



QAD Enterprise Applications

User Guide

QAD Data Warehouse Designer

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C H A P T E R 1

1. Overview

Traditionally data warehouses take too long to build and are too hard to change. QAD Data Warehouse Designer is an Integrated Development Environment to support the building and managing of data warehouses. It has the flexibility to enable you to build a variety of architectures including:

- enterprise data warehouses
- dimensional data warehouses
- data marts
- user facing views, aggregates and summaries

In all cases the core values of QAD Data Warehouse Designer are twofold: its rapid building capabilities that enable better data warehouses to be built, faster, and its integrated environment that simplifies management.

- As a data warehouse specific tool, QAD Data Warehouse Designer embodies a simple, pragmatic approach to building data warehouses. With QAD Data Warehouse Designer you specify what you want to achieve by dragging and dropping objects to create a meta view, and then let QAD Data Warehouse Designer do the heavy lifting of creating the necessary tables and procedures etc. Data warehouse wizards prompt for additional information at critical points to provide the maximum value from the generated objects.

Different data warehousing approaches including agile, prototyping and waterfall are supported by QAD Data Warehouse Designer. Agile developers will find specific functionality has been included to support common agile practices. For developers who are new to data warehousing, or are looking for a fast, pragmatic approach, QAD's Pragmatic Data Warehousing Methodology can be used.

The basic concepts behind QAD's Pragmatic Data Warehousing Methodology are:

- minimize the impact on the source systems
- centralize management within the data warehouse
- store transactional data at the lowest practical grain within the data warehouse
- snapshot, combine and rollup transactional tables to provide additional value
- utilize star schemas, views or cubes for end user access
- allow for incremental loads from day one
- use an iterative approach
- minimize cleansing and transformations to ease source system reconciliation
- design the data warehouse independently from the end user tool layer

QAD Data Warehouse Designer supports these concepts to facilitate very rapid delivery of data warehouses.

Data Flow - dimensional models

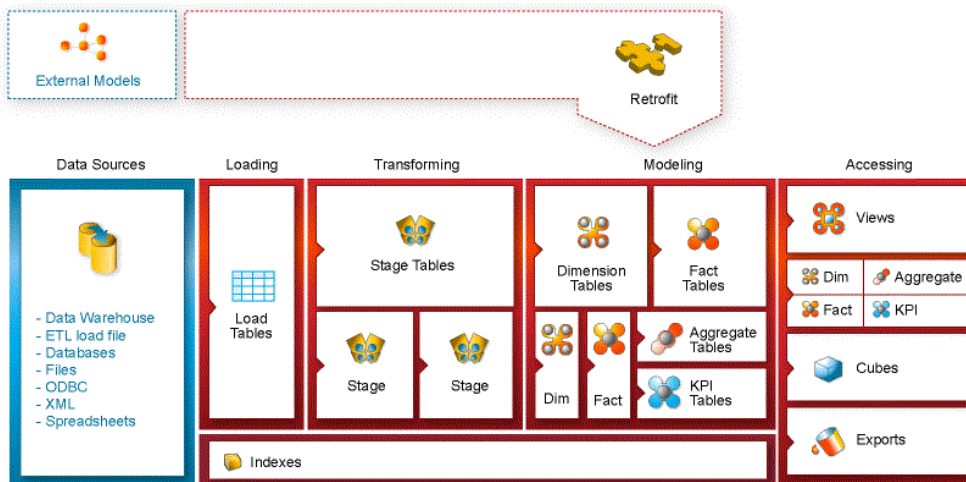
QAD Data Warehouse Designer controls the flow of data from the source systems through transforming and modelling layers to analysis areas. Different styles of data warehousing (normalized, dimensional etc) are supported and utilize different objects, but all follow the same basic flow. While some of these stages can be skipped, the expected flow for the common approaches are:

Data Flow - dimensional models

- 1 source (OLTP) system
- 2 load tables
- 3 stage tables
- 4 detailed (transactional) fact tables and dimensional tables
- 5 roll up fact table(s)
- 6 aggregate and/or KPI fact table(s)
- 7 views
- 8 Microsoft Analysis Services cubes
- 9 export objects

The diagram below shows the objects and the information flow:

OVERVIEW DIAGRAM: DIMENSIONAL

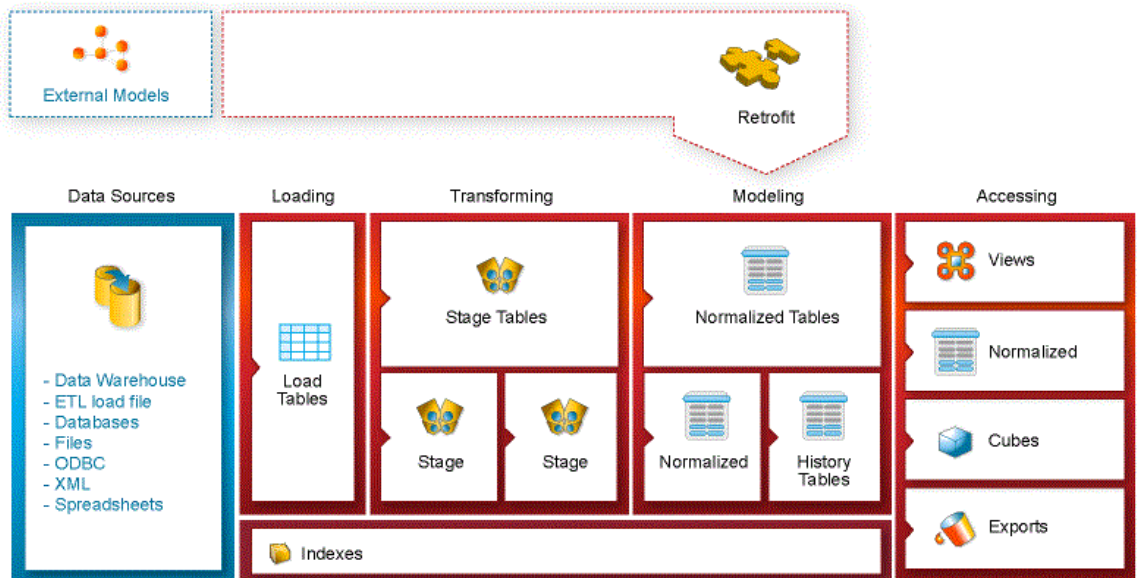


Data Flow - normalized models

- 1 source (OLTP) system
- 2 load tables
- 3 stage tables
- 4 normalized tables
- 5 history tables
- 6 views
- 7 Microsoft Analysis Services cubes
- 8 export objects

The diagram below shows the objects and the information flow:

OVERVIEW DIAGRAM: NORMALIZED

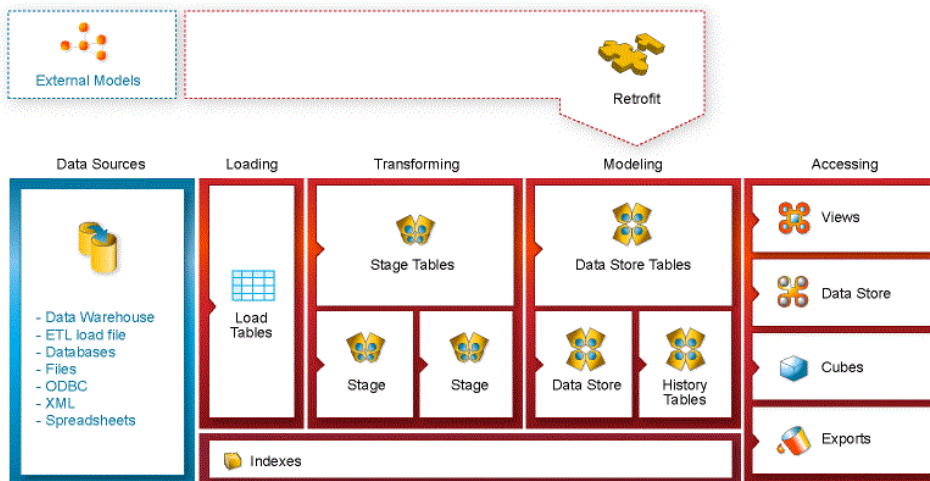


Data Flow - Data Store models

- 1 source (OLTP) system
- 2 load tables
- 3 stage tables
- 4 data store tables
- 5 history tables
- 6 views
- 7 Microsoft Analysis Services cubes
- 8 export objects

The diagram below shows the objects and the information flow:

OVERVIEW DIAGRAM: DATA STORE

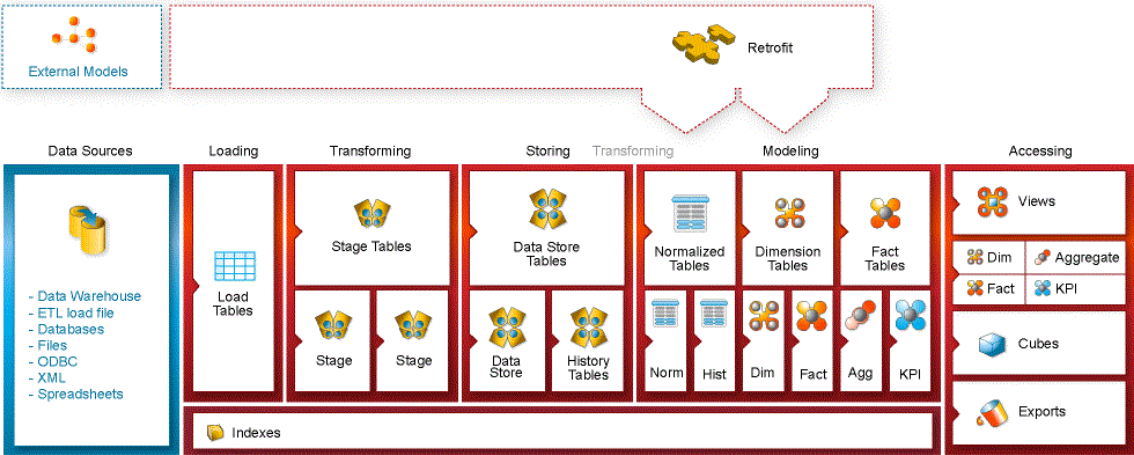


Data Flow - Enterprise models

- 1 source (OLTP) system
- 2 load tables
- 3 stage tables
- 4 data store tables
- 5 model tables, dimension tables, or detailed (transactional) fact tables
- 6 roll up fact table(s)
- 7 aggregate and/or KPI fact table(s)
- 8 views
- 9 export objects
- 10 Microsoft Analysis Services cubes

The diagram below shows the objects and the information flow:

OVERVIEW DIAGRAM: ENTERPRISE



Data Flow

Data is moved from source tables to load tables via scripts, database links and ODBC links. These load tables are created by dragging and dropping from a connection object. Load tables are generally based on source system tables. Their main purpose is to be a destination for moving data as simply and quickly as possible from the source system. Load tables will generally hold a single unit of data (e.g. last night or last month), and will be truncated at the start of each extract. Transformations can be performed on the columns during the load process if required.

Load tables feed stage tables, which in turn feed data store, model or dimension tables. Data from multiple load tables can be combined at this level.

First tier transactional tables (fact or model) are created and updated from stage tables. Second tier tables (model, summary rollup, aggregate, KPI etc) are created and updated from lower level tables.

Cubes can be created from transactional tables or views.

Procedural code

QAD Data Warehouse Designer generates procedural code in the target database's native language (e.g. PL/SQL for Oracle) at each stage in the data warehouse build process. The generated code is, in nearly all cases, sufficient to create a rapid prototype of the data warehouse.

While the generation of code is often seen as a key benefit of QAD Data Warehouse Designer, the ability to control and manage custom code is also critical to the long term management of the data warehouse environment.

In most cases 85-100% of the generated code will be taken through to production with no customization required.

Scheduler

The flow of data from the source systems to data warehouse tables is controlled and managed by the QAD Data Warehouse Designer scheduler. All generated code includes audit and error logging logic that is used by the scheduler.

The scheduler provides a single point of control for the warehouse. From the scheduler the state of all jobs can be ascertained. Any warning or error messages can be investigated, and should a problem occur the scheduler controls the restart of the job from the point of failure.

Documentation

Documenting the warehouse is often a task left until last, and in many cases done once (if at all!) and not kept up to date. QAD Data Warehouse Designer generates user and technical documentation, including diagrams, in HTML format.

Technical documentation includes copies of all current procedures.

User documentation includes a glossary of business terms available independently of any end user tool.

Where additional specific information needs to be included in the documentation, QAD Data Warehouse Designer supports the inclusion of custom HTML pages in the generated output. This means in many cases the entire documentation requirements can be managed from one location, and regenerated as changes occur.

QADData Warehouse Designer and Traditional ETL Tools

QAD Data Warehouse Designer's core strength is in the rapid building of data warehouse structures. Organizations that have already purchased traditional ETL tools can use QAD Data Warehouse Designer as a pureplay data warehouse toolset. QAD Data Warehouse Designer can be used to iteratively build data marts or presentation layer objects that need to be constantly updated to keep relevant for end users. In most cases customers will find that QAD Data Warehouse Designer has enough ETL capabilities to build the entire data warehouse, using the database rather than a proprietary engine to perform ETL processing.

The cross over in functionality between ETL tools and QAD Data Warehouse Designer is not large. QAD Data Warehouse Designer is tightly integrated into the data warehouse database and has an embedded data warehouse building approach. For QAD data movement is the start of the process - from source system to load tables. The key benefits of the product: development productivity and an integrated environment to manage and maintain your warehouse, come after the data movement stage. Where a traditional ETL tool is already in use, the output of the ETL process is a QAD Data Warehouse Designer's Load, Stage, Dimension, Fact or Model table from which QAD Data Warehouse Designer builds more advanced data warehouse structures.

CHAPTER 2

2. Design Introduction

Design Introduction

QAD Data Warehouse Designer can be used to build data warehouses based on any number of design philosophies from normalized enterprise data warehouses with consumer data marts through to federated or conformed star schema based warehouses. In the absence of another approach, the following methodology can be used for the design of data warehouses.

Note: This section can be skipped if you already have data warehouse design experience or a methodology you wish to utilize. It is meant to provide the novice designer with some tips for designing a data warehouse.

Design Approach

The concepts behind the QAD Pragmatic Data Warehouse Methodology are as follows:

- 1 Building an enterprise-wide data warehouse is a process - an evolution rather than a big bang. Start small and grow the warehouse in manageable chunks until all the pieces are in place. Once you reach that stage, changes and new source systems will continue the process.
- 2 You need to understand the big picture, but not get lost in it. Talk to all the various departments, business units and companies within the organization. Do so at a relatively high level and try to understand how the information from each area impacts or affects the others. Identify commonalities and areas where the same information is handled in different ways. This process should take days or weeks not months.
- 3 Identify the high value, high return and possibly easiest areas of the business. Drill down in these areas and break down the workload into small manageable chunks of work, for example, one to two analysis areas. Agree on the first component of the data warehouse and do that.
- 4 Get an understanding of the source system for this first component or analysis area. If possible, get an entity relationship diagram and talk to the people who built or support the application. Identify the tables that contain the key information you will need. The goal is a quick and initial view, a detailed specification is not required.
- 5 Design the first component. This design should be a first draft, and can be written rather than using a design tool. Remember at this stage what the end users want is not really known, so don't set the design in concrete, or spend a large amount of time in this area.

Note: Experienced users of QAD Data Warehouse Designer will often dispense with a design and go straight to building a prototype.

- 6 Build a prototype. In most cases this should not take more than one or two weeks - experienced QAD Data Warehouse Designer developers can expect to build prototypes in hours or days. Concentrate on the detailed and descriptive data, unless you have a clear picture of the summarized requirements. Do as much as possible in terms of validating the data back to the source system. If dealing with a large or complex source system then only deliver a segment in this prototype, e.g, one branch, one store, one product group, etc. Keep It Simple.

- 7** Demonstrate the prototype to a group of the key users. Then drill down to a subset of key users (we recommend no more than three) who will help you go forward with the design. If possible give these users access to the prototype and get them using the data. Stress that data accuracy is not the issue at this stage, rather the look and feel.
- 8** Enhance the prototype with the feedback provided by the users. Again a quick process. If complicated requirements evolve then create a plan to implement, doing the highest value parts first. The goal is to get quick buy in and support from the two or three key users.
- 9** Provide key users access to the reworked prototype and get them using the data. Have them define the business names for all the measures and attributes, and to define any pre-calculated measures that they frequently use. Get them to define the hierarchies in the data. Ascertain the commonly utilized queries and reports, and see if there would be a better way of presenting these.
- 10** From the user feedback look at the need or possibility of using higher level fact tables, such as summaries, aggregates, snapshot or composite rollup tables.

The concepts and methodologies for designing and building a data warehouse are beyond the scope of this manual. It is assumed that the reader understands the basic concepts of a data warehouse, and is familiar with modelling, normalized, star and snowflake schemas, dimensions, fact tables, etc. Refer to the QAD web site for a basic overview of data warehouse design if required.

CHAPTER 3

3. Objects and Windows

QAD Data Warehouse Designer makes use of an object concept when dealing with the different components that make up a data warehouse solution. The main object types are: Connection, Load Table, Dimension, Stage Table, Fact Table, Aggregate, Cube, Procedure, Host Script, Index, Export and Retro Copy.

This chapter explains and provides an overview of each of these object types and how they can be managed and organized. The full functionality of each object is covered in the following chapters.

The various Windows, Panes and Views that form the QAD Data Warehouse Designer tool are also explained.

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3.1 Object Types

QAD Data Warehouse Designer has a concept of objects which are combined to create real world data warehouses and data marts, fast. Each QAD Data Warehouse Designer object has properties that allow the data warehouse developer to change how the object is used.

Note: Some object types may not be available for certain types of QAD Data Warehouse Designer licenses.

QAD Data Warehouse Designer objects include:

Object Type	Purpose
Connection 	Connections define the path to external objects such as source data. Examples of connection object types are databases, analysis services cubes, operating systems or ODBC sources. Connections isolate environments simplifying, for example, the promotion of code between development and production.

Object Type	Purpose
Load Table 	<p>Load tables are the first entry point of data into the data repository, and typically hold the latest set of change data. These objects contain their definition. Load tables can be defined as database link, odbc, external, file, script or XML. Based on their definition they will, for example, run a predefined script or create a load script at run time. Pre load actions (e.g. truncate) or post load procedures can be defined as part of a load object. In addition, transformations (either during or after the load) can be defined against columns in a load table.</p>
Dimension 	<p>Dimension tables are the constraining elements in the star schema design, and are defined by this object type. QAD Data Warehouse Designer will automatically generate procedural code for the three standard types of slowly changing dimensions, as well as date ranged dimensions (where the current version is defined by an external system). QAD Data Warehouse Designer also ships with a standard time dimension which can of course be extended. Dimensions can also be defined as mapping or work tables which do not appear in the generated user documentation.</p>
Dimension View 	<p>A dimension view is a database view of a dimension table. It may be a full or partial view. A common usage is to create views where multiple date dimensions exist for one fact table. Other types of views supported by QAD Data Warehouse Designer include fact views, other table views, work views and user defined views.</p>
Stage Table 	<p>Stage tables are used in the transformation of raw data into model or star schema format. They typically hold only the latest set of change data. As well as custom procedures, QAD Data Warehouse Designer can generate different types of procedural code based on the complexity and size of the dataset and performance requirements. Examples of procedural types that can be generated are cursor, sorted cursor, set, set + cursor or set merge procedural code. A stage table can also be defined as a work table, which has the same properties as a stage table but does not appear in the generated user documentation.</p>
Normalized Table 	<p>A normalized table is a data warehouse object used to build third normal form enterprise data warehouses. In QAD Data Warehouse Designer, normalized objects have many of the code generating attributes of stage, dimension and fact tables. Third normal form enterprise data warehouses can be thought of as a source system for star schema data marts. Alternatively, they may be reported off directly by users and reporting tools.</p>
Data Store Table 	<p>A Data Store Table is a data warehouse object used to store any type of data for later processing. In QAD Data Warehouse Designer, Data Store objects have many of the code generating attributes of stage, dimension and fact tables. Data objects can be thought of as a source system for the data warehouse. Alternatively they may be reported off directly by users and reporting tools. Data Store Objects can be considered either reference or transactional in nature.</p>

Object Type	Purpose
Fact Table 	Fact tables are the central table in a star schema design. This object type allows the definition of fact tables. They support transactional, rollup, snapshot or partitioned (detail, rollup or exchange) fact tables. Changing a fact table's properties to partitioned will start a partitioning wizard that prompts for required information.
Kpi Fact Table 	This object type supports a special type of fact table. A mandatory KPI (Key Performance Indicator) dimension provides a set of KPIs which are stored and maintained by this object type.
Aggregate 	The aggregate object type provides a means to speed up access by summarizing data to a higher grain. For dimensional models a rollup of the fact data will allow removal of dimensions that are no longer valid.
OLAP Cube 	The OLAP Cube object type uses Analysis Services cubes to deliver OLAP functionality in QAD Data Warehouse Designer. A cube is a set of related measures and dimensions that is used to analyze data from a variety of different front end tools. OLAP Cubes are built from fact objects and aggregate objects in QAD Data Warehouse Designer.
OLAP Dimension 	An OLAP Dimension is built by QAD Data Warehouse Designer for every dimension table associated with the fact (or aggregate) table the OLAP Cube is derived from. OLAP Dimensions are shared across one or more OLAP Cubes. In analysis services, a dimension is a group of attributes that represent an area of interest related to the measures in the cube and which are used to analyze the measures in the cube.
Procedure 	The procedure object type is used to define and hold database stored procedures. As such it may contain functions, procedures and packages that are generated, modified or custom developed.
Host script 	Host script objects are either Windows or Unix scripts. These scripts are maintained within the QAD Data Warehouse Designer environment and can be scheduled to run in their host environments.
Index 	This object type defines database indexes used to improve the access times on any of the table object types (i.e. Load, Stage, Dimension, Fact, Kpi Fact and Aggregate).

Object Type	Purpose
Export 	Exports are used to manage exports from the data repository. In essence, exports are the reverse of load tables, taking data from a table to a flat file.
Retro 	Retros are used to load predefined data models from modelling tools and to retrofit existing tables into the QAD Data Warehouse Designer metadata.
Retro Copy 	Retro Copies are used to retrofit existing data warehouses into the QAD Data Warehouse Designer metadata and to transfer data from the existing data warehouse to the new data warehouse.
Template 	Template objects are used in Version 4 of QAD Data Warehouse Designer to provide example code.

Connections are normally the first objects created. These connections are then used in the creation of load tables through the drag and drop functionality. Subsequent objects can also be created through the use of drag and drop.

It should be noted that although the object types have names that correspond with their primary usage, they can be used for other purposes. For example, the fact object type could be used to create persistent stage tables if required.

Some objects are not supported by all databases, and some advanced properties are specific to the different databases.

3.3 Organizing Objects

As mentioned in the previous section there are many object types in QAD Data Warehouse Designer.

The objects in the metadata repository are displayed in the left hand pane of the Browser window. They are displayed in a tree structure which can be expanded and closed as required. The tree can be refreshed by using the F5 or Ctrl/R key.

Object Groups

The objects created in QAD Data Warehouse Designer are grouped together based on object type into object groups. For example we store all the dimension objects in the **Dimension object group**. Optionally we can choose to display dimension tables as the **Dimension** object group and dimension views as the **Dimension View** object group

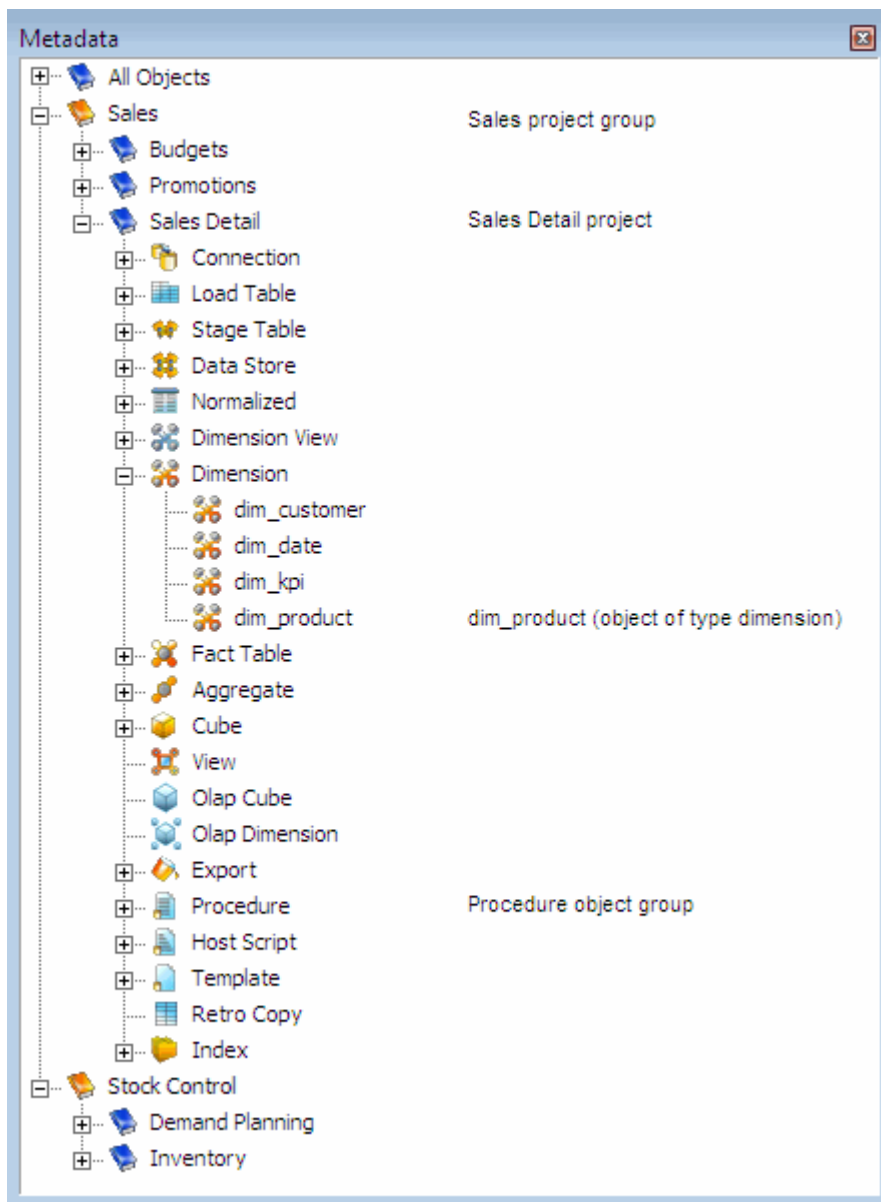
Projects

These object groups are in turn stored within **projects**. When QAD Data Warehouse Designer is first started the special project called **All Objects** is the only project. This project will always contain all the objects that exist in the metadata repository. Additional projects can be created if desired. These additional projects can hold some or all of the objects as seen in **All Objects**. An object as such only exists once in the metadata. Therefore if we have a dimension object called `dim_product`, there is and can only be one copy of the object `dim_product` within the metadata.

Projects are used to hold a group of objects that relate back to a similar module or analysis area of the data warehouse. In the example below we have additional projects called Budgets, Promotions, Sales Detail, Demand Planning and Inventory. In this way projects allow us to restrict the amount of information (objects) we need to deal with to just those relevant to the area being worked on.

Projects can also be used to group objects for an upcoming code promote.

The example below shows a meta repository using two project groups (Sales and Stock Control) and five additional projects (Budgets, Promotions, Sales Detail, Demand Planning and Inventory).



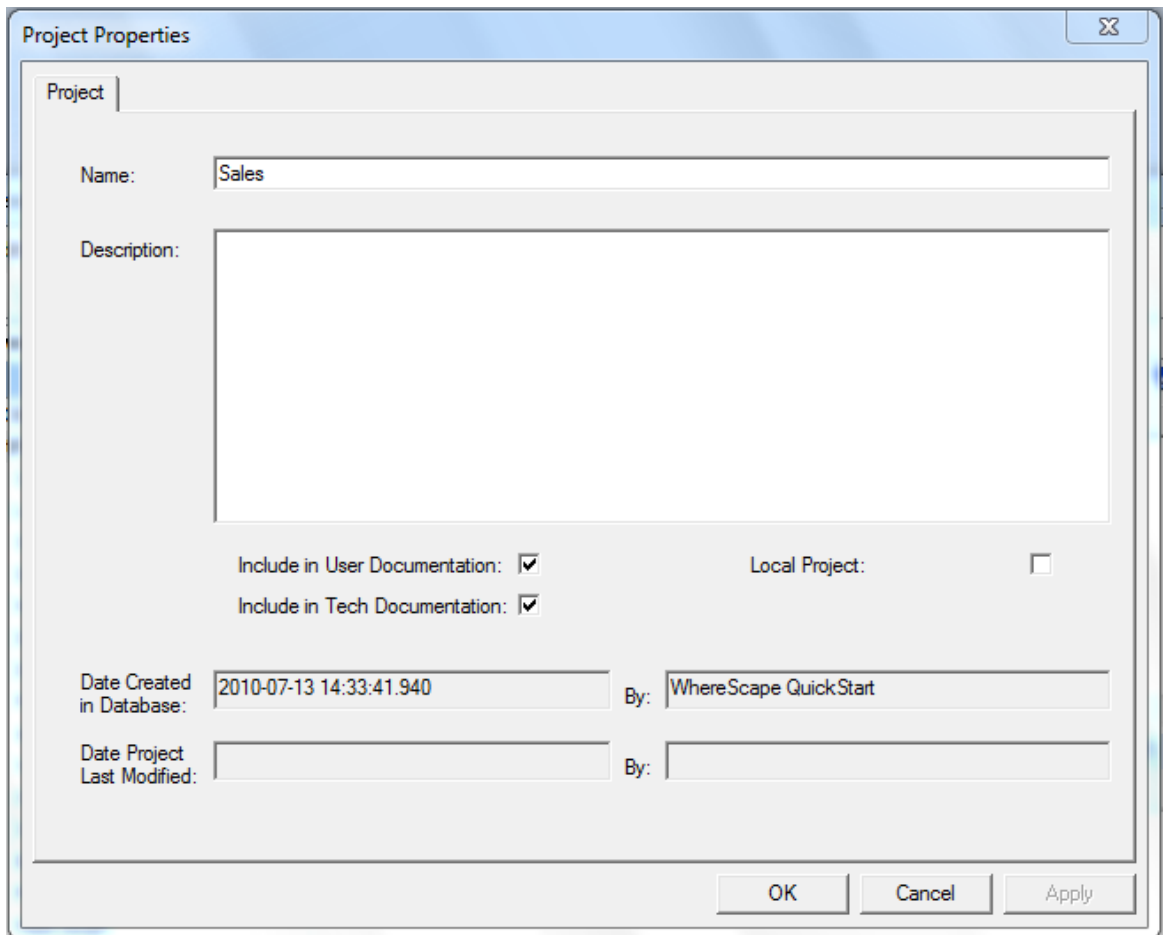
Note: If you delete an object using the right mouse menu, then the object will be deleted from the metadata and will be removed from all Projects. Remove the object from the project instead of deleting it.

It is important to understand that these projects are only a means of visualizing the objects. Even though an object may appear in many projects, it only exists *once* in the metadata.

To create a project, right click in the left pane below the last project and select 'New Project'.

The File / New Project menu option may also be used. Projects can be renamed, removed from the project group or deleted by using the right mouse menu when positioned on the project name. Deleting a project does not delete the objects from the metadata, it simply removes their reference in the project being deleted.

To view or make changes to the Project's Properties; right mouse when positioned on the project name and select 'Project properties'. The following screen shows three check boxes.



The screenshot shows a 'Project Properties' dialog box with a 'Project' tab. The 'Name' field contains 'Sales'. The 'Description' field is empty. There are three checkboxes: 'Include in User Documentation' (checked), 'Include in Tech Documentation' (checked), and 'Local Project' (unchecked). The 'Date Created in Database' field shows '2010-07-13 14:33:41.940' and the 'By' field shows 'WhereScape QuickStart'. The 'Date Project Last Modified' and 'By' fields are empty. At the bottom are 'OK', 'Cancel', and 'Apply' buttons.

Project	
Name:	Sales
Description:	
Include in User Documentation:	☒
Include in Tech Documentation:	☒
Local Project:	☐
Date Created in Database:	2010-07-13 14:33:41.940
By:	WhereScape QuickStart
Date Project Last Modified:	
By:	
OK Cancel Apply	

Include in User Documentation

When checked, the project will be included in the User Documentation. The default state is checked.

Include in Tech Documentation

When checked, the project will be included in the Technical Documentation. The default state is checked.

Local Project

When checked as local, the project will not be included in the Application files. The default state is unchecked.

Project Groups

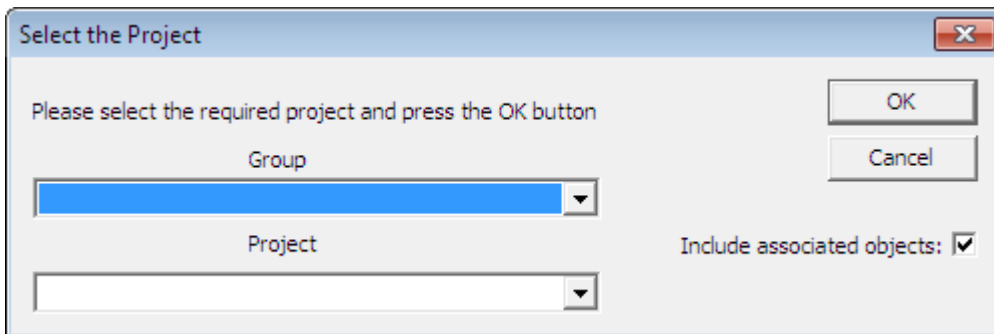
Projects can in turn be grouped together into Groups. A project must only appear in one Project Group. To create a Project Group use the **File / New Group** menu option. Project Groups can be removed by using the right mouse menu when positioned on a group name.

3.3.1 Adding Objects to Projects

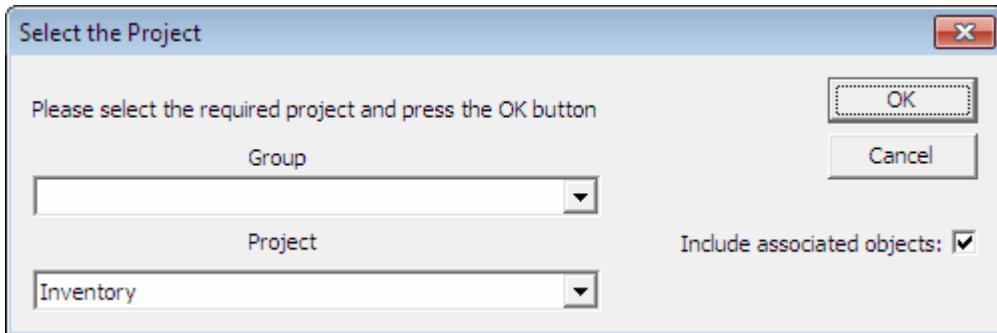
There are several different ways to add objects to a project:

- Click an object in the left hand pane, type **Ctrl/C**, click the target project (either the project folder or any object group or object within it) and type **Ctrl/V**
- Drag the object to the required project
- Right click on an object in the left hand pane and choose **Add to Project**
- Highlight a number of objects in the middle pane, right click and choose **Add to Project**
- **Using the Project/Object Maintenance Facility** (see "3.3.3 Using the Project/Object Maintenance Facility" on page 20)

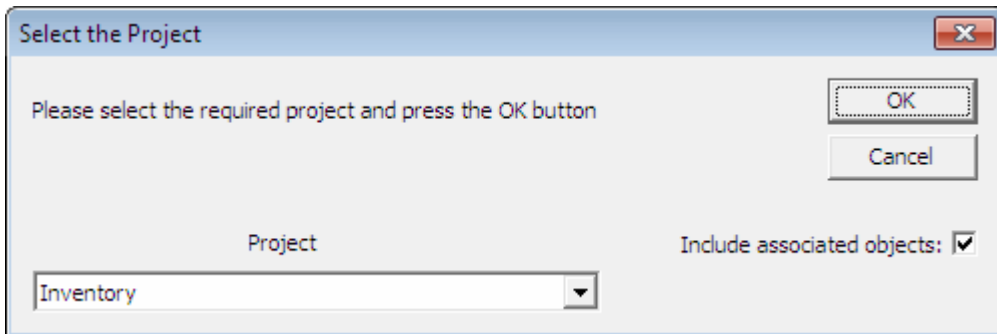
Both options above that use the right click **Add to Project** menu result in the following dialog box being displayed:



To add an object to an independent project (a project that is not in a group), choose the required project from the project drop down list and click OK:

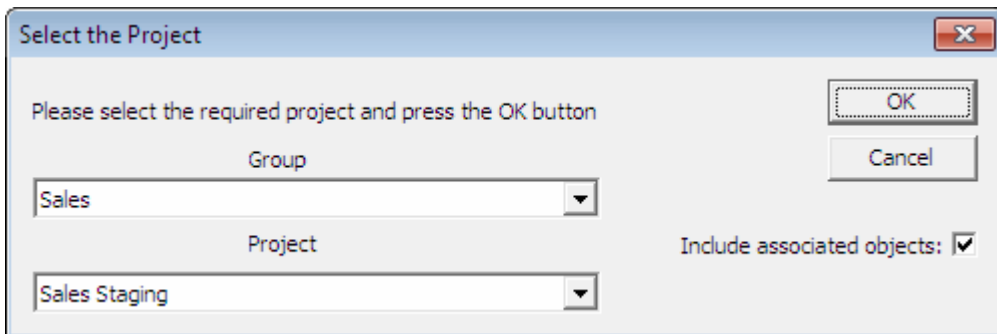


If Groups have been created, both drop down lists will be visible. If Groups have not been created, only the project drop down will be visible like this:



To add an object to a dependent project:

- 1 Choose the required group from the group drop down list
- 2 Choose the required project from the project drop down list
- 3 Click OK



Note: The Include associated objects check box on the above dialog boxes, will also add any indexes, procedures and scripts to the selected project.

3.3.2 Removing Objects from Projects

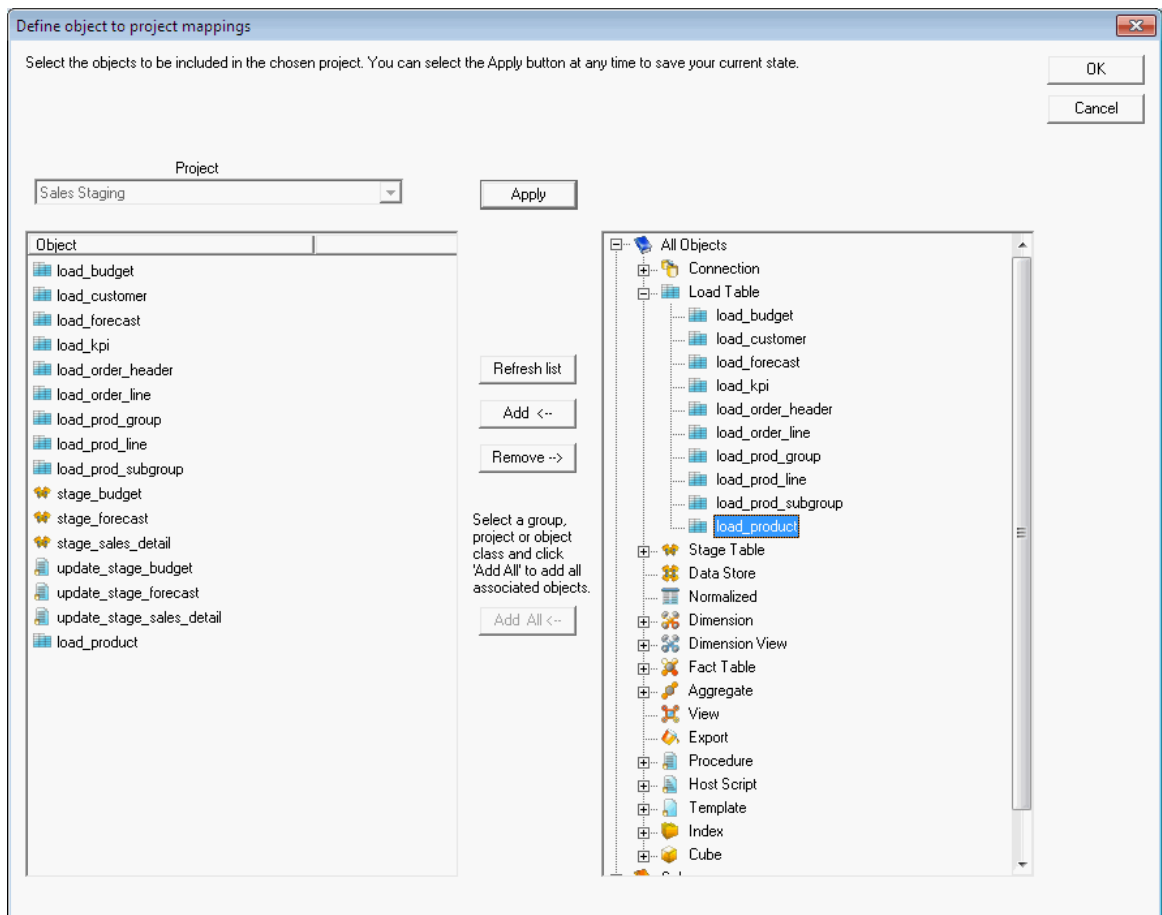
There are several different ways to remove objects from a project:

- Drag the object to the blank area at the bottom of the pane
- Drag the object into the middle pane
- Drag the object to the 'All Objects' project
- Right click on an object in the left hand pane and choose Remove from Project
- Highlight a number of objects in the middle pane, right click and choose Remove from Project
- **Using the Project/Object Maintenance Facility** (see "3.3.3 Using the Project/Object Maintenance Facility" on page 20)

3.3.3 Using the Project/Object Maintenance Facility

The Project/Object Maintenance Facility is invoked by right clicking on a project and choosing Project object maintenance.

This displays the following dialog:



To add objects to a project, move objects from the right to the left using the **Add** button or **Add All** button. By default, associated object (procedures, scripts and indexes) are also moved to the left. These can be manually removed if not required.

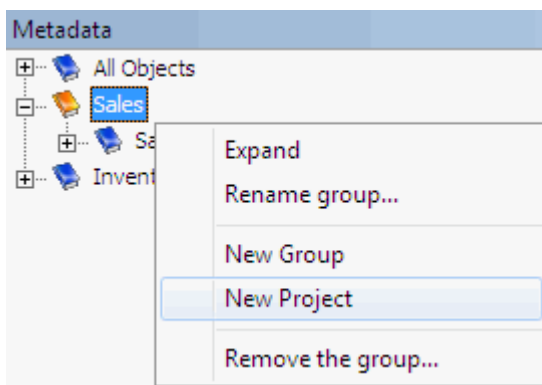
To remove objects from a project, move objects from the left to the right using the **Remove** button.

When done, click **OK**.

Clicking **Apply** will update object/project relationships without having to exit the Project/Object Maintenance Facility. Then clicking **Refresh** will refresh the object tree on the right hand side.

3.3.4 Adding Projects to Groups

The best way to move a project into a group is to create the project in the group in the first place. This is done by creating a new project using the right click **New Project** option while on the group:



The other option is to move an existing project from another group into this group. See **Moving Projects within Groups** (see "3.3.6 Moving Projects within Groups" on page 22)

3.3.5 Removing Projects from Groups

A project can be removed from a group by:

- Dragging the project to the blank area at the bottom of the pane
- Dragging the project into the middle pane
- Dragging the project to the 'All Objects' project
- Removing the project using right click **Remove Project from Group**
- Deleting the project using right click **Delete Project**

Note: The first four methods move the project out from the group to become an independent project. The last option removes the project from the metadata repository.

3.3.6 Moving Projects within Groups

Note: An object can be in any number of projects, but a project can only be in one Group.

Performing a drag from one group to another group will simply create an additional project->group mapping.

To move a project from one group to another group:

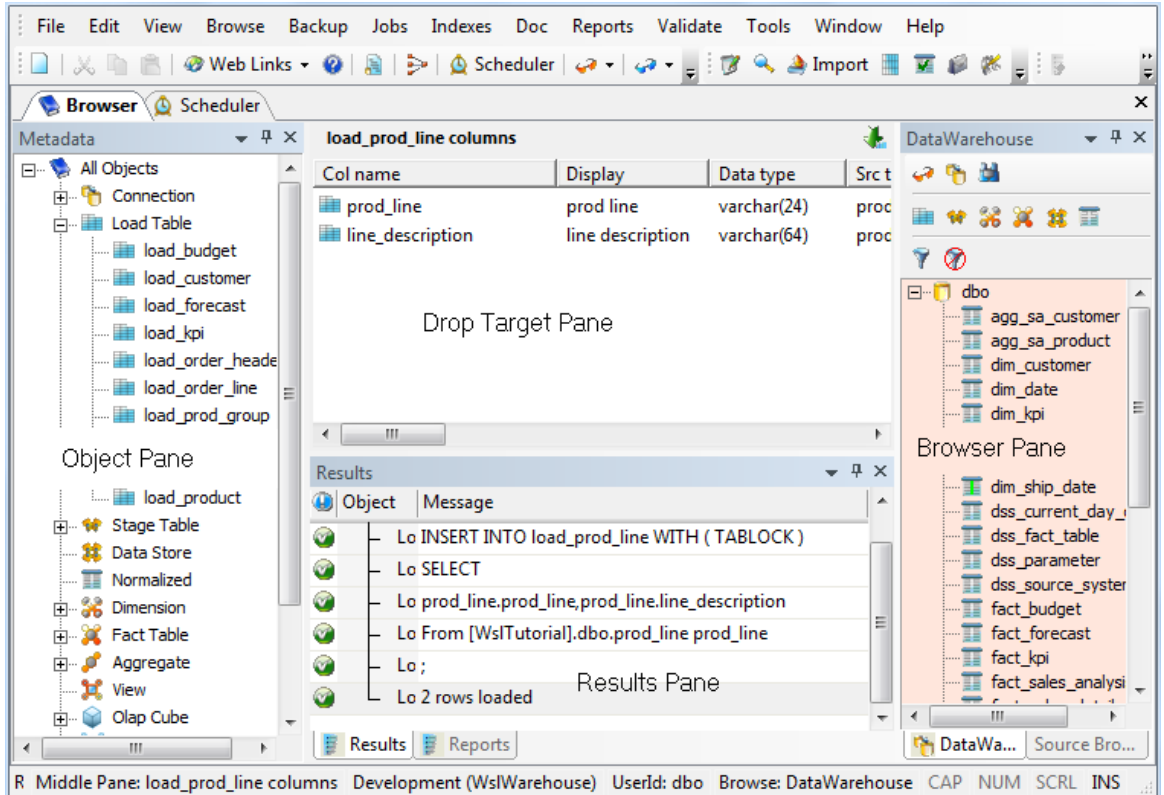
- 1** 'Copy' the project by dragging the project from the one group to the other group.
- 2** Remove the project from the original group by right clicking and selecting **Remove Project from Group**.

3.4 Windows and Panes

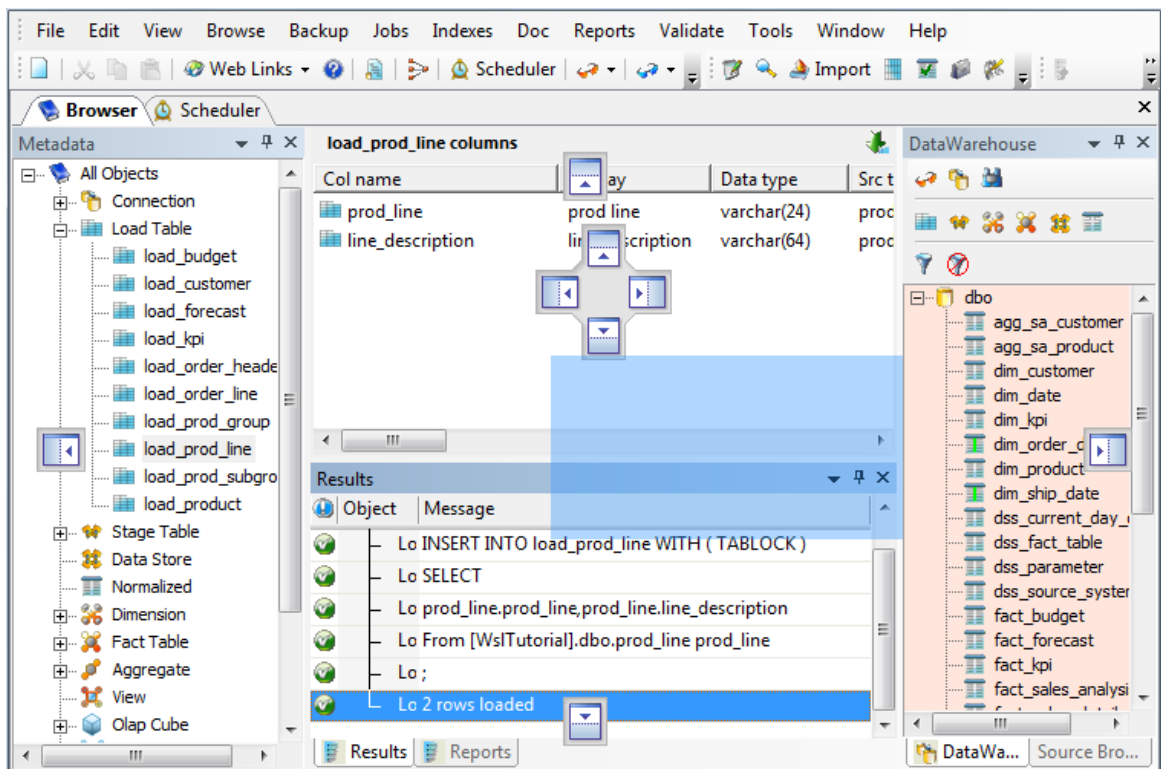
QAD Data Warehouse Designer has a number of different windows that are utilized in the building and maintenance of a data warehouse. Each window may in some cases be broken into panes. There are four main windows that are used extensively in the building of a data warehouse. These are the Browser window, the Scheduler window, the Diagrammatical window and the Procedure Editor window.

3.4.1 Main Browser Window

The following graphic is a snapshot of the main standard **Browser Window**. This window typically has three active panes.



The left, bottom and right panes can be dragged out of its docking place and docked elsewhere. Docking handles appear when a pane is dragged.



The left most pane contains all the objects within the metadata repository. These objects are stored in object groups (e.g. Dimension). The object groups are in turn optionally stored in Projects, and the Projects are optionally stored within Project Groups.

The middle pane is used to show the results of various queries on both the metadata and the underlying source and database tables. The middle pane is also used as the drop target in drag and drop operations. The status line at the bottom of the screen displays the current contents of the middle pane.

The right hand pane is the browser pane and it shows source systems. There are two browser panes available at any one time. This source may be the data warehouse itself. Typically this pane is used as the source of information in the drag and drop operations. The status line at the bottom of the screen displays the connection used in this right hand pane.

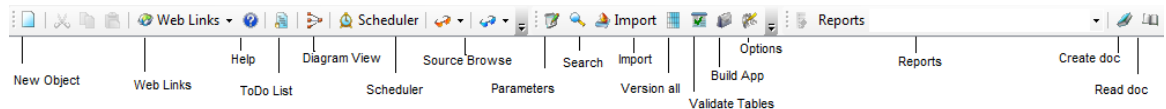
The bottom pane is the results pane. It shows the results of any command executed in the tool. The messages are related to an object, multiple messages can show as a result of a command executed for an object. Expand the '+' sign next to an object to see a complete list of messages relating to an object. When a report is run from the main menu, the results are displayed in a separate tab in the bottom pane.

Pop-up menus are available in all four panes.

F5 or Ctrl/R can be used to refresh the left and right hand panes, when the cursor is positioned within these panes.

Toolbar

The browser toolbar is shown below:



The **diagrammatical view** button (diagram view) switches to the diagrammatical window. This window allows the representation and printing of star schema and track back diagrams.

The **scheduler** button switches to the scheduler control window.

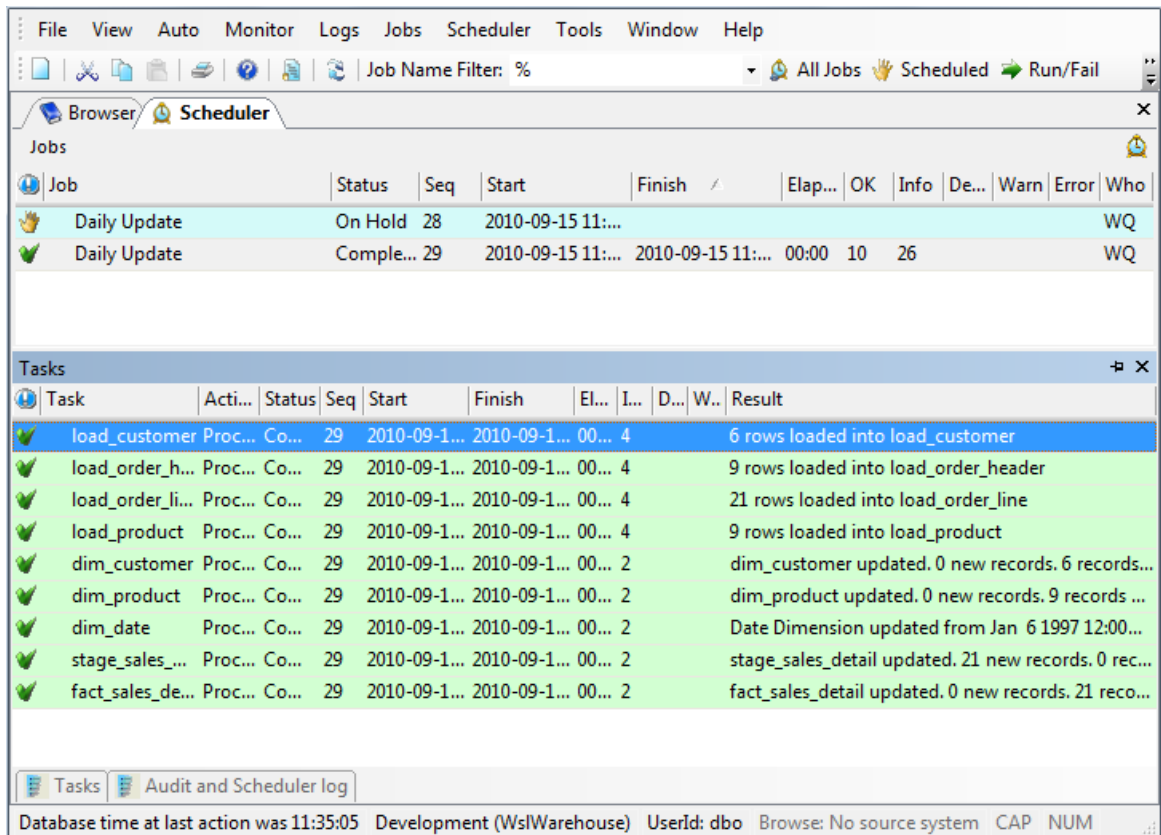
The **two source browse** buttons (one orange and one blue) allow a quick method of invoking the source browser which populates the 'Browser pane'. Each of the two browse buttons, when chosen, browses to the connection last used for that button. To change the connection being browsed click the down arrow beside the glasses icon.

The **Web Links** button brings up the online QAD forum in a new tab. To select or enter other web links, click the down arrow beside the Web Links button.

3.4.2 Scheduler window

The Scheduler window is used as the main interface to the scheduler. Jobs can be scheduled, monitored, edited and deleted through this window. The window consists of three panes. The toolbar provides a quick way to display various job selections in the top pane. Other jobs can be displayed through the Jobs menu. Double click on the job in the middle pane to see the tasks of the selected job. Double click on the task to see the audit trail in the bottom pane.

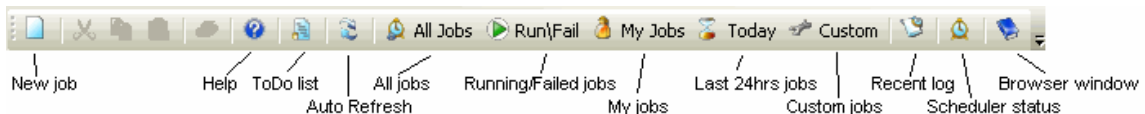
The following is an example of the Scheduler window:



The various options and displays are covered in the Scheduler chapter.

Toolbar

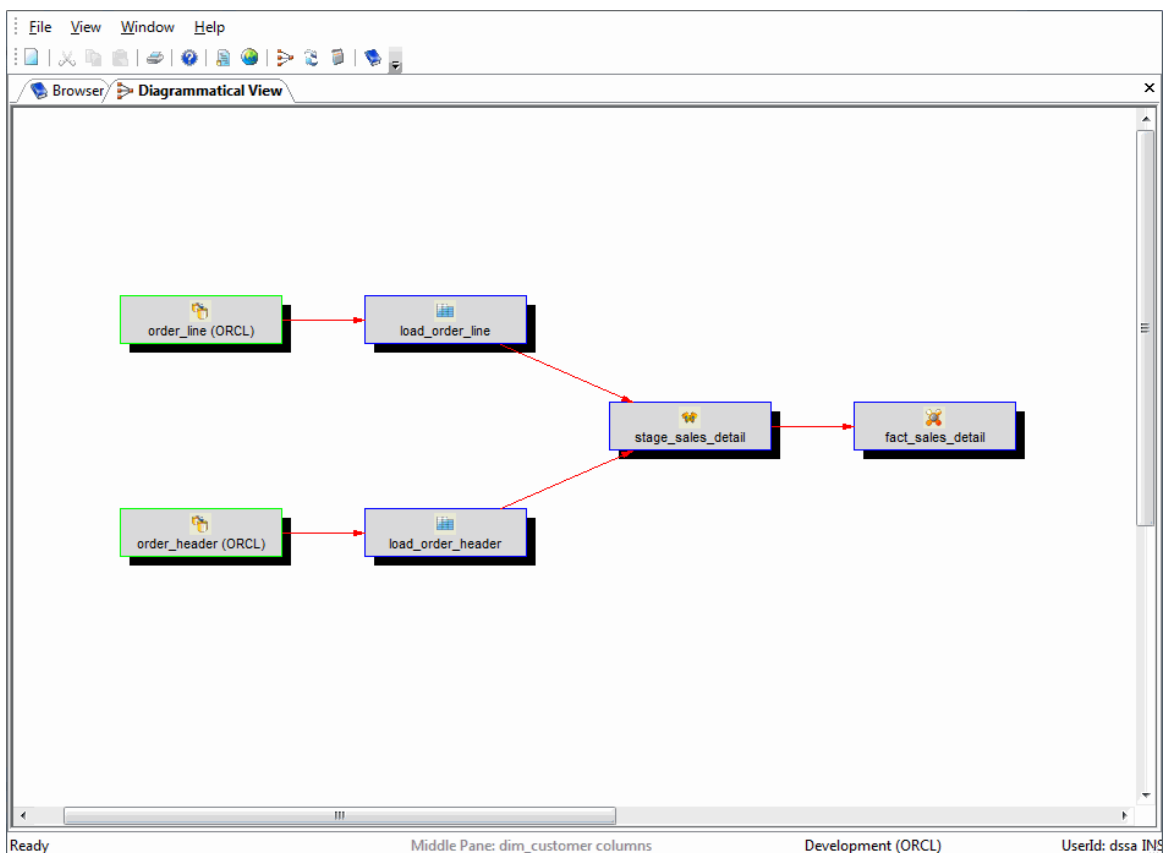
The scheduler toolbar is shown below:



The new job button invokes the dialog to create a new scheduled job. The browser window button switches back to the main browser window. The auto refresh button, when depressed, will result in a refresh of the current (right pane) display every 10 seconds. Click the button again to stop the auto refresh. The refresh interval can be adjusted through the menu option Auto/Refresh interval. Quick access to different categories of jobs are also available via the toolbar.

3.4.3 Diagrammatical window

The Diagrammatical view window is used to display the tables of the data warehouse in diagrammatical form. For fact and aggregate tables a star schema diagram can be produced. For all table types a track back or track forward diagram can be displayed showing the various sources or targets of information that went into the makeup of the chosen table. The following is an example of a track back diagram in the Diagrammatical window:



Toolbar

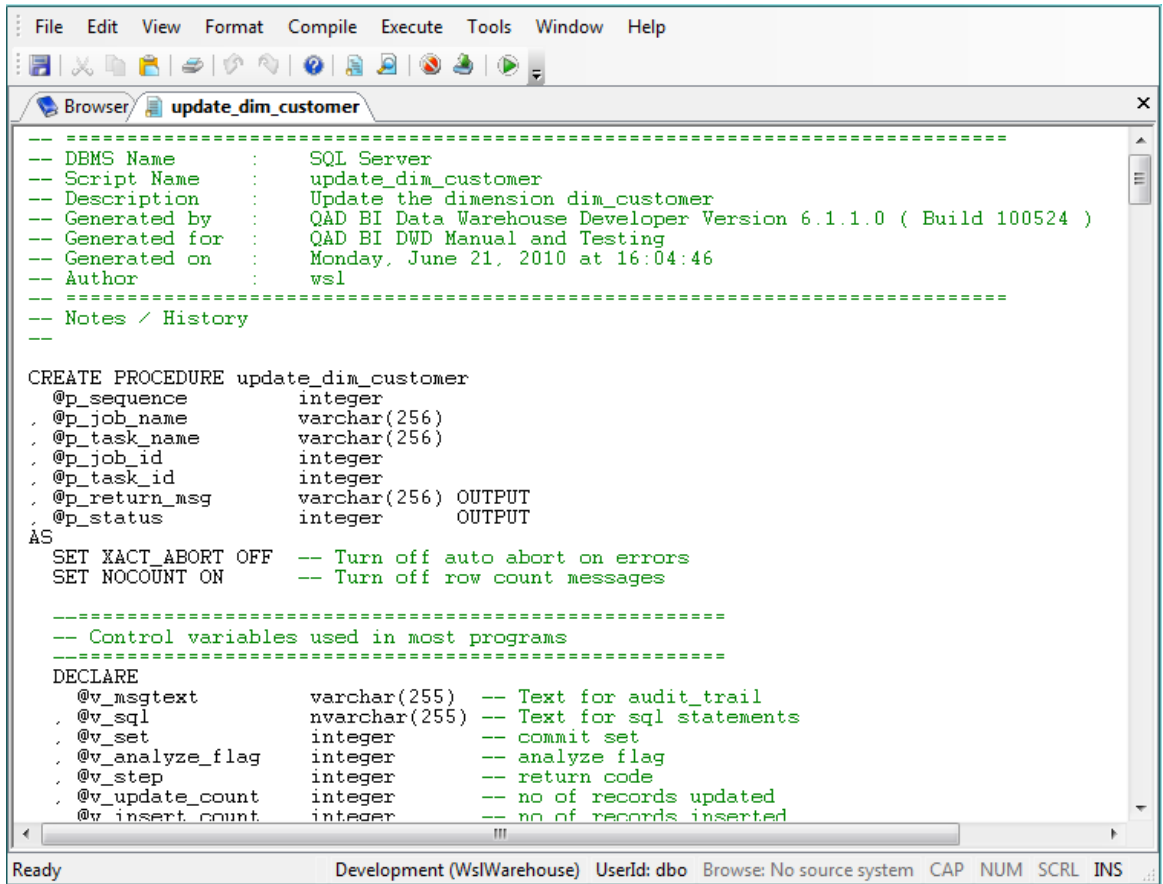
The diagrammatical toolbar is shown below:



The new diagram buttons provide a dialog to allow the selection of the diagram type and table. The overview button provides a diagram showing the various objects in the QAD metadata and the standard flow of data through these objects. Repeated clicking of the overview button will step through each stage of the data flow. The toggle button switches between display only diagrams and a printable variant. When the printable variation of a diagram is displayed the grid button will toggle the display of grid lines. The browser button switches back to the main browser window.

3.4.4 Procedure Editor window

The procedure editor window provides a means of viewing, editing, compiling, comparing and running procedures. Multiple such windows can be open at any one time, each processing a different procedure. An example of the procedure editor window is as follows:

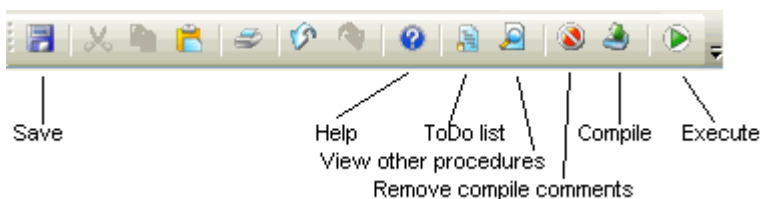


Comments (identified by a leading double dash --) are displayed in green in this window and the procedural code in black. The font by default is a fixed pitch font to make the indentation and alignment of code easier to view. The font, colors and indent size can all be changed if desired.

See the Procedures and Scripts chapter for more information on the procedure editor.

Toolbar

The procedure editor toolbar is shown below:



The save button will write the procedure to the QAD metadata repository in the database. The view other procedures button allows the concurrent viewing of older versions of the current procedure, other procedures in the metadata, compiled procedures in the database and templates. The compile button will attempt to compile the procedure. Once compiled the procedure is stored within the database as well as in the metadata. For Oracle data warehouses, if a procedure fails to compile it is flagged as invalid within the database. The execute button will run a procedure that conforms to the QAD parameter syntax. See the chapter on procedures for more details.

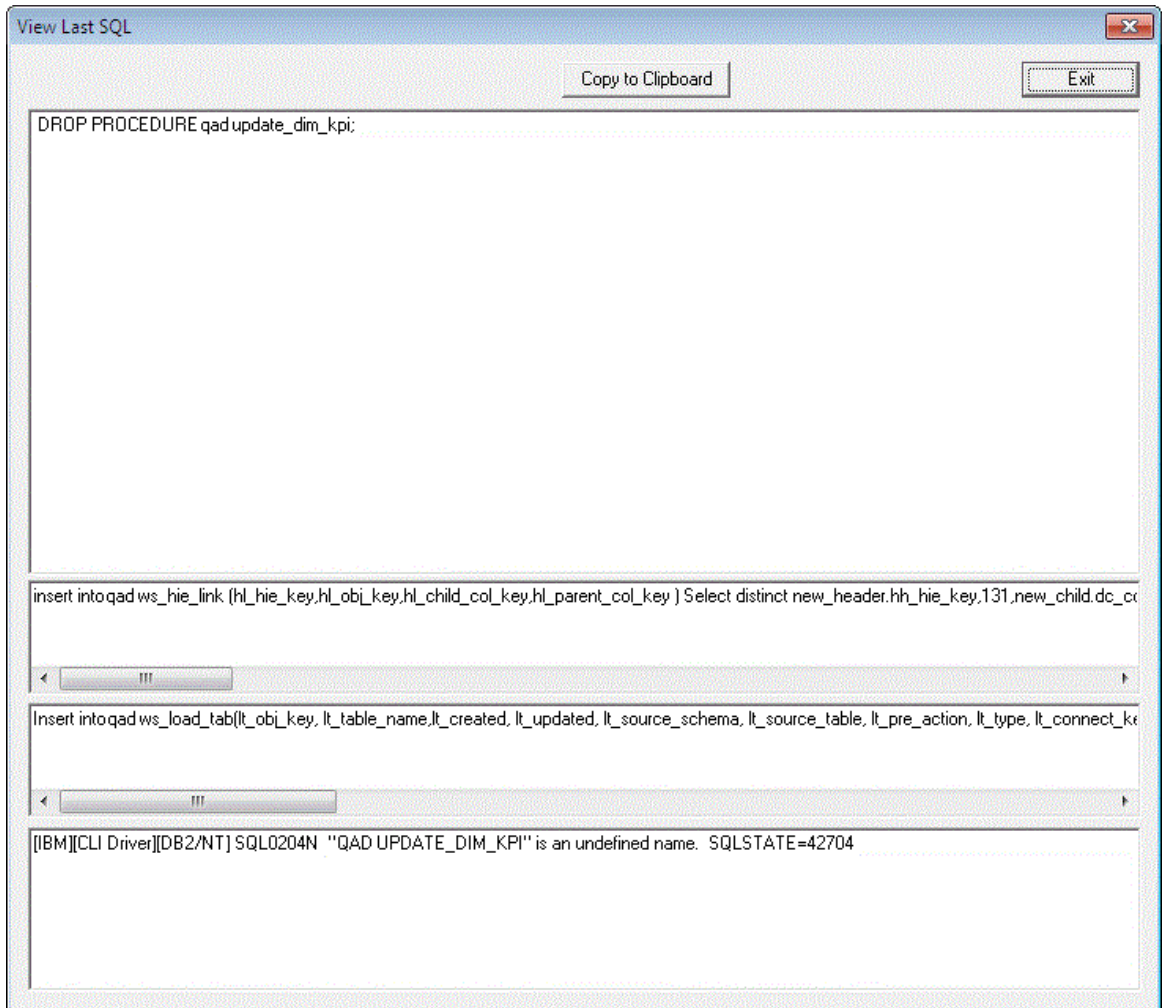
3.5 Database Error Messages

From time to time a SQL error may be raised by QAD Data Warehouse Designer.

These are usually caused by the data warehouse database returning an error.

There are many causes of database error messages being returned to Data Warehouse Designer. The most common include permission issues and invalid SQL statements being run.

To find the exact SQL statement run by QAD Data Warehouse Designer, go to the **View** menu and choose **Last SQL**. The following dialog box will be displayed:



The four fields shown are:

- The last SQL statement run
- The second to last SQL statement run
- The third to last SQL statement run
- The error message (if any) from the last SQL statement

In the example above, we have tried to drop a procedure that does not exist. IBM DB2 returned an error telling us Data Warehouse Designer.UPDATE_DIM_KPI does not exist in the database.

C H A P T E R 4

4. Tutorials

The QAD Data Warehouse Designer tutorials are located in the QAD Data Warehouse Designer Tutorial Help.

CHAPTER 5

5. Settings and Parameters

This chapter describes the settings and default values that can be made for a metadata repository. The concept of parameters is also covered. Parameters are the methodology used in the QAD Data Warehouse Designer tool set to allow communication between QAD Data Warehouse Designer and the various procedures.

In This Chapter

5.1 Default Settings.....	35
5.2 Parameters.....	64

5.1 Default Settings

This chapter describes how to set the default behavior and naming standards in QAD Data Warehouse Designer. The following defaults are covered:

- Repository Attributes and Options
- Object Options
- Table, Index and Key Name Defaults
- Procedure Naming Defaults
- Tablespace and Filegroup Defaults
- Ancillary Table and Column Defaults
- Icon Settings
- Documentation Settings
- Statistic Settings

QAD Data Warehouse Designer makes use of two metadata tables and a number of columns to assist in the development and operation of the data warehouse. These tables and columns are discussed along with the options for their use and the changing of the default values.

5.1.1 Settings - Repository Attributes and Options

The attributes of a Repository may be viewed and altered via the Tools / Options menu option. The repository name and type of repository can be set. The schema id will have been set during the repository creation and should not be changed.

Options

Repository Objects Naming (Local) Naming (Global) Procedure Filegroup Ancillary Icons Documentation Languages

Repository name:

Repository type:

Data Warehouse schema:

Dim Views visualized as a separate object group: ☐

Trace all Unix sessions (this session only): ☐

Remove shadows from star/track back diagrams: ☐

Put call to WsWrkTask in generated procedures: ☐

Prompt for index regeneration on procedure rebuild: ☐

Look and Feel Settings

Object Tree Color:

Browse Color:

Look and Feel style:

Window Tabs located at top of screen: ☒

Scheduler result line colors enabled: ☒

Reset all Look and Feel settings

Override path for backup executable. (i.e. bcp)

Override path for restore executable. (i.e. bcp)

SSIS Version:

Versioning

Automated Version Creation

--> on Table Delete: ☒ --> on Table Alter/Create: ☒

--> on Procedure Delete: ☒ --> on Procedure Compile: ☒

--> on Script Delete: ☒ --> on Script Save: ☒

--> on Connection Delete: ☒ --> on Connect Save: ☐

--> on Index Delete: ☒

Check Out / Check In

--> Enabled: ☐

--> Make check out reason mandatory: ☒

--> Default retention period: Years Months

Version to disk: ☐ Note: Versioning to disk will occur if the path is set and automated version creation is enabled for the object.

Table version path:

Script version path:

Procedure version path:

Repository Name

The repository name can be set. This appears in the top left hand corner of the title bar in QAD Data Warehouse Designer. Restart QAD Data Warehouse Designer for repository name changes to take affect.

Repository Type

The repository type should reflect the environment. For example a 'Production' type should be chosen for the production environment. A color is associated with each repository type. These colors tint the left hand pane of both the main browser window and the scheduler window. The colors can be changed on a specific PC by changing the object tree color (see below).

Data Warehouse schema

The schema of the data warehouse is used by the QAD Data Warehouse Designer scheduler. You should not normally need to change this value.

Views visualized as a separate object group

This check box will display a new object group called Views where all view objects are stored. The default (unchecked) state is that views are part of the dimension object group and are considered dimension views. QAD Data Warehouse Designer will have to be exited and restarted to see the impact of this change. This setting is only relevant for the PC on which the setting is made. (i.e. it is not a global setting for the repository).

Trace Unix sessions

This check box when set will trace all Unix activity undertaken by the QAD Data Warehouse Designer program until terminated. The file WslMedTelnet.txt will be created in the program directory for QAD Data Warehouse Designer. This option is intended for debugging of specific Unix problems and the setting of this switch would normally be done at the request of QAD when attempting to solve a Telnet issue. This setting is only relevant for the PC on which the setting is made. (i.e. it is not a global setting for the repository).

Remove shadows from star / track back diagrams

This check box when set will prevent a shadow appearing on all printable diagrams produced in the diagrammatical window.

Put call to WsWrkTask in generated procedures

This check box when set will result in a call to the WsWrkTask function being placed at the end of most of the generated update procedures. These calls to WsWrkTask result in counters being set in the meta table ws_wrk_task_log. These counters can be viewed via a query on the view ws_admin_v_task.

Prompt for index regeneration on procedure rebuild

This check box when set, results in QAD Data Warehouse Designer prompting for index regeneration whenever an update procedure is rebuilt.

Scheduler database logon uses Authenticated User

This option should be enabled if the scheduler is running under an operating system authenticated user. This option is only available in Oracle.

Override path for Backup executable

By default QAD Data Warehouse Designer tries to find the path of the backup executable. This is bcp.exe for SQL Server, exp.exe for Oracle and db2cmd.exe for IBM DB2. This edit box provides the ability to specify the exact location and name of the executable. This is useful when QAD Data Warehouse Designer cannot find the program or if there are multiple versions of the program on the PC.

Override path for Restore executable

By default QAD Data Warehouse Designer tries to find the path of the restore executable. This is bcp.exe for SQL Server, imp.exe for Oracle and db2cmd.exe for IBM DB2. This edit box provides the ability to specify the exact location and name of the executable. This is useful when QAD Data Warehouse Designer cannot find the program or if there are multiple versions of the program on the PC.

SSIS Version

Select the relevant version of SQL Server Integration Services from the drop down list.

Versioning

A number of check boxes exist to enable the selection of automated versioning of objects. The first group of five check boxes will version an object prior to its deletion. If all five boxes are set then every type of object will be versioned prior to deletion. These five check boxes are normally set by default. The table delete option also covers cube deletion.

The remaining four check boxes should normally be set in a production environment at the very least. They generate a version whenever a change is made that affects the data warehouse.

If the data warehouse is viewed as a series of tables, procedures and scripts then whenever one of these elements is changed a new version of the element (object) is created.

Version to disk

If any of the three version to disk paths are set, QAD Data Warehouse Designer will automatically create ascii files containing the applicable ddl or code each time an automated version occurs in the entered directory.

Look and Feel Settings

The **Object Tree Color** dialog allows the setting of the color of the left hand pane in the main browser window. The color can be set for each repository type. For example in your production repository this could be set to a light red to provide a visual reminder that the user is in the production environment. Any changes made are for the local PC only. All other users will continue to get the default color scheme.

The **Browse Color** dialog sets the default color for the right hand pane in the main browser window when the data warehouse connection is being browsed. It gives the ability to provide a visual reminder that the data warehouse is being browsed.

The **Look and Feel style** drop down provides several different options for the look and feel of QAD Data Warehouse Designer based on different available windows styles.

De-select the check box **Window Tabs location at top of screen** to change the tab location for the browser, scheduler, etc to the size of the display.

The **Scheduler result line color enabled** check box can be enabled to turn on job status color coding in the scheduler.

To reset the appearance of QAD Data Warehouse Designer to the defaults, click the **Reset all Look and Feel settings** button and restart QAD Data Warehouse Designer.

Check Out and Check In

Click on the **Enabled** check box to enable check in and check out in QAD Data Warehouse Designer. By choosing **Make check out reason mandatory**, developers are required to enter a check out reason. The **Default retention period** can be set in years and/or months.

5.1.2 Settings - Objects Options

The objects within QAD Data Warehouse Designer can be modified via the Objects tab via Tools/Options.

After QAD Data Warehouse Designer is installed, a license string is usually entered (see the **Administration Guide** for more information).

Some license strings disallow the use of some object types. In addition, some license strings allow some object types to be used but do not enable them by default.

The following full license types are available:

- Star
- Data Store
- Normalized

Additionally, an **evaluation** license will allow different object type use from a **full** license.

Default Star Options

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Set the Position to zero to disable an object.
If two objects share the same position then they are grouped under the first objects name where possible.

Internal Code	Object Name	Position	End User	Internal Code	Object Name	Position	End User
Connection	Connection	01					
Load	Load Table	02					
Stage	Stage Table	03					
Dimension	Dimension	06	☒	Dim View	Dimension View	06	☒
Fact	Fact Table	07	☒	Fact KPI	Kpi Fact Table	07	☒
Data Store	Data Store	00					
Normalized	Normalized	00	☐				
Aggregate	Aggregate	08	☒				
Index	Index	21					
View	View	09	☒				
Export	Export	12					
Procedure	Procedure	19					
Script	Host Script	20		Template	Template	20	
Retro	Retro Copy	21					
Cube	Cube	00	☒	Virtual	Cube Virtual	00	☒
Olap Cube	Olap Cube	11	☒	Olap Dimension	Olap Dimension	11	☒

OK Cancel

Default Data Store Options

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Set the Position to zero to disable an object.
If two objects share the same position then they are grouped under the first objects name where possible.

Internal Code	Object Name	Position	End User	Internal Code	Object Name	Position	End User
Connection	Connection	01					
Load	Load Table	02					
Stage	Stage Table	03					
Dimension	Dimension	00	☐	Dim View	Dimension View	00	☐
Fact	Fact Table	00	☐	Fact KPI	Kpi Fact Table	00	☐
Data Store	Data Store	04					
Normalized	Normalized	00	☐				
Aggregate	Aggregate	08	☒				
Index	Index	21					
View	View	09	☒				
Export	Export	12					
Procedure	Procedure	19					
Script	Host Script	20		Template	Template	20	
Retro	Retro Copy	21					
Cube	Cube	00	☒	Virtual	Cube Virtual	00	☒
Olap Cube	Olap Cube	11	☒	Olap Dimension	Olap Dimension	11	☒

OK Cancel

Default Normalized Options

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Set the Position to zero to disable an object.
If two objects share the same position then they are grouped under the first objects name where possible.

Internal Code	Object Name	Position	End User	Internal Code	Object Name	Position	End User
Connection	Connection	01					
Load	Load Table	02					
Stage	Stage Table	03					
Dimension	Dimension	00	☐	Dim View	Dimension View	00	☐
Fact	Fact Table	00	☐	Fact KPI	Kpi Fact Table	00	☐
Data Store	Data Store	04					
Normalized	Normalized	05	☐				
Aggregate	Aggregate	08	☒				
Index	Index	21					
View	View	09	☒				
Export	Export	12					
Procedure	Procedure	19					
Script	Host Script	20		Template	Template	20	
Retro	Retro Copy	21					
Cube	Cube	00	☒	Virtual	Cube Virtual	00	☒
Olap Cube	Olap Cube	11	☒	Olap Dimension	Olap Dimension	11	☒

OK Cancel

All Objects Enabled

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Set the Position to zero to disable an object.
If two objects share the same position then they are grouped under the first objects name where possible.

Internal Code	Object Name	Position	End User	Internal Code	Object Name	Position	End User
Connection	Connection	01					
Load	Load Table	02					
Stage	Stage Table	03					
Dimension	Dimension	06	☒	Dim View	Dimension View	06	☒
Fact	Fact Table	07	☒	Fact KPI	Kpi Fact Table	07	☒
Data Store	Data Store	04					
Normalized	Normalized	05	☒				
Aggregate	Aggregate	08	☒				
Index	Index	21					
View	View	09	☒				
Export	Export	12					
Procedure	Procedure	19					
Script	Host Script	20		Template	Template	20	
Retro	Retro Copy	21					
Cube	Cube	00	☒	Virtual	Cube Virtual	00	☒
Olap Cube	Olap Cube	11	☒	Olap Dimension	Olap Dimension	11	☒

OK Cancel

Evaluation License Default Options

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Set the Position to zero to disable an object.
If two objects share the same position then they are grouped under the first objects name where possible.

Internal Code	Object Name	Position	End User	Internal Code	Object Name	Position	End User
Connection	Connection	01					
Load	Load Table	02					
Stage	Stage Table	03					
Dimension	Dimension	06	☒	Dim View	Dimension View	06	☒
Fact	Fact Table	07	☒	Fact KPI	Kpi Fact Table	07	☒
Aggregate	Aggregate	08	☒				
Index	Index	21					
View	View	09	☒				
Export	Export	12					
Procedure	Procedure	19					
Script	Host Script	20		Template	Template	20	
Retro	Retro Copy	21					
Olap Cube	Olap Cube	11	☒	Olap Dimension	Olap Dimension	11	☒

OK Cancel

Internal Code

The internal name of the object.

Object Name

The displayed name of the object. This can be changed as required. For example, if you need to change Stage objects to be called Staging, then you would change the Object Name field from Stage Table to Staging.

Position

The position of the object in the Objects panel. Setting the position to 00 disables the object only if the object does not contain existing objects, otherwise the object will appear at the end of the object tree.

End User

This option determines whether the objects will be included in the user documentation that is generated by QAD Data Warehouse Designer.

5.1.3 Settings - Table, Index and Key Name Defaults

The default naming conventions for tables, keys and indexes can be set through the menu option **Tools / Options**.

Table Name defaults

There are five base object types that are essentially table, and a sixth cube type. The setting of default names for these object types is shown in the following screen shot. These defaults are applied during the drag and drop creation of a table or cube. An object name can be changed during the drag and drop process. These defaults are therefore only the initial name and are in no way enforced.

Options

Repository Objects **Naming (Local)** Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

Data Warehouse tables and column case conversion : Converted to lowercase

Name type	Prefix	Name type	Suffix	Use local naming ☒
Load Table:	load_			
Stage Table:	stage_			
Dimension:	dim_			
Fact Table:	fact_			
Data Store:	ods_			
Normalized:	norm_			
Aggregate:	agg_			
Join:	join_			
Cube:	cube_			
Dimension View:	dim_			
Export:	exp_			

Table keys

	Short name	
Dimension key:		_key
Fact Table key:		_key
Data Store key:		_key
Normalized key:		_key

Indexes

	Short name	
Load Table index:		_idx
Stage Table index:		_idx
Dimension index:		_idx
Fact Table index:		_idx
Data Store index:		_idx
Normalized index:		_idx
Aggregate index:		_idx
Join index:		_idx

OK Cancel

A prefix and/or a suffix string can be applied to an object name. Within Oracle and IBM DB2, a table name may be a maximum of 30 characters long, so these pre and post fix strings should not be more than eight characters long (QAD Data Warehouse Designer short names are a maximum of 22 long in Oracle and SQL Server and 12 long in DB2).

From the example screen above, if a source table called 'customer' (with a short name of 'customer') was dragged into a load table drop target then the default name would be 'load_customer'.

The object name defaults shown above are the values that are installed with the base metadata. They can be changed at any stage, however, the change does not affect any existing objects. So, if a new naming regime is chosen any existing objects will need to be renamed through the properties screen of the object.

Table and column case

QAD Data Warehouse Designer will automatically convert the case of table and column names when dragging from a source system. The default is to convert all table and column names to lower case. This case conversion setting is defined for the current computer only, as a local setting. Note that all Oracle table and column names are upper case by default.

Global and local settings

Table name defaults can either be saved globally (in the database) or locally (on the current computer). Choose the appropriate tabs Naming (Local) or Naming(Global) to save locally or globally.

Artificial Key name defaults

During the drag and drop generation of new dimension and fact tables, QAD Data Warehouse Designer will build an artificial (surrogate) key for the table. The naming convention for that key can be set through the same menu option as above. As well as potential pre-fix and suffix values, we also need to choose between the inclusion of the full table name, or the short name assigned to each table.

In the example screen above, which is the default, a dimension table key would use the table short name and have a suffix of "_key". So our load_customer table example would generate a key called dim_customer_key if it were dragged into a dimension drop target.

Index name defaults

Whenever a new procedure is defined, QAD Data Warehouse Designer builds or rebuilds a standard set of indexes for the table. These indexes will be created using the standard defined. As with the key naming we can set either a pre-fix or suffix value, or in fact both, as well as choosing the use of either the table name or the short name associated with the table.

In addition to the naming specifications above QAD Data Warehouse Designer will add up to a further 3 characters to the end of the index name. These additional values will be "_0" through "_99", or "_A" through "_Z", or "_SC". When a new index is manually added it will have the additional value of "_x" by default. This should be changed. The QAD Data Warehouse Designer naming standard for indexes is described below, but any valid name may be used.

From the example screen above, a fact table would have indexes generated using the short name and with a suffix of "_idx". Therefore a fact_sales fact table would have indexes such as fact_sales_idx_x.

Ultimate suffix	meaning
_0	artificial key

Ultimate suffix	meaning
_1 thru _99	bitmap key index on dimensional join
_A	primary business key
_B thru _Z	secondary business keys
_SC	key to support slowly changing dimensions

5.1.4 Settings - Procedure Naming Defaults

The default naming conventions for generated procedures can be set through the menu option **Tools / Options**. To generate a procedure select the (Build Procedure...) option from the update procedure drop list found in the table properties screen.

Procedure name defaults

The dialog shown in the screen shot below will appear in response to the tools / procedure name defaults menu option. It provides a means of setting the naming defaults for all types of generated procedure. The values as shown below are the default settings, but may be changed to meet the site requirements. The only restriction is on the size of the resultant name, which is database dependent.

The screenshot shows the 'Options' dialog box with the 'Procedure' tab selected. The dialog has several tabs: Repository, Objects, Naming (Local), Naming (Global), Procedure, Tablespace, Ancillary, Icons, Documentation, and Statistics. The 'Procedure' tab contains two columns of settings, each with a 'Procedure type', 'Prefix', 'Name type', and 'Suffix' field. The 'Name type' field is a dropdown menu with 'Short name' selected. The 'Suffix' field is a text box. The settings are as follows:

Procedure type	Prefix	Name type	Suffix
Load Table - script:	script_	Short name	
Load Table - post load:	post_	Short name	
Stage Table - update:	update_	Short name	
Stage Table - custom:	custom_	Short name	
Dimension - update:	update_	Short name	
Dimension - custom:	custom_	Short name	
Fact Table - update:	update_	Short name	
Fact Table - custom:	custom_	Short name	
Data Store - update:	update_	Short name	
Data Store - custom:	custom_	Short name	
Normalized - update:	update_	Short name	
Normalized - custom:	custom_	Short name	
Aggregate - update:	update_	Short name	
Aggregate - custom:	custom_	Short name	
View - update:	update_	Short name	
View - custom:	custom_	Short name	
Export - script:	exp_	Short name	
Export - post export:	export_	Short name	

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

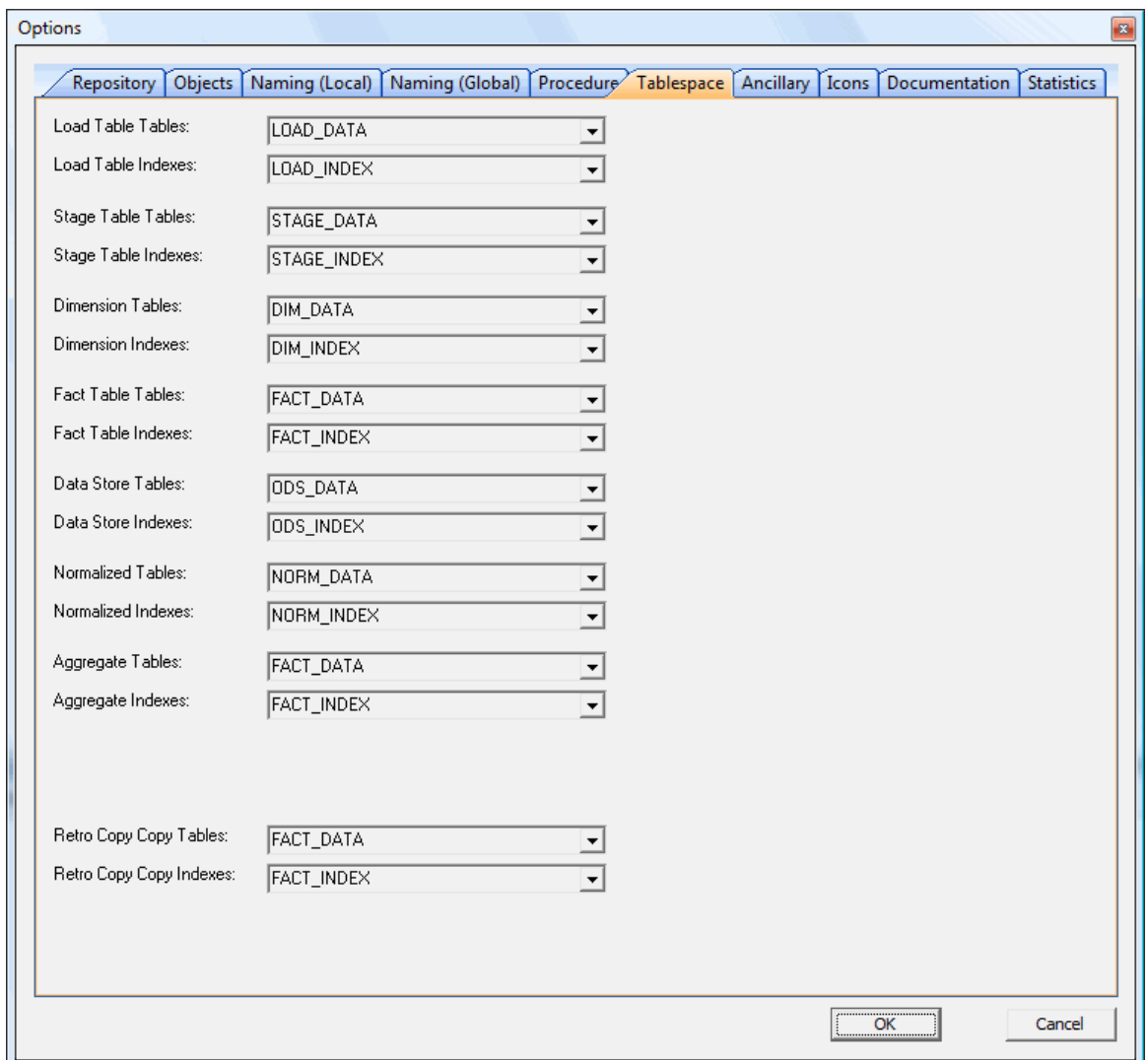
The contents of the prefix and suffix fields must contain characters that are valid in a database stored procedure name and should preferably not contain spaces.

The 'name type' may be either the full table name or the unique short name assigned to each table. In the case of smaller table names the short name is usually the same as the table name.

For example if we have a dimension called `dim_product`, then from the example screen above the three possible generated procedures would be called `update_dim_product`, `custom_dim_product` and `get_dim_product_key`.

5.1.5 Settings - Tablespace (Filegroup) Defaults

For each of the table based object types, it is possible to set a default table tablespace (filegroup in SQL Server) and a default index tablespace. These defaults are set via the Tools / Options menu option.



These defaults are applied when a table or index definition is created. They can be changed by selecting the Storage tab of a table or an index's properties.

5.1.6 Settings - Ancillary Table and Column Defaults

When building the data warehouse QAD Data Warehouse Designer makes use of a number of special tables and columns. Two tables are used. These are called by default `dss_source_system` and `dss_fact_table` and are discussed in detail in the sections below.

The special columns used are defined in the table below.

Column name	description
<code>dss_source_system_key</code>	Added to support dimensions that cannot be fully conformed, and the inclusion of subsequent source systems. See the section below for more details.
<code>dss_fact_table_key</code>	Used in composite rollup fact tables to identify the source fact table that contributed the particular row.
<code>dss_create_time</code>	Indicates when a dimension record was created.
<code>dss_update_time</code>	Indicates when the record was last updated in the data warehouse. Used in the updating of rollup fact tables and aggregate tables.
<code>dss_count</code>	Applied to fact tables. Provides a simple row count variable that can be used by end user tools.
<code>dss_current_flag</code>	Used for slowly changing dimensions. This flag identifies the current record where multiple versions exist.
<code>dss_version</code>	Used for slowly changing dimensions. This column contains the version number of a dimension record. Numbered from 1 upwards with the highest number being the latest or current version. It forms part of the unique constraint for the business key of a slowly changing dimension.
<code>dss_start_date</code>	Used for slowly changing dimensions. This column provides a date time stamp when the dimension record began life. If null then it was the first record. It is used to ascertain which dimension record should be used when multiple are available.
<code>dss_end_date</code>	Used for slowly changing dimensions. This column provides a date time stamp when the dimension record ceased to be the current record. It is used to ascertain which dimension record should be used when multiple are available.

All of these special columns may be renamed through the **Tools / Options** defaults menu option. The lower five columns in the screen shot example below can simply be renamed. The two tables however require valid table names that meet certain criteria. See the appropriate sections below.

Options

Repository Objects **Naming (Local)** Naming (Global) Procedure Tablespace Ancillary Icons Documentation Statistics

dss_batch: dss_batch. Table, used to record batch numbers for data loaded into the data warehouse. Blank to disable. Not used at this stage. See Help for further details.

dss_source_system: dss_source_system. Table, used to manage multiple source systems and non conformed dimensions. Added by default to dimension business keys. Blank to disable. See Help for further details.

dss_fact_table: dss_fact_table. Table, used in the handling of rollup fact tables. Contains a record per fact table. Required if rollup fact tables are to use generated code. See Help for further details.

dss_create_time: dss_create_time. Column added to all dimension tables for information only. Leave blank to disable.

dss_update_time: dss_update_time. Column added to all dim, stage and fact tables. Required if generated code for fact and aggregate tables is to be used.

dss_start_date: dss_start_date. Column, used for slowly changing dimensions. Used to identify when a dimension row was replaced. Required.

dss_end_date: dss_end_date. Column, used for slowly changing dimensions. Used to identify when a dimension row was replaced. Required.

dss_version: dss_version. Column, used for slowly changing dimensions. Used to store the version of a dimension row. Required for unique constraint.

dss_current_flag: dss_current_flag. Column, used for slowly changing dimensions. Used to identify the current dimension row. Required.

dss_count: dss_count. Column, added to fact tables to provide a simple row counter. Required, but can be deleted after generation.

dss_file_name: dss_file_name. Identifies a table holding names of files loaded into the system. Teradata only.

OK Cancel

Note: When using table names other than the defaults for `dss_source_system` and `dss_fact_table` it is worth considering the fact that by default the metadata backups will include any table that begins with "dss_". Therefore if a table is used it is recommended that it have a name starting with "dss_". The advantages are that a working meta repository will be established through a backup and restore if these tables are included in the backup set.

Dss_source_system

This pseudo dimension is designed to identify a data source for a dimension row. Its purpose is to handle non conformed dimensions, or changes in source systems. If its use is not desired (default) then leave this field blank.

For example:

An organization has a number of factories. These factories are referenced by all of the operational systems. The production system has its own code for each factory and this is the unique means of identifying the factory. The distribution system has a factory short name which it uses for the unique identifier. The raw materials system simply uses the factory name. It is probably not practical or even desirable to force these source systems to utilize a standard factory identification method, so instead we allow the dimension to be non conformed. We do however, insist on a standard factory name convention, so that our reports and queries will join information when the factory name is used.

In such an example the `dss_source_system_key` is used to identify the source of the data for the dimension row. It also adds to the unique business key, so that two source systems can utilize the same code to refer to different entities. This key also provides a degree of future proofing in the data warehouse, to assist in the possible changing of an underlying source system.

The generated procedure code will always set the key value of this table to 1. So, manual code changes will be required to make use of the functionality that this table offers.

When dimensions are built the `dss_source_system_key` is added by default. It can be deleted if the need for such a feature is not seen.

If this table is to be given a different name then it and all its columns can be renamed or the following steps can be taken:

- 1** Create a new table by dragging the column `dss_source_system_name` from `dss_source_system` into a dimension target.
- 2** Change the object type from dimension view to dimension and specify the new table name. (see note above on the use of "dss_").
- 3** Rename the `dss_source_system_name` column to match the new table name.
- 4** Delete the last two columns.
- 5** Under the tables properties, change the table type to 'Mapping table'. This will prevent the table from being seen as a dimension in the documentation.
- 6** Change the `dss_source_system` table name in the screen above, via the tools / ancillary column defaults menu option.

Dss_fact_table

This pseudo dimension is used internally by the QAD Data Warehouse Designer generated procedures to assist in the updating of rollup fact tables. It provides a means of identifying which fact table contributed a particular row to a composite rollup fact table. See the section on rollup fact tables for an explanation of how the generated procedures operate.

This table can be renamed, or a new table created. The table identified as the 'dss_fact_table' must, however, conform to a number of standards if the generated code is to compile and work correctly.

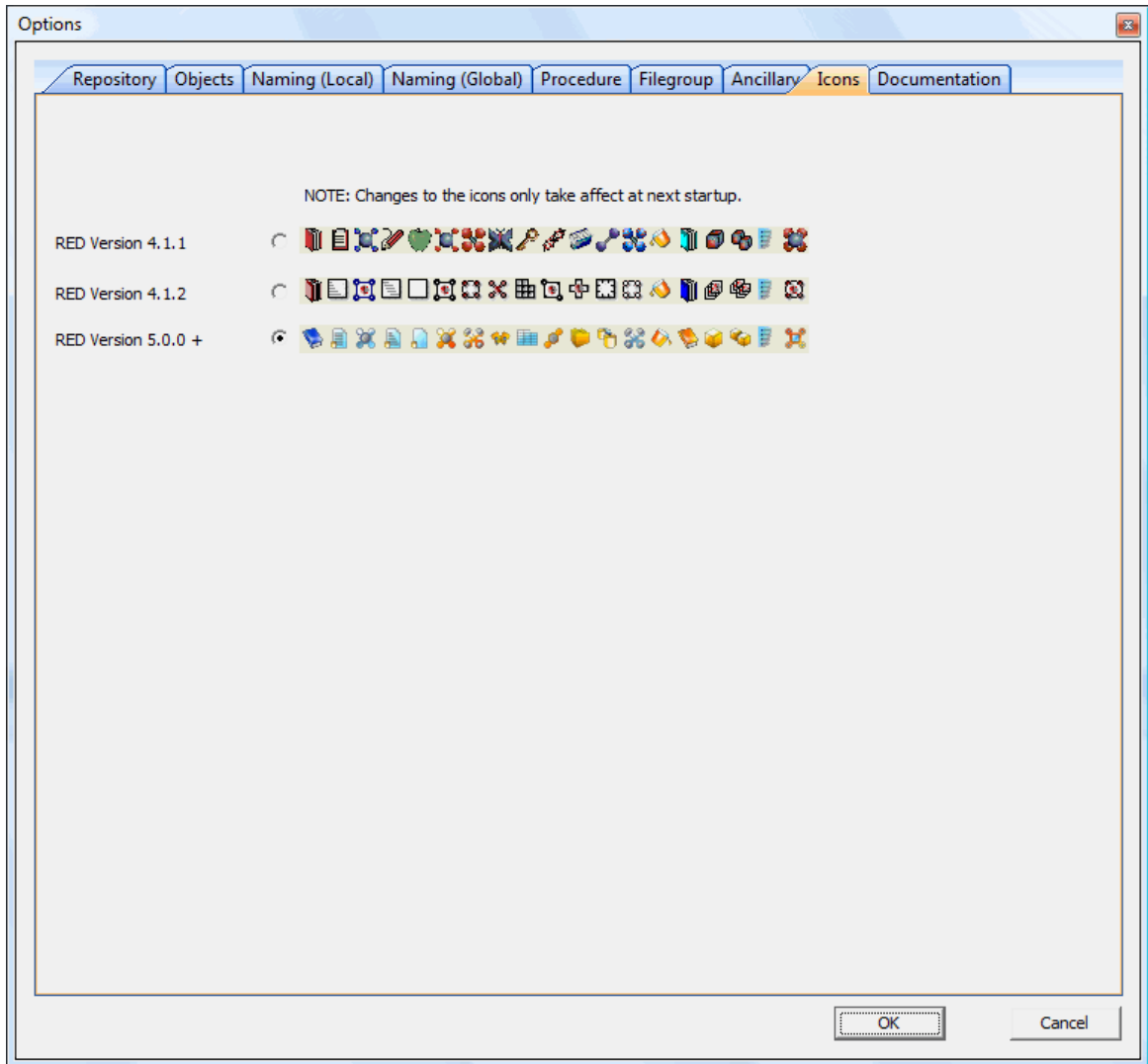
The following columns must exist, where *table_name* is the new name of the table:

Column name	purpose
<i>table_name_key</i>	The artificial key for the table. Must be a numeric data type.
<i>table_name_name</i>	The name of the fact table. Must be at least a varchar2(64) data type.
<i>table_name_type</i>	The type of fact table. Must be at least a varchar2(24).

The generated procedures will automatically add rows to this table as required. As with the dss_source_system table the table type for this table should be set to "Mapping table" to prevent it from being seen as a dimension in the documentation.

5.1.7 Settings - Icons

The icons used with QAD Data Warehouse Designer can be modified via the **Tools/Options** menu. Four different styles of icons are available.



5.1.8 Settings - Documentation

Documentation properties can be modified via the **Tools/Options** menu. To make a change, choose an **Object Type** from the drop down list. Then modify one or more of Label, User, BeforeCols or Order and click OK.

Options

Repository Objects Naming (Local) Naming (Global) Procedure Tablespace Ancillary Icons **Documentation** Statistics

Local Documentation Path: C:\Users\screens\Desktop\doco\ Change location

Object Type: **Aggregate**

	Document name	Label	User	BeforeCols.	Order
1.	Purpose	Purpose	☒	☒	01
2.	Concept	Concept	☒	☒	02
3.	Data Grain	Grain	☒	☒	03
4.	Query Examples	Examples	☒	☐	04
5.	Usage Tips	Usage	☒	☐	05
6.			☐	☐	06
7.			☐	☐	07
8.	Notes	Notes	☐	☐	08
9.			☐	☐	09
10.			☐	☐	10
11.			☐	☐	11
12.			☐	☐	12
13.			☐	☐	13
14.			☐	☐	14
15.			☐	☐	15
16.			☐	☐	16

OK Cancel

Object Type

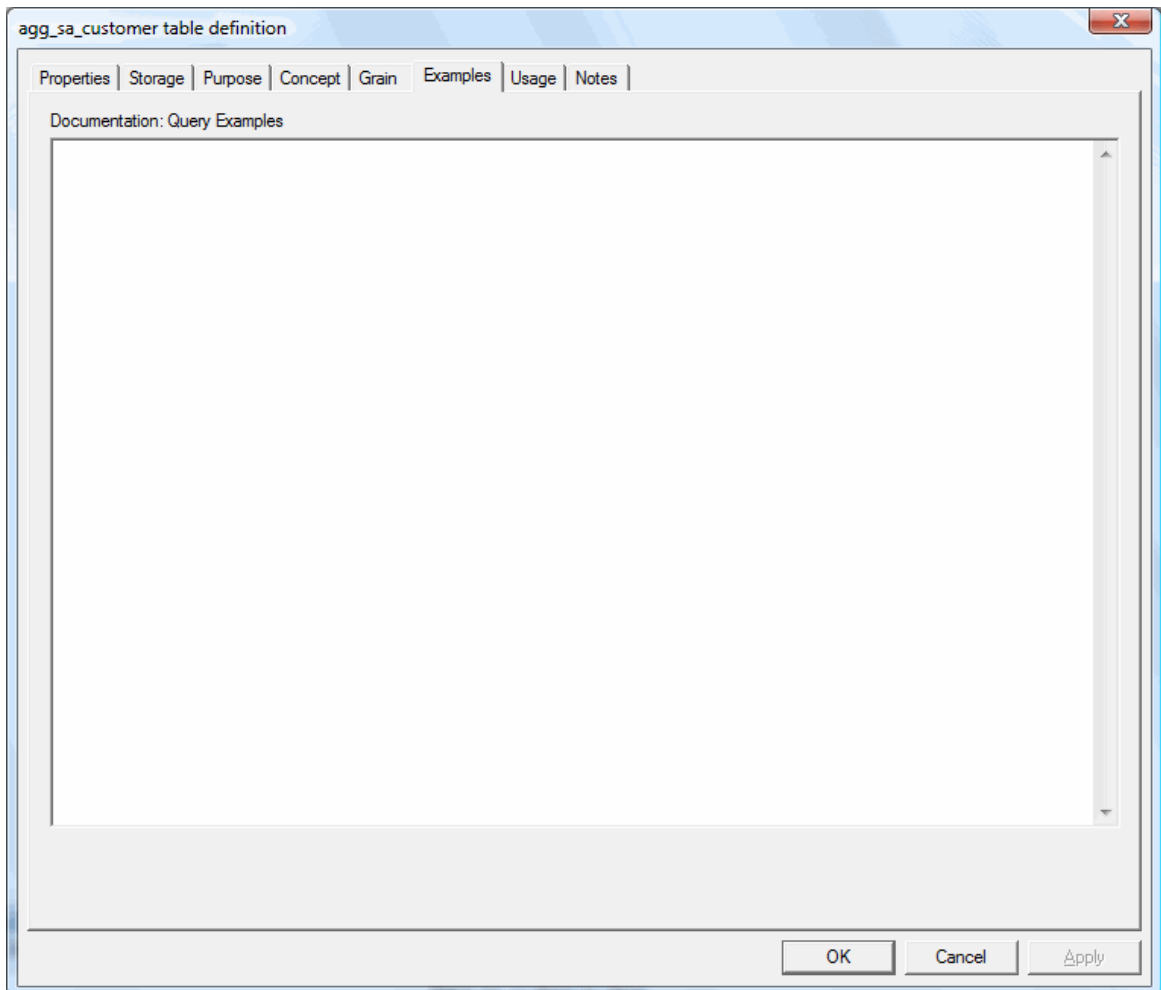
The QAD Data Warehouse Designer object type to which the displayed settings apply.

Document name

Name of the documentation section for the specified object. This will display as a tab that can be accessed by viewing the Properties of the object selected above.

Label

The label describes what is covered by the documentation section. For the label examples, the following field on an aggregate's properties will be used:



User

This option determines whether or not this section of the documentation will appear in the user documentation generated by QAD Data Warehouse Designer.

BeforeCols

This option determines whether this section of the documentation will appear before or after the column descriptions that are automatically generated by QAD Data Warehouse Designer within the user documentation.

Order

The order in which the section will appear in the documentation.

5.1.9 Settings - Statistics

Statistics properties can be modified via the Tools/Options menu. This option is only available for Oracle databases. A blank entry will result in a default value.

The following five commands are inserted into the generated procedural code. Insert the key word \$UNUSED\$ to remove this portion of generated code. A blank entry will result in a default value. The keyword \$TABLE\$ will be replaced at execute time with the table name.
 Example: BEGIN dbms_stats.gather_table_stats(ownname=>USER,tablename=>'\$TABLE\$',estimate_percent=>10); END;
 Example: analyze table \$TABLE\$ estimate statistics sample 5 percent

	Threshold
Dimension insert:	1000
Stage insert:	1000
Fact insert:	1000
Partition insert:	1000
Partition exchange:	

The following eight commands are used in the scheduler to gather statistics for tables and indexes.
 The following four commands gather statistics for tables. A blank entry will result in a default value. The keyword \$SCHEMA\$ will be replaced with the table owner and the keyword \$TABLE\$ will be replaced with the table name.

Table analyze full:	
Table analyze quick:	
Table stats full:	
Table stats quick:	

Example: analyze table \$TABLE\$ estimate statistics sample 5 percent
 Example: BEGIN dbms_stats.gather_table_stats(ownname=>'\$SCHEMA\$',tablename=>'\$TABLE\$',estimate_percent=>10); END;

The following four commands gather statistics for indexes. A blank entry will result in a default value. The keyword \$SCHEMA\$ will be replaced with the index owner and the keyword \$INDEX\$ will be replaced with the index name.

Index analyze full:	
Index analyze quick:	
Index stats full:	
Index stats quick:	

OK Cancel

Note: The example commands below contain returns and indents, these should be removed when entering into the fields in this options screen.

Procedure Statistic Command Call Example

BEGIN

```
dbms_stats.gather_table_stats(ownname=>USER,tablename=>'$TABLE$'  
    ,estimate_percent=>10);
```

END;

Threshold

The threshold parameter is used by the four statistic commands that are inserted into the automatically generated procedures. It indicates how many rows to be inserted before the statistic commands are executed.

Dimension insert

Statistics command entered here will be included in the automatically generated procedure for Dimension tables. Parameter \$TABLE\$ will be automatically replaced by the table name. The key word \$UNUSED\$ will remove the statistics portion from the generated code in procedure.

Stage insert

Statistics command entered here will be included in the automatically generated procedure for Stage tables. Parameter \$TABLE\$ will be automatically replaced by the table name. The key word \$UNUSED\$ will remove the statistics portion from the generated code in procedure.

Fact insert

Statistics command entered here will be included in the automatically generated procedure for Fact tables. Parameter \$TABLE\$ will be automatically replaced by the table name. The key word \$UNUSED\$ will remove the statistics portion from the generated code in procedure.

Partition insert

Statistics command entered here will be included in the automatically generated procedure for Partition tables. Parameter \$TABLE\$ will be automatically replaced by the table name. The key word \$UNUSED\$ will remove the statistics portion from the generated code in procedure.

Partition exchange

Statistics command entered here will be included in the automatically generated procedure during partition exchanges. Parameter \$TABLE\$ will be automatically replaced by the table name. The key word \$UNUSED\$ will remove the statistics portion from the generated code in procedure.

Scheduler Table Statistic Command Call Example

Analyze

analyze table \$TABLE\$ estimate statistics sample 35 percent

Stats

BEGIN

```
dbms_stats.gather_table_stats(ownname=>'$$SCHEMA$',,tabname=>'$TABLE$'  
    ,estimate_percent=>'10');
```

END;

Table analyze full

Analyze command entered here will be executed when using the scheduler with Analyze Action to gather statistics. Parameter \$TABLE\$ will be automatically replaced by the table name.

Table analyze quick

Analyze command entered here will be executed when using the scheduler with Quick Analyze Action to gather statistics. Parameter \$TABLE\$ will be automatically replaced by the table name.

Table stats full

Statistics command entered here will be executed when using the scheduler with Stats Action to gather statistics. Parameter \$TABLE\$ will be automatically replaced by the table name and parameter \$\$SCHEMA\$ will be replaced by the owner name.

Table stats quick

Statistics command entered here will be executed when using the scheduler with Quick Stats Action to gather statistics. Parameter \$TABLE\$ will be automatically replaced by the table name and parameter \$\$SCHEMA\$ will be replaced by the owner name.

Scheduler Index Statistic Command Call Example

Analyze

analyze index \$INDEX\$ estimate statistics sample 5 percent

Stats

BEGIN

```
dbms_stats.gather_index_stats(ownname=>'$$SCHEMA$',,indname=>'$INDEX$'  
    ,estimate_percent=>'10');
```

END;

Index analyze full

Analyze command entered here will be executed when using the scheduler with Analyze Action to gather statistics. Parameter \$INDEX\$ will be automatically replaced by the index name.

Index analyze quick

Analyze command entered here will be executed when using the scheduler with Quick Analyze Action to gather statistics. Parameter \$INDEX\$ will be automatically replaced by the index name.

Index stats full

Statistics command entered here will be executed when using the scheduler with Stats Action to gather statistics. Parameter \$INDEX\$ will be automatically replaced by the table name and parameter \$SCHEMA\$ will be replaced by the owner name.

Index stats quick

Statistics command entered here will be executed when using the scheduler with Quick Stats Action to gather statistics. Parameter \$INDEX\$ will be automatically replaced by the table name and parameter \$SCHEMA\$ will be replaced by the owner name.

5.1.10 Settings - Languages

Languages can be defined via the Tools/Options menu. This option is only available for SQL Server databases and applies only to dimension, fact and OLAP objects. A blank entry means that no languages have been defined and thus no translations can be saved.

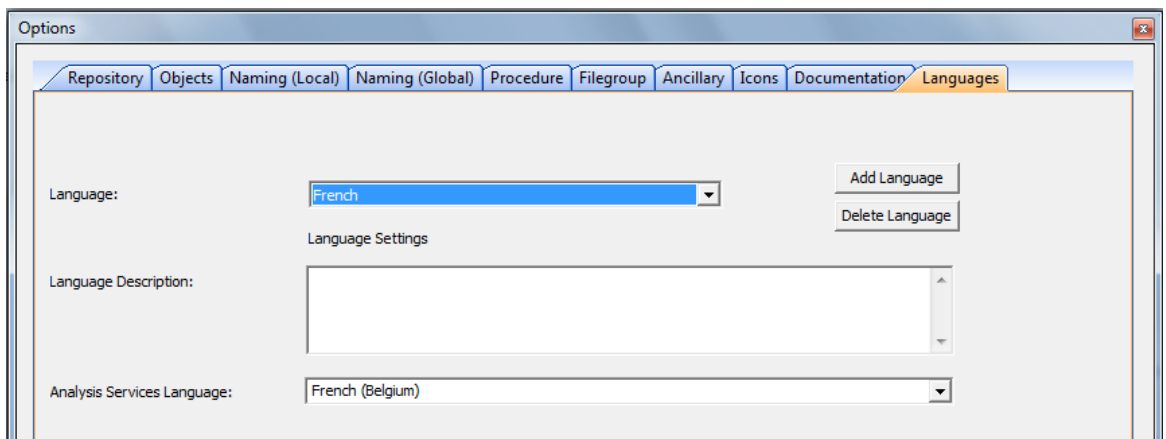
To add a language:

Select the 'Add Language' button; enter the new language ID and select OK.

To delete a language:

First select the language from the drop down list and then select the 'Delete Language' button.

Note that all translations for the selected language will also be deleted.



Language

The language Reference/ID.

Language Description

The language Description.

Analysis Services Language

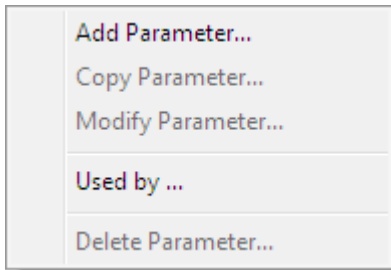
Used to identify the language ID as used in Analysis Services.

5.2 Parameters

Parameters are a means of passing information between two or more procedures and between the QAD Data Warehouse Designer environment and procedures. They can be edited within the QAD Data Warehouse Designer environment by selecting the **Tools / Parameters** menu option. A list of parameters is displayed as per the example below:

Parameter listing		
Parameter	Value	Comments
BUSINESS_DAYS_IN_MONTH	0	updated via daily_time_roll
BUSINESS_DAYS_MTD	1	updated via daily_time_roll
CURRENT_CAL_MONTH	200805	updated via daily_time_roll
CURRENT_CAL_MONTH_NO	5	updated via daily_time_roll
CURRENT_CAL_YEAR	2008	updated via daily_time_roll
CURRENT_DATE	01-MAY-08	updated via daily_time_roll
CURRENT_FIN_MONTH	200805	updated via daily_time_roll
CURRENT_FIN_MONTH_NO	5	updated via daily_time_roll
CURRENT_FIN_YEAR	2008	updated via daily_time_roll
FACT_KPI_END	200204	Period end value. April/2002 for tutorial
FACT_KPI_START	200006	Period start value. We have chosen cal_month as th...
PREVIOUS_CAL_MONTH	200804	updated via daily_time_roll
PREVIOUS_CAL_MONTH_NO	4	updated via daily_time_roll
PREVIOUS_CAL_YEAR	2007	updated via daily_time_roll
PREVIOUS_FIN_MONTH	200804	updated via daily_time_roll
PREVIOUS_FIN_MONTH_NO	4	updated via daily_time_roll
PREVIOUS_FIN_YEAR	2007	updated via daily_time_roll

A parameter can be added, edited, copied or deleted by using the right mouse menu in the Parameter column:



Typical parameter usage may be the global definition of how many days should be looked back for changed data, a month or processing period etc.

Parameters can be used in load tables to place limits in a Where clause, etc. See **Database Link Load - Source Mapping** (see "8.3.2 Database Link Load - Source Mapping" on page 122) for more information.

They are also used by stage table procedures as variables. See **Generating the Staging Update Procedure** (see "11.3 Generating the Data Store Update Procedure" on page 236) for more information.

IBM DB2: Two procedures are provided to allow procedures to read and write parameters. These procedures are **WsParameterRead** (see "29.20 WsParameterRead" on page 714) and **WsParameterWrite** (see "29.23 WsParameterWrite" on page 723). Using these procedures a procedure can load and use the contents of a parameter, or modify an existing parameter, or add a new parameter.

Oracle: Two functions are provided to allow procedures to read and write parameters. These functions are **WsParameterRead** (see "29.20 WsParameterRead" on page 714) and **WsParameterWrite** (see "29.23 WsParameterWrite" on page 723). Using these functions a procedure can load and use the contents of a parameter, or modify an existing parameter, or add a new parameter.

SQL Server: Two procedures are provided to allow procedures to read and write parameters. These procedures are **WsParameterRead** (see "29.20 WsParameterRead" on page 714) and **WsParameterWrite** (see "29.23 WsParameterWrite" on page 723). Using these procedures a procedure can load and use the contents of a parameter, or modify an existing parameter, or add a new parameter. A function **WsParameterReadF** (see "29.20 WsParameterRead" on page 714) is also provided. This function will return the value of a parameter.

Global Parameters

A number of global parameters are provided when loading tables either via QAD Data Warehouse Designer or via the scheduler. These global parameters are accessed by calling the function **WsParameterReadG** (see "29.21 WsParameterReadG" on page 717). The load table name and the source table name can be acquired by using this function.

See **Callable Procedures** (see "29. Callable Procedures" on page 631) for more information on **WsParameterRead** (see "29.20 WsParameterRead" on page 714), **WsParameterWrite** (see "29.23 WsParameterWrite" on page 723), **WsParameterReadF** (see "29.20 WsParameterRead" on page 714) and **WsParameterReadG** (see "29.21 WsParameterReadG" on page 717).

CHAPTER 6

6. Connections

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6.1 Connections Overview

Connection objects serve several purposes in QAD Data Warehouse Designer:

- 1 They are used to browse potential source data in source systems and to acquire metadata. Potential source data includes database tables and flat files. For database tables, QAD Data Warehouse Designer:

- Uses the **ODBC Source** set on each connection to browse the source system.
- Acquires the metadata for new **load tables** built from the source system using drag and drop.

For flat files, QAD Data Warehouse Designer:

- Connects directly to Windows, Linux or Unix to analyze the source file for the new load table and acquire its metadata.
- Prompts for user input for any metadata not available in the source file.

Note: *Windows* and *Unix* connections do not have an **ODBC Source** property. *Unix* connections are used for Unix and Linux systems.

- 2 Load tables with a connection of **Connection type ODBC** extract data from source systems using ODBC. The **ODBC Source** of the connection is the ODBC DSN used for the extract.
- 3 Each data warehouse metadata repository must have a Data Warehouse connection to use drag and drop to create new objects (other than load tables) in the data warehouse. QAD Data Warehouse Designer:
 - Uses the **ODBC Source** set on the Data Warehouse connection to browse the Data Warehouse database.
 - Acquires the metadata for any **tables** built from existing data warehouse tables.

Note: This connection always has a **Connection type** of *Database*.

- 4 Cube objects require a connection to define the Analysis Services server used to create and load cubes. This is a connection with a **Connection type** of *Analysis Server 2000* if SQL Server 2000 OLAP is being used. The **Connection type** is *Microsoft Analysis Server 2005* for later versions of SQL Server OLAP.
- 5 Export objects require a connection to define the target environment where exported data is written. This is a connection with a **Connection type** of *Unix* or *Windows*.

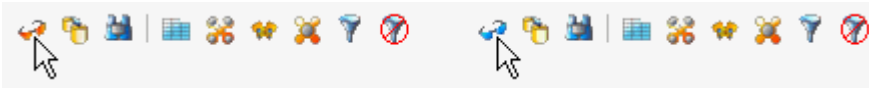
The tables or files associated with a connection are displayed one of the following ways:

- Selecting the **Browse / Data warehouse** menu option nominally for the data warehouse connection.
- Selecting the **Browse / Source Tables** menu option nominally for a source system connection.
- Clicking on one of the two browser buttons on the toolbar:



The orange button is nominally for the data warehouse connection and the blue button is nominally for a source system connection.

- Clicking on one of the browse source system buttons in the right pane:



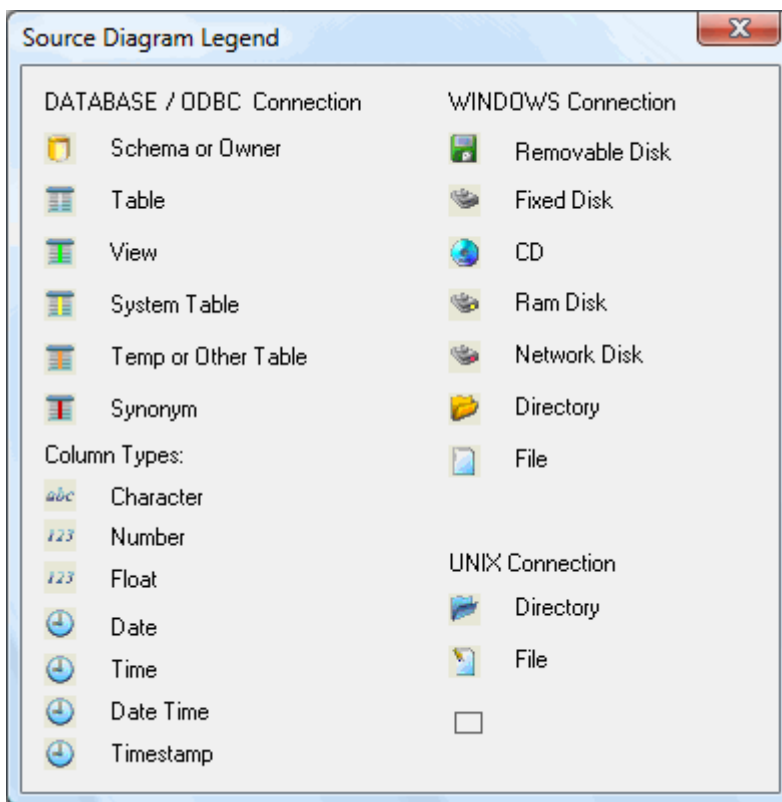
Each button remembers the last connection it browsed, so in this way one button can be used for the Data Warehouse and one for a source system. A click on one of the buttons will display the source tables without first displaying the source browser dialog box. To change the connection click the small black down arrow next to the glasses to access the source browser dialog box. The current connection being browsed is shown in the status bar at the bottom right of the screen.



TIP: When browsing to a connection, by default QAD Data Warehouse Designer will show a schema name. If you want to see all schemas, blank out the default schema name. You can also enter multiple schemas, separated by commas.

Browser Icons

When browsing a connection the following legend applies for the source tables and objects:



The legend is displayed via Help / Source Legend menu.

Connection types

Connections can be set up via the following methods:

- **Connection to the Data Warehouse** (see "**6.2 Connection to the Data Warehouse**" on page 71)
- **Connections to Another Database** (see "**6.3 Connections to Another Database**" on page 78)
- **ODBC Based Connections** (see "**6.4 ODBC Based Connections**" on page 87)
- **Connections to Unix** (see "**6.5 Connections to Unix**" on page 90)
- **Connections to Windows** (see "**6.6 Connections to Windows**" on page 94)
- **Connections to Analysis Services** (see "**6.7 Connections to Analysis Services**" on page 98)

6.2 Connection to the Data Warehouse

This section describes the connection to the Data Warehouse. Tutorial 1 gives basic instructions for creating a connection. This topic describes in greater detail the connection properties as they apply to the Data Warehouse connection. This connection is used in the drag and drop functionality to create the dimension, stage, fact and aggregate tables. It is also used to create cubes.



TIP: The Data Warehouse connection must exist if you wish to use drag and drop to create dimensions, stage tables, fact tables, aggregates and cubes.

Datawarehouse check box

There should only be one data warehouse connection in any QAD Data Warehouse Designer repository. The data warehouse connection must have the **Datawarehouse check box** enabled. No other connection should have this check box enabled.

Connection name

Enter a name for the connection. Typically this is 'Data warehouse'

Connection type

The connection type is **Database**.

ODBC Source

The ODBC Source is the name as defined in the Windows 'ODBC Data Source Administrator'. This Administrator is found in the Control Panel of the PC. The ODBC Source must be a valid User or System DSN and for Oracle must have the 'Server' field set to the Tnsnames entry for the data warehouse database.

Provider Name

Leave Blank



TIP: For Oracle the ODBC driver used for the ODBC Source must be the Microsoft ODBC Driver for Oracle Version 2.573.6019.00 or later.

If multiple PCs are accessing the meta repository there needs to be a standard naming convention such that all PCs use the same ODBC Source name.



TIP: The same ODBC source name must be used on all PCs that use this connection.

Oracle Example Screen:

DataWarehouse definition

Connection Properties | Notes

Data Warehouse ☒

Connection Name DataWarehouse 

Connection Type Database

ODBC Source ORCL

Database ID (SID) ORCL

Database Link ID

Extract User ID dssdemo Password ***

Admin User ID Password

SSIS Connect String 

Data Type Mapping Set (Default)

As a cube data source

Provider Type MSDAORA (OLE DB for Oracle)

Server ORCL

Database dssdemo

OK Cancel Apply

SQL Server Example Screen:

DataWarehouse definition

Connection Properties | Notes

Data Warehouse ☒

Connection Name DataWarehouse

Connection Type Database

ODBC Source WslWarehouse

Provider Name

Database ID (SID)

Database Link ID

Extract User ID dbo Password

Admin User ID Password

SSIS Connect String Reset

Data Type Mapping Set (Default)
As a cube data source

Provider Type SQLOLEDB (OLE DB for SQL Server)

Server SERVER\SQLSERVER

Database WslWarehouse

OK Cancel Apply

IBM DB2 Example Screen:

DataWarehouse definition

Connection Properties | Notes

Data Warehouse ☒

Connection Name DataWarehouse 

Connection Type Database

ODBC Source DBTWO

Work Directory

Database ID (SID)

Database Link ID

Extract User ID Password

Admin User ID Password

SSIS Connect String Reset

Data Type Mapping Set (Default)

As a cube data source

Provider Type IBM DADB2 (OLE DB for IBM DB2)

Server

Database QAD

OK Cancel Apply

Work Directory

The work directory must be an existing valid Windows directory.

Database id (SID)

For SQL Server and DB2 leave this field blank. For Oracle enter the database id of the Data Warehouse database, e.g, ORCL.

Database link id

As this is a link back to the data warehouse this field must be left blank.

Extract user id

Enter the data warehouse user id. That is the database username under which the meta repository is loaded. For SQL Server this must be dbo if a trusted connection or the server login id. For DB2, this should be left blank if OS authentication is being used.

Extract password

The password of the data warehouse user. For SQL Server blank if a trusted login, or the server login password. For DB2, this should be left blank if OS authentication is being used.

Admin user id

Left blank.

Admin password

Left blank.

For cubes, the properties dialog shows some additional columns at the bottom of the screen. These are required so that the data warehouse can be used as a source for the Analysis Services cubes. Some other fields are determined by the type of relation database being used for the data warehouse. These fields are:

SSIS Connect String

SSIS Connect String is a valid SSIS connection string that can be used to connect to the data source or destination. The Reset button will attempt to construct a valid connection string from the connection information supplied in the connection details consisting of the Database ID, Database Link ID (Instance name), Provider Name, Extract User details.

Data Type Mapping Set

XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop down list or create a new one.

As a cube data source:

This section of fields is only relevant and will only be visible if the Datawarehouse check box has been enabled.

Provider Type

Server

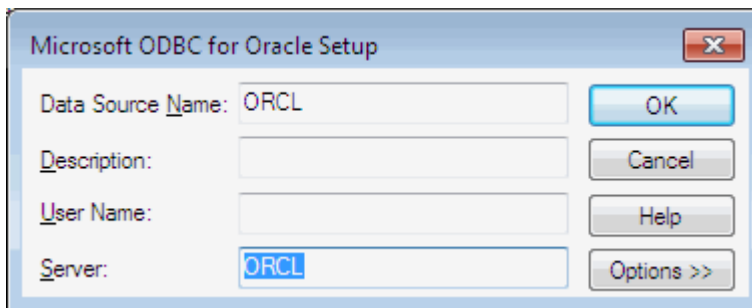
Database

For a SQL Server data warehouse:

- Set **Provider Type** to SQLOLEDB
- Set **Server** to the SQL Server server name
- Set **Database** to the SQL Server database name

For Oracle:

- Set **Provider Type** to MSDAORA
- Enter the oracle "TNS Server Name" for the **Server**, specifically the **Server** field in the ODBC set up screen shown:

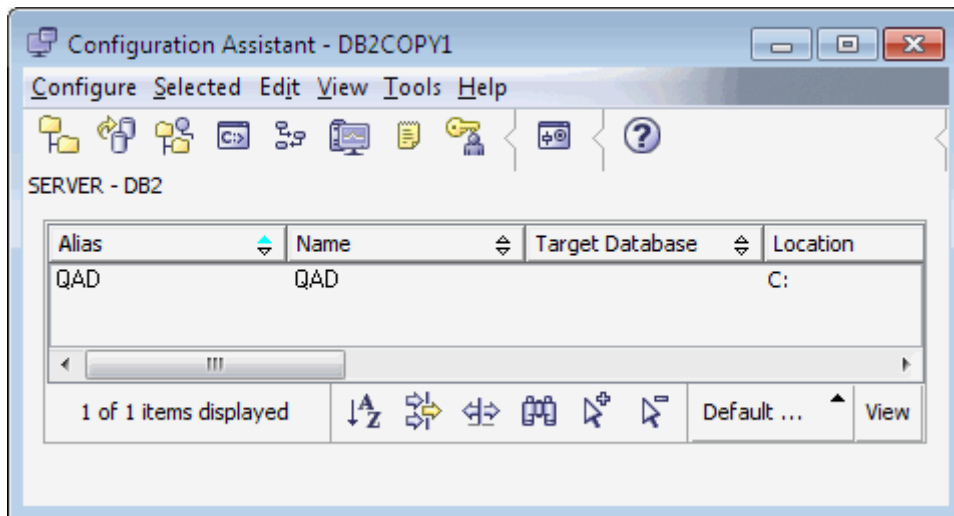


- Set **Database** to the data warehouse "schema"

For DB2:

- Set **Provider Type** to IBMDADB2
- Leave **Server** field empty for DB2

- Set Database to the server alias for the Database field, specifically the alias field for the IBM DB2 connection in the following DB2 Configuration Assistant screen:



6.3 Connections to Another Database

This section describes connections to another database source where a database link can be established.

If running a SQL Server data warehouse it is possible to create database links (linked server) to other SQL Server instances and most of the other major databases such as Oracle, DB2 etc.

Using the Oracle database it is possible to create a database link to another Oracle database as standard, or to any other database by using Oracles Heterogeneous Services. Tutorial 1 gives basic instructions for creating a connection. This topic describes in greater detail the connection properties. From this type of connection you can do database link loads.

When coming to the Data Warehouse from an OLTP source system, the connection defines the path to get to those source tables. A connection object must be defined for each source system.

The connection object properties window has the following fields:

Connection name

Enter a name for the connection. Typically this is a name that identifies the source system.

Connection type

The connection type is **Database**.

ODBC Source

The ODBC Source is the name as defined in the Windows 'ODBC Data Source Administrator'. This Administrator is found in the Control Panel of the PC. The ODBC Source must be a valid User or System DSN. For Oracle sources the 'Server' field must be set to the Tnsnames entry for the source system database.



TIP: For Oracle sources the ODBC driver used for the ODBC Source must be the Microsoft ODBC Driver for Oracle Version 2.573.6019.00 or later. If the source database is SQL Server, Progress, Informix, DB2, Sybase, Ingres or some other database then the ODBC driver available can be tested or you can contact QAD for a list of proven drivers.

If multiple PCs are accessing the meta repository there needs to be a standard naming convention such that all PCs use the same ODBC Source name.



TIP: The same ODBC source name must be used on all PCs that use this connection.

Provider Name

For SQL Server this is the name of the server or a provider type selected from the drop down list. To connect to another SQL Server database that resides on a different server select SQLOLEDB. In the example below MSDAORA is chosen for a connection to an oracle database.

Database id (SID)

For Oracle enter the database id of the Source database. For SQL Server enter the database name.

Database link id

If a database link already exists to this source database then enter that link name in this field. If no link exists then enter a link name. Under some circumstances Oracle insists that this link name is the same as the tnsnames entry for the database, so it may be good practice to use the source SID as the database link name. If this is a new link then see the notes later in this section on **database link creation** (see "**6.3.1 Database Link Creation**" on page 85).

If SQL Server and the database are on the same server as the data warehouse then no link needs to be defined, so this field can be left blank. Enter the defined SQL LINK name that points to the correct server, the link name does not need to be the same name as the server name.

If Oracle and the source tables are in the same database then no link is required and this field must be left blank.

Extract user id

Enter the source system user id under which you can logon to the source system. This is not necessarily the user that owns the tables you will be extracting. It must, however, be a user that has 'Select' access to the tables you wish to extract. For more information see **remote view extract** (see "**8.3.3 Remote View Extract**" on page 127).

Extract password

The password of the user on the source system

Admin user id

Leave blank.

Admin password

Leave blank.

SSIS Connect String

SSIS Connect String is a valid SSIS connection string that can be used to connect to the data source or destination. The Reset button will attempt to construct a valid connection string from the connection information supplied in the connection details consisting of the Database ID, Database Link ID (Instance name), Provider Name, Extract User details.

Data Type Mapping Set

XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop down list or create a new one.

Once the connection has been set up, you can right mouse click the connection in the middle pane and view the properties for that connection.

Browsing a connection



TIP: When browsing to a connection leave the schema field blank in order to see all schemas.

A **filter** can also be applied when browsing a connection. This filter restricts what is returned and can be:

- a standard SQL table name
- a project
- a group
- show/hide tables only
- show/hide views only
- show/hide system objects
- any combination of the above options

In addition to the filter, the dialog for browsing a connection allows for the input of a **user name** and **password**.

The screenshot shows a dialog box titled "List Source tables Connection". It contains the following fields and controls:

- Connection:** A dropdown menu with "DataWarehouse" selected.
- User ID:** A text input field.
- Password:** A text input field.
- Schema (Blank for all schemas):** A text input field with "dbo" entered.
- Filter (Blank for all tables, views):** A dropdown menu with "fact_%" selected.
- Show:** Three checkboxes: "Tables:" (checked), "Views:" (checked), and "System tables, etc.:" (unchecked).
- Group:** A dropdown menu.
- Project:** A dropdown menu.
- Buttons:** "OK", "Cancel", and "Refresh current connection" (disabled).

Examples

Sample Oracle data warehouse Connection for Oracle source properties screen:

The screenshot shows a 'Connection Properties' dialog box with two tabs: 'Connection Properties' and 'Notes'. The 'Connection Properties' tab is active. It contains the following fields and controls:

- Data Warehouse:** A checkbox that is currently unchecked.
- Connection Name:** A text box containing 'Production' with a help icon to its right.
- Connection Type:** A dropdown menu showing 'Database'.
- ODBC Source:** A dropdown menu showing 'WPRD001'.
- Database ID (SID):** A text box containing 'WPRD001'.
- Database Link ID:** A text box containing 'WPRD001'.
- Extract User ID:** A text box containing 'prod_user'.
- Password:** A text box containing masked characters '*****'.
- Admin User ID:** An empty text box.
- Password:** An empty text box.
- SSIS Connect String:** An empty text box with a 'Reset' button to its right.
- Data Type Mapping Set:** A dropdown menu showing '(Default)'.

At the bottom right of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

Sample SQL Server data warehouse Connection properties screen to local SQL Server database:

The screenshot shows the 'Connection Properties' dialog box for a SQL Server data warehouse connection. The 'Notes' tab is selected. The 'Data Warehouse' checkbox is unchecked. The 'Connection Name' is 'Northwind'. The 'Connection Type' is 'Database'. The 'ODBC Source' is 'Northwind'. The 'Provider Name' is empty. The 'Database ID (SID)' is 'Northwind'. The 'Database Link ID' is empty. The 'Extract User ID' is 'sa' and the 'Password' is masked with three asterisks. The 'Admin User ID' is empty and the 'Password' is empty. The 'SSIS Connect String' is empty, with a 'Reset' button next to it. The 'Data Type Mapping Set' is '(Default)'. At the bottom are 'OK', 'Cancel', and 'Apply' buttons.

Connection Properties		Notes	
Data Warehouse	☐		
Connection Name	Northwind		
Connection Type	Database		
ODBC Source	Northwind		
Provider Name			
Database ID (SID)	Northwind		
Database Link ID			
Extract User ID	sa	Password	***
Admin User ID		Password	
SSIS Connect String			Reset
Data Type Mapping Set	(Default)		
OK		Cancel	Apply

Sample SQL Server data warehouse Connection properties screen to Oracle database:

The screenshot shows the 'Connection Properties' dialog box for a SQL Server data warehouse connection to an Oracle database. The 'Notes' tab is selected. The 'Data Warehouse' checkbox is unchecked. The 'Connection Name' is 'Oracle'. The 'Connection Type' is 'Database'. The 'ODBC Source' is 'O11G'. The 'Provider Name' is 'MSDAORA'. The 'Database ID (SID)' is 'O11G'. The 'Database Link ID' is 'db_oracle'. The 'Extract User ID' is 'wtutorial' and the 'Password' is masked with three asterisks. The 'Admin User ID' is empty and the 'Password' is also empty. The 'SSIS Connect String' is empty, with a 'Reset' button next to it. The 'Data Type Mapping Set' is '(Default)'. At the bottom are 'OK', 'Cancel', and 'Apply' buttons.

Connection Properties		Notes	
Data Warehouse	☐		
Connection Name	Oracle		
Connection Type	Database		
ODBC Source	O11G		
Provider Name	MSDAORA		
Database ID (SID)	O11G		
Database Link ID	db_oracle		
Extract User ID	wtutorial	Password	***
Admin User ID		Password	
SSIS Connect String			Reset
Data Type Mapping Set	(Default)		
OK Cancel Apply			

Sample SQL Server data warehouse Connection properties screen to a SQL Server database residing on a different server. Note that the database link must be created. See the section on database links.

The screenshot shows the 'Connection Properties' dialog box with the following fields and values:

- Data Warehouse:** ☐
- Connection Name:** AppSvr01
- Connection Type:** Database
- ODBC Source:** AppSvr
- Provider Name:** SQLOLEDB
- Database ID (SID):** Production
- Database Link ID:** AppSvr01
- Extract User ID:** dbo
- Password:** (masked with asterisks)
- Admin User ID:** (empty)
- Password:** (empty)
- SSIS Connect String:** (empty)
- Data Type Mapping Set:** (Default)

Buttons at the bottom right: OK, Cancel, Apply.



TIP: When loading data from SQL Server on one server to a SQL Server Data Warehouse on another server, the Data Warehouse must have permissions to read data on the source server. This can be achieved using a database user name and password or via Windows Authentication. With Windows Authentication, it is the Data Warehouse server windows account that requires permission to read the source SQL Server database. Therefore, it is possible for a developer to be able to access both databases from their PC and a database link to be unable to copy data from the source to the data warehouse.

DB2 database connect for a SQL Server data warehouse

To create a database connection to DB2 in a SQL Server data warehouse proceed as follows:

- 1 First create the linked server from within the Microsoft Enterprise manager utility.

- 2 Create a database connection. Enter a valid ODBC source for the DB2 database. Leave the provider name blank and the database id blank. Enter the name of the linked server under the database link.

Altering a Connection's Properties

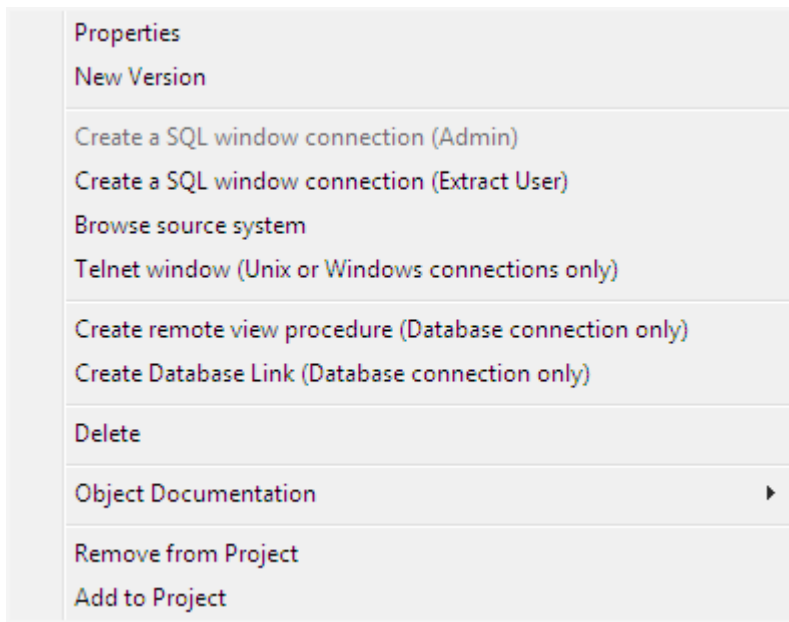
Whenever a connection's properties are changed, the impact on the objects that use that connection must be considered. Load tables have information from the connection stored within their properties. This information is stored in the load objects to minimize the complexity of the scheduled tasks. The database link and database name are stored locally in each load table. When either the database link or database name are changed on a connection, QAD Data Warehouse Designer displays the **Update Associated Load Tables** dialog box. Click **Yes** to automatically update the database link and/or database name on all associated load tables.

This can also be done manually by:

- 1 Double clicking on the 'Load Tables' object group in the left pane. This will display all load tables in the middle pane.
- 2 Select those load tables that use the connection that has changed. Use standard Windows selection.
- 3 Right mouse to bring up a menu and select 'Change Connect/Schema'.
- 4 Select a different connection (e.g. Data warehouse) to change all the selected load tables.
- 5 Repeat step (3) and now change the tables back to the altered connection. This will update all the load tables with the new connection information.

6.3.1 Database Link Creation

Once a connection has been set up, you can right mouse click on the connection name to receive the following menu:



If the connection is a database link connection then the link should be created.

Once selected the 'create database link' option will attempt to create a user database link to the source database. If the link already exists a prompt will appear asking if it is OK to overwrite the existing link. A number of problems can occur during this action, and your database administrator should be consulted.

For SQL Server a trusted link will be created if the extract user in the connection is set to 'dbo'. In all other cases the extract user/password will be used as the logon for the remote server.

For Oracle data warehouses the more common problems are:

- 1** Insufficient privileges to create the link. You need the 'Create database link' privilege in order to create a new link.
- 2** TNS could not resolve the connection to the remote database. The database link uses the value entered in the 'SID' field of the connection to identify the remote database. This value must be a valid entry in the Tnsnames table for the source database.

6.4 ODBC Based Connections

This connection is via an ODBC link. All data movement is performed using the ODBC connection.

Connection name

A name to define your connection.

Connection type

ODBC.

ODBC Source

The ODBC Source is the name as defined in the Windows 'ODBC Data Source Administrator'. This Administrator is found in the Control Panel of the PC. The ODBC Source must be a valid User or System DSN and for Oracle sources must have the 'Server' field set to the Tnsnames entry for the data warehouse database.



TIP: For Oracle data source the ODBC driver used for the ODBC Source must be the Microsoft ODBC Driver for Oracle Version 2.573.6019.00 or later.

If multiple PCs are accessing the meta repository there needs to be a standard naming convention such that all PCs use the same ODBC Source name.



TIP: The same ODBC source name must be used on all PCs that use this connection.

Work directory

The work directory must be an existing valid Windows directory.



TIP: This directory must be valid on the Server that is running the Scheduler.

Extract user id

Enter the source system user id under which you can logon to the source system. This is not necessarily the user that owns the tables you will be extracting. It must, however, be a user that has 'Select' access to the tables you wish to extract.

Extract password

The password of the user on the source system

Admin user id

Leave blank.

Admin password

Leave blank.

SSIS Connect String

SSIS Connect String is a valid SSIS connection string that can be used to connect to the data source or destination. The Reset button will attempt to construct a valid connection string from the connection information supplied in the connection details consisting of the Database ID, Database Link ID (Instance name), Provider Name, Extract User details.

Data Type Mapping Set

XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop down list or create a new one.

Sample ODBC connection properties screen:

Tutorial (OLTP) definition

Connection Properties | Notes

Data Warehouse ☐

Connection Name 

Connection Type

ODBC Source

Work Directory

Extract User ID Password

Admin User ID Password

SSIS Connect String

Data Type Mapping Set

6.5 Connections to Unix

Note: Unix connections are only supported from Oracle and DB2 data warehouses.

This section describes connections to Unix. Tutorial 1 gives basic instructions for creating a connection. This topic describes in greater detail the connection properties as they apply to Unix connections.

From a Unix connection you can only do flat file loads.



TIP: If the connection type is Linux then the connection name must contain the word **Linux**. This forces QAD Data Warehouse Designer to use `/bin/sh` shell instead of `/bin/ksh` shell.

Connection name

Enter a name for the connection. See the above tip regarding Linux connections.

Connection type

The connection type is **Unix**. See the above tip regarding Linux connections.

Host name

Enter the IP address or the host name of the Unix host.

Work directory

The directory must be a valid directory that you have write access to on the Unix machine, typically `/tmp`. This directory must be unique if multiple schedulers are running on the same Unix machine.

Note: There must be a different work directory for each scheduler running on a Unix platform. If this is not done and common usernames/passwords are used then the possibility exists that the wrong script or file based load could be processed.

Database id (SID)

Enter the database id of the Data Warehouse database, e.g, ORCL

Database home directory

If the home directory is different from the standard Oracle home directory then enter the directory here.

Unix user id

Enter the name of the Unix user being logged on to. That user must log on to the shell prompt for drag and drop features to be used.

Unix password

The password of the Unix user being logged on to.

Dss user id

Enter the database username for the Data Warehouse, e.g. dssadm

Dss password

Enter the password for the dss user.

Data Type Mapping Set

XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop down list or create a new one.

Sample Unix connection screen:

The screenshot shows a 'Connection Properties' dialog box with two tabs: 'Connection Properties' and 'Notes'. The 'Connection Properties' tab is active. It contains the following fields and settings:

- Data Warehouse:** ☐
- Connection Name:** Unix
- Connection Type:** Unix (dropdown menu)
- Host Name:** wsl-linux (dropdown menu)
- Work Directory:** /tmp
- Database ID (SID):** ORCL
- Database Home Dir.:** (empty field)
- Unix User ID:** dssadm
- Password:** ***
- DSS User ID:** dssdemo
- Password:** ***
- Data Type Mapping Set:** (Default) (dropdown menu)
- Unix Connection attributes:**
 - Shell Type:** SSH (dropdown menu)
 - Command:** c:\Program Files\PuTTY\plink.exe -ssh wsl-linux
 - Pre Login Action:** (empty field)
 - Login Prompt:** login:
 - Password Prompt:** assword:
 - Post Login Action:** (empty field)
 - Command Prompt:** \$

At the bottom right, there are three buttons: OK, Cancel, and Apply.

Shell Type

The shell type is either Telnet or SSH (secure shell). If SSH is selected, then the Command box is made available.

Command

This is the command used by SSH for securing a connection to the LINUX or UNIX server.

Pre Login Action, Login prompt, Password prompt, Post login action, and Command prompt.

These fields are only used to create a Telnet connection to the host machine. QAD Data Warehouse Designer uses the Telnet connection in the drag and drop functionality. It is not used in the actual production running of the Data Warehouse, and is only necessary if you wish to use the drag and drop functionality.

Pre Login Action

Only used as above, e.g, /n (to initiate a carriage return before the prompt).

Login prompt

The Unix login prompt, or the tail end of the login prompt, e.g, ogin:

Password prompt

The Unix password prompt, or the tail end of the password prompt, e.g, assword:

Post login action

Not often used but may be necessary to respond to a login question. It is preferable that the Unix login goes straight to the command prompt.

Command prompt

Enter the Unix command prompt, or the tail end of that prompt, typically \$

Note: In order to ascertain some of the above fields you will have to log in to the Unix system.

To validate the fields

- Right click on the connection name
- Select Telnet window

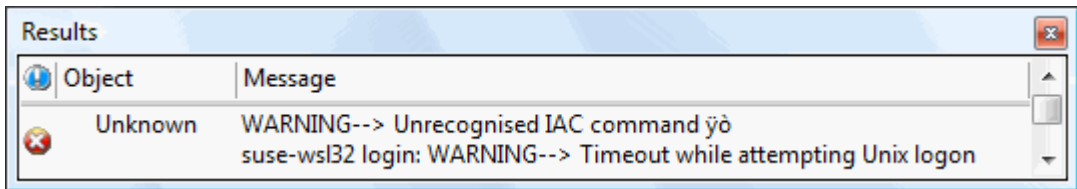
This will provide a telnet window that can be used to log on to the Unix server.

To test the drag and drop functionality

- From the menu strip select Browse | Source Tables
- Drill down to the area required
- Drag an item to the middle pane, (having first selected the object in the left pane).

Connection Failures

In the event that a telnet connection cannot be established to the Unix host the following result box will normally appear after approximately 30 seconds.

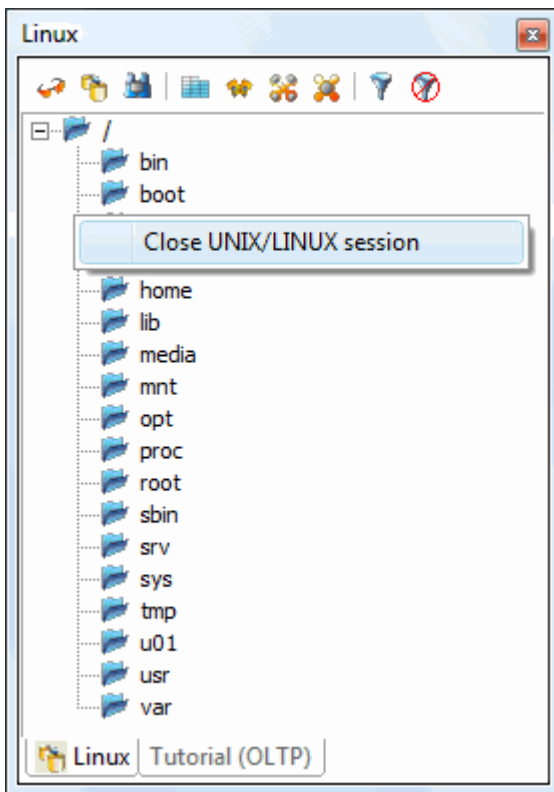


Attempt the connection again, and using the **Window** menu option select the **Telnet** window. This will display the login session, and should provide an insight as to why the connection is not being completed.

If the situation cannot be resolved a telnet trace can be acquired. Select the menu option **Tools/Options** and click on the check box 'Trace all Unix sessions'. Then try to do the connection or browse again. A log file called `WslMedTelnet.log` will be created in the QAD program directory. Edit the log file and ensure there are no passwords visible and then send to <http://support.qad.com>

Closing the Connection

To close the collection, right click in the browser pane and choose **Close UNIX/LINUX session**:



6.6 Connections to Windows

This connection is back to the PC that you are working on, or to a host Windows PC. From Windows you can only do flat file loads.

Connection name

A name to define your connection.

Connection type

Windows.

Host name

Leave this blank if you are connecting to your own PC. If you are connecting remotely to another Windows system, enter the name of that system.

Work directory

The work directory must be an existing valid Windows directory.



TIP: If a Windows Scheduler is being used then this directory must be valid on the Server that is running the Scheduler.

Database id (SID)

Enter the database id for the Data Warehouse database.

Database home directory

Enter the directory name here only if it differs from the standard.

Windows user id and password

Leave this blank if you are connecting to your own PC. Enter details if you are connecting remotely to another Windows system.

Dss user id and password

Enter the relevant details for connecting to the Data Warehouse.

Data Type Mapping Set

XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop down list or create a new one.

To test the connection

- Select Browse | Source Tables from the menu strip

- In the right pane you should be able to drill down to the area required.

Sample Oracle Windows connection screen:

The screenshot shows a 'Windows definition' dialog box with the following fields and values:

Field	Value
Data Warehouse	☐
Connection Name	Windows
Connection Type	Windows
Host Name	
Work Directory	c:\temp
Database ID (SID)	ORCL
Database Home Dir.	
Windows User ID	
Password	
DSS User ID	dssdemo
Password	***
Data Type Mapping Set	(Default)

Buttons at the bottom: OK, Cancel, Apply.

Sample SQL Server Windows connection screen:

The screenshot shows a 'Windows definition' dialog box with a title bar and a close button. It contains two tabs: 'Connection Properties' and 'Notes'. The 'Connection Properties' tab is active and displays the following fields:

- Data Warehouse:** A checkbox that is currently unchecked.
- Connection Name:** A text box containing the value 'Windows' and a help icon.
- Connection Type:** A dropdown menu with 'Windows' selected.
- Host Name:** A dropdown menu.
- Work Directory:** A text box containing 'c:\temp'.
- Database ID (SID):** A text box.
- Database Server:** A text box.
- Windows User ID:** A text box.
- Password:** A text box.
- DSS User ID:** A text box containing 'dbo'.
- Password:** A text box.
- Data Type Mapping Set:** A dropdown menu with '(Default)' selected.

At the bottom right of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

Sample IBM DB2 connection screen:

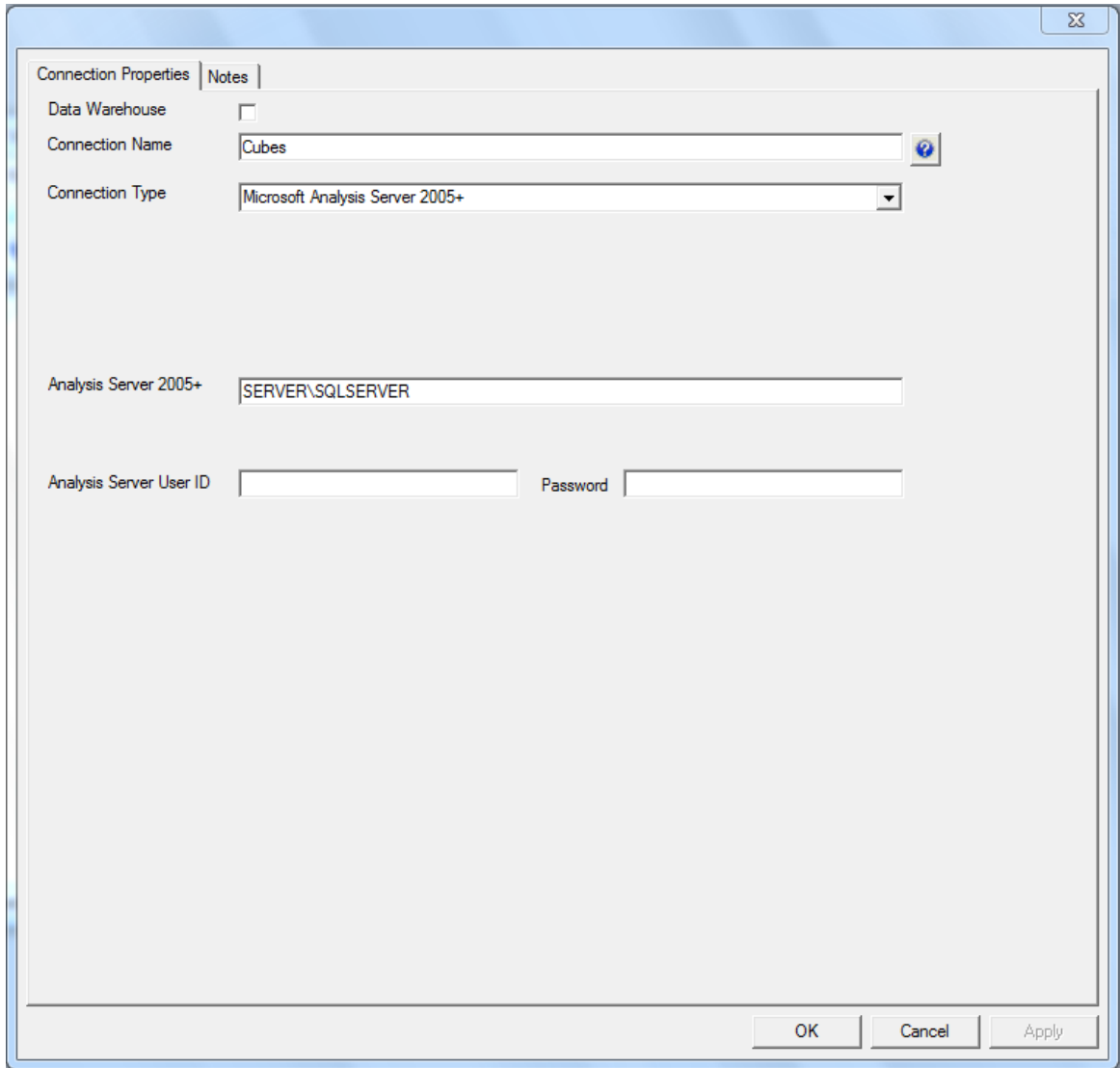
The screenshot shows a 'Windows definition' dialog box with a close button (X) in the top right corner. The dialog has two tabs: 'Connection Properties' (selected) and 'Notes'. The 'Connection Properties' tab contains the following fields:

- Data Warehouse:** A checkbox that is currently unchecked.
- Connection Name:** A text field containing the value 'Windows'.
- Connection Type:** A dropdown menu with 'Windows' selected.
- Host Name:** A dropdown menu.
- Work Directory:** A text field containing the value 'c:\temp'.
- Database ID (SID):** A text field.
- Database Home Dir.:** A text field.
- Windows User ID:** A text field.
- Password:** A text field (next to Windows User ID).
- DSS User ID:** A text field.
- Password:** A text field (next to DSS User ID).
- Data Type Mapping Set:** A dropdown menu with '(Default)' selected.

At the bottom right of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

6.7 Connections to Analysis Services

A Connection to an Analysis Services server provides the location for cubes defined in the metadata repository. This connection is used in the creation and processing of cubes. An example screen shot follows:



The screenshot shows a 'Connection Properties' dialog box with two tabs: 'Connection Properties' and 'Notes'. The 'Connection Properties' tab is active. It contains the following fields:

- Data Warehouse:** A checkbox that is currently unchecked.
- Connection Name:** A text box containing the value 'Cubes'.
- Connection Type:** A dropdown menu showing 'Microsoft Analysis Server 2005+'.
- Analysis Server 2005+:** A text box containing the value 'SERVER\SQLSERVER'.
- Analysis Server User ID:** An empty text box.
- Password:** An empty text box.

At the bottom right of the dialog box are three buttons: 'OK', 'Cancel', and 'Apply'.

Connection Name

Enter a name to identify the connection to the Analysis Services server

Connection Type

The connection type is chosen from the drop down list. SQL Server 2000 OLAP server use a connection type of “Analysis Server 2000” and for later versions of SQL Server OLAP server use “Microsoft Analysis Server 2005”.

Analysis Server

Enter the name of the Analysis Services server you wish to connect to. This must be a valid server name. Contact your system administrator if you do not have a valid server name.

User Id and Password

Unused.

C H A P T E R 7

7. Table Properties

Several generic properties can be set on all table objects in QAD Data Warehouse Designer. These are:

- Storage Properties
- Notes
- Documentation Fields

This Chapter discusses these properties.

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7.2 Table Notes 108

7.3 Table Documentation Fields 109

7.4 Table Statistics in DB2 111

7.1 Table Storage Properties

The fields on the **Storage** tab of the Properties screen for tables are described below. The properties available depend on the data warehouse database environment.

- For a SQL Server example, see **Table Storage Screen - SQL Server** (see "**7.1.1 Table Storage Screen - SQL Server**" on page 104).
- For an Oracle example, see **Table Storage Screen - Oracle** (see "**7.1.2 Table Storage Screen - Oracle**" on page 105).
- For a DB2 example, see **Table Storage Screen - DB2** (see "**7.1.3 Table Storage Screen - DB2**" on page 107).

Tablespace / Filegroup name

Select a name from the drop down list box. If no tablespace is selected in Oracle or DB2, then the default tablespace for the schema is used. If no filegroup name is selected for SQL Server, the default for the database is used.

VarDecimal

Enables variable numeric storage in SQL Server for the table. The default is off - no variable numeric storage. To enable variable number storage, the following command must also be run for the SQL Server database: `sp_db_vardecimal_storage_format 'DatabaseName', 'ON'`

Initial extent (KB)

Oracle only. The size of the first extent of a created database table. The default is 0 kilobytes - use the tablespace's default value. For locally managed tablespaces, this field is ignored.

Next extent (KB)

Oracle only. The size of the next (second) extent of a created database table, unless percent increase is specified. The default is 0 kilobytes - use the tablespace's default value. For locally managed tablespaces, this field is ignored.

Minimum extents

Oracle only. The number of extents the table is created with. The default is 0 - use the tablespace's default value. For locally managed tablespaces, this field is ignored.

Maximum extents

Oracle only. The maximum number of extents the table can have. The default is 0 - use the tablespace's default value. For locally managed tablespaces, this field is ignored.

Percent increase

Oracle only. The size the next extent is as a percent of the previous extent added. For example, a value of 5 will create the next extent 5% bigger than the previous extent added. The default is 0 - use the tablespace's default value. For locally managed tablespaces, this field is ignored.

Percent free

Oracle and DB2 only. The amount of free space to leave in each extent in Oracle and each page in DB2. The default is 0 - use the database default.

Buffer Pool attribute

Oracle Dimension tables only. Mark the table to be retained in a special buffer pool. Possible values are Default, Keep, Recycle and not set (blank). The default is not set.

Compress

DB2 only. Enable table compression. Default is off - no compression.

Volatile

DB2 only. Enable this option to alter the table after it is created to indicate size volatility to the DB2 optimizer.

Append Only

DB2 only. Enable this option to alter the table after it is created to append new data to the end of the table, rather than using available free space in the table.

Index build logging

DB2 only. Specifies the degree of logging performed by DB2 when creating, recreating and re-organizing indexes. Value is one of not selected, NULL, OFF or ON. Not selected and NULL are the same. The table is created without this option and then altered to add this property. The default is not set (no alter takes place). The following describes the values:

- NULL - Database parameter **logindexbuild** determines whether logging is minimal or full.
- OFF - only minimal logging occurs.
- ON - all operations are logged.

7.1.1 Table Storage Screen - SQL Server

The screenshot shows a dialog box titled "load_customer table definition" with a standard Windows window border and a close button (X) in the top right corner. The dialog has four tabs: "Properties", "Source Mapping", "Storage", and "Notes". The "Storage" tab is currently selected and highlighted. Inside the "Storage" tab, there is a label "Filegroup name:" followed by a text input field and a small downward-pointing arrow, indicating a dropdown menu. Below this, there is a label "VarDecimal:" followed by an unchecked checkbox. At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply". The "OK" button is highlighted with a dashed border.

7.1.2 Table Storage Screen - Oracle

Typical Storage Tab for an Oracle Table:

The screenshot shows a dialog box titled "load_budget table definition" with a close button (X) in the top right corner. The dialog has four tabs: "Properties", "File Attributes", "Storage", and "Notes". The "Storage" tab is currently selected. Inside the "Storage" tab, there are seven input fields, each with a label to its left:

- Tablespace name: A dropdown menu showing "LOAD_DATA".
- Initial extent (KB): A text input field containing "0".
- Next extent (KB): A text input field containing "0".
- Minimum extents: A text input field containing "0".
- Maximum extents: A text input field containing "0".
- Percent Increase: A text input field containing "0".
- Percent Free: A text input field containing "0".

At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

Storage Tab for an Oracle Dimension Table:

The screenshot shows a dialog box titled "dim_customer table definition" with a close button (X) in the top right corner. The dialog has several tabs: Properties, Storage, Purpose, Concept, Grain, Examples, Usage, and Notes. The "Storage" tab is currently selected. The dialog contains the following fields and controls:

- Tablespace name:** A dropdown menu showing "DIM_DATA".
- Initial extent (KB):** A text input field containing "0".
- Next extent (KB):** A text input field containing "0".
- Minimum extents:** A text input field containing "0".
- Maximum extents:** A text input field containing "0".
- Percent Increase:** A text input field containing "0".
- Percent Free:** A text input field containing "0".
- Buffer Pool attribute:** A dropdown menu showing "Keep".

At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

7.1.3 Table Storage Screen - DB2

The screenshot shows a dialog box titled "load_order_line table definition" with a close button (X) in the top right corner. The dialog has five tabs: "Properties", "Source Mapping", "Storage" (which is selected), "Statistics", and "Notes".

Under the "Storage" tab, the following options are visible:

- Table space name:** A dropdown menu currently showing "LOAD_DATA".
- Compress:** An unchecked checkbox.
- Volatile:** An unchecked checkbox.
- Append only:** An unchecked checkbox.
- Percent Free:** A text input field containing the value "0".
- Index Table space:** An empty dropdown menu.
- Index build logging:** An empty dropdown menu.

At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

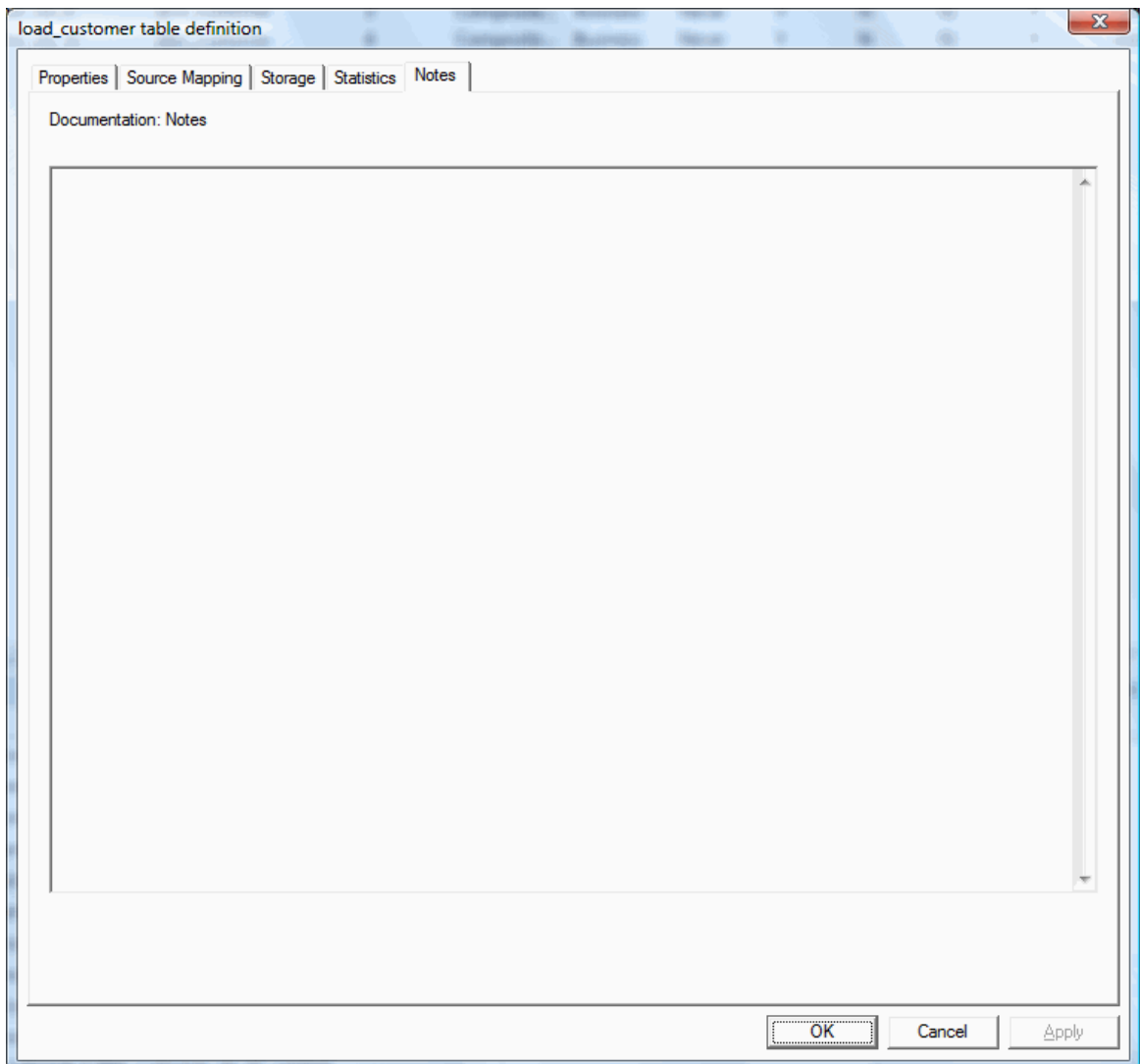
7.2 Table Notes

The notes screen is used to enter notes against QAD Data Warehouse Designer objects. The notes on an object are included in the QAD Data Warehouse Designer documentation. Up to 4000 characters of information can be stored in the Notes field.

By default, the Notes field is enabled for all object types.

Notes can be removed from the documentation via the Tools / Options menu - see **Settings - Documentation** (see "5.1.8 Settings - Documentation" on page 57) for more information.

7.2.1 Table Notes Screen



7.3 Table Documentation Fields

Each table has a set of associated documentation tabs. These are used to store descriptive metadata about the fact table and how it is used. The contents of each tab appears in the generated documentation. Their order and placement can be customized in the generated documentation using the Tools / Options menu.

The following tabs are available to store additional informational metadata that will appear in the generated QAD Data Warehouse Designer documentation:

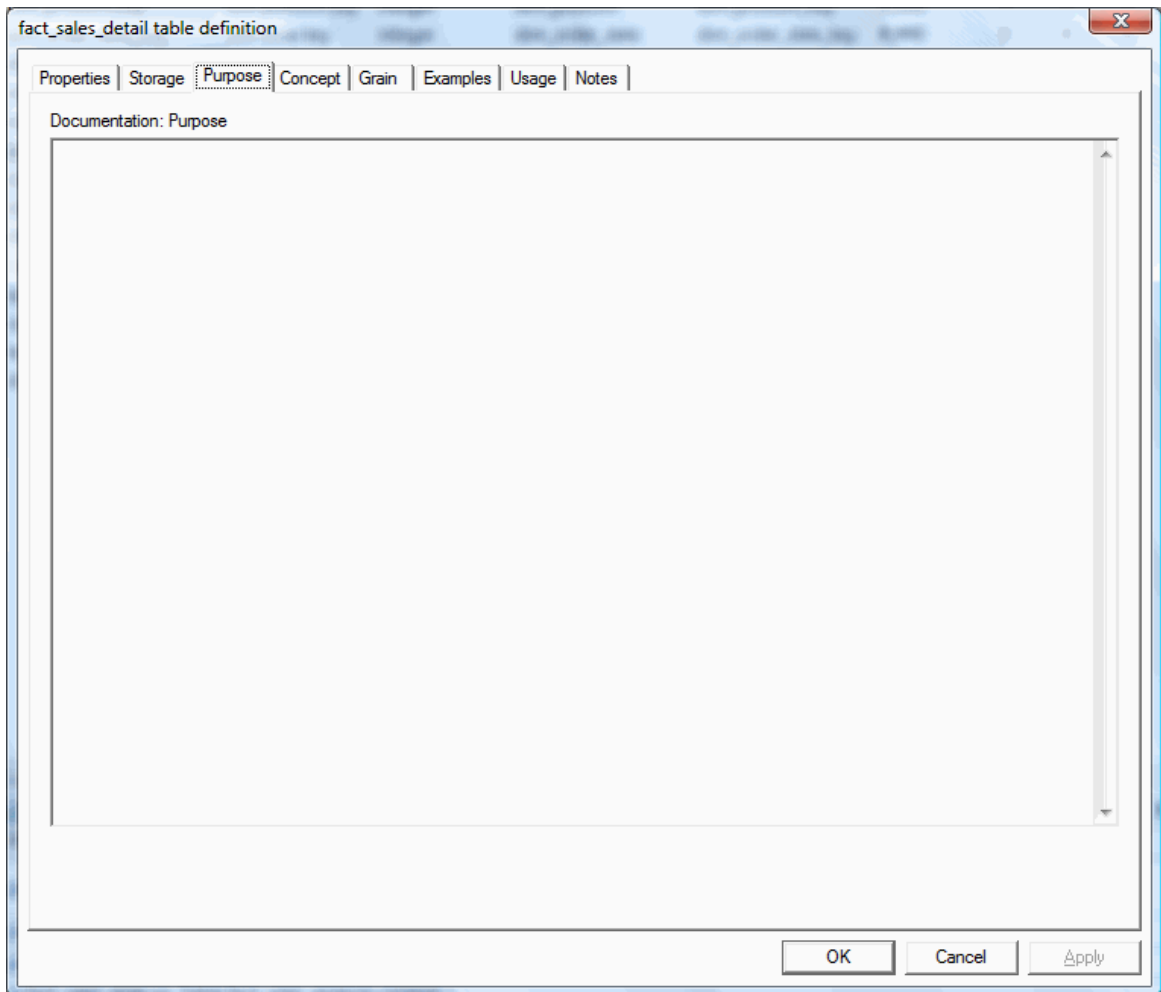
- Purpose
- Concept
- Grain
- Examples
- Usage

Note: These names of the tabs are completely arbitrary and can be changed in the generated documentation using Tools / Options menu, Documentation tab. By default, these fields are not enabled for load and stage tables, but can be enabled using the Tools / Options menu, Documentation tab.

Up to 4000 characters of information can be stored in each field.

Some or all of these fields can be removed from the documentation via the Tools / Options menu - see **Settings - Documentation** (see "**5.1.8 Settings - Documentation**" on page 57) for more information.

7.3.1 Table Documentation Fields Screen



7.4 Table Statistics in DB2

QAD Data Warehouse Designer for DB2 allows for table level statistics definition. Four different statistics command may be defined for a table:

- Stats Full
- Stats Quick
- Analyze Full
- Analyze Quick

These are arbitrary names, used as **actions** in the scheduler.

To set the command that is run for one of the actions above, enter the command to be run using the `$$SCHEMA$` and `$$TABLE$` variables.

Note: The variable `$$SCHEMA$` allows for metadata portability between environments. Variable `$$TABLE$` avoids any requirement to change the command if the table is renamed.

For example: enter *runstats on table \$\$SCHEMA\$\$.\$TABLE\$* to do basic statistics for the table.

If a particular statistics field is left blank, then the QAD Data Warehouse Designer default statistics options are used.

The default statistics method is the statistics method used in the scheduler if the chosen action is **Process with default stats**.

7.4.1 Table Statistics Screen

The screenshot shows a dialog box titled "load_customer table definition" with a close button in the top right corner. The dialog has five tabs: "Properties", "Source Mapping", "Storage", "Statistics" (which is selected), and "Notes".

Inside the "Statistics" tab, the text reads: "Select the statistics method to use with the Scheduler 'Process and Statistics' task action."

Below this text is a label "Process and Statistics method:" followed by a dropdown menu.

Further down, a paragraph of text states: "The following commands can be used to optionally override the defaults for gathering table statistics via the Scheduler. If a command is left blank then the corresponding Repository command or WhereScape RED default will be used for Use \$\$SCHEMA\$\$ to denote the table owner and \$\$TABLE\$\$ to denote the table name."

Below this text are four labels, each followed by a text input field:

- Stats:
- Quick Stats:
- Analyze:
- Quick Analyze:

At the bottom right of the dialog are three buttons: "OK", "Cancel", and "Apply".

CHAPTER 8

8. Loading Data

Load tables are the first entry point for all information coming into the data warehouse. There are multiple ways of getting data into load tables.

- Database link load - loaded from another database
- Externally loaded - the load table is populated by some external process, e.g. an ETL (Extract, Transform and Load) tool or EAI (Enterprise Application Integration) tool, putting the data directly into the load tables.
- ODBC based load - the data is loaded via an ODBC connection, either directly by reading and inserting each row (a Load Type of **ODBC load**), or via a file by reading from the source system using ODBC and writing to a file and then loading the file (a Load Type of **Native ODBC**). ODBC connections require a Windows scheduler.
- File load - a flat file load where most of the processing is managed and controlled by the scheduler.
- Script-based load - a flat file load where a host system, i.e. Unix or Windows script file is executed to perform the load.
- XML file load - loading an XML file from a Windows directory.

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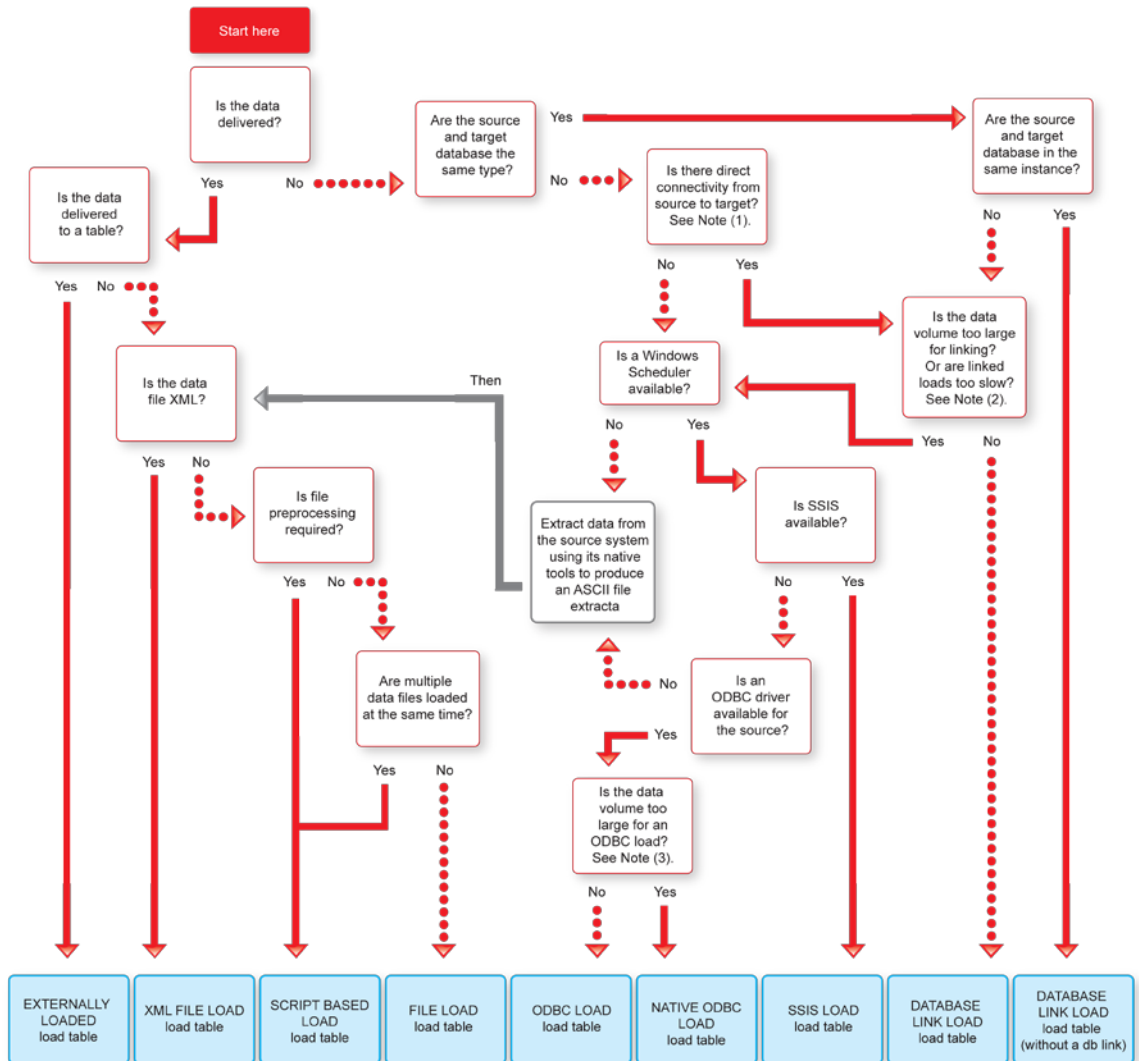
8.1 Choosing the Best Load Table

Several different factors need to be considered when choosing the best type of load table to use:

- Source and target database types
- Locations of source and target databases
- Available connectivity options and performance
- Amount of data being loaded
- Is the data delivered or fetched?
- For delivered data, what format is it in and does it require processing to make it loadable?

Load Table Decision Tree

The following decision tree can be used when selecting the best type of load table:



8.2 Load Drag and Drop

The simplest way to create a load table is to use the drag and drop functionality of QAD Data Warehouse Designer. Drag and drop can be used for all connection types and the process is the same in all cases.

- 1 Browse to the source system connection (Browse/Source Tables).
- 2 Create a drop target by double clicking on the Load Table object group in the left hand pane. The middle pane should have a column heading of 'Load Table Name' for the leftmost column.
- 3 Select a table or file in the right hand pane and drag it into the middle pane. Drop the table or file anywhere in the middle pane.

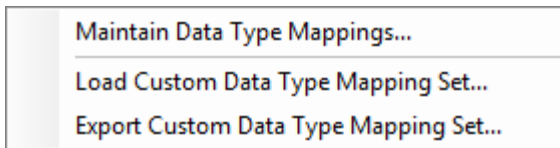
- 4 Answer the resulting prompts to create the load table. See the tutorials for examples on how to create load tables using drag and drop.

Note: When creating a load table in QAD Data Warehouse Designer by dragging over a source table, Data Warehouse Designer will read the structure of the table on the source system and attempt to construct an equivalent load table in the data warehouse. There are occasions when the load table creation will fail due to incompatible data types in the target data warehouse. The remedy is to change the data types of the particular attributes which are causing the load failure. Once corrected the load table should create. It is important that the table load is tested to ensure that data can be INSERTED into the load table from the source table. If the load fails then the data may need to be explicitly converted to the destination data type using a column transformation that is executed during the load (see **Load Table Transformations** (see "**8.11 Load Table Transformations**" on page 159)). Incompatible data types that cause load table creation errors are typically caused by:

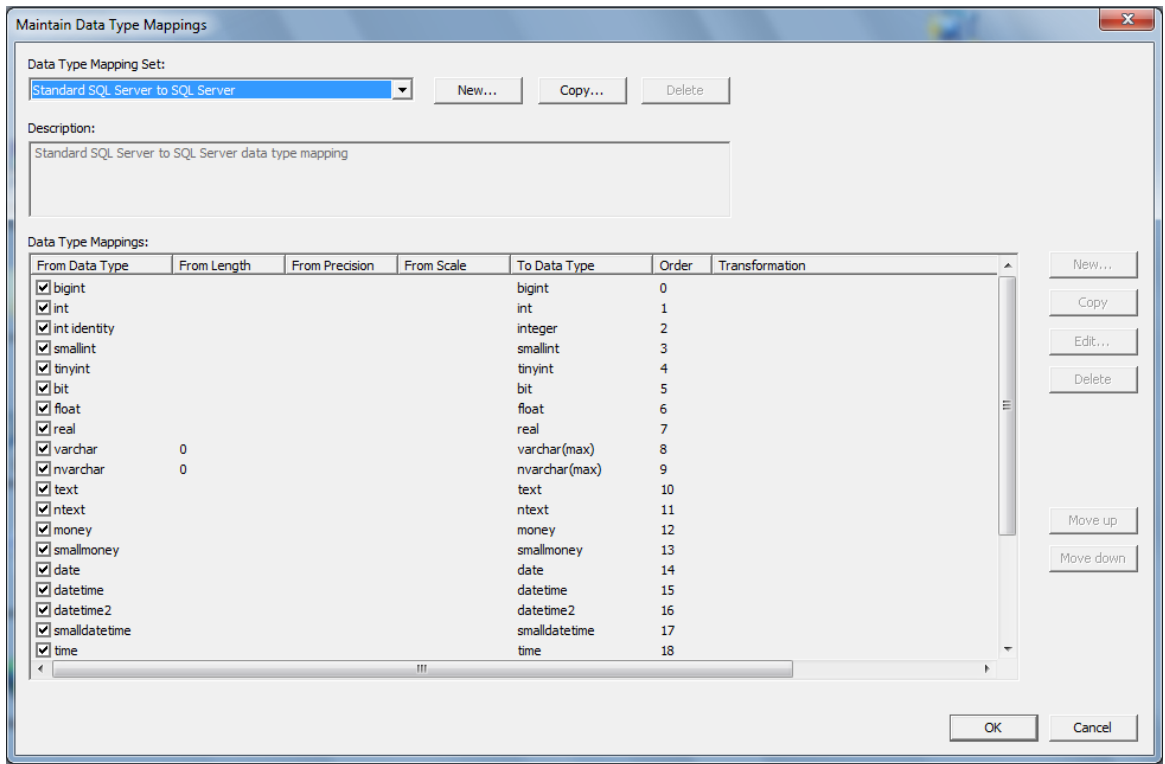
- User defined data types in the source database.
 - Incorrect data type mapping during load table definition in QAD Data Warehouse Designer.
 - Data types that cannot be inserted into (eg identity columns on SQL Server)
-

8.2.1 Data Type Mappings

In Tools/Data Type Mappings, the first menu option will allow you to maintain the data type mappings.

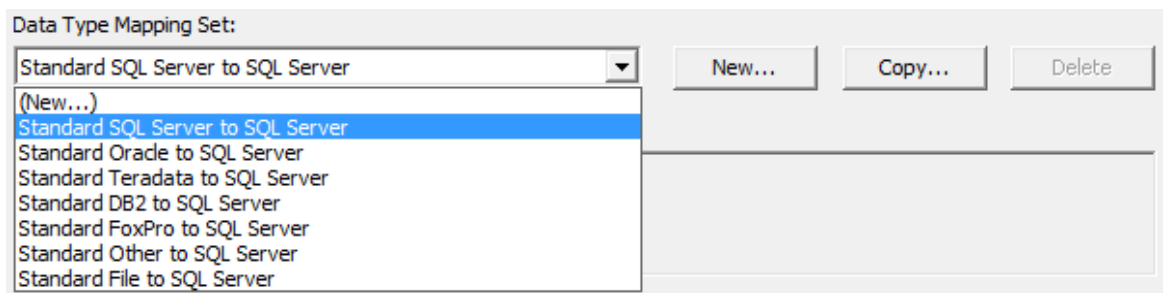


The user interface for maintaining data type mappings is as follows:



Data Type Mapping Set

Select a data type mapping set from the drop-down list. Of the standard files, only the files relevant to the database that you are on will be displayed in the list:



There are 3 buttons to the right of this field:

- 1 The New button allows you to create an empty data type mapping set. You can then manually enter the data type mappings into the table.
- 2 The Copy button allows you to create a new data type mapping set by copying an existing mapping set.
- 3 The Delete button allows you to delete any user defined data type mapping set.

Description

Enter the description for the data type mapping set.

Data Type Mappings

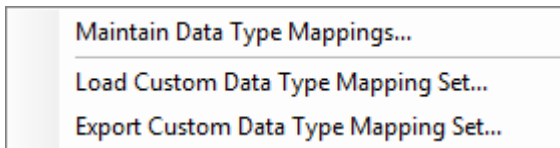
If the data type mapping set is **user defined** and not one of the standard files, then it is editable and can be maintained here either by using the buttons on the right hand side, or by entering the data type mappings directly into the table. If you select one of the standard data type mapping sets, then it will not be editable and the buttons on the right hand side will thus be disabled.

- 1 The **New** button allows you to create a new data type mapping.
- 2 The **Copy** button allows you to copy the highlighted data type mapping. The copy is inserted at the end of the list.
- 3 The **Edit** button allows you to edit the data type mapping.
- 4 The **Delete** button allows you to delete the data type mapping.
- 5 The buttons **Move up** and **Move down** allow you to move the highlighted data type mapping up or down in the list.

Note: The order of the data type mappings is significant as when loading a table, the procedure checks the data type mappings from top to bottom and stops when a data type and its parameters are correctly matched. A blank parameter means that it will match to anything.

Moving Sets between Environments

Go to Tools/Data Type Mappings:



The **Load Custom Data Type Mapping Set** menu option allows you to load a custom data type mapping set from an XML file into the metadata repository.

The **Export Custom Data Type Mapping Set** menu option allows you to export a custom data type mapping set from the metadata repository to an XML file.

8.3 Database Link Load

8.3.1 Database Link Load - Properties

The fields on the **Load Table Properties screen** (see "**8.3.1.1 Load Table Properties Screen**" on page 121) for database link loads are described below:

Load Table Name

The table name is limited by most relational databases to a maximum of 30 characters and must be unique. Table name defaults can be set up (**Tools/Options**) to define a prefix or a post fix that can be added in order to identify clearly that this is a load table. Example: `load_customer`. By default QAD Data Warehouse Designer uses the prefix `load_` for load tables.

Short Name

The table short name is limited in size to 22 characters in Oracle and SQL Server and 12 characters in DB2. It must be unique. The short name is used in the naming of indexes, keys, procedures and scripts.

Description

Enter here a description of the table. This description appears in the documentation that can be generated once the data warehouse is built.

Connection

Enter the connection being used to get the data. The connections for load tables can be changed on bulk see **Changing load Connection and Schema** (see "**8.12 Changing Load Connection and Schema**" on page 159).

Load Type

The load type is typically defined by the connection, and should not normally be changed. This drop down shows all valid load types for the connection.

Database Link

The database link will display in this field.

Script Name

This field is only active if this is a script based load.

Pre-load Action

Select an action to be performed on the table before the load occurs. Options are:

- Truncate
- Execute pre-load Sql
- Both Truncate and Execute pre-load Sql

- No action

Pre-load Sql

If a Pre-load Action of "Execute pre-load Sql" was selected, then the Sql statement to execute before the load takes place should be entered in this box.

The contents of pre-load sql can be a sql statement or a procedural block. If using a single statement then the trailing semi-colon is not required for Oracle. If using a procedural block then the final semi-colon is required. The following examples illustrate the possible values in this field. Note the trailing semi-colon on the procedural block example.

Example of pre-load statements:
delete from load_customer where code < 23
truncate table load_customer
DECLARE v_status number; v_result varchar2(256); BEGIN update_dim_customer(1,'a','b',0,0,v_result, v_status); END;

Note: Not all pre load SQL commands will work in a SQL Server database. These commands are executed as a batch. For example: create trigger as the second command will fail as it is not supported in batch mode unless it is the first command.

Table Properties clauses (e.g, Partition)

These are clauses that are added to the end of the table create statement. Typically used for putting partition information on the table. In Oracle, this can also be used to add a parallel clause or compression clause to the table.

Post Load Procedure

A procedure that is executed immediately following the load. If you execute an externally loaded table, no load occurs, but a post load procedure can still be executed.

Note: At the bottom of the Load Table Properties screen are three fields that display information on that load table:

- * Date table structure last updated
 - * Date created in database
 - * Date last updated in database
-

8.3.1.1 Load Table Properties Screen

load_customer table definition

Properties | Source Mapping | Storage | Notes

Load Table Name:

Short name. Must be unique and no more than 22 chars long

Description:

Connection:

Load Type:

Database Link:

Script Name:

Pre-load Action:

Pre-load Sql:

Table Properties Clauses:
(e.g. Partition)

Post Load Procedure:

Date table structure last updated:

Date created in database:

Date last updated in database:

8.3.2 Database Link Load - Source Mapping

The fields on the **Load Table Source Mapping** tab (see "**8.3.2.1 Load Table Source Mapping Screen**" on page 124) of the properties screen for database link loads are described below:

Source schema

This displays the schema in the source database (where the data is coming from).

Source table name(s)

The name of the table or tables that the data is coming from.

Non mandatory source columns

This box can only be checked if the **Use Source column/transformation** checkbox is checked. When the non mandatory source columns checkbox is selected QAD Data Warehouse Designer will process the load even when one or more of the source columns does not exist. In this way a super set of source columns can be selected across different versions of an application. If this option is chosen it may be advisable to set a default value via a transformation if the column is null. (see the section on **handling missing source columns** (see "**8.10 Handling Missing Source Columns**" on page 157)).

Note: This option is only available in Oracle.

Exit status when missing columns

If non mandatory source columns are detected how should the load exit? Options are success, warning or error.

Load Type

The load type field can be used to reduce database logging in DB2. The default is to reduce logging and to not provide for full recovery. The two options are:

- Minimal Logging.
- Recoverable Load.

Note: This option is only available in DB2.

Load Modifier

This option only applies if **Minimal Logging** is used in DB2. It allows for a LOAD statement load modifier to be added to the load.

Note: This option is only available in DB2.

Distinct data select

If checked, the keyword **DISTINCT** is added to the select statement.

Insert Hint

A database hint to include when running the insert statement for the load table.

Note: This option is only available in SQL Server.

Use Source column/transformation checkbox

If this box is checked then QAD Data Warehouse Designer uses the information stored against each column rather than the source columns as below. See the section on **transformation** (see "**8.11 Load Table Transformations**" on page 159) below for a fuller explanation.

Source columns

The names of the columns that the data is coming from.



TIP: When a table is created, by default QAD Data Warehouse Designer populates the fields Source table names and Source columns which show where each column came from. At the top right of the screen is a button called **Update columns and tables from the table column mappings**. If you click on this button you can update the Source table name and columns based on this information that is stored against each column. This will overwrite whatever is currently in those two fields.

Where, Group etc. clauses:

QAD Data Warehouse Designer builds a select statement (SELECT * from [table name]). The Where or Group clauses are those clauses that immediately follow the from verb of the select statement. For example: *SELECT * from Customer WHERE rownum < 300.*



TIP: This is where you can build a statement to handle change data.

Parameter values can be in-line replaced and included in the where clause. Prefix the parameter name with a '\$P' and add a trailing '\$'. For example if we have a parameter called SALES_LOCATION_CODE we could construct a statement such as WHERE location_code = '\$PSALES_LOCATION_CODE\$' AND region_code = 'NZ'. When this statement is executed the value of the parameter will replace the parameter name. For example if the parameter was set to 'Auckland' then the statement would execute as: WHERE location_code = 'Auckland' AND region_code = 'NZ'.

Remote view name

If a name is entered in this field, QAD Data Warehouse Designer will try and create a view over on the remote system and then extract from that view. If you enter a remote view name you must enter a remote view where clause. The remote view creation procedure must exist on the source system. See **Remote View Extract** (see "**8.3.3 Remote View Extract**" on page 127) topic.

Note: Remote view name and the view where clause are only available in Oracle.

Where clause (for Remote view)

These are typically the same as the Where clauses above, but may prefix table names or schemas. Parameter values can be in-line replaced and included in the where clause. See the example above in the 'Where, Group etc. clauses section'.

Load Statement

If this is populated QAD Data Warehouse Designer will override everything else and execute this particular SQL statement to load data into the table. Parameter values can be in-line replaced and included in the statement. Refer to the example above in the 'Where, Group etc. clauses section'.

8.3.2.1 Load Table Source Mapping Screen

DB2 Source Mapping Screen:

load_customer table definition

Properties | Source Mapping | Storage | Statistics | Notes

Source schema: tutorial Update columns and tables from the table column mappings

Source table name(s): customer

Load type: Recoverable Load Load modifier:

Distinct data select: ☐

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: customer.code, customer.name, customer.address, customer.city, cus

Where, Group etc. clauses:
Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement:
For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

OK Cancel Apply

Oracle Source Mapping Screen:

load_order_line table definition

Properties Source Mapping Storage Notes

Source schema: wtutorial Update columns and tables from the table column mappings

Source table name(s): order_line

Non mandatory source columns: ☐ Exit status when missing columns: See Help for further details

Distinct data select: ☐

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: order_line.order_number, order_line.order_line_no, order_line.pr
order_line.unit_sale_price, order_line.quantity, order_line.sale
order_line.tax

Where, Group etc. clauses:
Parameters can be replaced inline
by entering them in the following
construct \$Pparameter_name\$.
(i.e. leading \$P and trailing \$)

A remote view can be auto created on the source system to provide a more performant extract. If the 'Remote view name' column below is populated then a remote view will be used along with the remote where clause.

Remote view name:

Where clause (for Remote view)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement:
For a linked database use the full
statement including insert. For
ODBC just the source Select
statement can be used.

OK Cancel Apply

SQL Server Source Mapping Screen:

load_customer table definition

Properties | Source Mapping | Storage | Notes

Source schema: tutorial Update columns and tables from the table column mappings

Source table name(s): customer

Distinct data select: ☐ Insert hint: (e.g. TABLOCK)

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: customer.code, customer.name, customer.address, customer.city, cus

Where, Group etc. clauses:
Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$.
(i.e. leading \$P and trailing \$)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement:
For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

OK Cancel Apply

8.3.3 Remote View Extract

Note: To use Remote View Extracts, both the source database and target data warehouse database must be Oracle.

Remove view extracts are used to force a remote Oracle source system database to perform complex extraction logic in the remote source system database and return the results to the data warehouse.

When specifying a join in an extract (load) over a database link the Oracle cost based optimizer decides whether it is better to join the tables on the remote machine, or if the tables should be copied onto the local machine and the join performed locally. If the decision to copy is made for large tables this can result in huge extract times. The simplest method of forcing the join to occur on the remote machine is to create a view on the remote machine from which the extract is done.

The view is re-created every time the load table is run. Then the load table select all columns from the remote view and inserts the results into the load table over the defined database link.

The steps for creating a remote view load table are:

- 1 Create a connection object for the remote system, populating the following fields:
 - Connection Name
 - Connection Type => Database
 - ODBC Source
 - Database id (SID)
 - Database link id
 - Extract user name
 - Extract password
- 2 Ensure the user name and password being used to connect to the remote system have the following privileges:
 - create view (granted as a specific privilege and not part of a role)
 - compile procedure (granted as a specific privilege and not part of a role)
 - execute on sys.dbms_sql
- 3 Right click on the connection to the remote system and choose **Create Database Link**. When the dialog with the database link has been created message is displayed, click OK.
- 4 Right click on the connection to the remote system and choose **Create remote view procedure**. When the dialog with the Procedure dss_view_compile compiled is displayed, click OK.
- 5 Browse the connection in the right hand pane.
- 6 Drag and drop a source table or columns of the source tables to create the required load table.
- 7 Create the load table in the data warehouse database by selecting **Create (Recreate)** from the right click menu.
- 8 Right click on the load table and select **Source Mapping**.
- 9 Enter a name for the remote view to be created into the **Remote view name** box. For example, use the name of the load table.
- 10 Cut or copy any existing where clause from the **Where, Group etc. clauses** box and paste it into the **Where clause (for Remote view)** box. Alternatively, enter the where clause (including any table joins, if multiple source tables are being extracted from) into the **Where clause (for Remote view)** box.

Note: Once the load table has a remote view name, the where clause in the Where, Group etc. clauses box is ignored and the where clause in the Where clause (for Remote view) box is used instead.

11 Click OK.

12 Load or schedule the load table.

Example remote view load table source mapping properties:

The screenshot shows the 'load_customer table definition' dialog box with the 'Source Mapping' tab selected. The dialog has four tabs: Properties, Source Mapping, Storage, and Notes. The 'Source Mapping' tab contains the following fields and options:

- Source schema:** tutorial
- Source table name(s):** customer
- Use source column/transformation:** ☒ Uses the information stored against each column rather than 'Source columns' below
- Non mandatory source columns:** ☐ Exit status when missing columns: [dropdown menu] [See Help for further details](#)
- Distinct data select:** ☐
- Source columns:** customer.code, customer.name, customer.address, customer.city, customer.state
- Where, Group etc. clauses:** Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)
- Remote view name:** load_customer
- Where clause (for Remote view):** WHERE code <= 999
- Load Statement:** For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

Buttons at the bottom: OK, Cancel, Apply.

Note: During Load column transformations are ignored with Remote View Extract load tables. After Load column transformations can be used. To create a derived column on a Remote View Extract load table, add the column leaving its source table blank and setting its source column to NULL. Then create an After Load transformation to populate the derived column.

8.4 ODBC Based Load

An ODBC based load provides an extensive option for acquiring data from many sources. It will be slower than most other forms of loads, but may still be a viable option depending on the volume of data being loaded.

An ODBC based 'interactive load' when using the QAD Data Warehouse Designer tool will use the established ODBC connection to pull the data back to the local PC and then push the data to the data warehouse database via a sql ODBC statement.

A scheduler load will perform in the same way except that the data is loaded into the server that is running the scheduler and then pushed to the data warehouse database. For Oracle, this push to the data warehouse can be performed via Oracle Direct Path loading, which can be considerably faster than the ODBC sql method.

For Oracle Direct Path loading to work all dates and times must be a character string of the form 'YYYY-MM-DD HH24:MI:SS'. This is normally achieved via a 'During' load transformation such as `TO_CHAR(source_date_column, 'YYYY-MM-DD HH24:MI:SS')`

Note: Dates must be in the correct format for Oracle Direct Path loading to occur.

The obvious disadvantage in an ODBC based load is the two network transactions required and the overhead placed on the Scheduler Server. The Unix scheduler does not support ODBC based loads. Therefore a Windows scheduler must be available to handle ODBC based loads.

Note: A windows scheduler must be available to handle ODBC based loads.

The properties screens for an ODBC based load are the same as those of a database link load. Refer to the previous section for details.

8.5 SSIS Loader

Microsoft SQL Server Integration Services (SSIS) is an Extract Transform and Load (ETL) utility that is supplied and licensed as part of Microsoft SQL Server 2005+. SSIS is built to extract data from data sources using extraction technologies such as OLEDB, transform the data using its own .NET based language and then load it into data destination. SSIS is primarily used for loading data from various sources into SQL Server, but it can be used to extract from most databases and load into any other database.

QAD Data Warehouse Designer manages the extraction and load of data into the data warehouse as part of data warehouse processing. QAD Data Warehouse Designer attempts to utilize the optimum loading technology for each supported database platform. Optimal loading performance from a database source into SQL Server is achieved using SSIS. QAD Data Warehouse Designer provides the ability to leverage the extract and load performance available from SSIS as part of the QAD Data Warehouse Designer processing. QAD Data Warehouse Designer does this by generating and executing an SSIS package dynamically at run time. Any errors or messages resulting from execution are passed back into the QAD Data Warehouse Designer workflow metadata to drive subsequent workflow actions. In the event of an error during execution of the SSIS package, the package will be persisted to disk to assist the developer with problem resolution.

Select the relevant version of SSIS in Tools/Options/Repository.

8.5.1 How to use SSIS loading in Data Warehouse Designer

As with any load into Data Warehouse Designer a connection to the source data needs to be created to provide extraction details. If the connection is a database load then there is additional connection information that should be supplied to utilize SSIS as a loading option. This additional information needs to be supplied on both the source connection and data warehouse connection:

OrderSystem definition

Connection Properties | Notes

Data Warehouse ☐

Connection Name OrderSystem

Connection Type Database

ODBC Source OrderSystem

Provider Name SQLOLEDB

Database ID (SID) Orders

Database Link ID

Extract User ID Password

Admin User ID Password

SSIS Connect String Provider=SQLNCLI10.1;Integrated Security=SSPI;Initial Catalog=Orders;Data Source={local} Reset

Data Type Mapping Set (Default)

OK Cancel Apply

SSIS Connect String is a valid SSIS connection string that can be used to connect to the data source or destination. The Reset button will attempt to construct a valid connection string from the connection information supplied in the connection details consisting of the Database ID, Database Link ID (Instance name), Provider Name, Extract User details.

Once the connection is defined then a load table needs to be created to hold data landed into the data warehouse by dragging a source table to create a load table. (see **Loading data** (see "8. Loading Data" on page 113)) On the load table properties the Load type can be set to Integration Services (Beta). This will create and execute a SSIS package at run time to load data into the data warehouse load table.

The screenshot shows the 'load_customer table definition' dialog box with the following fields and values:

Field	Value
Load Table Name:	load_customer
Short name. Must be unique and no more than 22 chars long	load_customer
Description:	
Connection:	OrderSystem
Load Type:	Integration Services load (Beta)
Database Link:	
Script Name:	
Pre-load Action:	Truncate
Pre-load Sql:	
Table Properties Clauses: (e.g. Partition)	
Post Load Procedure:	
Date table structure last updated:	2010-12-14 20:33:07.843
Date created in database:	2010-12-14 20:33:14.250
Date last updated in database:	2010-12-14 20:33:14.250

Buttons at the bottom: OK, Cancel, Apply.

The configuration options available on an SSIS load are available on the Source Mapping tab of the load table's properties. These options are:

- **SSIS Table Lock** - Specify whether the destination table is locked during the load. This allows SQL Server to reduce lock escalation overheads during loading and will promote minimal logging in SQL 2008+ when a Bulk Logged recovery model is used for the database. The default value of this property is true.
- **SSIS Rows Per Batch** – Specify the number of rows in a batch. The default value of this property is empty, which indicates that no value has been assigned.
- **Commit Interval** - Specify the batch size that the OLE DB destination tries to commit during fast load operations. The default value of 2147483647 indicates that all data is committed in a single batch after all rows have been processed. If you provide a value for this property, the destination commits rows in batches that are the smaller of (a) the Maximum insert commit size, or (b) the remaining rows in the buffer that is currently being processed.

The screenshot shows the 'load_customer table definition' dialog box with the 'Source Mapping' tab selected. The 'SSIS Table lock' checkbox is checked and highlighted with a red box. The 'Commit interval' is set to 2147483647. The source schema is 'dbo' and the source table is 'customer'. The source columns are 'customer.code, customer.name, customer.address, customer.city, customer.state'. The 'Where, Group etc. clauses' field is empty. The 'Load Statement' field is empty.

load_customer table definition

Properties | Source Mapping | Storage | Notes

Source schema: dbo

Source table name(s): customer

Update columns and tables from the table column mappings

SSIS Table lock: ☒

SSIS Rows/batch: Commit interval: 2147483647

Distinct data select: ☐

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: customer.code, customer.name, customer.address, customer.city, customer.state

Where, Group etc. clauses: Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement: For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

OK Cancel Apply

8.5.2 Troubleshooting

If an SSIS load fails due to incorrect connection strings then the SSIS package will fail to create at run time. The connection string information in both the source connection and the data warehouse connection (the destination) should be checked to ensure that they are correct.

If the SSIS load fails due to incorrect extraction SQL, due to mismatched destination load table structure or due to constraint violation then the SSIS package will be created in the file system for the developer to check. The SSIS package file will be created in the QAD Data Warehouse Designer Work Directory (shown in the dialog opened from the QAD Data Warehouse Designer menu item Tools / Object Count). This SSIS package will have a DTSX file extension and can be opened using the appropriate version of Microsoft's BI Development Studio add-in to Visual Studio.

8.6 Native ODBC Based Load

A Native ODBC based load is similar to an ODBC load, except it provides a faster method to load data from non-linked databases.

A Native ODBC based 'interactive load' when using the QAD Data Warehouse Designer tool will use the established ODBC connection to pull the data back to a delimited file on the local PC and then push the data to the data warehouse database via a Bulk Insert in SQL Server, SQL*LOADER in Oracle or LOAD statement in DB2.

A scheduler load will perform in the same way except that the data is loaded into the server that is running the scheduler and then pushed to the data warehouse database.

All loaders require dates in the default format of the target data warehouse database. This is normally achieved via a 'During' load transformation using the correct casting function for the source database.

The properties and storage screens for a Native ODBC based load are the same as those of a database link load. Refer to the previous section for details. Details of the source mapping screen follow.

Native Loads in Oracle

Some versions of Oracle do not return the ORACLE_SID correctly when an ODBC call requests it. To ensure that you don't have any issues because of this, please ensure that the following steps are followed:

If you are doing interactive Native Loads in Data Warehouse Designer into Oracle:

- 1 Ensure that the "Database id (SID)" field on the Data Warehouse connection properties screen is set to the actual ORACLE_SID for your database.

This value is used in the sqldr connection during the native load IF the ORACLE_SID is not returned correctly by the ODBC driver.

If you are using the windows scheduler for Native Loads into Oracle:

- 1 Change the scheduler to be a direct path load (via maintain scheduler in the QAD Administrator).
- 2 Ensure that the TNS Service is set to the actual ORACLE_SID for your database.

3 Restart the scheduler.

This value is used in the sqldr connection IF the SID is not returned by the ODBC driver and only IF the scheduler is set to do direct path loads.

8.6.1 Native ODBC Based Load - Source Mapping

The fields on the Source Mapping tab of the properties screen for Native ODBC loads are described below:

Source schema

This displays the source database where the data is coming from.

Source table name(s)

The name of the table or tables that the data is coming from.

Non mandatory source columns

This box can only be checked if the **Use Source column/transformation** checkbox is checked. When the non mandatory source columns checkbox is selected QAD Data Warehouse Designer will process the load even when one or more of the source columns does not exist. In this way a super set of source columns can be selected across different versions of an application. If this option is chosen it may be advisable to set a default value via a transformation if the column is null. (see the section on **handling missing source columns** (see "**8.10 Handling Missing Source Columns**" on page 157)).

Note: This option only applies to Oracle.

Exit status when missing columns

If Non mandatory source columns are detected how should the load exit. Options are success, warning or error. This only applies to Oracle.

Native Load Routine

Choose the databases file loading routine. In some databases there may be only one Native Routine available.

Native Load Delimiter

The native load delimiter is used to specify the character used as the delimiter of the extract file that is built during the load. The default value is a | character (pipe). This should be changed if pipes are possible in the source data.

UNICODE extract file

If you create a native ODBC load from any database containing UNICODE characters, then this field must be checked. The default is unchecked and this field is not available on DB2.

Distinct data select

If checked, the keyword DISTINCT is added to the select statement.

Use Source column/transformation check box

If this box is checked then QAD Data Warehouse Designer uses the information stored against each column rather than the source columns as below. See the section on **Load Table Transformations** (see "**8.11 Load Table Transformations**" on page 159) below for a fuller explanation.

Source columns

The names of the columns that the data is coming from.



TIP: When a table is created, by default QAD Data Warehouse Designer populates the fields Source table names and Source columns which show where each column came from. At the top right of the screen is a button called **Update columns and tables from the table column mappings**. If you click this button you can update the Source table name and columns based on this information that is stored against each column. This will overwrite whatever is currently in those two fields.

Where, Group etc. clauses:

QAD Data Warehouse Designer builds a select statement (SELECT * from [table name]). The Where or Group clauses are those clauses that immediately follow the from verb of the select statement. For example: *SELECT * from Customer WHERE code > 225*.



TIP: This is where you can build a statement to handle change data.

Parameter values can be in-line replaced and included in the where clause. Prefix the parameter name with a '\$P' and add a trailing '\$'. For example if we have a parameter called SALES_LOCATION_CODE we could construct a statement such as WHERE location_code = '\$PSALES_LOCATION_CODE\$' AND region_code = 'NY'. When this statement is executed the value of the parameter will replace the parameter name. For example if the parameter was set to 'New York' then the statement would execute as: WHERE location_code = 'New York' AND region_code = 'US'.

Remote view name

If a name is entered in this field, QAD Data Warehouse Designer will try and create a view over on the remote system and then extract from that view. If you enter a remote view name you must enter a remote view where clause. The remote view creation procedure must exist on the source system. See **Remote View Extract** (see "**8.3.3 Remote View Extract**" on page 127) topic.

Note: Remote view name and the view where clause are only available in Oracle.

Where clause (for Remote view)

These are typically the same as the Where clauses above, but may prefix table names or schemas. Parameter values can be in-line replaced and included in the where clause. See the example above in the 'Where, Group etc. clauses section'.

Load Statement

If this is populated QAD Data Warehouse Designer will override everything else and execute this particular SQL statement to load data into the table. Parameter values can be in-line replaced and included in the statement. Refer to the example above in the 'Where, Group etc. clauses section'.

8.6.1.1 Load Table Source Mapping Screen (Native)

DB2 Source Mapping Screen:

The screenshot shows a dialog box titled "load_customer table definition" with a close button in the top right corner. The dialog has several tabs: "Properties", "Source Mapping", "File Actions", "Storage", "Statistics", and "Notes". The "Source Mapping" tab is selected.

Fields and options in the "Source Mapping" tab include:

- Source schema:** A text box containing "tutorial". To its right is a button labeled "Update columns and tables from the table column mappings".
- Source table name(s):** A text box containing "customer".
- Native Load Routine:** A dropdown menu set to "Load".
- Delimiter:** A text box containing a vertical bar character "|".
- Distinct data select:** An unchecked checkbox.
- Use source column/transformation:** A checked checkbox followed by the text "Uses the information stored against each column rather than 'Source columns' below".
- Source columns:** A text box containing "customer.code, customer.name, customer.address, customer.city, cus".
- Where, Group etc. clauses:** A text box. Below it is a note: "Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)".
- The Load Statement if provided overrides the source information above and any where clause.** A text box. Below it is a note: "For a linked database use the full statement including insert. For ODBC just the source Select statement can be used."

At the bottom right of the dialog are three buttons: "OK", "Cancel", and "Apply".

Oracle Source Mapping Screen:

load_order_line table definition

Properties Source Mapping File Actions Storage Notes

Source schema: wtutorial Update columns and tables from the table column mappings

Source table name(s): order_line

Non mandatory source columns: ☐ Exit status when missing columns: See Help for further details

Native Load Routine: SQL*Loader Delimiter: | UNICODE extract file ☐

Distinct data select: ☐

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: order_line.order_number,order_line.order_line_no,order_line.pr
order_line.unit_sale_price,order_line.quantity,order_line.sale
order_line.tax

Where, Group etc. clauses:
Parameters can be replaced inline
by entering them in the following
construct \$Pparameter_name\$.
(i.e. leading \$P and trailing \$)

A remote view can be auto created on the source system to provide a more performant extract. If the 'Remote view name' column below is populated then a remote view will be used along with the remote where clause.

Remote view name:

Where clause (for Remote view)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement:
For a linked database use the full
statement including insert. For
ODBC just the source Select
statement can be used.

OK Cancel Apply

SQL Server Source Mapping Screen:

load_customer table definition

Properties Source Mapping File Actions Storage Notes

Source schema: tutorial Update columns and tables from the table column mappings

Source table name(s): customer

Native Load Routine: BULK INSERT Delimiter: | UNICODE extract file ☐

Distinct data select: ☐ Insert hint: (e.g. TABLOCK)

Use source column/transformation: ☒ Uses the information stored against each column rather than 'Source columns' below

Source columns: customer.code, customer.name, customer.address, customer.city, cus

Where, Group etc. clauses:
Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)

The Load Statement if provided overrides the source information above and any where clause.

Load Statement:
For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

OK Cancel Apply

8.6.2 File Actions

A file action defines a copy, move or delete step that happens to Native ODBC temporary files after a load is run. There are six different file action programs:

File Action	Description
copy all files	Copies all temporary files for the load table (including the temporary data file) to another specified directory.

copy data files	Copies the Native ODBC load table's temporary data file to another specified directory. Also allows a new file name to be specified.
delete all files	Deletes all temporary files for the load table (including the temporary data file).
delete data files	Deletes the Native ODBC load table's temporary data file.
move all files	Moves all temporary files for the load table (including the temporary data file) to another specified directory.
move data files	Moves the Native ODBC load table's temporary data file to another specified directory. Also allows a new file name to be specified.

Note: A load table may have more than one file action. File actions are processed in order, based on the action number.

Creating a File Action

To create a file action:

- 1** Click on the File Actions tab of the load table properties dialog.
- 2** Click the **Add new action** button.
- 3** Choose *After load* from the **Action Type** drop down list.
- 4** Enter the **Action Description**.
- 5** Choose the **Action Program** from the drop down list (see above for the options).
- 6** For action programs of copy... and move..., enter the target directory name.
- 7** For copy data files and move data files, optionally enter the file's new name.
- 8** Click on **Save / update action**.
- 9** Repeat if necessary for additional file actions.
- 10** Click **OK**.

8.6.2.1 File Action Example

The following example moves the Native ODBC Load data file to another directory then deletes all temporary files.

Note: the data file is not deleted as it has been moved prior to the delete action.

Sample move data file action:

The screenshot shows a dialog box titled "load_customer table definition" with a close button (X) in the top right corner. The "File Actions" tab is selected, showing a list of actions defined for the load process. The actions are listed in a table with columns for Action Number, Action Type, Action Description, Action Program, Action Connection, Target directory, and Target file name (optional). The first action is "01 Move the data file to the data file back up directory" with the target directory "e:\backup\load_customer". The second action is "02 Delete all temporary files (note: data file not deleted as it has already been moved)".

Action Number	Action Type	Action Description	Action Program	Action Connection	Target directory	Target file name (optional)
01	After load	Move the data file to the data file back up directory	move data file	Tutorial (OLTP)	e:\backup\load_customer	
02		Delete all temporary files (note: data file not deleted as it has already been moved)				

Sample delete all files file action:

load_customer table definition

Properties | Source Mapping | File Actions | Storage | Notes

A number of actions can be defined to take place either before or after the load has occurred. Select an action type to activate the applicable fields.

Action Number: 02 Add new action Save / update action ?

Action Type: After load Remove action

Action Description: Delete all temporary files (note: data file not deleted as it has already been moved)

Action Program: delete all files

Action Connection: Tutorial (OLTP)

Actions

01 Move the data file to the data file back up directory
02 Delete all temporary files (note: data file not deleted as it has already been moved)

OK Cancel Apply

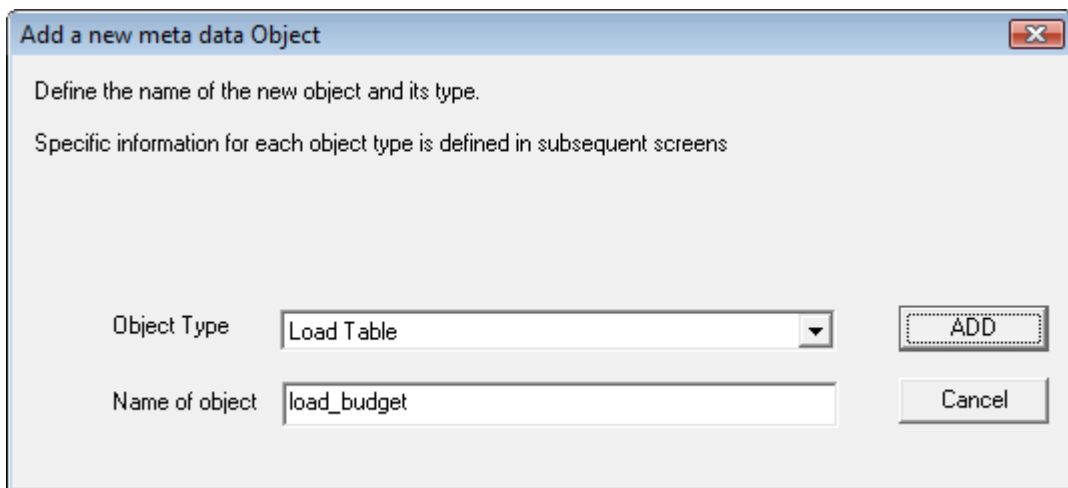
8.7 Flat File Loads

Flat file loads

Flat file loads can be performed from either a Windows or Unix connection. As with all other load types it is easier to use the drag and drop functionality to create the load table. The drag and drop process for flat files is as follows:

- 1 Browse to the directory and file via the appropriate **Connections** (see "6. **Connections**" on page 67).
- 2 Double click the **Load Table** object in the left pane to create a drop target.

- 3 Drag the file from the right pane and drop it into the middle pane. The following dialog appears:



Add a new meta data Object

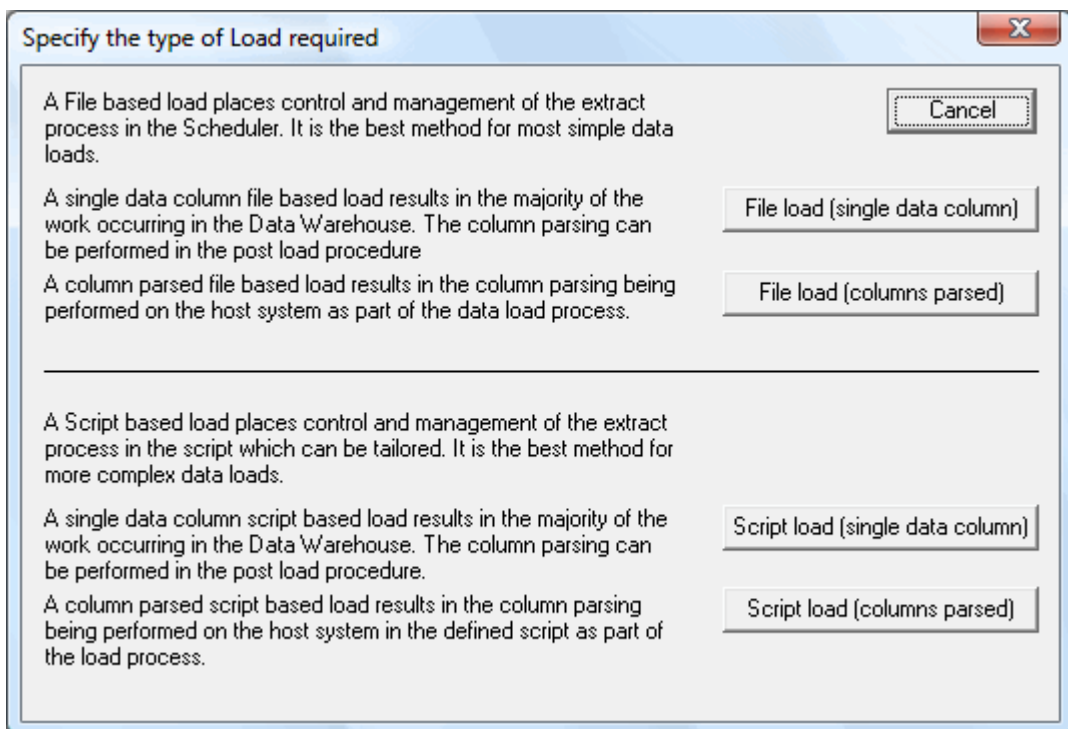
Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens

Object Type:

Name of object:

- 4 Click the Add button. The following dialog appears.



Specify the type of Load required

A File based load places control and management of the extract process in the Scheduler. It is the best method for most simple data loads.

A single data column file based load results in the majority of the work occurring in the Data Warehouse. The column parsing can be performed in the post load procedure.

A column parsed file based load results in the column parsing being performed on the host system as part of the data load process.

A Script based load places control and management of the extract process in the script which can be tailored. It is the best method for more complex data loads.

A single data column script based load results in the majority of the work occurring in the Data Warehouse. The column parsing can be performed in the post load procedure.

A column parsed script based load results in the column parsing being performed on the host system in the defined script as part of the load process.

There are four options on this screen (buttons at right).

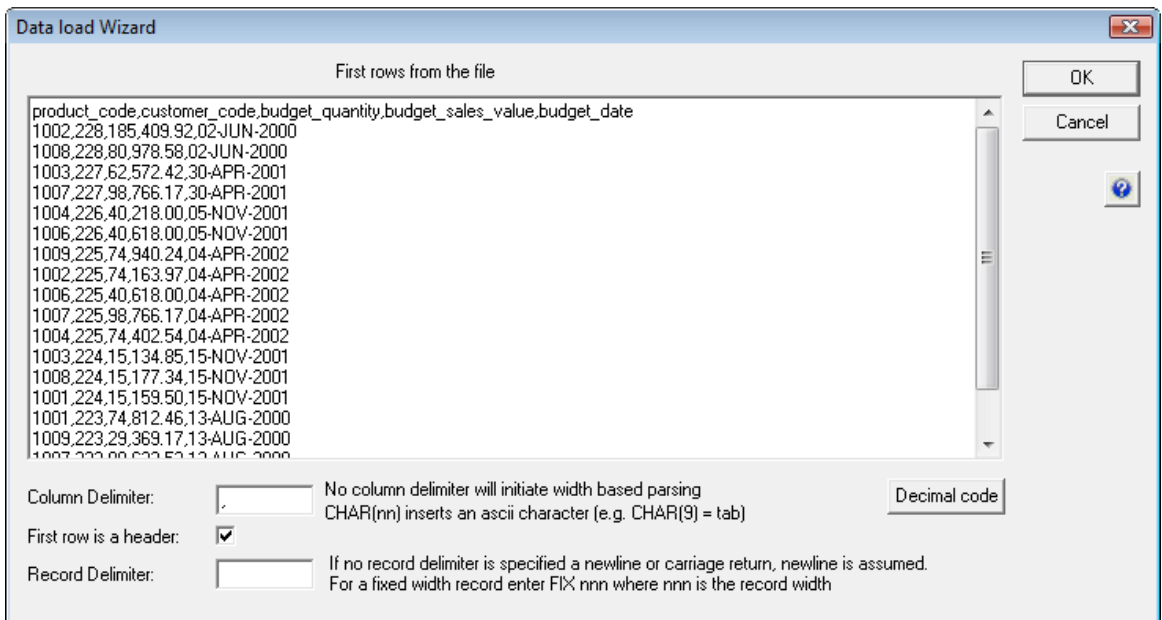
- The first two options result in a 'File based load table' where the bulk of the load management is handled by the scheduler.
- If you select either of the last two options, then QAD Data Warehouse Designer will generate a host script and the load table will be a 'Script based load'. This host script is executed by the scheduler to effect the load.

Single data column

As stated beside the button, the majority of the work in terms of parsing the file must occur in a subsequent procedure within the data warehouse. The data is dumped into a single column. The task of coding a procedure to parse the data must then be undertaken. Three columns are created under Oracle. These include the data column, a sequence column (row_sequence) and the file name column (row_file_name). The file name and sequence columns can be deleted if they are not required for a File based load.

Columns parsed

QAD Data Warehouse Designer attempts to parse the columns. You will be asked for details and for the column delimiter. You then step through the columns providing names and data types. QAD Data Warehouse Designer attempts to guess the data type, but it needs to be checked and the field length will probably need to be adjusted. The following screen shot shows the initial file parsed screen.



The 'decimal code' button (toggle) will show the decimal value of each character in the lines retrieved from the source file. These decimal codes will be shown below each line and are green. Once the screen above is completed a screen will appear to allow the breakdown of the source data into columns. If no delimiter is entered then width based parsing is assumed and an addition width size is prompted for. Use the Back button to revert to the previous column if an incorrect width or delimiter is entered. The following screen is an example of the file parsing technique.

Data load Wizard - Column definition

Column Data

File Data

product_code	product_code,customer_code,budget_quantity,budget_sales_value,budget_date
1002	1002,228,185,409.92,02-JUN-2000
1008	1008,228,80,978.58,02-JUN-2000
1003	1003,227,62,572.42,30-APR-2001
1007	1007,227,98,766.17,30-APR-2001
1004	1004,226,40,218.00,05-NOV-2001
1006	1006,226,40,618.00,05-NOV-2001
1009	1009,225,74,940.24,04-APR-2002
1002	1002,225,74,163.97,04-APR-2002
1006	1006,225,40,618.00,04-APR-2002
1007	1007,225,98,766.17,04-APR-2002
1004	1004,225,74,402.54,04-APR-2002
1003	1003,224,15,134.85,15-NOV-2001
1008	1008,224,15,177.34,15-NOV-2001

Display decimal character values

Column Name:

Business Display Name:

Data Type: ☒ Nulls

Conversion:

Business Definition:

Add Cancel Back

Conversion

During the parsing of the columns an Oracle SQL*Loader or SQL Server BULK Insert conversion string can be used and is required in the case of dates for Oracle. Refer to the Oracle Sql loader manual for syntax. Any Oracle function can be used if enclosed in quotes and with the column name prefixed by a colon. For example: when loading a column called 'product_name', use the following syntax to bring over only the first 30 characters:

```
product_name "substr(:product_name,1,30)"
```

A special variable %FILE_NAME% can be used in an Oracle File based load. This will be substituted with the actual source file name. So for example a transformation such as "SUBSTR(%FILE_NAME%,INSTR(%FILE_NAME%,',',-1,1)+1) can be used to pull out just the file part of the full file name path.

Note: If running from the windows scheduler then a wildcard must be used in the file name if you wish to use the %FILE_NAME% variable. If a wild card is not used then the literal file name appears enclosed in double quotes. When a wild card is used Windows looks up the file and returns the actual file name with no enclosing double quotes.

Understanding SQL*Loader

When using either type of loading method SQL*Loader is called to perform the actual load. There is therefore a requirement that the executable called 'sqlldr' be in the path.

Under Unix this means that the Unix user must be able to execute 'sqlldr' from the command prompt under a normal log on.

Under Windows 'sqlldr' must execute when the command is issued from a DOS prompt.

In both the Windows and Unix environments sqlldr returns a result code indicating if the load worked fully, partially or failed. QAD Data Warehouse Designer makes use of this returned code to report on the results of the load.

8.7.1 File Load

When a file based load table is created a different tab is displayed on the properties screen. This is the **File Attributes** tab (see "8.7.1.1 Load Table File Attributes Screen" on page 151). The fields are described below:



TIP: If the file has been *dragged and dropped* (see "8.7 Flat File Loads" on page 143) into the load table (middle pane) then some of the fields on this tab are automatically populated.

File Path

The full path name to the directory in which the file is located on the Windows or Unix system.

File Name

The name of the file in the directory.

File Column Delimiter

Any delimiter in the file that splits out the columns, e.g. a comma (,). Note that if an ASCII character value is used this field may show as an unprintable character. To enter a special character enter the uppercase string CHAR with the ASCII value in brackets (e.g. CHAR(9)).

Optionally enclosed by

Oracle Only. Allows the entry of an optionally enclosed by statement in SQL*Loader. Normally this will be a double quote

File has a Header line

If the file has a header line and this checkbox is ticked, then QAD Data Warehouse Designer will drop the first line from the load.

File Record Delimiter

Enter the record delimiter of FIXnnn to specify a fixed length record. By default the delimiter is a newline (\n). If no delimiters are used then enter the width of the record (e.g. FIX80 for a 80 byte record).

Sql loader options

Oracle only. Allows the entry of both SQL*Loader options and a 'When' statement. If both options and a when statement are used then the when statement must follow the options. (e.g. options (direct=true,parallel=true) when product_code = '02').

Note: There are some limitations on the 'When statement'. At the time of writing the not symbol (!) will not work for a Windows based load but will work under Unix.

BULK INSERT options

SQL Server only. Allows the entry of both BULK INSERT options. For Example: to ensure a lock is place on a table enter TABLOCK, to set the batch size for the load to 100000 rows enter BATCHSIZE=100000, to make bulk insert error on the first row, enter MAXERRORS=0. Separate multiple values using commas.

LOAD options

DB2 only. Allow the entry of options for the LOAD statement. By default, this field is populated with the NONRECOVERABLE option. This may be removed if not required.

LOAD modifier

DB2 only. Allow the entry of modifiers for the LOAD statement. By default, this field is populated with the TIMESTAMPFORMAT option set. This may be modified or removed.

Wait seconds

Enter a time here, being the number of seconds to wait for a file, e.g, 1800 seconds. A value of 0 equates to no wait. If the wait time expires and the specified file cannot be found, then the load will exit with the status defined in Action, e.g, **Default Action = Error**

Action on wait expire

This will enable a scheduled job to continue if the file was not found within the wait period. If the action chosen is success or warning then the scheduler will continue to run other scheduled tasks. An error will cause the scheduler to stop the job and hold any remaining tasks.

Trigger Path

The purpose of the trigger file is to indicate that the copying / loading of the main file has completed and that it is now safe to load the file. Secondly the trigger file may contain control sums to validate the contents of the main load file. This field should contain the full path name to the directory in which a trigger file is located on the Windows or Unix systems. If this field and/or the 'Trigger Name' field is populated then the scheduler will look for this file rather than the actual load file.

Trigger Name

Refers to the name of the file that is used as a trigger to indicate that the main load file is available. A trigger file typically contains check sums. If the trigger file exists then this is the file that is used in the Wait Seconds, and Action on wait expire processing. (see notes under Trigger Path above).

Trigger Delimiter

If the trigger file provides control information then the delimiter identifies the field separation, e.g , or \n for a return. The data found will be loaded into parameter values whose names will be prefixed by the prefix specified and numbered 0 to n.

Trigger Parameter Prefix

If a trigger file and delimiter have been specified then the contents of the trigger file are loaded into parameters. The parameters will be prefixed by the contents of this field and suffixed by an underscore and the parameter number. These parameters can be viewed under (Tools / Parameters) from the QAD Data Warehouse Designer menu bar. The checking of these parameters can be achieved by generating a 'Post Load procedure'. An example set of parameters may be budget_0, budget_1 and budget_2 where there are 3 values in the trigger file and the prefix is set to 'budget'.

Rename File Path

Allows you to move the data file following a successful load.

Rename File Name

Once the file has been loaded it can be renamed. If a value is entered into this field then a rename will occur.



TIP: The variable `$SEQUENCE$` can be used to provide a unique sequence number. Also the date/time components, `YYYY`, `MM`, `DD`, `HH`, `MI` and `SS` can be used when enclosed with the `$` character. For example, a rename filename might be `budget_$YYYYMMDD$.txt` which would result in a filename like `budget_20021231.txt`.

Rename Trigger Path

Allows you to rename the file path of the trigger file following a successful load.

Rename Trigger Name

Allows you to rename the trigger file following a successful load.

8.7.1.1 Load Table File Attributes Screen

load_budget table definition

Properties | File Attributes | Storage | Statistics | Notes

File Path: C:\Program Files\QAD\Tutorial\
File Name: budget.txt
File Column Delimiter: , CHAR(\n) inserts an ascii character (e.g. CHAR(9) = tab)
No column delimiter indicates a width based record.
File has a header line: ☒
File Record Delimiter: FIX nnn indicates a fixed length record of length nnn.
No record delimiter indicates a line feed delimited record.
LOAD options: NONRECOVERABLE See online help for further details.
(e.g. NONRECOVERABLE)
LOAD modifier: TIMESTAMPFORMAT="DD-MMM-YYYY" (e.g. timestampformat="YYYY-MM-DD")

Wait identifies the time the load process will wait for the file or trigger to arrive if not present. A value of 0 equates to no wait.
If the wait expires with no file then the load will exit with the status defined in Action. (Default Action=Error)
Wait seconds: 0 Action on wait expire: Warning

If a trigger file is specified then the load will not occur unless this file exists. If the trigger file also provides control
information then the delimiter identifies the field separation. (E.g. , or \n for a return). The data found will be loaded into
parameter values whose names will be prefixed by the Prefix specified and numbered 0 to n.

Trigger Path:
Trigger Name:
Trigger Delimiter:
Trigger Parameter Prefix:

Once the file has been loaded it can be renamed. If at least the Name component is entered in the fields below then a rename will occur. The
variable \$SEQUENCE\$ can be used to provide a unique sequence number. Also the date/time
components YYYY, MM, DD, HH, MI and SS can be used when enclosed with the \$ character. For example a rename file name might be
budget_\$YYYYMMDD\$.txt which would result in a file name like budget_20021231.txt

Compress on rename: ☐
Rename File Path:
Rename File Name:
Rename Trigger Path:
Rename Trigger Name:

OK Cancel Apply

8.7.2 Host Script Loads

A script based load table will have a Host Script defined. During the load process this host script is executed and the results returned.

During the 'drag and drop' creation of a load table from a Unix or Windows file a script can be generated by selecting one of the 'Script based' load options. This script can then be edited to more fully meet any requirements.

Note: If the Unix Scheduler is not being used and a Unix script is generated and executed interactively the following two variables will be setup as part of the environment.

DSS_USER=username

DSS_PWD=password

Where 'username' and 'password' are the entries for the data warehouse database.

There are a number of conventions that must be followed if these host scripts are to be used by the QAD scheduler.

- 1 The first line of data in 'standard out' must contain the resultant status of the script. Valid values are '1' to indicate success, '-1' to indicate a Warning condition occurred but the result is considered a success, '-2' to indicate a handled Error occurred and subsequent dependent tasks should be held, -3 to indicate an unhandled Failure and that subsequent dependent tasks should be held.
- 2 The second line of data in 'standard out' must contain a resultant message of no more than 256 characters.
- 3 Any subsequent lines in 'standard out' are considered informational and are recorded in the audit trail. The normal practice is to place a minimum of information in the audit trail. All bulk information should be output to 'standard error'
- 4 Any data output to 'standard error' will be written to the error/detail log. Both the audit log and detail log can be viewed from the QAD Data Warehouse Designer tool under the scheduler window.

8.7.3 File Wild Card Loads

The loading of multiple files in one pass is best undertaken as a host script.

A generated host script contains the code to handle wild card loads and the subsequent loading and renaming of multiple files. The process for setting up wild card loads is as follows:

- 1 Drag one of the files into a 'Load Table' target and select one of the 'Script' based options.
- 2 If necessary edit the generated script and replace the load file name with the required wild card version. (For example test_result_234.txt renamed to test_result_*.txt. This load file name is defined as a variable at the start of the script.
- 3 If renaming or moving to another directory is required, then you may need to uncomment the rename phase and enter the desired directory or rename syntax.
- 4 If only one file at a time is to be processed, but still based on a wild card file name, then you may need to uncomment the break statement at the bottom of the script. This will result in the loading of only the first file encountered that matches the wild card criteria.

In every event check the generated script as it will contain instructions on how to handle wild cards for the appropriate script type (Windows or Unix).

8.8 XML File load

XML file loads are only supported from a Windows connection. There are multiple formats for data exchange when using XML. See the following section for details on how an XML file is handled.

To load an XML file located in a Windows directory proceed as follows:

- Create a connection to the Windows system.
- Browse to the connection and locate the XML file.
- Make Load tables the middle pane drop target by double clicking on the Load Table object group in the left hand pane.
- Drag the XML file into the middle pane.

Supported XML Formats

QAD Data Warehouse Designer supports two types of xml file construct. The normal xml standards have the data in the xml file and the table definitions in a separate xsd (xml schema definition) file which is only required when the table is being created or when the xml file is being validated for form. An alternate standard is used by Microsoft. This second standard is an in line definition which produces one file which contains a Schema element in the data stream where the column names and their approximate data types are defined.

Separate XML and XSD files

The normal XML standards have the data in the xml file and the table definitions in a separate xsd (xml schema definition) file which is only required when the table is being created or when the xml file is being validated for form. The xsd file name is found within the xml file in an xsi (xml schema instance) statement which can include a namespace definition;e.g.

```
<root xmlns="http://www.qad.com/wsl-schema"
      xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
      xsi:schemaLocation="http://www.qad.com/load_table.xsd">
```

or no namespace;e.g.

```
<root xmlns="http://www.qad.com/wsl-schema"
      xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance"
      xsi:noNamespaceSchemaLocation="load_table.xsd">
```

The xsd file is an xml file and should be found in the same directory as the xml file that calls it. This xsd file will contain the column definitions for the load table which will be defined during the drag and drop.

The column definitions within the xsd file must be detailed enough to define a load table that the xml file can be loaded into. The data type mapping between the xsd file and the database have been implemented as below:

XSD	SQL Server	Oracle	IBM DB2
string with length	char()	char()	char()

XSD	SQL Server	Oracle	IBM DB2
string with maxlength	varchar()	varchar2()	varchar()
integer	integer	integer	integer
decimal with precision and scale	numeric(x,y)	number(x,y)	decimal(x,y)
dateTime (ISO8601)	datetime	date	timestamp
i2	integer	integer	integer
i4	integer	integer	integer
r4	float	number	float
r8	float	number	float
float	float	number	float

These are the ISO-ANSI SQL/XML standards and in the case of integers, datetime and floats the column can be defined with one line.i.e.

```
<xsd:element name="Policy_ID" type="xsd:integer"/>
<xsd:element name="Quote_Date" type="xsd:dateTime"/>
<xsd:element name="Quote_Price" type="xsd:r4"/>
```

In the case of strings and decimals the column requires a bit more detail to produce the correct data type. Strings can be fixed length with padded data by using the length attribute. The following will produce a char(1) column called Excess_Waiver:

```
<xsd:element name="Excess_Waiver">
  <xsd:restriction base="xsd:string">
    <xsd:length value="1"/>
  </xsd:restriction>
</xsd:element>
```

Strings can be of variable length by using the maxLength attribute. The following produces a column of SQL Server varchar(8) or Oracle varchar2(8) called Password:

```
<xsd:element name="Password">
  <xsd:restriction base="xsd:string">
    <xsd:maxLength value="8"/>
  </xsd:restriction>
</xsd:element>
```

Decimal numbers are defined with the precision and scale attributes. If the scale attribute is zero or missing then the column will be a whole number of size precision. The following produces a SQL Server column of numeric(6) or an Oracle column of number(6):

```
<xsd:element name="code" >
```

```

        <xsd:restriction base="xsd:decimal">
        <xsd:precision value="6"/>
        <xsd:scale value="0"/>
        </xsd:restriction>
</xsd:element>

```

The following produces a SQL Server column of numeric(8,2) or an Oracle column of number(8,2):

```

<xsd:element name="code" >
    <xsd:restriction base="xsd:decimal">
    <xsd:precision value="8"/>
    <xsd:scale value="2"/>
    </xsd:restriction>
</xsd:element>

```

An example file with most data types would be as follows:

```

<xsd:schema xmlns="http://www.qad.com/wsl-schema"
             xmlns:xsd="http://www.qad.com/XMLSchema">
<xsd:element name="Col_name1" type="xsd:integer"/>
<xsd:element name="Col_name4" type="xsd:dateTime"/>
<xsd:element name="Col_name5">
    <xsd:restriction base="xsd:string">
    <xsd:maxLength value="100"/>
    </xsd:restriction>
</xsd:element>
<xsd:element name="Col_name6">
    <xsd:restriction base="xsd:string">
    <xsd:length value="100"/>
    </xsd:restriction>
</xsd:element>
<xsd:element name="Col_name7" type="xsd:float"/>
<xsd:element name="Col_name8" >
    <xsd:restriction base="xsd:decimal">
    <xsd:precision value="6"/>
    <xsd:scale value="2"/>
    </xsd:restriction>
</xsd:element>
</xsd:schema>

```

The column order will be the same as the xsd file.

The only rules concerning the xml file are that the data element tags are the column names and each row of data is a child of the root element. eg

```

<row>
    <dim_customer_key>7</dim_customer_key>
    <code>228</code>
    <name>JOHN AND JOES TOYS</name>
    <address>3700 PARNELL RISE</address>
    <city>BEAVERTON</city>
    <state>OR</state>
    <dss_source_system_key>1</dss_source_system_key>
    <dss_update_time>2003-10-03T10:02:15.310</dss_update_time>
</row>

```

Any columns which are missing from the row will be NULL in the loaded row.

The dateTime format in the xml file is defined as ISO8601 which looks like this:

2003-10-03T10:02:15.310

QAD Data Warehouse Designer will load this string into Oracle as:

`TO_DATE( '20031003100215', 'YYYYMMDDHH24MI' )`

or for SQL Server:

`CONVERT( DATETIME, '2003-10-03T10:02:15.310', 126 )`

or for DB2:

`TIMESTAMP_FORMAT( '20031003100215', 'YYYYMMDDHH24MISS' )`

The xsd file is only required to create the load table, if the load table is only being loaded then this file is ignored. To check that the xml and xsd files are well formed you can open them with any web browser. If the files display with no errors then they are valid xml files.

In line schema definition

The other supported xml construct allows the use of in line schema definitions as produced by the Microsoft FOR XML AUTO, ELEMENTS, XMLDATA query. This will produce one file which contains a Schema element in which the column names and their approximate data types are defined. Because the supplied data types are not concise enough to define the table columns correctly, this method will produce load tables of either data type text for SQL Server or varchar2(4000) for Oracle. The column names are taken from the `<element type="col_name"/>` strings within the Schema element. The data elements will be the same as above with the column names making up the start and end tags and the rows being the children of the root element. The file that is produced by the FOR XML query above needs to be changed slightly to comply with the xml standard. Remove everything before the Schema element and then give the file a starting root element and a closing root element.eg `<root>` and `</root>`

The xml files can optionally start with an xml pre process statement.eg

`<?xml version="1.0"?>`

They may also contain xml comments.eg

`<!-- comments -->`

8.9 External Load

For an externally loaded table the only property that is executed is the Post Load procedure.

Any 'After' transformations recorded against any of the columns in an Externally loaded table will also be processed.

8.10 Handling Missing Source Columns

Note: This option is only available when running an Oracle data warehouse.

By default a load will fail if a source column that is to be loaded does not exist. This default action can be modified by using the 'Non mandatory source column' feature of a load table. When this feature is enabled the load process will check all source columns, and if any are found to be missing will replace those missing columns with a Null value (which can be changed, see below).

On the 'Source Mapping' tab of a load tables properties there are two check boxes and a drop down list that we will cover in this section. See the following example:

The screenshot shows the 'load_order_line table definition' dialog box with the 'Source Mapping' tab selected. The dialog has several sections for configuring the load process.

- Source schema:** wtutorial
- Source table name(s):** order_line
- Non mandatory source columns:** ☒ Exit status when missing columns: Success
- Native Load Routine:** SQL*Loader
- Delimiter:** |
- UNICODE extract file:** ☐
- Distinct data select:** ☐
- Use source column/transformation:** ☒ Uses the information stored against each column rather than 'Source columns' below
- Source columns:** order_line.order_number, order_line.order_line_no, order_line.pr, order_line.unit_sale_price, order_line.quantity, order_line.sale, order_line.tax
- Where, Group etc. clauses:** Parameters can be replaced inline by entering them in the following construct \$Pparameter_name\$. (i.e. leading \$P and trailing \$)
- Remote view name:**
- Where clause (for Remote view)**
- The Load Statement if provided overrides the source information above and any where clause.**
- Load Statement:** For a linked database use the full statement including insert. For ODBC just the source Select statement can be used.

Buttons at the bottom: OK, Cancel, Apply.

Use Source column/transformation

When this check box is checked the 'Source columns' edit window is disabled. By default, and with this box unchecked, a load table uses the contents of the 'Source columns' to specify which columns are being extracted during a table load.

When this box is checked the load process builds up the statement to select from the source table(s) by looking at the two fields source table and source column and any transformations associated with each column in the load table. If a transformation is present then the transformation overrides the contents of source table/source column. See the following section for more information on transformations.

Note: This box must be checked to enable non mandatory source column support.

Non mandatory source columns

When this check box is checked the load process will examine every column in the load table. Based on the source table/source column fields associated with each column it will check to see if the column exists in the source database. If the column exists normal processing will occur. If the column does not exist then a Null will be substituted for the column, and the load will proceed.

If one or more columns are found to be missing the load process reports this situation. The status level of this reporting can be set via the 'Exit status' drop down. See the following topic. In all cases the load will be deemed to have been successful provided that no other errors occur.

Often Null values are not desirable in a data warehouse. This Null value can be replaced by some other value by means of a 'During' or 'After' transformation. For example, a 'During' transformation, as shown below, set on a missing column called 'State' will replace the Null with the value 'N/A'.

NVL(state,'N/A')

Exit status when missing columns

If columns are found to be missing as a result of a 'Non mandatory' check then a message is recorded in the Audit trail and against the task if running in the Scheduler. The drop down list of the same name allows the choice of action in the event of a missing column or columns. The choices are:

Choice	Impact
Success	The message informing that columns are missing uses an information status.
Warning	The message issued is a warning. The table load will be identified as successful but with warnings.
Error	The message issued is an error. The table load will still complete successfully albeit with an error message.

This drop list is only available if the 'Non mandatory source columns' check box is checked.

Limitations of Missing Column check

The check for missing columns will only examine and check those columns that are recorded in the source table and source column fields of a load table's column properties. Therefore if a source column is used in a transformation or join, but is not recorded in the two fields mentioned above it will not be checked.

If a column is used in a transformation, it should have the same usage (name and case) as is found in the source column and source table fields.

This check has no upper limit on the number of missing columns. All columns can be missing and the load will still succeed.

8.11 Load Table Transformations

Each load table column can have a transformation associated with it. See ***Transformations*** (see "19. ***Transformations***" on page 425) and ***Load Table Column Transformations*** (see "19.1.2 ***Load Table Column Transformations***" on page 428) for more details.

8.11.1 Post-Load Procedures

If a procedure name is entered in the post-load procedure field of a load table's properties, then this procedure will be executed after the load has completed and after any 'after' transformations have occurred.

8.12 Changing Load Connection and Schema

The connection associated with a load table can be changed through the properties of that table.

Connections can also be changed in bulk by using the following process:

- 1 Double click on the 'Load Tables' object group in the left pane. This will display all load tables in the middle pane.
- 2 Select those load tables that you wish to change using standard Windows selection.
- 3 Right mouse to bring up a menu and select 'Change Connect/Schema'.
- 4 Select the new connection to change all the selected load tables.

Note: You cannot change the connection **type** but it is possible to change from Database to ODBC connections when the following considerations are taken into account.

Switching Connection from ODBC to Database

This switch should be successful in most cases, although it may not provide the most performant load possible. By default ODBC connections use the source table / column transformation loading method as dates and potentially other data types need to be converted.

When switching to a database link load any transformations will still occur although they may no longer be necessary.

Switching Connection from Database to ODBC

Although it is possible to switch from a Database connection to an ODBC connection, the resultant extract may not function correctly. The main issue is around the conversion of date fields under Oracle. SQL Server tends to handle the date conversion better in most cases. When an extract occurs over an ODBC connection the date is converted in the extract from the source system into a standard ASCII format. This ASCII formatted date is then converted back when it is loaded into the load table. To resolve this problem place a transformation on any date fields. Examples of typical Oracle transformations are:

```
'to_date(''||to_char(ORDER_DATE,'YYYYMMDD')||','||'YYYYMMDD')
```

```
to_char(ORDER_DATE,'YYYY-MM-DD HH24:MI:SS')
```

where ORDER_DATE is the name of the column being extracted. In the first example the conversion string is enclosed within quote marks (') so that it is passed as a literal to the select statement that will be built. Quote marks within the conversion string are protected from premature evaluation by the inclusion of a second quote mark alongside the original.

Note: If a load table is created via drag and drop from an ODBC based connection QAD Data Warehouse Designer will build all the required date transformations.

There are several supplied APIs for changing schema and connections programmatically. See **Callable Procedures** (see "**29. Callable Procedures**" on page 631) for more details.

CHAPTER 9

9. Dimensions

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9.1 Dimensions Overview

A dimension table is normally defined, for our purposes, as a table that allows us to constrain queries on the fact table.

A dimension is built from the Data Warehouse connection. Unless you are doing a retro-fit of an existing system, dimensions are typically built from one or more load tables.

The normal steps for creating a dimension are defined below and are covered in this chapter. The steps are:

- Identify the source transactional data that will constitute the dimension. If the data is sourced from multiple tables ascertain if a join between the source tables is possible, or if a series of lookups would be a better option.
- Using the 'drag and drop' functionality drag the load table that is the primary source of information for the dimension into a dimension target. See ***Building a Dimension*** (see "9.2 Building a Dimension" on page 164).
- If only one table is being sourced and most of the columns are to be used (or if prototyping) you can select the auto create option to build and load the dimension and skip the next 4 steps. See ***Building a Dimension*** (see "9.2 Building a Dimension" on page 164).
- Add columns from other load tables if required. See ***Building a Dimension*** (see "9.2 Building a Dimension" on page 164).
- Create the dimension table in the database. See ***Building a Dimension*** (see "9.2 Building a Dimension" on page 164).
- Build the update procedure. See ***Generating the Dimension Update Procedure*** (see "9.3 Generating the Dimension Update Procedure" on page 172).
- Run the update procedure and analyze the results. See ***Dimension Initial Build*** (see "9.6 Dimension Initial Build" on page 186).

Modify the update procedure as required. See ***Dimension Initial Build*** (see "9.6 Dimension Initial Build" on page 186).

Dimension Keys

Dimensions have two types of keys that we will refer to frequently. These are the Business Key and the Artificial Key. A definition of these two key types follows:

Business Key

The business key is the column or columns that uniquely identify a record within the dimension. Where the dimension maps back to a single or a main table in the source system, it is usually possible to ascertain the business key by looking at the unique keys for that source table. Some people refer to the business key as the 'natural' key. Examples of business keys are:

- The product SKU in a product dimension
- The customer code in a customer dimension
- The calendar date in a date dimension
- The 24 hour time in a time dimension (i.e. HHMM) (e.g. 1710)
- The airport short code in an airport dimension.

It is assumed that business keys will never be NULL. If a null value is possible in a business key then the generated code will need to be modified to handle the null value by assigning some default value. For example the Where clause in a dimension update may become:

SQL Server: Where isnull(business_key,'N/A') = isnull(v_LoadRec.business_key,'N/A')

Oracle: Where nvl(business_key,'N/A') = nvl(v_LoadRec.business_key,'N/A')

DB2: Where coalesce(business_key,'N/A') = coalesce(v_LoadRec.business_key,'N/A')

Note: Business keys are assumed to never be Null. If they could be null it is best to transform them to some value prior to dimension or stage table update. If this is not done an unmodified update will probably fail with a duplicate key error on the business key index.

Artificial Key

The artificial key is the unique identifier that is used to join a dimension record to a fact table. When joining dimensions to fact tables it would be possible to perform the join using the business key. For fact tables with a large number of records this however would result in slow query times and very large indexes. As query time is one of our key drivers in data warehouse implementations the best answer is always to use some form of artificial key. A price is paid in the additional processing required to build the fact table rows, but this is offset by the reduced query times and index sizes. We can also make use of database specific features such as bitmap indexes in Oracle.

The artificial key is an integer and is built sequentially from 1 upwards. See the section on artificial keys for a more detailed explanation. An artificial key is sometimes referred to as a "surrogate" key.

9.2 Building a Dimension

Dimensions are often sourced from one table in the base application. In many cases there are also codes that require description lookups to complete the de-normalization of the dimensional data. The process for building a dimension is the same for most other tables and begins with the drag and drop of the load table that contains the bulk of the dimensional information.

Drag and Drop

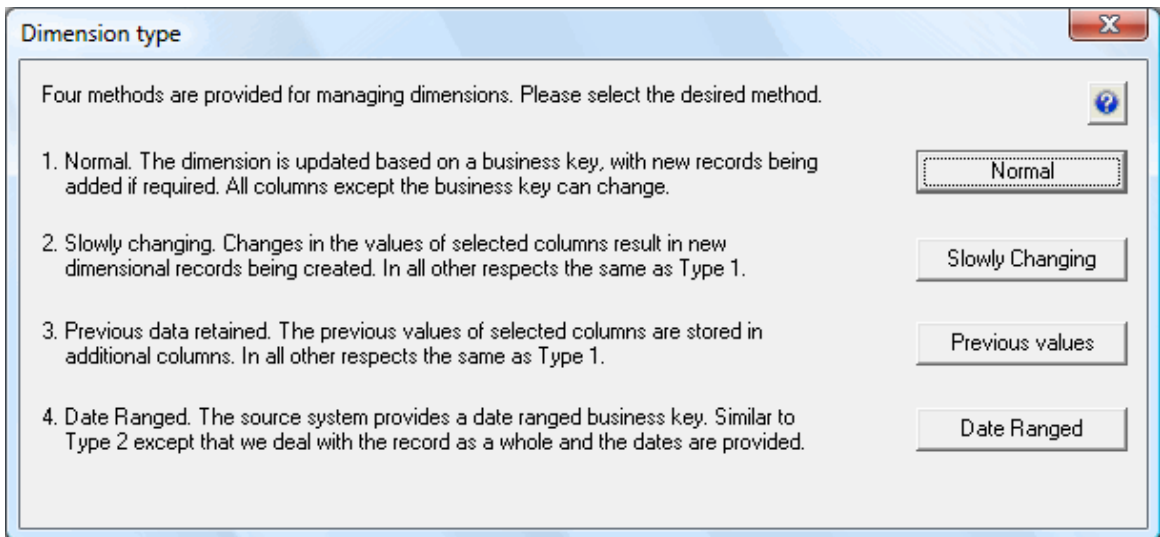
Create a dimension target by double clicking on the 'Dimension' group in the left hand pane. The middle pane will display a list of all existing dimensions. When such a list is displayed in the middle pane, the pane is identified as a target for new dimension tables.

Browse to the Data Warehouse via the Browse/Source Data menu option. Drag the load table, that contains the bulk of the dimensional columns, into the middle pane. Drop the table anywhere in the pane.

The new object dialog box will appear and will identify the new object as a Dimension and will provide a default name based on the load table name. Either accept this name or enter the name of the dimension and click OK to proceed.

Dimension Type

A dialog will appear as shown below. There are four choices for the default generation of the dimension table and its update procedure. The first choice being a normal dimension where a dimensional record is updated and changed whenever any of the non business key information changes. The second choice is a slowly changing dimension where new dimension records are created when certain identified columns in the dimension change. The third choice allows the storing of the last value of selected fields in secondary columns. The fourth choice supports source systems that provide start and end dates.



With any dimension we identify a business key that uniquely identifies the dimension records. For example in the case of the product dimension from the tutorial the product **code** is deemed to be the business key. The code uniquely identifies each product within the dimension. The product may also have a name or description and various other attributes that distinguish it. (e.g. Size, shape, color etc.). A common question when handling dimensions is what to do when the name or description changes. Do we want to track our fact table records based only on the product code or do we also want to track records based on different descriptions.

An example :

code	description	product_group	sub_group
1235	15oz can of brussel sprouts	canned goods	sprouts

This product has been sold for many years and we consequently have a very good history of sales and the performance of the product in the market. The company does a '20% extra for free' promotion for 3 months during which time it increases the size of the can to 18oz. The description is also changed to be '15 + 3oz can of brussel sprouts'. At the end of the promotion the product is reverted to its original size and the description changed back to its original name.

The question is do we want to track the sales of the product when it had a different description (slowly changing) , or should the description of the product simply change to reflect its current name (normal). For this scenario a previous value dimension would not provide much advantage, so it is not discussed.

The decision is not a simple one and the advantages and disadvantages of each of the two choices is discussed below.

Slowly Changing

- Allows the most comprehensive analysis capabilities when just using the product dimension.
- Complicates the analysis. Does not allow a continuous analysis of the product called '15oz can of brussel sprouts' when the description is used. This analysis is however still available through the code which has not changed.
- Adds considerable additional processing requirements to the building of the fact tables that utilize this dimension.
- May track data quality improvements rather than real business change.

Normal

- Does not allow specific analysis of the product during its size change. Note, however that this analysis will probably be available through the combination of a 'promotion' dimension.
- Provides a continuous analysis history for the product called '15oz can of brussel sprouts'. An analysis via description and code will produce the same results.
- Simplifies analysis from an end user's perspective.

As mentioned above the choice is never a simple one. Even amongst experienced data warehouse practitioners there will be a variety of opinions. The decision must be based on the business requirements. In many cases keeping the analysis simple is the best choice, at least in the early stages of a data warehouse development. Slowly changing dimensions do have a place, but there is nearly always an alternate method that provides equal or better results. In the example above a promotion dimension coupled with the product dimension could provide the same analysis results whilst still keeping product only analysis simple and easy to understand.



TIP: Do not overcomplicate the design of an analysis area. Keep it simple and avoid the unnecessary use of slowly changing dimensions.

Dimension Properties

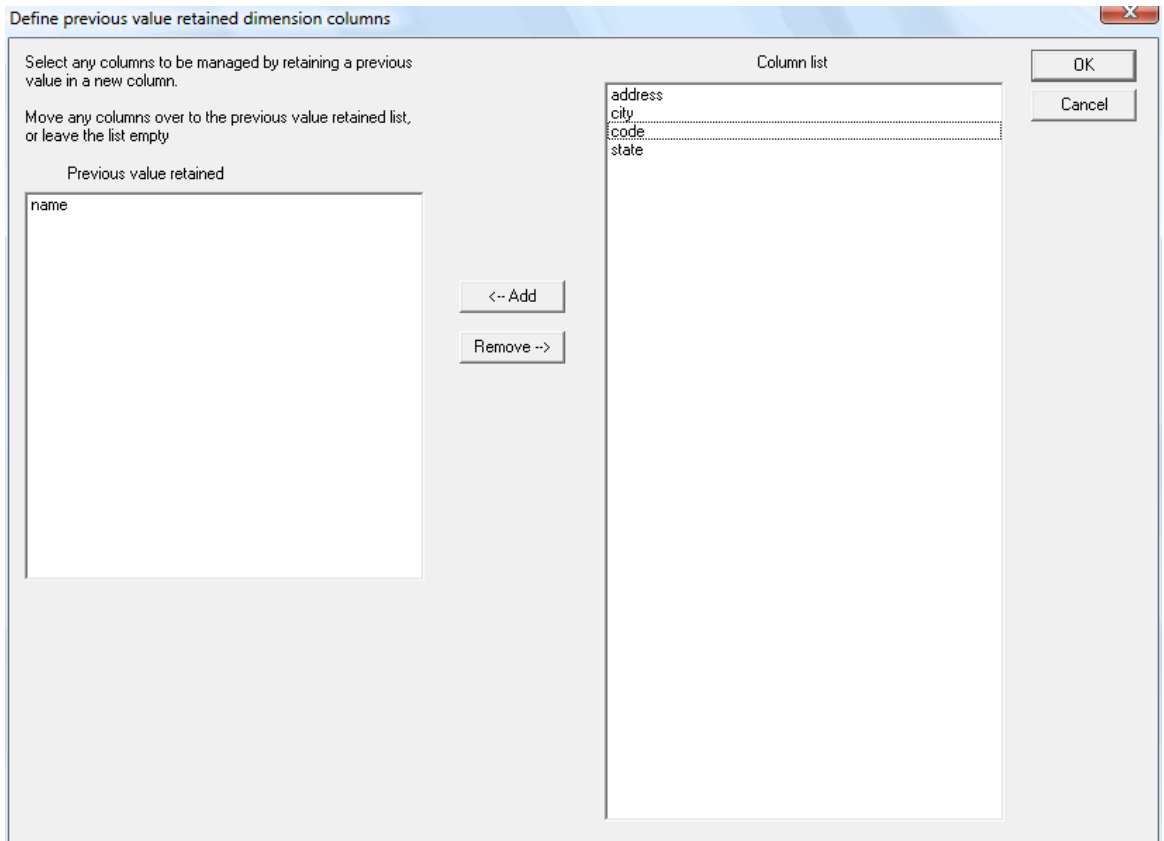
Once the dimension type is chosen the properties page will appear. Change the storage options if desired.

If prototyping, and the dimension is simple (i.e. one source table) then it is possible to create, load and update the dimension in a couple of steps. If you wish to do this select the (Build Procedure...) option from the 'Update Procedure' drop down, and answer 'Create and Load' to the next question.

Previous Values Dimension Type

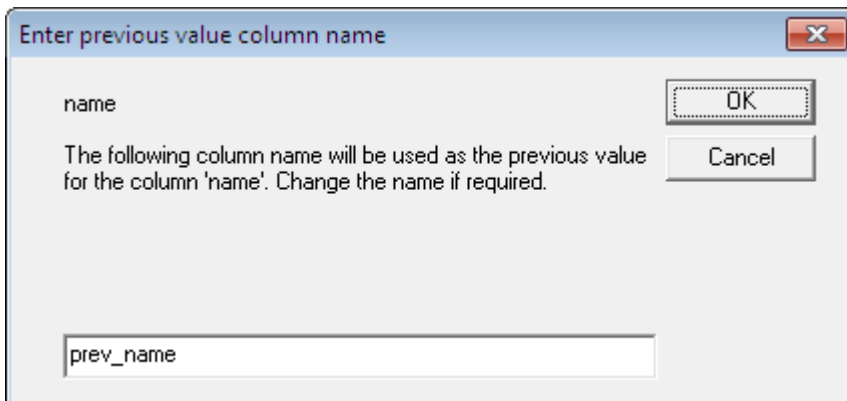
If you selected a 'Previous values' dimension type then the following questions will be asked. If one of the other two types were chosen then proceed directly to 'Create and Load'.

The following dialog will appear:



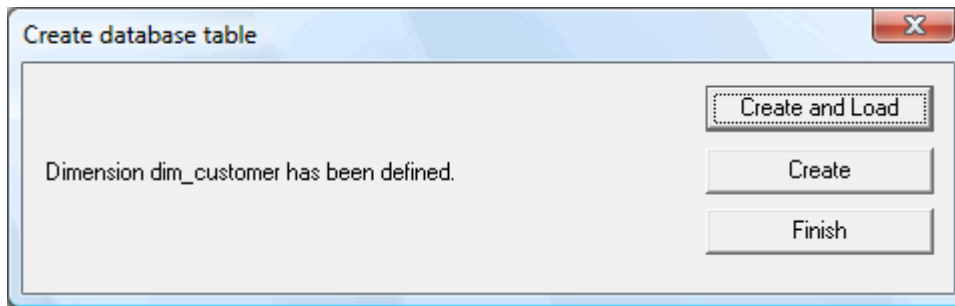
It requests the definition of each column that will be managed by storing the previous value in a separate additional column. Note that the business key cannot be used in this manner, as a change to the business key will result in a new record.

Select the columns to be managed and click OK. The following dialog will then appear for each column that has been selected. Either accept the name of the additional column or enter a new name.



Create and Load

The following dialog appears after the properties page and asks if you want to create the dimension table in the database and execute the update procedure.



If you are satisfied with the columns that will be used and do not wish to add additional columns you can select the **Create and Load** button. In such an event it would be normal practice to select the (Build Procedure...) option from the 'Update Procedure' drop down box in the previous properties page. If no procedure has been selected then select the **Create** button as no update will occur in any event.

If **Create** or **Create and Load** is selected and a new procedure creation was chosen proceed directly to the **Generating the Dimension Update Procedure** (see "**9.3 Generating the Dimension Update Procedure**" on page 172) section.

If you have additional columns to add or columns to delete then select **Finish** and proceed as follows.

Deleting and Changing columns

The columns defined for the dimension will be displayed in the middle pane. It is possible to delete any unwanted columns by highlighting a column name or a group of names and choosing the 'Delete' key.

The name of a column can also be changed by selecting the column and using the right mouse menu to edit its properties. Any new name must conform to the database naming standards. Good practice is to use alphanumerics and the underscore character. See the section on column properties for a fuller description on what the various fields mean.

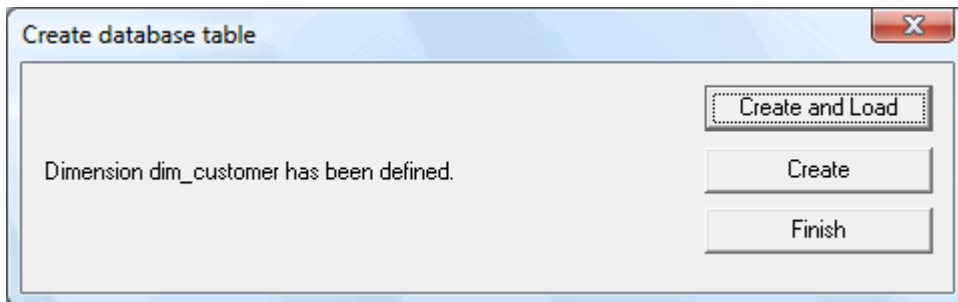


TIP: When prototyping, and in the initial stages of an analysis area build it is best not to remove columns, nor to change their names to any great extent. This type of activity is best left until after end users have used the data and provided feedback.

Adding additional columns

With the columns of the dimension table displayed in the middle pane, this pane is considered a drop target for additional columns.

It is a simple matter therefore to select columns from other load tables and to drag these columns into the middle pane. The following column list is from the customer table as supplied in the tutorial data set.



The source table shows where each column was dragged from. Although not the case in the tutorial, it is often common to have columns of the same name coming from different tables. In the example above the description column is acquired from the load_product, load_prod_group and load_prod_subgroup tables. In order that the dimension table be created we need to assign these columns unique names, so for this example the last two columns in question have been renamed to group_description and subgroup_description.

There are a number of columns that do not have a source table. These columns have been added by QAD Data Warehouse Designer, and are added depending on earlier choices. A description of these columns follows.

Column name	description
dim_customer_key	The unique identifier (artificial key) for the dimension. This key is used in the joins to the fact table. It is generated via a sequence (Oracle) or identity (SQL Server) associated with the table, except for the date dimension where it has the form YYYYMMDD
dss_start_date	Used for slowly changing dimensions. This column provides a date time stamp when the dimension record came into existence. It is used to ascertain which dimension record should be used when multiple are available.
dss_end_date	Used for slowly changing dimensions. This column provides a date time stamp when the dimension record ceased to be the current record. It is used to ascertain which dimension record should be used when multiple are available.
dss_current_flag	Used for slowly changing dimensions. This flag identifies the current record where multiple versions exist.
dss_source_system_key	Added to support dimensions that cannot be fully conformed, and the inclusion of subsequent source systems. See the ancillary settings section for more details.
dss_version	Used for slowly changing dimensions. This column contains the version number of a dimension record. Numbered from 1 upwards with the highest number being the latest or current version. It forms part of the unique constraint for the business key of a slowly changing dimension.
dss_update_time	Indicates when the record was last updated in the data warehouse.
dss_create_time	Indicates when the record was first created in the data warehouse

Manually adding previous value columns

If a 'Previous value' type of dimension is chosen, or in fact if the dimension is converted to this type, it is possible to manually add any required columns that were not defined as part of the create. The steps are:

- 1 Add a new column by dragging in the column that is to have a previous value stored.
- 2 Change the name to a unique name. Typically by adding the prefix 'prev_' to the column name.
- 3 Change the source table, to be that of the dimension we are building.
- 4 Set the Key Type to 4.

Having performed these actions QAD Data Warehouse Designer will detect the column and build the appropriate code during the procedure generation phase.

Create the table

Once the dimension has been defined in the metadata we need to physically create the table in the database. This is achieved by using the right mouse button when positioned over the dimension name and selecting Create (ReCreate) from the popup menu.

A results dialog box will appear to show the results of the creation.

The contents of this dialog are a message to the effect that the dimension table was created. A copy of the actual database create statement, the sequence create statement (Oracle only), and if defined the results of any index create statements will be listed. For the initial create no indexes will be defined.

If the table was not created then ascertain and fix the problem. A common problem is 'Duplicate column' where a column has the same name in two of the source tables. The best way of finding such a column is to double click on the list heading 'Col name'. This will sort the column names into alphabetic order. Another double click on the heading will sort the columns back into their create order.

For Oracle data warehouses the sequence created as part of the table create is normally called *table_name_seq* unless the default has been overridden. If this sequence already exists a warning is issued. This sequence is used in the assigning of a unique artificial key to the dimension. SQL Server makes use of an identity attribute on the artificial key column.

The next section covers the ***Generating the Dimension Update Procedure*** (see "9.3 ***Generating the Dimension Update Procedure***" on page 172).

9.3 Generating the Dimension Update Procedure

Once a dimension has been defined in the metadata and created in the database an update procedure can be generated to handle the joining of any tables and the update of the dimension records.

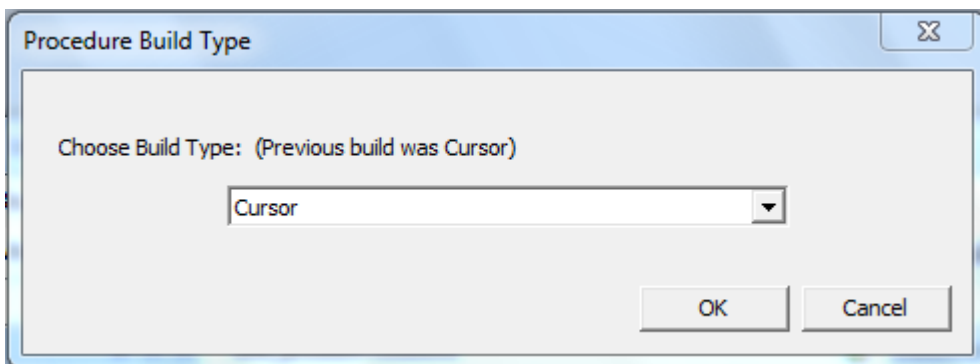
The zero key row

QAD Data Warehouse Designer will by default always insert a record into the dimension with an artificial key value of zero. This record is used to link any fact records that do not have valid dimension joins. The values of the various columns in this record are acquired from the contents of the field 'Zero key value' which is set in the properties screen of each dimension column.

Generating a Procedure

To generate a procedure use the right mouse menu when positioned on the dimension name to edit the properties for the dimension. From the 'Update Procedure' drop down list select (Build Procedure...). Click OK to update the properties and start the process of generating the new procedure.

A Procedure Build Type dialog will appear, requesting you to choose between Cursor and Set.



If Set is chosen then another dialog will appear, allowing you to select the relevant build options.

Define Dimension procedure type and options

Procedure Types

Procedure typeSetPrevious build was : Set

OKCancel

Build Options

☐ Process in batch

☐ Distinct data select

☐ Include delete before insert

☐ Include initial load insert

☒ Include update statement

☒ Include insert statement

☐ Changed rows only

Update hint:(e.g. TABLOCK)

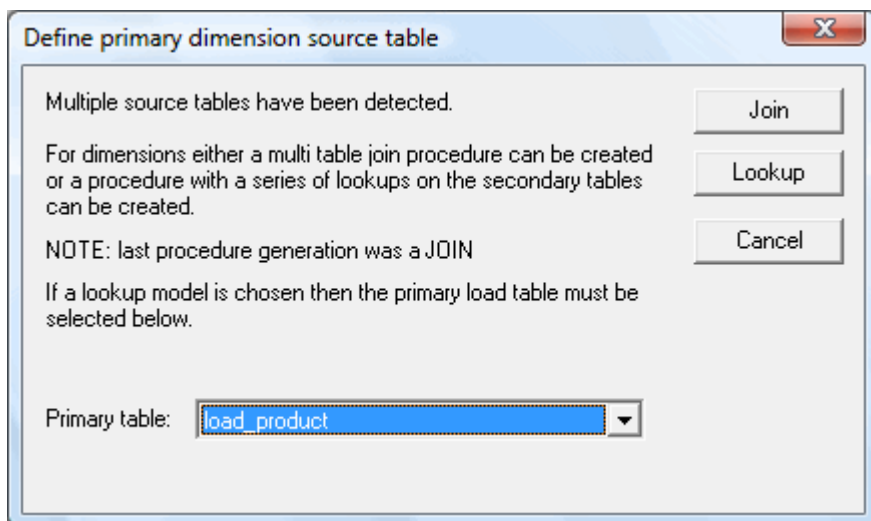
☒ New rows onlyExcept

Insert hint: TABLOCK(e.g. TABLOCK)

A series of questions will be asked during the procedure generation based on the type of load information. If only one source table was used then proceed directly to the 'Business Key' section and skip the subsequent sections on Joining and Lookups.

Join Or Lookup

If columns from multiple source tables were used to create the dimension then the following dialog will appear at the start of the procedure creation process.



The choice provided is either to create a join that will combine all the information from the various tables into one large select statement, or to do a series of lookups.

The normal process would be to join the tables to create one large select statement. There are however situations where this is not desirable or possible. When a large number of tables are involved then a join will be slower than a series of lookups. In some situations we may not have all the information to do an initial join. A series of lookups may be required to build up the information.

For complex situations it will be necessary to edit and enhance the generated procedure code.

If Lookup is chosen then the primary table for the dimension must be chosen. The philosophy here is that a series of lookups will be conducted against the secondary tables using information from this primary table.

Business Key definition

A dialog will appear asking for the business key that will uniquely identify each dimension record. The source table from which the dimension is derived would normally have some form of unique constraint applied. In most cases this will be the business key. In the example below the product code is selected as the business key.

Define dimension business key(s)

Select the business keys that uniquely identify each record in the Dimension table.

Move them over to the business key list

Business key list

code

Column list

description
group_description
line_description
prod_group
prod_line
subgroup
subgroup_description

<-- Add

Remove -->

☐ Allow Where clause editing

☒ Include Minus dimension select

☐ Add a hierarchy for cubes

OK

Cancel

A business key can be made up of multiple columns, but it must provide a unique identifier. Where multiple columns uniquely and separately identify the dimension, choose one to act as the primary business key. For example a source table may have a unique constraint on both a product code and a product description. Therefore the description as well as the code must be unique. It is of course possible to combine the two columns, but the normal practice would be to choose the code as the business key.

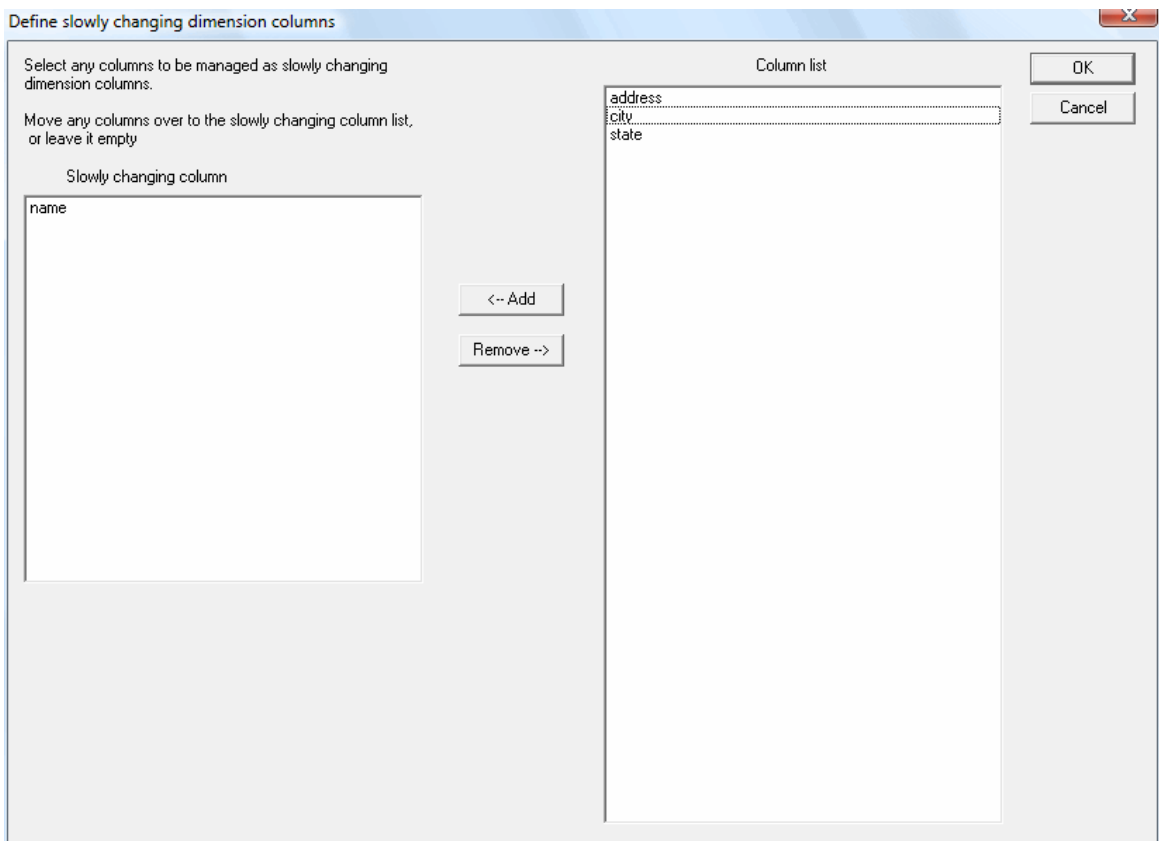
None of the columns chosen as the business key should ever contain a NULL value. See the note at the start of this chapter.

The 'Include minus dimension select' check box (available in SQL Server as **Not Exists Select**) will add additional code to the main select statement. This code will exclude every row in the source table that has not changed in the dimension table and can result in faster execution of the update procedure for large dimensions.

The 'Add a hierarchy for cubes' check box will produce another dialog that allows the definition of a simple hierarchy structure. This is useful if the hierarchy of the dimension is known and the dimension will be used in the creation of Analysis services cubes. Hierarchies may be defined now or later when required. They may also be defined or modified after the dimension has been created.

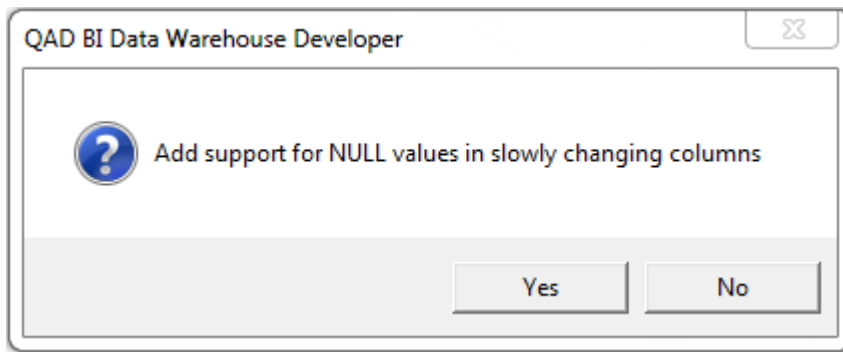
Slowly Changing columns

If the dimension was defined as a slowly changing dimension then the following additional dialogs will appear. The first dialog requests the selection of the columns to be managed as slowly changing dimension columns. Select the required columns and click OK to proceed. In the example below the name is to be managed as a slowly changing column.



The advantages and disadvantages of slowly changing dimensions are discussed earlier in this chapter, but as a general rule try to minimize their usage, as they invariably complicate the processing and end user queries.

The following dialog will appear if one or more columns are chosen for management.



Null values are the enemy of a successful data warehouse. They result in unreliable query results and can often lead to a lack of confidence in the data. If a column is considered important enough to be managed as a slowly changing column then it should not normally contain null values. It is often best to ensure that a Null cannot occur by using a IsNull() (SQL Server), Nvl() (Oracle) or Coalesce() (DB2) transformation when loading the column. If, however, this situation is unavoidable then answering 'Yes' to this question will result in additional code to test for Nulls during the update of the dimension records. If 'No' is answered and Nulls are encountered then a unique constraint violation will occur during the dimension update.

Joining multiple source tables

If multiple source tables were used to build the dimension then an option would have appeared in an earlier dialog to choose between a join or a lookup. If 'Join' was chosen then a dialog box will appear prompting for the joins.

Provide Cursor mapping

Cursor Name (if applicable):

Define the joins (or edit the where clause).
To define a Join select two tables and press the 'Join' button. Then select the join columns from the dropdown lists presented.

Source Tables:
☐ load_product
☐ load_prod_subgroup
☐ load_prod_line
☐ load_prod_group

'From and Where' clause

```
FROM load_product
LEFT OUTER JOIN load_prod_group
ON load_product.prod_group = load_prod_group.prod_group
LEFT OUTER JOIN load_prod_subgroup
ON load_product.prod_group = load_prod_subgroup.prod_group
AND load_product.subgroup = load_prod_subgroup.subgroup
```

ANSI join code generated ☒

Outer Join Simple Join See Help for further details

Select the columns that join the two tables. Select the column from the master table first.

load_product subgroup load_prod_subgroup prod_group
subgroup
subgroup_description

Two tables are selected in the left hand box and one of the join buttons clicked. The columns for the two tables then appear at the bottom of the dialog and one column is selected from each drop down list to effect the join between the selected tables. In the example above the load_product and load_prod_subgroup tables are joined by two columns namely prod_group and subgroup. In such a case two joins are actioned for these two tables, so that both columns can be selected.

Simple Join

A simple join joins the two tables via a where clause in Oracle. In SQL Server either a where or from clause join can be generated. In DB2, only a from clause join can be generated. A simple join only returns rows where data is matched in both tables. So for example if table A has 100 rows and table B has a subset of 24 rows. If all the rows in table B can be joined to table A then 24 rows will be returned. The other 76 rows from table A will not be returned.

Outer Join

An outer join joins the two tables via a where clause in Oracle. In SQL Server either a where or from clause join can be generated. In DB2, only a from clause join can be generated. The ANSI standard 'from clause' join is recommended as multiple 'where clause' outer joins will return incorrect results under SQL Server. The outer join returns all rows in the master table regardless of whether or not they are found in the second table. So if the example above was executed with table A as the master table then 100 rows would be returned. 76 of those rows would have null values for the table B columns. When QAD Data Warehouse Designer builds up a where clause join it must place the outer join indicator next to the appropriate column. As this indicator goes on the subordinate table in Oracle, and the master in SQL Server, QAD Data Warehouse Designer needs to know which table is master and which subordinate. Select the join column from the master table first. In the example screen above the table 'load_product' has had its column chosen and the column for the table 'load_prod_subgroup' is currently being chosen. This will result in the 'load_product' table being defined as the master, as per the example statement as shown in the 'Where clause edit window' above. The results of this example select are that a row will be added containing product information regardless of whether or not a corresponding prod_subgroup entry exists.

As the join columns are selected the join statement is built up in the large edit window on the right hand side. Once all joins have been made the contents of this window can be changed if the join statement is not correct. For example the Oracle outer join indicator (+) could be removed if required.

Once satisfied with the join clause click the OK button to proceed to the next step. For Oracle this clause is the where clause that will be applied to the select statement of the cursor to allow the joining of the various tables. For SQL Server this clause will be either the where clause or a combined from and where clause depending on the option chosen. This clause can of course be edited in the procedure that is generated if not correct.

For SQL Server data warehouses you have the choice between 'Where' statement joins and ANSI standard joins. For DB2 data warehouses, only ANSI standard joins are available.

Note: Where joins will not work correctly in SQL Server if more than two tables are used in an outer join.

The example below shows the result of a SQL Server ANSI standard join which takes place in the 'From' statement.

Provide Cursor mapping

Cursor Name (if applicable):

Define the joins (or edit the where clause).
To define a Join select two tables and press the 'Join' button. Then select the join columns from the dropdown lists presented.

Source Tables:

'From and Where' clause

ANSI join code generated ☒

```
FROM load_product  
LEFT OUTER JOIN load_prod_group  
ON load_product.prod_group = load_prod_group.prod_group  
LEFT OUTER JOIN load_prod_subgroup  
ON load_product.prod_group = load_prod_subgroup.prod_group  
AND load_product.subgroup = load_prod_subgroup.subgroup  
LEFT OUTER JOIN load_prod_line  
ON load_product.prod_line = load_prod_line.prod_line
```

 See Help for further details

Select the columns that join the two tables. Select the column from the master table first.

Lookup

If multiple source tables were used to build the dimension then an option would have appeared in an earlier dialog to choose between a join or a lookup. If 'Lookup' was chosen then a dialog box will appear prompting for the joins between the primary table and each secondary (lookup) table.

The example below shows the lookup dialog for two tables from the tutorial data set.

Dimension lookup table definition

Create the condition that defines the lookup from our primary table to the lookup table.

Select columns from each table that are used in the join and add them to the where clause

NOTE: Lookup for line_description

load_product

load_prod_line

prod_line

prod_line

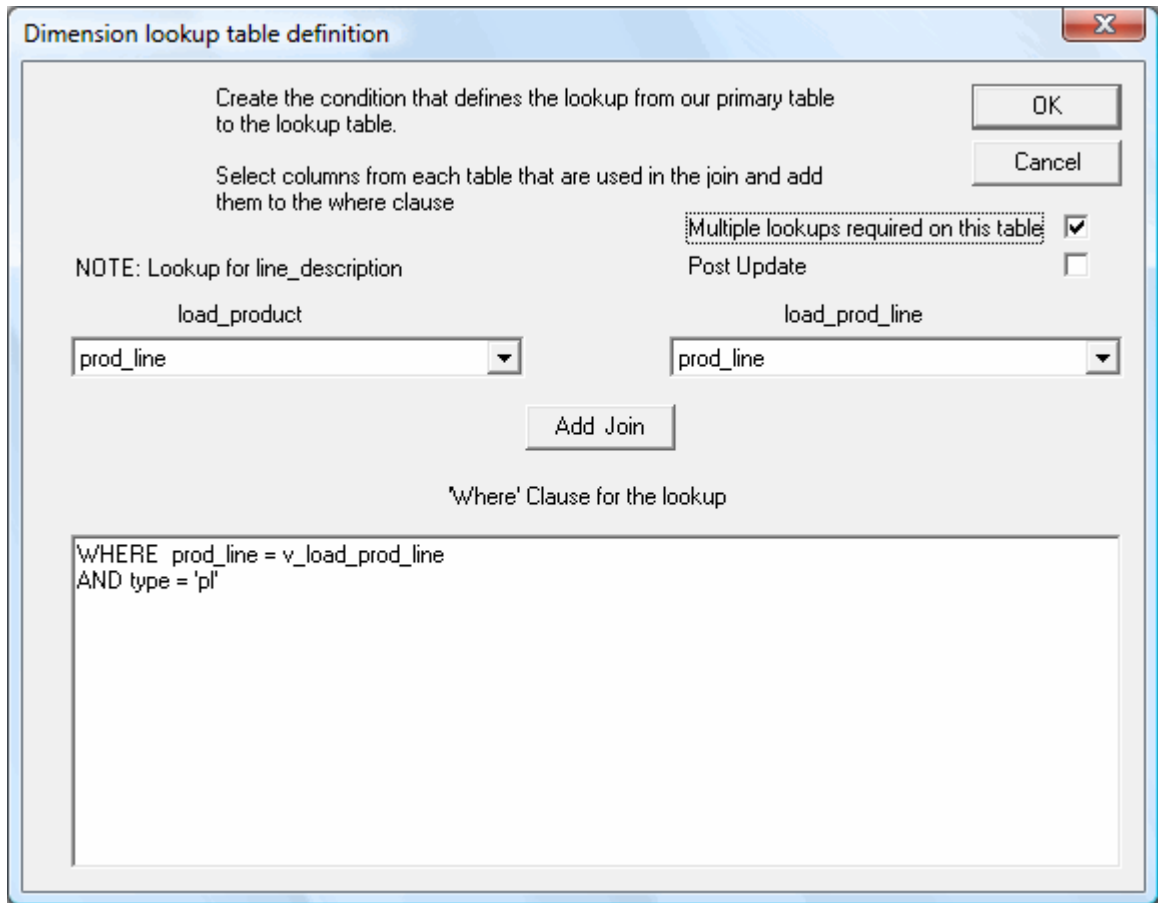
Add Join

'Where' Clause for the lookup

```
WHERE prod_line = v_load_prod_line
AND type = 'pl'
```

The load_product table is the main table and a lookup is being performed on the load_code_table table. Columns are selected from the drop down column list for each table and then the 'Add Join' button pressed to add these two columns to the 'Where' clause as shown in the bottom box. This 'Where' clause may be edited and goes to form a 'lookup' select statement within the main cursor loop of the update procedure. In this example the 'Where' clause has had the second line manually added to identify the type of lookup in the code table.

Multiple lookups can occur on the same table. Where we have a generic code table, for example, we may do multiple lookups to get descriptions. The check box 'Multiple lookups required for this table' will result in repeated lookups against the second table until all columns sourced from this table have been utilized in the lookup statements. If the 'Multiple lookup...' check box is ticked then the following dialog will appear to allow selection of the columns that are to be retrieved by the lookup.



Dimension lookup table definition

Create the condition that defines the lookup from our primary table to the lookup table.

Select columns from each table that are used in the join and add them to the where clause

NOTE: Lookup for line_description

load_product

prod_line

load_prod_line

prod_line

Add Join

'Where' Clause for the lookup

```
WHERE prod_line = v_load_prod_line
AND type = 'pl'
```

Multiple lookups required on this table ☒

Post Update ☐

OK

Cancel

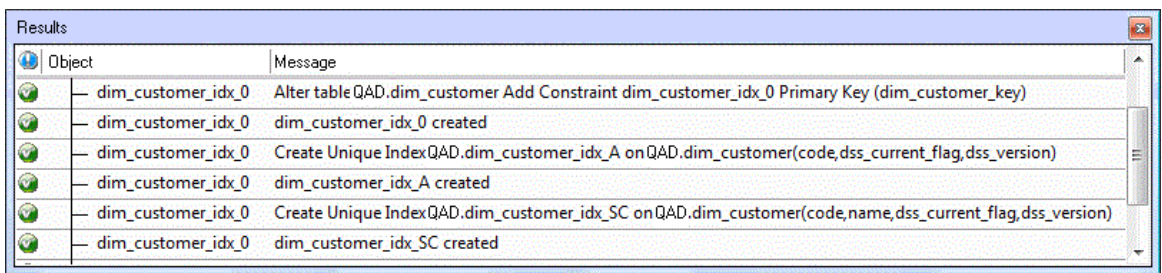
Building and Compiling the Procedure

Once the above questions are completed the procedure is built and compiled automatically. If the compile fails an error will be displayed along with the first few lines of error messages. Compile fails typically occur when the physical creation of the table was not done. If the compile fails for some other reason the best approach is to use the procedure editor to edit and compile the procedure. The procedure editor will highlight all the errors within the context of the procedure.

Once the procedure has been successfully compiled it can either be executed interactively or passed to the scheduler.

Indexes

By default a number of indexes will be created to support the dimension. These indexes will be added once the procedure has been built. An Oracle example of the type of indexes created is as follows:



Object	Message
dim_customer_idx_0	Alter table QAD.dim_customer Add Constraint dim_customer_idx_0 Primary Key (dim_customer_key)
dim_customer_idx_0	dim_customer_idx_0 created
dim_customer_idx_0	Create Unique Index QAD.dim_customer_idx_A on QAD.dim_customer(code,dss_current_flag,dss_version)
dim_customer_idx_0	dim_customer_idx_A created
dim_customer_idx_0	Create Unique Index QAD.dim_customer_idx_SC on QAD.dim_customer(code,name,dss_current_flag,dss_version)
dim_customer_idx_0	dim_customer_idx_SC created

This example shows three indexes being created. They are:

- 1 A primary key constraint placed on the artificial key for the dimension.
- 2 A unique index placed on the business key for the dimension.
- 3 A unique index placed on the business key and a slowly changing column from the dimension.

This third index is only created when a 'Slowly Changing' dimension is chosen.

Additional indexes can be added, or these indexes changed. See the chapter on indexes for further details.

9.4 Dimension Artificial Keys

The artificial (surrogate) key for a dimension is set via a sequence in Oracle and an identity column in SQL Server and DB2. This artificial key normally, and by default, starts at one and progresses as far as is required.

A QAD standard for the creation of special rows in the dimension is as follows:

Key value	Usage
1 upwards	The normal dimension artificial keys are numbered from 1 upwards, with a new number assigned for each distinct dimension record.
0	Used as a join to the dimension when no valid join existed. It is the normal convention in the QAD generated code that any dimension business key that either does not exist or does not match is assigned to key 0.

Key value	Usage
-1 through -9	Used for special cases. The most common being where a dimension is not appropriate for the record. For example we may have a sales system that has a promotion dimension. Not all sales have promotions. In this situation it is best to create a specific record in the dimension that indicates that a fact table record does not have a promotion. The stage table procedure would be modified to assign such records to this specific key. A new key is used rather than 0 as we want to distinguish between records that are invalid and not appropriate.
-10 backward	Pseudo records. In many cases we have to deal with different granularities in our fact data. For example we may have a fact table that contains actual sales at a product SKU level and budget information at a product group level. The product dimension only contains SKU based information. To be able to map the budget records to the dimension we need to create these pseudo keys that relate to product groups. The values -10 and backwards are normally used for such keys. A template called 'Pseudo' is shipped with QAD Data Warehouse Designer to illustrate the generation of these pseudo records in the dimension table.

9.5 Dimension Get Key Function

When QAD Data Warehouse Designer is asked to generate a new procedure to support the updating of a dimension it also generates a 'Get Key' function (procedure in SQL Server and DB2). Such a function is also generated when dimension views are created, and can be generated for retro-fitted dimensions.

This 'Get Key' function is used to return an artificial key when supplied a business key. The normal syntax is to call the function passing the business key and be returned a status indicating the result of the lookup. On a successful lookup the artificial key for the dimension record is also returned. If the lookup fails because the business key is not found in the dimension then an appropriate status is returned and the artificial key is set to 0.

Note: Two parameters exist on the generated 'Get Key' function that allow manipulation of the process. It is possible to automatically add a new dimension record when a match is not made. It is also possible to record the lookup failure in the detail/error log. By default both these options are disabled.

Modifying the 'Get Key' function

There may be a situation where a dimension record can have multiple business keys.

For example: you may be able to look up a 'factory' based on the factory code, the name of the factory or its address. The generated 'Get Key' function will only support the primary business key which in this case may be the factory code. However, we may have a fact record that only contains the factory name. In such a case we need to modify the 'Get Key' function or add a second function. The advantages of adding a second function are that any code generated in the future that uses this dimension will work without modification. The disadvantages are the multiple points of maintenance required when changing the dimension. Both options are discussed below:

Adding a second 'Get Key' function for a dimension

Choose a name similar to the existing function. If say we have a 'get_dim_factory_key' function then we may choose a name like 'get_factory_name_key'. Proceed to create and populate the function as follows:

- 1 Using the right mouse menu with the 'Procedure' group highlighted in the left pane, select the 'New Object' option to create a new procedure. Put the name chosen in the name field and click ADD.
- 2 A properties dialog will appear. Change the type to 'Function' for Oracle, leave as a 'Procedure' for SQL Server. Enter a description under the 'Purpose' column and click the UPDATE button.
- 3 Expand the 'Procedure' group in the left pane and double click on the new object just created. This will start the editor.
- 4 Select the Tools/View procedure or template menu option. This will start a dialog box.
- 5 Select the existing 'Get Key' function from the procedure drop down. A new window will appear on the right hand side showing the existing 'Get Key' function.
- 6 Click the mouse in the existing function window. Using the right mouse menu choose 'Select All' and then using the right mouse menu again choose 'Copy'.
- 7 Click the mouse in the main editor window and paste the existing function into the window. The existing function window can now be closed if desired.
- 8 Using the menu option Edit/Replace change all occurrences of the old function name to the new name.

- 9 Change the various occurrences of the business key name and variable to match the new one and test it all.

Once a new 'Get Key' function has been produced it will obviously be necessary to modify the stage update procedure to utilize the new function.



TIP: An alternative approach is to create a dimension view specifically to generate a different kind of get key function. Then use this view's surrogate key in the stage table instead of the dimension table's surrogate key. This approach avoids modifying the staging table procedure.

Extending the 'Get Key' function

If you want to keep all the information for the lookup of dimension keys in one location then extend the functionality of the existing 'Get Key' function. The normal practice in this case is to include all potential business keys as parameters. Multiple select statements can be employed to select the keys based on the appropriate business key. To choose the correct statement either use Nulls in the unused business keys or include an additional parameter to indicate which business key is being passed.

If this method is used then any stage update procedures will need to be modified to handle the new calling syntax.

9.6 Dimension Initial Build

The initial population of a dimension with data can be achieved by generating a custom procedure and then; using the right mouse on the dimension, choosing **Execute Custom Procedure via Scheduler**. The dimension should be analyzed once the custom procedure is completed so that the database query optimizer can make use of the indexes.

For smaller dimensions (i.e. less than 500,000 rows) run the normal 'Update' procedure against an empty dimension table. There is however a danger in this action in that the query optimizer will not have any information on the table and hence will do a full table pass when adding each new row. For a very small dimension this will not be an issue, but it will rapidly become a major problem as the row count increases. The problem with the initial update is that the database does not know to use the index that has been created for the business key, and hence does a full table pass when attempting to update/insert a record.

To prevent this problem the generated code will issue an analyze statement after 1000 rows have been added to the table. The statement used is as follows:

SQL Server: update statistics *dim_table* with sample 5 percent

Oracle: analyze table *dim_table* estimate statistics sample 5 percent for all indexed columns

DB2: runstats on table *dim_table*

where *dim_table* is the name of the dimension.

This command will be issued whenever 1000 or more new rows are added to a dimension. If this is undesirable then the code should be removed from the update procedure. It may be undesirable if a plan has been locked in for the table.

9.7 Dimension Column Properties

Each dimension column has a set of associated properties. The definition of each property is described below:



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the Tools/Validate table create status to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name. See the example below.

A sample property screen is as follows:

The screenshot shows a 'Column definition' dialog box with the following fields and options:

- Table:** dim_customer
- Column name:** address
- Business display name:** address
- Data type:** varchar(40)
- Format:** (empty field)
- Column order:** 40
- Default Value:** (empty field)
- Nulls:** ☒
- End User Layer Display:** ☒
- Numeric:** ☐
- Key Type (D,A,B,C...):** ☐
- Additive:** ☐
- Artificial Key:** ☐
- Attribute:** ☒
- Primary Business Key:** ☐
- Source table:** load_customer
- Source column:** address
- Business Definition:** The physical shipping address of the customer.
- Source strategy:** (max 2048 chars.)
- Zero key value:** Unknown

Buttons on the right: Update, Update <, Update >. Buttons at the bottom: OK, Cancel, Apply.

The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics, and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. It does not affect the physical table definition, but rather provides input to the documentation and to the view `ws_admin_v_dim_col` which can be used to assist in the population of a end user tool's end user layer. As such it is a free form entry and any characters are valid.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical data types for Oracle are integer, number, char(), varchar2() and date. For SQL Server common types are integer, numeric, varchar() and datetime. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid. Typically format masks are only used on numeric fields. Example: `#,###0.00`. It is not worth the effort of populating this field unless it can be utilized by the end user tools in use.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the '**Respace order number**' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This checkbox when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column.

Numeric

This checkbox indicates that the column in question is numeric when set. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Additive

This checkbox indicates that the column in question is additive when set. This implies that the column can be summed when performing data grouping in a query. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Attribute

This checkbox indicates that the column in question is an attribute when set. An attribute is defined as a column that is non factual. For example we may have an order number, or a invoice number stored in the fact table. Such columns are considered attributes, rather than facts. This checkbox is therefore normally only relevant for fact tables. This checkbox does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tools end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Source table

Indicates the table from which the column was sourced. This source table is normally a load table within the data warehouse. If the column was sourced from multiple tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Source strategy' field. This field is used when generating a procedure to update the dimension. It is also used in the track back diagrams and in the documentation.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a load table column, which in turn may have been a transformation or the combination of multiple columns. For previous value managed columns the source column is the column in the table whose previous value is being recorded.

Business definition / Source strategy

Normally this field will contain a business definition of the column. Such a definition may be a description of the column from a business user's point of view. This field might additionally contain information on where and how the column was acquired. For example if the column is sourced from multiple tables or is a composite or derived column then this definition would normally describe the process used to populate the column. This field is used in the documentation and is available via the view `ws_admin_v_dim_col`. This field is also stored as a comment against the column in the database.

Zero key value

The field contains the data that will be placed in the zero key row in the dimension. All dimensions that use standard QAD Data Warehouse Designer generated procedures have a row with an artificial key of zero. This row is used to link to the fact records when no match on the dimension can be found. For example we may have some sales records that come through without a product defined. QAD Data Warehouse Designer will by default associate these fact records with the zero key product dimension entry. So, we might set the zero key value to 'Unknown product' for the name column in the product dimension.

End User Layer display

This checkbox when set indicates that the column is intended for end user view. If set the documentation will include the column in the glossary and in the user documentation. It is also used to decide what columns appear in the view `ws_admin_v_dim_col`. Typically columns such as the artificial key would not be enabled for end user display.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key. For example: By default the <code>dss_source_system_key</code> is added to every dimension table. It is considered part of any lookup on that table and has the key type set to 1. Set when the column is added during drag and drop table generation.
2	Indicates that this column is a dimensional join. Used on fact tables to indicate the dimension keys. Results in an index being built for the column (Bitmap in Oracle). Set during the update procedure generation for a fact table, based on information from the staging table.
3	Slowly changing column indicator. Used on dimension tables to indicate that the column is being managed as a slowly changing column within the context of a slowly changing dimension. Set when a column is identified during the dimension update procedure generation.
4	Previous value column indicator. Used on dimension tables to indicate that the column is being managed as a previous value column. The source column identifies the parent column. Set during the dimension creation.
5	Start date of a date ranged dimension. Used on dimension tables to indicate that the column is defined as the starting date for a source system date ranged dimension. Forms part of the business key. Set during the dimension creation.
6	End date of a date ranged dimension. Used on dimension tables to indicate that the column is defined as the ending date for a source system date ranged dimension. Forms part of the business key. Set during the dimension creation.
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.

Key type	Meaning
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

This checkbox indicates that the column is the artificial key when set. Only one artificial key is supported. This indicator is set by QAD Data Warehouse Designer during the initial drag and drop creation of a table, and should not normally be altered.

Primary Business Key

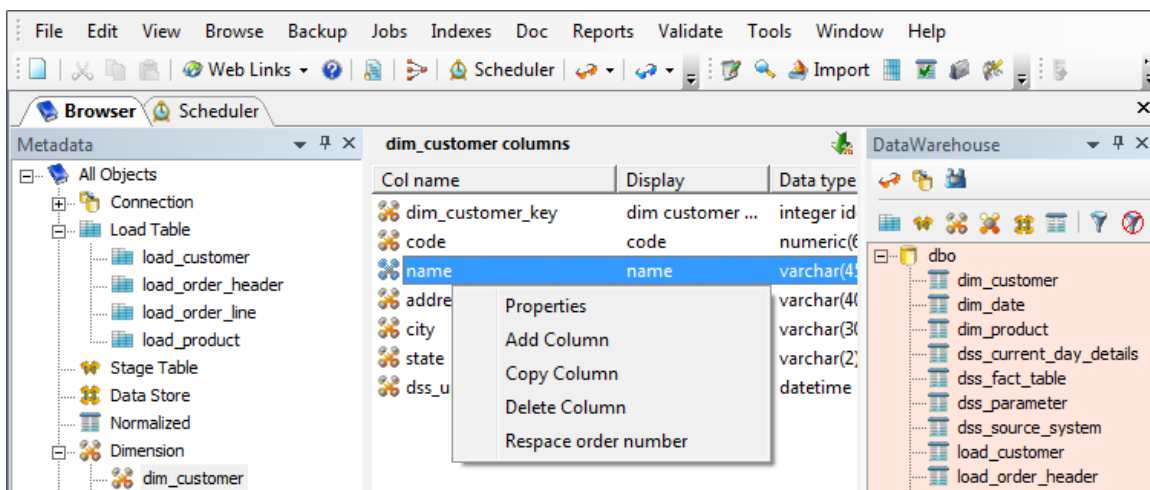
This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the dimension update procedure generation process. This checkbox should not normally be altered.

Changing a Column name

If the Column name or Data type is changed for a column then the metadata will differ from the table as recorded in the database. Use the Tools/Validate table create status menu option or the right mouse menu to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.

For example: Analysis Services does not like 'name' as a column name. For dim_customer it will therefore be necessary to change the column name from 'name' to 'cname'.

- 1 Click on the dim_customer object in the left hand pane to display the dim_customer columns in the middle pane.
- 2 When positioned on the column 'name' in the middle pane, right click and select 'Properties' from the drop down menu.



- 3 Change the column name from 'name' to 'cname' as shown below. Click OK to leave the properties page.

Column definition

Column Properties | Transformation | Language Mapping

Table: dim_customer

Column name: cname

Business display name: cname

Data type: varchar(45)

Format:

Column order: 30

Default Value:

Nulls: ☒

End User Layer Display: ☒

Numeric: ☐

Additive: ☐

Attribute: ☒

Key Type (0,A,B,C,...): ☐

Artificial Key: ☐

Primary Business Key: ☐

Source table: load_customer

Source column: name

Business Definition: Source strategy: (max 2048 chars.)

The full name of the customer. Forms a hierarchy with city and state.

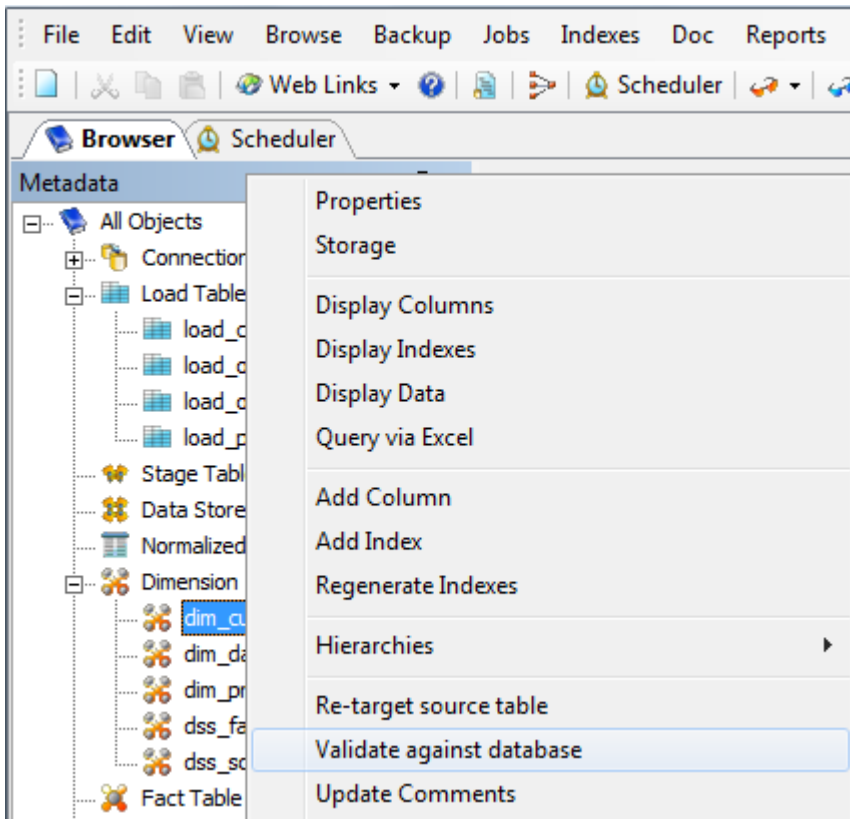
The value shown below is loaded in this column for the 'Invalid Join' record. When empty NULL is used.

Zero key value: Unknown

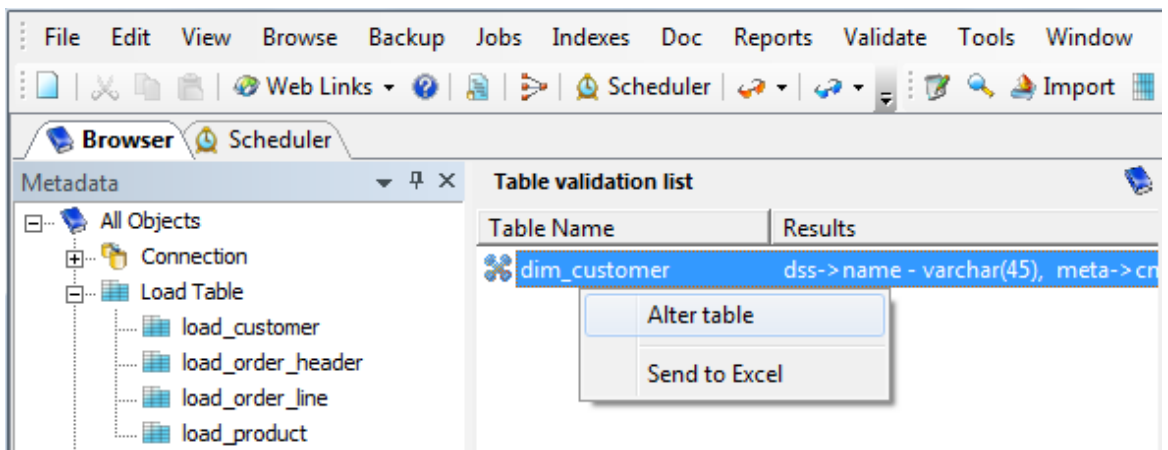
Update Update < Update >

OK Cancel Apply

- 4 Right click on the dim_customer object in the left hand pane and choose 'Validate against Database'.



- 5 The results in the centre pane will show that the metadata has been changed to 'cname' while the column name in the database is still 'name'.
- 6 Right click on dim_customer in the centre pane and select 'Alter table' from the drop down list.



- 7 A warning dialog will appear, displaying the table and column name to be altered. Select 'Alter Table'.
- 8 A dialog will appear confirming that dim_customer has been altered. Select OK.

9.8 Dimension Column Transformations

Each dimension table column can have a transformation associated with it. The transformation will be included in the generated procedure and will be executed as part of the procedure update. The transformation must therefore be a valid SQL construct that can be included in a 'Select' statement. For example we could have a transformation of 'load_order_line.qty * 0.125' to calculate a tax column of 12.5%. Click the 'Transformation' tab to enter a transformation.

Note: transformations are only put into effect when the procedure is re-generated.

9.9 Dimension Hierarchies

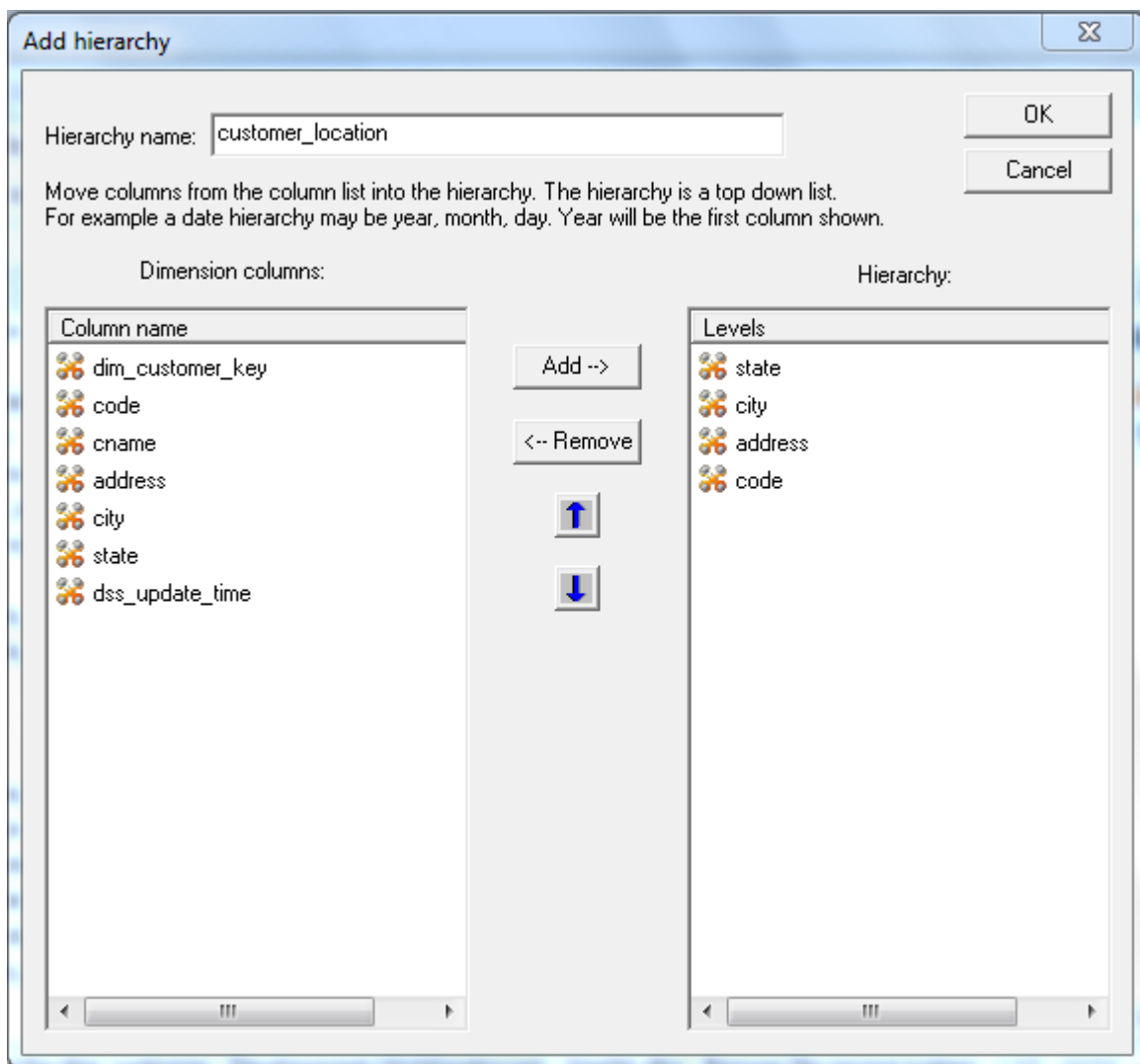
The various hierarchies associated with a dimension can be recorded in the QAD Data Warehouse Designer metadata. These hierarchies are often not used in any form, except to provide documentary completeness. They can however be used in conjunction with the QAD hierarchy maintenance utility to allow the maintenance of hierarchy elements externally to a production source system.

When used in conjunction with the hierarchy maintenance utility these dimension hierarchies add a powerful method of enriching the analysis capabilities of the data warehouse. For example we may have a source system that has a dimension called sales_person. This dimension has no information apart from employee_code, name and title. We could add additional columns of sales_manager, territory, state and region to this dimension. A hierarchy could then be formed from the salesperson name, sales_manager, territory, state and region. The hierarchy maintenance utility allows the maintenance of this hierarchy externally to the data warehouse. This external hierarchy can then become a source system to enrich the data in the warehouse.

Two areas will be covered. The first the creation of hierarchies using QAD Data Warehouse Designer, and secondly the process required to setup and use externally maintained hierarchies as source systems to the data warehouse.

9.9.1 Adding a Dimension Hierarchy

Any number of hierarchies can be created against a dimension. There is no restriction on the form of the hierarchy. To add a new hierarchy, position on the dimension table in the left hand pane and using the right mouse menu select 'Hierarchies' / 'Add Hierarchy'. The following dialog will appear.

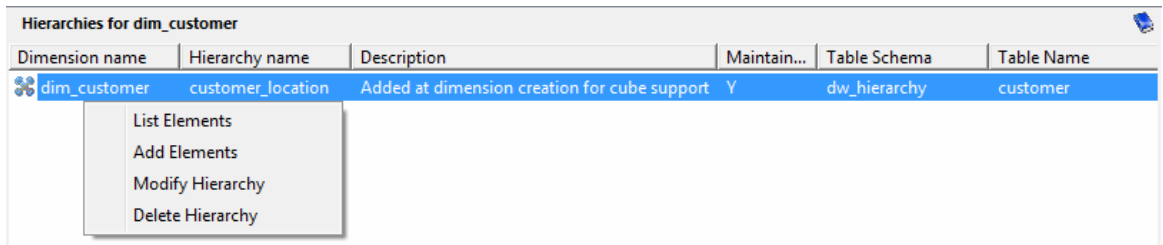


Enter a meaningful name for the hierarchy.

The hierarchy is built with the highest level at the top; for example a customer dimension may have **state** at the highest level, then **city**, then **address** and finally **code** at the lowest level.

To enter the hierarchy elements, select them, in the required order, from the left hand pane and choose **Add**. This will add them to the right hand column. Once all the hierarchy elements have been added, choose **OK**.

A hierarchy and its elements can be edited by listing the hierarchies associated with a dimension and using the right mouse menu options available in the middle pane.



9.9.2 Using a Maintained Hierarchy

Once a hierarchy has been added to a dimension it can be maintained externally by the hierarchy maintenance utility if the 'Maintained' attribute is set. The process for maintaining this hierarchy externally and using it as a source system to the data warehouse is as follows.

- 1 Grant the user that is to undertake the maintenance select access to the following tables: ws_dim_tab, ws_dim_col, ws_hie_header, ws_hie_link, ws_meta_tables.
- 2 Grant the user that is to undertake the maintenance select access to the dimension that has the hierarchy.
- 3 Using the hierarchy maintenance utility (see online documentation) log on to the maintenance area and create and populate/edit the maintenance table.
- 4 In QAD Data Warehouse Designer Create a connection to the hierarchy maintenance schema / database.
- 5 Browse the hierarchy connection.
- 6 Using drag and drop create a load table from the hierarchy maintenance table.
- 7 Edit the columns in the dimension that are to be sourced from the maintenance table and change their source table and column to that of the load table and columns created in step 6.
- 8 Generate a new update procedure for the Dimension and either do a lookup of the maintenance table or a join based on the business key.
- 9 Run the update procedure.

9.10 Snowflake

Snowflake schemas normalize dimensions to eliminate redundancy. That is, the dimension data has been grouped into multiple tables instead of one large table. For example, a product dimension table in a star schema might be normalized into a products table, a product_category table, and a product_manufacturer table in a snowflake schema. While this saves space, it increases the number of dimension tables and requires more foreign key joins. The result is more complex queries and reduced query performance.

9.10.1 Creating a Snowflake

A snowflake dimensional structure is supported by QAD Data Warehouse Designer. A snowflake can be created for normalized or partially normalized dimension tables. It is created by including the surrogate key of the parent dimension in the child dimension. In the example below, the dim_state table represents the parent dimension. The column dim_state_key is added to the child dimension dim_customer. Any fact tables that include the dim_customer dimension will inherently have a link to the dim_state dimension.

The process for creating a snowflake is as follows:

- 1** Build both dimensions (see previous sections).
- 2** Expand dimensions in the left hand pane.
- 3** Click on the child dimension table in the left hand pane to display its columns in the centre pane.
- 4** Browse the data warehouse connection in the right hand pane.
- 5** Expand the parent dimension table in the right hand pane.
- 6** Drag the surrogate key of the parent dimension table from the right hand pane to the child dimension's column list in the middle pane.
- 7** Create/Recreate the child dimension.
- 8** Rebuild the child dimension's update procedure.

- 9 A dialog will now appear asking for the business key column(s) in the child dimension that match the business key for the parent dimension:

Dimension Business Key definition

Business Keys for snowflake dimension dim_state

Select the business key from the dimension table that matches each business key for this snowflake dimension.

Move them over to the business key list. They must be in the correct order to match the snowflake dimension business keys.

Snowflake business keys

state_code

Dimension business key list

state

=

Dimension table column

address
city
code
dim_customer_key
dss_current_flag
dss_end_date
dss_start_date
dss_version
name
state

<-- Add

Remove -->

dim_state

☐ No warning if dimension joins do not succeed

☐ Automatically add a new entry if no valid dimension record.

☐ Write detail log message when no dimension record match.

Enter a text string and press Add Text to add a static business key

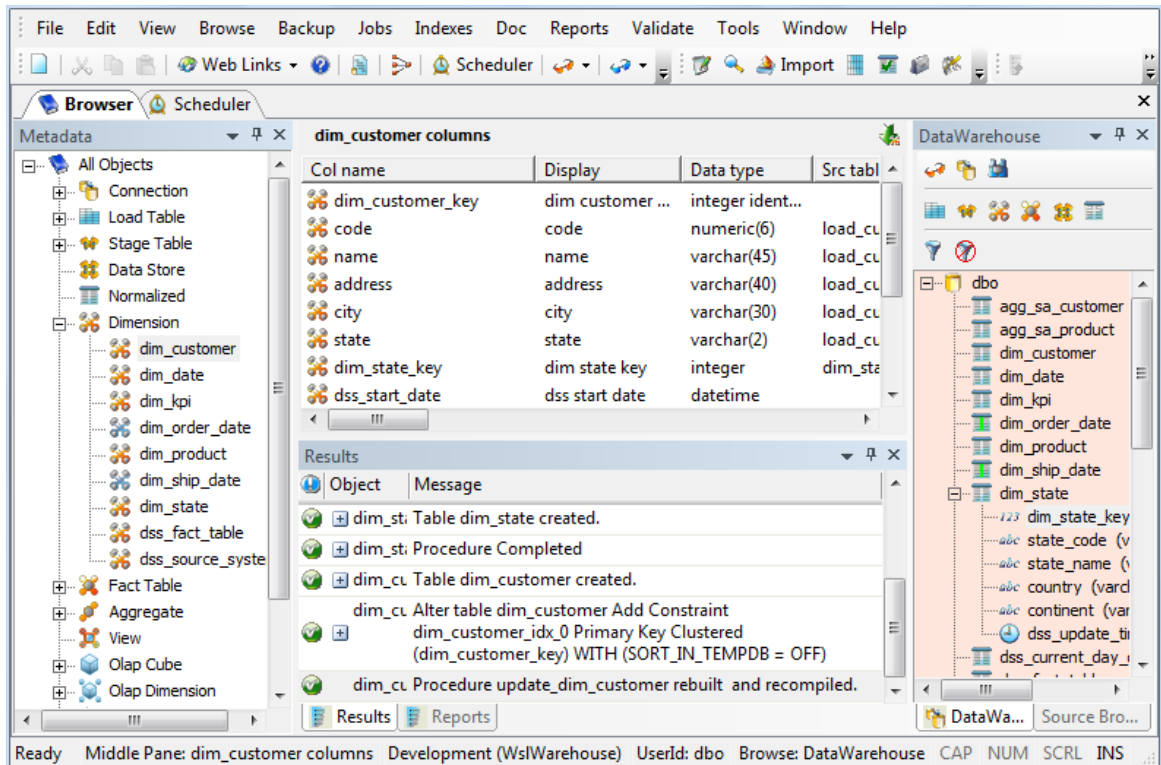
Add Text

OK

Cancel

- 10 Add the business key column(s) and click OK.

The QAD Data Warehouse Designer screen should look like this:



9.11 Dimension Language Mapping

The Dimension Properties screen has a tab called 'Language Mapping'.

Select the language from the drop down list and then enter the translations for the **Business Display Name** and the **Description** in the chosen language. The translations for these fields can then be pushed through into OLAP cubes.

The screenshot shows a software window titled "dim_customer table definition" with a close button in the top right corner. Below the title bar is a tabbed interface with the following tabs: Properties, Storage, Language Mapping (which is the active tab), Purpose, Concept, Grain, Examples, Usage, and Notes. The main content area of the "Language Mapping" tab is divided into two sections. The first section, labeled "Language :", contains a dropdown menu currently set to "French". Below this is a sub-section labeled "Language Settings". Under "Language Settings", there are two groups of input fields. The first group is for the "Business Display Name:", showing the current value "dim_customer" and a field for the "Translated Value of Business Display Name". The second group is for the "Description:", showing the current value "Customer Dimension" and a field for the "Translated Value of Dimension Description". Each of these description fields has small up and down arrow buttons on its right side.

CHAPTER 10

10. Staging

Stage tables are used to transform the data to a star schema or third normal form model. A stage table can be a fact or normalized table that only contains change data or a work table. In star schema data warehouses, the stage table brings all the dimensional joins together in preparation for publishing into the fact table.

A stage table is built from the Data Warehouse connection. Unless you are retrofitting an existing system, stage tables are typically built from one or more load or stage tables. They can utilize the surrogate keys from a number of dimension tables.

The normal steps for creating a stage table are defined below and are covered in this chapter. The steps are:

- Identify the source transactional data that will ultimately constitute the fact or normalized table. If the data is sourced from multiple tables ascertain if a join between the source tables is possible, or if a series of passes will be required to populate the stage table. If the latter option is chosen then bespoke code is needed.
- Using the 'drag and drop' functionality drag the table with the lowest granular data into a stage target. See ***Building the Stage Table*** (see "10.1 Building the Stage Table" on page 204).
- Add columns from other source tables. See ***Building the Stage Table*** (see "10.1 Building the Stage Table" on page 204).
- Add any relevant dimension table or normalized table keys. See ***Building the Stage Table*** (see "10.1 Building the Stage Table" on page 204).
- Create the stage table in the database. See ***Building the Stage Table*** (see "10.1 Building the Stage Table" on page 204).
- Build the update procedure. See ***Generating the Staging Update Procedure*** (see "10.2 Generating the Staging Update Procedure" on page 207).
- Test the update procedure and analyze the results. See ***Tuning the Staging Update Process*** (see "10.3 Tuning the Staging Update Process" on page 220).
- Modify the update procedure as required. See ***Tuning the Staging Update Process*** (see "10.3 Tuning the Staging Update Process" on page 220).

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10.1 Building the Stage Table

Building the stage table is potentially the most challenging part of the overall task of building a data warehouse analysis area. Most of the effort required is in the design phase, in terms of knowing what data needs to come into the fact table that will ultimately be built. This section assumes that the decision as to what to include has been made.

Multiple data sources

A stage table typically contains the change data for a detail fact table. As such it normally maps to a specific function within the business and in many cases relates back to one main OLTP table. In many cases however it may be necessary to combine information from a number of tables. One of the decisions required is whether or not it is practical or even possible to join the data from the different source tables.

In the tutorial the `stage_sales_detail` stage table is built by combining information from the `order_header` table and the `order_line` table. These two tables are connected via the `order_number` field which is common to both tables. The tutorial shows the building of a stage table and the joining of these two tables.

We could however also include two additional source tables being `invoice_header` and `invoice_line` which contain specific information relating to what was on the invoice. We may want our fact table to contain information from these tables as well. Although these two tables may contain the `order_number` and hence potentially allow a join with the order tables we may choose not to perform such a join for performance reasons. In such a situation we have three obvious choices in terms of how we ultimately update our fact table. These are:

- 1 Join all four tables in one large join in our staging table.
- 2 Update the staging table in two passes. One pass updating the order information and one pass updating the invoice information.
- 3 Generate two stage tables, one for order and one for invoice. Use these two staging tables to update the one `sales_detail` fact table.

Although all three options are viable and a normal situation in the QAD Data Warehouse Designer environment, options (2) and (3) will require specific coding and modifications to the generated procedures from the outset. Given the example provided option (2) would be the normal approach, although in some cases option (3) would be valid.

Drag and Drop

The best approach in creating a stage table is to choose the source table that contains the most fields that we will be using and drag this table into the stage target. Then drag specific columns from the other source tables until we have all the source data that is required.

The process for defining the metadata is as follows:

- 1 Double click on the 'Stage Table' object group in the left hand pane. This will result in all existing stage tables being displayed in the middle pane. This also sets the middle pane as a **stage drop target**.
- 2 Browse the Data warehouse connection to display our load tables in the right hand pane. This is achieved via the **Browse/Source Tables** menu option and then choosing the **Data warehouse connection**.
- 3 Drag the **primary load table** (i.e. the one with the most columns, or the lowest data granularity) from the right hand pane and drop it in the middle pane. A dialog will appear to create the new staging object. Leave the object type as 'Stage Table' and change the name to reflect what is being done. For example in the tutorial the `load_order_line` table is dropped and a stage table called `stage_sales_detail` defined.

- 4 Once a valid name is entered the properties for the new stage table are displayed. Normally these would be left unchanged except perhaps for storage settings.
- 5 Once the properties dialog is closed the columns for the new stage table are displayed in the middle pane. This middle pane is now considered a *drop target for this specific stage table*. Any additional columns or tables dropped into the middle pane are considered additions to this stage table definition. Any columns that are not required can be deleted.
- 6 Drag and drop **additional columns** from other source tables if appropriate. In the tutorial we would now drag the customer_code, order_date and ship_date from the load_order_header table.
- 7 Drag in the **dimension artificial key** from each dimension that is to be joined to the stage/fact table. We can only join a dimension if a business key exists amongst the stage table columns or it is possible to derive that business key in some way from the columns or other dimensions.

Note: If a column is being used to join information from two or more source tables, that column must only appear once in the stage table. It is irrelevant which table is used to create the column in the new stage table.

Once completed our list of columns for the stage table should look something like the list below. Note the source table for each column.

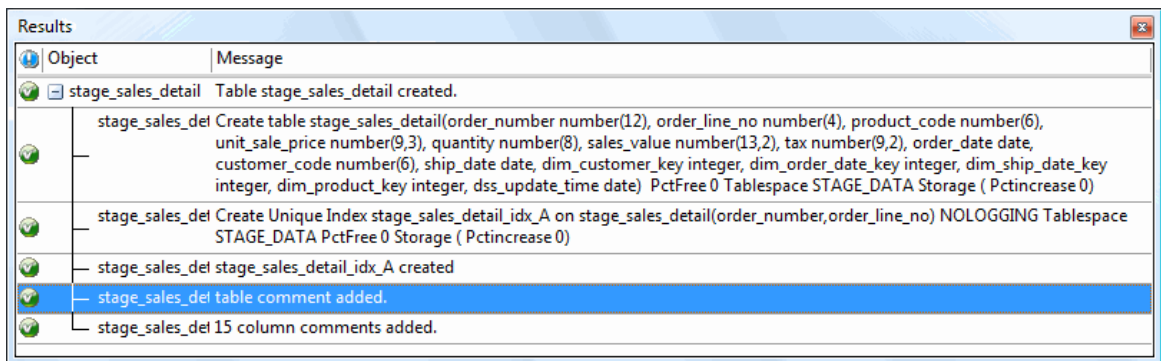
stage_sales_detail columns				
Col name	Display	Data type	Src table	Src column
🔗 order_number	order number	number(12)	load_order_line	order_number
🔗 order_line_no	order line no	number(4)	load_order_line	order_line_no
🔗 product_code	product code	number(6)	load_order_line	product_code
🔗 unit_sale_price	unit sale price	number(9,3)	load_order_line	unit_sale_price
🔗 quantity	quantity	number(8)	load_order_line	quantity
🔗 sales_value	sales value	number(13,2)	load_order_line	sales_value
🔗 tax	tax	number(9,2)	load_order_line	tax
🔗 order_date	order date	date	load_order_header	order_date
🔗 customer_code	customer code	number(6)	load_order_header	customer_code
🔗 ship_date	ship date	date	load_order_header	ship_date
🔗 dim_customer_key	dim customer key	integer	dim_customer	dim_customer_key
🔗 dim_order_date_key	dim time key	integer	dim_order_date	dim_order_date_key
🔗 dim_ship_date_key	dim time key	integer	dim_ship_date	dim_ship_date_key
🔗 dim_product_key	dim product key	integer	dim_product	dim_product_key
🔗 dss_update_time	dss update time	date		dss_update_time

The source table (src table) reflects where each column was dragged from. In the example above the bulk of the columns came from the load_order_line table, and the customer_code, order_date and ship_date came from the load_order_header columns. These two load tables will be joined via the order_number column. This order_number column appears in both load tables but is sourced, in this example, from the load_order_line table. Each dimension artificial key was dragged from its appropriate table. The final column 'dss_update_time' was generated by QAD Data Warehouse Designer and has no source.

Create the table

Once the stage table has been defined in the metadata we need to physically create the table in the database. This is achieved by using the right mouse button when positioned over the stage table name and selecting **Create (ReCreate)** from the popup menu.

A results box will appear to show the results of the creation. The following Oracle example shows a successful creation.



The contents of this dialog are a message to the effect that the table was created followed by a copy of the actual database create statement, and if defined the results of any index creates. For the initial create no indexes will be defined.

If the table was not created then ascertain and fix the problem. A common problem is 'Duplicate column' where a column has been accidentally added twice. The best way of finding such a column is to double click on the list heading 'Col name'. This will sort the column names into alphabetic order. Another double click on the heading will sort the columns back into their create order. Column ordering can be changed by altering the column order value against a column's properties.



TIP: Double clicking on the heading of a column in a list sorts the list into alphabetical order based on the column chosen.

The next section covers **Generating the Staging Update Procedure** (see "10.2 Generating the Staging Update Procedure" on page 207).

10.2 Generating the Staging Update Procedure

Once a stage table has been defined in the metadata and created in the database an update procedure can be generated to handle the joining of any tables and the lookup of the dimension table artificial keys.

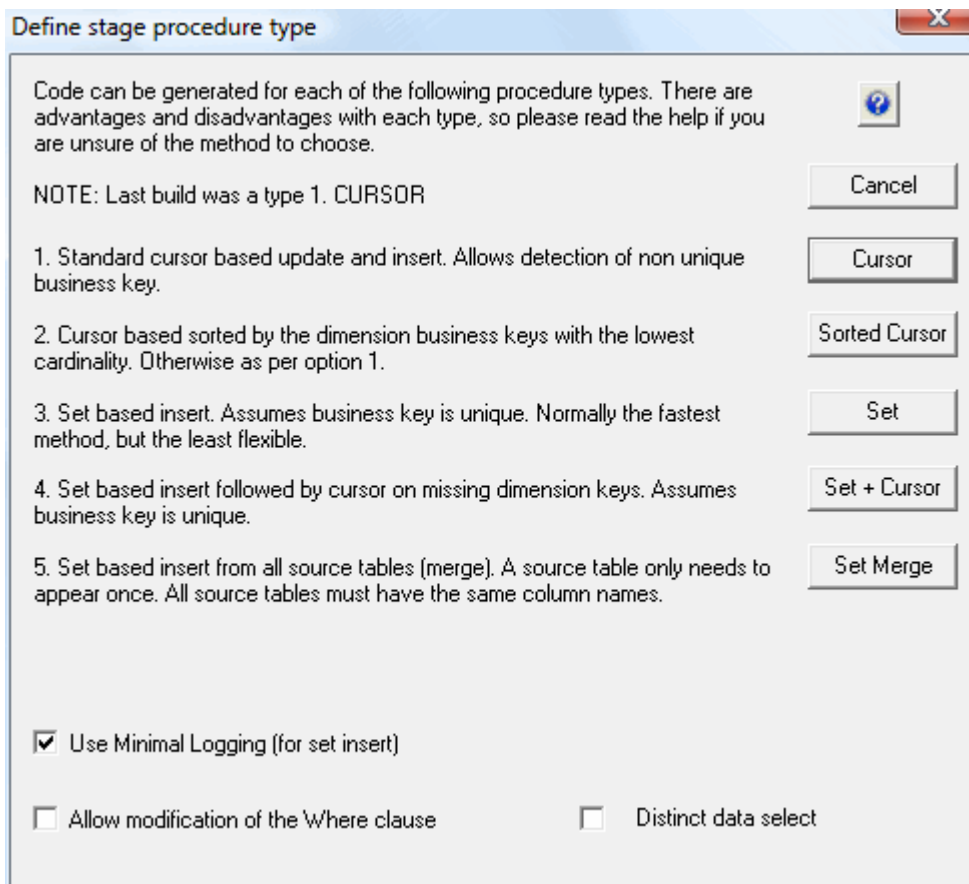
Generating a Procedure

To generate a procedure use the right mouse menu when positioned on the stage table name to edit the properties for the stage table. From the 'Update Procedure' drop down list select (Build Procedure...). Click OK to update the properties and start the process of generating the new procedure.

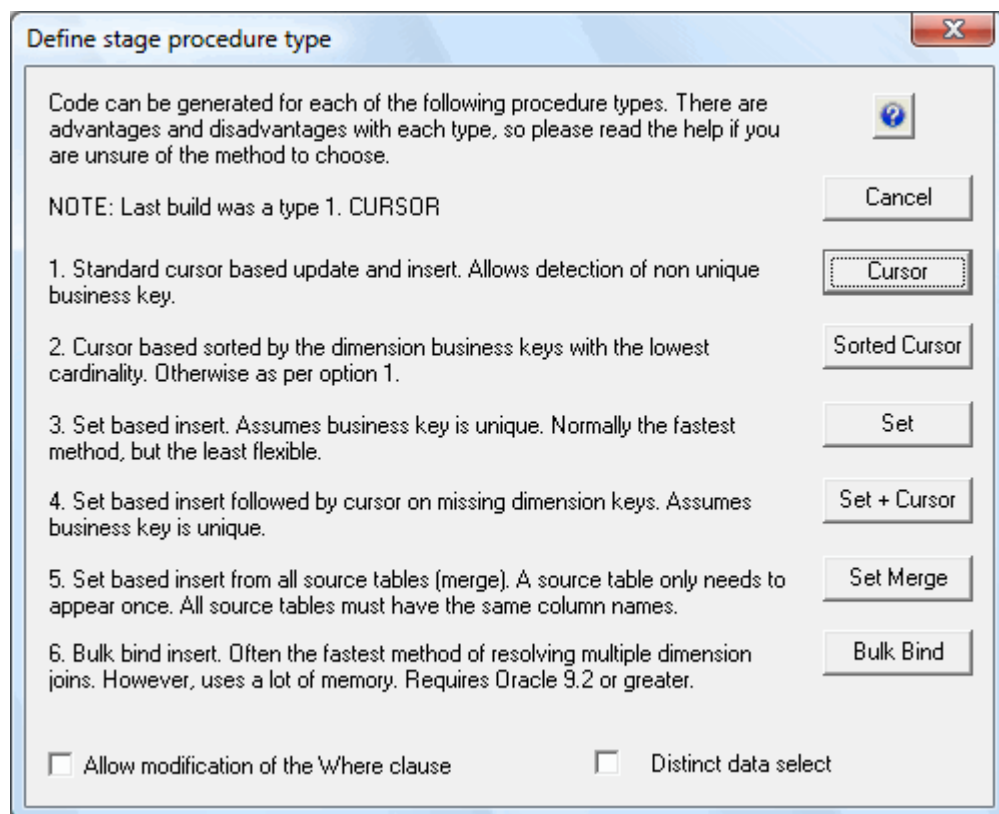
A series of questions will be asked during the procedure generation to join the tables and link in the dimensions.

Procedure type

The first dialog box asks for the type of procedure that is to be generated. An example of this follows: DB2:



Oracle:



SQL Server:

Define stage procedure type

Code can be generated for each of the following procedure types. There are advantages and disadvantages with each type, so please read the help if you are unsure of the method to choose.

NOTE: Last build was a type 1. CURSOR

1. Standard cursor based update and insert. Allows detection of non unique business key.

2. Cursor based sorted by the dimension business keys with the lowest cardinality. Otherwise as per option 1.

3. Set based insert. Assumes business key is unique. Normally the fastest method, but the least flexible.

4. Set based insert followed by cursor on missing dimension keys. Assumes business key is unique.

5. Set based insert from all source tables (merge). A source table only needs to appear once. All source tables must have the same column names.

Insert hint: (e.g. TABLOCK)

Update hint: (e.g. TABLOCK)

☐ Allow modification of the Where clause ☐ Distinct data select

Buttons: Cancel, Cursor, Sorted Cursor, Set, Set + Cursor, Set Merge

A number of different types of procedure generation are available. Each type is discussed below. There is a check box at the bottom of the dialog box. This check box will only be present if advanced procedure building features are enabled. This check box allows the editing of the 'Where' clause when no table joining is being performed, and hence the where clause would not be exposed.

Cursor based procedure

This option creates a procedure that loops through each source transaction performing specific tasks on each transaction before writing the transaction to the stage table. The tasks performed include the lookup of each dimension key, and any bespoke value assignments or adjustments.

Sorted cursor procedure

This is a variant on the regular cursor procedure. In this case dimension key lookups only occur when there is a change in the business key for a given dimension. This can improve the performance of the procedure particularly when one or more of the dimensions has a low cardinality. Where slowly changing dimensions are used this advantage is lessened as the relative date of the dimension records also comes into play.

Set based procedure

A set based procedure performs one SQL statement to join all the dimensions and source tables together and then insert this data into the stage table. This is normally the fastest method of building the stage table. It is also the least flexible method and is easily prone to incorrect syntax. Care and experience must be used with this option to ensure that all source transactions are processed and that they are processed correctly. This option is only recommended for the experienced practitioner where performance is the overriding requirement. Particular care must be taken with regards to NULL values in the business keys that are used to make the table joins. The generated code deliberately does not handle such null values.

Set + Cursor Procedure

This option is normally used where a number of dimension keys will fail to join and we wish to automatically add new dimension records. The first phase of the generated code will perform a set based join and insert of the data. The dimensions that failed to join will be assigned the zero key value. The second phase of the procedure will use a cursor to cycle through all the stage records that have a zero key dimension join. By setting the appropriate flags in the dimension joins when building this procedure we can request that any missing dimension records be automatically added.

Set Merge Procedure

This option is to allow the merging of two or more identical tables. The tables to be merged must have exactly the same number of columns and column names. If necessary additional blank columns could be added to one or other of the tables to make them identical. To use this procedure you must simply have the tables to be merged mentioned at least once in the 'Source Table' field of a columns properties.

Bulk Bind Procedure

The bulk bind procedure is only available for Oracle. It uses memory arrays to join all the information before writing it to the table. It can be the fastest method of performing a stage table update when a lot of dimension joins are being used.

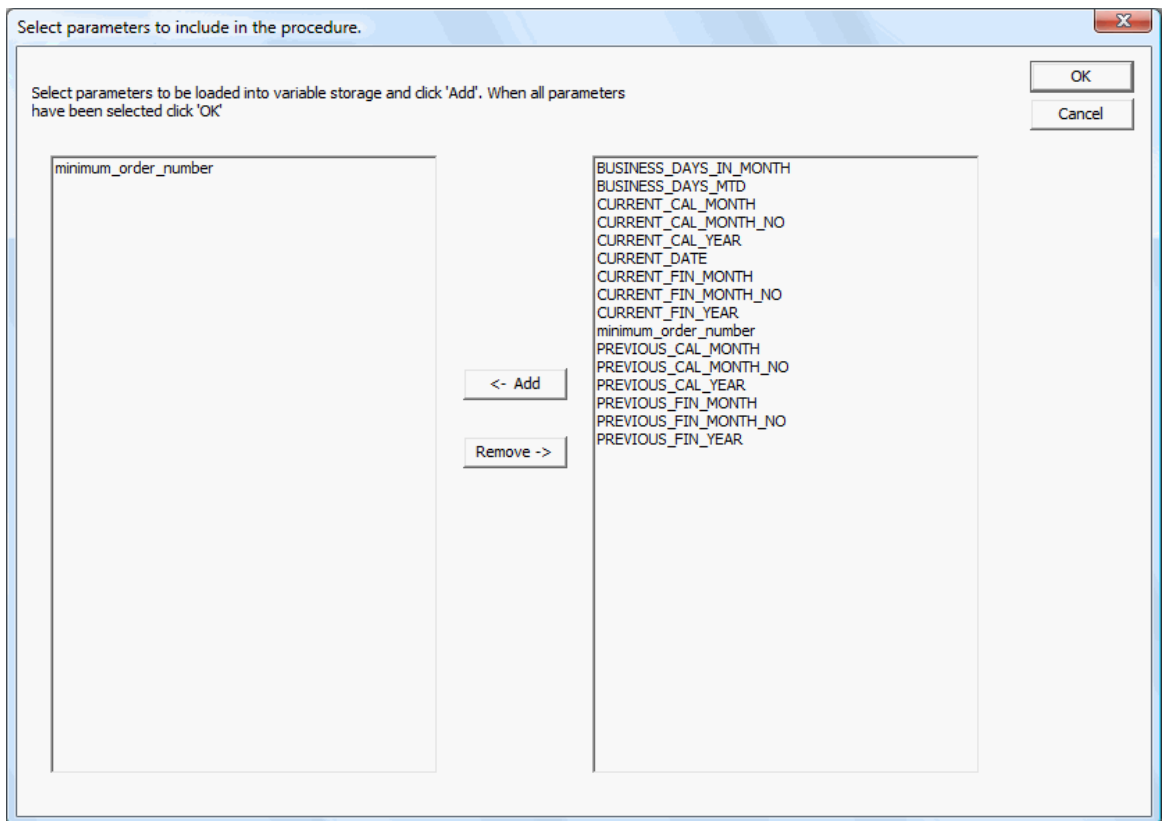
Note: The bulk bind procedure is only available for Oracle.

There are also some options available in this dialog:

- **Allow modification of the Where clause.** The where clause dialog is displayed automatically if the table has more than one source table, but not for a single source table stage table unless this option is chosen.
- **Distinct data select.** Choosing this option adds the DISTINCT key word to the SELECT statement in the staging procedure.
- **Use Minimal Logging (for set insert).** DB2 only. The staging procedure uses the LOAD FROM CURSOR option in DB2 to minimize database logging.
- **Insert hint.** SQL Server only. Enter a database hint to be used in the INSERT statement.
- **Update hint.** SQL Server only. Enter a database hint to be used in the UPDATE statement.

Parameters variables

If QAD Data Warehouse Designer parameters exist in the metadata, the following dialog is displayed. Any parameters selected in this dialog (by moving them to the left hand side), are included in the generated update procedure as variables. The procedure will include code to retrieve the value of the parameter at run time and store it in the declared variable.



The variables can also be used in column transformations and in the from / where clause for the update procedure. Some databases have a 30 character limit for variable names. QAD Data Warehouse Designer ensures the variables added for any parameters are less than 30 characters long by creating variable names in the form v_ followed by the first 28 characters of the parameter name.

For example, a parameter called MINIMUM_ORDER_NUMBER_SINCE_LAST_SOURCE_LOAD will be available as the variable v_MINIMUM_ORDER_NUMBER_SINCE_L.

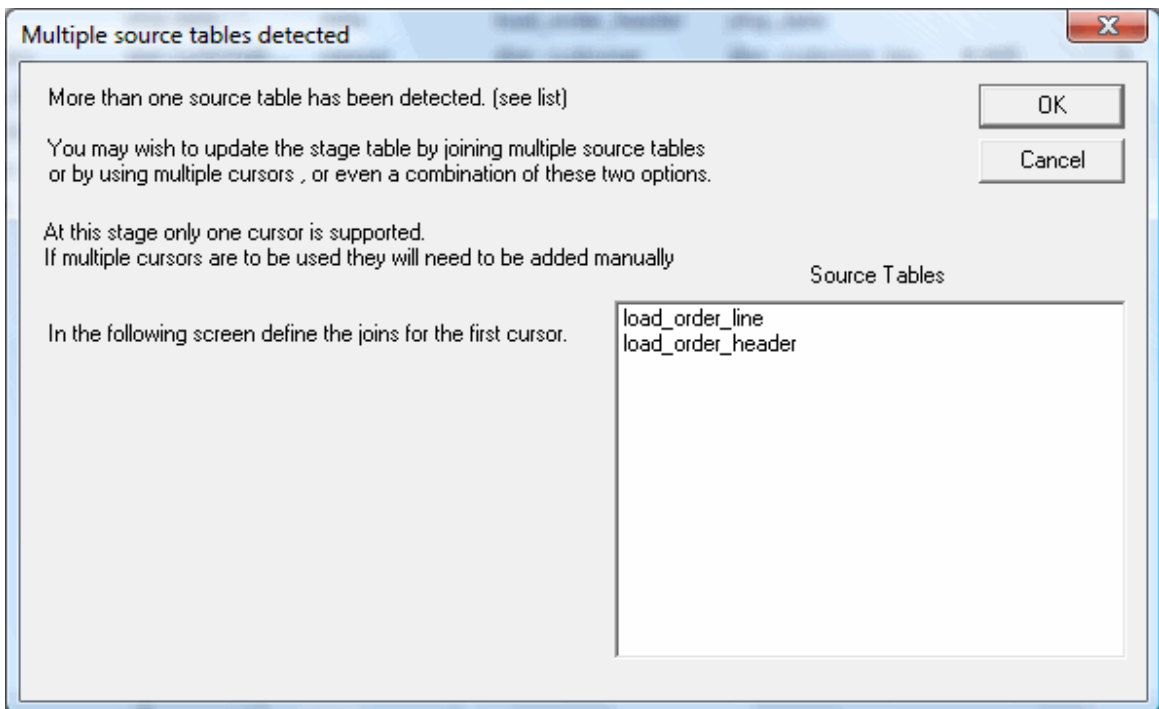


TIP: QAD Data Warehouse Designer parameters should be unique within the first 28 characters to avoid conflicting variables names.

See **Parameters** (see "5.2 Parameters" on page 64) for more information on QAD Data Warehouse Designer Parameters

Multiple source tables

If multiple tables are being joined and we did not choose a 'Set' based procedure then an initial dialog will display (as follows) advising that multiple source tables have been detected and that QAD Data Warehouse Designer will only generate one cursor (one join) to handle these tables. If multiple cursors or passes of the data are required, as in scenario (2) in the previous section then it is best to proceed with one set of joins and manually do the second set after the generation of the procedure has completed.



Source table joins

If multiple source tables are detected then a dialog will appear to allow the definition of the joins between the various tables.

Note: Joins to dimension tables are not defined in this step. These joins only relate to the source tables.

The joining of the tables will provide either the data for a cursor loop, or part of the construct of the set based update in the update procedure. If a cursor based procedure is being generated then the default name for the cursor will be 'Load' unless altered. If a set based procedure then the cursor name is ignored.

Only two tables may be joined at a time. To join two tables select the two tables in the left hand box and click either the outer join or simple join button. Column lists for both tables will appear at the bottom of the dialog box. Select the column (or one of the columns) that allows the two tables to be joined. If an outer join is being used, the column for the master table must be chosen first. If there are multiple columns joining two tables then this action must be repeated for each column. Continue to perform all joins between all tables. The Oracle example below only has two tables with one join column so is a relatively simple case. For SQL Server an additional option is available to allow either an ANSI standard join or a 'Where clause' based join. In DB2, only a from clause join can be generated. The ANSI standard join should be chosen in most situations. See the example screen in the following section.

Provide Cursor mapping

Cursor Name (if applicable):

Define the joins (or edit the where clause).
To define a Join select two tables and press the 'Join' button. Then select the join columns from the dropdown lists presented.

Source Tables

- load_order_line
- load_order_header

'Where' Clause

```
WHERE load_order_line.order_number = load_order_header.order_number (+)
AND load_order_line.order_number >= v_minimum_order_number
```

Outer Join Simple Join See Help for further details

OK Cancel

Simple Join

A simple join joins the two tables, and only returns rows where data is matched in both tables. So for example if table A has 100 rows and table B has a subset of 24 rows. If all the rows in table B can be joined to table A then 24 rows will be returned. The other 76 rows from table A will not be returned.

Outer Join

An outer join joins the two tables, and returns all rows in the master table regardless of whether or not they are found in the second table. So if the example above was executed with table A as the master table then 100 rows would be returned. 76 of those rows would have null values for the table B columns. When QAD Data Warehouse Designer builds up the where clause for Oracle it places the outer join indicator (+) at the end of each line. As this indicator goes on the subordinate table, it must be that table whose column is selected last. In the example screen above the table 'load_order_line' has had its column chosen and the column for the table 'load_order_header' is currently being chosen. This will result in the statement as shown in the 'Where clause edit window'. The results of this select are that a row will be added containing order_line information regardless of whether or not an order_header exists.

As the join columns are selected the 'Where' statement is built up in the large edit window on the right hand side. Once all joins have been made the contents of this window can be changed if the join statement is not correct. For example the Oracle outer join indicator (+) could be removed if required.

Once satisfied with the 'Where' statement click the OK button to proceed to the next step. As indicated in its description this statement is the where clause that will be applied to the select statement of the cursor to allow the joining of the various source tables. It can of course be edited in the procedure that is generated if not correct.

For SQL Server data warehouses you have the choice between 'Where' statement joins and ANSI standard joins. For DB2 data warehouses, only ANSI standard joins are available.

Note: 'Where' joins will not work correctly in SQL Server if more than two tables are used in an outer join.

The example below shows the result of an ANSI standard join which takes place in the 'From' statement.

Provide Cursor mapping

Cursor Name (if applicable):

Define the joins (or edit the where clause).
To define a Join select two tables and press the 'Join' button. Then select the join columns from the dropdown lists presented.

Source Tables:

'From and Where' clause:

```
FROM load_order_line  
LEFT OUTER JOIN load_order_header  
ON load_order_line.order_number = load_order_header.order_number
```

ANSI join code generated ☒

 See Help for further details

Select the columns that join the two tables. Select the column from the master table first.

Dimension Joins

For each dimension key a dialog will now appear asking for the business key from the stage table that matches the business key for the dimension.

In the example below we are asked for the stage table business key for the customer dimension. The dimension name is shown both on the first prompt line and at the lower left hand side of the dialog box. The customer dimension has a unique business key named 'code'. We must provide the corresponding business key from the staging table. In the case of our example this is the customer_code column.

Dimension Business Key definition

Business Keys for dim_customer

Select the business key from the staging table that matches each business key for this dimension.

Move them over to the business key list. They must be in the correct order to match the dimension business keys.

Dimension business keys: code

Stage business key list: customer_code

Stage table column list:

- customer_code
- order_date
- order_line_no
- order_number
- product_code
- quantity
- sales_value
- ship_date
- tax
- unit_sale_price

dim_customer

☐ No warning if dimension joins do not succeed

☐ Automatically add a new entry if no valid dimension record.

☐ Write detail log message when no dimension record match.

Enter a text string and press Add Text to add a static business key

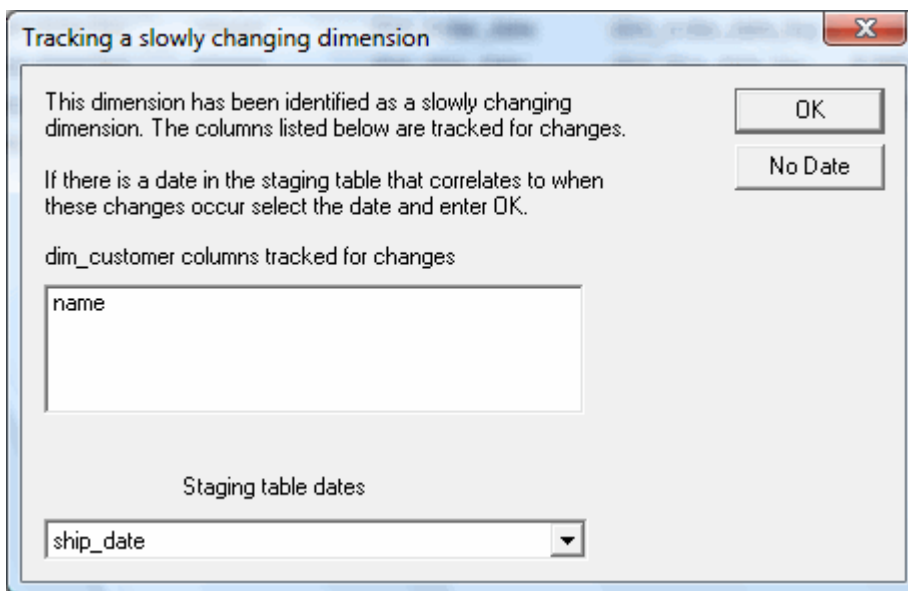
Add Text

Note: the 'Add Text' button and the associated message and edit box are only shown if the user possesses a full license, thus enabling the advanced procedure build options. When the 'Add Text' button is clicked any data in the edit box to the right of the button is placed in the stage table column list. In this way a number or string can be assigned as part or all of a dimension join.

Click the OK button after the correct business key has been entered. If the business key does not exist and will be derived from another dimension or from some form of lookup then enter any column and edit the procedure once produced.

Slowly changing dimension information

If the dimension being joined was defined as a slowly changing dimension, then an additional dialog will appear asking for a date in the stage table that allows the coordination of the dimension record changes. Select the date and click OK or click 'No Date' if a date does not apply.



The screenshot shows a dialog box titled "Tracking a slowly changing dimension". It contains the following elements:

- Text: "This dimension has been identified as a slowly changing dimension. The columns listed below are tracked for changes."
- Buttons: "OK" and "No Date" on the right side.
- Text: "If there is a date in the staging table that correlates to when these changes occur select the date and enter OK."
- Text: "dim_customer columns tracked for changes"
- Text box: "name" (part of a list of columns tracked for changes).
- Text: "Staging table dates"
- Text box: "ship_date" (selected date from the staging table).

For Example:

Say we have defined the `product_name` as a slowly changing column. This implies we want to create a new dimensional record whenever a product name is changed even though the SKU for the product remains the same.

Customer A orders 100 units of product SKU 123 on the 1st of the month and is shipped the order 3 days later on the 4th of the month.

The product has a name change on the 5th of the month. We may therefore decide that any of the product shipped before the 5th of the month were shipped under the old name and any product shipped on or after the 5th has the new product name.

If the example order shown above is not processed in the data warehouse until the 7th of the month we need to ensure it acquires the correct version of its product dimension record. We would therefore assign the 'Ship date' as the date that corresponds to the correct dimension record.

The product dimension record would therefore be assigned as the record in force on the 4th day of the month or more specifically the old product name.

Staging table business key

Once all the dimensional joins have been defined we will be asked to define the unique business key for the staging table. This is the column or columns that allow us to uniquely identify each record in the staging table. In the example below and in our tutorial the unique business key is a combination of the `order_number` and the `order_line_no`.

Define staging business key(s)

Select the business keys that uniquely identify each record in the Staging table.

Move them over to the business key list

Business key list

- order_number
- order_line_no

<-- Add Remove -->

☒ Include update statement

Column list

- customer_code
- order_date
- order_line_no
- order_number
- product_code
- quantity
- sales_value
- ship_date
- tax
- unit_sale_price

OK Cancel

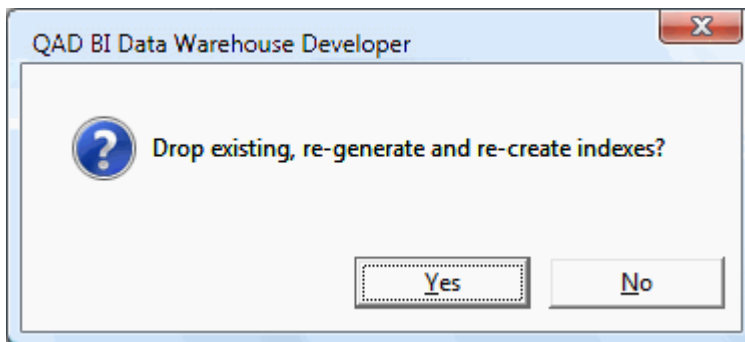
None of the columns chosen as the business key should ever contain a NULL value. See the note at the start of the Dimension chapter.

Note: The order of the columns in the business key list is set to the order that the columns appear in the table. This is done to optimize performance for any indexes.

The 'Include update statement' check box provides two options in the generated procedure. If checked then an update/insert combination will be included. If clear then only an Insert statement will be included in the procedure. If cleared you must be sure that the business key for the table is unique, otherwise either a duplicate key error will occur or records will be lost depending on the type of procedure.

Index re-creation

Finally, we're asked if we want to drop and re-create any indexes defined on the table:



Click Yes to drop and re-create, No to leave existing indexes in place.

Building and Compiling the Procedure

Once the above questions are completed the procedure is built and compiled automatically. If the compile fails an error will be displayed along with the first few lines of error messages. Compilation failures typically occur when the physical creation of the table was not done. If the compile fails for some other reason the best approach is to use the procedure editor to edit and compile the procedure. The procedure editor will highlight all the errors within the context of the procedure.

Once the procedure has been successfully compiled it can either be executed interactively or passed to the scheduler.

10.3 Tuning the Staging Update Process

This section is for **Cursor** based procedures only. It is not relevant for Set based or other types.

When generating the cursor based procedures to update the staging table QAD Data Warehouse Designer includes Update/Insert logic. This logic first attempts to update an existing staging record and then inserts a new record if the record does not exist. This build option should be altered once an understanding of the data you are dealing with is acquired. For the initial prototype and testing phases of a data warehouse analysis area we need to find out if our business keys for the fact table are genuinely unique. The update/insert logic in the staging procedure will only perform an 'Update' if our business key is not unique. In such a situation we need to decide if this is a failure in the business key, or some form of additive record situation we need to handle and code accordingly.

Removing the Update Component

Once we have resolved any data issues we would normally remove the update component to speed up the processing of the stage data. There are two ways of doing this. Firstly we can clear the 'Include update statement' check box when defining the table business key. This will result in a procedure with only an insert statement. The other option is to do it manually as follows:

There are normally three steps to removing the update component. These being:

- 1** The update makes use of an index that can also be deleted in most situations.
- 2** The actual 'Update' statement can be removed from the code such that the insert is always executed.
- 3** The procedure also includes an analyze of the table after 1000 rows have been inserted. This code is present to ensure that the index is used in the update. We can now remove this code. It would normally look like the following (Oracle version):

```
--=====
-- If 1000 or more rows inserted then perform an analyze
--=====

IF v_insert_count >= 1000 And v_analyze_flag = 0 THEN
    v_analyze_flag := 1;
    v_Sql := 'analyze table stage estimate statistics sample 5 percent for all indexed columns';
    execute immediate v_Sql;
END IF;
```

10.4 Stage Table Column Properties

Each stage table column has a set of associated properties. The definition of each property is defined below:

If the **Column name** or **Data type** is changed for a column then the metadata will differ from the table as recorded in the database. Use the **Tools/Validate table create status** menu option to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the **Tools/Validate table create status** to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name.

A sample property screen is as follows:

Column definition

Column Properties | Transformation

Table: stage_sales_detail Update

Column name: order_number Update <

Business display name: order number Update >

Data type: numeric(12)

Format: #,##0

Column order: 50

Nulls: ☒

Numeric: ☒ Dimension Join: ☐ Manual Dimension Join: ☐

Additive: ☒ Key Type (O,A,B,C.): A

Attribute: ☐ Primary Business Key: ☒

Note: When the Dimension Join flag is set then the contents of Source column denotes the foreign key. Business definition denotes the join.

Source table: load_order_line

Source column: order_number

Business Definition:
Source strategy:
(max 2048 chars.)
Every order has a unique generated order number. Link to the order_header table.

OK Cancel Apply

The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. Although it would not be normal practise to provide end user access to stage tables, the contents of this field are passed through to the fact table during the drag and drop operation, so this field can be commented for later use in the fact table if desired. This field does not affect the physical table definition.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical Oracle data types are number, char(), varchar2() and date. SQL Server databases often have integer, numeric, varchar(), and datetime data types. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition. This field would not normally be populated.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the 'Respace order number' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This checkbox when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column.

Numeric

This checkbox indicates that the column in question is numeric when set. This is normally only relevant for fact tables and would not normally be used for stage tables.

Additive

This checkbox indicates that the column in question is additive when set. This is normally only relevant for fact tables and would not normally be used for stage tables.

Attribute

This checkbox indicates that the column in question is an attribute when set. This is normally only relevant for fact tables and would not normally be used for stage tables.

Source table

Indicates the table from which the column was sourced. This source table is normally a load table, or a dimension table within the data warehouse. If the column was sourced from multiple tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Source strategy' field. This field is used when generating a procedure to update the stage table. It is also used in the track back diagrams and in the documentation.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a load table column, which in turn may have been a transformation or the combination of multiple columns. This may also be a dimensional key where a dimension is being joined.

Business definition / Source strategy

Normally this field will contain the strategy for acquiring or populating a column. It is a useful place to record specific problems with the source data.

In the case of dimension keys this field is used to show the join between the stage table and the dimension, once it has been defined as part of the stage table update procedure generation.

Dimension Join

This checkbox is set by QAD Data Warehouse Designer during the building of the update procedure and should not normally be altered. It indicates that the column in question provides a join to a dimension table. The 'Source table' and 'Source column' fields will provide the dimension table's side of the join.

Manual Dimension Join

This checkbox can be set to change the way the dimension table is looked up during the staging table update procedure build. Enabling this option allows you to join to the dimension manually in the Cursor mapping dialog (where the **Where** clause is built). The usual dialog for matching the dimension business key to a column or columns in the staging table is not displayed if this option is enabled.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
----------	---------

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key. For example: By default the <code>dss_source_system_key</code> is added to every dimension table. It is considered part of any lookup on that table and has the key type set to 1. Set when the column is added during drag and drop table generation.
2	Indicates that this column is a dimensional join. Used on fact tables to indicate the dimension keys. Results in bitmap indexes being built for the columns. Set during the update procedure generation for a fact table, based on information from the staging table.
3	Slowly changing column indicator. Used on dimension tables to indicate that the column is being managed as a slowly changing column within the context of a slowly changing dimension. Set when a column is identified during the dimension update procedure generation.
4	Previous value column indicator. Used on dimension tables to indicate that the column is being managed as a previous value column. The source column identifies the parent column. Set during the dimension creation.
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

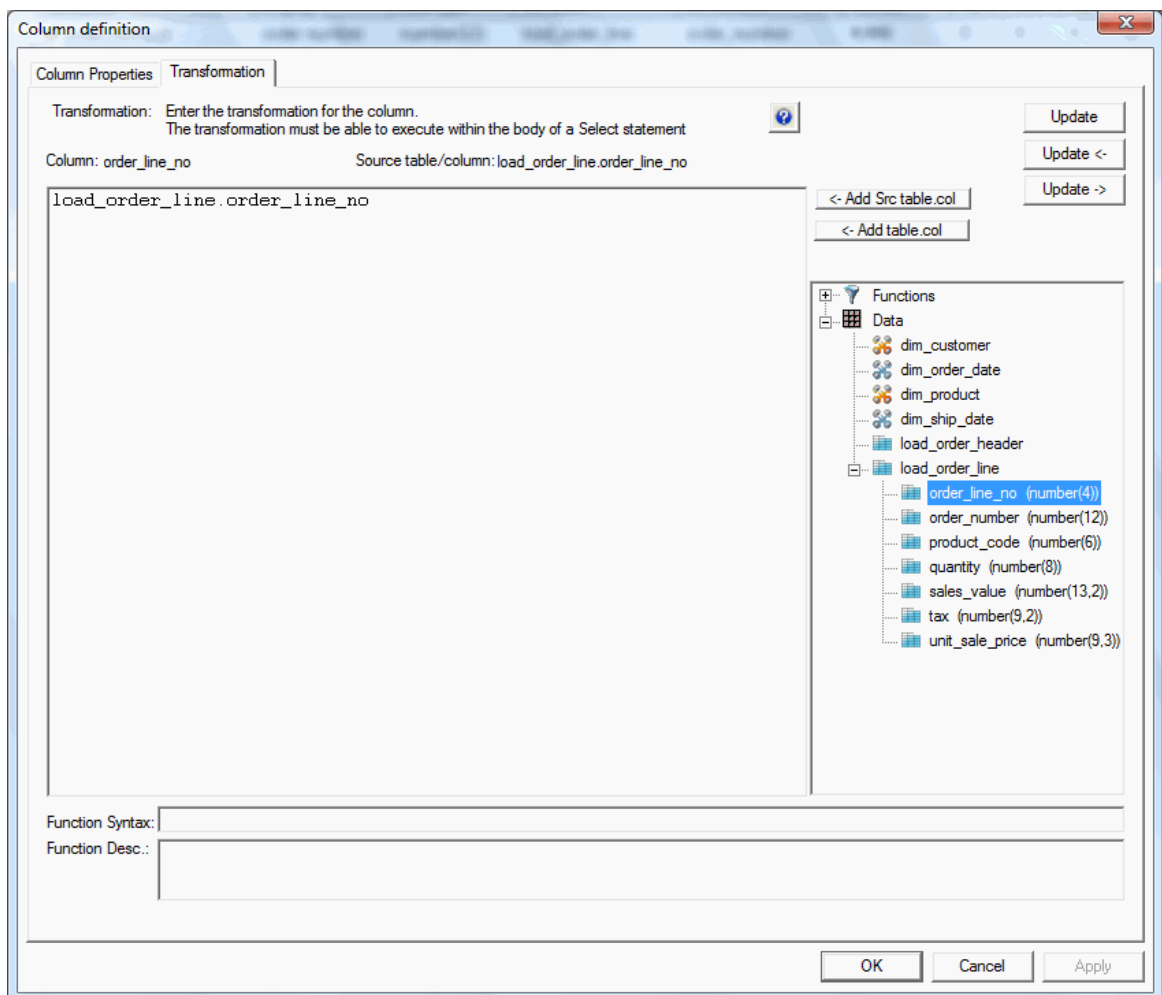
This checkbox has no effect for stage tables and should be left unchecked.

Primary Business Key

This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the stage update procedure generation process. This checkbox should not normally be altered.

Transformation Tab

It is possible to do transformations on stage table columns. It is recommended that transformations are not performed on columns that are dimension keys or the business keys for the table. The transformation screen is as follows:



10.5 Stage Table Column Transformations

Each stage table column can have a transformation associated with it. The transformation will be included in the generated procedure and will be executed as part of the procedure update. The transformation must therefore be a valid SQL construct that can be included in a 'Select' statement. For example we could have a transformation of 'load_order_line.qty * 0.125' to calculate a tax column of 12.5%. Click the 'Transformation' tab to enter a transformation.

Note: transformations are only put into effect when the procedure is re-generated.

See *Transformations* (see "*19. Transformations*" on page 425) for more details.

CHAPTER 11

11. Data Store Objects

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11.1 Data Store Object Overview

A Data Store Object is a data warehouse object used to store any type of data for later processing. In QAD Data Warehouse Designer, Data Store objects have many of the code generating attributes of stage, dimension and fact tables. Data Store objects can be thought of as a source system for the data warehouse. Alternatively, they may be reported off directly by users and reporting tools. Data Store Objects can be considered either reference or transactional in nature.

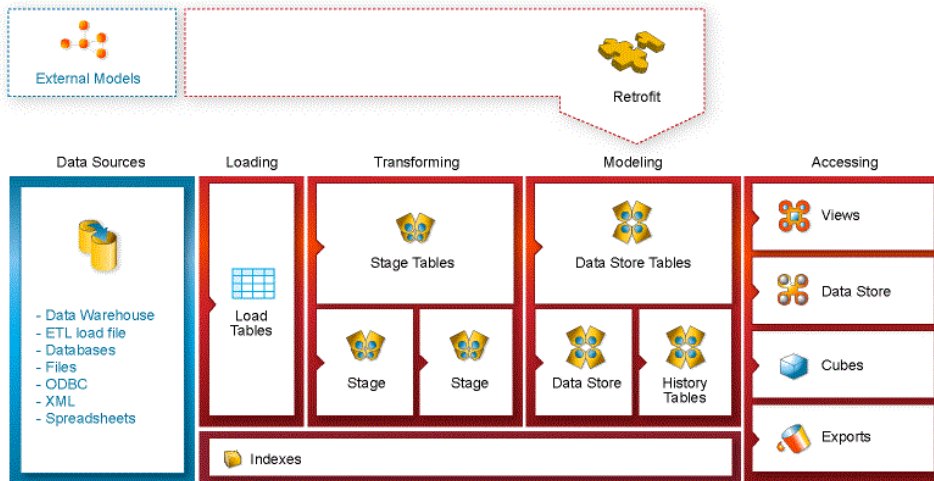
A Data Store Object is built from the Data Warehouse connection. Unless you are retrofitting an existing system, Data Store Objects are typically built from one or more load or stage tables. The Data Store model may be retrofitted from an enterprise modelling tool. See **Importing a Data Model** (see "30.2 Importing a Data Model" on page 754) for more details.

The usual steps for creating a Data Store model are defined below and are covered in this chapter. The steps are:

- Identify the source reference or transactional data that will constitute the Data Store Object. If the data is sourced from multiple tables ascertain if a join between the source tables is possible, or if one or more intermediate stage (work) tables would be a better option.
- Using the 'drag and drop' functionality drag the load or stage table that is the primary source of information for the Data Store Object into a Data Store target. See **Building a Data Store Object** (see "11.2 Building a Data Store Object" on page 232).
- If there's only one source table and all of the columns from it are being used, you can select the auto create option to build and load the table. This automatically completes the next four steps. See **Building a Data Store Object** (see "11.2 Building a Data Store Object" on page 232).
- Add columns from other load and/or stage tables if required. See **Building a Data Store Object** (see "11.2 Building a Data Store Object" on page 232).
- Create the Data Store Object in the database. See **Building a Data Store Object** (see "11.2 Building a Data Store Object" on page 232).
- Build the update procedure. See **Generating the Data Store Update Procedure** (see "11.3 Generating the Data Store Update Procedure" on page 236).
- Run the update procedure and analyze the results.

If necessary, modify the update procedure or create a custom procedure.

OVERVIEW DIAGRAM: DATA STORE



Data Store Object Keys

Data Store Objects have Business Keys, they do not usually have Artificial Keys.

Business Key

The business key is the column or columns that uniquely identify a record within a Data Store Object. Where the Data Store Object maps back to a single or a main table in the source system, it is usually possible to ascertain the business key by looking at the unique keys for that source table. The business key is sometimes referred to as the 'natural' key. Examples of business keys are:

- The product SKU in a product table
- The customer code in a customer table
- The IATA airport code in an airport table.

It is assumed that business keys will never be NULL. If a null value is possible in a business key then the generated code will need to be modified to handle the null value by assigning some default value. In the following examples, the business key column is modified by using a database function and default value:

- DB2: COALESCE(business_key,'N/A')
- SQL Server: ISNULL(business_key,'N/A')
- Oracle: NVL(business_key,'N/A')

Note: Business keys are assumed to never be Null. If they can be null it is best to transform them to some value prior to the Data Store or stage table update. If this is not done, an un-modified update procedure will probably fail with a duplicate key error on the business key index.

11.2 Building a Data Store Object

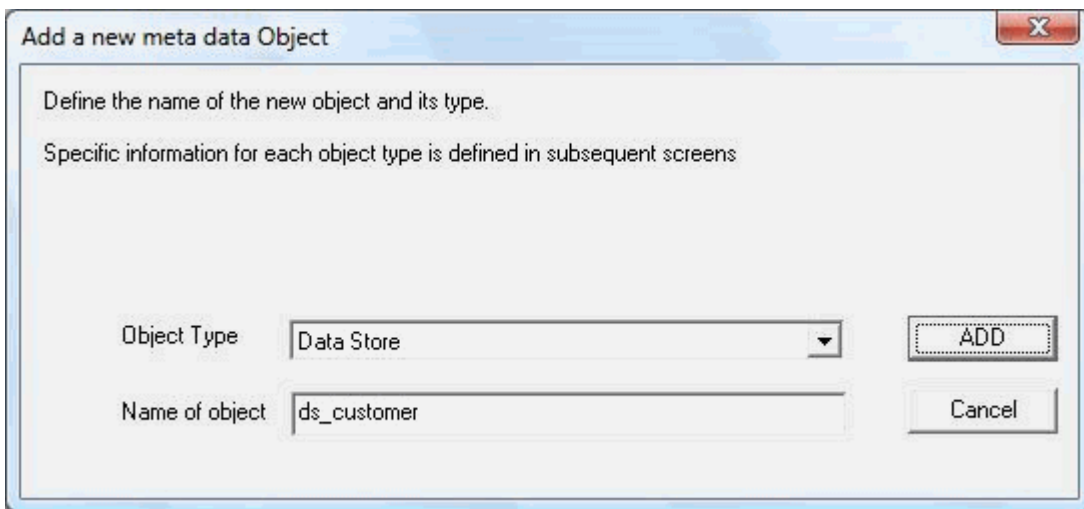
Data Store Objects are often sourced from one table in the base application. The process for building a Data Store Object begins with the drag and drop of the load or stage table that contains the bulk of the Data Store Object's information.

Drag and Drop

Create a Data Store Object target by double clicking on the 'Data Store' group in the left hand pane. The middle pane will display a list of all existing Data Store Objects in the current project. When such a list is displayed in the middle pane, the pane is identified as a target for new Data Store Objects.

Browse to the Data Warehouse via the Browse/Source Data menu option. Drag the load or stage table, that contains the bulk of the Data Store Object columns, into the middle pane. Drop the table anywhere in the pane.

The new object dialog box will appear and will identify the new object as a Data Store Object and will provide a default name based on the load or stage table name. Either accept this name or enter the name of the Data Store Object and click ADD to proceed:



Add a new meta data Object [X]

Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens

Object Type: Data Store [v]

Name of object: ds_customer

[ADD] [Cancel]

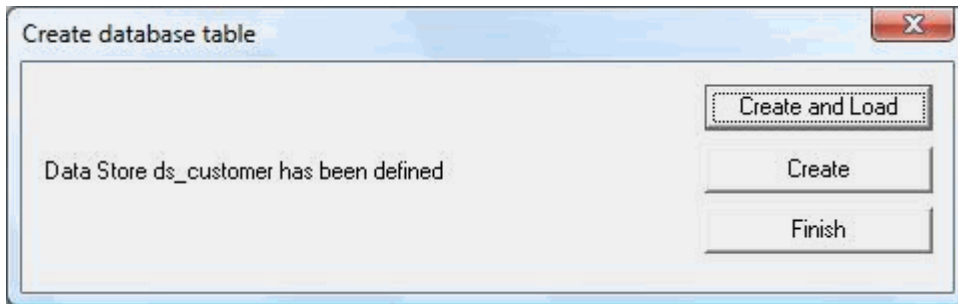
Data Store Object Properties

The table properties dialog for the new table is now displayed. If required, the Data Store Object can be changed to be a history table by choosing History from the table type drop down list on the right hand side of the dialog. History tables are like slowly changing dimensions in dimensional data warehouses. See ***Building a Dimension*** (see "9.2 ***Building a Dimension***" on page 164) for more information. Change the storage options if desired.

If prototyping, and the Data Store Object is simple (i.e. one source table) then it is possible to create, load and update the Data Store Object in a couple of steps. If you wish to do this select the (Build Procedure...) option from the 'Update Procedure' drop down, and answer 'Create and Load' to the next question.

Create and Load

The following dialog appears after the properties page and asks if you want to create the Data Store Object in the database and execute the update procedure.



If you are satisfied with the columns that will be used and do not wish to add additional columns you can select the **Create and Load** button. In such an event it would be normal practice to select the (Build Procedure...) option from the 'Update Procedure' drop down box in the previous properties page. If no procedure has been selected then select the **Create** button as no update will occur in any event.

If **Create** or **Create and Load** is selected and a new procedure creation was chosen proceed directly to the **Generating the Update Procedure** (see "**12.3 Generating the Normalized Update Procedure**" on page 264) section.

If you have additional columns to add or columns to delete then select **Finish** and proceed as follows.

Deleting and Changing columns

The columns defined for the Data Store Object will be displayed in the middle pane. It is possible to delete any unwanted columns by highlighting a column name or a group of names and pushing the 'Delete' key.

The name of a column can also be changed by selecting the column and using the right mouse menu to edit its properties. Any new name must conform to the database naming standards. Good practice is to use alphanumeric and the underscore character. See the section on column properties for a fuller description on what the various fields mean.



TIP: When prototyping, and in the initial stages of an analysis area build it is best not to remove columns, nor to change their names to any great extent. This type of activity is best left until after end users have used the data and provided feedback.

Adding additional columns

With the columns of the Data Store Object displayed in the middle pane, this pane is considered a drop target for additional columns.

It is a simple matter to select columns from other load and/or stage tables and drag these columns into the middle pane. The source table column in the middle pane shows where each column was dragged from. The column **description** could be acquired from three different tables. The best practise is to rename at least two of the columns, perhaps also adding context to the column name. For example, description could become group_description, and so forth.

There are a number of QAD Data Warehouse Designer ancillary columns that do not have a source table. These columns have been added by QAD Data Warehouse Designer, and are added depending on earlier choices. A description of these columns follows.

Column name	description
dss_start_date	Used for history tables. This column provides a date time stamp when the Data Store Object record came into existence. It is used to ascertain which Data Store Object record should be used when multiple are available.
dss_end_date	Used for history tables. This column provides a date time stamp when the Data Store Object record ceased to be the current record. It is used to ascertain which Data Store Object record should be used when multiple are available.
dss_current_flag	Used for Data Store history tables. This flag identifies the current record where multiple versions exist.

Column name	description
dss_source_system_key	Added to support history tables that cannot be fully conformed, and the inclusion of subsequent source systems. See the ancillary settings section for more details.
dss_version	Used for Data Store history tables. This column contains the version number of a Data Store history tables record. Numbered from 1 upwards with the highest number being the latest or current version. It forms part of the unique constraint for the business key of a Data Store history tables.
dss_update_time	Indicates when the record was last updated in the data warehouse.
dss_create_time	Indicates when the record was first created in the data warehouse

Create the table

Once the Data Store Object has been defined in the metadata we need to physically create the table in the database. This is achieved by using the right mouse button when positioned over the Data Store Object name and selecting **Create (ReCreate)** from the popup menu.

A results dialog box will appear to show the results of the creation.

The contents of this dialog are a message to the effect that the Data Store Object was created. A copy of the actual database create statement and if defined the results of any index create statements will be listed. For the initial create no indexes will be defined.

If the table was not created then ascertain and fix the problem. A common problem is 'Duplicate column' where a column has the same name in two of the source tables. The best way of finding such a column is to double click on the list heading 'Col name'. This will sort the column names into alphabetic order. Another double click on the heading will sort the columns back into their create order.

The next section covers ***Generating the Data Store Update Procedure*** (see "**11.3 Generating the Data Store Update Procedure**" on page 236).

11.3 Generating the Data Store Update Procedure

Once a Data Store Object has been defined in the metadata and created in the database, an update procedure can be generated to handle the joining of any tables and the update of the Data Store Object.

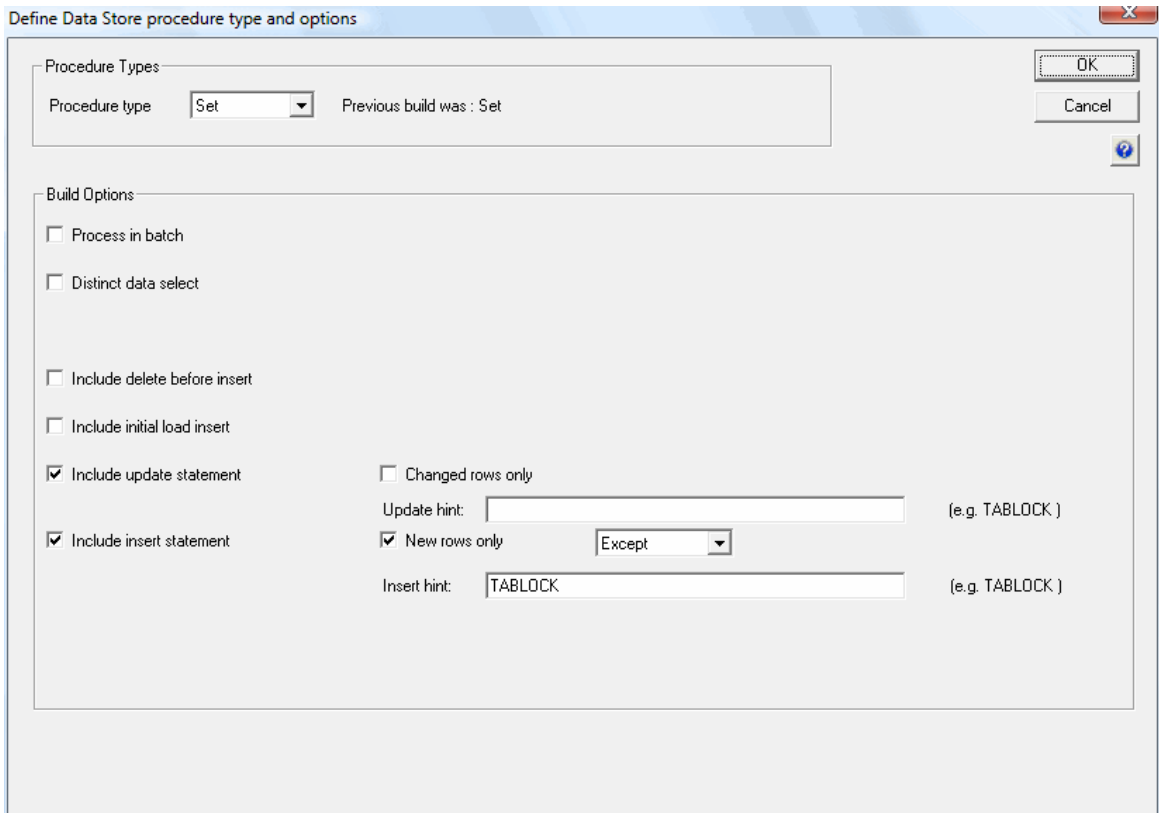
Generating a Procedure

To generate a procedure use the right mouse menu when positioned on the Data Store Object name to edit the properties for the Data Store Object. Click on the **Rebuild** button to start the process of generating the new procedure.

A series of questions will be asked during the procedure generation based on the type of load information.

Procedure type and options

The first dialog displayed when generating a Data Store Object update procedure is the procedure types and options dialog:



The dialog box is titled "Define Data Store procedure type and options". It contains two main sections: "Procedure Types" and "Build Options".

Procedure Types:

- Procedure type: Set (dropdown menu)
- Previous build was : Set
- Buttons: OK, Cancel

Build Options:

- ☐ Process in batch
- ☐ Distinct data select
- ☐ Include delete before insert
- ☐ Include initial load insert
- ☒ Include update statement
- ☒ Include insert statement
- ☐ Changed rows only
- Update hint: (text field) (e.g. TABLOCK)
- ☒ New rows only (Except dropdown menu)
- Insert hint: TABLOCK (text field) (e.g. TABLOCK)

Several different questions need to be answered on this dialog to ensure the required type of update procedure is generated. Once the required options have been selected, click OK to proceed to the next dialog.

Procedure Types

A number of different types of procedure generation are available. The procedure type is chosen from the procedure type drop down list. A set based procedure performs one SQL statement to join all the source tables together and then insert this data into the Data Store Object. This is normally the fastest method of populating a table.

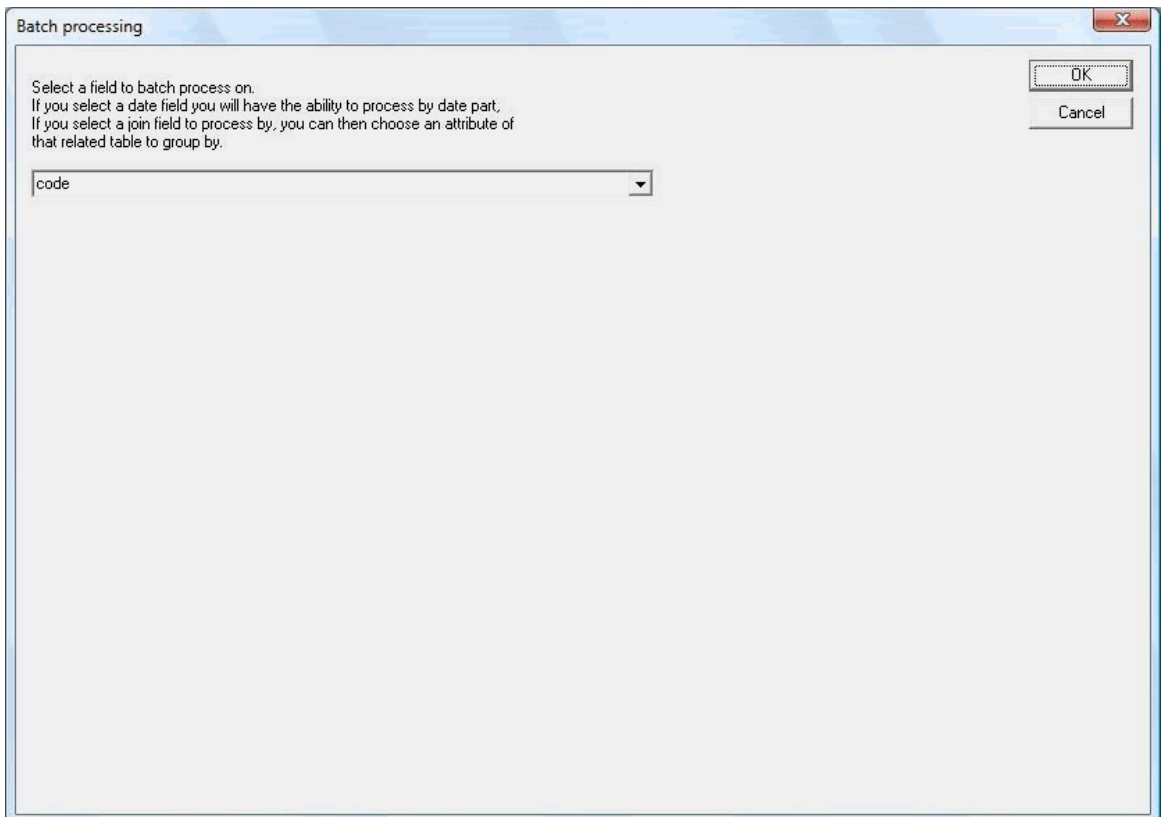
Build Options

The following build options are available:

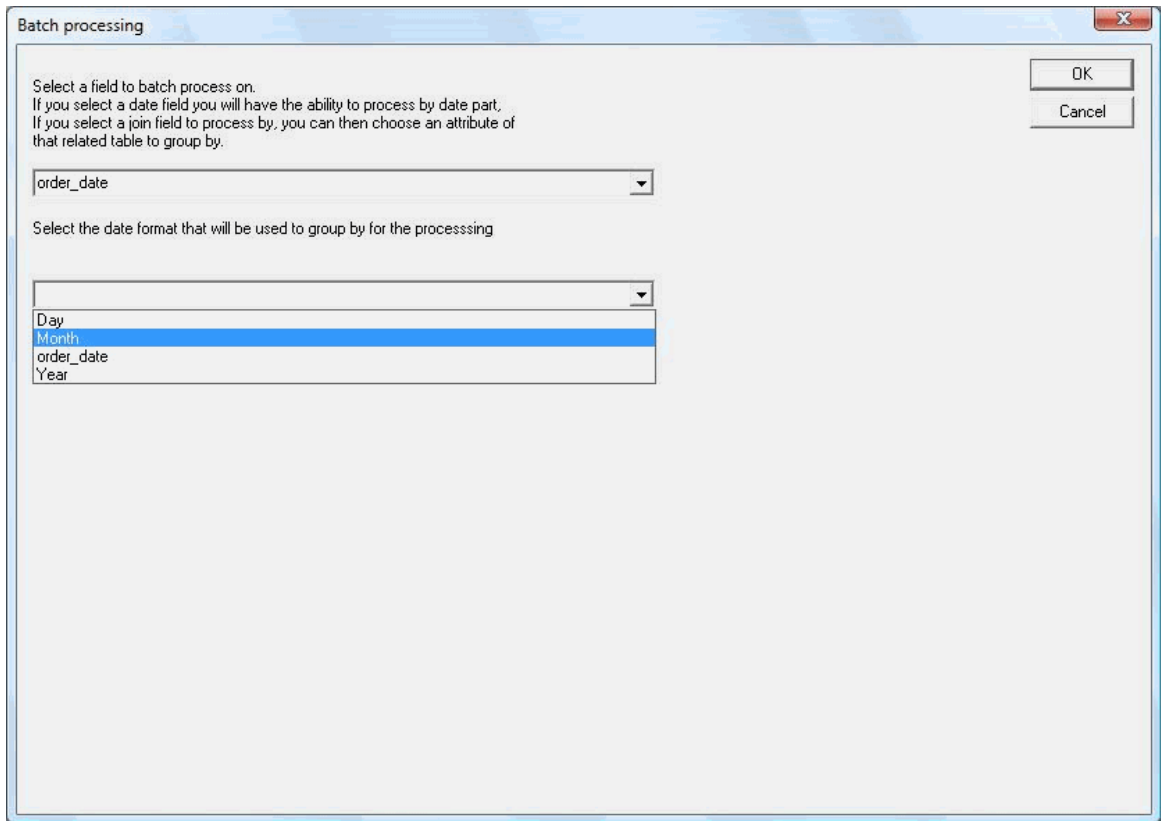
Process in batch

The **process in batch** check box allows the user to select a column to use to break up the data being processed in a loop based on the distinct values in the column. The update procedure loops on this column and performs the delete, update and/or insert for each value. If the column chosen is a date datatype (date, datetime or timestamp), then the user is able to specify yearly, monthly, daily or column level looping. The default for this field is off (do not do batch processing).

The following dialog is the default for a non-date column:



The following dialog is displayed for date fields:



A screenshot of a 'Batch processing' dialog box. The dialog has a title bar with a close button (X). Inside, there is instructional text: 'Select a field to batch process on. If you select a date field you will have the ability to process by date part. If you select a join field to process by, you can then choose an attribute of that related table to group by.' Below this is a dropdown menu showing 'order_date'. Another instruction follows: 'Select the date format that will be used to group by for the processing'. Below this is a list box with four options: 'Day', 'Month', 'order_date', and 'Year'. The 'Month' option is currently selected and highlighted in blue. In the top right corner of the dialog, there are two buttons: 'OK' and 'Cancel'.

Batch processing

Select a field to batch process on.
If you select a date field you will have the ability to process by date part.
If you select a join field to process by, you can then choose an attribute of that related table to group by.

order_date

Select the date format that will be used to group by for the processing

Day
Month
order_date
Year

OK
Cancel

Distinct data select

The **distinct data select** option ensures duplicate rows are not added to the Data Store Object. This is achieved by the word **DISTINCT** being added to the source select in the update procedure. The default for this field is off (i.e.: duplicates are not removed).

Include delete before insert

The **include delete before insert** option enables a delete statement to be added to the update procedure before any update or insert statement. This is a particularly useful option for purging old data and for updates based on a source system batch number. If this option is selected, the following dialog is displayed:

The dialog box is titled "Definition for a delete statement before the Data Store table insert". It contains the following elements:

- Instructions:** "Select the Data Store table column on which the delete will be based. All values in the source table for the selected column will be used to delete the corresponding records in the Data Store table. The 'Where' clause can be edited, or directly entered."
- Buttons:** "OK" and "Cancel" in the top right corner.
- Fields:**
 - Data Store table column:** A dropdown menu with "order_number" selected.
 - Source table:** A dropdown menu with "stage_sales_detail" selected.
 - Source table column:** A dropdown menu with "order_number" selected. A list of available columns is shown below the dropdown, including "customer_code", "dim_customer_key", "dim_order_date_key", "dim_product_key", "dim_ship_date_key", "dss_update_time", "order_date", "order_line_no", "order_number" (highlighted), "product_code", "quantity", "sales_value", "ship_date", "tax", and "unit_sale_price".
- Options:** Three checkboxes are present:
 - ☐ Issue warning if a delete occurs
 - ☐ Multiple pass delete (smaller transactions)
 - ☐ Truncate table before insert
- Delete 'Where' statement:** A text area containing the following SQL code:

```
WHERE ods_sales_detail.order_number
IN ( SELECT DISTINCT stage_sales_detail.order_number
      FROM [TABLEOWNER].[stage_sales_detail] stage_sales_detail )
```

Use the wizard to build a where clause for the delete statement. Additional options included in this dialog are:

- Issue warning if a delete occurs
- Multiple pass delete - if this option is chosen, the delete is performed in a loop, 50000 rows at a time, until the required rows have been deleted.
- Truncate table before insert - if this option is chosen, the delete is ignore and the Data Store Object is truncated.

The default for this field is off (i.e.: a delete statement is not added to the procedure).

Include initial load insert

The **include initial load insert** option adds an additional insert statement to the update procedure that runs if the target Data Store Object is empty. The benefit of this is improved performance inserting into an empty table without performing any checks to see if rows already exist. The default for this field is off (i.e.: an initial insert statement is not added to the procedure).

Include update statement with/without Minus Select using except/checksum

The **include update statement** option includes an update statement in the procedure to update changing rows in the Data Store Object. If this option is chosen, then the **Changed rows only** option is available. Choosing this option, displays the **code type** drop down, enabling the generated update statement to use either a sub-select with *except* change detection or *checksum* change detection to work out what rows in the Data Store Object require updating. If this option is turned off, the update procedure will not contain an update statement. The default for this field is on (i.e.: an update statement is included).

Include insert statement with/without Minus Select using except/checksum

The **include insert statement** option includes an insert statement in the procedure to insert new rows in the Data Store Object. If this option is chosen, then the **New rows only** option is available. Choosing this option, displays the **code type** drop down, enabling the generated update statement to use either a sub-select with *except* change detection or *checksum* change detection to work out what rows in the source table(s) are new. If this option is turned off, the update procedure will not contain an insert statement. The default for this field is on (i.e.: an insert statement is included).

Update hint.

Enter a database hint to be used in the UPDATE statement.

Note: SQL Server only.

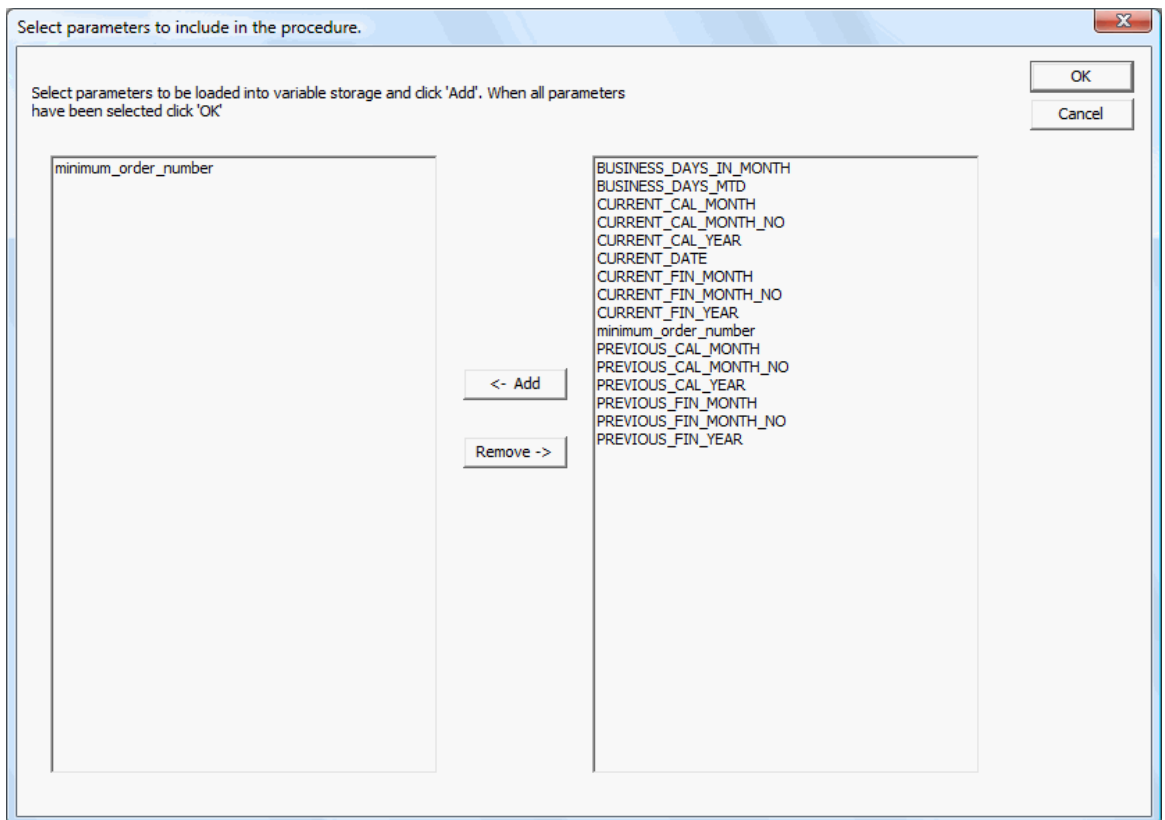
Insert hint.

Enter a database hint to be used in the INSERT statement.

Note: SQL Server only.

Parameters variables

If QAD Data Warehouse Designer parameters exist in the metadata, the following dialog is displayed. Any parameters selected in this dialog (by moving them to the left hand side), are included in the generated update procedure as variables. The procedure will include code to retrieve the value of the parameter at run time and store it in the declared variable.



The variables can also be used in column transformations and in the from / where clause for the update procedure. Some databases have a 30 character limit for variable names. QAD Data Warehouse Designer ensures the variables added for any parameters are less than 30 characters long by creating variable names in the form v_ followed by the first 28 characters of the parameter name.

For example, a parameter called MINIMUM_ORDER_NUMBER_SINCE_LAST_SOURCE_LOAD will be available as the variable v_MINIMUM_ORDER_NUMBER_SINCE_L.



TIP: QAD Data Warehouse Designer parameters should be unique within the first 28 characters to avoid conflicting variables names.

See **Parameters** (see "5.2 Parameters" on page 64) for more information on QAD Data Warehouse Designer Parameters

Business Key definition

The define business key dialog will appear asking for the business key that will uniquely identify each Data Store Object record. The source table from which the Data Store Object is derived would normally have some form of unique constraint applied. In most cases this will be the business key. In the example below the customer code is selected as the business key.

Define Data Store business key(s)

Select the business keys that uniquely identify each record in the Data Store table.

Move them over to the business key list

Business key list

order_number

<-- Add

Remove -->

Column list

customer_code
order_date
ship_date

OK

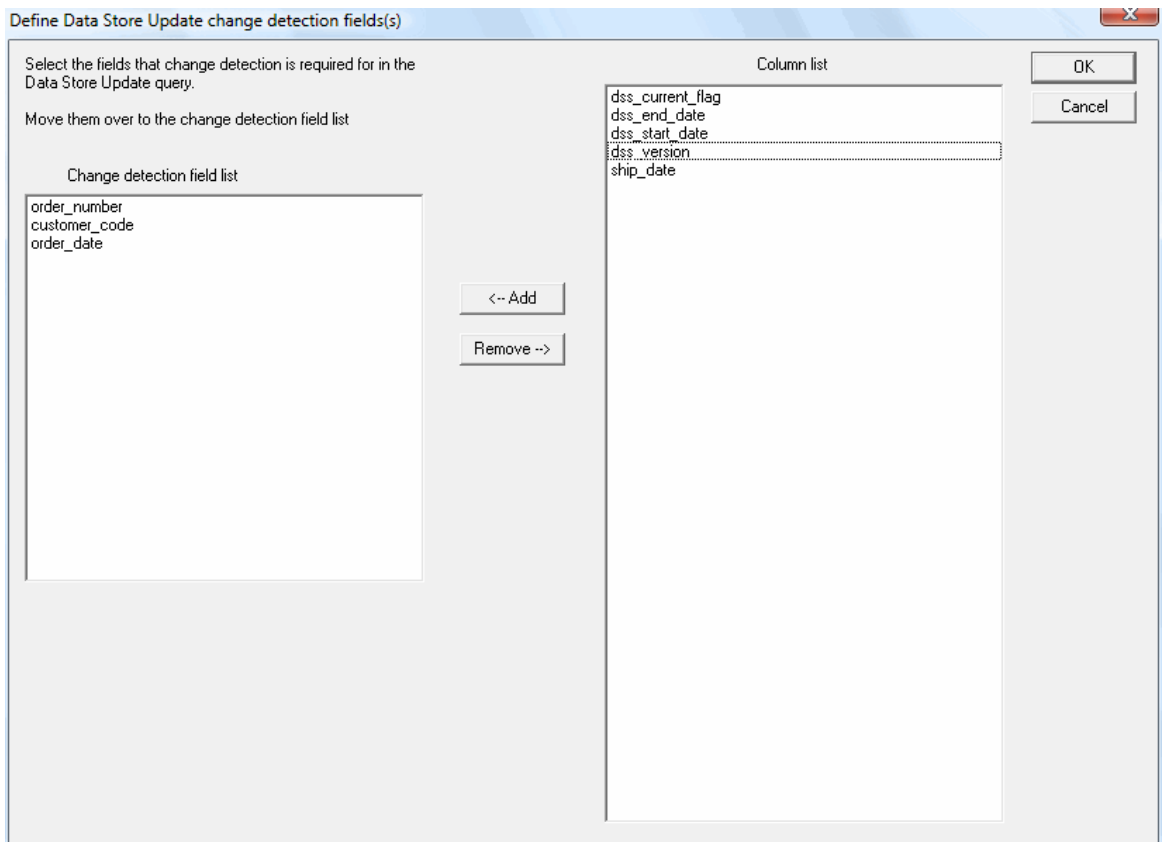
Cancel

A business key can be made up of multiple columns, but it must provide a unique identifier. Where multiple columns separately uniquely identify rows in the Data Store Object, choose one to act as the primary business key. For example a source table may have a unique constraint on both a product code and a product description. Therefore the description as well as the code must be unique. It is of course possible to combine the two columns, but the normal practice would be to choose the code as the business key.

None of the columns chosen as the business key should ever contain a NULL value. See the note at the start of this chapter.

Change Detection and History Tables

If the Data Store Object was defined as a history table then the following additional dialogs will appear. Data Store history tables are like slowly changing dimensions. The first dialog requests the selection of the columns to be managed as change detection columns. Select the required columns and click OK to proceed. In the example below the customer name is to be managed as a change detection column.



The following dialog will appear if one or more columns are chosen as change detection columns. When completed, click OK to continue.

History record settings

Add null support: ☐

Update Current records only: ☒

Please enter the default start and end dates to be used.
Correctly formatted dates or variables may be used.
Pressing Reset will reset the dates to the default settings.

Reset

Start date for initial member (A):
TIMESTAMP(DATE('1900-01-01'),'00:00:00')

End date for current member (B):
TIMESTAMP(DATE('2999-12-31'),'00:00:00')

Start date for new member entry (C):
v_current_timestamp

End date for expiring member entry (D):
v_current_timestamp - 1 MICROSECOND

Business ID	History Field	Start Date	End Date	Version	Current Flag
Project RED	Started	(A)	(D)	1	N
Project RED	Complete	(C)	(B)	2	Y

Add null support

If the **Add null support** option is selected, then change detect column management will cater for null values in any change detect columns. If this option is not selected, and null values are present, errors may occur running the update procedure. The default for this value is off (i.e.: nulls are not catered for).

Update Current record only

The **Update Current record only** option will only apply changes to non-change detect columns on the **current** record. If this option is not selected, all past (non-current) rows will also be updated to reflect changes to non-change detect columns. The default for this value is on (i.e.: only the current record is updated).

Start date for initial member

The **Start date for initial member** field contains the start date for the first version of a particular business key. The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is 1 January 1900.

End date for current member

The **End date for current member** field contains the end date for the current version (the row with a current flag of Y and the maximum version number) of a particular business key. The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is 31 December 2999.

Start date for new member entry

The **Start date for new member entry** field contains the start date for any subsequent rows added to the history table (not the first row for a particular business key i.e.: not version 1). The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is the current date and time.

End date for expiring member entry

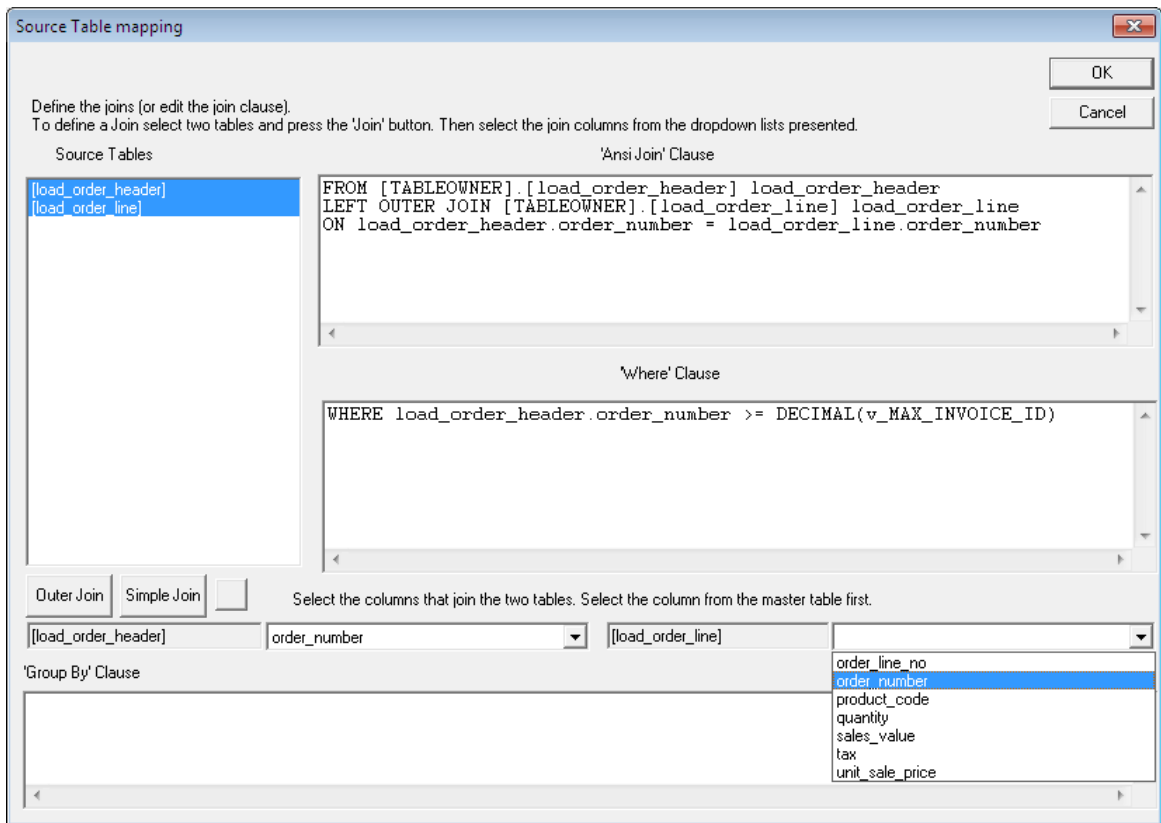
The **End date for expiring member entry** field contains the end date for any rows updated to no longer be the current row in the history table (i.e.: rows that are replaced by a new current row). The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is the current date and time less an arbitrary small amount (for SQL Server this is 0.00000005 of a day, or about 4 thousandth of a second).

Reset

Click on the **Reset** button to return all fields in this dialog to their default values.

Joining multiple source tables, where and group by clauses

Next the **Source table mapping** dialog appears. This dialog is used to join source tables, add where clauses and specify group by clauses.



The **Source Table mapping** dialog box is used to define joins and clauses for source tables. It includes fields for Source Tables, 'Ansi Join' Clause, 'Where' Clause, and 'Group By' Clause. The 'Ansi Join' Clause field contains the following SQL code:

```
FROM [TABLEOWNER].[load_order_header] load_order_header  
LEFT OUTER JOIN [TABLEOWNER].[load_order_line] load_order_line  
ON load_order_header.order_number = load_order_line.order_number
```

The 'Where' Clause field contains the following SQL code:

```
WHERE load_order_header.order_number >= DECIMAL(v_MAX_INVOICE_ID)
```

The 'Group By' Clause field contains the following columns:

Column
order_line_no
order_number
product_code
quantity
sales_value
tax
unit_sale_price

The dialog also includes buttons for **Outer Join**, **Simple Join**, and **OK**, and a **Cancel** button. The **Source Tables** list contains **[load_order_header]** and **[load_order_line]**. The **'Ansi Join' Clause** field is labeled **'Ansi Join' Clause**. The **'Where' Clause** field is labeled **'Where' Clause**. The **'Group By' Clause** field is labeled **'Group By' Clause**. The **Outer Join** button is selected. The **Simple Join** button is disabled. The **OK** button is enabled. The **Cancel** button is disabled.

To join two tables, start by selecting the two tables in the left hand box and then clicking one of the join buttons. The columns for the two tables then appear at the bottom of the dialog and one column is selected from each drop down list to effect the join between the selected tables. In the example above the `load_prod_group` and `load_prod_subgroup` tables are joined by the column `prod_group`. For multiple column joins, repeat the join process.

Simple Join

A simple join only returns rows where data is matched in both tables. So for example if table A has 100 rows and table B has a subset of 24 rows. If all the rows in table B can be joined to table A then 24 rows will be returned. The other 76 rows from table A will not be returned.

Outer Join

The outer join returns all rows in the master table regardless of whether or not they are found in the second table. So if the example above was executed with table A as the master table then 100 rows would be returned. 76 of those rows would have null values for the table B columns.

Note: When QAD Data Warehouse Designer builds up an outer join, it needs to know which table is the master table and which is subordinate. Select the join column from the master table first. In the example screen above the table `'load_prod_group'` has had its column chosen and the column for the table `'load_prod_subgroup'` is currently being chosen. This will result in the `'load_prod_group'` table being defined as the master, as per the example statement above. The results of this example select are that a row will be added containing product information regardless of whether or not a corresponding `prod_subgroup` entry exists.

As the join columns are selected the join statement is built up in the large edit window on the right hand side. Once all joins have been made the contents of this window can be changed if the join statement is not correct. For example the Oracle outer join indicator (+) could be removed if required.

Where Clause

A where clause can be manually added to the where clause field in this dialog.

Group By Clause

A group by clause (and any other clauses that come after the where clause) can be added to the group by clause in this dialog.

Building and Compiling the Procedure

Once the above questions are completed the procedure is built and compiled automatically. If the compile fails an error will be displayed along with the first few lines of error messages. Compile fails typically occur when the physical creation of the table was not done. If the compile fails for some other reason the best approach is to use the procedure editor to edit and compile the procedure. The procedure editor will highlight all the errors within the context of the procedure.

Once the procedure has been successfully compiled it can either be executed interactively or passed to the scheduler.

Indexes

By default a number of indexes will be created to support each Data Store Object. These indexes will be added once the procedure has been built. An example of the type of indexes created is as follows:

Object	Message
ds_orders	Table dssdemo.ds_orders created.
ds_orders	Create table dssdemo.ds_orders(order_number decimal(12), order_date timestamp, customer_code decimal(6), ship_date timestamp, order_line_no decimal(4), product_code decimal(6), unit_sale_price decimal(9,3), quantity decimal(8), sales_value decimal(13,2), tax decimal(9,2), dss_update_time timestamp) ;
ds_orders_idx_A	Create Unique Index dssdemo.ds_orders_idx_A on dssdemo.ds_orders(order_number,order_line_no)
ds_orders_idx_A	ds_orders_idx_A created
ds_orders	table comment added.
ds_orders	11 column comments added.
ds_orders	Procedure Completed
ds_orders	1 ds_orders updated. 0 new records. 0 records updated.

Additional indexes can be added, or these indexes changed. See the chapter on indexes for further details.

11.4 Data Store Artificial Keys

By default, Data Store Objects in QAD Data Warehouse Designer do not have an artificial (surrogate) key. Artificial keys can be added manually, but needing to do so could indicate Data Store Objects are not the correct QAD Data Warehouse Designer object for this table (perhaps a Normalized Table would be more appropriate). The quickest way to do this is to add an extra column to the Data Store Object by using either **Add Column** or **Copy Column**. Edit the properties of the new column to have the correct name and order, source table and column, datatype, key type and flags. Specifically:

- The column name and source column name should be the same.
- The source table should be empty.
- The datatype should be:
 - DB2: integer generated by default as identity (start with 1, increment by 1)
 - Oracle: integer
 - SQL Server: integer identity(0,1)

- The key type should be 0.
- Only the numeric and artificial key flags should be set on.

The following example shows a manually added artificial key column:

The screenshot shows the 'Column definition' dialog box with the 'Transformation' tab selected. The 'Table' field is set to 'Data Store'. The 'Column name' is 'customer_code', the 'Business display name' is 'customer code', and the 'Data type' is 'number(6)'. The 'Format' is '###0'. The 'Column order' is '30'. The 'Nulls' checkbox is checked. The 'Numeric' checkbox is checked. The 'Additive' checkbox is checked. The 'Attribute' checkbox is unchecked. The 'Key Type (0,A,B,C,...)' dropdown is set to '0'. The 'Artificial Key' checkbox is checked. The 'Primary Business Key' checkbox is unchecked. The 'Source table' is 'load_order_header' and the 'Source column' is 'customer_code'. The 'Business Definition' text area contains the text: 'The code that relates to the customer who placed the order. Link to the customer table.'

The artificial key for a Data Store Object is set via a sequence in Oracle and an identity column in SQL Server and DB2. This artificial key normally, and by default, starts at one and progresses as far as is required.

A QAD standard for the creation of special rows in the normalized tables is as follows:

Key value	Usage
1 upwards	The standard artificial keys are numbered from 1 upwards, with a new number assigned for each distinct Data Store Object record.
0	Used as a join to the Data Store Object when no valid join existed. It is the convention in the QAD generated code that any normalized table business key that either does not exist or does not match is assigned to key 0.

Key value	Usage
-1 through -9	Used for special cases. The most common being where a normalized table is not appropriate for the record. A new key is used rather than 0 as we want to distinguish between records that are invalid and not appropriate.
-10 backward	Pseudo records. In many cases we have to deal with different granularities in our data. For example we may have a table that contains actual sales at a product SKU level and budget information at a product group level. The product table only contains SKU based information. To be able to map the budget records to the same table, we need to create these pseudo keys that relate to product groups. The values -10 and backwards are normally used for such keys.

11.5 Data Store Column Properties

Each Data Store Object column has a set of associated properties. The definition of each property is described below:

If the **Column name** or **Data type** is changed for a column then the metadata will differ from the table as recorded in the database. Use the **Tools/Validate table create status** menu option or the right mouse menu to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the **Tools/Validate table create status** to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name.

A sample property screen is as follows:

Column definition

Column Properties

Transformation

Table:

ds_orders

Update

Column name:

order_number

Update <

Business display name:

order number

Update ->

Data type:

decimal(12)

Format:

###0

Column order:

10

Default Value:

Nulls:

☒

Numeric:

☒

Additive:

☒

Attribute:

☐

Key Type (0,A,B,C..):

☐A

Artificial Key:

☐

Primary Business Key:

☒

Source table:

load_order_header

Source column:

order_number

Business Definition:
Source strategy:
(max 2048 chars.)

Every order has a unique generated order number. Cancelled orders are removed to the cancelled_orders table.

OK

Cancel

Apply

The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics, and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. It does not affect the physical table definition, but rather provides input to the documentation and to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical data types for DB2 are integer, numeric, `char()`, `varchar()` and date. Typical data types for Oracle are integer, number, `char()`, `varchar2()` and date. For SQL Server common types are integer, numeric, `varchar()` and `datetime`. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid. Typically format masks are only used on numeric fields. Example: `#,###0.00`. It is not worth the effort of populating this field unless it can be utilized by the end user tools in use.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the 'Respace order number' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This check box when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column.

Numeric

This check box indicates that the column in question is numeric when set. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Additive

This check box indicates that the column in question is additive when set. This implies that the column can be summed when performing data grouping in a query. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Attribute

This checkbox indicates that the column in question is an attribute when set. An attribute is defined as a column that is non factual. For example we may have an order number, or an invoice number stored in the fact table. Such columns are considered attributes, rather than facts. This checkbox is therefore normally only relevant for fact tables. This checkbox does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tools end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Source table

Indicates the table from which the column was sourced. This source table is normally a load table within the data warehouse. If the column was sourced from multiple tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Source strategy' field. This field is used when generating a procedure to update the Data Store Object. It is also used in the track back diagrams and in the documentation.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a load table column, which in turn may have been a transformation or the combination of multiple columns. For previous value managed columns the source column is the column in the table whose previous value is being recorded.

Business definition / Source strategy

Normally this field will contain a business definition of the column. Such a definition may be a description of the column from a business user's point of view. This field might additionally contain information on where and how the column was acquired. For example if the column is sourced from multiple tables or is a composite or derived column then this definition would normally describe the process used to populate the column. This field is used in the documentation and is available via the view `ws_admin_v_dim_col`. This field is also stored as a comment against the column in the database.

Default Value

This field contains the default value applied to the column if it is not explicitly specified when the table has data inserted into it.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key.
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

This checkbox indicates that the column is the artificial key when set. Only one artificial key is supported. This indicator is set by QAD Data Warehouse Designer during the initial drag and drop creation of a table, and should not normally be altered.

Primary Business Key

This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the Data Store Object update procedure generation process. This check box should not normally be altered.

11.6 Data Store Object Column Transformations

Each Data Store Object column can have a transformation associated with it. The transformation will be included in the generated procedure and will be executed as part of the procedure update. The transformation must therefore be a valid SQL construct that can be included in a 'Select' statement. For example we could have a transformation of 'load_order_line.qty * 0.125' to calculate a tax column of 12.5%. Click the 'Transformation' tab to enter a transformation.

Note: transformations are only put into effect when the procedure is re-generated.

CHAPTER 12

12. Normalized Tables

In This Chapter

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12.1 Normalized Tables Overview

A Normalized Table is a data warehouse object used to build third normal form enterprise data warehouses. In QAD Data Warehouse Designer, normalized objects have many of the code generating attributes of stage, dimension and fact tables. Third normal form enterprise data warehouses can be thought of as a source system for star schema data marts. Alternatively, they may be reported off directly by users and reporting tools. Normalized Tables can be considered either reference or transactional in nature.

A Normalized Table is built from the Data Warehouse connection. Unless you are retrofitting an existing system, Normalized Tables are typically built from one or more load or stage tables. The normalized model may be retrofitted from an enterprise modelling tool. See **Importing a Data Model** (see "30.2 Importing a Data Model" on page 754) for more details.

The usual steps for creating a normalized model are defined below and are covered in this chapter. The steps are:

- Identify the source reference or transactional data that will constitute the Normalized Table. If the data is sourced from multiple tables ascertain if a join between the source tables is possible, or if one or more intermediate stage (work) tables would be a better option.
- Using the 'drag and drop' functionality drag the load or stage table that is the primary source of information for the Normalized Table into a normalized target. See **Building a Normalized Table** (see "12.2 Building a Normalized Table" on page 260).
- If there's only one source table and all of the columns from it are being used, you can select the auto create option to build and load the table. This automatically completes the next four steps. See **Building a Normalized Table** (see "12.2 Building a Normalized Table" on page 260).
- Add columns from other load and/or stage tables if required. See **Building a Normalized Table** (see "12.2 Building a Normalized Table" on page 260).
- Create the Normalized Table in the database. See **Building a Normalized Table** (see "12.2 Building a Normalized Table" on page 260).
- Build the update procedure. See **Generating the Update Procedure** (see "12.3 Generating the Normalized Update Procedure" on page 264).
- Run the update procedure and analyze the results.

If necessary, modify the update procedure or create a custom procedure.

Normalized Table Keys

Normalized Tables have two types of keys that we will refer to frequently. These are the Business Key and the Artificial Key. A definition of these two key types follows:

Business Key

The business key is the column or columns that uniquely identify a record within a Normalized Table. Where the Normalized Table maps back to a single or a main table in the source system, it is usually possible to ascertain the business key by looking at the unique keys for that source table. The business key is sometimes referred to as the 'natural' key. Examples of business keys are:

- The product SKU in a product table
- The customer code in a customer table
- The IATA airport code in an airport table.

It is assumed that business keys will never be NULL. If a null value is possible in a business key then the generated code will need to be modified to handle the null value by assigning some default value. In the following examples, the business key column is modified by using a database function and default value:

- DB2: COALESCE(business_key,'N/A')
- SQL Server: ISNULL(business_key,'N/A')
- Oracle: NVL(business_key,'N/A')

Note: Business keys are assumed to never be Null. If they can be null it is best to transform them to some value prior to the normalized or stage table update. If this is not done, an un-modified update procedure will probably fail with a duplicate key error on the business key index.

Artificial Key

By default, Normalized Tables in QAD Data Warehouse Designer do not have an artificial key (artificial keys can be added manually, see *Normalized Table Artificial Keys* (see "12.4 Normalized Table Artificial Keys" on page 277) for more details).

An artificial key is the unique identifier that can be used to join a Normalized Table record to other Normalized Tables. When joining Normalized Tables it would be possible to perform the join using the business key. For Normalized Tables that satisfy one of more of the following conditions, joining with business keys could result in slow query times and excessive use of database storage:

- Multiple column business keys (excessive storage and multiple column joins)
- One or more large character business key columns (excessive storage)
- Very large tables (excessive storage - integer artificial keys often use less space than one small character field)
- History Normalized Tables (complex joins involving a between dates construct)

As query time is one of our key drivers in data warehouse implementations the best answer is often to use some form of artificial key. A price is paid in the additional processing required doing key lookups, but this is offset by the reduced query times and reduced complexity.

The artificial key is an integer and is built sequentially from 1 upwards. See the section on artificial keys for a more detailed explanation. An artificial key is sometimes referred to as a "surrogate" key.

12.2 Building a Normalized Table

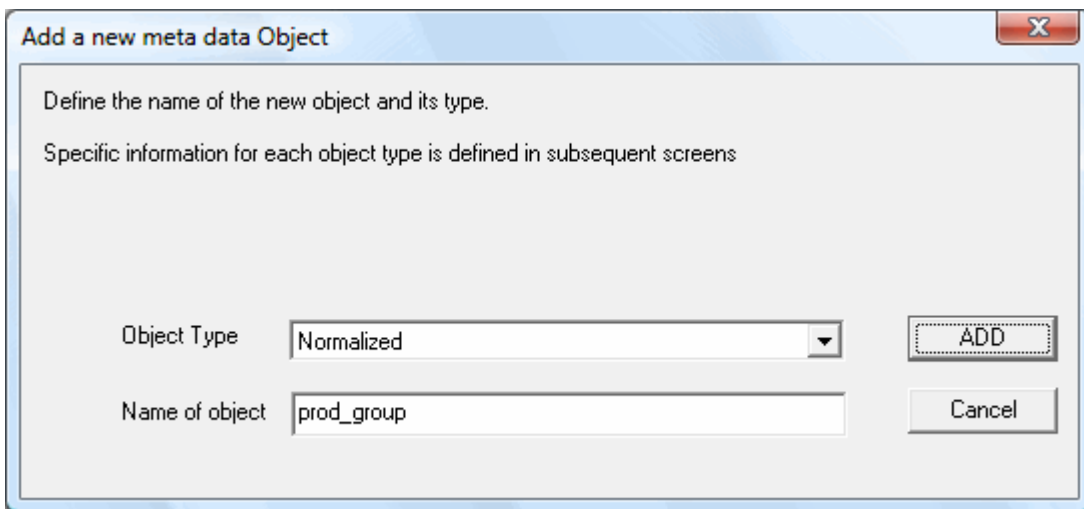
Normalized tables are often sourced from one table in the base application. The process for building a normalized table begins with the drag and drop of the load or stage table that contains the bulk of the normalized table's information.

Drag and Drop

Create a normalized table target by double clicking on the 'Normalized' group in the left hand pane. The middle pane will display a list of all existing normalized tables in the current project. When such a list is displayed in the middle pane, the pane is identified as a target for new normalized tables.

Browse to the Data Warehouse via the Browse/Source Data menu option. Drag the load or stage table, that contains the bulk of the normalized table columns, into the middle pane. Drop the table anywhere in the pane.

The new object dialog box will appear and will identify the new object as a Normalized table and will provide a default name based on the load or stage table name. Either accept this name or enter the name of the normalized table and click ADD to proceed:



Add a new meta data Object [X]

Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens

Object Type: [v] [ADD]

Name of object: [Cancel]

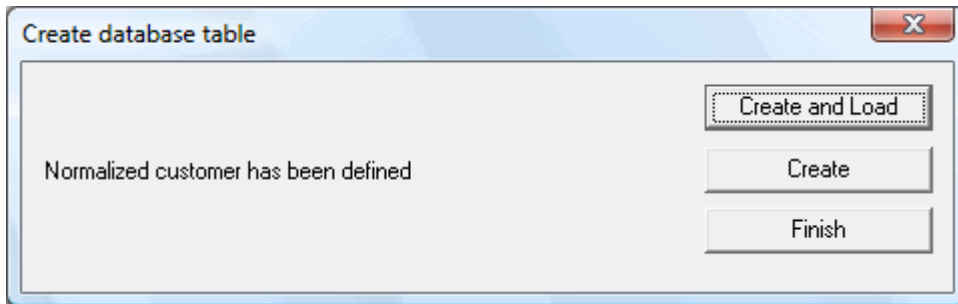
Normalized Table Properties

The table properties dialog for the new table is now displayed. If required, the normalized table can be changed to be a history table by choosing History from the table type drop down list on the right hand side of the dialog. History tables are like slowly changing dimensions in dimensional data warehouses. See ***Building a Dimension*** (see "9.2 ***Building a Dimension***" on page 164) for more information. Change the storage options if desired.

If prototyping, and the normalized table is simple (i.e. one source table) then it is possible to create, load and update the normalized table in a couple of steps. If you wish to do this select the (Build Procedure...) option from the 'Update Procedure' drop down, and answer 'Create and Load' to the next question.

Create and Load

The following dialog appears after the properties page and asks if you want to create the normalized table in the database and execute the update procedure.



If you are satisfied with the columns that will be used and do not wish to add additional columns you can select the **Create and Load** button. In such an event it would be normal practice to select the (Build Procedure...) option from the 'Update Procedure' drop down box in the previous properties page. If no procedure has been selected then select the **Create** button as no update will occur in any event.

If **Create** or **Create and Load** is selected and a new procedure creation was chosen proceed directly to the **Generating the Update Procedure** (see "**12.3 Generating the Normalized Update Procedure**" on page 264) section.

If you have additional columns to add or columns to delete then select **Finish** and proceed as follows.

Deleting and Changing columns

The columns defined for the normalized table will be displayed in the middle pane. It is possible to delete any unwanted columns by highlighting a column name or a group of names and pushing the 'Delete' key.

The name of a column can also be changed by selecting the column and using the right mouse menu to edit its properties. Any new name must conform to the database naming standards. Good practice is to use alphanumeric and the underscore character. See the section on column properties for a fuller description on what the various fields mean.



TIP: When prototyping, and in the initial stages of an analysis area build it is best not to remove columns, nor to change their names to any great extent. This type of activity is best left until after end users have used the data and provided feedback.

Adding additional columns

With the columns of the normalized table displayed in the middle pane, this pane is considered a drop target for additional columns.

It is a simple matter to select columns from other load and/or stage tables and drag these columns into the middle pane. The source table column in the middle pane shows where each column was dragged from. The column **description** could be acquired from three different tables. The best practise is to rename at least two of the columns, perhaps also adding context to the column name. For example, description could become group_description, and so forth.

There are a number of QAD Data Warehouse Designer ancillary columns that do not have a source table. These columns have been added by QAD Data Warehouse Designer, and are added depending on earlier choices. A description of these columns follows.

Column name	description
dss_start_date	Used for history tables. This column provides a date time stamp when the normalized table record came into existence. It is used to ascertain which normalized table record should be used when multiple are available.
dss_end_date	Used for history tables. This column provides a date time stamp when the normalized table record ceased to be the current record. It is used to ascertain which normalized table record should be used when multiple are available.
dss_current_flag	Used for normalized history tables. This flag identifies the current record where multiple versions exist.

Column name	description
dss_source_system_key	Added to support history tables that cannot be fully conformed, and the inclusion of subsequent source systems. See the ancillary settings section for more details.
dss_version	Used for normalized history tables. This column contains the version number of a normalized history tables record. Numbered from 1 upwards with the highest number being the latest or current version. It forms part of the unique constraint for the business key of a normalized history tables.
dss_update_time	Indicates when the record was last updated in the data warehouse.
dss_create_time	Indicates when the record was first created in the data warehouse

Create the table

Once the normalized table has been defined in the metadata we need to physically create the table in the database. This is achieved by using the right mouse button when positioned over the normalized table name and selecting **Create (ReCreate)** from the popup menu.

A results dialog box will appear to show the results of the creation.

The contents of this dialog are a message to the effect that the normalized table was created. A copy of the actual database create statement and if defined the results of any index create statements will be listed. For the initial create no indexes will be defined.

If the table was not created then ascertain and fix the problem. A common problem is 'Duplicate column' where a column has the same name in two of the source tables. The best way of finding such a column is to double click on the list heading 'Col name'. This will sort the column names into alphabetic order. Another double click on the heading will sort the columns back into their create order.

The next section covers **Generating the Update Procedure** (see "**12.3 Generating the Normalized Update Procedure**" on page 264).

12.3 Generating the Normalized Update Procedure

Once a normalized table has been defined in the metadata and created in the database, an update procedure can be generated to handle the joining of any tables and the update of the normalized table.

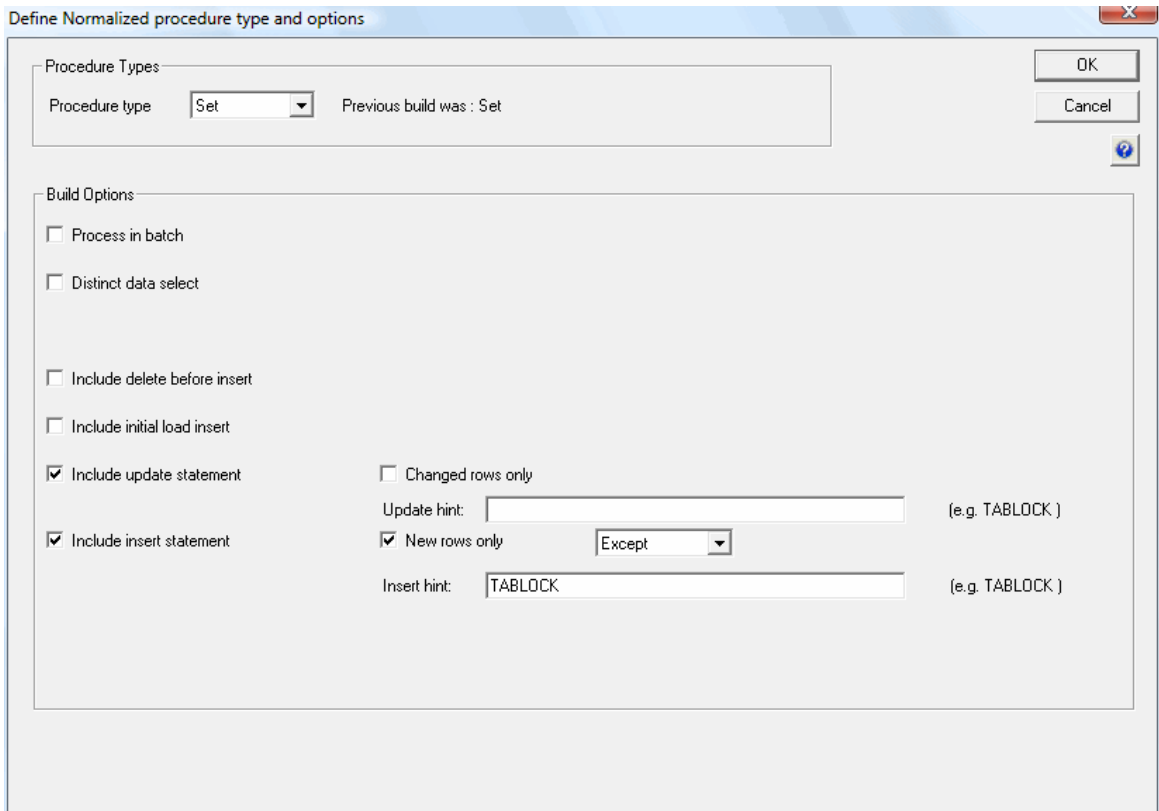
Generating a Procedure

To generate a procedure use the right mouse menu when positioned on the normalized table name to edit the properties for the normalized table. Click on the **Rebuild** button to start the process of generating the new procedure.

A series of questions will be asked during the procedure generation based on the type of load information.

Procedure type and options

The first dialog displayed when generating a normalized table update procedure is the procedure types and options dialog:



The dialog box is titled "Define Normalized procedure type and options". It contains two main sections: "Procedure Types" and "Build Options".

Procedure Types:

- Procedure type: Set (dropdown menu)
- Previous build was : Set
- Buttons: OK, Cancel

Build Options:

- ☐ Process in batch
- ☐ Distinct data select
- ☐ Include delete before insert
- ☐ Include initial load insert
- ☒ Include update statement
- ☒ Include insert statement
- ☐ Changed rows only
- Update hint: (text field) (e.g. TABLOCK)
- ☒ New rows only (Except (dropdown menu))
- Insert hint: TABLOCK (text field) (e.g. TABLOCK)

Several different questions need to be answered on this dialog to ensure the required type of update procedure is generated. Once the required options have been selected, click OK to proceed to the next dialog.

Procedure Types

A number of different types of procedure generation are available. The procedure type is chosen from the procedure type drop down list. A set based procedure performs one SQL statement to join all the source tables together and then insert this data into the normalized table. This is normally the fastest method of populating a table.

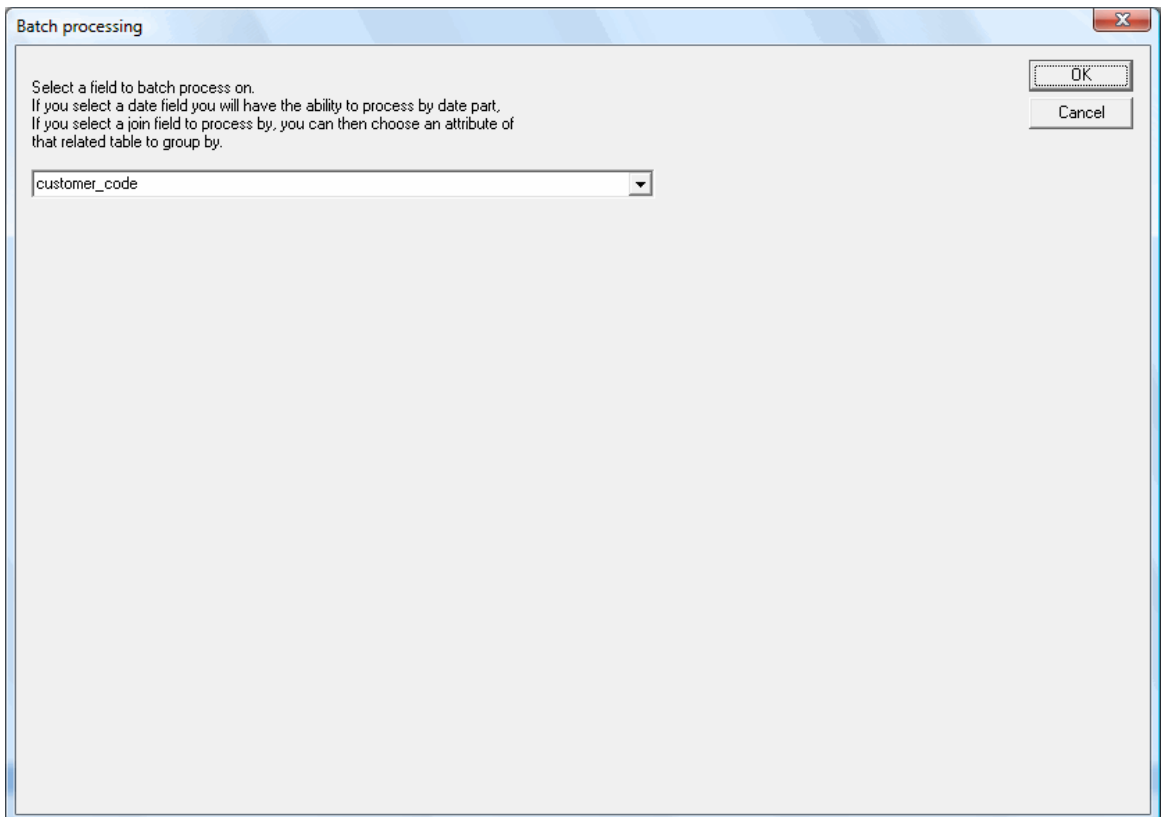
Build Options

The following build options are available:

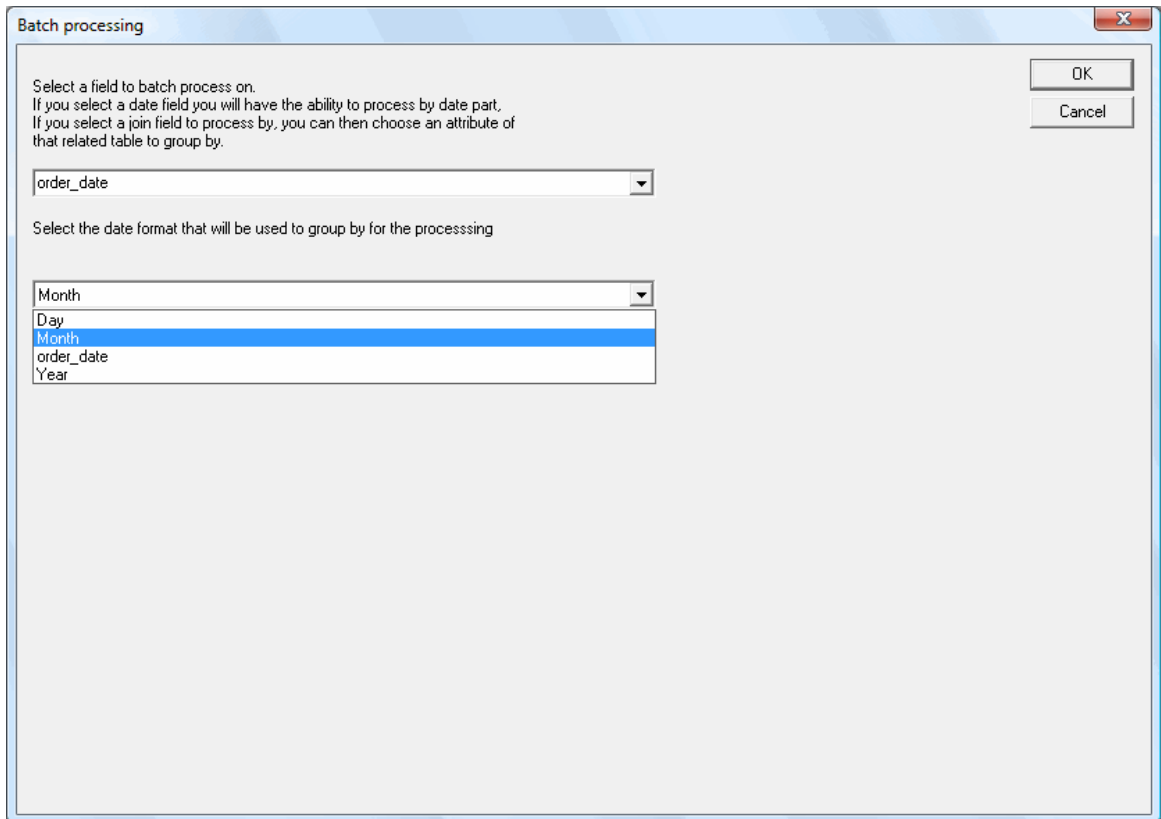
Process in batch

The **process in batch** check box allows the user to select a column to use to break up the data being processed in a loop based on the distinct values in the column. The update procedure loops on this column and performs the delete, update and/or insert for each value. If the column chosen is a date datatype (date, datetime or timestamp), then the user is able to specify yearly, monthly, daily or column level looping. The default for this field is off (do not do batch processing).

The following dialog is the default for a non-date column:



The following dialog is displayed for date fields:



A screenshot of a 'Batch processing' dialog box. The dialog has a title bar with a close button (X). Inside, there is instructional text: 'Select a field to batch process on. If you select a date field you will have the ability to process by date part. If you select a join field to process by, you can then choose an attribute of that related table to group by.' Below this text is a dropdown menu currently showing 'order_date'. Underneath that is another instruction: 'Select the date format that will be used to group by for the processing'. Below this is a second dropdown menu currently showing 'Month', which is open, displaying a list of options: 'Day', 'Month' (highlighted in blue), 'order_date', and 'Year'. In the top right corner of the dialog, there are two buttons: 'OK' and 'Cancel'.

Batch processing

Select a field to batch process on.
If you select a date field you will have the ability to process by date part.
If you select a join field to process by, you can then choose an attribute of that related table to group by.

order_date

Select the date format that will be used to group by for the processing

Month
Day
Month
order_date
Year

OK
Cancel

Distinct data select

The **distinct data select** option ensures duplicate rows are not added to the normalized table. This is achieved by the word **DISTINCT** being added to the source select in the update procedure. The default for this field is off (i.e.: duplicates are not removed).

Include delete before insert

The **include delete before insert** option enables a delete statement to be added to the update procedure before any update or insert statement. This is a particularly useful option for purging old data and for updates based on a source system batch number. If this option is selected, the following dialog is displayed:

Definition for a delete statement before the Normalized table insert

Select the Normalized table column on which the delete will be based. All values in the source table for the selected column will be used to delete the corresponding records in the Normalized table.
The 'Where' clause can be edited, or directly entered.

OK Cancel

Normalized table column: customer_code

Source table: load_customer

Source table column: code (selected from list: address, city, code, name, state)

☐ Issue warning if a delete occurs

☐ Multiple pass delete (smaller transactions)

☐ Truncate table before insert

Delete 'Where' statement

```
WHERE customer.customer_code IN ( SELECT DISTINCT load_customer.code FROM load_customer )
```

Use the wizard to build a where clause for the delete statement. Additional options included in this dialog are:

- Issue warning if a delete occurs
- Multiple pass delete - if this option is chosen, the delete is performed in a loop, 50000 rows at a time, until the required rows have been deleted.
- Truncate table before insert - if this option is chosen, the delete is ignore and the normalized table is truncated.

The default for this field is off (i.e.: a delete statement is not added to the procedure).

Include initial load insert

The **include initial load insert** option adds an additional insert statement to the update procedure that runs if the target normalized table is empty. The benefit of this is improved performance inserting into an empty table without performing any checks to see if rows already exist. The default for this field is off (i.e.: an initial insert statement is not added to the procedure).

Include update statement with/without Minus Select using except/checksum

The **include update statement** option includes an update statement in the procedure to update changing rows in the normalized table. If this option is chosen, then the **Changed rows only** option is available. Choosing this option, displays the **code type** drop down, enabling the generated update statement to use either a sub-select with *except* change detection or *checksum* change detection to work out what rows in the normalized table require updating. If this option is turned off, the update procedure will not contain an update statement. The default for this field is on (i.e.: an update statement is included).

Include insert statement with/without Minus Select using except/checksum

The **include insert statement** option includes an insert statement in the procedure to insert new rows in the normalized table. If this option is chosen, then the **New rows only** option is available. Choosing this option, displays the **code type** drop down, enabling the generated update statement to use either a sub-select with *except* change detection or *checksum* change detection to work out what rows in the source table(s) are new. If this option is turned off, the update procedure will not contain an insert statement. The default for this field is on (i.e.: an insert statement is included).

Update hint.

Enter a database hint to be used in the UPDATE statement.

Note: SQL Server only.

Insert hint.

Enter a database hint to be used in the INSERT statement.

Note: SQL Server only.

Parameters variables

If QAD Data Warehouse Designer parameters exist in the metadata, the following dialog is displayed. Any parameters selected in this dialog (by moving them to the left hand side), are included in the generated update procedure as variables. The procedure will include code to retrieve the value of the parameter at run time and store it in the declared variable.

Select parameters to include in the procedure.

Select parameters to be loaded into variable storage and click 'Add'. When all parameters have been selected click 'OK'

minimum_order_number

BUSINESS_DAYS_IN_MONTH
BUSINESS_DAYS_MTD
CURRENT_CAL_MONTH
CURRENT_CAL_MONTH_NO
CURRENT_CAL_YEAR
CURRENT_DATE
CURRENT_FIN_MONTH
CURRENT_FIN_MONTH_NO
CURRENT_FIN_YEAR
minimum_order_number
PREVIOUS_CAL_MONTH
PREVIOUS_CAL_MONTH_NO
PREVIOUS_CAL_YEAR
PREVIOUS_FIN_MONTH
PREVIOUS_FIN_MONTH_NO
PREVIOUS_FIN_YEAR

<- Add

Remove ->

OK

Cancel

The variables can also be used in column transformations and in the from / where clause for the update procedure. Some databases have a 30 character limit for variable names. QAD Data Warehouse Designer ensures the variables added for any parameters are less than 30 characters long by creating variable names in the form v_ followed by the first 28 characters of the parameter name.

For example, a parameter called MINIMUM_ORDER_NUMBER_SINCE_LAST_SOURCE_LOAD will be available as the variable v_MINIMUM_ORDER_NUMBER_SINCE_L.



TIP: QAD Data Warehouse Designer parameters should be unique within the first 28 characters to avoid conflicting variables names.

See **Parameters** (see "5.2 Parameters" on page 64) for more information on QAD Data Warehouse Designer Parameters

Business Key definition

The define business key dialog will appear asking for the business key that will uniquely identify each normalized table record. The source table from which the normalized table is derived would normally have some form of unique constraint applied. In most cases this will be the business key. In the example below the customer code is selected as the business key.

Define Normalized business key(s)

Select the business keys that uniquely identify each record in the Normalized table.

Move them over to the business key list

Business key list

order_number
order_line_no

<-- Add

Remove -->

Column list

customer_code
dim_customer_key
dim_order_date_key
dim_product_key
dim_ship_date_key
order_date
product_code
quantity
sales_value
ship_date
tax
unit_sale_price

OK

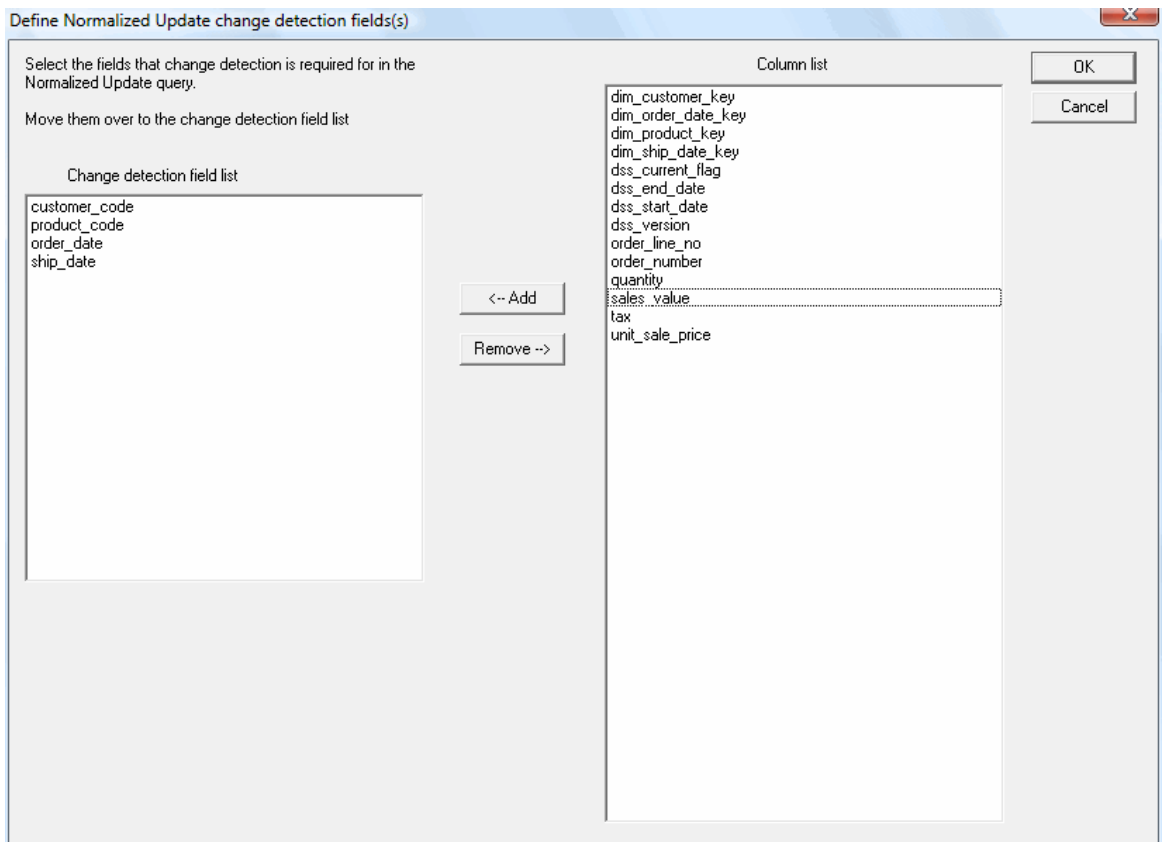
Cancel

A business key can be made up of multiple columns, but it must provide a unique identifier. Where multiple columns separately uniquely identify rows in the normalized table, choose one to act as the primary business key. For example a source table may have a unique constraint on both a product code and a product description. Therefore the description as well as the code must be unique. It is of course possible to combine the two columns, but the normal practice would be to choose the code as the business key.

None of the columns chosen as the business key should ever contain a NULL value. See the note at the start of this chapter.

Change Detection and History Tables

If the normalized table was defined as a history table then the following additional dialogs will appear. Normalized history tables are like slowly changing dimensions. The first dialog requests the selection of the columns to be managed as change detection columns. Select the required columns and click OK to proceed. In the example below the customer name is to be managed as a change detection column.



The following dialog will appear if one or more columns are chosen as change detection columns and if the user possesses a full license, enabling the additional procedure build options.

If one or more columns are chosen as change detection columns but the user only possesses a trial license, thus disabling the additional procedure build options, then the default values shown below will be used and the dialog will not be displayed.

When completed, click OK to continue.

History record settings

Add null support: ☐

Update Current records only: ☒

Please enter the default start and end dates to be used.
Correctly fomatted dates or variables may be used.
Pressing Reset will reset the dates to the default settings.

Reset

Start date for initial member (A):
CAST('01-JAN-1900' AS datetime)

End date for current member (B):
CAST('31-DEC-2999' AS datetime)

Start date for new member entry (C):
CONVERT(datetime,@v_current_date,112)

End date for expiring member entry (D):
CONVERT(datetime,@v_current_date,112)-0.00000005

Business ID	History Field	Start Date	End Date	Version	Current Flag
Project RED	Started	(A)	(D)	1	N
Project RED	Complete	(C)	(B)	2	Y

OK Cancel

Add null support

If the **Add null support** option is selected, then change detect column management will cater for null values in any change detect columns. If this option is not selected, and null values are present, errors may occur running the update procedure. The default for this value is off (i.e.: nulls are not catered for).

Update Current record only

The **Update Current record only** option will only apply changes to non-change detect columns on the **current** record. If this option is not selected, all past (non-current) rows will also be updated to reflect changes to non-change detect columns. The default for this value is on (i.e.: only the current record is updated).

Start date for initial member

The **Start date for initial member** field contains the start date for the first version of a particular business key. The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is 1 January 1900.

End date for current member

The **End date for current member** field contains the end date for the current version (the row with a current flag of Y and the maximum version number) of a particular business key. The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is 31 December 2999.

Start date for new member entry

The **Start date for new member entry** field contains the start date for any subsequent rows added to the history table (not the first row for a particular business key i.e.: not version 1). The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is the current date and time.

End date for expiring member entry

The **End date for expiring member entry** field contains the end date for any rows updated to no longer be the current row in the history table (i.e.: rows that are replaced by a new current row). The value should be specified in an appropriate form, taking into account the default date format in the databases. The date may need to be explicitly cast to the correct data type. The default value provided will usually be cast to the correct datatype and can be treated as a template. The default value for this field is the current date and time less an arbitrary small amount (for SQL Server this is 0.00000005 of a day, or about 4 thousandth of a second).

Reset

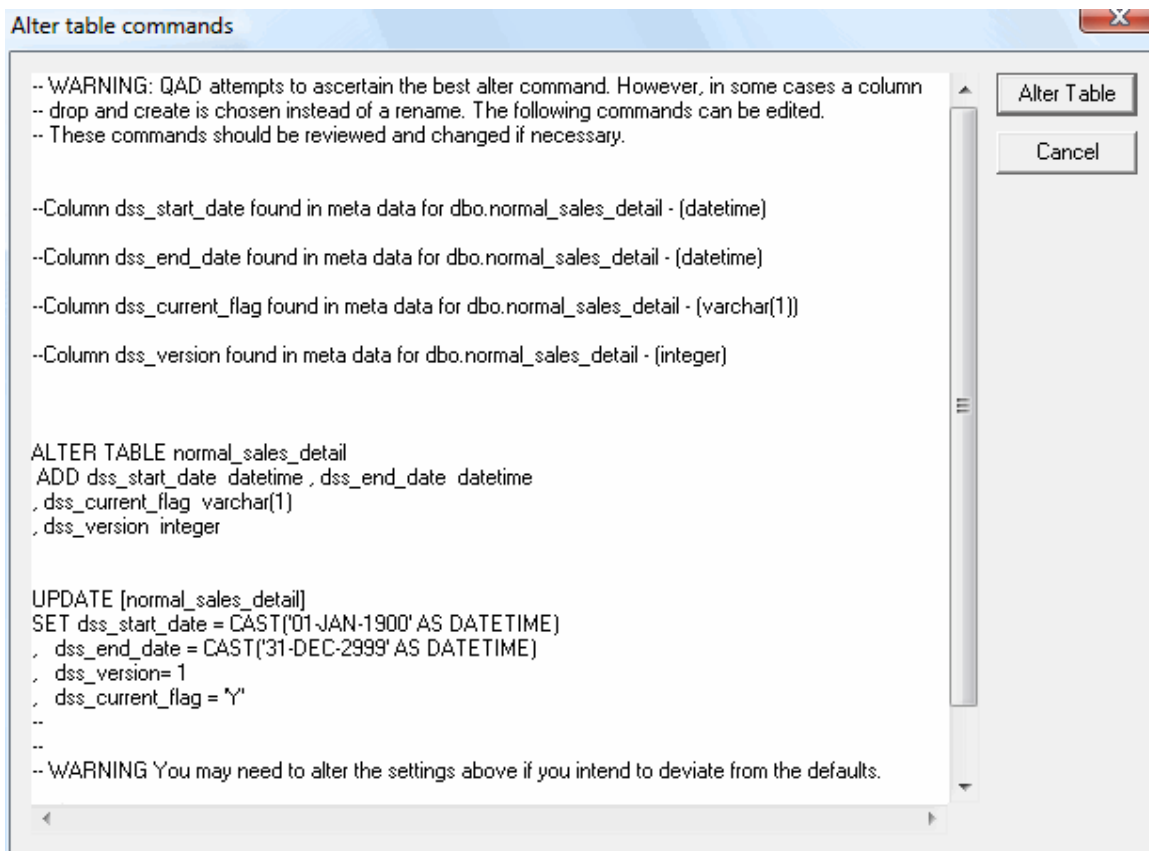
Click on the **Reset** button to return all fields in this dialog to their default values.

Converting an existing Normalized Table to a Normalized History Table

To convert a normalized table to a normalized history table, change the table type to **History**, choose (Build Procedure...) from the Update Procedure drop down list and click OK.

If the existing Normalized table is NOT to be dropped and recreated, then the following process should be followed:

- 1 Click OK on the Procedure Type dialog.
- 2 Click OK on the Business Key dialog.
- 3 Click **Alter** on the Adding Additional Columns dialog.
- 4 Click **Alter Table** on the Alter Table Commands dialog:



Note: The SQL in this dialog can be edited if required.

- 5 Click OK on all remaining dialogs.

Joining multiple source tables, where and group by clauses

Next the Source table mapping dialog appears. This dialog is used to join source tables, add where clauses and specify group by clauses.

The dialog box is titled "Source Table mapping" and contains the following sections:

- Define the joins (or edit the join clause).**

To define a Join select two tables and press the 'Join' button. Then select the join columns from the dropdown lists presented.
- Source Tables:** A list containing "[load_prod_group]" and "[load_prod_subgroup]".
- 'Ansi Join' Clause:** A text area containing the SQL: `FROM [TABLEOWNER].[load_prod_group] load_prod_group
LEFT OUTER JOIN [TABLEOWNER].[load_prod_subgroup] load_prod_subgroup
ON load_prod_group.prod_group = load_prod_subgroup.prod_group`
- 'Where' Clause:** A text area containing the SQL: `WHERE load_prod_group.group_description IS NOT NULL`
- Outer Join / Simple Join:** Two buttons, with "Simple Join" selected.
- Select the columns that join the two tables. Select the column from the master table first.**

Two dropdown menus are shown. The first dropdown (for "[load_prod_group]") has "prod_group" selected. The second dropdown (for "[load_prod_subgroup]") has "prod_group" selected.
- 'Group By' Clause:** A text area containing the SQL: `GROUP BY load_prod_group.group_description`
- Column Selection:** A dropdown menu showing "prod_group", "subgroup", and "subgroup_description", with "prod_group" selected.

Buttons for "OK" and "Cancel" are located in the top right corner.

To join two tables, start by selecting the two tables in the left hand box and then clicking one of the join buttons. The columns for the two tables then appear at the bottom of the dialog and one column is selected from each drop down list to effect the join between the selected tables. In the example above the `load_prod_group` and `load_prod_subgroup` tables are joined by the column `prod_group`. For multiple column joins, repeat the join process.

Simple Join

A simple join only returns rows where data is matched in both tables. So for example if table A has 100 rows and table B has a subset of 24 rows. If all the rows in table B can be joined to table A then 24 rows will be returned. The other 76 rows from table A will not be returned.

Outer Join

The outer join returns all rows in the master table regardless of whether or not they are found in the second table. So if the example above was executed with table A as the master table then 100 rows would be returned. 76 of those rows would have null values for the table B columns.

Note: When QAD Data Warehouse Designer builds up an outer join, it needs to know which table is the master table and which is subordinate. Select the join column from the master table first. In the example screen above the table '`load_prod_group`' has had its column chosen and the column for the table '`load_prod_subgroup`' is currently being chosen. This will result in the '`load_prod_group`' table being defined as the master, as per the example statement above. The results of this example select are that a row will be added containing product information regardless of whether or not a corresponding `prod_subgroup` entry exists.

As the join columns are selected the join statement is built up in the large edit window on the right hand side. Once all joins have been made the contents of this window can be changed if the join statement is not correct. For example the Oracle outer join indicator (+) could be removed if required.

Where Clause

A where clause can be manually added to the where clause field in this dialog.

Group By Clause

A group by clause (and any other clauses that come after the where clause) can be added to the group by clause in this dialog.

Building and Compiling the Procedure

Once the above questions are completed the procedure is built and compiled automatically. If the compile fails an error will be displayed along with the first few lines of error messages. Compile fails typically occur when the physical creation of the table was not done. If the compile fails for some other reason the best approach is to use the procedure editor to edit and compile the procedure. The procedure editor will highlight all the errors within the context of the procedure.

Once the procedure has been successfully compiled it can either be executed interactively or passed to the scheduler.

Indexes

By default a number of indexes will be created to support each normalized table. These indexes will be added once the procedure has been built. An example of the type of indexes created is as follows:

Results	
Object	Message
customer	Table customer created.
customer	Create table customer(code numeric(6), name varchar(45), address varchar(40), city varchar(30), state varchar(2), dss_start_date datetime, dss_end_date datetime, dss_current_flag varchar(1), dss_version integer, dss_update_time datetime) ;
customer	table comment added.
customer	10 column comments added.
customer_A	Create Unique NonClustered Index customer_A on customer(code,dss_current_flag,dss_version)
customer_A	customer_A created
customer	Procedure Completed
customer	1 customer updated. 6 records added. 0 records updated.0 records deleted.

Additional indexes can be added, or these indexes changed. See the chapter on indexes for further details.

12.4 Normalized Table Artificial Keys

By default, normalized tables in QAD Data Warehouse Designer do not have an artificial (surrogate) key. Artificial keys can be added manually. The quickest way to do this is to add an extra column to the normalized table by using either **Add Column** or **Copy Column**. Edit the properties of the new column to have the correct name and order, source table and column, datatype, key type and flags. Specifically:

- The column name and source column name should be the same.
- The source table should be empty.
- The datatype should be:
 - DB2: integer generated by default as identity (start with 1, increment by 1)
 - Oracle: integer
 - SQL Server: integer identity(0,1)

- The key type should be 0.
- Only the numeric and artificial key flags should be set on.

The following example shows a manually added artificial key column:

Column definition

Column Properties | Transformation

Table: customer

Column name: customer_key

Business display name: customer key

Data type: integer identity(0,1)

Format: #,##0

Column order: 10

Nulls: ☐

Numeric: ☒

Additive: ☐

Attribute: ☐

Default Value:

End User Layer Display: ☐

Join: ☐ Manual Join: ☐

Key Type (0,A,B,C,...): 0

Artificial Key: ☒

Primary Business Key: ☐

Note: When the Dimension Join flag is set then the contents of Source column denotes the foreign key. Business definition denotes the join.

Source table:

Source column: customer_key

Business Definition: Generated artificial key

Source strategy: (max 2048 chars.)

The value shown below is loaded in this column for the 'Invalid Join' record. When empty NULL is used.

Zero key value:

Update Update < Update > OK Cancel Apply

The artificial key for a normalized table is set via a sequence in Oracle and an identity column in SQL Server and DB2. This artificial key normally, and by default, starts at one and progresses as far as is required.

A QAD standard for the creation of special rows in the normalized tables is as follows:

Key value	Usage
1 upwards	The standard artificial keys are numbered from 1 upwards, with a new number assigned for each distinct normalized table record.
0	Used as a join to the normalized table when no valid join existed. It is the convention in the QAD generated code that any normalized table business key that either does not exist or does not match is assigned to key 0.

Key value	Usage
-1 through -9	Used for special cases. The most common being where a normalized table is not appropriate for the record. A new key is used rather than 0 as we want to distinguish between records that are invalid and not appropriate.
-10 backward	Pseudo records. In many cases we have to deal with different granularities in our data. For example we may have a table that contains actual sales at a product SKU level and budget information at a product group level. The product table only contains SKU based information. To be able to map the budget records to the same table, we need to create these pseudo keys that relate to product groups. The values -10 and backwards are normally used for such keys.

12.5 Normalized Table Column Properties

Each normalized table column has a set of associated properties. The definition of each property is described below:

If the Column name or Data type is changed for a column then the metadata will differ from the table as recorded in the database. Use the Tools/Validate table create status menu option or the right mouse menu to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the Tools/Validate table create status to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name.

A sample property screen is as follows:

The screenshot shows a 'Column definition' dialog box with the following fields and options:

- Table:** customer
- Column name:** address
- Business display name:** address
- Data type:** varchar(40)
- Format:** (empty)
- Column order:** 30
- Default Value:** (empty)
- Nulls:** ☒
- Numeric:** ☐
- Additive:** ☐
- Attribute:** ☒
- End User Layer Display:** ☒
- Join:** ☐ Manual Join: ☐
- Key Type (0,A,B,C..):** (empty)
- Artificial Key:** ☐
- Primary Business Key:** ☐
- Note:** When the Dimension Join flag is set then the contents of Source column denotes the foreign key. Business definition denotes the join.
- Source table:** load_customer
- Source column:** address
- Business Definition:** The physical shipping address of the customer.

Buttons on the right: Update, Update <, Update >. Buttons at the bottom: OK, Cancel, Apply.

The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics, and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. It does not affect the physical table definition, but rather provides input to the documentation and to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical data types for DB2 are integer, numeric, `char()`, `varchar()` and date. Typical data types for Oracle are integer, number, `char()`, `varchar2()` and date. For SQL Server common types are integer, numeric, `varchar()` and `datetime`. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid. Typically format masks are only used on numeric fields. Example: `#,###0.00`. It is not worth the effort of populating this field unless it can be utilized by the end user tools in use.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the 'Respace order number' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This check box when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column.

Numeric

This check box indicates that the column in question is numeric when set. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Additive

This check box indicates that the column in question is additive when set. This implies that the column can be summed when performing data grouping in a query. This is normally only relevant for fact tables. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Attribute

This checkbox indicates that the column in question is an attribute when set. An attribute is defined as a column that is non factual. For example we may have an order number, or an invoice number stored in the fact table. Such columns are considered attributes, rather than facts. This checkbox is therefore normally only relevant for fact tables. This checkbox does not affect the physical table definition, but rather provides input to the view `ws_admin_v_dim_col` which can be used to assist in the population of an end user tools end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Source table

Indicates the table from which the column was sourced. This source table is normally a load table within the data warehouse. If the column was sourced from multiple tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Source strategy' field. This field is used when generating a procedure to update the normalized table. It is also used in the track back diagrams and in the documentation.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a load table column, which in turn may have been a transformation or the combination of multiple columns. For previous value managed columns the source column is the column in the table whose previous value is being recorded.

Business definition / Source strategy

Normally this field will contain a business definition of the column. Such a definition may be a description of the column from a business user's point of view. This field might additionally contain information on where and how the column was acquired. For example if the column is sourced from multiple tables or is a composite or derived column then this definition would normally describe the process used to populate the column. This field is used in the documentation and is available via the view `ws_admin_v_dim_col`. This field is also stored as a comment against the column in the database.

Default Value

This field contains the default value applied to the column if it is not explicitly specified when the table has data inserted into it.

End User Layer display

This checkbox when set indicates that the column is intended for end user view. If set the documentation will include the column in the glossary and in the user documentation. It is also used to decide what columns appear in the view `ws_admin_v_dim_col`. Typically columns such as the artificial key would not be enabled for end user display.

Join

This checkbox is set by QAD Data Warehouse Designer during the building of the update procedure and should not normally be altered. It indicates that the column in question provides a join to another normalized table. The 'Source table' and 'Source column' fields will provide the other normalized table's side of the join.

Manual Join

This checkbox can be set to change the way the other normalized table is looked up during the update procedure build. Enabling this option allows you to join to the normalized table manually during the procedure build process. The usual dialog for matching the other normalized table business key to a column or columns in the table is not displayed if this option is enabled.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key.
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

This checkbox indicates that the column is the artificial key when set. Only one artificial key is supported. This indicator is set by QAD Data Warehouse Designer during the initial drag and drop creation of a table, and should not normally be altered.

Primary Business Key

This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the normalized table update procedure generation process. This checkbox should not normally be altered.

12.6 Normalized Table Column Transformations

Each normalized table column can have a transformation associated with it. The transformation will be included in the generated procedure and will be executed as part of the procedure update. The transformation must therefore be a valid SQL construct that can be included in a 'Select' statement. For example we could have a transformation of 'load_order_line.qty * 0.125' to calculate a tax column of 12.5%. Click the 'Transformation' tab to enter a transformation.

Note: transformations are only put into effect when the procedure is re-generated.

CHAPTER 13

13. Fact Tables

A Fact Table is normally defined, for our purposes, as a table with facts (measures) and dimensional keys that allow the linking of multiple dimensions. It is normally illustrated in the form of a Star Schema with the central fact table and the outlying dimensions.

The ultimate goal of the Fact Table is to provide business information to the end user community. In many cases, different types of fact table are required to address different end user requirements. For simplicity the different types of fact table will be grouped together under the following headings:

- **Detail** (see "**13.1 Detail Fact Tables**" on page 286)
- **Rollup** (see "**13.2 Rollup or Combined Fact Tables**" on page 288)
- **KPI** (see "**13.3 KPI Fact Tables**" on page 290)
- **Snapshot** (see "**13.4 Snapshot Fact Tables**" on page 300) (essentially a type of Rollup fact table)
- **Slowly Changing** (see "**13.5 Slowly Changing Fact Tables**" on page 300)
- **Partitioned** (see "**13.6 Partitioned Fact Tables**" on page 301)

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13.1 Detail Fact Tables

A detail fact table is normally a transactional table that represents the business data at its lowest level of granularity. In many ways these tables reflect the business processes within the organization. Such fact tables are usually large and are focused on a specified analysis area.

There may be quite a large number of detail fact tables in a data warehouse implementation, of which only a few are used on any regular basis by the end user community. The disadvantage of such fact tables is that they provide isolated pools of information. Although joined by conformed dimensions, it is still often difficult to answer queries across the various analysis areas. They do however provide the ultimate drill down for all information and also the platform on which to build higher level and more complex fact tables. In terms of the time dimension detail fact tables are typically at a daily or even hourly granular level.

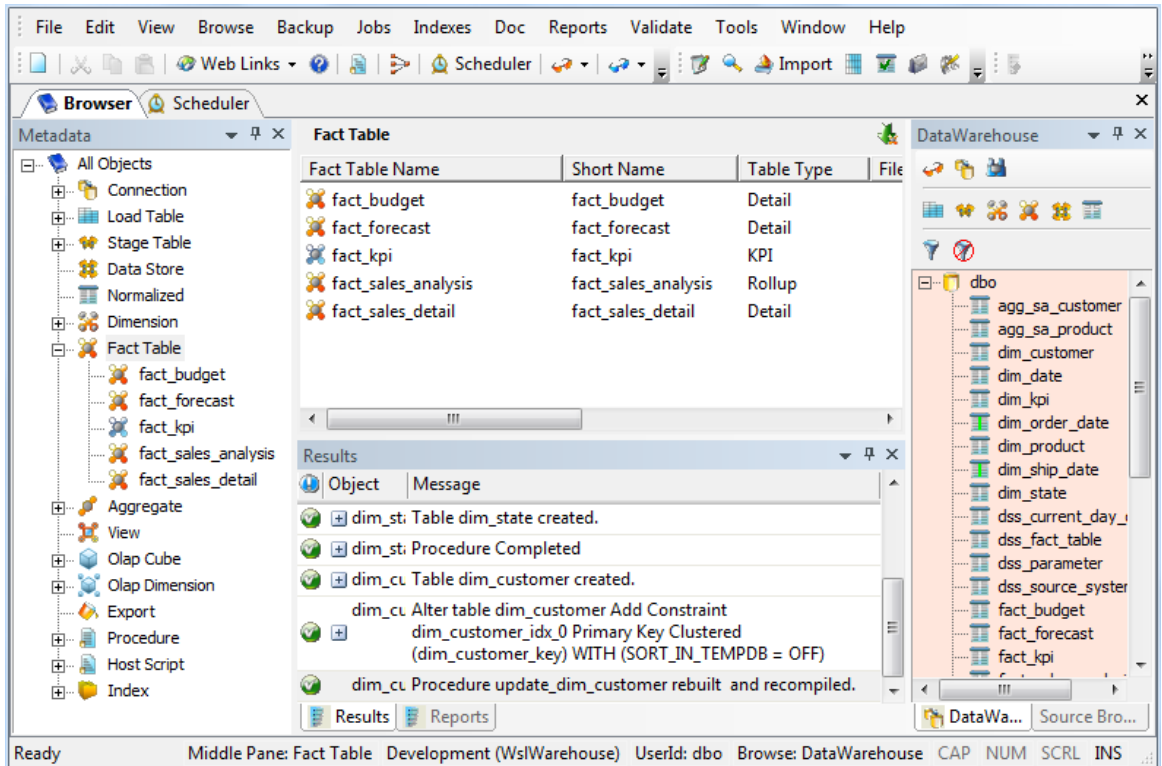
An example of a detail fact table may be the sales, or orders fact tables that have a daily granularity, and show all sales by product, by customer etc. on a given day.

13.1.1 Creating Detail Fact Tables

A detail fact table is typically created by dragging a staging table onto a fact table list.

In the following example screen the fact table list has been produced by double clicking on the Fact Table object group under the Sales project. A list is produced showing the existing two fact tables.

A **fact_forecast** detail fact table can be created by selecting the stage_forecast name in the right hand pane of the browser window, holding down the left mouse button and dragging the table into the middle (fact table list) pane. Once released, the dialog to create the fact table will commence.



When a staging table is dragged into the list window (middle pane) all fact tables are by default *detail fact tables*. If manually creating a table, then the table type can be selected under the Properties of the fact table.

Detail Fact Columns

The columns for a detail fact table are typically those of the staging table. Such fact tables typically contain a wide range of measures and attributes as well as the business keys used to look up the artificial dimension keys. These business keys should be included whenever possible as they provide a means of rebuilding the dimensional link. If size prohibits their inclusion it will probably be necessary to backup or archive all source data to ensure that the fact table can be rebuilt.

These fact tables normally contain a large number of attributes such as dates, which have not been converted to dimensions. Also contained would be information such as order numbers, invoice numbers etc.

See the first tutorial for an example of a fact table creation.

13.2 Rollup or Combined Fact Tables

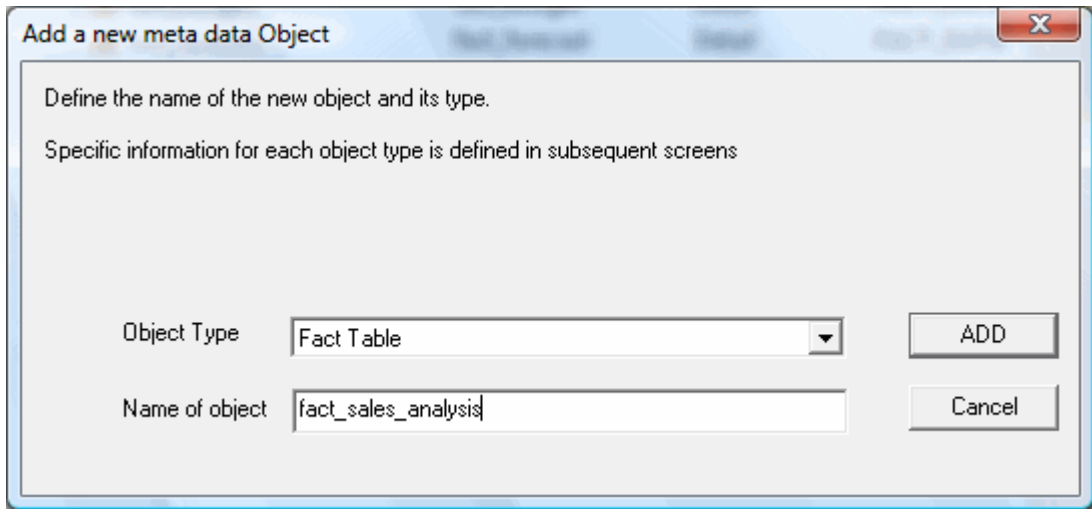
Rollup fact tables are typically the most heavily used fact tables in a data warehouse implementation. They provide a smaller set of information at a higher level of granularity. These fact tables typically have a monthly granularity in the time dimension and reflect figures for the month or month-to-date. They often combine multiple analysis areas (detail fact tables) into one super set of information. This allows simpler comparisons or joining of otherwise isolated pools of information.

An example may be the combination of daily sales, weekly demand forecasts, and monthly budgets, into one rollup fact table. Such a fact table provides the ability to compare monthly or month-to-date sales against budget and forecast.

These rollup/combined fact tables may and often do contain different levels of granularity, as well as different sets of dimensions. For example it may be possible to look at sales and forecasts by promotion, but the budget information does not have a populated promotion dimension, so we will not get a budgeted value for the promotion.

13.2.1 Creating Rollup Fact Tables

A rollup or combined fact table is typically created by dragging a fact table onto a fact table list. In the example screenshot below a double click on the Fact Table object group under the Sales project produced a list in the middle pane showing the existing fact tables. A `fact_sales_analysis` rollup fact table is being created after having selected the `fact_sales_detail` table in the right hand panel, holding down the left mouse button and dragging the table into the middle pane. The initial object create dialog will appear. Note that the name implies that this is a rollup fact table. The name will be changed to the one chosen above. A list of columns is displayed and those not required are deleted (everything except additive measures and dimensions).



Drag and drop additional columns from other fact tables into the middle pane if required. Where columns have the same name these will need to be changed. For example if we acquired a quantity column from `fact_sales_detail` and a column of the same name from `fact_forecast` we may choose to change the names to `actual_quantity` and `forecast_quantity`.

Once all columns have been defined:

- 1 create the table
- 2 edit the properties of the table and request that a new procedure be created.

Once OK is entered the dialog to create a template procedure will commence. Included in this process will be the definition of the date dimension granularity. Monthly rollup is the norm. To just combine fact tables with no rollup select the date dimension key as directed in the dialog. Other forms of dimension rollup will require some alteration to the produced template procedure.

Rollup Fact Columns

The columns for a rollup fact table are typically the dimensions, and only those key measures that are added. For example in the sales world, measures may simply be quantity, kilograms, \$value, `forecast_quantity`, `forecast_$value`, `budget_quantity`, `budget_$value`.

See the second tutorial for an example of rollup fact table creation.

13.3 KPI Fact Tables

Key Performance Indicator (KPI) fact tables share a lot of similarities with the rollup fact tables in that they are typically at a monthly level of granularity and they combine information from multiple detail fact tables. They differ in that they provide specific sets of pre-defined information (KPIs). Such KPIs are often difficult to answer and require the implementation of some form of business rule. Also they often provide pre-calculated *year-to-date*, *same month last year*, and *previous year-to-date* values for easier comparisons. They will have a KPI dimension which provides a list of all the specific statistics or performance indicators we are tracking.

An example from our previous sales examples may be a set of KPIs dealing with customer acquisition and loss. We may have a specific KPI that records the number of new customers during the period and the \$value of their business during that period. Another KPI may record the percentage growth of all customers over the last six months. Another may show the number of customers who closed their accounts in the period, and the value of their business over the preceding 12 months.

KPI fact tables require the specific definition of each KPI.

It is strongly recommended that the KPI tutorial be undertaken. This tutorial will give an understanding of what can be achieved via a KPI fact table.

13.3.1 Creating the KPI Dimension

The KPI dimension essentially provides a record of each KPI or statistic we are tracking. There should be one row in this table for each such element. The KPI fact table requires that this dimension contain at the least an artificial dimension key and a business key. We will refer to the business key as the KPI Identifier.

The following example covers the manual creation of a basic KPI dimension:

- 1 When positioned over the Dimension object group use the right mouse menu and select the 'New Object' menu option.
- 2 Give the new dimension a name for example `dim_kpi`.
- 3 Select a **Normal** dimension and click OK on the properties screen to define the dimension table.
- 4 Position on the dimension name in the left hand pane and using the right mouse menu to 'Add Column', add the three columns defined in the following table.

Field	Column 1	Column 2	Column 3
Column Name	<code>dim_kpi_key</code>	<code>kpi_identifier</code>	<code>kpi_name</code>
Business display	kpi artificial key	kpi unique id	kpi name
Datatype			
- Oracle	integer	<code>varchar2(12)</code>	<code>varchar2(256)</code>
- SQL Server / DB2	integer	<code>varchar(12)</code>	<code>varchar(256)</code>
Nulls	Clear	Clear	Checked
Key Type	0	A	Clear
Artificial Key	Checked	Clear	Clear

Field	Column 1	Column 2	Column 3
Primary Business	Clear	Checked	Clear

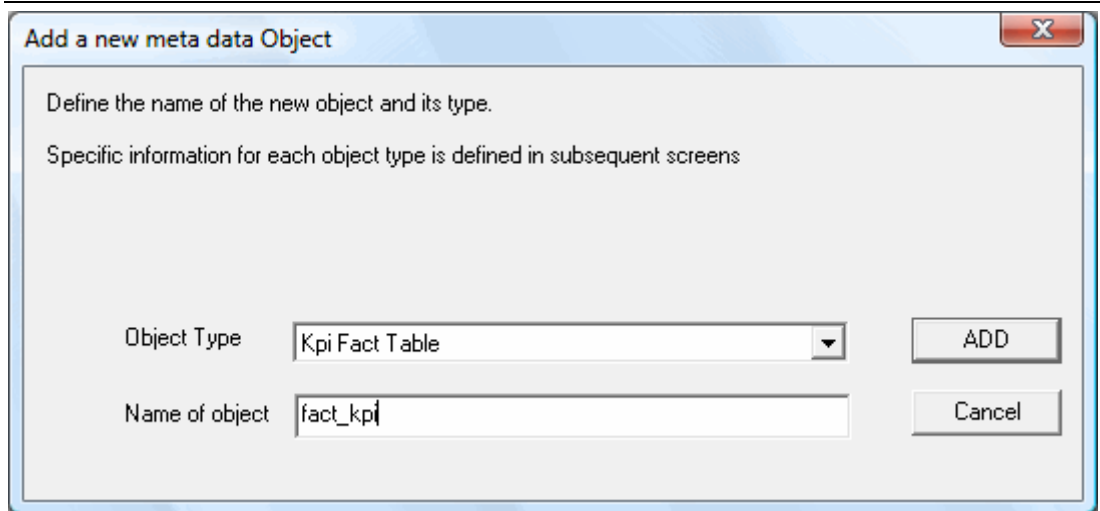
The first two columns are required, and should be set up as shown above, although a different data type can be used for the second column, and the names can be chosen to suit the requirements.

13.3.2 Creating KPI Fact Tables

A KPI fact table is normally created manually.

- 1 Position the cursor on the Fact Table object group. Use the right mouse button to display a menu.
- 2 Select the New Object option. A dialog displays as shown below.

Note: The default object type is **Fact Table**. This must be changed to **KPI Fact Table** and a table name entered. For example:



Add a new meta data Object

Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens

Object Type: Kpi Fact Table

Name of object: fact_kpi

Buttons: ADD, Cancel

Adding columns

Once created the KPI fact table will need to have columns added. New columns can be added by dragging columns from the browser window, or manually adding from the right mouse menu. Dimension keys should normally be dragged to ensure that all the properties are correctly set.

The columns for a KPI fact table are typically the dimensions and generic measures. For example valid measures could be `kpi_count`, `kpi_quantity` and `kpi_value`. The interpretation of these measures will depend on the KPI or group of KPIs being queried. As with the rollup fact table it is normal and desirable to keep the number of measures as small as possible. Attributes should not be included in these fact tables. These measures must allow Null values for the generated update procedure to function correctly.

Notes:

1. The kpi measure column order is important. For example if we have mtd count, quantity and value in that order then the prev month, prev ytd and ytd figures also need count first followed by quantity and finally value. If this order is not adhered to then the generated procedure will load the wrong values into the wrong columns.
 2. A kpi fact table should also have the column `dss_update_time` added. This column is required if this kpi table is to be used to populate higher level fact tables, aggregates or cubes. This column should be populated with the current date time whenever the particular row is updated.
-

13.3.3 Setup of KPI Fact Tables

The set-up of a KPI fact table is somewhat more complex than the other types of fact table. Once all columns have been defined the following steps need to be taken:

- 1 Create and populate a KPI dimension that provides at least an id (unique identifier) for each KPI and a description. The key from this dimension must be one of the columns in the fact table.
- 2 Physically create the KPI fact table in the database once all columns including the KPI dimension key have been added.
- 3 Define the column type and default value for ALL columns in the table. There must be at least one date dimension key and one KPI dimension key. These attributes are set by selecting a column and modifying its properties.
- 4 Create the update procedure for the fact table.
- 5 Set-up each individual KPI.

13.3.3.1 KPI Setup

KPI Dimension

The KPI dimension provides a means of selecting a specific KPI. This dimension needs to be built in advance of the KPI fact table. It does not need to be populated, as the KPI fact table will add entries to this table as required. A key and some form of unique identifier for the KPI is required, e.g, they may be numbered or given short names.

Create the KPI Fact Table

Using the right mouse menu when positioned on the KPI table name select Create/Recreate to physically create the table in the database.

Defining column types and default values

- 1 List all the columns for the KPI fact table.
- 2 Amend the properties for each column. The column types can be one of the following:

Type	Description
Dimension Key	Any dimension that is not the time or KPI dimension
Time Dimension Key	Time dimension key
KPI Dimension Key	KPI dimension key
Month-to-date Measure	Used to identify the normal KPI measures. These are calculated to populate the KPI during each run.
Year-to-date Measure	Used to identify year-to-date measures for the KPI. Optionally calculated or derived from existing rows and measures in the KPI fact table.
Last year same month Measure	Used to identify measures for same month last year comparisons. Derived from existing rows and measures in the KPI fact table.
Previous year-to-date Measure	Used to identify previous year-to-date measures. Derived from existing rows and measures in the KPI fact table.
Fact Table Key	Not normally used
Date	Not normally used
Attribute	Not normally used
Measure	Not normally used



TIP: If an **Attribute** or **Measure** column is specified then this column will just be set to its default value. In this way an update_time column can be set by making its default value sysdate.

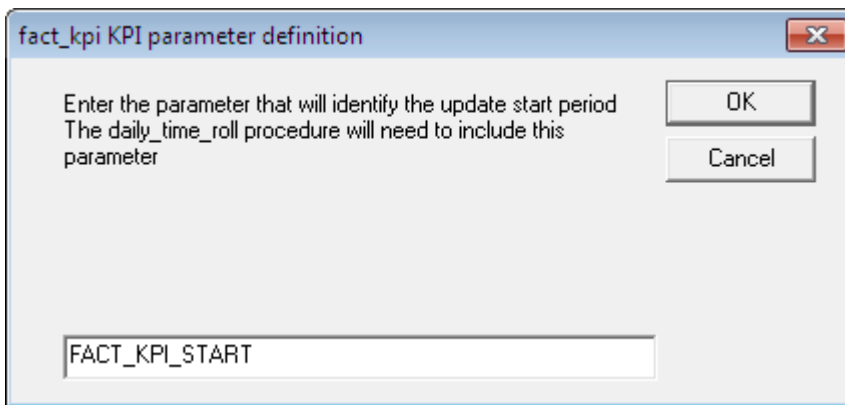
- 1 For each column set a default value.
 - For measures and dimension keys this would normally be zero (0). Nulls can be represented as two single quotation marks, i.e, ''

- `sysdate` can be used for a default date value
- These default values populate the columns where and when no other information is available. For example if a KPI only makes use of 4 of the 6 dimensions available then the remaining 2 dimensions will be set to their default values.

Create the 'Update' procedure

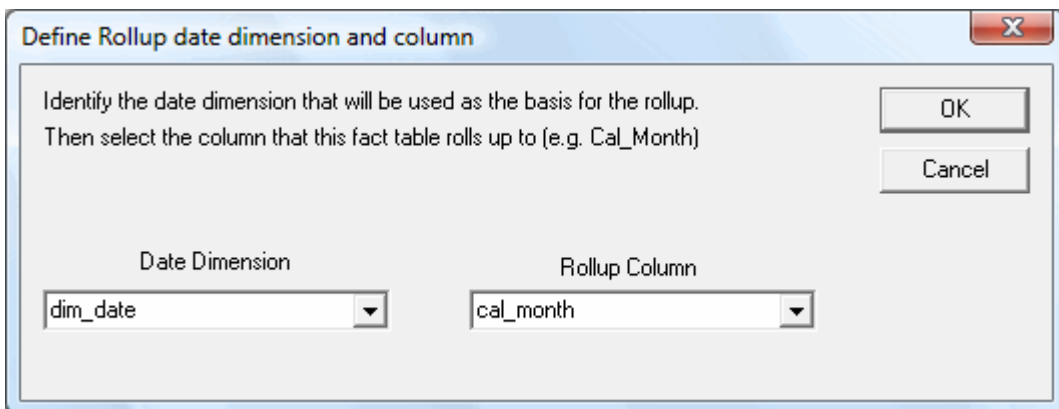
Right mouse on the KPI fact table name and select 'Properties'. In the Properties dialog box set the update procedure list to the (Build Procedure...) option. When OK is entered this will initiate a series of dialogs to create a procedure used to update the kpi fact table.

This first two dialogs ask for parameter names to define the start and end periods for which the KPIs will be updated. The default naming convention is `fact_table_name_START` and `fact_table_name_END`. Accept these default names if possible. These two parameters will need to be created, and will need to be updated once the KPIs have been defined and tested. Under normal operation these parameters should probably be set daily from the `daily_time_roll` procedure.



A dialog box titled "fact_kpi KPI parameter definition" with a close button (X) in the top right corner. The main text area contains the instruction: "Enter the parameter that will identify the update start period. The daily_time_roll procedure will need to include this parameter". To the right of the text are "OK" and "Cancel" buttons. At the bottom, there is a text input field containing the value "FACT_KPI_START".

The date dimension and column for rollup is required. Normally this would be `cal_month` or `fin_month`. This is based on the assumption that most KPIs are monthly or annual. Subsequently a rollup year and date will be required from the same date dimension.



A dialog box titled "Define Rollup date dimension and column" with a close button (X) in the top right corner. The main text area contains the instruction: "Identify the date dimension that will be used as the basis for the rollup. Then select the column that this fact table rolls up to (e.g. Cal_Month)". To the right of the text are "OK" and "Cancel" buttons. Below the text, there are two dropdown menus. The first is labeled "Date Dimension" and has "dim_date" selected. The second is labeled "Rollup Column" and has "cal_month" selected.

The KPI dimension is required. Also the identifier column (not the key) that uniquely identifies the KPI. This would normally be a number or short name (max 64 chars).

Select the KPI dimension and identifier

Select the KPI dimension, and the column that provides the identifier for the KPI

KPI Dimension: dim_kpi

KPI Identifier: kpi_identifier

OK Cancel

The procedure is then created and compiled.

Define each KPI

Once the procedure has successfully compiled we are ready to start setting up each of the KPIs. Right mouse on the KPI table name to get the popup menu. This menu is similar to the other fact table menus except for the additional options to display and add KPIs. A display of the KPIs will list any KPIs that are currently defined. The result set is as appears below:

KPI list for fact_kpi				
Id	Name	Active	Method	Description
Activity	Customer activity (counts and value)	Enabled	Statement	Provides a count of active customers in a pa
Sales	Customer sales (quantity and value)	Enabled	Statement	Provides a count and dollar value of sales in

The 'Id' is the same unique identifier that will be found in the kpi dimension. The Name is a name entered in the properties of the KPI and does not relate to the dimension in any way. The Active flag indicates if the KPI will be processed when the 'Update' or 'Process' menu options are selected. Each KPI can be defined as a SQL Statement, a Procedural Block or a Procedure. The current method used to update the KPI is one of these three and is displayed under Method. The description is a comment or description field entered in the properties of the KPI and in no way relates in the KPI dimension.

A right mouse button anywhere in the List Window will allow a KPI add. If a right mouse button is depressed while positioned over the 'Id' then a menu popup will provide options to copy, modify, delete, add and view the KPI statement.

When the add KPI option is selected a properties window will appear, as shown below. The id and name fields are required. If the active button is checked the procedure will be enabled for update.

The 'Select Columns' button allows the selection of the columns that this KPI will update during the month to date update pass. The date and KPI dimensions will be updated for you so are not provided as choices. The only choices provided are the 'Month to date measures' and the other 'Dimensions'. Select those measures and dimensions that will be updated. All non selected measures and dimensions will be set to their default values. The resultant choice is shown in the Update Columns window. This window should only be updated via the 'Select Columns' button.

KPI definition

Properties | Mtd Statement | Ytd Statement | Procedural Block

KPI Identifier: Activity

KPI Name: Customer activity (counts and value)

Active: ☒

Description: Provides a count of active customers in a particular month, together with total sales

Month to Date Update columns: mtd_quantity, mtd_sales
Select Columns

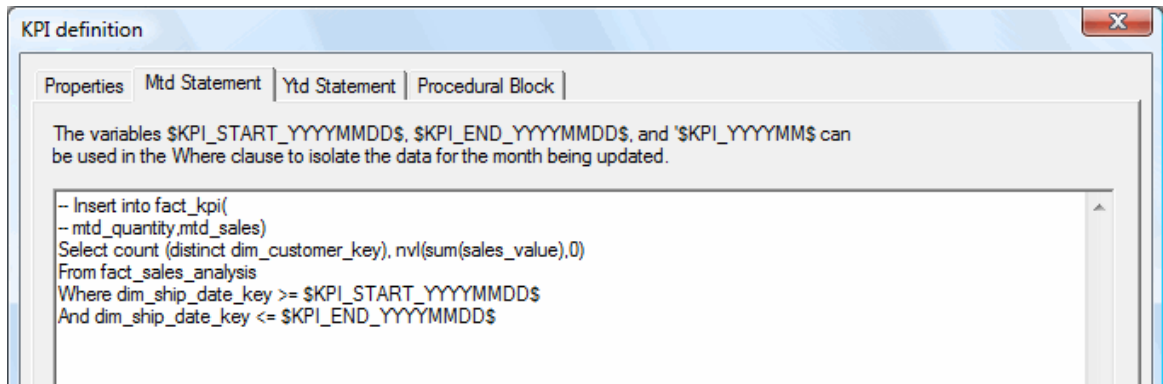
Year to Date Update columns: ytd_quantity, ytd_sales
Select YTD Cols

OK Cancel Apply

Once these initial values are defined the 'Statement' tab can be selected to define the update SQL statement. If a procedural block or procedure is required for the update (i.e. too complex for a single SQL statement) then select the Procedural Block tab.

The KPI Statement

The 'Statement' tab presents an edit window that allows the input of a select statement that will return the values for the columns being updated. It must return the values for the columns selected in the properties tab in the order shown in the 'Update Columns' window. An example of a completed Oracle KPI statement follows:



The first two lines are comments inserted (when modifying) to provide a reminder of the columns and order required by the select statement. Anything prior to the initial select statement is ignored.

The statement must make use of at least one of the variables provided to select the appropriate period. This variable will be replaced with the values for the period being updated at run time. These values are derived from the start and end parameters defined for the KPI fact table.

In order to group by the non selected columns and any attributes etc. QAD Data Warehouse Designer must be able to break this statement into its component Select, From, Where, Group By, and Having components (where present). If a complex statement is used that has more than one of these key words then the primary one must be in UPPER case. For example if a sub query is being used then the main SELECT and FROM key words must be in upper case and must be the only occurrence of these key words in uppercase. QAD Data Warehouse Designer will check and issue a warning if it is unable to resolve the main key words.

To facilitate the testing of a statement there is a 'View statement' option when you right mouse button on the KPI Id. This will provide a window with the full statement with the default columns inserted and the parameters converted. This statement can be cut and run in Sql Admin (shipped with QAD Data Warehouse Designer) or in a database specific utility for testing.

Procedural Block

The 'Procedural Block' tab presents an edit window that allows the input of an Oracle anonymous block. If there is anything in this window it will be actioned instead of the statement. A button in the lower right allows a rudimentary template block to be built. If used this block must do the actual insert statement rather than just the select. It must also handle ALL dimension, month to date measure and non standard columns. In addition, it will need to put default values in columns not actively being updated. The KPI dimension and date dimension keys must also be updated. The output from a 'View Statement' option for another KPI will give an indication of what the block must do. The same month last year, year to date and previous year to date measures will still be handled automatically. The same \$KPI_ variables as shown above the statement edit window can and must be used.

Procedure

If for some reason it is not possible to implement the KPI in either the statement or procedural block then a procedure may be created. The name of such a procedure can be entered in the window at the bottom of the Procedural Block tab. If any value is in this window then the procedure will take precedence over both the statement and block.

This procedure must adhere to the standard set of parameters as with all other procedures to be executed by the scheduler. It must undertake the same tasks as defined above in the Procedural Block section, and as with those tasks it does not need to set the year to date, last year same month and previous year to date values.

Copying KPIs

By choosing 'copy kpi' from the right mouse popup menu when positioned over a KPI 'Id' an exact duplicate of the KPI will be inserted. This copy can then have its Id and Name changed along with its statement to create a new KPI. This is particularly useful when only small differences exist between a number of KPIs.

Testing / Development.

During testing it would be normal to DISABLE all KPIs except the one currently being developed. In this way the update or process options will only utilize that KPI. As mentioned above the 'View Statement' option of the KPI popup menu displays, and allows the cutting of, the statement that will be executed to acquire the KPI information. This statement can be tested in sql*plus or some other environment if problems are encountered.

13.4 Snapshot Fact Tables

Snapshot fact tables provide an 'as at' view of some part of the business. They always have a time dimension that represents the 'as at' date. For example, we may have a weekly or monthly snapshot of our inventory information. Such a snapshot would allow us to see what inventory we had at a particular point in time, and allow us to compare our holdings over time. Snapshots are often used when dealing with people profiles or client/customer profiles to enable us to view the state of our relationship with an entity at a given point in time, e.g, to see a monthly trend of a client's outstanding balance.

13.4.1 Creating Snapshot Fact Tables

The creation of snapshot fact tables is very dependent on the method used to create the snapshot. In some cases they may be created in exactly the same way as detail fact tables. Such cases are typically where the OLTP application provides the 'as at' state. For example an inventory system may provide a weekly stock take table which is the basis for our snapshot fact table. In such cases the table is created as per a detail fact table, but with additional tailoring around the time dimension. In other situations the snapshot is built from an existing transactional fact table, where all information up to a specific date is summarized or frozen to create the snapshot. In these instances the snapshot can be created as a rollup fact table. Regardless of whether a detail or rollup method is used for the creation of the snapshot table, a significant amount of work will be required to tailor the update procedure to reflect the particular requirements of the snapshot table.

Snapshot Fact Columns

The columns for a snapshot fact table vary to a large degree. A date dimension is always present to reflect the 'as at' date. Some snapshots may have a large number of measures reflecting \$values quantities etc, whereas others may be rich in attribute (non additive) facts.

13.5 Slowly Changing Fact Tables

Slowly changing fact tables provide a complete history of changes for some part of the business. Typically such fact tables are used for situations where a relatively small number of changes occur over time, but we need to track all of these changes. A good example is an inventory stock holding that does not change very often. In such a case a slowly changing fact table can record both the current inventory levels as well as providing a means of seeing the state of inventory holdings at any point in time.

13.5.1 Creating Slowly Changing Fact Tables

QAD Data Warehouse Designer does not provide any automated way for creating a slowly changing fact table. The best method is to proceed as follows.

- 1 Drag and drop the stage table into a dimension target and create a dummy slowly changing dimension with the name we will be using for our fact table. (i.e. fact_...).
- 2 Answer the questions to the pop-up dialog boxes. Select a join if asked, but do not bother to join any of the tables. Select the columns to be managed as slowly changing. Normally these will be the measures such as quantity and all of the dimension keys. The generated procedure will fail to compile.
- 3 Inspect the additional columns added for the dimension and make a note of them. Specifically dss_end_date, dss_start_date, dss_current_flag and dss_version.
- 4 Inspect the indexes created to help manage the slowly changing dimension and make a note of their columns.
- 5 Delete the dummy dimension you have created.
- 6 Delete the get_..._key procedure created for the dimension. Do not delete the update procedure.
- 7 Create a detail fact table in the normal manner.
- 8 Add in the special columns as created for the dimension. Namely dss_end_date, dss_start_date, dss_current_flag and dss_version.
- 9 Recreate the table
- 10 Create indexes as per the dimension table to help maintain the slowly changing fact table.
- 11 Modify the update procedure for the fact table. Bring up the old version of the procedure that was created for the dimension of the same name. This will have been automatically versioned out when the latest procedure was created and can be seen through the procedure viewer.
- 12 This new procedure will need to merge the code from the old procedure, which will provide a guide in how to build the code for a slowly changing fact table.

13.6 Partitioned Fact Tables

Partitioned fact tables are normally used for performance reasons. They allow us to break a large fact table into a number of smaller tables (partitions).

Note: Partitioned fact tables are not directly supported in SQL Server 2000. A view must be created over a number of tables to create the concept of a logical partitioned fact table.

QAD Data Warehouse Designer supports partitioned fact tables. The following section explains their creation and support.

13.6.1 Creating a Partitioned Fact Table in SQL Server

In QAD Data Warehouse Designer a partitioned fact table can only be created from an existing fact table. The process therefore is to create a fact table normally, including the update procedure and indexes. The table type is then changed to a partitioned table type and QAD Data Warehouse Designer will assist in creating the exchange table, modifying the indexes and building the procedure to handle the update of the partitions.

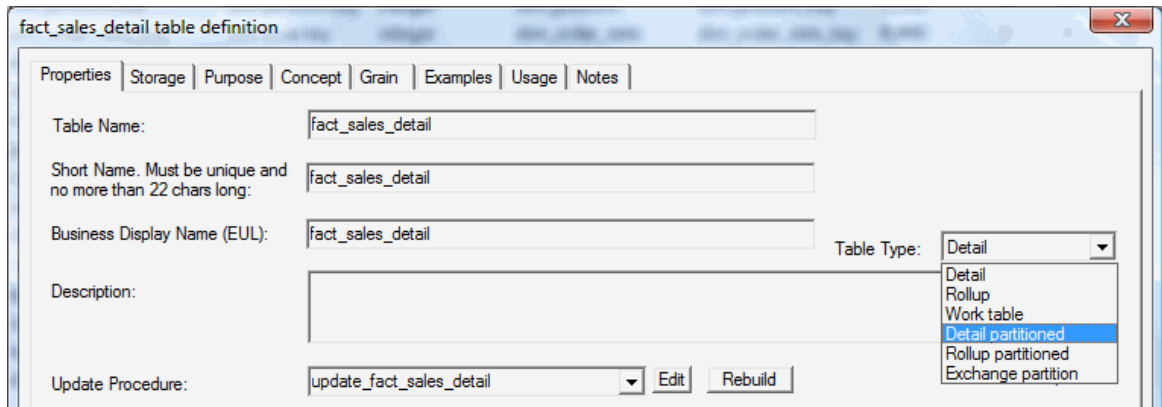
Note: Partitioned fact tables are not directly supported in SQL Server 2000. A view must be created over a number of tables to create the concept of a logical partitioned fact table.

Create a detail or rollup/combined fact table

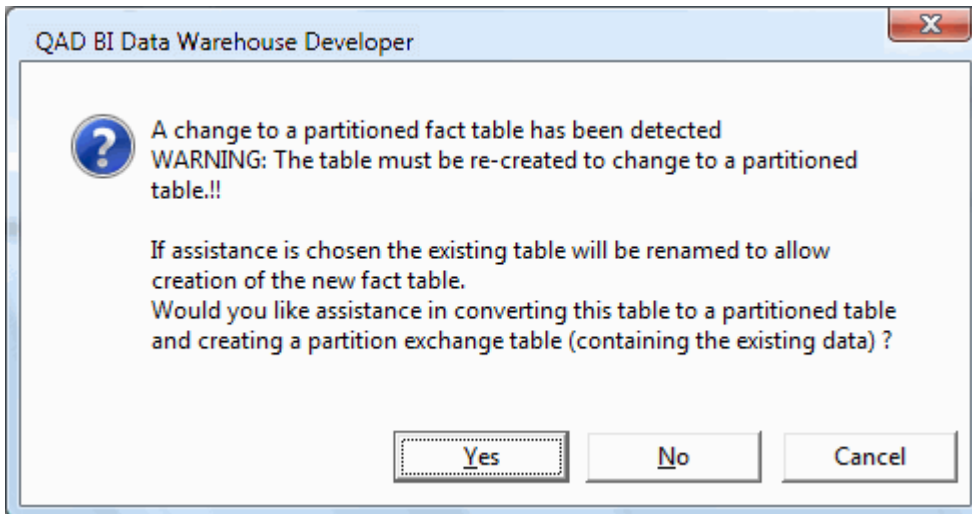
Create the fact table that you wish to partition in the normal way. You must create an update procedure but do not need to load any data. The process of creating the update procedure will also build any indexes for the fact table. We will be using a partition exchange table to move data to and from the partitioned fact table. This exchange table must have the same columns, column order and indexes as the fact table. It is therefore well worth getting the fact table into its final form before partitioning it. Add any indexes to avoid extra work later.

Convert to a partitioned fact table.

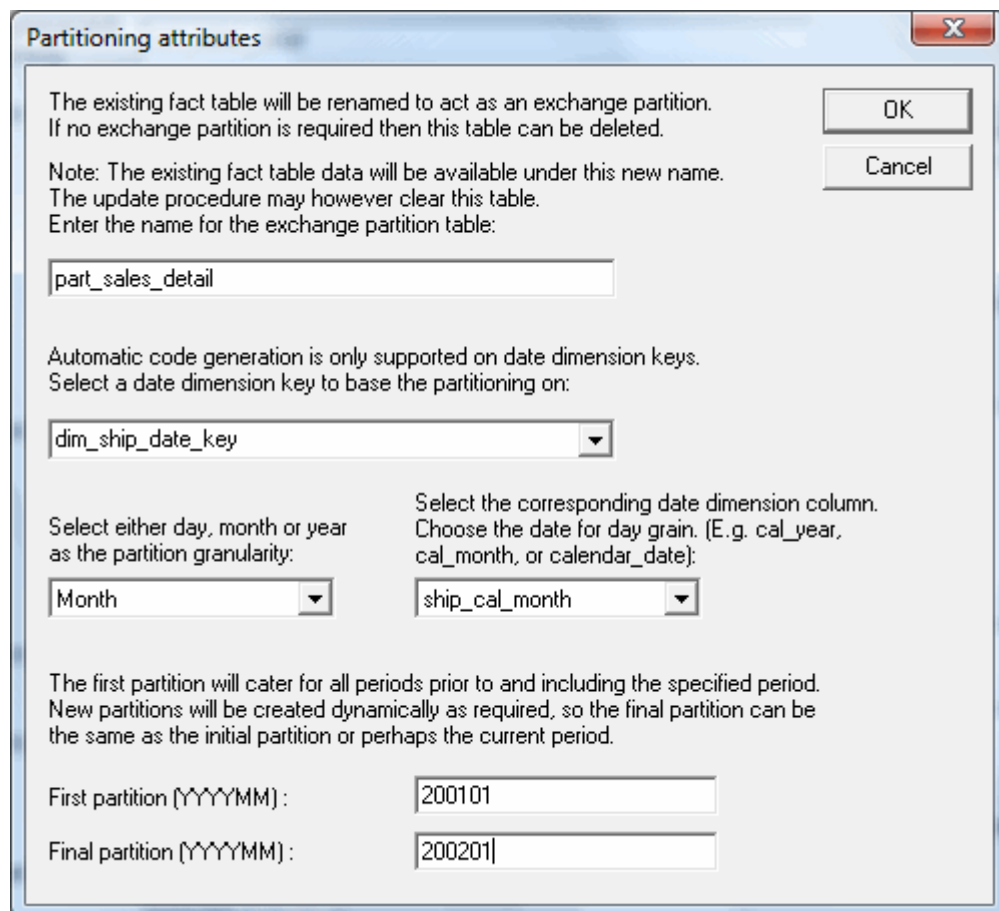
Edit the properties of the fact table to be converted and change the table type to either 'Detail partitioned' or 'Rollup partitioned'. See example below. These two options reflect two different methodologies in the updating of a partitioned fact table. The first (Detail) method moves a partition from the fact table into the exchange table. The data in the exchange table is then updated with any changes or additions. When the update process has completed the exchange table data is moved back into position in the fact table. During the update process the partition in the fact table will be empty. The second (Rollup) method builds all information for a period in the exchange table. The exchange table is then used to replace the relevant period in the fact table. The fact table remains in a queryable state throughout the process.



A dialog will pop-up as follows, asking for confirmation that the table is to be converted to a partitioned fact table. If 'yes' is chosen then the existing fact table will be renamed to become the partition exchange table. Any current data will remain in this table.



The parameters for the partitioned fact table are then prompted for:



Partitioning attributes

The existing fact table will be renamed to act as an exchange partition.
If no exchange partition is required then this table can be deleted.

Note: The existing fact table data will be available under this new name.
The update procedure may however clear this table.
Enter the name for the exchange partition table:

Automatic code generation is only supported on date dimension keys.
Select a date dimension key to base the partitioning on:

Select either day, month or year as the partition granularity:

Select the corresponding date dimension column.
Choose the date for day grain. (E.g. cal_year, cal_month, or calendar_date):

The first partition will cater for all periods prior to and including the specified period.
New partitions will be created dynamically as required, so the final partition can be the same as the initial partition or perhaps the current period.

First partition (YYYYMM):

Final partition (YYYYMM):

OK Cancel

The partition exchange table name is prompted for. This table is identical to the fact table and is used to swap partitions to and from the fact table. Select a name that indicates that the table is not a fact table as such.

The fact table will be partitioned by the date dimension key. You need to specify the date dimension key that will be used as the basis for the partitioning of the fact table. It is assumed that this key has the standard QAD format of YYYYMMDD.

A partition granularity of day, month or year must then be selected along with the corresponding column in the date dimension. For a daily partition a column with a date data type must be chosen. The date dimension key will actually be used for the partitioning but the date column is required. For a monthly partition a column with the format YYYYMM must be chosen. In the standard QAD date dimension this is the column cal_month. For a yearly partition a column with the format YYYY must be chosen. In the standard QAD date dimension this is the column cal_year.

The first and last partition should then be selected. The last partition is not that important as additional partitions will be created as required. Normally just select a partition a few on from the first. The first partition is however important as any data that is dated prior to the first partition will be loaded into this first partition. The partition must be entered in the format shown. For example monthly partitions require the format YYYYMM.

Once the OK button is clicked the conversion process will populate the 'table properties clauses' field of the tables properties. Note that this field is limited in size, so if too many partitions are chosen only the first few will be added to this field. The other partitions will be created dynamically by the update procedure.

fact_sales_detail table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name: fact_sales_detail

Short Name. Must be unique and no more than 22 chars long: fact_sales_detail

Business Display Name (EUL): fact_sales_detail

Table Type: Detail partitioned

Description:

Update Procedure: update_fact_sales_detail Edit Rebuild Cursor Based Update

Custom Procedure:

Table Properties clauses:
(e.g. Partition)

Partition Function command:
create partition function function_part_sales_detail(int) as range left for values
(20010131,20010231,20010331,20010431,20010531,20010631,20010731,20010831,20010931,20011031)

Partition Scheme command:
create partition scheme scheme_part_sales_detail as partition function_part_sales_detail all to ((PRIMARY))

Get Key Function:

Mnemonic (EUL):

Date table structure last updated: 2006-01-05 14:05:43.000

Date created in database: 2008-06-13 15:06:47.400

Date last updated in database: 2008-06-13 15:06:47.400

OK Cancel Apply

Click the OK button on the table properties dialog to begin the process of converting the fact table, creating the new fact table and building the new update procedure. Examine the results screen to see what has been done.

The partition table will now have any current data, to populate the fact table, copy the data from partition table to the fact table, drop and recreate fact index. The date dimension key used to base the partitioning on is not allowed to have nulls. QAD Data Warehouse Designer has modified the table property, however the partition table needs to be validated and recreated to be valid. Now the fact table can be processed.

The partitioned fact table update procedure

The generated procedure will handle the creation of new partitions as required. Any data for periods prior to the first partition is placed in the first partition. If data is received for a period after the last partition then new partitions are created. Empty partitions are created if necessary to skip periods where no data is present. For example, if we have a table partitioned by month and the latest partition is 200204 (april/2002). If data is then received for say september 2002 the update procedure will build partitions for may, june, july, august and september. There is a variable at the start of the update procedure called `v_max_skip_periods`. This variable is by default set to 12. This defines the maximum number of continuous partitions we will leave empty. From our previous example if our latest partition was april 2002 and we received data for july 2003 with no interim data then the update procedure will fail as it would have to skip 14 partitions. This check is present to prevent erroneous data from creating hundreds of partitions into the future.

13.6.2 Creating a Partitioned Fact Table in Oracle

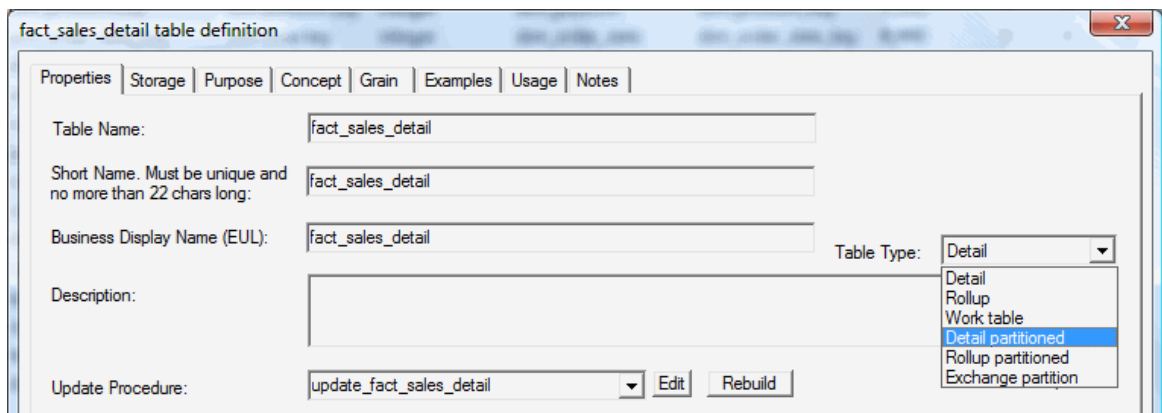
In QAD Data Warehouse Designer a partitioned fact table can only be created from an existing fact table. The process therefore is to create a fact table normally, including the update procedure and indexes. The table type is then changed to a partitioned table type and QAD Data Warehouse Designer will assist in creating the exchange table, modifying the indexes and building the procedure to handle the update of the partitions.

Create a detail or rollup/combined fact table

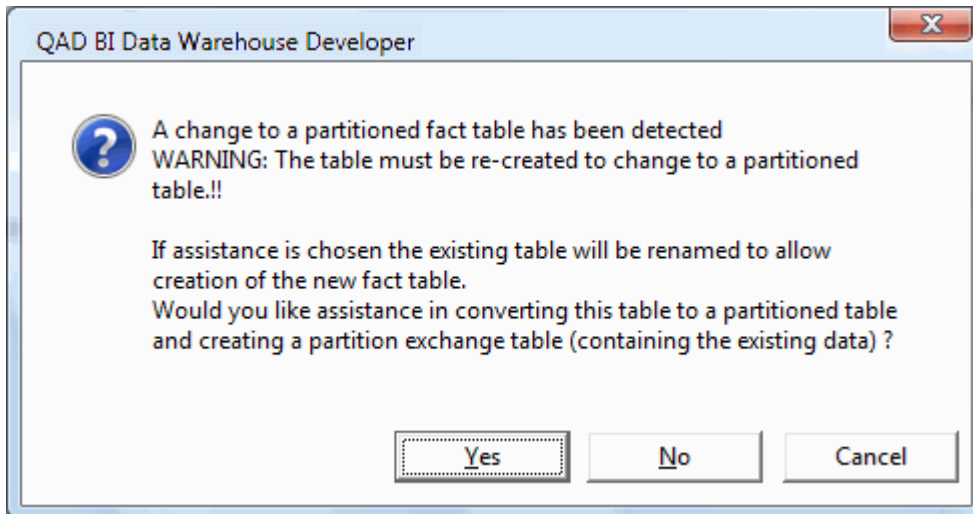
Create the fact table that you wish to partition in the normal way. You must create an update procedure but do not need to load any data. The process of creating the update procedure will also build any indexes for the fact table. We will be using a partition exchange table to move data to and from the partitioned fact table. This exchange table must have the same columns, column order and indexes as the fact table. It is therefore well worth getting the fact table into its final form before partitioning it. Add any indexes to avoid extra work later.

Convert to a partitioned fact table.

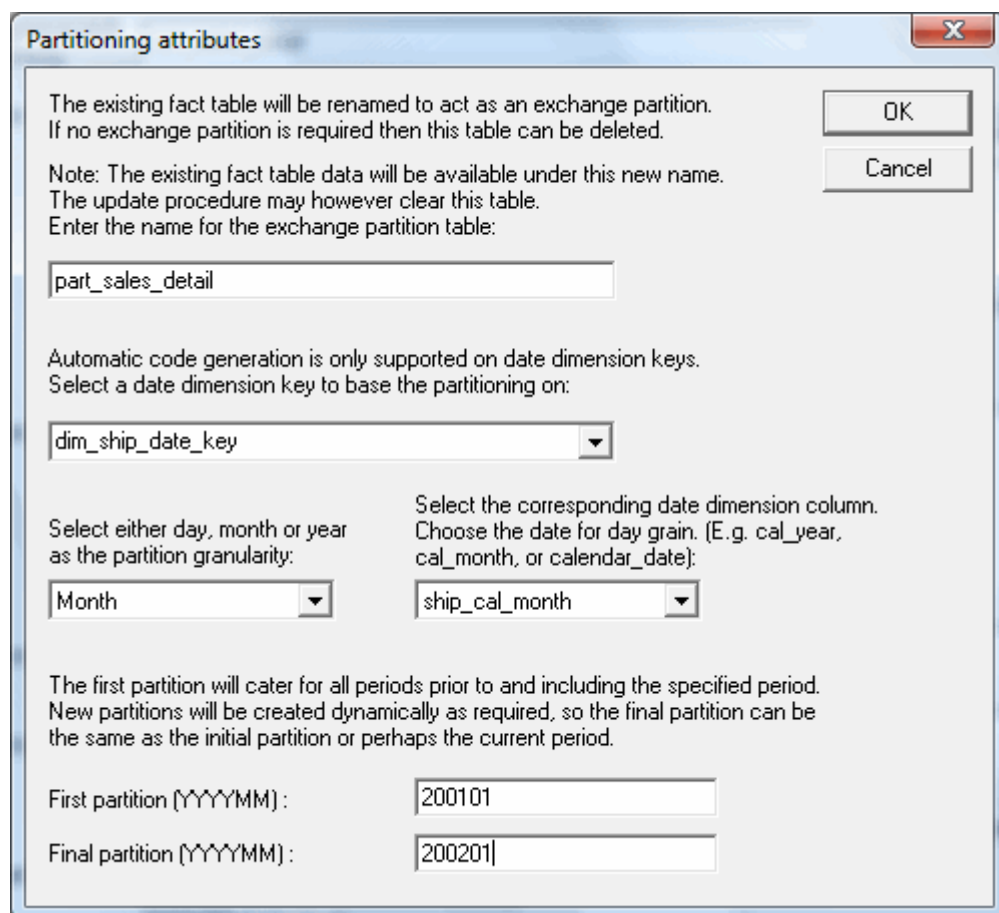
Edit the properties of the fact table to be converted and change the table type to either 'Detail partitioned' or 'Rollup partitioned'. See example below. These two options reflect two different methodologies in the updating of a partitioned fact table. The first (Detail) method moves a partition from the fact table into the exchange table. The data in the exchange table is then updated with any changes or additions. When the update process has completed the exchange table data is moved back into position in the fact table. During the update process the partition in the fact table will be empty. The second (Rollup) method builds all information for a period in the exchange table. The exchange table is then used to replace the relevant period in the fact table. The fact table remains in a queryable state throughout the process.



A dialog will pop-up as follows, asking for confirmation that the table is to be converted to a partitioned fact table. If 'yes' is chosen then the existing fact table will be renamed to become the partition exchange table. Any current data will remain in this table.



The parameters for the partitioned fact table are then prompted for:



Partitioning attributes

The existing fact table will be renamed to act as an exchange partition.
If no exchange partition is required then this table can be deleted.

Note: The existing fact table data will be available under this new name.
The update procedure may however clear this table.
Enter the name for the exchange partition table:

Automatic code generation is only supported on date dimension keys.
Select a date dimension key to base the partitioning on:

Select either day, month or year as the partition granularity:

Select the corresponding date dimension column.
Choose the date for day grain. (E.g. cal_year, cal_month, or calendar_date):

The first partition will cater for all periods prior to and including the specified period.
New partitions will be created dynamically as required, so the final partition can be the same as the initial partition or perhaps the current period.

First partition (YYYYMM):

Final partition (YYYYMM):

OK Cancel

The partition exchange table name is prompted for. This table is identical to the fact table and is used to swap partitions to and from the fact table. Select a name that indicates that the table is not a fact table as such.

The fact table will be partitioned by the date dimension key. You need to specify the date dimension key that will be used as the basis for the partitioning of the fact table. It is assumed that this key has the standard QAD format of YYYYMMDD.

A partition granularity of day, month or year must then be selected along with the corresponding column in the date dimension. For a daily partition a column with a date data type must be chosen. The date dimension key will actually be used for the partitioning but the date column is required. For a monthly partition a column with the format YYYYMM must be chosen. In the standard QAD date dimension this is the column cal_month. For a yearly partition a column with the format YYYY must be chosen. In the standard QAD date dimension this is the column cal_year.

The first and last partition should then be selected. The last partition is not that important as additional partitions will be created as required. Normally just select a partition a few on from the first. The first partition is however important as any data that is dated prior to the first partition will be loaded into this first partition. The partition must be entered in the format shown. For example monthly partitions require the format YYYYMM.

Once the OK button is clicked the conversion process will populate the 'table properties clauses' field of the tables properties. Note that this field is limited in size, so if too many partitions are chosen only the first few will be added to this field. The other partitions will be created dynamically by the update procedure.

fact_sales_detail table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name: fact_sales_detail

Short Name. Must be unique and no more than 22 chars long: fact_sales_detail

Business Display Name (EUL): fact_sales_detail

Table Type: Detail partitioned

Description:

Update Procedure: update_fact_sales_detail Edit Rebuild Cursor Based Update

Custom Procedure:

Table Properties clauses: (e.g. Partition)

```
partition by range (dim_ship_date_key)
(partition p_200101 values less than (20010201) tablespace FACT_DATA
, partition p_200102 values less than (20010301) tablespace FACT_DATA
, partition p_200103 values less than (20010401) tablespace FACT_DATA
, partition p_200104 values less than (20010501) tablespace FACT_DATA
, partition p_200105 values less than (20010601) tablespace FACT_DATA
```

Partition Function command:

Partition Scheme command:

Get Key Function:

Mnemonic (EUL):

Date table structure last updated: 2005-11-17 14:38:00

Date created in database: 2008-05-15 09:37:16

Date last updated in database: 2008-05-15 09:37:16

OK Cancel Apply

Click the OK button on the table properties dialog to begin the process of converting the fact table, creating the new fact table and building the new update procedure. Examine the results screen to see what has been done.

The partitioned fact table update procedure

The generated procedure will handle the creation of new partitions as required. Any data for periods prior to the first partition is placed in the first partition. If data is received for a period after the last partition then new partitions are created. Empty partitions are created if necessary to skip periods where no data is present. For example, if we have a table partitioned by month and the latest partition is 200204 (april/2002). If data is then received for say september 2002 the update procedure will build partitions for may, june, july, august and september. There is a variable at the start of the update procedure called `v_max_skip_periods`. This variable is by default set to 12. This defines the maximum number of continuous partitions we will leave empty. From our previous example if our latest partition was april 2002 and we received data for july 2003 with no interim data then the update procedure will fail as it would have to skip 14 partitions. This check is present to prevent erroneous data from creating hundreds of partitions into the future.

13.6.3 Creating a Partitioned Fact Table in DB2

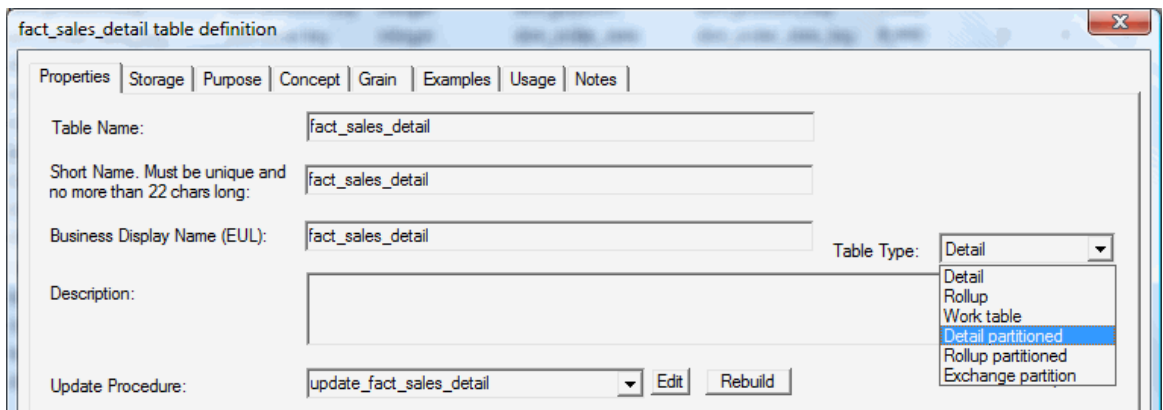
In QAD Data Warehouse Designer a partitioned fact table can only be created from an existing fact table. The process therefore is to create a fact table normally, including the update procedure and indexes. The table type is then changed to a partitioned table type and QAD Data Warehouse Designer will assist in creating the exchange table, modifying the indexes and building the procedure to handle the update of the partitions.

Create a detail or rollup/combined fact table

Create the fact table that you wish to partition in the normal way. You must create an update procedure but do not need to load any data. The process of creating the update procedure will also build any indexes for the fact table.

Convert to a partitioned fact table.

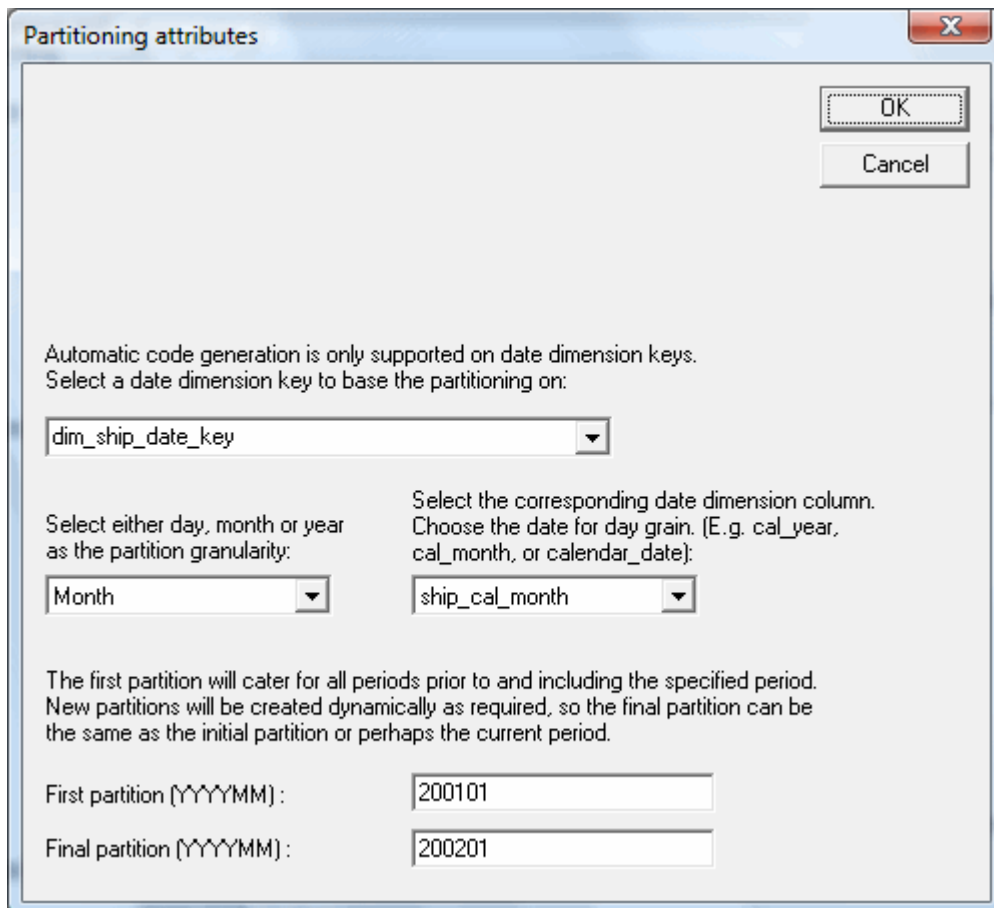
Edit the properties of the fact table to be converted and change the table type to either 'Detail partitioned'. See example below.



A dialog will pop-up as follows, asking for confirmation that the table is to be converted to a partitioned fact table. If 'yes' is chosen then the existing fact table will be dropped and any current data will be lost.



The parameters for the partitioned fact table are then prompted for:



The fact table will be partitioned by the date dimension key. You need to specify the date dimension key that will be used as the basis for the partitioning of the fact table. It is assumed that this key has the standard QAD format of YYYYMMDD.

A partition granularity of day, month or year must then be selected along with the corresponding column in the date dimension. For a daily partition a column with a date data type must be chosen. The date dimension key will actually be used for the partitioning but the date column is required. For a monthly partition a column with the format YYYYMM must be chosen. In the standard QAD date dimension this is the column cal_month. For a yearly partition a column with the format YYYY must be chosen. In the standard QAD date dimension this is the column cal_year.

The first and last partition should then be selected. The last partition is not that important as additional partitions will be created as required. Normally just select a partition a few on from the first. The first partition is however important as any data that is dated prior to the first partition will be loaded into this first partition. The partition must be entered in the format shown. For example monthly partitions require the format YYYYMM.

Once the OK button is clicked the conversion process will populate the 'table properties clauses' field of the tables properties. Note that this field is limited in size, so if too many partitions are chosen only the first few will be added to this field. The other partitions will be created dynamically by the update procedure.

fact_sales_detail table definition

Properties | Storage | Statistics | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name:

Short name. Must be unique and no more than 12 chars long:

Business Display Name (EUL):

Table Type:

Description:

Update Procedure:

Custom Procedure:

Table Properties clauses:
(e.g. Partition)

```
PARTITION BY RANGE (dim_ship_date_key)
(PARTITION P_200101 STARTING FROM (20010101) INCLUSIVE ENDING AT (20010201) EXCLUSIVE
, PARTITION P_200102 STARTING FROM (20010201) INCLUSIVE ENDING AT (20010301) EXCLUSIVE
, PARTITION P_200103 STARTING FROM (20010301) INCLUSIVE ENDING AT (20010401) EXCLUSIVE
, PARTITION P_200104 STARTING FROM (20010401) INCLUSIVE ENDING AT (20010501) EXCLUSIVE
, PARTITION P_200105 STARTING FROM (20010501) INCLUSIVE ENDING AT (20010601) EXCLUSIVE
```

Get Key Function:

Mnemonic (EUL):

Date table structure last updated:

Date created in database:

Date last updated in database:

Click the OK button on the table properties dialog to begin the process of converting the fact table to be partitioned. This drops and re-creates the fact table in DB2. The new update procedure is also generated and compiled. Examine the results screen to see what has been done.

The partitioned fact table update procedure

The generated procedure will handle the creation of new partitions as required. Any data for periods prior to the first partition is placed in the first partition. If data is received for a period after the last partition then new partitions are created. Empty partitions are created if necessary to skip periods where no data is present. For example, if we have a table partitioned by month and the latest partition is 200204 (april/2002). If data is then received for say september 2002 the update procedure will build partitions for may, june, july, august and september. There is a variable at the start of the update procedure called `v_max_skip_periods`. This variable is by default set to 12. This defines the maximum number of continuous partitions we will leave empty. From our previous example if our latest partition was april 2002 and we received data for july 2003 with no interim data then the update procedure will fail as it would have to skip 14 partitions. This check is present to prevent erroneous data from creating hundreds of partitions into the future.

13.7 Fact Table Column Properties

Each fact table column has a set of associated properties. The definition of each property is defined below:

If the **Column name** or **Data type** is changed for a column then the metadata will differ from the table as recorded in the database. Use the **Tools/Validate table create status** menu option to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the **Tools/Validate table create status** to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name.

A sample property screen is as follows:

The screenshot shows a 'Column definition' dialog box with two tabs: 'Column Properties' and 'Transformation'. The 'Column Properties' tab is active. It contains the following fields and options:

- Table:** fact_sales_detail
- Column name:** quantity
- Business display name:** quantity
- Data type:** numeric(8)
- Format:** #,##0
- Column order:** 90
- Nulls:** ☒
- Numeric:** ☒
- Additive:** ☒
- Attribute:** ☐
- End User Layer Display:** ☒
- Dimension Join:** ☐ **Manual Dimension Join:** ☐
- Key Type (D,A,B,C.):** ☐
- Artificial Key:** ☐
- Primary Business Key:** ☐

Note: When the Dimension Join flag is set then the contents of Source column denotes the foreign key. Business definition denotes the join.

Source table: stage_sales_detail

Source column: quantity

Business Definition: Quantity of product sold (i.e. number of product units).

Source strategy: (max 2048 chars.)

Buttons on the right: Update, Update <, Update >. Buttons at the bottom: OK, Cancel, Apply.

The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. It does not affect the physical table definition, but rather provides input to the documentation and to the view **ws_admin_v_fact_col** which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical Oracle data types are number, char(), varchar2() and date. For SQL Server common types are integer, numeric, varchar() and datetime. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition, but rather provides input to the view **ws_admin_v_fact_col** which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid. Typically format masks are only used on numeric fields. Example: #,###0.00. It is not worth the effort of populating this field unless it can be utilized by the end user tools in use.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the '**Respace order number**' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This checkbox when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column.

Numeric

This checkbox indicates that the column in question is numeric when set. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_fact_col` which can be used to assist in the population of an end user tools end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Additive

This checkbox indicates that the column in question is additive when set. This implies that the column can be summed when performing data grouping in a query. It does not affect the physical table definition, but rather provides input to the view `ws_admin_v_fact_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Attribute

This checkbox indicates that the column in question is an attribute when set. An attribute is defined as a column that is non factual. For example we may have an order number, or a invoice number stored in the fact table. Such columns are considered attributes, rather than facts. This checkbox does not affect the physical table definition, but rather provides input to the view `ws_admin_v_fact_col` which can be used to assist in the population of an end user tool's end user layer. The use of this field is not relevant unless it can be utilized by the end user tools.

Source table

Indicates the table from which the column was sourced. This source table is normally a stage table within the data warehouse. If the column was sourced from multiple stage tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Business definition / Source strategy' field. This field is used when generating a procedure to update the fact table. It is also used in the track back diagrams and in the documentation.

If the column is a dimension join then the table shown will be the dimension table to which we are joining. A dimension join will have the 'Dimension Join' checkbox set. Such joins are visible in the view `ws_admin_v_fact_join`.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a stage table column or a dimension table column.

If the column is a dimension join then the column shown will be the dimension table key column to which we are joining. A dimension join will have the 'Dimension Join' checkbox set. Such joins are visible in the view `ws_admin_v_fact_join`.

Business definition / Source strategy

Normally this field will contain a business definition of the column. Such a definition may be a description of the column from a business user's point of view. This field might additionally contain information on where and how the column was acquired. For example if the column is sourced from multiple tables or is a composite or derived column then this definition would normally describe the process used to populate the column. This field is used in the documentation and is available via the view `ws_admin_v_fact_col`. This field is also stored as a comment against the column in the database.

Column Type

Only used by KPI fact tables. This field defines the column type. Refer to the KPI table creation section for more details on this field.

Default Value

Only used by KPI fact tables. This field contains the default value applied to the column if it is not populated as part of the KPI statement. Two single quotes should be used to denote a null value.

End User Layer display

This checkbox when set indicates that the column is intended for end user view. If set the documentation will include the column in the glossary and in the user documentation. It is also used to decide what columns appear in the view `ws_admin_v_fact_col`. Typically columns such as the artificial key would not be enabled for end user display.

Dimension Join

This checkbox is set by QAD Data Warehouse Designer during the building of the update procedure and should not normally be altered. It indicates that the column in question provides a join to a dimension table. The 'Source table' and 'Source column' fields will provide the dimension table's side of the join. This property is inherited from the stage table the fact has been built from.

Manual Dimension Join

This is inherited from the stage table the fact has been built from and should not be changed.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key. For example: By default the <code>dss_source_system_key</code> is added to every dimension table. It is considered part of any lookup on that table and has the key type set to 1. Set when the column is added during drag and drop table generation.
2	Indicates that this column is a dimensional join. Used on fact tables to indicate the dimension keys. Results in bitmap indexes being built for the columns. Set during the update procedure generation for a fact table, based on information from the staging table.
3	Slowly changing column indicator. Used on dimension tables to indicate that the column is being managed as a slowly changing column within the context of a slowly changing dimension. Set when a column is identified during the dimension update procedure generation.
4	Previous value column indicator. Used on dimension tables to indicate that the column is being managed as a previous value column. The source column identifies the parent column. Set during the dimension creation.

Key type	Meaning
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

This checkbox indicates that the column is the artificial key when set. Only one artificial key is supported. This indicator is set by QAD Data Warehouse Designer during the initial drag and drop creation of a table, and should not normally be altered.

Primary Business Key

This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the update procedure generation process. This checkbox should not normally be altered.

13.8 Fact Table Language Mapping

The Fact Properties screen has a tab called 'Language Mapping'.

Select the language from the drop down list and then enter the translations for the **Business Display Name** and the **Description** in the chosen language. The translations for these fields can then be pushed through into OLAP cubes.

The screenshot shows the 'fact_sales_detail table definition' window with the 'Language Mapping' tab selected. The window has a title bar with a close button. Below the title bar is a tabbed interface with tabs for 'Properties', 'Storage', 'Language Mapping' (selected), 'Purpose', 'Concept', 'Grain', 'Examples', 'Usage', and 'Notes'. The 'Language Mapping' tab contains the following fields:

- Language :** A dropdown menu currently set to 'French'.
- Language Settings** (Section Header):
 - Business Display Name:** A text field containing 'fact_sales_detail' and a sub-field labeled 'Translated Value of Business Display Name'.
 - Description:** A text field containing 'Sales' and a sub-field labeled 'Translated Value of Description'.

C H A P T E R 1 4

14. Aggregation

Two types of aggregate tables are discussed.

The first is where all non-additive facts and one or more dimensions are removed from a fact table. Typically this results in a smaller table that can answer a subset of the queries that could be posed against the fact table. This aggregate table still maintains full integrity to the remaining dimensions, and consequently reflects all changes to those dimensions.

The second type, we will call an aggregate summary, or summary table. This table includes additive measures and in some cases hierarchical elements of one or more of the dimensions providing a rolled-up summary of the fact table data. For example we may choose to deal at product group level rather than product SKU which is the granularity of the dimension.

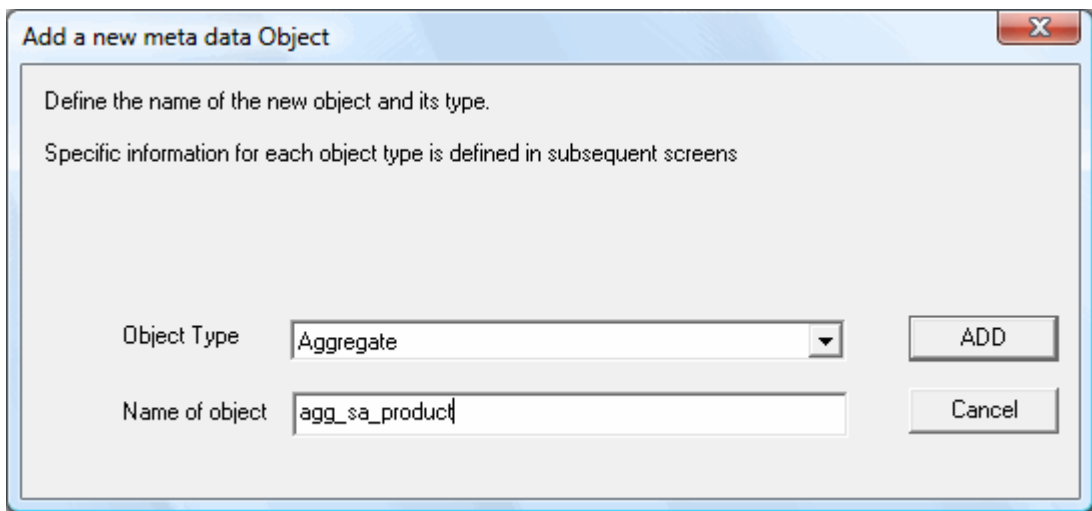
When using the Oracle database the aggregate tables are seen as pre-built materialized views with reduced precision and query rewrite enabled.

In This Chapter

14.1 Creating an Aggregate Table 323
14.2 Creating an Aggregate Summary Table 328

14.1 Creating an Aggregate Table

- 1 In the left pane double click on the aggregate group to list the aggregates in the middle pane and set aggregates as the drop target.
- 2 From the Data Warehouse browse (right) pane drag a fact table into the middle pane and enter the aggregate name. Click ADD.



The screenshot shows a dialog box titled "Add a new meta data Object" with a close button (X) in the top right corner. Inside the dialog, there is instructional text: "Define the name of the new object and its type." and "Specific information for each object type is defined in subsequent screens". Below this text, there are two input fields. The first is labeled "Object Type" and contains a dropdown menu with "Aggregate" selected. The second is labeled "Name of object" and contains the text "agg_sa_product". To the right of these fields are two buttons: "ADD" and "Cancel".

Add a new meta data Object

Define the name of the new object and its type.
Specific information for each object type is defined in subsequent screens

Object Type: Aggregate

Name of object: agg_sa_product

Buttons: ADD, Cancel

- 3 The aggregate properties are displayed. Click OK.

agg_sa_product table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name:

Short Name. Must be unique and no more than 22 chars long:

Business Display Name (EUL): Table Type:

Description:

Update Procedure:

Custom Procedure:

Table Properties clauses:
(e.g. Partition)

Mnemonic (EUL):

Date table structure last updated:

Date created in database:

Date last updated in database:

- 4 The list of columns in the Aggregate is displayed in the middle pane:

Aggregate columns				
Col name	Display	Data type	Src table	Src column
 dim_customer_key	dim customer key	integer	dim_customer	dim_customer_key
 dim_product_key	dim product key	integer	dim_product	dim_product_key
 dim_ship_date_key	dim time key	integer	dim_ship_date	dim_ship_date_key
 quantity	quantity	number(8)	fact_sales_analysis	quantity
 sales_value	sales value	number(13,2)	fact_sales_analysis	sales_value
 tax	tax	number(9,2)	fact_sales_analysis	tax
 budget_quantity	budget quantity	integer	fact_sales_analysis	budget_quantity
 budget_sales_value	budget sales value	number(13,2)	fact_sales_analysis	budget_sales_value
 forecast_quantity	forecast quantity	integer	fact_sales_analysis	forecast_quantity
 forecast_sales_value	forecast sales value	number(13,2)	fact_sales_analysis	forecast_sales_value
 dss_fact_table_key	dss fact table key	integer	fact_sales_analysis	dss_fact_table_key
 dss_update_time	dss update time	date		dss_update_time

- 5 Remove any columns that will not make sense at an aggregated level. For example, dss_fact_table_key, any business keys, any non-additive facts, any measures that relate to detail (e.g, unit price) and any dimension keys not required:

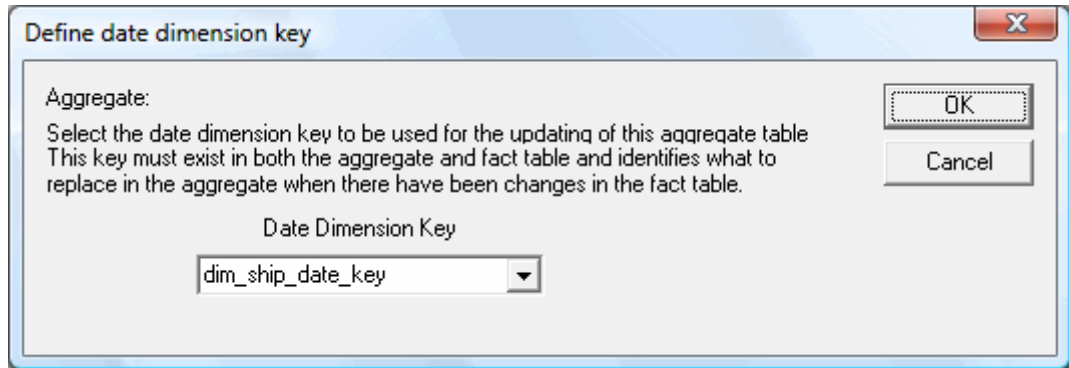
agg_sa_product columns				
Col name	Display	Data type	Src table	Src column
 dim_product_key	dim product key	integer	dim_product	dim_product_key
 dim_ship_date_key	dim time key	integer	dim_ship_date	dim_ship_date_key
 quantity	quantity	number(8)	fact_sales_analysis	quantity
 sales_value	sales value	number(13,2)	fact_sales_analysis	sales_value
 tax	tax	number(9,2)	fact_sales_analysis	tax
 budget_quantity	budget quantity	integer	fact_sales_analysis	budget_quantity
 budget_sales_value	budget sales value	number(13,2)	fact_sales_analysis	budget_sales_value
 forecast_quantity	forecast quantity	integer	fact_sales_analysis	forecast_quantity
 forecast_sales_value	forecast sales value	number(13,2)	fact_sales_analysis	forecast_sales_value

Note: All aggregate table columns (other than dss columns) should always have a source table specified, even if a column transformation is in use.

- 6 Create the aggregate table in the database by right clicking on the aggregate and selecting Create(ReCreate).
- 7 Create a procedure to update the aggregate by right clicking on the aggregate, selecting Properties and selecting (Build Procedure...) in the Update Procedure field.

Note: QAD Data Warehouse Designer generated update procedures for aggregates are incremental. Incremental updates are based on a date dimension key and number of look back days. The aggregate update process looks at any records that have been updated in the fact table in the last 7 days (by default).

To support this, a date dimension key must be selected. The columns chosen must be in both the source fact table and the aggregate. Select this column and click OK.



8 Update the table by right clicking and choosing Update.

Note: Any column transformations added to a measure column of an aggregate table must always include an aggregate function, usually SUM. For example, an ISNULL added to forecast_quantity should be entered as: SUM(ISNULL(forecast_quantity,0)).

Results		
Object	Message	
agg_sa_product	Table agg_sa_product created.	
agg_sa_product	Create table agg_sa_product(dim_product_key integer, dim_ship_date_key integer, quantity number(8), sales_value number(13,2), tax number(9,2), budget_quantity integer, budget_sales_value number(13,2), forecast_quantity integer, forecast_sales_value number(13,2)) PctFree 0 Tablespace FACT_DATA Storage (Pctincrease 0)	
agg_sa_product	Materialized view not created at this stage	
agg_sa_product	table comment added.	
agg_sa_product	5 column comments added.	
agg_sa_product_idx_1	Create Bitmap Index agg_sa_product_idx_1 on agg_sa_product(dim_product_key) NOLOGGING PctFree 0 Storage (Pctincrease 0)	
agg_sa_product_idx_1	agg_sa_product_idx_1 created	
agg_sa_product_idx_2	Create Bitmap Index agg_sa_product_idx_2 on agg_sa_product(dim_ship_date_key) NOLOGGING PctFree 0 Storage (Pctincrease 0)	
agg_sa_product_idx_2	agg_sa_product_idx_2 created	
agg_sa_product	Procedure Completed	
agg_sa_product	1 agg_sa_product updated. 23 new records. 0 records deleted.	
agg_sa_product	I Date: 20010401 Deleted: 0 Inserted: 2.	
agg_sa_product	I Date: 20010201 Deleted: 0 Inserted: 4.	
agg_sa_product	I Date: 20000801 Deleted: 0 Inserted: 4.	
agg_sa_product	I Date: 20011101 Deleted: 0 Inserted: 5.	
agg_sa_product	I Date: 20000601 Deleted: 0 Inserted: 2.	
agg_sa_product	I Date: 20020101 Deleted: 0 Inserted: 1.	
agg_sa_product	I Date: 20020401 Deleted: 0 Inserted: 5.	

Oracle: When the procedure runs it first removes the materialized view, then updates any changes from the fact table into the aggregate. It then re-establishes the materialized view, enabling query rewrite.

DB2: When the procedure runs it first removes the materialized query table, then updates any changes from the fact table into the aggregate. It then re-establishes the materialized query table, enabling query rewrite.

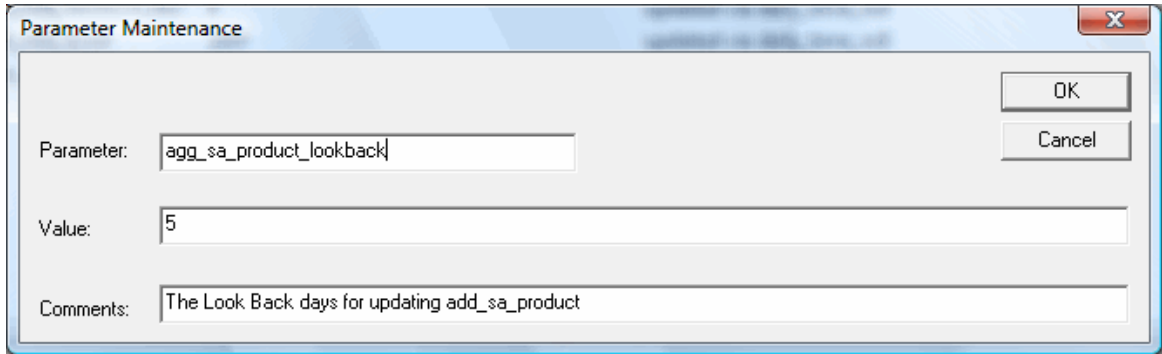
14.1.1 Change an Aggregates Default Look Back Days

QAD Data Warehouse Designer generate update procedures for aggregates that are incremental. Incremental updates are based on a date dimension key and number of look back days.

The aggregate update process looks at any records that have been updated in the fact table in the last number of look back days.

The default number of look back days is 7. The default is set in each update procedure. To change the number of look back days for an aggregate table, create a QAD Data Warehouse Designer parameter called `AggregateName_lookback` and enter the required number of look back days as the parameter value.

For Example, add the following parameter to change the look back days to 5 for `agg_sa_product`:



The screenshot shows a 'Parameter Maintenance' dialog box. It has a title bar with the text 'Parameter Maintenance' and a close button (X). The dialog contains three input fields: 'Parameter:' with the value 'agg_sa_product_lookback', 'Value:' with the value '5', and 'Comments:' with the text 'The Look Back days for updating add_sa_product'. There are 'OK' and 'Cancel' buttons on the right side.

See **Parameters** (see "5.2 Parameters" on page 64) for more information on QAD Data Warehouse Designer parameters.

14.2 Creating an Aggregate Summary Table

The creation of a summary table proceeds initially in the same way as an aggregate table.

- 1 In the left pane double click on the aggregate group to list the aggregates in the middle pane and set aggregates as the drop target.
- 2 From the Data Warehouse browse (right) pane drag a fact table into the middle pane. Remove any columns that will not make sense at an aggregated level. For example, `dss_fact_table_key`, any business keys, any non-additive facts, any measures that relate to detail (e.g, unit price).
- 3 Drag over columns from dimensions that are linked to the fact table. Delete the dimension keys to allow a rollup to the level of the dimension elements.

agg_customer_address columns				
Col name	Display	Data type	Src table	Src column
 dim_product_key	dim product key	integer	dim_product	dim_product_key
 dim_ship_date_key	dim time key	integer	dim_ship_date	dim_ship_date_key
 address	address	varchar2(40)	dim_customer	address
 city	city	varchar2(30)	dim_customer	city
 state	state	varchar2(2)	dim_customer	state
 quantity	quantity	number(8)	fact_sales_analysis	quantity
 sales_value	sales value	number(13,2)	fact_sales_analysis	sales_value
 tax	tax	number(9,2)	fact_sales_analysis	tax
 budget_quantity	budget quantity	integer	fact_sales_analysis	budget_quantity
 budget_sales_value	budget sales value	number(13,2)	fact_sales_analysis	budget_sales_value
 forecast_quantity	forecast quantity	integer	fact_sales_analysis	forecast_quantity
 forecast_sales_value	forecast sales value	number(13,2)	fact_sales_analysis	forecast_sales_value
 dss_update_time	dss update time	date		dss_update_time

Note: All aggregate summary table columns (other than dss columns) should always have a source table specified, even if a column transformation is in use.

- 4 In the properties of the aggregate table change the 'Table Type' to 'Summary':

agg_customer_address table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name:

Short Name. Must be unique and no more than 22 chars long:

Business Display Name (EUL):

Table Type:

- Aggregate
- Summary
- Work Table

Description:

Update Procedure:

Custom Procedure:

Table Properties clauses: (e.g. Partition)

Date table structure last updated:

Mnemonic (EUL):

Date created in database:

Date last updated in database:

- 5 Create the aggregate summary table in the database by right clicking on the aggregate and selecting Create(ReCreate).
- 6 Create a procedure to update the aggregate summary by right clicking on the aggregate, selecting Properties and selecting (Build Procedure...) in the Update Procedure field. The aggregate summary table is totally rebuilt each time the procedure is executed.

Note: Any column transformations added to a measure column of an aggregate summary table must always include an aggregate function, usually SUM. For example, an ISNULL added to forecast_quantity should be entered as: SUM(ISNULL(forecast_quantity,0)).

Results	
Object	Message
agg_customer_address	Table agg_customer_address created.
agg_customer_addre	Create table agg_customer_address(dim_product_key integer, dim_ship_date_key integer, address varchar2(40), city varchar2(30), state varchar2(2), quantity number(8), sales_value number(13,2), tax number(9,2), budget_quantity integer, budget_sales_value number(13,2), forecast_quantity integer, forecast_sales_value number(13,2), dss_update_time date) PctFree 0 Storage (Pctincrease 0)PARALLEL NOLOGGING
agg_customer_addre	Materialized view not created at this stage
agg_customer_addre	table comment added.
agg_customer_addre	9 column comments added.
agg_customer_address_ix	Create Bitmap Index agg_customer_address_idx_1 on agg_customer_address(dim_product_key) NOLOGGING PctFree 0 Storage (Pctincrease 0)
agg_customer_addre	agg_customer_address_idx_1 created
agg_customer_addre	Create Bitmap Index agg_customer_address_idx_2 on agg_customer_address(dim_ship_date_key) NOLOGGING PctFree 0 Storage (Pctincrease 0)
agg_customer_addre	agg_customer_address_idx_2 created
agg_customer_address	Procedure Completed
agg_customer_addre	1 agg_customer_address updated. 24 new records.

CHAPTER 15

15. Views

Views are normally created from dimensions. These views are then used to define dimensions in a fact table where the dimension appears multiple times. A classic example is that of the date dimension. In our tutorials we create a fact table that has two date dimensions. An order date and a ship date dimension. To facilitate the creation of the fact table we create two dimension views to allow the date dimension to be joined to the fact table twice.

Views can also be created from any other table type. By default views are visualized as part of the dimension object group. If fact table views or other views are being used then views can be visualized as a separate object type by checking the appropriate box under the Tools/Options menu item.

In This Chapter

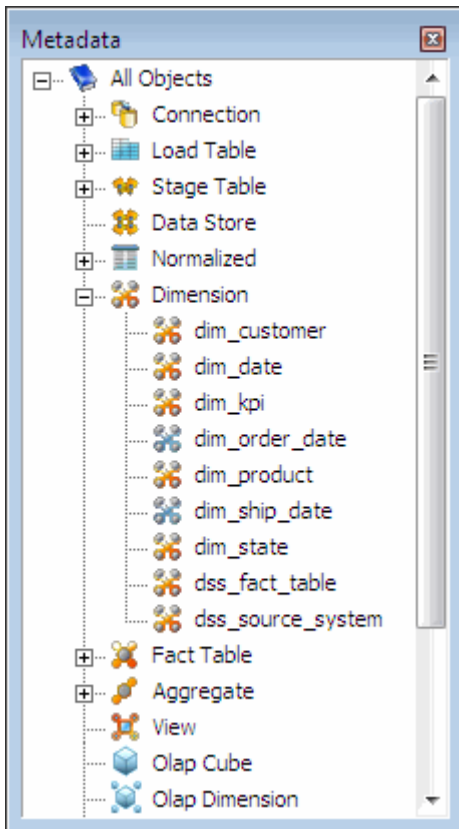
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15.1 Creating a Dimension View

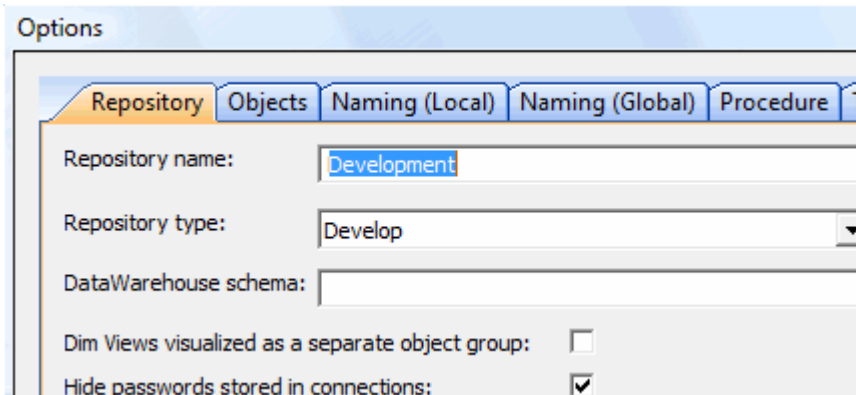
A dimension view is a database view of a dimension table. It may be a full or partial view. It is typically used in such cases as date dimensions where multiple date dimensions exist for one fact table.

In many data warehouses dimension views are built as part of the end user layer, but creating them in the data warehouse means they are available regardless of the end user tools used.

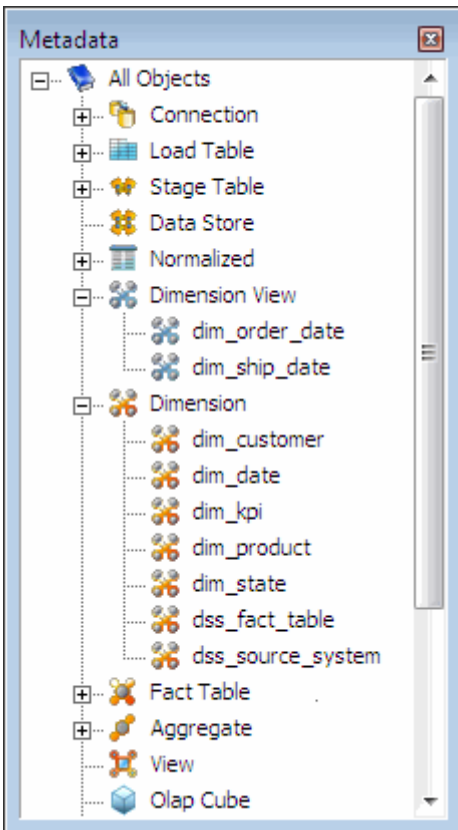
Views can be visualized in QAD Data Warehouse Designer either as part of the Dimension object group or in a separate object group called View. The default is to view dimensions and dimension views together:



This visualization option is set from the Tools/Options menu item:



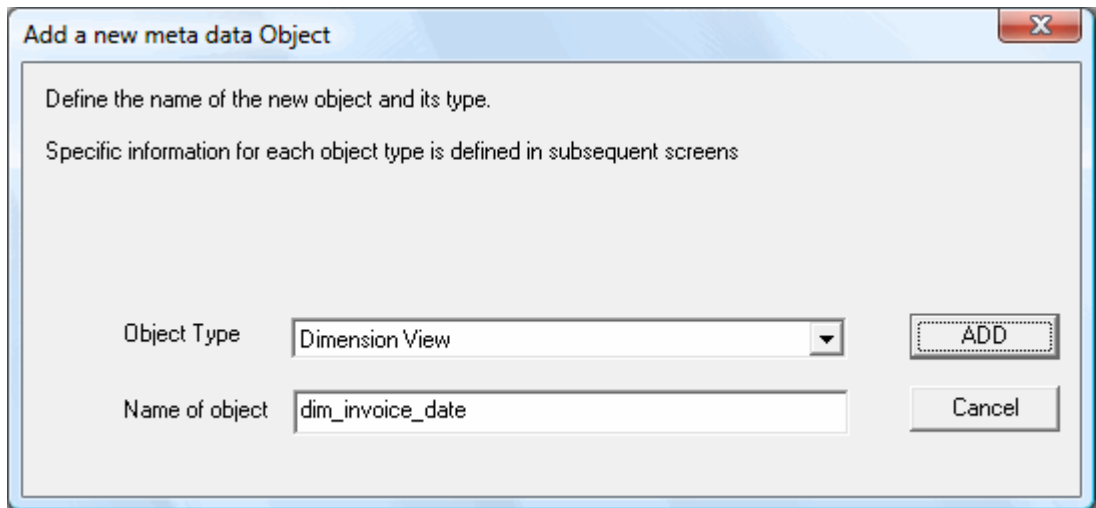
This example shows dimensions and dimension views separately:



The process for creating a view is as follows:

- 1 Double click on Dimension (or View) in the left hand pane.
- 2 Browse to the data warehouse in the right hand pane.
- 3 Drag a table from the right pane into the center pane.
 - The dialog box defaults the object type to a dimension view

- Change the view name as required, and click Add.



The screenshot shows a dialog box titled "Add a new meta data Object" with a close button (X) in the top right corner. Inside the dialog, there is instructional text: "Define the name of the new object and its type." and "Specific information for each object type is defined in subsequent screens". Below this text are two input fields. The first field is labeled "Object Type" and contains a dropdown menu with "Dimension View" selected. The second field is labeled "Name of object" and contains the text "dim_invoice_date". To the right of the "Object Type" field is an "ADD" button, and to the right of the "Name of object" field is a "Cancel" button.

- 4 The view property defaults dialog will appear. A 'Where' clause could be entered, but this can be done later. Normally we would just click OK.

dim_invoice_date table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name: dim_invoice_date

Short Name. Must be unique and no more than 22 chars long: dim_invoice_date

Business Display Name (EUL): dim_invoice_date

Table Type: View of a Dimension

Description:

Table Properties clauses:
(e.g. Partition)

Where Clause: WHERE calendar_date >= '01-JAN-2005'

Get Key Function:

Mnemonic (EUL):

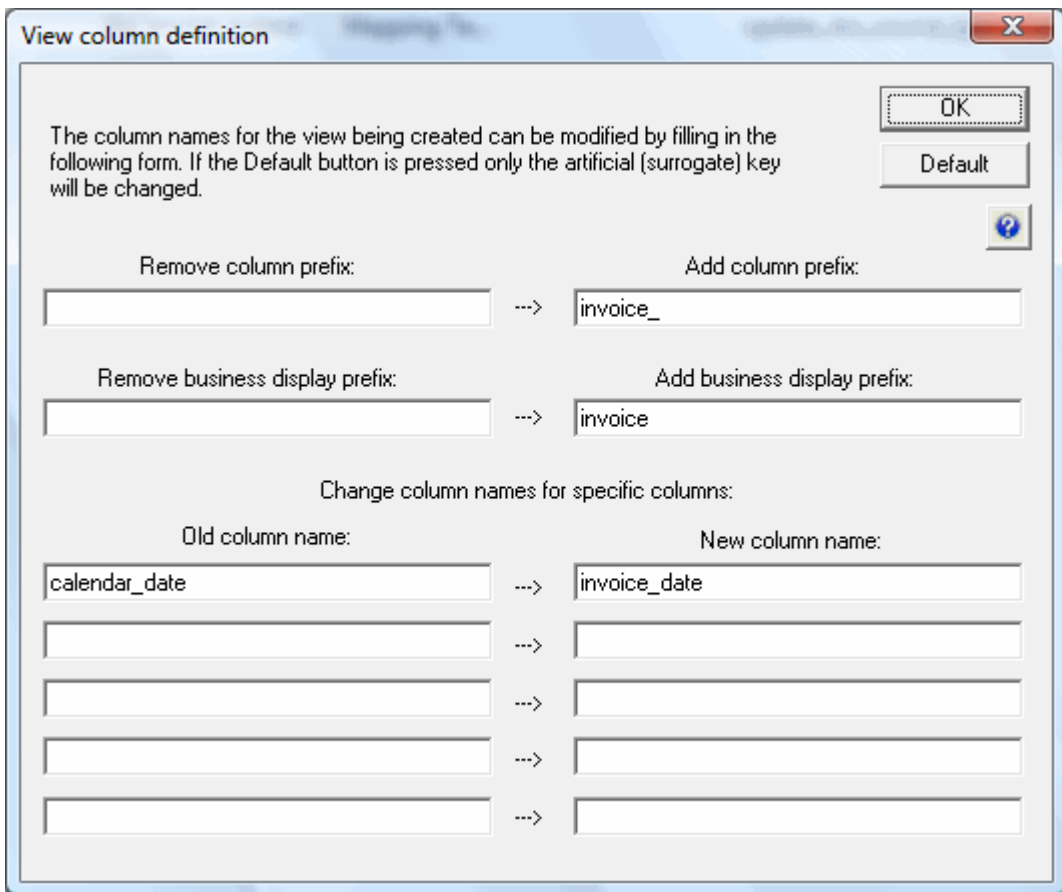
Date table structure last updated: 2008-05-15 14:30:14.653

Date created in database:

Date last updated in database:

OK Cancel Apply

- 5 A dialog box displays to provide a means of re-mapping some of the column names in the view if required. A description of the fields in this dialog are provided in the section that follows.



The column names for the view being created can be modified by filling in the following form. If the Default button is pressed only the artificial (surrogate) key will be changed.

Remove column prefix: ---> Add column prefix:

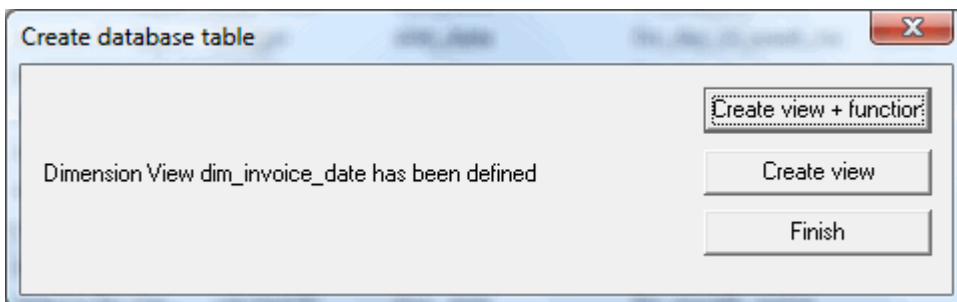
Remove business display prefix: ---> Add business display display prefix:

Change column names for specific columns:

Old column name:		New column name:
<input type="text" value="calendar_date"/>	--->	<input type="text" value="invoice_date"/>
<input type="text"/>	--->	<input type="text"/>
<input type="text"/>	--->	<input type="text"/>
<input type="text"/>	--->	<input type="text"/>
<input type="text"/>	--->	<input type="text"/>

Buttons: OK, Default, ?

- 6 A dialog box indicates that the view has been defined. If this is a dimension view then you will be given an option to create both the view and an associated Get Key function.



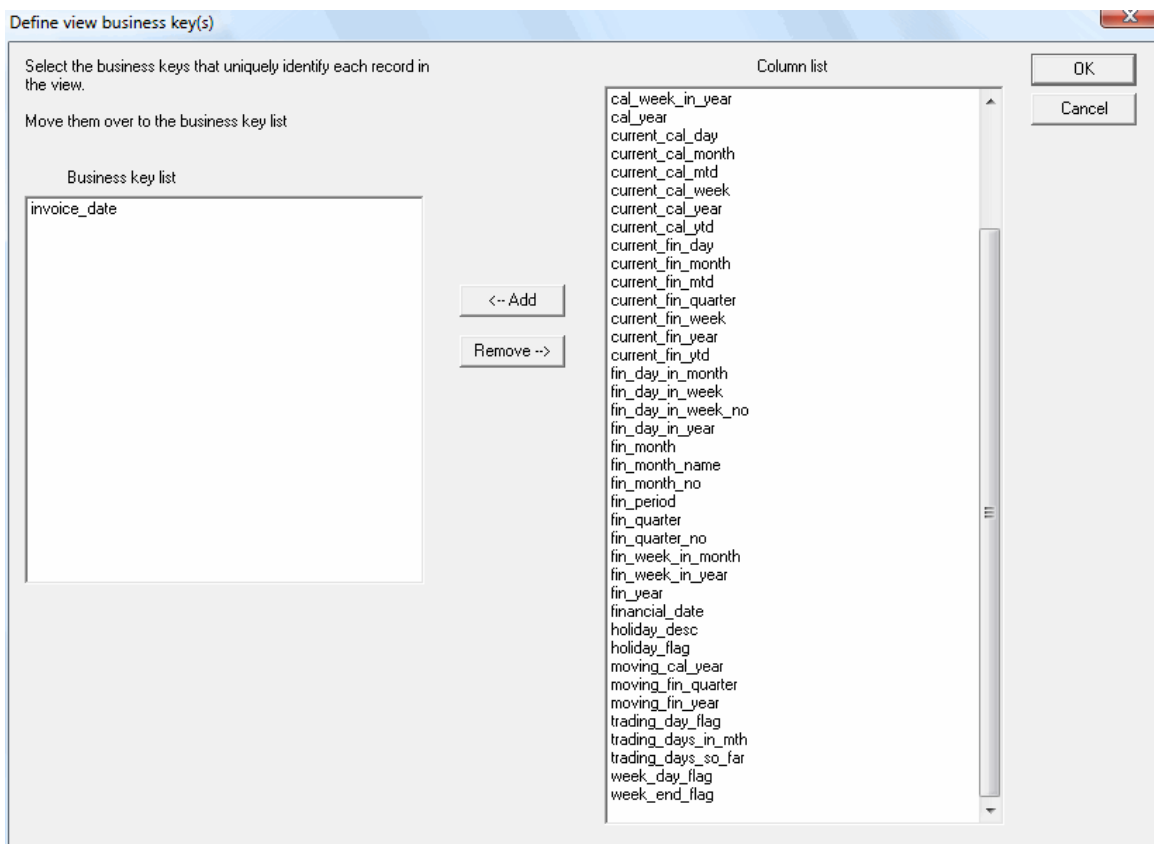
Create database table

Dimension View dim_invoice_date has been defined

Buttons: Create view + function, Create view, Finish

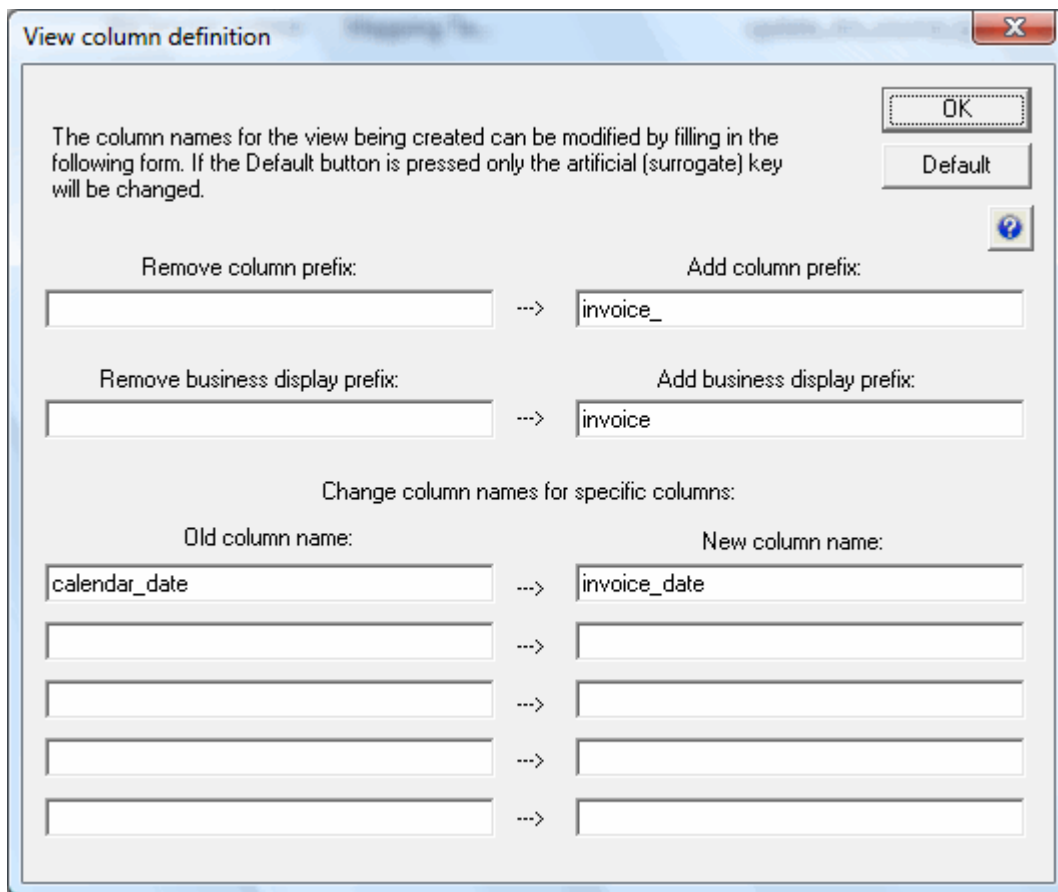
For any other view type a Get Key function is not created.

- 7 If a dimension view and the function create button is clicked then a dialog box will appear to allow the selection of a business (natural) key for the dimension view.



15.1.1 View Column Re-mapping

The view column definition dialog allows for the automated re-mapping of certain column names. It provides an easy method for changing the column names for a large number of columns when creating a view. The various actions undertaken as a result of entries in this dialog can all be done or reversed manually by changing the individual column properties. The various fields are described below:



The dialog box, titled "View column definition", contains the following sections:

- Instructions:** "The column names for the view being created can be modified by filling in the following form. If the Default button is pressed only the artificial (surrogate) key will be changed."
- Buttons:** "OK", "Default", and a help icon (?)
- Remove column prefix:** An empty text field.
- Add column prefix:** A text field containing "invoice_".
- Remove business display prefix:** An empty text field.
- Add business display prefix:** A text field containing "invoice".
- Change column names for specific columns:**
 - Old column name:**
 - calendar_date
 - (empty)
 - (empty)
 - (empty)
 - (empty)
 - New column name:**
 - invoice_date
 - (empty)
 - (empty)
 - (empty)
 - (empty)

Remove column prefix

If the columns in the source table are prefixed then that prefix can be removed by entering it in this field. An example may be a date dimension which has each column prefixed with date_ (e.g. date_month, date_year etc.). If this field is left blank then no removal action is taken.

Add column prefix

If required a prefix can be added to each column name. This is particularly useful when defining a date dimension view where you would like each column to be prefixed by the date type.

Remove business display prefix

As per the column names it may be required to remove a prefix from the business display fields. If so enter the prefix to remove in this column.

Add business display prefix

The business display fields are used in the creation of the glossary. It is therefore quite useful to prefix these display fields with an identifier for the view being created. It is assumed that these business display names will be carried forward to the end user layer. Enter a value in this field to prefix the business display name fields for each column. It is normal to include a space at the end of this field.

Old column name

Up to five individual column names can be re mapped. Enter the column name as it appears in the source table in one of the 'old column name' fields in order to re map that column name. The business display name is also changed to match.

New column name

Place a new column name alongside any existing column name you wish to re map. In the example dialog above a column named 'calendar_date' is being renamed to 'order_date' in the view.

15.2 Non-Dimension Object Views

QAD Data Warehouse Designer also supports creating views of objects other than dimensions (load tables, facts, stage tables, aggregates, ...).

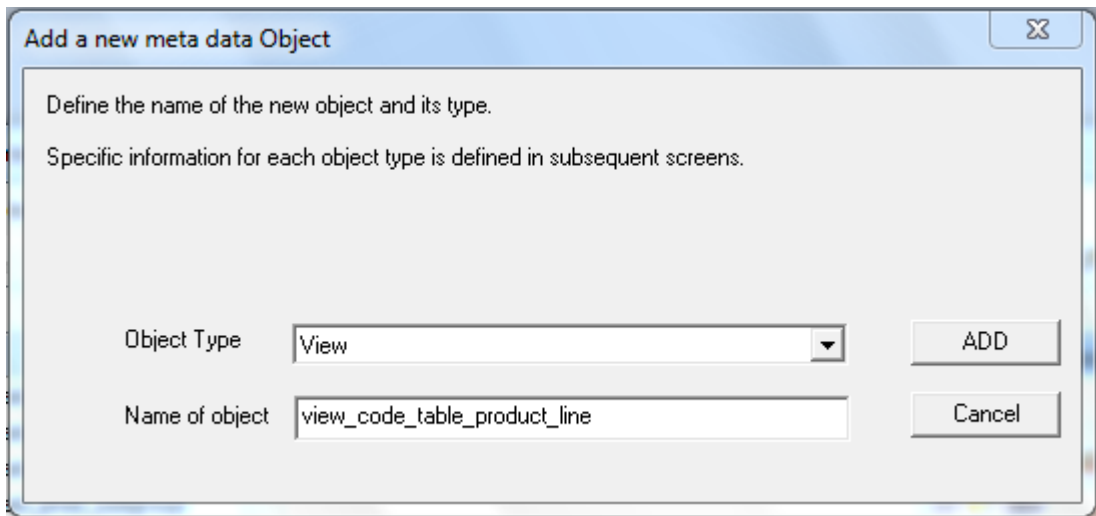
A fact view is a database view of a fact table. It may be a full, partial view, or a view incorporating both the fact data and some dimensional attributes. It is typically used in cases where a subset of information is to be provided for specific end user communities. It is common that the 'Where' clause be populated in fact views, either to join the dimension tables or restrict the data that the view represents.

Similarly, views may be created over staging tables or any other **table** object.

The creation of non-dimension table views is the same process as that for dimension views:

- 1 Drag a table from the right pane into the center pane.
- 2 The dialog box defaults the object type to a view.

- 3 Change the view name as required, and click **Add**.



The screenshot shows a dialog box titled "Add a new meta data Object" with a close button (X) in the top right corner. Inside the dialog, there is instructional text: "Define the name of the new object and its type." and "Specific information for each object type is defined in subsequent screens." Below the text, there are two input fields. The first is labeled "Object Type" and has a dropdown menu with "View" selected. The second is labeled "Name of object" and has the text "view_code_table_product_line" entered. To the right of the "Object Type" field is an "ADD" button, and to the right of the "Name of object" field is a "Cancel" button.

- 4 The view property defaults dialog will appear. A 'Where' clause could be entered, or done later. Click **OK**.

view_code_table_product_line table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name:

Short name. Must be unique and no more than 22 chars long:

Business Display Name (EUL): Table Type:

Description:

Custom Procedure:

From/Where or Where Clause:

Mnemonic (EUL):

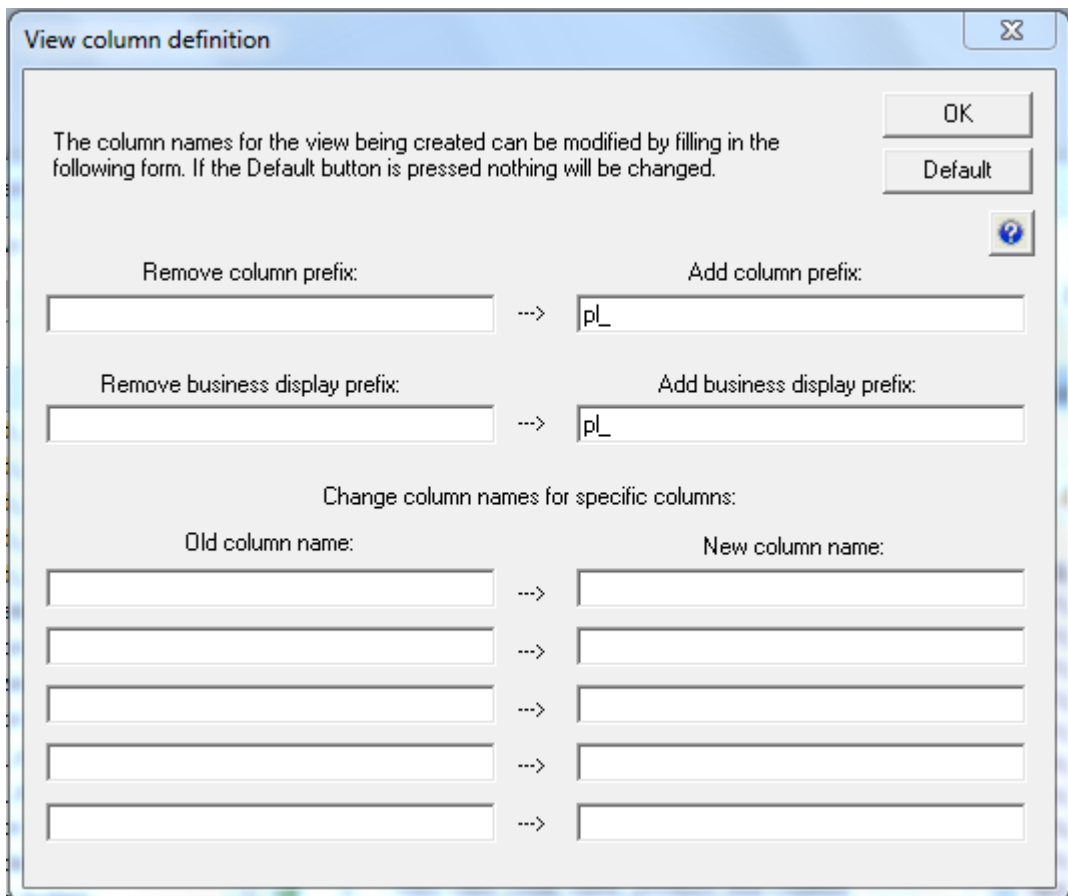
Date table structure last updated:

Date created in database:

Date last updated in database:

OK Cancel Apply

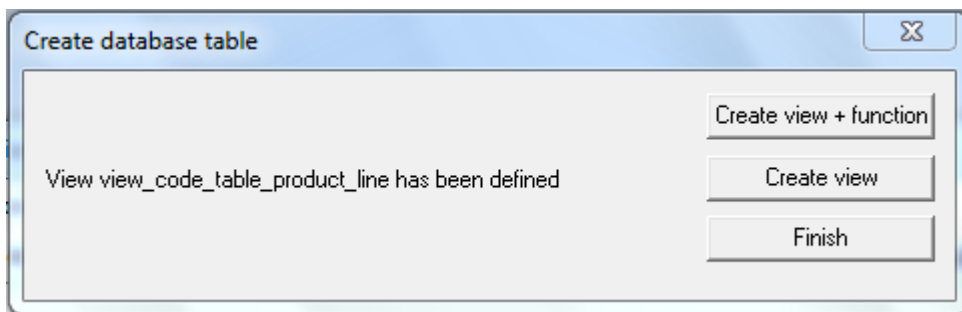
- 5 The view column definition dialog allows for the automated re-mapping of certain column names. It provides an easy method for changing the column names for a large number of columns when creating a view.



The dialog box is titled "View column definition" and has a close button (X) in the top right corner. It contains the following elements:

- A text box with the message: "The column names for the view being created can be modified by filling in the following form. If the Default button is pressed nothing will be changed."
- Buttons: "OK", "Default", and a help button (question mark icon).
- Two input fields for prefixes:
 - "Remove column prefix:" followed by an empty text box.
 - "Add column prefix:" followed by a text box containing "pL_".
- Two input fields for business display prefixes:
 - "Remove business display prefix:" followed by an empty text box.
 - "Add business display prefix:" followed by a text box containing "pL_".
- A section titled "Change column names for specific columns:" containing a table with two columns: "Old column name:" and "New column name:". The table has five empty rows for mapping.

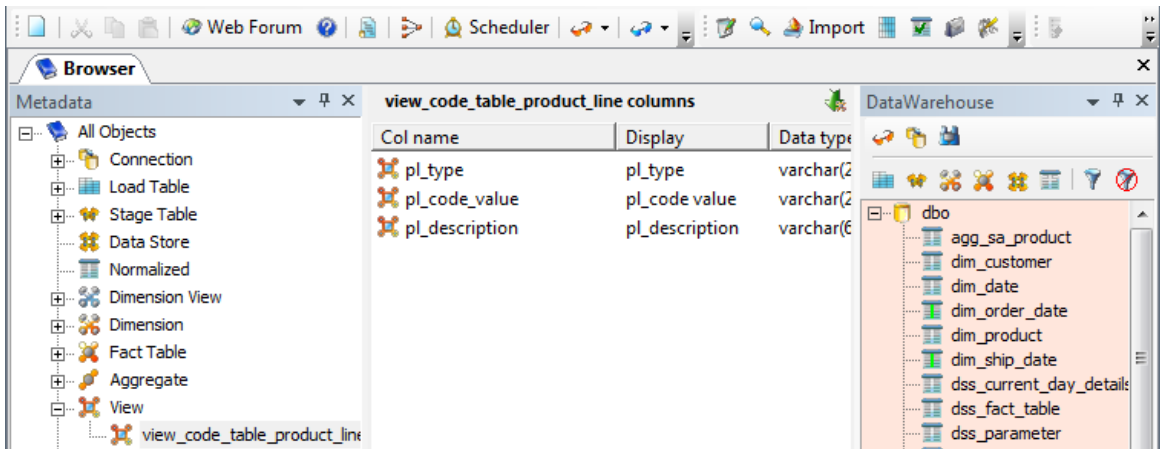
- 6 A dialog box indicates that the view has been defined. Create the view.



The dialog box is titled "Create database table" and has a close button (X) in the top right corner. It contains the following elements:

- A text box with the message: "View view_code_table_product_line has been defined".
- Buttons: "Create view + function", "Create view", and "Finish".

- 7 The columns of the view table will be displayed in the centre pane.



Note: If dimension attributes are being added (eg: to a fact view) then drag these attributes into the views column list, create the view and edit the 'Where' clause for the view.

15.3 Creating a Custom View

A custom view can be created within QAD Data Warehouse Designer to handle views that are not strictly one to one such as where multiple tables are joined or where a complex condition is placed on the view. There are two options for custom views, the first where the columns are defined in QAD Data Warehouse Designer and the 'Select' component of the view is customized. The second option is where the view is totally customized and no columns need to be defined in QAD Data Warehouse Designer, although it is good practice to still define the columns for documentation purposes.

To create a Custom or 'User Defined' view proceed as follows:

- 1 Create a view in the normal manner either by dragging a table in or adding a new object.
- 2 Change the 'Table Type' to 'User Defined View' in the properties of the view.

stage_latest_forecast table definition

Properties | Storage | Purpose | Concept | Grain | Examples | Usage | Notes

Table Name: stage_latest_forecast

Short Name. Must be unique and no more than 22 chars long: stage_latest_forecast

Business Display Name (EUL): stage_latest_forecast

Description:

Table Type: Other table View
View of a Dimension
Fact View
Other table View
Work View
User defined View

Table Properties clauses:
(e.g. Partition)

Where Clause:

Get Key Function:

Mnemonic (EUL):

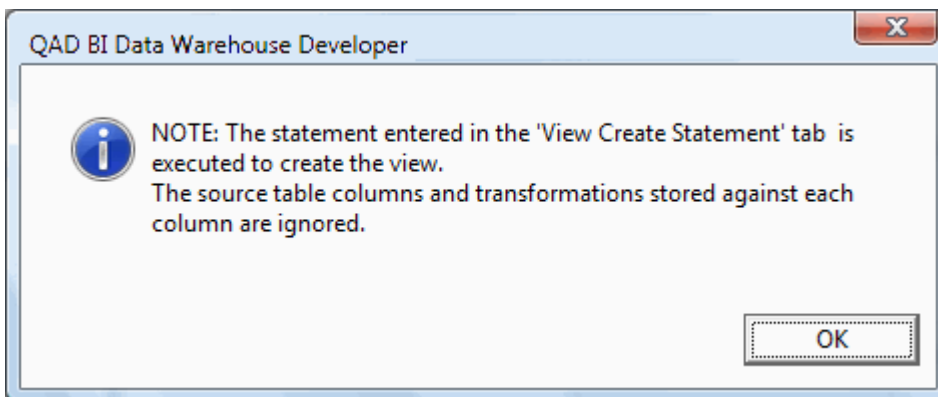
Date table structure last updated: 2008-05-15 14:42:05.397

Date created in database:

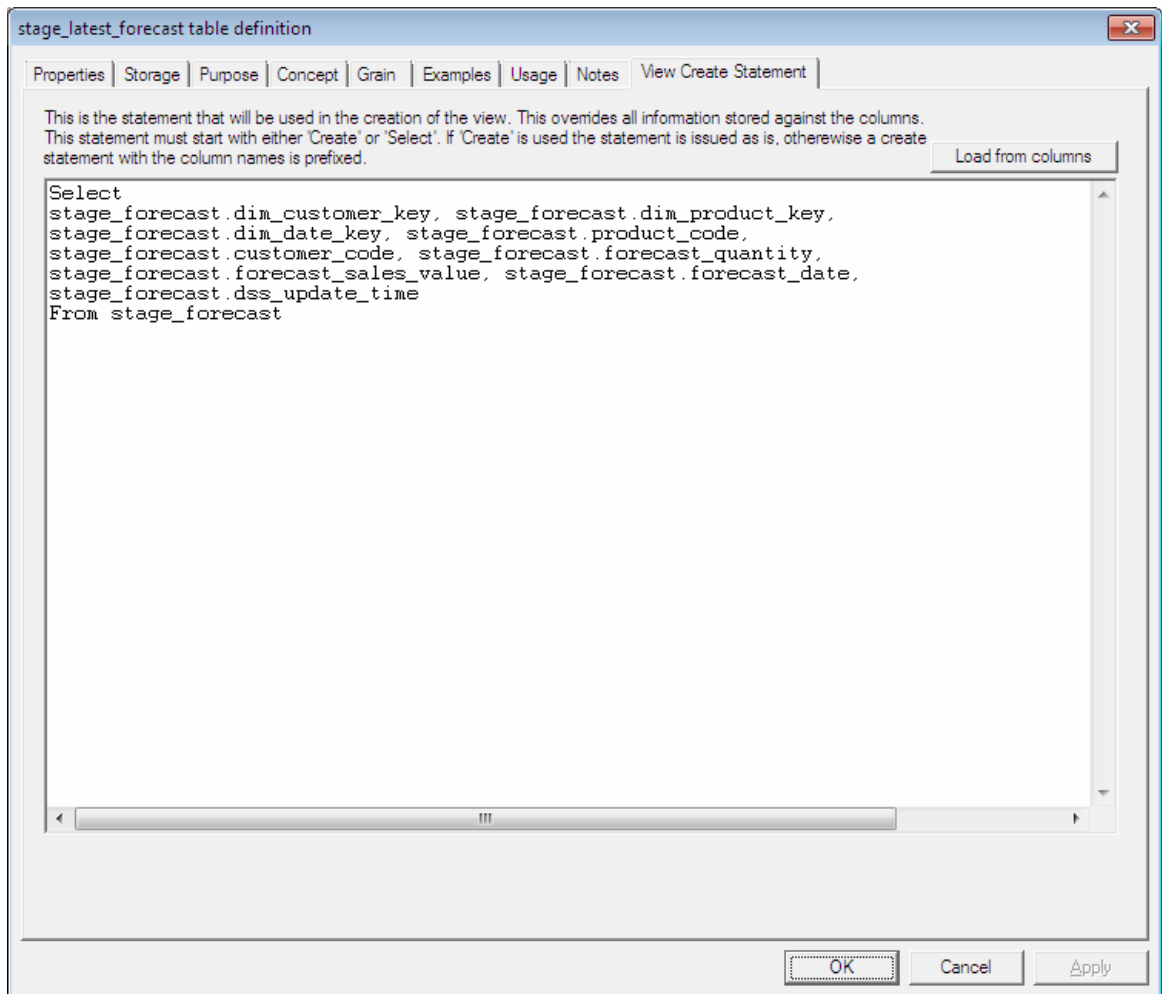
Date last updated in database:

OK Cancel Apply

- 3 The following message is displayed. Click OK.



- 4 Edit the new tab 'View Create Statement' and insert the SQL Statement that will be used to create the view. This SQL Statement must start with either 'Create' or 'Select'. If 'Create' is used then the columns in the view are ignored and the statement will be issued to create the view. If the statement starts with 'Select' then QAD Data Warehouse Designer will build up a view create statement from the column names and the supplied 'Select' clause. A button 'Load from Columns' is available to get a sample 'Select' statement based on the columns in the view and any transformations.



15.4 Dimension View Language Mapping

The Dimension View Properties screen has a tab called 'Language Mapping'.

Select the language from the drop down list and then enter the translations for the **Business Display Name** and the **Description** in the chosen language. The translations for these fields can then be pushed through into OLAP cubes.

The screenshot shows a software window titled "dim_order_date table definition" with a close button in the top right corner. The window contains a tabbed interface with the following tabs: Properties, Storage, Language Mapping (selected), Purpose, Concept, Grain, Examples, Usage, and Notes. The "Language Mapping" tab is active and displays the following fields:

- Language :** A dropdown menu currently set to "French".
- Language Settings** (Section Header):
- Business Display Name:** A text input field containing "dim_order_date". Below it is a text input field labeled "Translated Value of Business Display Name".
- Description:** A text input field containing "Order Date". Below it is a text input field labeled "Translated Value of Description".

CHAPTER 16

16. Analysis Services OLAP Cubes

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16.1 Overview

A **cube** is a set of related measures and dimensions that is used to analyze data.

- A **measure** is a transactional value or measurement that a user may want to aggregate. The source of measures are usually columns in one or more source tables. Measures are grouped into **measure groups**.
- A **dimension** is a group of attributes that represent an area of interest related to the measures in the cube and which are used to analyze the measures in the cube. For example, a customer dimension might include the attributes:
 - Customer Name
 - Customer Gender
 - Customer City

These would enable measures in the cube to be analyzed by Customer Name, Customer Gender, and Customer City. The source of attributes are usually columns in one or more source tables. The attributes within each dimension can be organized into hierarchies to provide paths for analysis.

A cube is then augmented with **calculations**, key performance indicators (generally known as KPIs), **actions**, **partitions**, **perspectives**, and **translations**.

The information required to build and support an Analysis Services cube and its surrounding structure is reasonably complex and diverse. In attempting to automate the building of Analysis Services cubes QAD Data Warehouse Designer has simplified and restricted many of the functions available to the cube designer. QAD Data Warehouse Designer includes most of the commonly used capabilities and the components that logically fit into the methodology incorporated within QAD Data Warehouse Designer.

QAD Data Warehouse Designer broadly provides functionality to manage all of the above, except for perspectives and translations. These can be created outside of QAD Data Warehouse Designer, scripted in xmla and executed from within QAD Data Warehouse Designer. Features of cubes that are not supported in QAD Data Warehouse Designer can be added to the cube via the Microsoft tools. These altered cubes can still be processed through the QAD Data Warehouse Designer scheduler, and the cube should be documented within QAD Data Warehouse Designer to explain the post creation phases required.

As a general rule, once a cube or a component of a cube is created on the Analysis Services server it cannot be altered through QAD Data Warehouse Designer. The OLAP object can be dropped and recreated easily using Data Warehouse Designer. New OLAP objects defined in Data Warehouse Designer (e.g. additional calculations or measures) can be added by recreating the cube.

QAD Data Warehouse Designer supports cubes in Microsoft Sql Server Analysis Services versions 2005 and 2008.

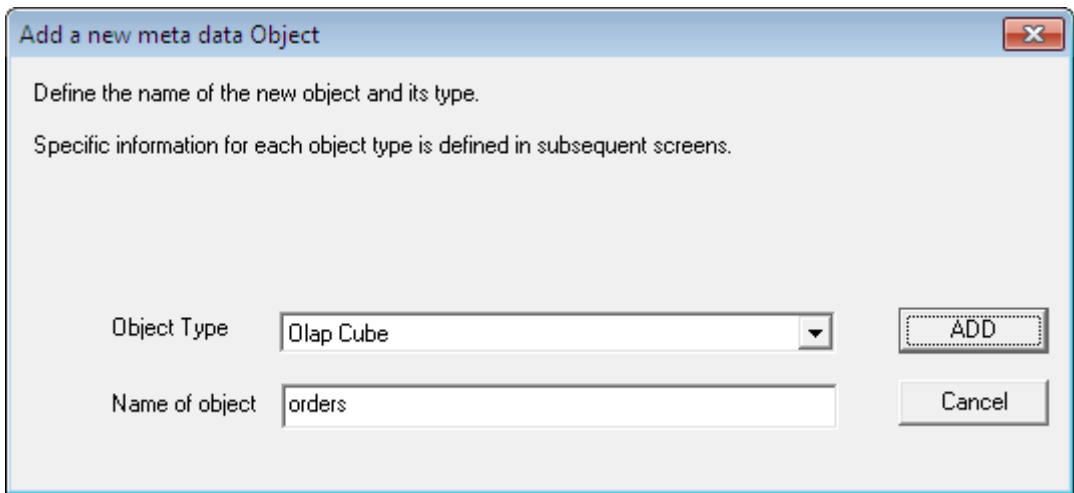
16.2 Defining an OLAP Cube

OLAP Cubes can be created from fact, fact view or aggregate objects . A single cube can contain dates from multiple source star schemas, each defined with a measure group. An OLAP Cube consists of many parts namely, measure groups, measures, calculations, actions, dimensions, dimension hierarchies, dimension attributes and dimension attribute relationships. It is strongly recommended that drag and drop is used to create an OLAP Cube in order that all the components are set up correctly. OLAP Cubes can utilize a hierarchical structure in the dimensions to facilitate user queries. Therefore each dimension present in an OLAP Cube should have either a hierarchy of levels or attributes and relationships.. The hierarchies are defined against the underlying dimensional attributes which can be inherited from the source dimension metadata. Individual attributes can be added to the dimension after the OLAP Cube or OLAP Dimension metadata has been created.

Building a New OLAP Cube

To create an OLAP Cube proceed as follows:

- 1 Double click on the 'OLAP Cube' object group to make the middle pane a cube drop target.
- 2 Select the data warehouse connection to browse in the source pane. The connection can be selected by right clicking the Data Warehouse connection in the Object pane and choosing Browse Source System.
- 3 Drag a fact table from the source pane into the target pane.
- 4 Set the cube name in the 'Create new metadata Object' dialog box and click Add.



Add a new meta data Object

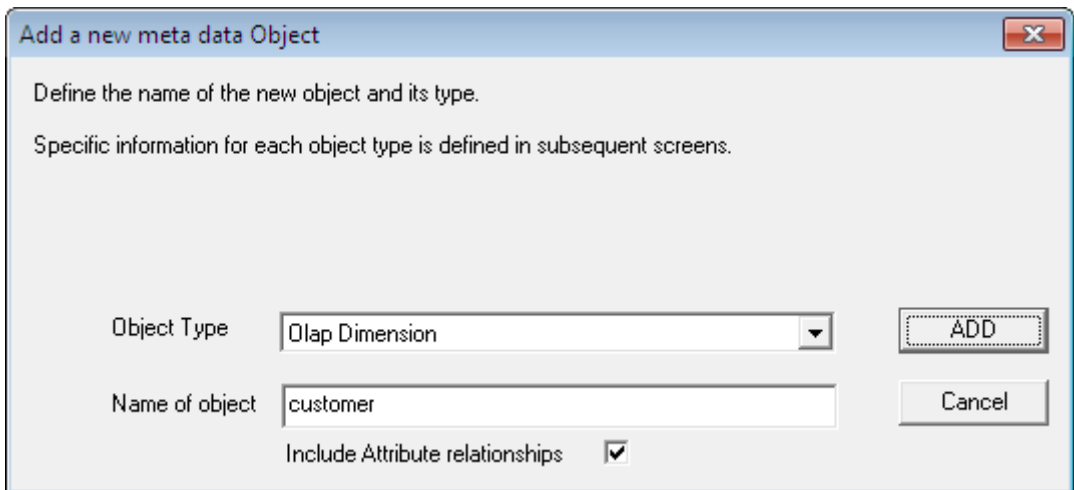
Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens.

Object Type:

Name of object:

- 5 A dialog box will prompt for any OLAP Dimensions that do not already exist that are required for this cube (based on the fact table metadata). Set the dimension name in the "Add a new metadata Object" dialog box and click Add.



Add a new meta data Object

Define the name of the new object and its type.

Specific information for each object type is defined in subsequent screens.

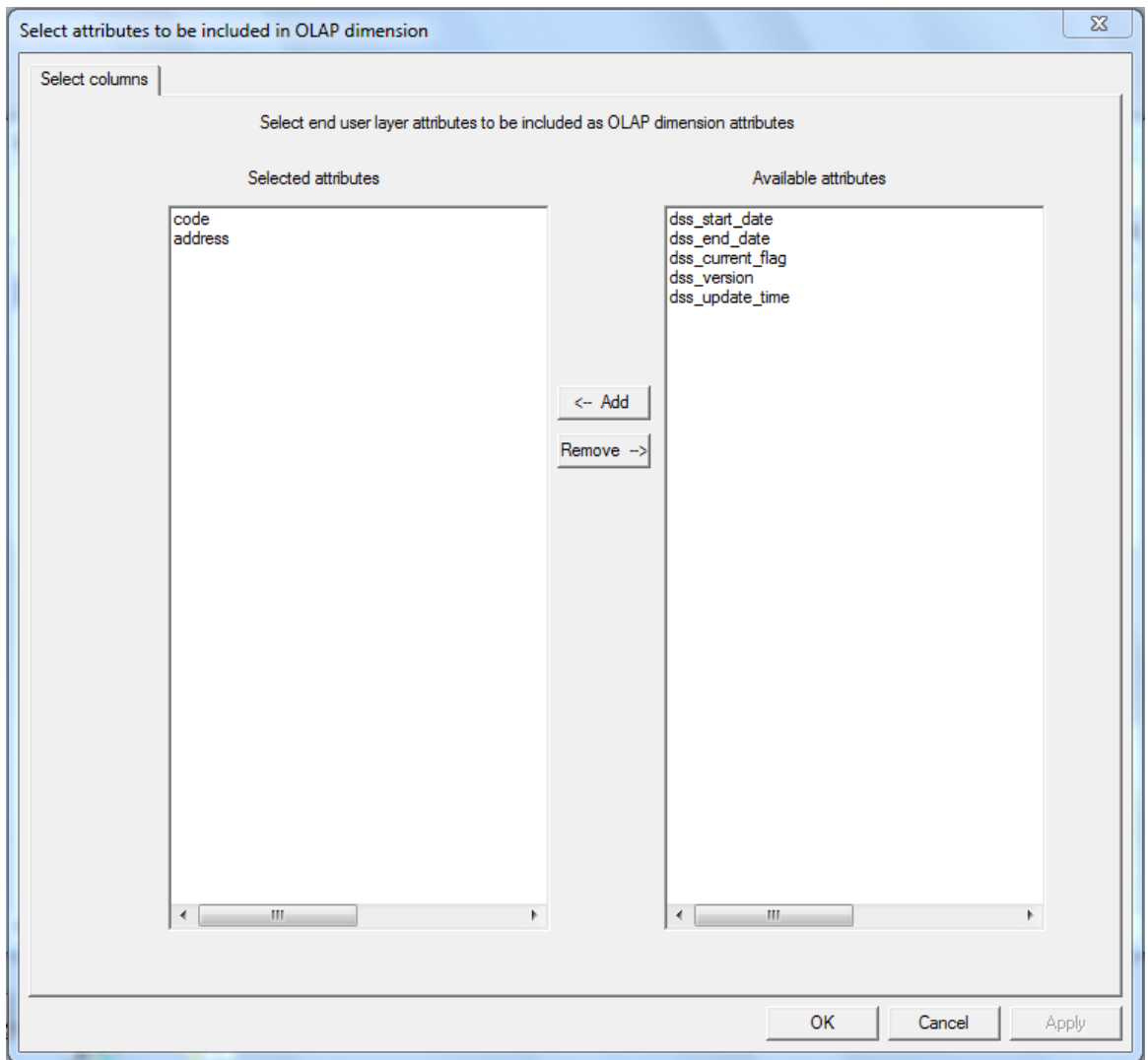
Object Type:

Name of object:

Include Attribute relationships ☒

NOTE: If you wish to include Attribute Relationships in Analysis Services for this dimension, click on the Include Attribute relationships check box.

The following dialog appears, prompting you to select the attributes to be included in the *Customer* OLAP dimension.

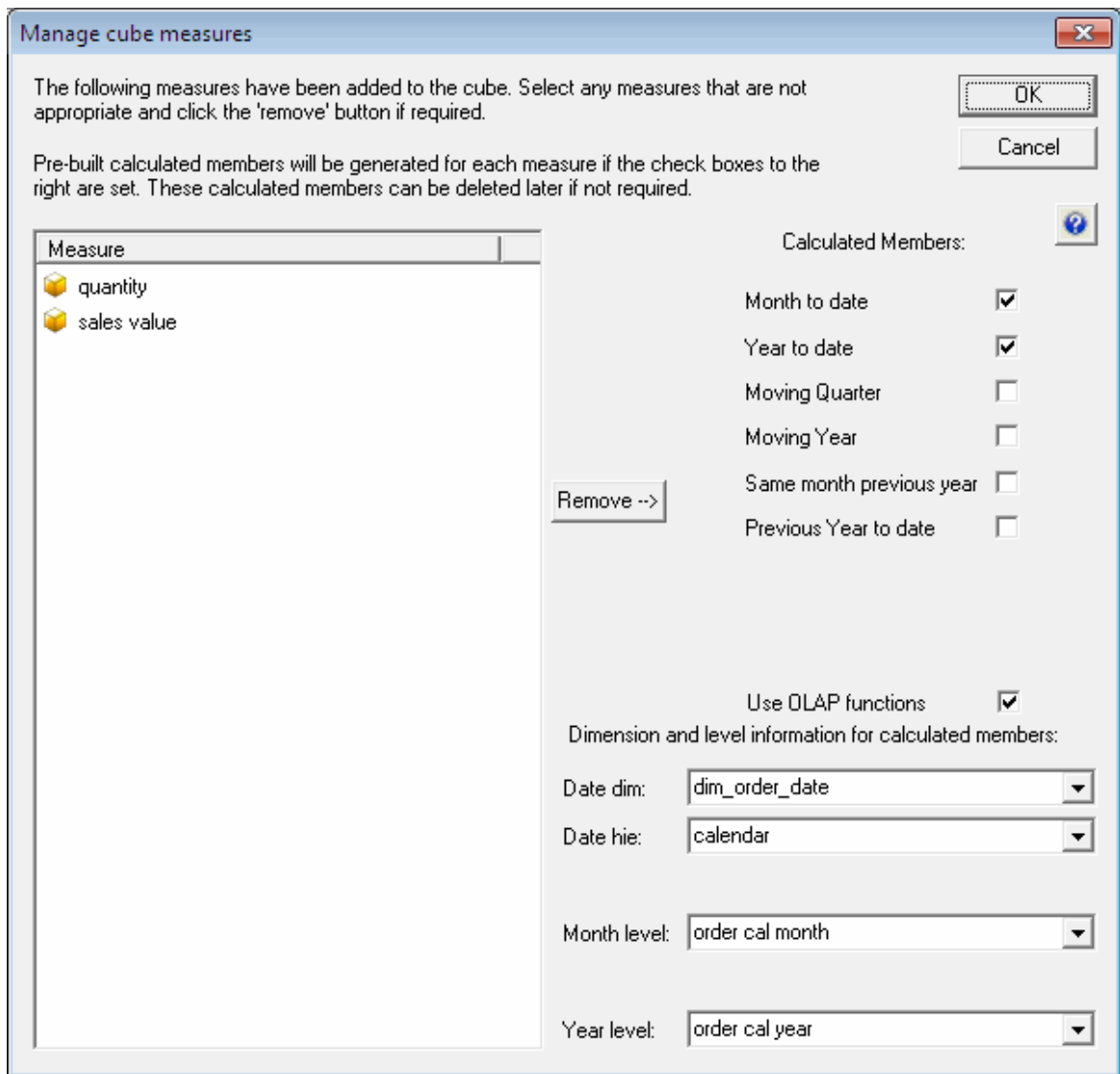


The attributes available for selection are in the right hand column. To select an attribute, click on the attribute in the right hand column and choose 'Add'. This will move the attribute to the left hand column.

To de-select an attribute, click on the attribute in the left hand column and choose 'Remove'. This will move the attribute to the right hand column.

Repeat Step 5 for each dimension as required.

- 6 A dialog will appear with a list of the fields that are to be added as measures. Remove any columns that are not measures. A measure is a column that uses the sum, count, min or max of the column. Calculations can be chosen if required at this point. A date dimension must be present along with a hierarchy to allow the definition of these calculated members.



- 7 During cube creation the "Adding Cube Measures" dialog is shown. In this dialog the following options are provided:
- Measure, provides a list of measures that can be aggregated (e.g. using Sum, Count, Min, Max or Distinct Count) . By default QAD Data Warehouse Designer will show all attributes in the fact table that are defined as numeric and additive. Those attributes that should not be considered measures can be removed using the Remove button.
 - Calculated Member options will allow the user to add some predefined date based calculated member definitions to be built against the cube. The standard calculations:

- Month to date
- Year to date
- Moving Quarter
- Moving Year
- Same Month Previous Year
- Previous Year to date

These will define a calculated measure based on the associated drop down boxes. There are 2 different ways that QAD Data Warehouse Designer will implement these calculations which is dictated by the Use OLAP functions check box:

- Using OLAP Functions - will implement the calculations using MDX Expressions within the cube using date based MDX functions. These calculations are efficiently executed by Analysis Services.
 - Without using OLAP functions - will implement the calculations using an MDX Filter function built over date dimension attributes. This option leverages the flags from the relational date dimension and ensures that a query using the calculations in the Cube will match an equivalent query against the star schema and is particularly useful if non-standard date periods are used.
- 8 The cube and dimensions will be created in QAD Data Warehouse Designer metadata and the cube measures will be displayed.

Setting Cube Properties

The properties of the cube must be completed before we can create the cube in the Analysis services database. Most of the elements in the properties screen will be defaulted, but each of the following columns will probably need to be completed.

- 1 The **connection** to the Analysis services server must be defined within the cube properties. This connection is a connection object. If no such connection exists then a new connection of type must be created and configured. SQL Server 2005 or 2008 Analysis Services use a connection type of "Analysis Server 2005+". This connection name must then be chosen in the cubes properties.
- 2 A **cube database name** must be selected. A new database name can be created by clicking the 'new database' button. This database name is the database that the cubes will reside in on the Analysis services server.
- 3 The **data source connection** must be defined and the three derived values shown under this connection must be present. If there is nothing in the three fields below the data source connection then the connection object will need to be modified. The provider type will normally be MSDAORA if the data warehouse is an Oracle database or SQLOLEDB if the data warehouse is SQL Server. The Server is either the SQL Server database server, or the Oracle TNS name. The database is the data warehouse database name.

16.3 Inspecting and Modifying Advanced Cube Properties

Now that the basic OLAP Cube has been defined, various properties of the OLAP Cube can be inspected or modified:

Measure Groups

- 1 Display the Measure Groups by selecting the right mouse menu option "Display Measure Groups" when positioned on the cube name.

- 2 Measure Group properties can be changed by using the right mouse menu option "Properties" when positioned over the measure.

Measures

- 1 Display all of the Measures associated with a cube by selecting the right mouse menu option "Display Measures" when positioned on the cube name.
- 2 The measure properties can be changed by using the right mouse menu option "Properties" when positioned on a measure name.

Calculations

- 1 Display all of the Calculated members defined on the cube by selecting the right mouse menu option "Display Calculations" when positioned on the cube name.
- 2 Calculated members can be changed by using the right mouse menu item "Properties" when positioned on the calculation name.

KPIs

- 1 Display all of the KPIs defined on the cube by selecting the right mouse menu option "Display KPIs" when positioned on the cube name.
- 2 KPIs can be changed by using the right mouse menu item "Properties" when positioned on the KPI name.

Actions

- 1 Display all of the Actions defined on the cube by selecting the right mouse menu option "Display Actions" when positioned on the cube name.
- 2 Actions can be changed by using the right mouse menu item "Properties" when positioned on the Action name.

Partitions

- 1 Display all of the Partitions defined on the Measure Groups that are associated with the cube by selecting the right mouse menu option "Display Partitions" when positioned on the cube name.
- 2 Partitions can be changed by using the right mouse menu item "Properties" when positioned on the Partition name.

Dimensions

- 1 Display all of the OLAP Dimensions associated with the cube by selecting the right mouse menu option 'Display Dimensions' when positioned on the cube name.
- 2 OLAP Dimension properties that are customisable for a cube can be changed by using the right mouse menu item "Properties" when positioned on the OLAP Dimension name.

Measure Group Dimensions

- 1 Display the relationship of OLAP Dimensions to Measure Groups defined against the cube by selecting the right mouse menu option 'Display Measure Group Dimensions' when positioned on the cube name.
- 2 The properties of the relationship of the OLAP Dimension to Measure Group that are customisable can be changed by using the right mouse menu item "Properties" when positioned on the OLAP Dimension name.

16.4 Creating an OLAP Cube on the Analysis Services Server

If all of the tasks above are completed then it should be possible to now create the cube on the Analysis Services server. When positioned on the **OLAP Cube** name use the right mouse menu and select the **Create Cube** option. QAD Data Warehouse Designer will check that key components of the cube are correct before it proceeds to issue the create command.

The create cube menu option will perform the following tasks on the Analysis Services server:

- Create an Analysis Services database if the name specified is not already present.
- Create a Data Source with connection information back to the data warehouse based on the cube source information in the Data Warehouse connection.
- Create a Data Source View to support the cube objects defined
- Create the dimensions used by the cube as database shared dimensions if they do not already exist.
- Create the cube if it does not exist
- Create a partition for the cube.

16.5 Cube Objects

16.5.1 Properties

The properties associated with a cube are described below. These properties relate both to the cube environment and the cube itself. There are seven tabs in the cube properties screen. The first is the main properties, the second the processing and partitioning options and the rest are for documentation stored in the QAD Data Warehouse Designer metadata and displayed in the generated QAD Data Warehouse Designer documentation. In order to see the cube properties use the right mouse menu item Properties when over the cube name.

The screenshot shows a dialog box titled "Cube sales_analysis definition". It has a tabbed interface with the following tabs: OLAP Cube Properties, Language Mapping, Purpose, Concept, Grain, Examples, Usage, and Notes. The "OLAP Cube Properties" tab is selected. The dialog contains the following fields and controls:

- Internal cube name: sales_analysis
- Cube publish name: sales_analysis
- Cube description: (Empty text box)
- Cube database connection: (Analysis services connect): Cubes
- Cube database name: Tutorial5
- Data source connection: (Data Warehouse): DataWarehouse
- Data source provider type: SQLOLEDB
- Data source server: SSERVER
- Data source database: WslWarehouse
- Post create XML/A Script: (Empty text box) [Edit]
- Post update XML/A Script: (Empty text box) [Edit]
- Processing mode: Regular
- Processing priority: 0
- Update dimensions: ☒
- Storage mode: Molap
- Default measure: (Empty text box)
- Estimated rows: 0
- Visible: True

At the bottom right, there are three buttons: OK, Cancel, and Apply.

Internal Cube Name

This is the name by which the cube is known within QAD Data Warehouse Designer. This name is limited to 64 characters in length and may contain only alphanumeric characters and underscores.

Cube Publish Name

This is the name that the cube will have in the Analysis Services server. It is not constrained in its content except for the limitations imposed on it by Analysis Services.

Cube Description

A description of the cube. This is used both in the QAD Data Warehouse Designer documentation and is also stored against the cube in Analysis Services.

Cube Database Connection

This field allows the selection of one of the existing connections defined within QAD Data Warehouse Designer. The connection must be of type 'Microsoft Analysis Server 2005+'. If no such connection exists then a new connection object must be created. This connection object is used to point to the Analysis Services server.

Cube Database Name

An Analysis Services server must have databases associated with it. Each database can contain one or more cubes, dimensions, data sources etc. Select the name of an existing database on the server from the drop down list. To create a new Database name, select '(Define New Cube Database)' from the drop down list and the dialog that follows will allow you to register the name within the QAD Data Warehouse Designer metadata. Once registered, the name can then be selected as the database.

Data Source Connection

In Analysis Services the data source is the location of the data to be used to build the cube. It also defines the path for any drill through operations. This field provides a drop down of the existing connections. The Data Warehouse connection must be chosen.

Data Source Provider Type

This field essentially defines what type of database the Data Warehouse is. The three options are MSDAORA where the data source is an Oracle database. OLESQLDB where the data source is a SQL Server database, or MSDASQL to define an ODBC source. The MSDASQL provider type could be used for either Oracle or SQL Server data warehouses, but performance may be compromised. This field is a read only field in the properties screen. Its value is set in the properties of the data source connection.

Data Source Server

The data source server is also a read only field being sourced from the properties of the data source connection. For SQL Server it defines the server on which the data warehouse database runs. For Oracle it is the TNS names entry for the database.

Data Source Database

The data source database is also a read only field being sourced from the properties of the data source connection. For SQL Server it defines the database in which the data warehouse runs. For Oracle it is also the database name.

Post Create XML/A Script

This is an XML/A script that is run on the cube database when the cube is created. This script allows Analysis Services features to be added to the cube or cube database that have been built outside of QAD Data Warehouse Designer - for example security roles that has been defined for the cube can be recreated from the script when the cube is created (or recreated).

Post Update XML/A Script

This is an XML/A script that is run on the cube database when the cube is updated or processed via the scheduler. This script allows Analysis Services features to be added to the cube or cube database that have been built outside of QAD Data Warehouse Designer - for example security roles that has been defined for the cube can be recreated from the script when the cube is updated or processed.

Processing Mode

Gets or sets the index and aggregation settings for cube processing. The value indicates whether processed data is available after all required data aggregation has been completed (Regular) or immediately after the data has been loaded (Lazy Aggregations). This setting will be used as the default for new measure groups and partitions created for the cube.

Processing Priority

Gets or sets the processing priority for the cube.

Update Dimensions

Will determine whether to process the OLAP Dimension related to the cube as part of the processing of the cube.

Storage Mode

This field allows two options; MOLAP - Multidimensional OLAP or ROLAP.- Relational OLAP. At the cube properties level, setting this field will determine the defaults for the Storage Mode field on its related Measure Groups and partitions.

Default Measure

Specifies the measure used to resolve MDX expressions if a measure is not explicitly referenced in the expression. If no default measure is specified an arbitrary measure is used as the default measure.

Estimated Rows

Specifies the estimated number of rows in the fact tables. Enter the size of the fact or source table if known, otherwise leave as zero.

Visible

Indicates whether the cube is visible to client applications.

ROLAP stands for Relational Online Analytical Processing.

ROLAP is an alternative to the MOLAP (Multidimensional OLAP) technology. While both ROLAP and MOLAP analytic tools are designed to allow analysis of data through the use of a multidimensional data model, ROLAP differs significantly in that it does not require the pre-computation and storage of information. Instead, ROLAP tools access the data in a relational database and generate SQL queries to calculate information at the appropriate level when an end user requests it. With ROLAP, it is possible to create additional database tables (summary tables or aggregations) which summarize the data at any desired combination of dimensions.

While ROLAP uses a relational database source, generally the database must be carefully designed for ROLAP use. A database which was designed for OLTP will not function well as a ROLAP database. Therefore, ROLAP still involves creating an additional copy of the data. However, since it is a database, a variety of technologies can be used to populate the database.

Language Mapping

The OLAP Cube Properties screen has a tab called 'Language Mapping'.

Select the language from the drop down list and then enter the translations for the Cube Publish Name and the Cube Description in the chosen language.

The screenshot shows a window titled "Cube olap_sales_detail definition" with a close button in the top right corner. Below the title bar is a tabbed interface with the following tabs: "OLAP Cube Properties", "Language Mapping" (which is the active tab), "Purpose", "Concept", "Grain", "Examples", "Usage", and "Notes".

Inside the "Language Mapping" tab, there is a "Language :" label followed by a dropdown menu currently showing "French". Below this is a section titled "Language Settings".

Under "Language Settings", there are two main input areas:

- Cube Publish Name:** This section contains two text boxes. The first box contains the text "olap_sales_detail". The second box is labeled "Translated Value of Cube Publish Name" and is currently empty.
- Cube Description:** This section contains two text boxes. The first box contains the text "This cube contains sales information collected from the primary point of sale system". The second box is labeled "Translated value of Cube Description" and is currently empty.

16.5.2 Measure Groups

A cube can contain multiple measure groups. In QAD Data Warehouse Designer each measure group can belong to a single cube, and each measure group relates to a single star schema. The Measure Groups Cube processing is defined on the tab entitled 'OLAP Measure Group Properties'.

The Measure Group's properties are shown by choosing the Properties option of the right mouse menu of the Measure Group. The properties of the measure groups that are associated with cubes are described below.

Measure group sales_detail definition

OLAP Measure Group Properties | Measure group processing / partitions | Language Mapping | Purpose | Concept | Grain | Examples | Usage

Measure Group name: sales_detail [Update]

Measure Group description: [Update <] [Update >]

Source table type: Fact Table

Source table: fact_sales_detail

Estimated rows: 0

Storage mode: Molap

Ignore unrelated dimension: True

Measure Group type: Regular

Processing mode: Regular

Processing priority: 0

[OK] [Cancel] [Apply]

Measure Group Name

Specifies the name of the Measure Group in Analysis Services

Measure Group Description

Specifies the Metadata description of the Measure Group. This description is stored in Analysis Services and is also used in the QAD Data Warehouse Designer auto-generated documentation.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current Measure Group to the previous and next Measure Group respectively for the current OLAP cube. The alternative is to exit the Measure Group and choose the next Measure Group Properties screen.

Source Table Type

Specifies the type of table from which the Measure Group has been built in QAD Data Warehouse Designer.

Source Table

Specifies the table from which the Measure Group has been built and populated in QAD Data Warehouse Designer.

Estimated Rows

Specifies the estimated number of rows in the source table. If it is unknown then leave this value as 0.

Storage Mode

This field allows two options; MOLAP - Multidimensional OLAP or ROLAP.- Relational OLAP. The default value is inherited from the value set at the Cube level. Again, setting this field at the Measure Group level will determine the default for the Storage Mode field on the related Partitions.

Ignore Unrelated Dimensions

Indicates whether dimensions that are unrelated to the Measure Group are forced to their top level when their members are included in a query.

Measure Group Type

Specifies the type of information the Measure Group contains. In some cases this enables specific treatment by the server and client applications.

Processing Mode

Indicates whether processed data is available after all the aggregations have been computed (Regular) or immediately after the data has been loaded (Lazy Aggregations).

Processing Priority

Specifies the priority for processing the measure group.

16.5.3 Measure Group Processing / Partitions

Partitions define separately manageable data slices of the measure group data. Partitions can be created, processed and deleted independently within a Measure Group. Each Measure Group needs at least one partition to be defined to allow the Measure Group to be processed.

Partitions are managed through the Measure Group Processing / Partitions tab of the Measure Group's properties within QAD Data Warehouse Designer.

The screenshot shows a dialog box titled "Measure group sales_detail definition" with a close button (X) in the top right corner. The dialog has several tabs: "OLAP Measure Group Properties", "Measure group processing / partitions" (which is selected), "Purpose", "Concept", "Grain", "Examples", "Usage", and "Notes".

Below the tabs, there is a text box with the following text: "The measure group processing method is, by default, inherited by all partitions. Partitions can be individually changed to utilize a different method if required." To the right of this text is a help icon (a question mark inside a circle).

Below this text is a label "Process method:" followed by a dropdown menu showing "Full process".

Below that is a label "Increment filter: (Do not include 'Where')" followed by a large empty text area.

Below that is another text box with the following text: "The partitions for the measure group can be viewed. These partitions can be managed manually or automatically by RED. Select the desired partition management strategy."

Below this text are several labels and dropdown menus:

- "Partitioning method:" followed by a dropdown menu showing "Auto create partitions as required (one numeric level)".
- "Partition by dimension:" followed by a dropdown menu showing "dim_order_date".
- "Partition by attribute:" followed by a dropdown menu showing "order cal month".
- "Partition value type:" followed by a dropdown menu showing "YYYYMM".

Below these is a label "Fact partition lookup clause (Do not include 'Where')" followed by a text area containing the SQL clause: "dss_update_date < GETDATE()-14".

Below that are two labels and text input fields:

- "Max # auto created partitions: (0 = unlimited)" followed by a text input field containing "12".
- "# historic partitions updated:" followed by a text input field containing "3".

At the bottom right of the dialog are three buttons: "OK", "Cancel", and "Apply".

Process Method

The processing or updating method of a Measure Group is an area that requires careful consideration. The default option is 'Full process' which will result in the Measure Group being rebuilt. This is in many ways the safest option, but processing time may mean other options must be chosen. The valid options are:

The following describes the processing methods that are available in Analysis Services for Measure Groups:

- **Default Process**
Detects the process state of the measure group, and performs processing necessary to deliver a fully processed state.
- **Full Process**
Processes an Analysis Services Measure Group regardless of state. When Process Full is executed against a Measure Group that has already been processed, Analysis Services drops all data, and then processes it.
- **Incremental Process**
Adds newly available fact data and process only to the relevant partitions. In order to use this option you must set the 'incremental filter' field with a statement that will result in only new data being selected. Failure to do so will result in duplicated data in the cube. In many data warehouses a fact table undergoes changes to the data as well as the addition of new data, and so the incremental update option is not possible. A validation regime should be put in place to compare cube data to the fact data if incremental is used. This validation regime should be used to notify the administrator in the event that duplicate data is inserted into the cube.
- **Update Data**
Processes data only without building aggregations or indexes. If there is data in the partitions, it will be dropped before re-populating the partition with source data. This processing option is supported for dimensions, cubes, measure groups, and partitions.
- **Build Structure**
If the cube is unprocessed, Analysis Services will process, if it is necessary, all the cube's dimensions. After that, Analysis Services will create only cube definitions. The build structure option just builds the cube structure without populating it. This can be useful if you have a very large cube and want to validate the design.

Increment Filter

If an incremental processing option is chosen then a filter statement must be selected to only return those rows that are to be added to the Measure Group. As mentioned above, care must be taken when using incremental updates. For example, if the Measure Group is accidentally processed twice and the filter is based on date, then duplicate data will be inserted into the Measure Group without any warning.

Partitioning

Partitioning is useful for handling large datasets where it is impractical to reprocess the entire Measure Group. In such a case the full process option would probably be chosen but only selected partitions would be processed. See the section on partitioning for more information. The default process will perform a full process on the first pass followed by incremental updates on subsequent processing runs. Care should be taken when choosing default for the cube.

Partitioning Method

Three options are provided for handling Measure Group partitions. They are:

1 One partition only

When this option is selected the partition information for the Measure Group is ignored and one partition is created and processed for the Measure Group. This would be the normal situation unless performance issues require an alternate strategy.

2 Manually managed multiple partitions

With this option the partition information stored for the Measure Group is used in the creation and processing of the Measure Group.

3 Automatic partition handling

This option is available if the Measure Group is to be partitioned by one numeric value. The partitioning should preferably be on something like day, month or year. (i.e. YYYY, YYYYMM or YYYYDDD). If this option is chosen together with one of the date formats described above, then QAD Data Warehouse Designer will automatically create partitions as required and process only those partitions that are marked for processing.

Partition by Dimension

This field is only available if automatic partition handling is chosen. Select the dimension in the Measure Group that we will partition by. This would normally be a date dimension.

Partition by Attribute

This field is only available if automatic partition handling is chosen. Select the attribute that we are to partition by. This would normally be a year or maybe a month level. (e.g. cal_year, fin_year from the QAD date dimension).

Partition by Value Type

This field is only available if automatic partition handling is chosen. Select the type of level we are dealing with. Choose YYYY for a year partition and YYYYMM for a month partition. This format must correspond with the column in the date dimension. QAD Data Warehouse Designer only supports partitioning by Year, Quarter, month or day.

Fact Partition Lookup Clause

This field is only available if automatic partition handling is chosen. In order to know when to create a new partition QAD Data Warehouse Designer executes a query against the fact table and the date dimension to acquire each unique period. When dealing with a large fact table, such a query may take a long time to complete. This field can be used to include the components of the 'Where' clause to restrict the amount of data examined. For example we may enter 'dss_update_time < GETDATE()-14' to only look at fact table records that have been inserted or updated in the last 14 days. This should still allow us to catch any new partitions and add them. The first time a cube is converted to auto partitioning handling, a full pass of the fact table should occur to allow inclusion of every partition. This field should therefore only be populated once the cube has been initially built with all partitions intact.

Max Number of Auto Created Partitions

This field is only available if automatic partition handling is chosen. You can specify an upper limit for automatically created partitions. The default is zero, or no limit. This limit may be useful if your source system can get erroneous data. If set, then the processing of the Measure Group will fail if a new partition will exceed the counter.

Number of Historic Partitions Updated

This field is only available if automatic partition handling is chosen. This field allows you to restrict the partition updating to the latest nnn partitions. If for example, we were partitioning by year and we set this value to 2, we would process the current and previous years only. QAD Data Warehouse Designer turns off partition processing after it does a partition update, so the first pass will still update all partitions.

To Display Measure Groups

To display a list of measure groups defined against a cube, right click on a cube and choose Display Measure Groups.

To Add a Measure Group

To add a measure group, display the measure groups in the middle pane and either:

- Drag over a new fact table into the target pane - this will automatically create a new measure group in the cube. Any additional dimensions required to support analysis of the Measure Group will be added to the cube.
- Right click the cube in the object pane and select Add Measure Group and fill in the Measure Group properties.

To Delete a Measure Group

To delete a measure group, display the measure groups in the middle pane and right-click, select delete measure group.

Displaying Measures

Measures can be displayed or added while viewing measure groups in the middle pane. Right-click on a measure group and select the appropriate option.

Displaying Partitions

Partitions can be displayed or added while viewing measure groups in the middle pane. Right-click on a measure group and select the appropriate option.

16.5.4 Measure Group Partitions

The Measure Group Partition's properties are shown by choosing the Properties option of the right mouse menu of the Measure Group Partition. The properties of the partitions that are associated with a measure group are described below.

Measure Group partition definition

Partition Properties

Cube name: sales_analysis

Data source: sales_detail

Fact table: fact_sales_detail

Partition name: fact_sales_detail

Partition description:

Data slice formular:

[cube dimension].[level].[slice]
Example: [ship_date].[cal year].[2003]

Aggregation prefix:

Filter statement:

Storage mode: Molap

Partition type: Local

Remote server:

Processing method: Default processing

Update

Update <

Update >

Cube name

The name of the cube that the partition belongs to.

Data source

The data source for the partitions. This will be inherited from the cube and cannot be changed. You cannot have partitions with different data sources or different fact tables in QAD Data Warehouse Designer. If you need to support either scenario then the partition must be created directly within Analysis Services. In such a case it can still be managed in terms of processing through QAD Data Warehouse Designer.

Fact table

The fact table that the data is derived from. This is inherited from the cube and cannot be changed. See the notes above under data source.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current Measure Group Partition to the previous and next Measure Group Partition respectively for the current Measure Group. The alternative is to exit the Measure Group Partition and choose the next Measure Group Partition Properties screen.

Partition name

Where only one partition exists it is normally given the same name as the cube. If manually creating then a unique name must be assigned for each partition. If auto partitioning is chosen then QAD Data Warehouse Designer will use the cube name plus the level value to make the partition name.

Partition description

A description of the partition for documentation purposes.

Data slice formula

This field defines the range of data stored in the partition. It is a very simplified version of what can be done in Analysis Services. If a more complex partitioning algorithm is required then the partition will need to be created in Analysis Services. The format for the formula is as follows:

The brackets must surround each name and a full stop must separate the three parts of the formula. For example a cube that is partitioned by year on its date dimension would have the following formula for the 2003 year. [dim_date].[cal_year].[2003]

Aggregation prefix

By default any cube aggregation will be prefixed with the partition name. An alternate name can be entered here. See Analysis Services for more details.

Filter statement

Not implemented.

Storage mode

This field allows two options; MOLAP - Multidimensional OLAP or ROLAP.- Relational OLAP. This determines how the OLAP cube is processed. The default value is inherited from the value set at the Measure Group level.

Partition type

The partition can be either Local or Remote. Local means that the partition resides on the same Analysis Services server as the cube. If Remote is chosen then a server must be specified where the partition will be located.

Remote server

If a Remote partition then the name of the remote Analysis Services server must be entered here.

Processing method

A partition is either enabled for processing or disabled. This field can be set to Always process or Never process. If left as default and in automatic mode then QAD Data Warehouse Designer will disable the processing once the partition has been aged out.

16.5.5 Measures

Measures represent the numeric attributes of a fact table that are aggregated using an OLAP aggregate function defined against each Measure. Each Measure is defined against a Measure Group, which is defined against a cube. The properties of a measure are shown by right clicking on a Measure and choosing Properties. In more detail:

Cube measure definition

Cube measure properties | Language Mapping | Purpose | Usage | Issues

Cube: sales_analysis

Measure name: unit sale price

Measure group: sales_detail

Source table: fact_sales_detail

Source column: unit_sale_price

Data type: numeric(9,3)

Aggregation method: Sum

Display format: #, #.00

Null processing: Automatic

Order number: 50

Visible: True

Description: Standard sale price per unit of product in effect at the time of the order.

Update Update < Update >

OK Cancel Apply

Cube

A Read Only field that indicates against which OLAP Cube the measure is defined.

Measure Name

Specifies the Analysis Services name defined for the measure.

Measure Group

Specifies against which Measure Group the Measure is defined. This is related to the fact table of which the Measure is an attribute.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current Measure to the previous and next Measure respectively for the current OLAP Cube Measure Group. The alternative is to exit the Measure and choose the next Measure Properties screen.

Source Table

A read only field that indicates the fact table that is related to the Measure Group.

Source Column

Specifies from which numeric attribute of the underlying fact table the Measure is built. This is a drop down list populated from Data Warehouse Designers metadata definition of the fact table associated with the Measure Group above.

Data Type

Specifies the data type used by Analysis Services. The data type specified for this property is inherited from the fact table attribute defined in QAD Data Warehouse Designer metadata but can be different (typically a larger data type is used in the cube to cope with the larger numbers generated by aggregating the source data).

Aggregation Method

Specifies the OLAP function used to aggregate measure values. The default options are:

- Sum
- Count
- Distinct Count - only one distinct count is allowed per Measure Group and can have query performance implications.
- Min - Minimum
- Max - Maximum

Display Format

Specifies the format used by clients when displaying the measure value.

Null Processing

Specifies the processing null values. Setting this property to Automatic means that Analysis Services uses default behavior.

Order number

The order in which the measures appear in the cube is dictated by their order number.

Visible

Measures are normally visible, but some measures used in calculations may be hidden. In such a case clear this check box.

Description

A description of the measure which is stored in the cube. This description will by default be acquired from the source column.

To View measures

The measures can be viewed by clicking on an OLAP Cube in the left pane which will display the measures in the middle pane.

To Add a New Measure

To add a new measure, view the measures in the middle pane, right-click in the middle pane and select add measure. This can also be done when viewing measure groups in the middle pane. Alternatively to create measure which is very similar to an existing measure, view the measures in the middle pane and right-click, select "copy measure". The same dialog box appears as for "add measure" with most of the fields filled in. Notice that the measure name has the suffix "- Copy". Change the name in the Measure Name field and make any other alterations and click OK.

To Delete a measure

Display the measures in the middle pane, select the measure to delete, right-click and select Delete.

16.5.6 Calculations

Calculations provide the ability to define the derivation of a value at query time within a cube. The calculation is most typically a numeric derivation based on measures, but can be defined against any dimension. The calculation is defined in MDX (Multi-Dimensional eXpressions). The definition of a Calculation is shown by right clicking a Calculation and choosing Properties. The following Cube Calculated Member Definition dialog is shown:

Cube calculated member definition

Cube calculated member properties | Language Mapping | Purpose | Usage | Issues

Cube:

Calculated member name:

Associated Measure Group:

Parent hierarchy:

Parent member:

Expression:

Display format:

Font: Microsoft Sans Serif Bold: ☐

Fore color: Back color:

Visible:

Non empty behavior:

Order number:

Description:

Cube

A Read Only field that indicates against which OLAP Cube the Calculation is defined.

Calculated Member Name

Specifies the Analysis Services name defined for the Calculation.

Associated Measure Group

Specifies against which Measure Group the Measure is defined. This is related to the fact table of which the Measure is an attribute.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current Calculation to the previous and next Calculation respectively for the current OLAP Cube. The alternative is to exit the Calculation and choose the next Calculation Properties screen.

Parent Hierarchy

Specifies the dimension hierarchy in which the calculation is created.

Parent Member

If the Parent Hierarchy is anything other than Measures, then this value specifies the parent member for the calculation.

Expression

Specifies the MDX expression that defines the calculation.

Display Format

Specifies the format used by clients when displaying the measure value.

Visible

Specifies whether the calculation is visible to client tools.

Non Empty Behavior

Determines the non-empty behavior associated with the calculation

Order Number

The create order of the member in the dimension hierarchy.

Description

A business description of the Calculation that is used to populate QAD Data Warehouse Designer documentation.

To View Calculations

To view the list of calculations (sometimes called a calculated measure), right-click on an OLAP Cube in the left pane and select **Display Calculations**.

To Add a Calculation

- 1** To add a calculation, right-click on an OLAP Cube in the left pane and select "Add Calculation". This can also be achieved by displaying calculations in the middle pane, right-clicking and selecting "add calculation". Fill out the dialog box with the relevant details.
- 2** To create a calculation that is similar to an existing calculation, display the calculations in the middle pane and select "copy Calculation". The same dialog box appears as for "add calculation" with most of the fields filled in. Notice that the calculated member name has the suffix "- Copy". Change the name in the Measure Name field and make any other alterations and click OK.

To Delete a calculation

Display the calculations in the middle pane, select the calculation to delete, right-click and select Delete.

16.5.7 Key Performance Indicators

In Analysis Services, a KPI is a collection of calculations that are associated with a measure group in a cube that are used to evaluate business success. Typically, these calculations are a combination of Multidimensional Expressions (MDX) expressions or calculated members. KPIs also have additional metadata that provides information about how client applications should display the results of the KPI's calculations. The definition of a Calculation is shown by right clicking a Calculation and choosing Properties. The following Cube KPI Definition dialog is shown below:

Cube KPI definition

Cube KPI Definition | Language Mapping | Purpose | Usage | Issues

Cube: sales_analysis

KPI Name: Sales Growth

Description: The KPI shows growth against the same period last year. The goal is to attain 10% growth year on year.

Associated Measure Group: sales_detail

Value Expression: [Measures].[order count]

Goal Expression: [Measures].[prev year month order count]*1.1

Status Indicator: Smiley Face

Status Expression: KpiValue('Sales Growth')/KpiGoal('Sales Growth') >= 0.85

Trend Indicator: Standard Arrow

Trend Expression: KpiValue('Sales Growth')/KpiGoal('Sales Growth')*1.1

Parent KPI:

Weight:

Update Update <- Update >- OK Cancel Apply

Cube

A Read Only field that indicates against which OLAP Cube the KPI is defined.

KPI Name

Specifies the name of the KPI defined in Analysis Services.

Description

A business description of the KPI that is used to populate QAD Data Warehouse Designer documentation.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current KPI to the previous and next KPI respectively for the current OLAP Cube. The alternative is to exit the KPI and choose the next KPI Properties screen.

Associated Measure Group

Specifies the Measure Group against which the KPI is defined.

Value

An MDX numeric expression that returns the actual value of the KPI.

Goal

An MDX numeric expression or a calculation that returns the target value of the KPI.

Status

An MDX expression that represents the state of the KPI at a specified point in time.

The status MDX expression should return a normalized value between -1 and 1. Values equal to or less than -1 will be interpreted as "bad" or "low." A value of zero (0) is interpreted as "acceptable" or "medium." Values equal to or greater than 1 will be interpreted as "good" or "high."

An unlimited number of intermediate values can optionally be returned and can be used to display any number of additional states, if supported by the client application.

Status Indicator

A visual element that provides a quick indication of the status of a KPI. The display of the element is determined by the value of the MDX expression that evaluates status.

Trend

An MDX expression that evaluates the value of the KPI over time. The trend can be any time-based criterion that is useful in a specific business context.

The trend MDX expression enables a business user to determine whether the KPI is improving over time or degrading over time.

Trend Indicator

A visual element that provides a quick indication of the trend for a KPI. The display of the element is determined by the value of the MDX expression that evaluates trend.

Display Folder

The folder in which the KPI will appear when a user is browsing the cube.

Parent KPI

A reference to an existing KPI that uses the value of the child KPI as part of computation of the parent KPI. Sometimes, a single KPI will be a computation that consists of the values for other KPIs. This property facilitates the correct display of the child KPIs underneath the parent KPI in client applications.

Current Time Member

An MDX expression that returns the member that identifies the temporal context of the KPI.

Weight

An MDX numeric expression that assigns a relative importance to a KPI. If the KPI is assigned to a parent KPI, the weight is used to proportionally adjust the results of the child KPI value when calculating the value of the parent KPI.

To View KPIs

To view the list of KPIs, right-click on an OLAP Cube in the left pane and select "Display KPIs".

To Add a KPI

- 1 To add a calculation, right-click on an OLAP Cube in the left pane and select "Add KPI". This can also be achieved by displaying KPIs in the middle pane, right-clicking and selecting "Add KPI". Fill out the dialog box with the relevant details.
- 2 To create a KPI that is similar to an existing KPI, display the KPIs in the middle pane and select "Copy KPI". The same dialog box appears as for "Add KPI" with most of the fields filled in. Notice that the KPI name has the suffix "- Copy". Change the name in the KPI Name field and make any other alterations and click OK.

To Delete a KPI

Display the KPIs in the middle pane, select the KPI to delete, right-click and select Delete.

16.5.8 Actions

An action provides information to a client application to allow an action to occur based on the property of a clicked dimensional member. Actions can be of different types and they have to be created accordingly. To view the definition of an Action, right click the action and choose Properties. The following Cube Action Definition will be shown:

The screenshot shows the 'Cube action definition' dialog box with the 'Cube Action properties' tab selected. The dialog contains the following fields and controls:

- Cube:** sales_analysis
- Action Type:** Drillthrough Action
- Action name:** budget Drillthrough Action
- Target Type:** Cells
- Measure Group Members:** budget
- Condition:** (Empty text area)
- Server:** (Empty text field)
- Report Path:** (Empty text field)
- Rpt Fmt ContType:** (Empty dropdown menu)
- Expression:** (Empty text area)
- Default:** False
- Invocation:** Interactive
- Application:** (Empty text field)
- Description:** Drill through action
- Caption:** (Empty text field)
- Caption is MDX:** False

Buttons on the right side: Update, Update <, Update >. Buttons at the bottom: OK, Cancel, Apply.

Cube

A Read Only field that indicates against which OLAP Cube the Calculation is defined.

Action Type

Actions can be of the following types:

- **Drill through actions** which return the set of rows that represents the underlying data of the selected cells of the cube where the action occurs. When this option is chosen an additional tab is enabled that allows drill through columns to be chosen.
- **Reporting actions** which return a report from Reporting Services that is associated with the selected section of the cube where the action occurs.
- **Standard actions (Action)**, which return the action element (URL, HTML, DataSet, RowSet, and other elements) that is associated with the selected section of the cube where the action occurs.

The action type chosen determines which action specific fields are enabled within the dialog.

Action Name

Defines the name of the Action in the Cube.

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current Action to the previous and next Action respectively for the current OLAP Cube. The alternative is to exit the Action and choose the next Action Properties screen.

Target Type

Select the object to which the action is attached. Generally, in client applications, the action is displayed when end users select the target object; however, the client application determines which end-user operation displays actions. For Target type, select from the following objects:

- Attribute members
- Cells
- Cube
- Dimension members
- Hierarchy
- Hierarchy members
- Level
- Level members
-

Target Object

The cube object of the designated target type against which the action is defined.

Condition

Specify an optional Multidimensional Expressions (MDX) expression that resolves to a Boolean value. If the value is True, the action is performed on the specified target. If the value is False, the action is not performed.

Report Action: Server

The name of the computer running report server.

Report Action: Report Path

The path exposed by report server.

Content Type

Select the type of action. The following table summarizes the available types.

- Data Set - Retrieves a dataset
- Proprietary - Performs an operation by using an interface other than those listed in this table.
- Row Set - Retrieves a rowset.
- Statement - Runs an OLE DB command.
- URL - Displays a page in an Internet Browser.

Expression

Specifies the parameters that are passed when the action is run. The syntax must evaluate to a string, and you must include an expression written in MDX. MDX expressions are evaluated before the parameters are passed.

Default

An additional true/false drop list is enabled for Drill through actions. This gets or sets the current DrillThroughAction as the default action when multiple drillthrough actions are defined. This is important for users of Excell 2007 to browse the Olap Cube because Excell will only invoke the Drill through Action marked as the default.

Invocation

Specifies how the action is run. Interactive, the default, specifies that the action is run when a user accesses an object. The possible settings are:

- Batch
- Interactive
- On Open

Application

Describes the application of the action.

URL

The URL opened by the action.

Description

Describes the action.

Caption

Provides a caption that is displayed for the action.

Caption is MDX

If the caption is MDX, specify True, if not specify False.

To View Actions

To view the list of Actions, right-click on an OLAP Cube in the left pane and select "Display Actions".

To Add an Action

- 1 To add an Action, right-click on an OLAP Cube in the left pane and select "Add Action". This can also be achieved by displaying Actions in the middle pane, right-clicking and selecting "Add Action". Fill out the dialog box with the relevant details.
- 2 To create an Action that is similar to an existing Action, display the Actions in the middle pane and select "Copy Action". The same dialog box appears as for "Add Action" with most of the fields filled in. Notice that the Action name has the suffix "- Copy". Change the name in the Action Name field and make any other alterations and click OK.

To Delete an Action

Display the Actions in the middle pane, select the Action to delete, right-click and select Delete.

16.5.9 Cube Dimensions

OLAP Dimensions are associated automatically with a cube when a cube is created in QAD Data Warehouse Designer based on the underlying star schema. OLAP Dimensions that are associated with a cube can be displayed, or additional OLAP Dimensions can be manually added from the list of OLAP Dimensions defined in QAD Data Warehouse Designer.

Once an OLAP Dimension is associated with a cube a relationship is created with the relevant Measure Groups within the cube - these relationships are defined automatically with QAD Data Warehouse Designer, and they can also be added. The properties of an OLAP Dimension associated with a cube are shown by right clicking the cube dimensions listed in the middle pane and selecting properties from the right mouse menu. The properties are shown below:

Cube Dimension dim_customer definition

OLAP Cube Dimension Properties | Language Mapping

Internal dimension name: 

OLAP dimension name:

Cube dimension name:

Dimension description:

Order number: Update dimension with cube: ☒

Visible:

All member aggregation usage:

Hierarchy unique name style:

Member unique name style:

Source table type:

Source table:

Source table key:

Processing mode:

All caption:

OLAP dimension type:

Unknown member action:

Unknown member name:

Internal Dimension Name

A read only field displaying the name of the OLAP Dimension in QAD Data Warehouse Designer.

OLAP Dimension Name

Specifies the name of the OLAP Dimension as a Dimension in Analysis Services.

Cube Dimension Name

Specifies the exposed name of the Dimension when associated with a cube (this can be different from the OLAP Dimension Name).

Update Buttons

The Update Buttons: **Update <** and **Update >** are used to move from the current OLAP Dimension to the previous and next OLAP Dimension respectively for the current OLAP Cube. The alternative is to exit the OLAP Dimension and choose the next OLAP Dimension Properties screen.

Dimension Description

A description of the dimension when associated with the cube.

Order Number

The order number.

All member aggregation usage

Specifies how aggregations will be designed by the BIDS Storage Design Wizard if it is used to design cube aggregations.

Hierarchy unique name style

Indicates whether the dimension name will be included in the name of the hierarchies. If set to Default then the system will apply a default behavior and will include the dimension name in the case where there is more than one usage of the same dimension.

Member unique name style

Indicates how member unique names will be formed.

Other Read only fields that are displayed in this dialog are configurable against the OLAP Dimensions' properties and cannot be changed in this dialog, including:

- Source Table Type
- Source Table
- Source Table Key
- Processing Mode
- All caption
- OLAP Dimension Type
- Unknown Member Action

- Unknown Member Name

To View Cube Dimensions

To view the list of Dimensions associated with a cube, right-click on an OLAP Cube in the left pane and select "Display Dimensions".

To Add a Cube Dimension

To add an existing OLAP Dimension, right-click on an OLAP Cube in the left pane and select "Add Dimension". This can also be achieved by displaying Dimensions in the middle pane, right-clicking and selecting "Add Dimension". Fill out the dialog box with the relevant details.

To Remove a Cube Dimension

Display the Cube Dimensions in the middle pane, select the Dimension to remove, right-click and select Remove Dimension from Cube. This action removes the association of the OLAP Dimension from the OLAP Cube.

16.5.10 Measure Group Dimensions

Measure group dimensions are the relationships between cube Measure Groups and OLAP Dimensions. In QAD Data Warehouse Designer this equates to the relationships between fact tables and dimensions in the underlying star schema.

The properties are shown below:

Measure Group Dimension dim_customer definition

OLAP Cube Dimension Properties

Internal dimension name: 

OLAP dimension name:

Cube dimension name:

Dimension description:

Order number: Update dimension with cube: ☒

Visible:

All member aggregation usage:

Hierarchy unique name style:

Member unique name style:

Measure group:

Measure group column:

Relationship type:

Cardinality:

Source table type:

Source table:

Source table key:

Processing mode:

All caption:

OLAP dimension type:

Unknown member action:

Unknown member name:

Internal Dimension Name

A read only field displaying the name of the OLAP Dimension in QAD Data Warehouse Designer.

OLAP Dimension Name

A read only field displaying the name of the OLAP Dimension as a Dimension in Analysis Services.

Cube Dimension Name

A read only field displaying the name of the Dimension when associated with a cube (this can be different from the OLAP Dimension Name).

Update Buttons

The Update Buttons: **Update <-** and **Update ->** are used to move from the current OLAP Measure Group Dimension to the previous and next OLAP Measure Group Dimension respectively for the current OLAP Cube. The alternative is to exit the OLAP Measure Group Dimension and choose the next OLAP Measure Group Dimension Properties screen.

Dimension Description

A description of the dimension when it is associated with the cube.

Order Number

The order number.

Update dimension with Cube

A read only check box showing whether the dimension is processed when the cube is processed.

Visible

A read only field displaying the visibility of the dimension on the cube.

All member aggregation usage

A read only field displaying how aggregations will be designed by the BIDS Storage Design Wizard if it is used to design cube aggregations.

Hierarchy unique name style

A read only field which indicates whether the dimension name will be included in the name of the hierarchies.

Member unique name style

A read only field which indicates how member unique names will be formed. A read only field.

Measure group

A read only field displaying the Measure Group which is being referenced by the Measure Group Dimension relationship.

Measure group column

Specifies which fact table key joins to the dimension key.

Relationship type

Defines the relationship type for the relationship between the Dimension and Measure Group. In QAD Data Warehouse Designer this option can be Regular, which means that the relationship is based on a dimension key join, or No Relationship between the Measure Group and Dimension.

Cardinality

Indicates whether the measure group has a many to one or one to one relationship with the dimension.

Source Table Type

A read only field that displays the type of table from which the OLAP Dimension was created.

Source Table

A read only field that displays the name of the table from which the OLAP Dimension was created.

Source Table Key

A read only field that displays the key (typically the primary key) that relates the dimension to the fact in the underlying star schema.

Processing Mode

A read only field that indicates whether processed data is available after all aggregations have been computed or immediately after the data has been loaded.

All Caption

A read only field that displays the name of the (All) member. This applies to all hierarchies in the dimension that have an (All) member.

OLAP Dimension Type

A read only field that displays the type of information contained by the dimension.

Unknown member Action

A read only field that displays the existence of an Unknown member and whether that member is visible or hidden.

Unknown Member Name

A read only field that displays the caption for the unknown member.

16.6 Dimension Objects

16.6.1 Dimension Overview

OLAP Dimensions are dimensions that get created in an Analysis Services database.

An OLAP Dimension is a collection of related attributes which can be used to provide information about fact data in one or more cubes. By default attributes are visible as attribute hierarchies and can be used to understand the fact data in a cube. Attributes can be organized into user-defined hierarchies that provide navigational paths to assist users when browsing the data in a cube.

They are typically created and populated from a relational dimension.

One or more OLAP Dimensions are defined automatically by QAD Data Warehouse Designer when a fact table is dragged over to create a cube or measure group. QAD Data Warehouse Designer will take the relational dimension tables and related metadata (including hierarchies) defined in the star schemas and create OLAP Dimensions automatically. They can also be defined manually in QAD Data Warehouse Designer.

The properties of an OLAP Cube dimension are shown by right clicking on the OLAP Dimension and choosing Properties. The following dialog is shown:

Dimension odim_customer definition

OLAP Dimension Properties | Language Mapping | Purpose | Concept | Grain | Examples | Usage | Notes

Internal dimension name: odim_customer

Dimension publish name: dim_customer

Dimension description:

Default database connection: (Analysis services connect) Cubes

OLAP database name: Tutorial5

Data source connection: (Data Warehouse) DataWarehouse

Data source provider type: SQLOLEDB

Data source server: SSERVER

Data source database: WslWarehouse

Source table type: Dimension

Source table: dim_customer Source table key: dim_customer_key

Processing group: ByAttribute

Processing mode: Regular

Processing method: Default process

Storage mode: Molap

All caption: All customer

OLAP dimension type: Regular

Unknown member action: None Unknown member name: Unknown

Internal Dimension Name

Specifies the name of the dimension in QAD Data Warehouse Designer.

Dimension Publish Name

Specifies the name of the dimension as created in Analysis Services.

Dimension Description

A business description of the OLAP Dimension for use in documentation - this description also gets created in the analysis services metadata.

Default database connection and OLAP Database Name

The QAD Data Warehouse Designer connection that is an OLAP connection to an analysis services server. These fields only need to be populated when the OLAP Dimension needs to be created in Analysis Services separately from a cube. If these fields are blank this dimension can only be created in the same Analysis Services server and database as the related cubes when the cubes get created.

Data Source Connection

Defines the QAD Data Warehouse Designer connection that points to the relational dimensional table(s) used to populate the OLAP Dimension - typically the Data Warehouse connection. When the connection is defined the following read only fields are populated with the connection information:

- Data Source Provider Type
- Data Source Server
- Data Source Database

Source Table Type

Specifies the type of table from which the OLAP Dimension was created.

Source Table

Specifies the name of the table from which the OLAP Dimension was created.

Source Table Key

Specifies the key (typically the primary key) that relates the dimension to the fact in the underlying star schema.

Processing Group

Specifies the processing group for processing the dimension. This determines how much data is read into memory during dimension processing at any one time.

Processing Mode

Indicates whether processed data is available after all aggregations have been computed (Regular) or immediately after the data has been loaded (Lazy aggregations).

Processing Method

Indicates which processing method should be used for populating the dimension:

- **Process Default** - Detects the process state of an object, and performs processing necessary to deliver unprocessed or partially processed objects to a fully processed state.
- **Process Full** - Processes an Analysis Services object and all the objects that it contains. When Process Full is executed against an object that has already been processed, Analysis Services drops all data in the object, and then processes the object. This kind of processing is required when a structural change has been made.
- **Rebuild Data** - Processes data only without building aggregations or indexes.

Storage Mode

This field allows two options; MOLAP - Multidimensional OLAP or ROLAP.- Relational OLAP. This determines how the OLAP cube is processed.

All Caption

Specifies the name of the (All) member. This applies to all hierarchies in the dimension that have an (All) member.

OLAP Dimension Type

Specifies the type of information contained by the dimension. Some client tools can treat the dimension differently based on this information.

Unknown member Action

Specifies the existence of an Unknown member and whether that member is visible or hidden. Fact data not associated with a member can be associated with the unknown member.

Unknown Member Name

Specifies the caption for the unknown member.

Language Mapping

The OLAP Dimension Properties screen has a tab called 'Language Mapping'.

Select the language from the drop down list and then enter the translations for the Dimension Publish Name, All Caption, Dimension Description and the Unknown Member Name.

Dimension odim_product definition ✕

OLAP Dimension Properties | Language Mapping | Purpose | Concept | Grain | Examples | Usage | Notes |

Language :

Language Settings

Dimension Publish Name:

All Caption:

Dimension Description:

Unknown Member Name:

16.6.2 Dimension Attributes

Dimensional attributes contain information about the Dimension object. Attributes are exposed in the cube to provide the ability to navigate and aggregate the data in the cube.

User defined hierarchies can be built over attributes to provide drill paths through the data and to aid aggregation.

The properties of an attribute can be displayed by right clicking an attribute in the middle pane and choosing properties. The following dialog is displayed:

Dimension odim_order_date attribute definition

Attribute Properties | Language Mapping

Dimension name: odim_order_date [?] Update

Internal attribute name: order_cal_year Update <

Published name: order cal year Update >

Description: The calendar year. Format YYYY

Estimated count: 1

Member names unique: False

Hierarchy visible: True

Hierarchy enabled: True

Hierarchy optimized state: FullyOptimized

Order by: Key

Order by attribute:

Type: Years

Usage: Regular

Key Column: dim_order_date order_cal_year

Name Column: dim_order_date order_cal_year

OK Cancel Apply

Dimension Name

A read only field to display the dimension which the attribute is related to.

Internal Attribute Name

The name of the attribute in QAD Data Warehouse Designer.

Published Name

The name of the attribute created in Analysis Services.

Description

A business name that is stored in QAD Data Warehouse Designer for documentation and stored in the Analysis Services metadata.

Estimated Count

Specifies the number of members in the attribute. This number is either the amount last counted by Analysis Services or a user provided estimate of the member count.

Member Names Unique

Indicates whether member names are unique for this attribute.

Hierarchy Visible

Indicates whether the attribute hierarchy is visible to client applications. Even if the attribute hierarchy is not visible it can still be used in a user defined hierarchy .

Hierarchy Enabled

Indicates whether an attribute hierarchy is enabled for this attribute. If the attribute hierarchy is not enabled then the attribute cannot be used in a user defined hierarchy.

Hierarchy Optimized state

Specifies the level of optimization applied to the attribute hierarchy.

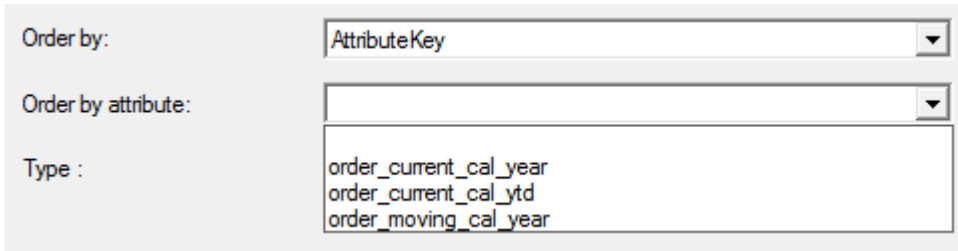
Order by

Specifies the method used to order the members of the attribute.

Order by attribute

Specifies the attribute used to order the members of the attribute hierarchy

If the 'Order by' property is set to 'AttributeKey' or 'AttributeName' then 'Order by attribute' cannot be empty. It must be populated with values from attribute relationships.



Order by: AttributeKey

Order by attribute:

Type :

- order_current_cal_year
- order_current_cal_ytd
- order_moving_cal_year

Type

Specifies the type of information contained by the attribute.

Usage

Specifies the usage of the attribute.

Key Column

Specifies the details of the binding to the column containing the member key.

Name Column

Specifies the details of the binding to the column containing the member name.

To View Attributes

To view the list of Attributes, right-click on an OLAP Dimension in the left pane and select "Display Attributes".

To Add an Attribute

- 1 Display the attributes of an OLAP Dimension in the middle pane. Display the columns of the dimension in the right hand pane then drag over a column from the underlying relational dimension into the middle pane.
- 2 To add an Attribute, right-click on an OLAP Dimension in the left pane and select "Add Attribute". This can also be achieved by displaying Attributes in the middle pane, right-clicking and selecting "Add Attribute". Fill out the dialog box with the relevant details.
- 3 To create an Attribute that is similar to an existing Attribute, display the Attributes in the middle pane and select "Copy Attribute". The same dialog box appears as for "Add Attribute" with most of the fields filled in. Notice that the Attribute name has the suffix "- Copy". Change the name in the Attribute Name field and make any other alterations and click OK.

To Delete an Attribute

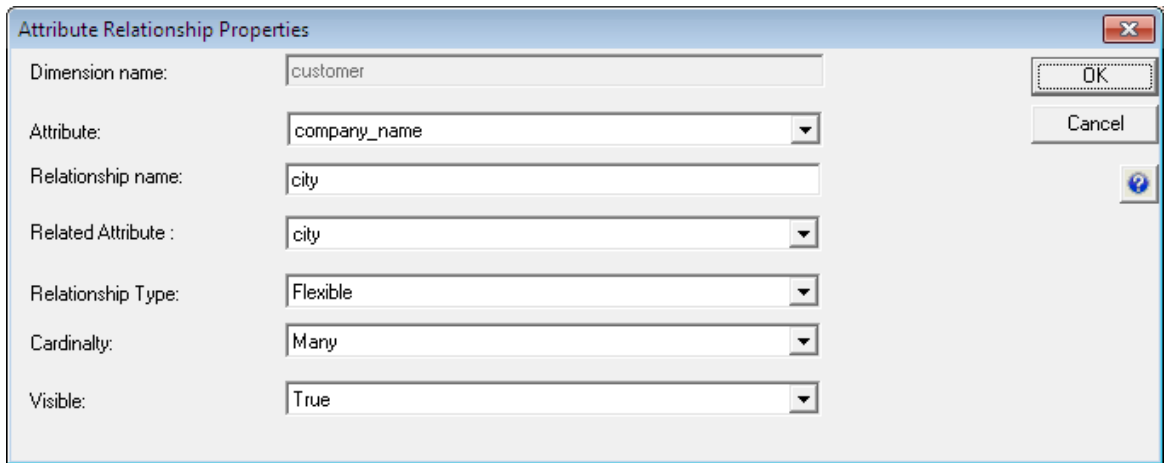
Display the Attributes in the middle pane, select the Attribute to delete, right-click and select Delete.

16.6.3 Attribute Relationships

Attribute relationships define functional dependencies between attributes. If attribute A has a related attribute B in a hierarchical relationship then an attribute relationship can be defined that assists Analysis Services to aggregate data.

Note: Attribute relationships require unique members in order to function correctly - if there are duplicate values participating in an attribute relationship then cube data can be incorrectly aggregated and displayed.

To view the properties of an attribute relationship right click an attribute relationship and choose properties to show the dialog below:



The screenshot shows a dialog box titled "Attribute Relationship Properties" with a standard Windows window border (title bar, maximize, minimize, close buttons). The dialog contains several labeled input fields and a set of control buttons on the right. The fields are as follows:

Label	Value
Dimension name:	customer
Attribute:	company_name
Relationship name:	city
Related Attribute :	city
Relationship Type:	Flexible
Cardinality:	Many
Visible:	True

On the right side of the dialog, there are three buttons: "OK" (top), "Cancel" (middle), and a help icon (bottom right, represented by a question mark in a circle).

Dimension Name

A read only field indicating the dimension associated with the attribute relationship.

Attribute

Specifies the attribute on which the attribute relationship is based.

Relationship Name

Specifies the name of the attribute relationship.

Related Attribute

Specifies the name of the related attribute.

Relationship Type

Indicates whether the relationship between attributes can change over time.

Cardinality

Indicates if the related attribute has a many to one or a one to one relationship with this attribute.

Visible

Indicates whether the attribute relationship is visible to the client applications.

To View Attribute Relationships

To view the list of Attribute Relationships, right-click on an OLAP Dimension in the left pane and select "Display Attribute Relationships".

To Add an Attribute Relationship

- 1** Attribute relationships are defined automatically when a User Defined hierarchy is inherited from an underlying relational dimension.
- 2** To add an Attribute Relationship, right-click on an OLAP Dimension in the left pane and select "Add Attribute Relationship". Fill out the dialog box with the relevant details.

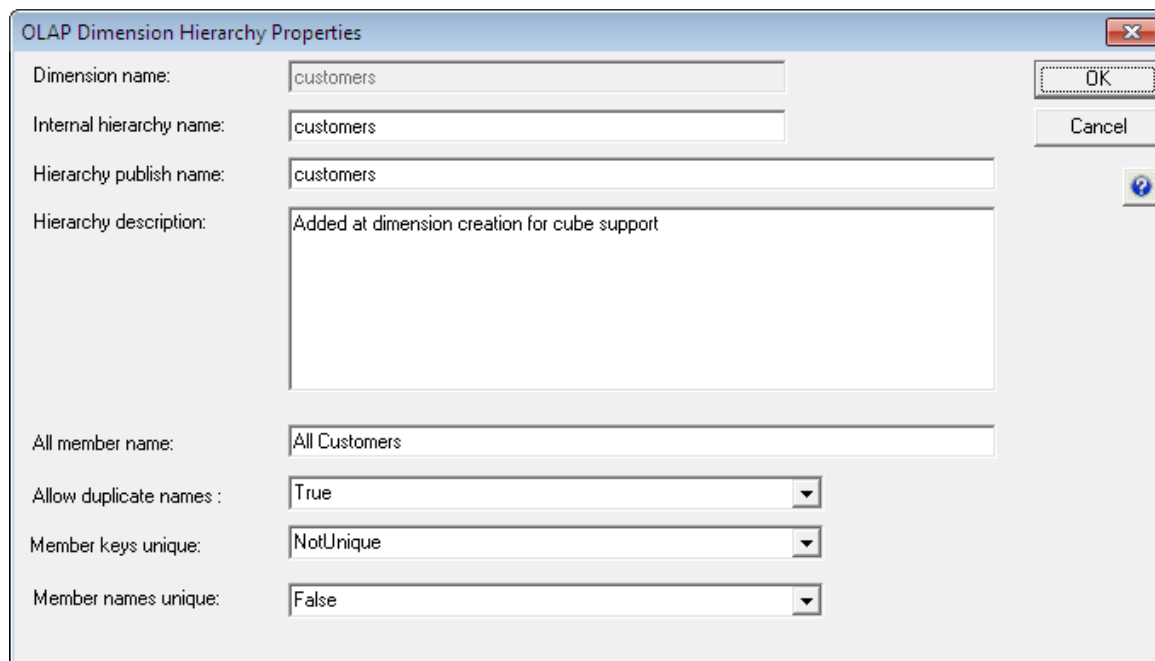
To Delete an Attribute Relationship

Display the Attribute Relationships in the middle pane, select the Attribute Relationship to delete, right-click and select Delete.

16.6.4 Dimension Hierarchies

User defined hierarchies define hierarchical relationships between related dimensional attributes (e.g. Geographical or time based attributes). These related attributes are defined as levels within the hierarchy.

To view the properties of a user defined Hierarchy right click the **Hierarchy** and choose properties to show the dialog below:



The screenshot shows a Windows-style dialog box titled "OLAP Dimension Hierarchy Properties". It contains several input fields and dropdown menus for configuring a dimension hierarchy. The fields are as follows:

- Dimension name:** A text box containing the value "customers".
- Internal hierarchy name:** A text box containing the value "customers".
- Hierarchy publish name:** A text box containing the value "customers".
- Hierarchy description:** A large text area containing the text "Added at dimension creation for cube support".
- All member name:** A text box containing the value "All Customers".
- Allow duplicate names :** A dropdown menu with "True" selected.
- Member keys unique:** A dropdown menu with "NotUnique" selected.
- Member names unique:** A dropdown menu with "False" selected.

On the right side of the dialog, there are three buttons: "OK", "Cancel", and a help icon (a question mark inside a circle). The dialog has a standard Windows title bar with a close button (an 'X' in a red box) in the top right corner.

Dimension Name

A read only field indicating the dimension associated with the attribute relationship.

Internal Hierarchy Name

The name of the hierarchy within QAD Data Warehouse Designer.

Hierarchy Publish Name

The name of the hierarchy as created within Analysis Services.

Hierarchy Description

A business name that is stored in QAD Data Warehouse Designer for documentation and stored in the Analysis Services metadata.

All Member Name

Specifies the name of the member in the All level

Allow duplicate Names

Indicates whether the members under a common parent can have the same name.

Member Keys Unique

Indicates whether member keys are unique for this hierarchy.

Member Names Unique

Indicates whether member names are unique for this hierarchy.

To view User Defined Hierarchies

To view the list of User Defined Hierarchies, right-click on an OLAP Dimension in the left pane and select "Display Hierarchies".

To Add a User Defined Hierarchy

To add a User Defined Hierarchy, right-click on an OLAP Dimension in the left pane and select "Add Hierarchy". Fill out the dialog box with the relevant details.

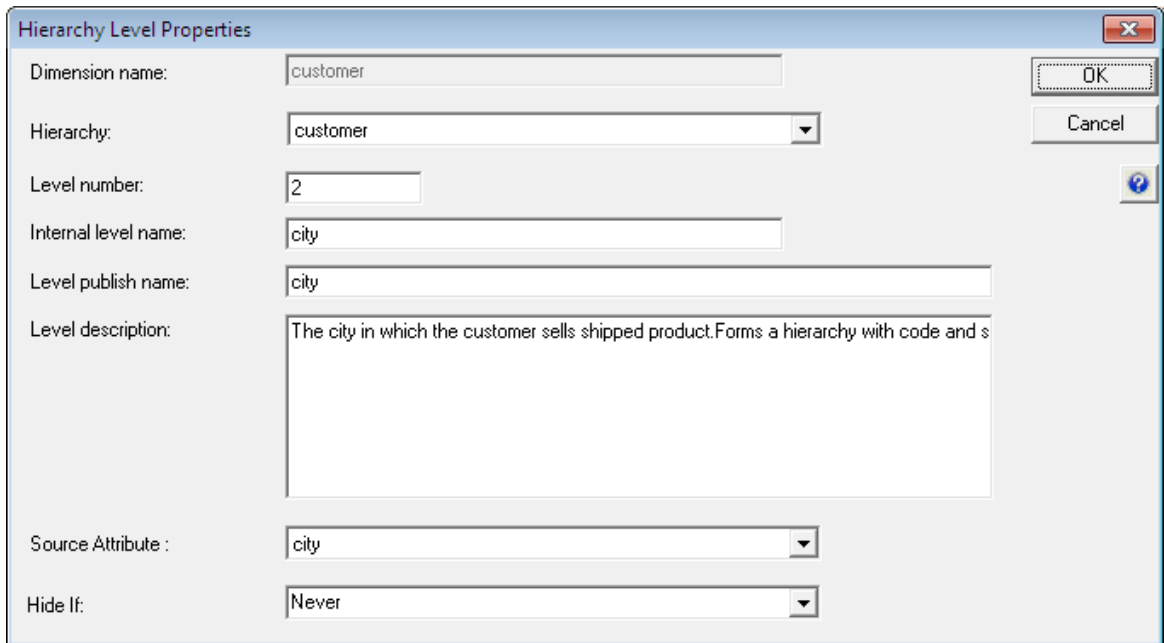
To Delete a User Defined Hierarchy

Display the User Defined Hierarchies in the middle pane, select the User Defined Hierarchy to delete, right-click and select Delete.

16.6.5 Dimension User Defined Hierarchy Levels

The levels specify the drill path over a set of related attributes. The classic hierarchy levels are Year, Month, Date in a Calendar based hierarchy in the date dimension.

To view the properties of a user defined Hierarchy Level right click a user defined Hierarchy Level and choose properties to show the dialog below:



The screenshot shows a dialog box titled "Hierarchy Level Properties". It contains several input fields and buttons. The fields are: "Dimension name:" with the value "customer", "Hierarchy:" with a dropdown menu showing "customer", "Level number:" with the value "2", "Internal level name:" with the value "city", "Level publish name:" with the value "city", and "Level description:" with a text area containing "The city in which the customer sells shipped product. Forms a hierarchy with code and s". There are also "Source Attribute :" and "Hide If:" dropdown menus, both showing "city" and "Never" respectively. On the right side, there are "OK", "Cancel", and a help icon (question mark) buttons.

Dimension name:	customer	OK
Hierarchy:	customer	Cancel
Level number:	2	?
Internal level name:	city	
Level publish name:	city	
Level description:	The city in which the customer sells shipped product. Forms a hierarchy with code and s	
Source Attribute :	city	
Hide If:	Never	

Dimension Name

A read only field indicating the dimension associated with the attribute relationship.

Hierarchy

The User Defined Hierarchy that contains the level.

Level Number

The number of levels from the top most hierarchy level. These level numbers must start at 1 for the top level and provide continuous numbering to the bottom level.

Internal Level Name

The name of the Level within QAD Data Warehouse Designer.

Level Publish Name

The name of the Level as created within Analysis Services.

Level Description

A business name that is stored in QAD Data Warehouse Designer for documentation and stored in the Analysis Services metadata.

Source Attribute

Specifies the source attribute on which the level is based.

Hide If

Specifies which members are hidden. This property supports ragged hierarchies containing logical gaps between members.

To View User Defined Hierarchy Levels

To view the list of User Defined Hierarchy Levels, right-click on an OLAP Dimension in the left pane and select "Display Hierarchy Levels".

To Add a User Defined Hierarchy

- 1 To add a User Defined Hierarchy level, right-click on an OLAP Dimension in the left pane and select "Add Hierarchy Level". Fill out the dialog box with the relevant details.
- 2 Alternatively right click on a User Defined Hierarchy in the middle pane and select "Add Hierarchy Level". Fill out the dialog box with the relevant details.

To Delete a User Defined Hierarchy Level

Display the User Defined Hierarchy Levels in the middle pane, select the User Defined Hierarchy Level to delete, right-click and select Delete.

16.7 Changing OLAP Cubes

An understanding of the dependency of objects within Analysis Services is the key to figuring out what needs to be dropped or recreated in a cube database using QAD Data Warehouse Designer.

Changes to the underlying relational star schema can cause cube processing to fail as the star schema is frozen in the Data Source View (DSV) of the cube database. Minor changes such as the addition of table columns, or altered data types (e.g. changing a char to varchar) will not break the cube, but renaming a source table or column that is used as a source to the cube will invalidate the DSV and cause processing to fail.

The solution to this issue is to drop and recreate the Cube database from Data Warehouse Designer to recreate the DSV or manually update the DSV using Microsoft BIDS.

If an object needs to be dropped and recreated in Data Warehouse Designer then these are two separate actions. For example to drop the OLAP database, right click an OLAP cube within that database in Data Warehouse Designer and choose Drop Analysis Services Object, then using the drop down boxes in the Drop Analysis Services Object dialog choose the object to drop, and select the Drop button. This will drop the object from Analysis Services.

Analysis services object type:

Database

Analysis services object to drop:

Tutorial5

Drop

A Create action on an Analysis Services object in Data Warehouse Designer will be different depending on whether or not the object already exists in Analysis Services:

- If the object does not already exist in Analysis Services then Data Warehouse Designer will create the object (and any related objects e.g. OLAP database and DSV).
- If the object does already exist in Analysis Services then Data Warehouse Designer will try to detect any changes or additional features that need to be added to the object and add or alter the existing Analysis Services object.

Some objects need to be dropped and recreated in order to be changed (eg dimension structures), and some only need to be recreated (eg calculations).

Changes to cube runtime objects do not require the cube database to be dropped. For example a new or changed definition of a calculation or KPI will not require the cube to be dropped and recreated (so data is retained). By Recreating the cube the definition of these runtime objects will be updated and available immediately to cube users.

A brief summary of the hierarchy of objects and the remedial action is shown below:

Cube Object	Change	Action
Data Source	This changes the source database connection. It is defined in the Data Warehouse connection in Data Warehouse Designer.	OLAP database needs to be dropped and recreated.

Data Source View (underlying relational star)	The DSV reflects the design of the relational star. So the DSV would need to be updated if any changes are made to tables or views that are used to build OLAP objects.	Changes to the underlying relational star that affect an existing OLAP Object requires that the OLAP Database is dropped and recreated to regenerate the DSV.
OLAP Dimension	The addition or deletion of attributes or hierarchies to an existing OLAP dimension.	The OLAP dimension plus any OLAP cubes associated with the dimension need to be dropped and recreated.
OLAP Cube Measure Group	Delete or Add a Measure Group based on a fact that already exists in the DSV.	Recreate the cube in Data Warehouse Designer and reprocess.
OLAP Cube Measure Group	Add a Measure Group based on a fact that does not exist in the DSV.	Recreate the OLAP cube database and reprocess.
OLAP Cube Measures	Delete or Add measures based on columns that already exist in the DSV.	Recreate the cube in Data Warehouse Designer and reprocess.
OLAP Cube Measures	Add measures that are based on new columns that do not exist in the DSV.	Recreate the OLAP cube database and reprocess.
OLAP Cube Calculations, KPIs, Actions	Add, change or delete definition on the cube.	Recreate the cube in Data Warehouse Designer (a reprocess is not necessary because just the calculation definition is stored in the cube - the result is calculated at query time).

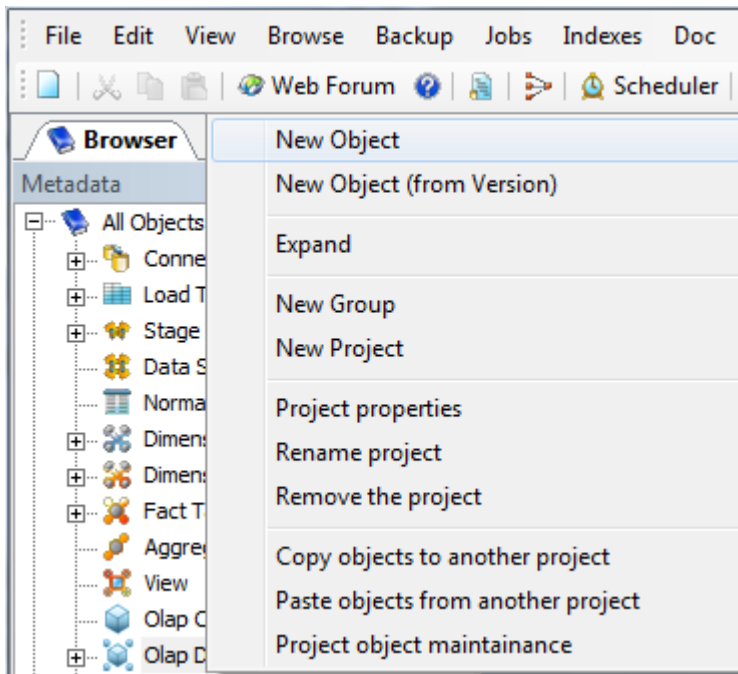
16.8 Retrofitting an OLAP Object

QAD Data Warehouse Designer provides the functionality for retrofitting OLAP cubes from Analysis Services.

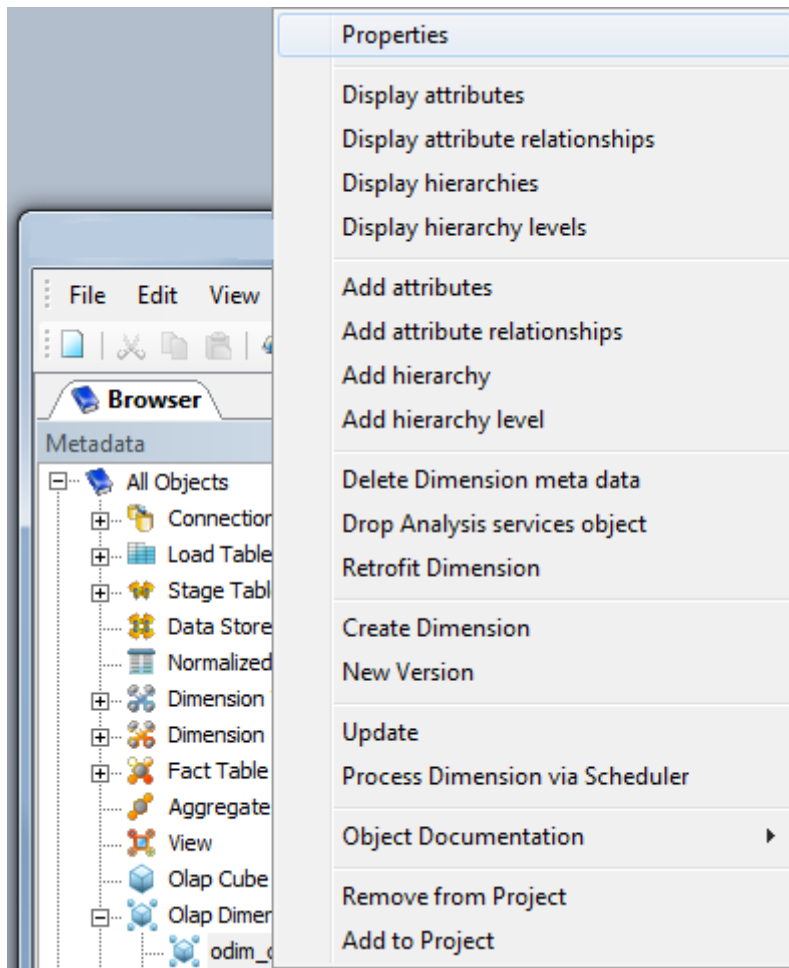
Note: Before you can retrofit an OLAP cube, you must first retrofit any and all of the OLAP dimensions used by the OLAP cube.

The process to retrofit an OLAP dimension is as follows:

- 1 Right click on the 'OLAP Dimension' object heading in the left hand pane and choose 'New Object'.



- 2 Enter any name for the object name and select 'Add'.
- 3 Right click on the newly created OLAP Dimension in the left hand pane and choose 'Properties'.



- 4 In the properties box:
For the **Dimension publish name** enter the name that matches exactly the name of the OLAP Dimension in Analysis Services that you want to retrofit.

For the **Dimension description** enter a description for the dimension.

For the **Default database connection** select the required Analysis Services connection.

For the **OLAP database name** select the database name in Analysis Services.

For the **Data source connection** select the relevant data source connection.

Dimension odim_customer definition

OLAP Dimension Properties | Language Mapping | Purpose | Concept | Grain | Examples | Usage | Notes

Internal dimension name: odim_customer

Dimension publish name: dim_customer

Dimension description:

Default database connection: (Analysis services connect) Cubes

OLAP database name: Tutorial5

Data source connection: (Data Warehouse) DataWarehouse

Data source provider type:

Data source server:

Data source database:

Source table type:

Source table:

Source table key:

Processing group: ByAttribute

Processing mode: Regular

Processing method: Default process

Storage mode: Molap

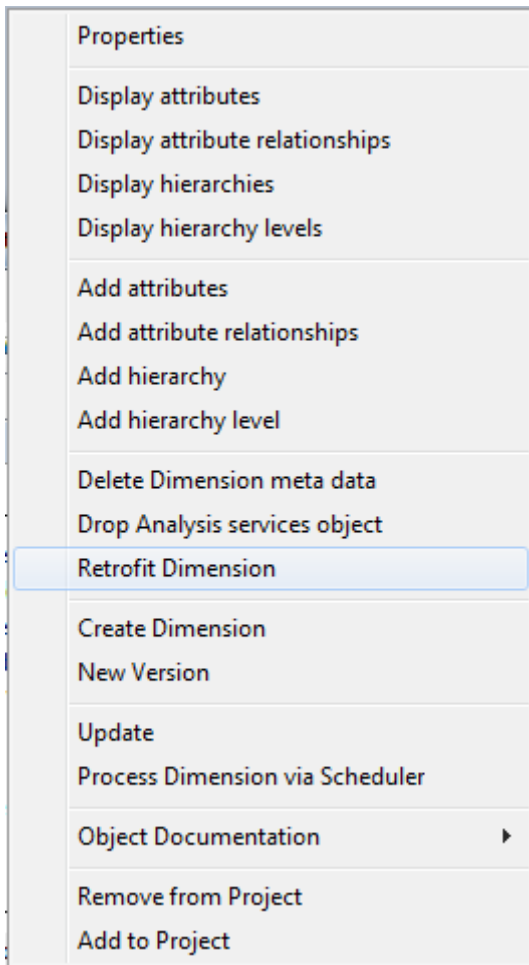
All caption: All odim_customer

OLAP dimension type:

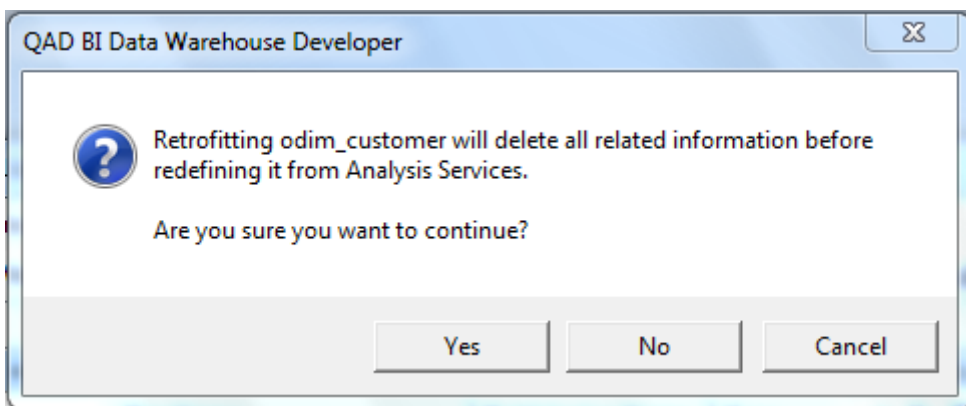
Unknown member action: None

Unknown member name: Unknown

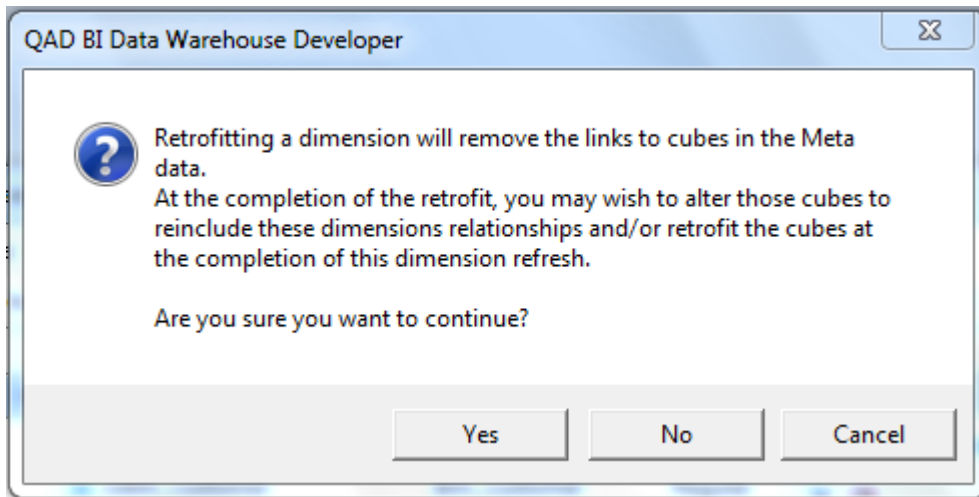
- 5 The OLAP Dimension can now be retrofitted by right-clicking the object in the left pane and choosing 'Retrofit Dimension'.



- 6 Two warning dialogs now appear. The first dialog warns that the existing information will be deleted before being redefined from Analysis Services. Select Yes.



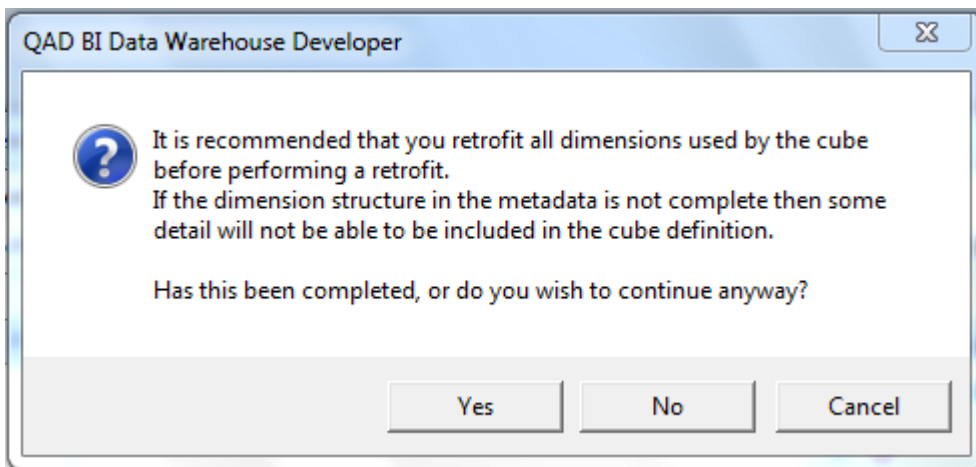
- 7 The second dialog warns that retrofitting a dimension will remove the links to cubes in the Metadata. Select Yes.



- 8 The results of the retrofit are displayed in the results panel at the bottom of the screen. If it was successful the new object should now have all the attributes, hierarchies and hierarchy levels (as well as all of their properties) as set in Analysis Services.

Once all of the dimensions have been retrofitted you can retrofit the OLAP Cube. Follow steps 1-6 above to retrofit the OLAP Cube as for the OLAP dimensions.

The final dialog is a reminder to only retrofit an OLAP cube once the dimensions used by the cube have been retrofitted. If all relevant dimensions have been retrofitted, select Yes.



Once again, the results of the retrofit are displayed in the results panel at the bottom of the screen.

C H A P T E R 17

17. Exporting Data

Export objects are used in QAD Data Warehouse Designer to produce ascii files from a single database table or view for a downstream feed. Some or all of the columns in a table or view can be exported. There are two ways of performing exports.

- File export - an export where most of the processing is managed and controlled by the scheduler
- Script-based export - an export where a Windows script file is executed to perform the load.

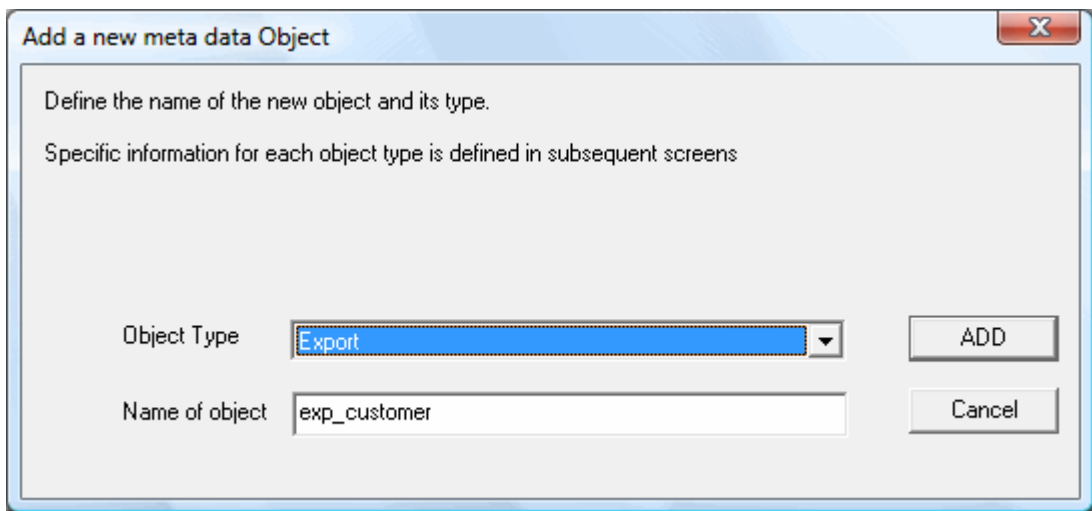
In This Chapter

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17.2 File Attributes.....	415
17.3 Export Column Attributes	418
17.4 Host Script Exports	421

17.1 Building an Export Object

The simplest way to create an export object is to use the drag and drop functionality of QAD Data Warehouse Designer.

- 1** Browse to the data warehouse connection (Browse/Source Tables).
- 2** Create a drop target by double clicking on the Export object group in the left hand pane. The middle pane should have a column heading of 'Export Objects' for the leftmost column.
- 3** Select a table or view in the right hand pane and drag it into the middle pane. Drop the table or view anywhere in the middle pane. The following dialog appears:



- 4 If the export object needs to be renamed, do so and then click the Add button. The following dialog appears.

exp_customer table definition

Properties | File Attributes | Storage | Notes | Purpose | Concept | Grain | Examples | Usage

Export Object Name: exp_customer

Short name. Must be unique and no more than 22 chars long: exp_customer

Description:

Connection:

Export Type: File export

Database Link:

Script Name:

Pre-export Action: No action

Pre-export Sql:

Where clause:
Allows filtering of the export data.

Post Export Procedure:

Date object structure last updated: 2008-05-15 15:28:48.673

Date last exported:

Date last updated in database:

OK Cancel Apply

5 Change the Connection to Windows

exp_customer table definition

Properties | File Attributes | Storage | Notes | Purpose | Concept | Grain | Examples | Usage

Export Object Name: exp_customer

Short name. Must be unique and no more than 22 chars long: exp_customer

Description:

Connection: DataWarehouse

Export Type: Tutorial (OLTP) Windows

Database Link:

Script Name:

Pre-export Action: No action

Pre-export Sql:

Where clause:
Allows filtering of the export data.

Post Export Procedure:

Date object structure last updated: 2008-05-15 15:28:48.673

Date last exported:

Date last updated in database:

OK Cancel Apply

- 6 Click on the File Attributes tab and fill in the fields as described in the next section.
- 7 Now run the export by right clicking on it and selecting export.

17.2 File Attributes

The following fields are available to define the location, name and contents of the exported data file:

Export File Path

The full path name to the directory in which the file is to be created on the Windows system.

Export File Name

The name of the file in the directory.

Export Routine

For Oracle this is SQL*Plus. In SQL Server 2000 this is BCP or isql. In later versions of SQL Server this is BCP or sqlcmd. For DB2 the supported export routine is EXPORT.

Export Format

This is the format of the data in the export file and is either Delimited Text or Width Fixed Text in Oracle and SQL Server. In DB2, the supported formats are DEL (delimited), WSF (worksheet format) and IXF(intergrated exchange format).

Export File Delimiter

Any delimiter in the file that splits out the columns, e.g, a comma (.). To enter a special character enter the uppercase string CHAR with the ASCII value in brackets (e.g. CHAR(9)). This is only available if the Export Format is Delimited Text.

Optionally Enclosed by

Character to enclose each text field with. This is only available if the Export Format is Delimited Text.

Header row in export file

If a header line is required, choose business names or column names from this drop down list. This option is not available in DB2.

Export options

Allows the entry of export utility options. If more than one option is required, then a semi-colon should be used between options. This option is not available in DB2.

Export modifier

Allows the entry of EXPORT modifiers in DB2.

Trigger Path

The purpose of the trigger file is to indicate that the copying / loading of the main file has completed and that it is now safe to load the file. Secondly the trigger file may contain control sums to validate the contents of the main load file. This field should contain the full path name to the directory in which a trigger file is to be generated on the Windows systems.

Trigger Name

Refers to the name of the file that is to be created as a trigger file. A trigger file typically contains check sums (row count or the sum of a numeric column).

Trigger Delimiter

Multiple fields in the trigger file are to be separated by the trigger delimiter.

Trigger Parameter 1,2,3

The checksums to be put in the trigger file. One of the row count and the sum of any numeric fields in the source data.

Compress after export

Check this box if you want to compress the export file after it has been created.

Compress Utility Path

The directory in which the compress utility exists.

Compress Utility Name

The name of the compression utility executable.

Compress Utility Parameters

The name of the file to be compressed (using the QAD Data Warehouse Designer variable \$EXPFILE\$) and any switches required to make the compression utility work.

17.2.1 Export Object File Attributes Screen

exp_sales_detail table definition

Properties | **File Attributes** | Storage | Notes | Purpose | Concept | Grain | Examples | Usage

Export File Definition

The variable \$SEQUENCE\$ can be used to provide a unique sequence number for the export file. Also the date/time components YYYY, MM, DD, HH, MI and SS can be used when enclosed with the \$ character. For example an export file name might be budget_\$YYYYMMDD\$.txt which would result in a file name like budget_20021231.txt

Export File Path: c:\temp

Export File Name: customer.txt

Export Routine: sqlcmd

Export Format: Delimited Text

Export File Delimiter: | Optionally enclosed by (E.g. "):

Export Options:

Header row in export file: Column names

If a trigger file is specified then this file is created after the export file. It will normally contain a row count and check sum.

Trigger Path: c:\temp

Trigger Name: customer.trg

Trigger Delimiter: |

Trigger Parameter 1: Row Count

Trigger Parameter 2:

Trigger Parameter 3:

The variable \$EXPFILE\$ can be used in 'Compress Parameters' to substitute in the export file path and name.

Compress after export: ☐

Compress Utility Path::

Compress Utility Name:

Compress Parameters:

OK Cancel Apply

17.3 Export Column Attributes

Table

The export object to which the column belongs. Read only.

Column name

The name of the column in the export object. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. It provides input to the documentation and to the view `ws_admin_v_fact_col` which can be used to assist in the population of an end user tool's end user layer. As such it is a free form entry and any characters are valid.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. The data type determines the space used by the column in a fixed width export.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the 'Respace order number' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Format

Not relevant for Export Objects.

Nulls

Not relevant for Export Objects.

Numeric

Not relevant for Export Objects.

Additive

Not relevant for Export Objects.

Attribute

Not relevant for Export Objects.

Source table

The name of the source table or view this column is extracted from when the export is run.

Source column

The name of the source column in the source table or view. This column name is extracted when the export is run.

Business definition / Source strategy

Normally this field will contain a business definition of the column. Such a definition may be a description of the column from a business user's point of view. This field might additionally contain information on where and how the column was acquired. For example if the column is sourced from multiple tables or is a composite or derived column then this definition would normally describe the process used to populate the column. This field is used in the documentation and is available via the view `ws_admin_v_fact_col`. This field is also stored as a comment against the column in the database.

17.3.1 Export Column Attributes Screen

Column definition for Export.name

Column Properties | Transformation

Table:

Column name:

Business display name:

Data type:

Format:

Column order:

Nulls: ☒

Numeric: ☐

Additive: ☐

Attribute: ☒

Source table:

Source column:

Business Definition:
Source strategy:
(max 2048 chars.)

17.4 Host Script Exports

A script based export object will have a Host Script defined. During the export process this host script is executed and the results returned.

During the 'drag and drop' creation of a export object from a single table or view, a script can be generated by selecting one of the 'Script based' export options. This script can then be edited to more fully meet any requirements.

There are a number of conventions that must be followed if these host scripts are to be used by the QAD scheduler.

- 1** The first line of data in 'standard out' must contain the resultant status of the script. Valid values are '1' to indicate success, '-1' to indicate a Warning condition occurred but the result is considered a success, '-2' to indicate a handled Error occurred and subsequent dependent tasks should be held, -3 to indicate an unhandled Failure and that subsequent dependent tasks should be held.
- 2** The second line of data in 'standard out' must contain a resultant message of no more than 256 characters.
- 3** Any subsequent lines in 'standard out' are considered informational and are recorded in the audit trail. The normal practice is to place a minimum of information in the audit trail. All bulk information should be output to 'standard error'
- 4** Any data output to 'standard error' will be written to the error/detail log. Both the audit log and detail log can be viewed from the QAD Data Warehouse Designer tool under the scheduler window.

CHAPTER 18

18. MicroStrategy Projects

MicroStrategy Projects can be designed and created from within the QAD Data Warehouse Designer framework. This chapter covers the procedures required to create and manage these MicroStrategy Projects.

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18.1 MicroStrategy Prerequisites

Before building MicroStrategy projects using QAD Data Warehouse Designer, the following prerequisites are required:

- MicroStrategy must be installed on the Developer's PC.
- Install the QAD Data Warehouse Designer for MicroStrategy extension package. This is a separately shipped package that you must acquire via your account or partner manager.

Note: Installing this package enables the **Tools/Build MicroStrategy Project** menu in QAD Data Warehouse Designer.

18.2 Building MicroStrategy Projects

For full instructions for build MicroStrategy Projects, refer to the documentation contained in the QAD Data Warehouse Designer for MicroStrategy extension package.

CHAPTER 19

19. Transformations

Standard **column transformations** (see "**19.1 Column Transformations**" on page 425) can be used in QAD Data Warehouse Designer to perform calculations, change data types or format data.

Re-using complex transformations can save a significant amount of time. These can be achieved in two ways with QAD Data Warehouse Designer:

- Database Functions
- QAD Data Warehouse Designer Re-usable Transformations

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19.1 Column Transformations

Each table or export object column can have a transformation associated with it. For all table types, except for load tables, the transformation will be included in the generated procedure for the table. These are executed as part of the procedure update. The transformation must therefore be a valid SQL construct that can be included in a 'Select' statement. For example, we could have a transformation of 'load_order_line.qty * 0.125' to calculate a tax column of 12.5%. Click the 'Transformation' tab on the column properties to enter a transformation.

Note: Transformations added to an existing table that have an update procedure are only put into effect when the procedure is re-generated and re-compiled.

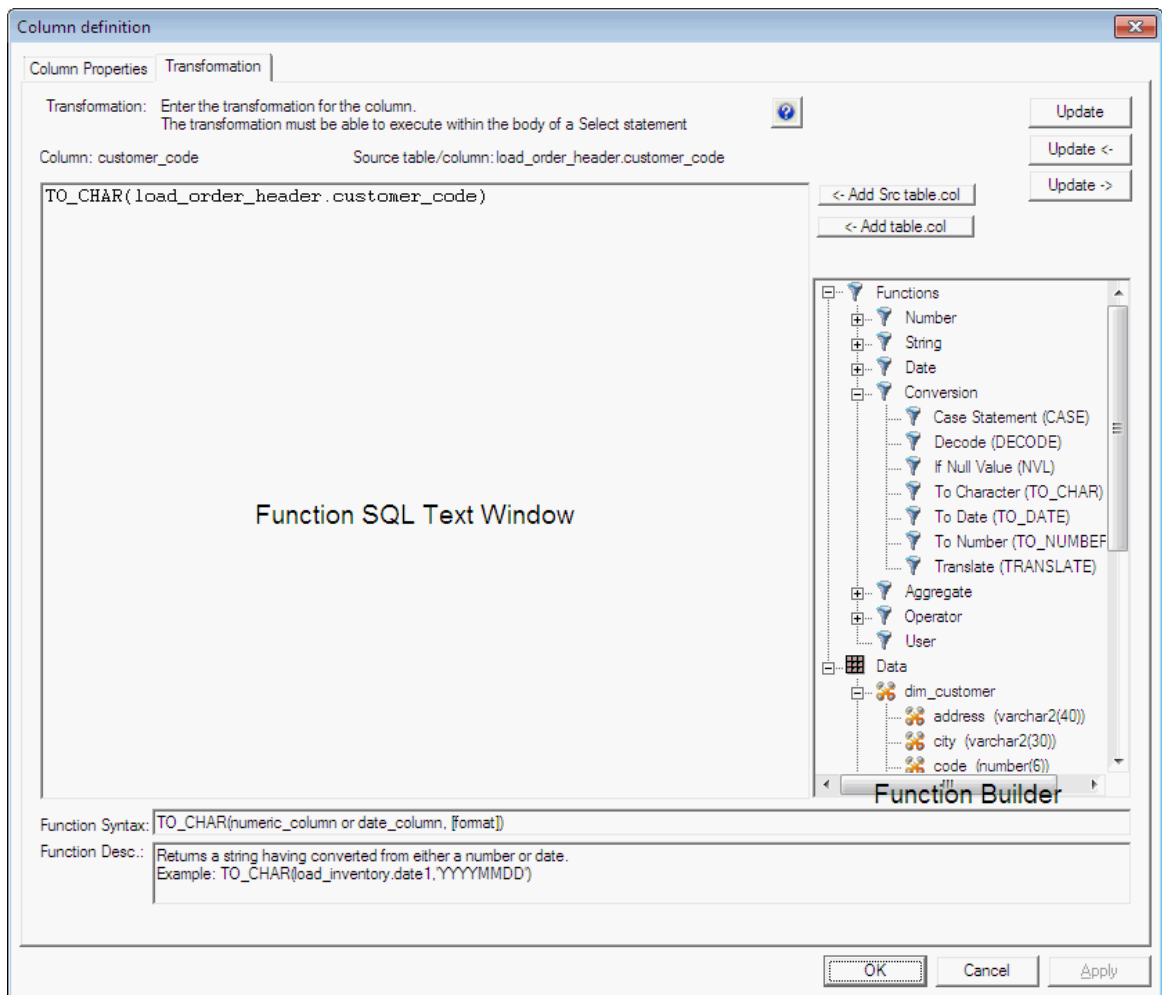
Column transformations on load tables are more complex, due to the unique nature of load tables. See **Load Table Column Transformations** (see "**19.1.2 Load Table Column Transformations**" on page 428) for more details.

Dimension View transformations are included in the Database Definition Language (DDL) that creates the view in the database. Any changes to Dimension View column transformations require the view to be dropped and recreated.

Export object column transformations are dynamically applied for file exports. If the export object is executed via a host script, then the script needs to be regenerated for changes to transformations to take effect.

19.1.1 Column Transformation Properties

An example below shows the transformation property screen with a simple transformation:



The two special update keys allow you to update the column and step either forward or backward to the next column's properties. **ALT-Left Arrow** and **ALT-Right Arrow** can also be used instead of the two special update keys.

Function SQL Text Window

The Function SQL Text Window contains the SQL used in the transformation. It can be directly entered, built up using the Function Builder and Add buttons or a combination of both.

Function Builder

The Function Builder contains a list of standard database functions, operators, user defined functions and all columns belonging to all source tables.

Expanding the Function Heading displays the Function Groups (Number, String, Data, Conversion, etc) and the Re-usable Function Heading. Similarly, expanding the Data Heading displays Source Tables.

Each function group or source table can in turn be expanded to show individual Functions and Source Columns.

Double clicking on a function adds the Function Model to the Function SQL Text Window. The first variable (almost always the source column) is left highlighted in the Function SQL Text Window. This allows additional Functions or Source Columns to be added to the correct place in the Function SQL Text Window by double clicking on the required Function or Source Column in the Function Builder.

Add Src table.col Button

The <-Add Src table.col button adds the source table and source column of the column in the form TableName.ColumnName to the Function SQL Text Window at the location of the cursor.

Add table.col Button

The <-Add table.col button adds the current table and column in the form TableName.ColumnName to the Function SQL Text Window at the location of the cursor.

Transform Stage

Only visible on load table column transformations. See **Load Table Column Transformations** (see "19.1.2 Load Table Column Transformations" on page 428) for more information.

Update Buttons

The Update Buttons: Update <- and Update -> are used to move from the current column to previous and next columns respectively in the current table. The alternative is to exit the Column Transformation Properties, choose the next column, re-enter the Column Properties and choose the transformation tab.

Function Syntax

The syntax guide for the Function, visible when you click on the function. Essentially the same as the Function model; loaded into the Function SQL Text Window when you click on the function. Read only.

Function Desc

The description of the Function visible when the function is clicked on. Read only.

Function Model

The model (template SQL code) for a Re-usable Transformations. This is only visible for Re-usable Transformations. Read only.

Localize Transformation

The Localize transformation button breaks the link between a column transformation and the Re-usable Transformation it is based on. If this button is clicked on, changes to the underlying re-usable transformation cannot be automatically propagated to the column transformation. This is only visible for Re-usable Transformations.

19.1.2 Load Table Column Transformations

Overview

Data entering the data warehouse can be manipulated if required. This manipulation can occur at any stage, but is supported via a number of methods during the Load stage. Load tables provide options to transform data. If multiple pass transformations are required then a load table can be created from another load table, i.e. multiple load tables can be supported in the data flow path.

The options available differ depending on the type of load but in most cases the "after" transformation and post load procedure can be utilized. Specifically:

Database Link Load	<ul style="list-style-type: none">▪ During Load transformations▪ After Load transformations▪ Post Load procedure
ODBC Based Load	<ul style="list-style-type: none">▪ During Load transformations▪ After Load transformations▪ Post load procedure
File Based Load	<ul style="list-style-type: none">▪ During Load transformations▪ After Load transformations▪ Post load procedure
Script Based Load	<ul style="list-style-type: none">▪ During Load transformations▪ After Load transformations▪ Post load procedure
Externally Loaded	<ul style="list-style-type: none">▪ After Load transformations▪ Post Load procedure

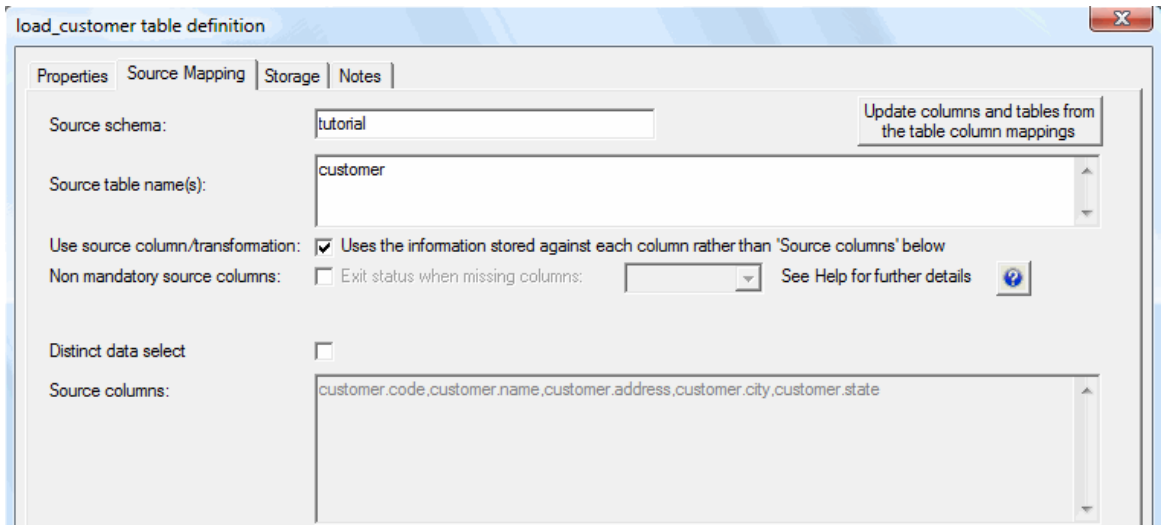
The **Transformation** tab of a column's properties is used to define "during" and "after" load transformations. It can only be one or the other for a specific column. One column can be used to build another, so an "after" can be based on the results of a "during", if different columns are used.

Note: The "*During*" transformations use **Source Table** columns. The "*After*" transformations use the **Load Table** columns.

All 'After' transformations take place in the native SQL language of the data warehouse database. The 'During' transformations differ in terms of which language is used. This is particularly true for file based loads. Normally the 'During' transformation will occur in the native SQL language of the source database.

19.1.2.1 Database Link During Load Transformations

The 'during' load transformation allows the manipulation of column data as it enters the data warehouse. By default, Database link loads and ODBC based loads have 'During' and 'After' transformations enabled.

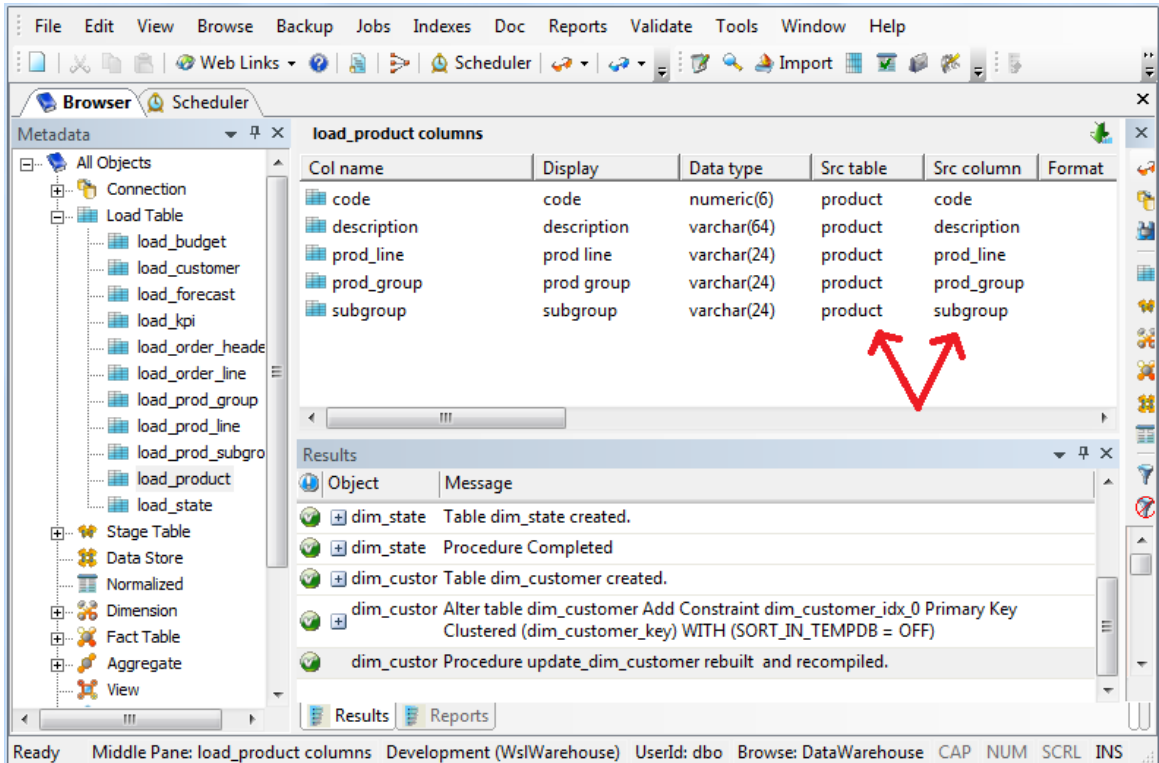


When transformations are enabled, the contents of a source table/source column for each column are used as the basis of the loading statement.

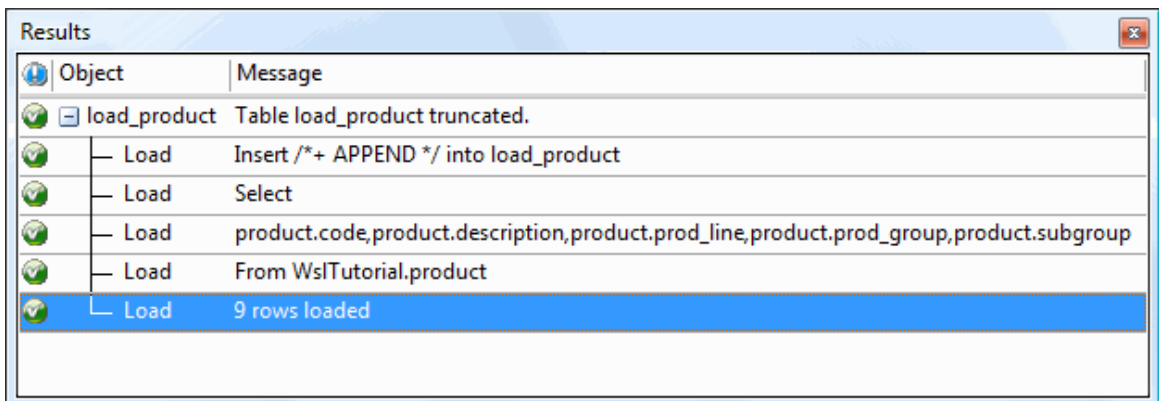
- If source table and source column are null, then a null is used.
- If data exists in the transformation tab of a column's properties, then this transformation data is used instead of the source table/source column combination.

Example

The following load table columns will generate the load sql statement if no transformation data is present against these columns.



The SQL code from the load results is:



If the column 'description' has a transformation defined as follows:

```
upper(substr(description,1,1))||lower(substr(description,2))
```

then the following SQL statement will be executed.

Results		
Object	Message	
load_product	Table load_product truncated.	
Load	Insert /*+ APPEND */ into load_product	
Load	Select	
Load	product.code,UPPER(SUBSTR(product.description,1,1)) LOWER(SUBSTR(product.description,	
Load	2)),product.prod_line,product.prod_group,product.subgroup	
Load	From WsITutorial.product	
Load	9 rows loaded	

19.1.2.2 File During Load Transformations

The loading of flat files is performed using the database specific loader. For Oracle, this is SQL*LOADER. For SQL Server it is the Bulk Insert Transact SQL statement. The contents of the transformation tab in the column's properties are the functions and conversions supported by the database loader.

Example

SQL*LOADER performs transformations such as:

- DATE 'DD-MMM-YYYY' converts from a value such as 23-Mar-1999 to an Oracle date.
- "TO_NUMBER(:COL)" converts the data to a number
- "NVL(TRIM(:COL),0)" trims leading and trailing white characters and inserts zero if null.

19.1.2.3 After Load Transformations

'After' transformations will initiate a pass of the load table after the load has occurred. They allow manipulation of the load table columns using the database and SQL functions.

Example

The following 'after' transformation set for the column code in the table load_product

```
lpad(code,5,'0')
```

would result in the following SQL statement being executed after the load:

```
update load_product set code = lpad(code,5,'0');
```

19.2 Database Functions

Database functions can be created in the data warehouse database (as procedure objects in QAD Data Warehouse Designer) and used in column transformation in QAD Data Warehouse Designer. See the Oracle and SQL Server documentation on functions and ***Procedures and Scripts*** (see "**20. Procedures and Scripts**" on page 443) for more information on creating functions inside QAD Data Warehouse Designer.

19.3 Re-usable Transformations

QAD Data Warehouse Designer Re-usable Transformations allow a complex SQL transformation using standard database functions (including User Defined Functions) to be built once and reused in multiple column transformations. Functionality is included to manage and propagate changes to re-usable transformations.

19.3.1 Creating a New Re-usable Transformation

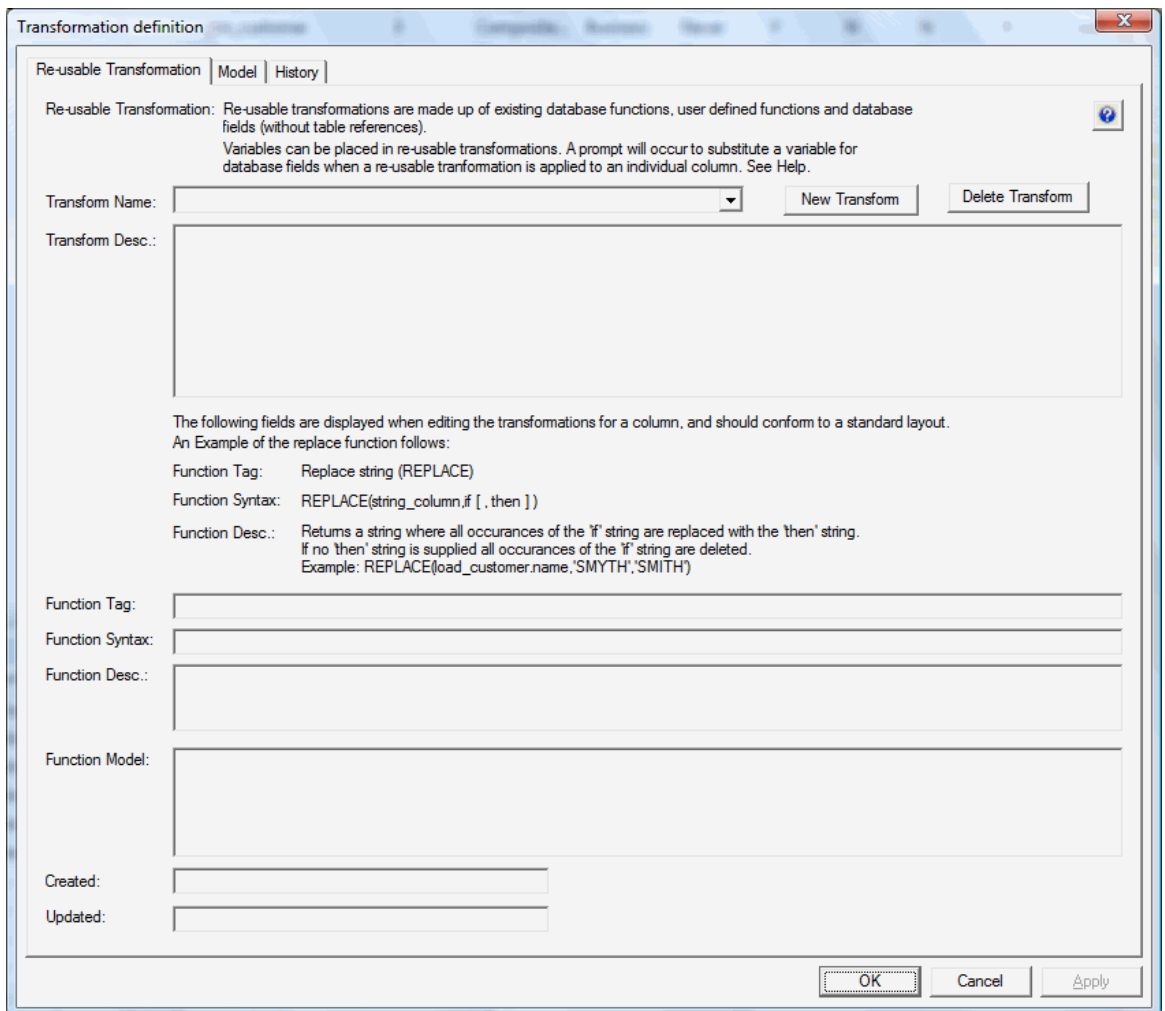
New re-usable transformations are created from the Tools / Re-usable transformation menu.

Creating a new re-usable transformation is a three step process:

- Specify the name of the transformation
- Enter metadata for the transformation
- Define the transformation

19.3.1.1 Specify the Name of the Transformation

After selecting re-usable transformations from the Tools menu the following dialog is displayed:



The dialog box is titled "Transformation definition" and has three tabs: "Re-usable Transformation", "Model", and "History". The "Re-usable Transformation" tab is active. It contains a text area for "Transform Desc.:" and a "Transform Name:" dropdown menu. To the right of the dropdown are "New Transform" and "Delete Transform" buttons. Below the text area, there is a section titled "The following fields are displayed when editing the transformations for a column, and should conform to a standard layout. An Example of the replace function follows:" followed by "Function Tag:", "Function Syntax:", and "Function Desc.:". Below these are input fields for "Function Tag:", "Function Syntax:", "Function Desc.:", and "Function Model:". At the bottom are "Created:" and "Updated:" labels with corresponding input fields. The "OK", "Cancel", and "Apply" buttons are at the bottom right.

Transformation definition

Re-usable Transformation | Model | History

Re-usable Transformation: Re-usable transformations are made up of existing database functions, user defined functions and database fields (without table references).
Variables can be placed in re-usable transformations. A prompt will occur to substitute a variable for database fields when a re-usable transformation is applied to an individual column. See Help.

Transform Name: New Transform Delete Transform

Transform Desc.:

The following fields are displayed when editing the transformations for a column, and should conform to a standard layout.
An Example of the replace function follows:
Function Tag: Replace string (REPLACE)
Function Syntax: REPLACE(string_column,if [, then])
Function Desc.: Returns a string where all occurrences of the 'if' string are replaced with the 'then' string.
If no 'then' string is supplied all occurrences of the 'if' string are deleted.
Example: REPLACE(load_customer.name,'SMYTH','SMITH')

Function Tag:

Function Syntax:

Function Desc.:

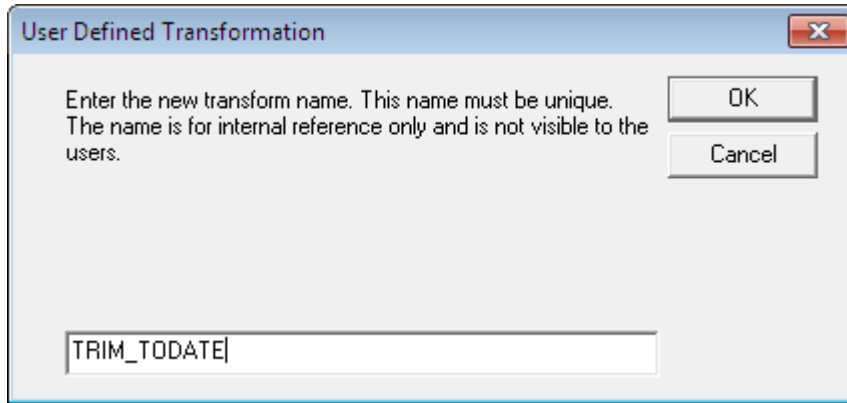
Function Model:

Created:

Updated:

OK Cancel Apply

Click **New Transformation** and enter a name for the re-usable transformation:

A screenshot of a 'User Defined Transformation' dialog box. The dialog has a title bar with the text 'User Defined Transformation' and a close button (X). Inside the dialog, there is a text area with the instruction: 'Enter the new transform name. This name must be unique. The name is for internal reference only and is not visible to the users.' To the right of this text are 'OK' and 'Cancel' buttons. At the bottom of the dialog is a text input field containing the text 'TRIM_TODATE|'.

Note: This is the internal QAD Data Warehouse Designer name for the transformation, not the name developers reference when utilizing the transformation on column transformations.

Click **OK**.

19.3.1.2 Enter Re-usable Transformation Metadata

Enter the following metadata for the transformation to describe the transformation for developers.

Transform Desc

A general description of the transformation.

Function Tag

This is the function name visible to the users, which can be selected from the function builder when building column transformations.

Function Syntax

The syntax guide for the function. This is visible in the function builder when clicking on the User defined function.

Function Desc

The description of the function visible in the function builder when clicking on the User defined function.

19.3.1.3 Define the Transformation Model

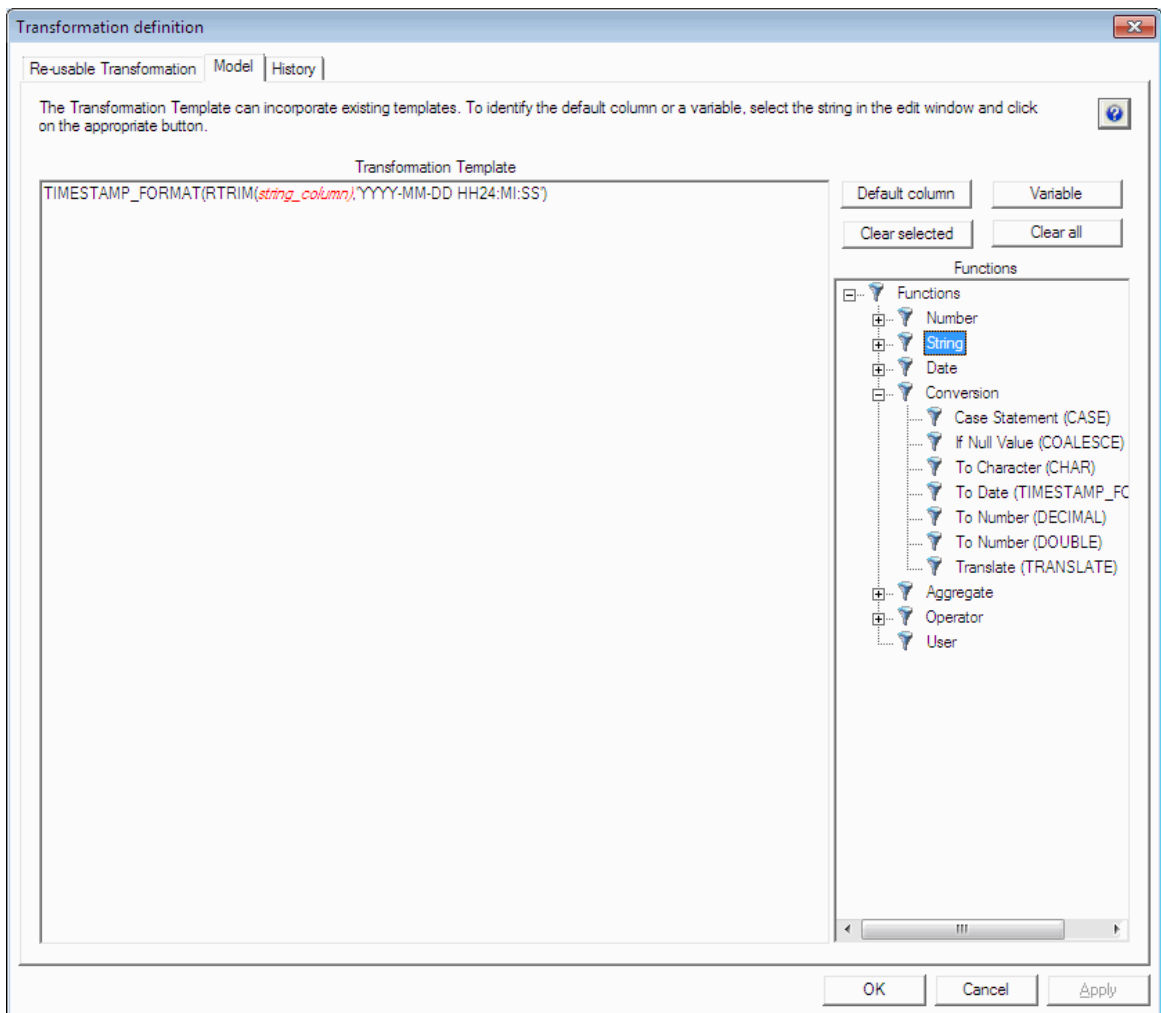
Once the transformation has been created and the metadata entered, the actual SQL code used by the transformation can be defined. The SQL code can be entered directly or via the **Function Builder** on the right hand side. To use the function builder, expand the tree to find the required function.

Example of Building a Transformation Model

To build a model `TO_DATE`, converting a trimmed string in `YYYYMMDD` format to a date, do the following:

- Click on the **Model** tab
- Expand **Functions** heading
- Expand the **Conversion** heading
- Double click on **To Date (TO_DATE)**
- Expand the **String** heading
- Double click on **Right Trim (RTRIM)**
- Highlight **format** and type `'YYYYMMDD'`

You should see the following:



Now click OK.

19.3.1.4 Completed Re-usable Transformation

Transformation definition

Re-usable Transformation | Model | History

Re-usable Transformation: Re-usable transformations are made up of existing database functions, user defined functions and database fields (without table references).
Variables can be placed in re-usable transformations. A prompt will occur to substitute a variable for database fields when a re-usable transformation is applied to an individual column. See Help.

Transform Name: TRIM_TODATE

Transform Desc.: Trim and convert to a date

The following fields are displayed when editing the transformations for a column, and should conform to a standard layout.
An Example of the replace function follows:

Function Tag: Replace string (REPLACE)
Function Syntax: REPLACE(string_column,if [, then])
Function Desc.: Returns a string where all occurrences of the 'if' string are replaced with the 'then' string.
If no 'then' string is supplied all occurrences of the 'if' string are deleted.
Example: REPLACE(load_customer.name,'SMYTH','SMITH')

Function Tag: TDATEYYYYMMDDHHMISS

Function Syntax: TIMESTAMP_FORMAT(RTRIM(string_column),'YYYY-MM-DD HH24:MI:SS')

Function Desc.: Trim and then convert to a date from a string in the format YYYY-MM-DD HH24:MI:SS

Function Model: TIMESTAMP_FORMAT(RTRIM(string_column),'YYYY-MM-DD HH24:MI:SS')

Created:

Updated:

19.3.2 Changing a Re-usable Transformation

To change a re-usable transformation:

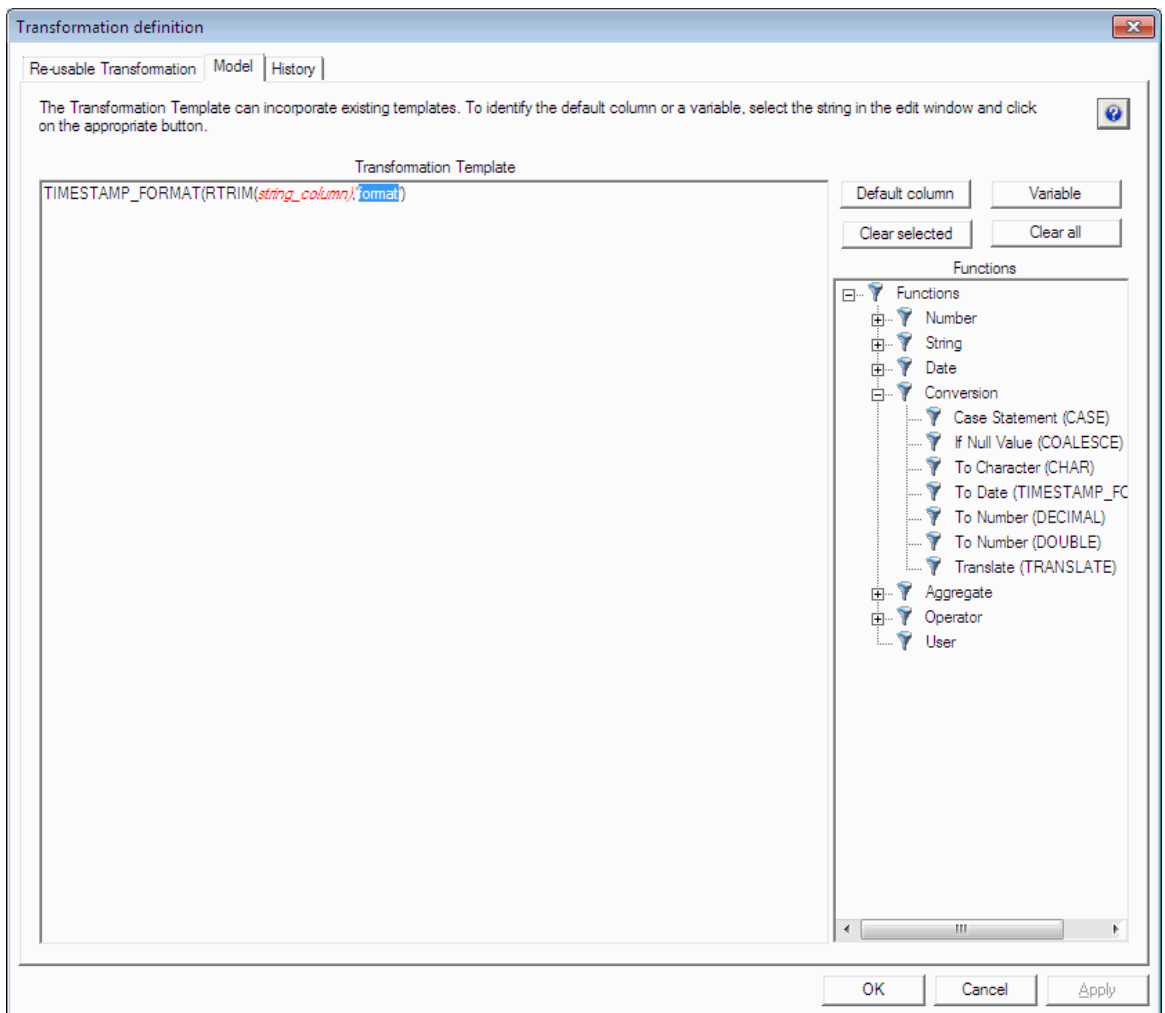
- Select Re-usable transformations from the Tools menu
- Choose the transformation for the Transform Name drop down list
- Click on the Model Tab
- Change the SQL as required
- Click OK

Example of a change to the Model SQL

In the example used in *Creating a New Re-usable Transformation* (see "19.3.1 Creating a New Re-usable Transformation" on page 432), the SQL was:

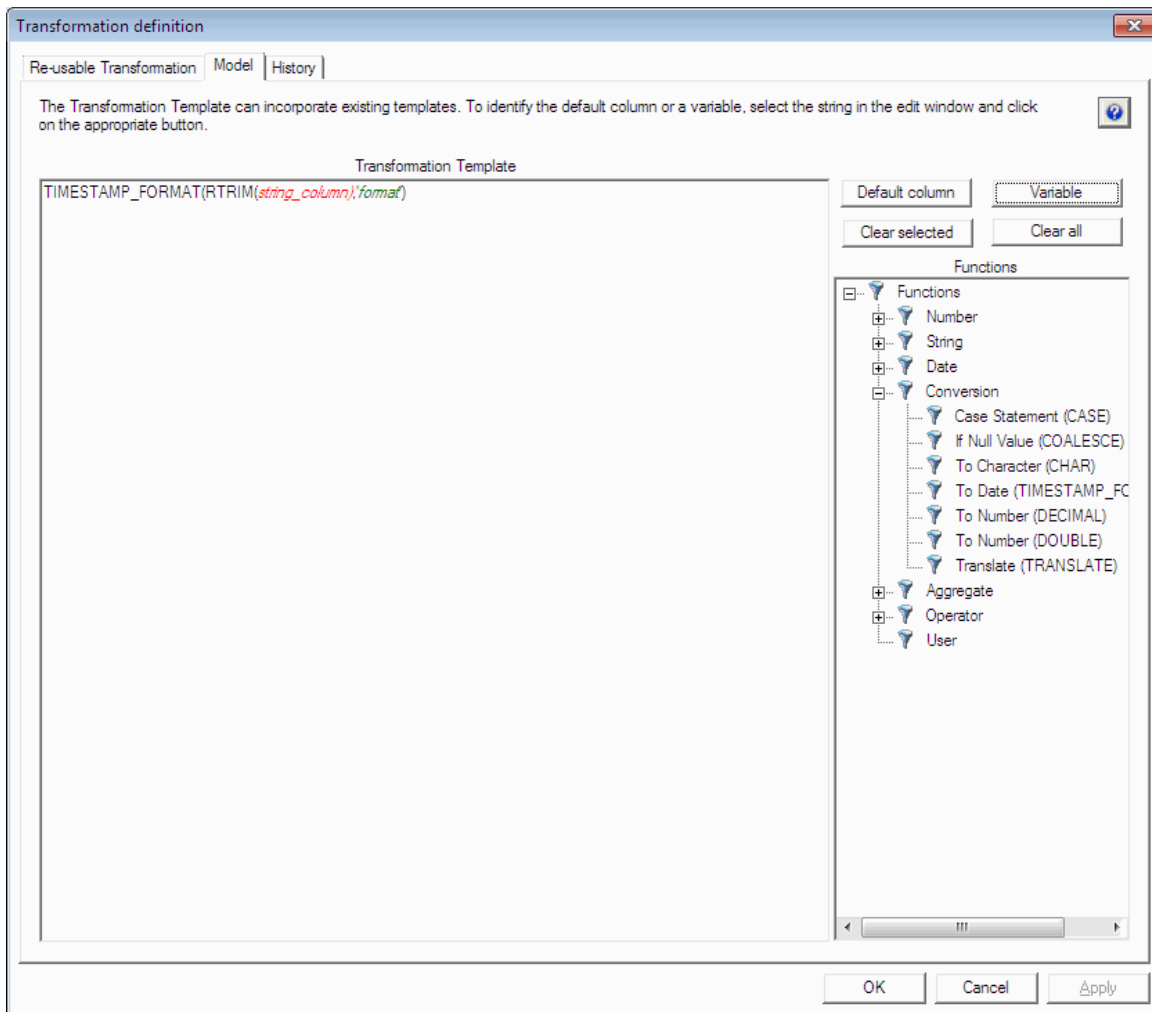
```
TO_DATE(LTRIM(column),'YYYYMMDD')
```

Change the SQL to allow the format to be specified when the transformation is used by changing YYYYMMDD to format.



Then highlight the word **format** and click on the **Variable** button. This makes the word **format** a variable than can be substituted when the Re-usable Transformation is used.

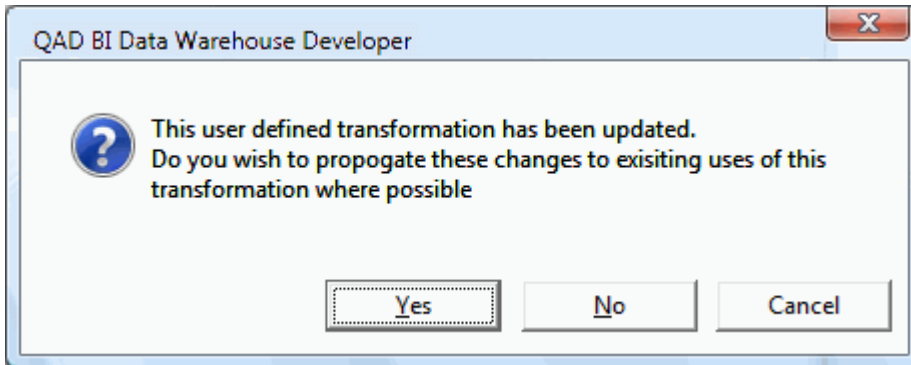
Now **format** is green and in italics:



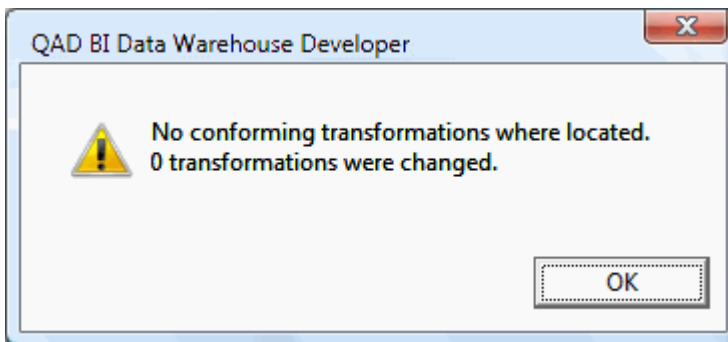
Click on OK.

19.3.2.1 Applying Changes to Dependant Transformations

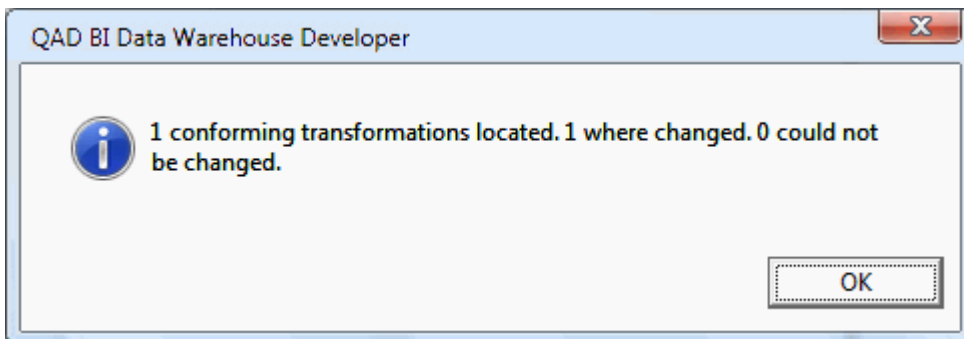
After changing a Re-usable Transformation, a dialog appears asking to confirm that changes should be applied to individual columns using the transformation, where possible:



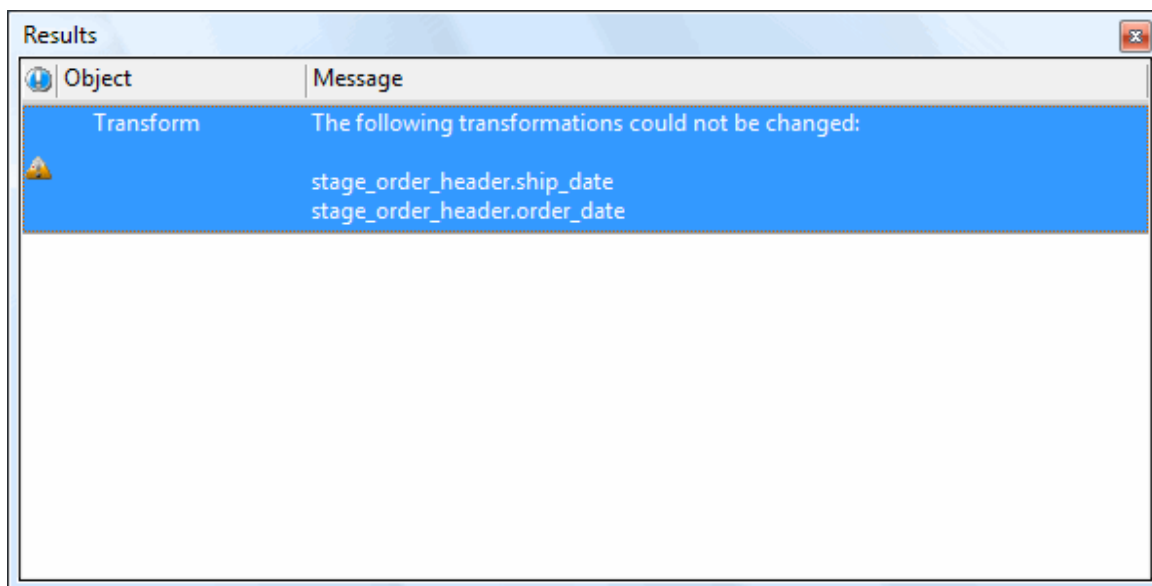
If the Re-usable Transformation doesn't have any dependant columns, then the following message is displayed:



If the Re-usable Transformation has been used for dependant columns then this message is displayed:



When an attempt is made to update a dependant Transformation, and the transformation has been modified in such a way as to make it impossible for the changes to the Re-usable Transformation to be applied, the error message above will include a count of the failures. The results window will detail the columns (and tables) where the update failures have occurred:



19.3.3 Using Re-usable Transformations

Re-usable transformations are used exactly the same way as any standard database Function. They can be used on any object type. See *Column Transformation Properties* (see "19.1.1 Column Transformation Properties" on page 426)

CHAPTER 20

20. Procedures and Scripts

QAD Data Warehouse Designer has a **Procedure** object group for database stored procedures and a **Script** object group for host system scripts, such as Unix shell scripts or Windows batch files.

Procedures

QAD Data Warehouse Designer generates the bulk of the procedures during a prototype build, but these procedures can be customized. In fact it would be normal practice once the prototype phase is completed to modify these procedures to meet specific requirements. The procedure object group refers to the concept of database stored procedures. Specific objects may in fact be functions, procedures or packages. In this chapter the generation, editing and compilation of procedures is covered.

Scripts

Host scripts are generated when a script based file load is chosen during a file drag and drop from a Windows or Unix connection. Scripts can also be created manually provided the rules for their inclusion into the scheduling process are followed. This chapter covers the generation, editing and testing of host scripts as well as explaining the components required to allow them to work in the scheduler environment.

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20.1 Procedure Generation

QAD Data Warehouse Designer generates template procedures to assist in the various phases of the data warehouse build process. A procedure is generated by selecting the (Build Procedure...) option from a drop down box that is used to display the update, initial build, or post load procedure in a table's properties.

For **Load** tables a post load procedure can be generated by selecting the option above. This post load procedure is designed to assist in the management of file loads where a trigger file has been used.

For **Dimension**, **Stage**, **Fact** and **Aggregate** tables an Update or Initial Build procedure can be generated by selecting the option above from the appropriate drop down box. When an 'Update' procedure generation is selected for a Dimension a **get_key** function is also automatically created.

If a new procedure is created from scratch (i.e. not auto generated) then an outline of the syntax required by the QAD scheduler can be generated by selecting the **Tools/create procedure outline** menu option when in the procedure editor.

Wrapper procedures

In some cases multiple procedures will be required to update a table. In such cases it is best to create a top level procedure that is seen by the scheduler as the 'Update' procedure. This procedure can in turn call other procedures.

For example: We may have a fact table that is updated from multiple stage tables. The Oracle wrapper procedure may look as follows:

```

CREATE OR REPLACE procedure update_fact_sales_detail
(
  v_sequence          IN  number,
  v_job_name          IN  varchar2,
  v_task_name         IN  varchar2,
  v_job_id            IN  number,
  v_task_id           IN  number,
  v_return_msg        OUT varchar2,
  v_status            OUT number
)
AS
  =====
  -- Control variables used in most programs
  =====
  v_MsgText          varchar2(255); -- Text for audit_trail
  v_step             integer := 0;  -- return code
  v_invoice_msg      varchar2(256); -- from invoice update
  v_order_msg        varchar2(256); -- from order update
  v_invoice_status    number  := 0;  -- from invoice update
  v_order_status      number  := 0;  -- from order update
  v_retcode          varchar2(1);

BEGIN
  =====
  -- Update fact table with info from orders stage table
  -- Report the results to the audit trail.
  =====
  v_step := 10;
  update_fact_sales_detail_o(v_sequence,v_job_name,v_task_name,
                             v_job_id, v_task_id,v_order_msg, v_order_status);
  If v_order_status = 1 Then
    v_retcode := 'S';
  ElseIf v_order_status = -1 Then
    v_retcode := 'W';
  ElseIf v_order_status = -2 Then
    v_retcode := 'E';
  ElseIf v_order_status = -3 Then
    v_retcode := 'F';
  End If;
  v_status := WsWrkAudit(v_retcode,v_job_name,v_task_name, v_sequence,
                        v_order_msg,NULL,NULL,v_task_id, v_job_id);

  =====
  -- If The previous update (orders) was successful
  -- Update fact table with info from invoice stage table
  =====
  If v_order_status > -2 Then

```

```

        v_step := 20;
        update_fact_sales_detail_i(v_sequence,v_job_name,v_task_name,
                                v_job_id, v_task_id,v_invoice_msg, v_invoice_status);
        If v_invoice_status = 1 Then
            v_retcode := 'S';
        ElseIf v_invoice_status = -1 Then
            v_retcode := 'W';
        ElseIf v_invoice_status = -2 Then
            v_retcode := 'E';
        ElseIf v_invoice_status = -3 Then
            v_retcode := 'F';
        End If;
        v_status := WsWrkAudit(v_retcode,v_job_name,v_task_name, v_sequence,
                                v_invoice_msg,NULL,NULL,v_task_id, v_job_id);
    Else
        v_invoice_status := 0;
    End If;

    -----
    -- All Done report the results
    -- If any of our called procedures failed or gave
    -- warnings then report the final status as such
    -----
    v_step := 90;
    v_status := v_order_status;
    If v_invoice_status < v_order_status Then
        v_status := v_invoice_status;
    Else
        v_status := v_order_status;
    End If;
    v_return_msg := 'fact_sales_detail update ';
    If v_status = 1 Then
        v_return_msg := v_return_msg||'completed.';
    ElseIf v_status = -1 Then
        v_return_msg := v_return_msg||'completed with warnings.';
    Else
        v_return_msg := v_return_msg||'Failed.';
    End If;
    RETURN;

EXCEPTION
    WHEN OTHERS THEN
        v_return_msg := 'Unhandled Exception in '||'update_fact_sales_detail.'||
            ' Step '||v_step||' '||SQLERRM;
        v_status := WsWrkAudit('F',v_job_name,v_task_name, v_sequence,
                                v_return_msg,SQLCODE,SQLERRM,v_task_id, v_job_id);
        v_status := -3;

    RETURN;
END update_fact_sales_detail;

```

This Oracle wrapper procedure calls two child procedures, one for each stage table that is to update the fact table. A status is reported back to the audit trail for each stage and an overall status ascertained for the fact table update.

20.2 Procedure Editing

QAD Data Warehouse Designer includes a procedure editor which allows the maintenance of the various procedures, functions and packages within the data warehouse. The editor is invoked by double clicking on a procedure name in the left hand pane or by selecting the 'Edit the procedure' pop-up menu option when a right mouse menu is activated on the procedure name.

A procedure can be compiled by selecting the Compile/Compile menu option. See the section on compiling procedures for more information.

This section will discuss some of the features of the procedure editor.

In the following sections reference is made to a selected block of text. A selected block of text is a normal windows selection where the text in question is highlighted. Normally achieved by holding down the left mouse button and moving the cursor.

Indenting code

The **tab** character inserts four spaces into the text. A **shift/tab** removes four spaces.

Cut, Copy, Paste and Delete

The normal Windows cut, copy, paste and delete functions are available either through the toolbar or via the right mouse popup menu.

Indenting a block of text

A selected block of text can be indented by four spaces by depressing the **tab** character. Each tab will indent by a further four spaces. A **shift/tab** will remove four spaces from the front of each line in the selected block.

Commenting out a block of text

A selected block of text can be turned into a comment by using the 'Comment' option in the right mouse pop-up menu. The editor will place two dashes '--' at the front of each line in the selected block. In the same way a block of text can be uncommented by choosing the 'UnComment' option. Note that only lines that start with two dashes in the left most column can be uncommented.

Inserting Steps

The right mouse pop-up menu has an option to **insert step**. This option will insert a code line of the format 'v_step := 1000;'. Each subsequent insert will add 100 to the step value. The Alt/Z key can also be used to insert a step line.

The v_step variable is used in the event of an unhandled exception. In such a case the current v_step value is reported, and it may be possible to ascertain the code that failed based on the value of this v_step variable.

Note: If a step is inserted via this method then the step numbering will be automatically reset for all steps numbering from 100 in increments of 100 when the procedure is compiled or saved.

Inserting Audit Message

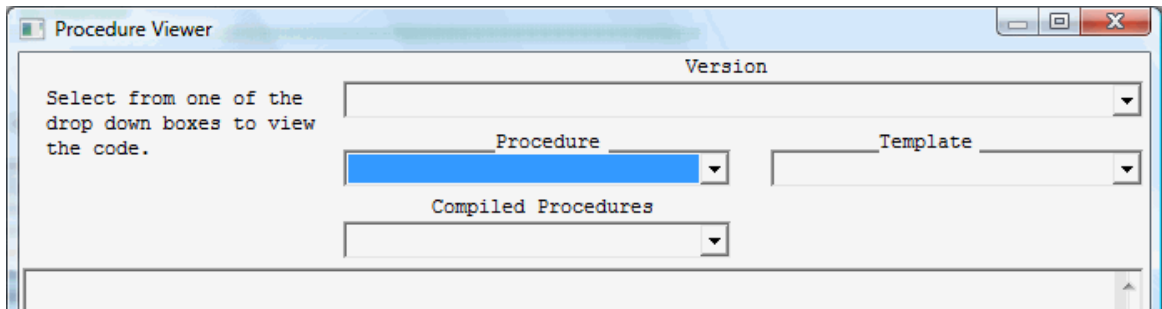
The right mouse pop-up menu has an option to **Insert Audit Log call**. This option inserts several lines of code into the procedure which calls `WsWrkAudit`. This API is used to log messages to the audit log in the QAD Data Warehouse Designer scheduler. By default, the message is generated to log the current step number. It can be changed by altering the first added line. The **Alt/A** key can also be used instead of the right click menu option.

Inserting Detail/Error Message

The right mouse pop-up menu has an option to **Insert Detail/Error Log call**. This option inserts several lines of code into the procedure which calls `WsWrkError`. This API is used to log messages to the detail/error log in the QAD Data Warehouse Designer scheduler. By default, the message is generated to log the current step number. It can be changed by altering the first added line. The **Alt/D** key can also be used instead of the right click menu option.

Viewing other procedural code

During the editing process it is possible to pop up a window containing other procedural code. This window allows cut and paste operations. In such a way it can be used as a work area or as a source of code. Select the **Tools/view procedure or template** menu option to bring the viewer window up. A dialog will appear as follows:



There are a number of drop down list boxes to choose from. Once an item is selected the viewer loads the code and moves to the right hand side of the edit window. The various options are:

- Version: A previously saved version of this procedure. The description and time are shown.
- Procedure: Some other procedure stored within the QAD metadata.
- Template: A template procedure as defined in the QAD metadata.
- Compiled procedure: One of the currently compiled procedures existing in the database.

Once an item is chosen the viewer appears on the right hand side of the edit window. The viewer or the main edit window can receive the focus by clicking the mouse within the appropriate window. Code can be cut from one window and pasted into the other. Any changes made in the viewer window cannot be saved. An example of an active view window is as follows:

```

-- DBMS Name      : SQL Server
-- Script Name     : update_dim_custome
-- Description     : Update the dimensi
-- Generated by    : QAD BI Data Wareho
-- Generated for    : QAD BI DWD Manual
-- Generated on     : Monday, June 21, 2
-- Author          : wsl

-- Notes / History

CREATE PROCEDURE update_dim_customer
    @p_sequence      integer
    , @p_job_name     varchar(256)
    , @p_task_name    varchar(256)
    , @p_job_id       integer
    , @p_task_id      integer
    , @p_return_msg   varchar(256) OUTPUT
    , @p_status       integer OUTPUT
AS
    SET XACT_ABORT OFF -- Turn off auto abort on errors
    SET NOCOUNT ON   -- Turn off row count messages

    -----
    -- Control variables used in most programs
    -----
    DECLARE
        @v_msgtext      varchar(255) -- Text for audit_t
        , @v_sql         nvarchar(255) -- Text for sql sta
        , @v_set         integer -- commit set
        , @v_analyze_flag integer -- analyze flag
        , @v_step         integer -- return code
        , @v_update_count integer -- no of records up
        , @v_insert_count integer -- no of records in

-- DBMS Name      : SQL Server
-- Script Name     : update_dim_custome
-- Description     : Update the dimensi
-- Generated by    : QAD BI Data Wareho
-- Generated for    : QAD BI DWD Manual
-- Generated on     : Monday, June 21, 2
-- Author          : wsl

-- Notes / History

CREATE PROCEDURE update_dim_customer
    @p_sequence      integer
    , @p_job_name     varchar(256)
    , @p_task_name    varchar(256)
    , @p_job_id       integer
    , @p_task_id      integer
    , @p_return_msg   varchar(256) OUTPUT
    , @p_status       integer OUTPUT
AS
    SET XACT_ABORT OFF -- Turn off auto ab
    SET NOCOUNT ON   -- Turn off row cou

    -----
    -- Control variables used in most progr
    -----
    DECLARE
        @v_msgtext      varchar(255) -- T
        , @v_sql         nvarchar(255) -- T
        , @v_set         integer -- c
        , @v_analyze_flag integer -- a
        , @v_step         integer -- r
        , @v_update_count integer -- n
        , @v_insert_count integer -- n
        , @v_count       integer -- G
  
```

20.3 Procedure Loading and Saving

Procedures are normally stored in the QAD Data Warehouse Designer metadata tables. When a procedure is opened within QAD Data Warehouse Designer then the data is retrieved from the meta tables. Likewise when the procedure is saved it overwrites the existing data in the meta tables.

When a procedure is compiled it is also written to the database system tables. In the case of Oracle a compiled procedure can be viewed via the 'User_source' view (e.g. select text from user_source where name = 'MY_PROCEDURE' order by line;). For SQL Server the command is sp_helptext 'MY_PROCEDURE'.

Loading data

As mentioned above when a procedure is opened for editing the information stored in the metadata is loaded. Additional text can be loaded into the procedure edit window by selecting the **File/Insert from File** menu option which allows the browsing and inserting of a PC based file. Also paste buffer data can be inserted in the normal manner. In the previous 'Editing' section the viewer window was discussed. This window can also be a source of data via cut and paste.

Saving the Procedure

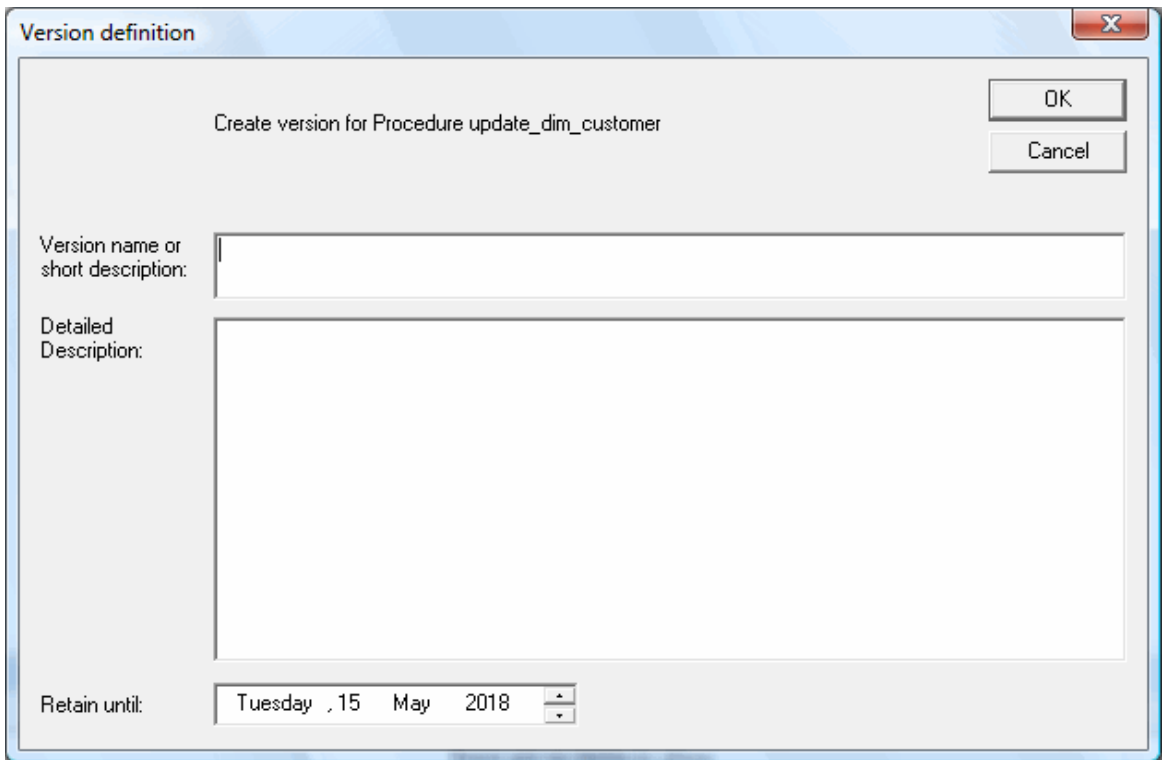
The default **File/Save Procedure** menu option overwrites the existing procedure in the metadata. In addition a procedure can be saved to a Windows disk by selecting the **File/Write procedure to disk** menu option. All procedures can be written to disk from the main Browser menu option **Backup/Save procedures to disk**. This option allows the selection of a directory. The procedures are then written individually into that directory. All procedures are also written to one text file as part of the **Backup/Export the metadata** menu option.

Versions

Multiple versions of a procedure can be stored. Once a version is created that version may be read but may not be updated. Only the current procedure can be edited. There are a number of ways of creating a version of a procedure. These are:

- 1 By setting the 'Auto version on procedure compile' option on under the **Tools/Options Browser** menu. If set a new version of a procedure will be created whenever the procedure is compiled.
- 2 The Procedure Editor menu option **File/Save and Version** will save a procedure and create a version at the same time.
- 3 By selecting the 'New Version' menu option from the pop-up menu when positioned on a procedure when in the main Browser window.
- 4 By selecting the **Tools / Version All** menu option.

When a version is created via method (2) or (3) above the following screen will appear, to allow the definition of the version. If an auto version is created then the person creating the version is recorded along with the reason for the version. (e.g. Version on compile, Version on procedure delete)



The image shows a 'Version definition' dialog box. At the top, it says 'Create version for Procedure update_dim_customer'. There are 'OK' and 'Cancel' buttons in the top right. Below the title bar, there are two text input fields: 'Version name or short description:' and 'Detailed Description:'. At the bottom, there is a 'Retain until:' label followed by a date picker showing 'Tuesday , 15 May 2018'.

The version name / description appears when the versions are subsequently browsed. The Retain until date is set ten years in the future by default. The automated deletion of versions is not supported.

20.4 Procedure Comparisons

A procedure can be compared to either an earlier version, or to the currently running code as compiled/stored in the database. The menu option **Tools/compare to compiled source** allows the comparison of the procedure being edited with the code currently compiled and running in the database. If a viewer window is open (see the procedure editing section) then the **Tools/compare to viewer** menu option will compare the contents of the viewer window with the current code. Therefore to compare against an older version, we first load the viewer window with the older version and perform a 'compare to viewer'.

The comparison will highlight the differences, as shown in the Oracle example below:

```
-->-- v_step :=100;
      select count(1) into v_count  --<--
      from fact_sales --<--
      where dss_update_time >= sysdate-7; --<--
```

In this Oracle example the line `v_step := 100;` has been removed from the current code in the edit window and the remaining three lines have been inserted.

Once the comparison has been completed you can either remove the compare comments or accept the compare changes. The menu option Tools/Remove compare comments will remove the added blue comments and code. The menu option Tools/Accept compare changes will implement the changes highlighted. For the above example the line `'v_step := 100;'` would be added and the following three lines deleted.

20.5 Procedure Compilation

From within the procedure editor a procedure can be compiled by selecting the menu option **Compile/Compile** or by pressing the compile icon. If the procedure compiles successfully a dialog box will appear notifying of a successful compile. If the compile fails then error message comments will be inserted into the procedure code. In the following example the error messages are in red and begin with `--E--`.

```
-----
-- Control variables used in most programs
-----
v_MsgText      varchar2(255); -- Text for audit_trail
v_step         integer := 0;   -- return code
v_update_count integer := 0;   -- no of records updated
v_insert_count integer := 0;   -- no of records inserted
v_count        integer := 0;   -- General counter;

BEGIN

--E--line 24-- Pos 5--      select count(1) into v_count
--E--line 24-- Pos 5-- PL/SQL: SQL Statement ignored
      select count(1) into v_count
--E--line 25-- Pos 10--      from fact_sales
--E--line 25-- Pos 10-- PLS-00201: identifier 'FACT_SALES' must be declared
      from fact_sales
      where dss_update_time >= sysdate-7;

-----
--All Done report the results and return.
-----
COMMIT;
v_step := 200;
v_status := 1;
v_return_msg := 'fact_sales_update completed. '
               || v_insert_count || ' new records. '
               || v_update_count || ' records updated.';
```

Error comments will be inserted at each error point. *A compile will delete any previous error comments.* Error comments can also be removed through the menu option **Compile/Delete Error messages**.

Note: In some instances the error comments may not be positioned on the correct line. This can occur as the result of one or more procedure lines being wrapped. Therefore, ensure the procedure editor window is maximized when dealing with compile errors.

If an Oracle procedure fails to compile then it is invalidated in the database, and will not run until successfully compiled.

20.6 Procedure Running

Only procedures that conform to the QAD scheduler syntax can be executed from within the procedure editor. Select the **Execute/Execute** menu option or click the execute icon to run the procedure. A procedure must have been compiled in order to run.

The results of the procedure will be displayed in a dialog box. The result code and result message will be displayed as well as any additional messages.

20.7 Procedure Syntax

The procedures managed by the QAD scheduler require the following standards. If a function or procedure is being developed that is not called directly by the scheduler then it does not need to conform with this standard. If however such a procedure or function wants to log messages to the audit or error logs then it will need the input parameters included in its parameter list.

Parameters

The procedure must have the following parameters in the following order:

Parameter name	Input/Output	Oracle Type	SQL Server / DB2 Type
p_sequence	Input	Number	Integer
p_job_name	Input	Varchar2	Varchar(256)
p_task_name	Input	Varchar2	Varchar(256)
p_job_id	Input	Number	Integer
p_task_id	Input	Number	Integer
p_return_msg	Output	Varchar2	Varchar(256)
p_status	Output	Number	Integer

The input parameters are passed to the procedure by the scheduler. If the procedure is called outside the scheduler then the normal practice is to pass zero (0) in the sequence, job_id and task_id. A description of the run can be passed in the job name and the task name is typically the name of the procedure.

The output parameters must be populated by the procedure on completion. The return_msg can be any string up to 256 characters long that describes the result of the procedures execution. The status must be one of the following values:

Status	Meaning	Description
1	Success	Normal completion
-1	Warning	Completion with warnings
-2	Error	Hold subsequent tasks dependent on this task
-3	Fatal Error	Hold all subsequent tasks

20.8 Procedure Properties

The properties screen for procedures and scripts is the same. A procedure can be renamed by changing the name field. If renamed then it will also be necessary to change the procedure name within the actual code. The purpose and owner fields are purely informational. The 'Type' drop list allows the selection of Procedure, Function, Unix Script or Windows Script.

The screenshot shows a dialog box titled "update_dim_customer definition". It has two tabs: "Procedure/ Script Properties" (selected) and "Notes". The form contains the following fields and controls:

- Name:** A text box containing "update_dim_customer".
- Purpose:** A text box containing "update_dim_customer".
- Owner:** A text box containing "auto created".
- Created:** A date/time box containing "2010-07-05 22:25:21".
- Compiled:** A date/time box containing "2010-07-05 22:25:21".
- Last Update:** An empty date/time box.
- Type:** A dropdown menu currently set to "Procedure".
- Delete Lock:** A checkbox that is checked.
- Last Update by:** An empty text box.
- Checked out by:** A text box containing "QAD QuickStart". To its right is a "Clear Checkout" button.
- Checkout reason: or Last Update:** A text box containing "new procedure".

At the bottom right of the dialog are three buttons: "OK", "Cancel", and "Apply".

In the example above the 'Delete Lock' check box is checked. This will prevent the procedure being deleted through the 'delete' menu option. It will also prevent the procedure being overwritten if a new procedure generation is requested.

Also in the example above the procedure is currently being edited, and is shown as being checked out. A button to the right of the check out message allows the check out to be cleared. If QAD Data Warehouse Designer, the database or the PC crashes when a procedure is open, then the check out will need to be cleared through this screen.

The check out reason is for information only, and can be used as another comment field if desired.

20.9 Script Generation

QAD Data Warehouse Designer generates template scripts to assist in the loading of textual files from Unix or Windows. These scripts are generated when a Unix or Windows file is dragged into a load table target and one of the two 'Script based' file load options is chosen. Typically script loads are used when some complexity prevents the use of the standard file based load. In such a case the script will probably need modification.

Note: Unix scripts are only supported for an Oracle data warehouse running on a Unix platform.

The following sample scripts are covered in the remainder of this section:

- 1 Windows script for SQL.
- 2 Unix script for Oracle.
- 3 Windows script for Oracle.
- 4 Windows script for DB2.

20.9.1 Script Generation (Windows/SQL Server)

A sample Windows script for SQL Server is as follows. The key components of the script are described below:

```
@echo off
setlocal enabledelayedexpansion
setlocal enableextensions
REM *****
REM ***** Load of D:\forecast.txt into load_forecast.txt
REM *****

REM *****
REM ***** NOTE: The following environment variables will be set
REM ***** WSL_LOAD_TABLE = the load table name
REM ***** WSL_SEQUENCE = a unique sequence number for the scheduler
REM ***** WSL_WORKDIR = the work directory defined in the connection
REM ***** WSL_SERVER = the server defined in the connection
REM ***** WSL_DATABASE = the database defined in the connection
REM ***** WSL_USER = the dss user defined in the connection
REM ***** WSL_PWD = the dss password defined in the connection
REM ***** WSL_PARAMnnn = Any parameters that start with the load
REM ***** table name. For example: A table called load_abc has a
REM ***** parameter called load_abc_server defined. In this case
REM ***** a variable called WSL_PARAM_SERVER will be created
REM *****

SET LOAD_FILE=D:\forecast.txt
SET TRIG_FILE=D:\forecast.trg

if defined WSL_LOAD_TABLE (SET LOAD_TABLE=%WSL_LOAD_TABLE%) else SET LOAD_TABLE=load_forecast_txt
if defined WSL_SERVER (SET SERVER=%WSL_SERVER%) else SET SERVER=PMSDEV\PMSEDEV
if defined WSL_DATABASE (SET DATABASE=%WSL_DATABASE%) else SET DATABASE=DataWarehouse
if defined WSL_USER (SET USER=%WSL_USER%) else SET USER=sa
if defined WSL_PWD (SET PWD=%WSL_PWD%) else SET PWD=9986
if defined WSL_WORKDIR (SET WORKDIR=%WSL_WORKDIR%) else goto LABEL_FILE_DEFAULT
if defined WSL_SEQUENCE (SET SEQUENCE=%WSL_SEQUENCE%) else goto LABEL_FILE_DEFAULT
SET FILECTL=%WORKDIR%\wsl%SEQUENCE%.ctl
SET FILELOG=%WORKDIR%\wsl%SEQUENCE%.log
SET FILEAUD=%WORKDIR%\wsl%SEQUENCE%.aud
goto LABEL_WAIT
:LABEL_FILE_DEFAULT
SET FILECTL=c:\temp\wsl39.ctl
SET FILELOG=c:\temp\wsl39.log
SET FILEAUD=c:\temp\wsl39.aud
:LABEL_WAIT
```


The script makes use of a number of environmental variables. These variable are acquired from both the table and connection properties. These variables are established in the environment by either QAD Data Warehouse Designer or the scheduler. If the script is to be executed outside of QAD Data Warehouse Designer or scheduler control then these variables will need to be assigned.

The first section of the script defines the variables. The second section provides a timed wait for the load file to arrive. By default the WAITSECS variable is set to zero, so that no wait occurs. This can be set to a number of seconds that the script is to wait for the file to arrive.

```

REM *****
REM ***** W A I T       T I M E R *****
REM *****
REM If a wait time specified then loop looking for the file
REM or trigger file to arrive until the wait time expires.
SET /A WAITSECS=0
:LABEL_WAITLOOP
if %WAITSECS% LEQ 0 goto LABEL_FILECHECK
REM see if the file exists and if so skip the wait check
if exist %TRIG_FILE% goto LABEL_FILECHECK
Call WslSleep to wait for 30 seconds. It will return remaining seconds
D:\Pms\Release\WslSleep %WAITSECS% 30
SET /A WAITSECS=%errorlevel%
goto LABEL_WAITLOOP
REM
REM Finished our wait loop. See if we have the file
REM *****
REM ***** F I L E       C H E C K *****
REM *****
:LABEL_FILECHECK
if exist %TRIG_FILE% goto LABEL_TRIGGER
echo -1
echo File %TRIG_FILE% was not found.
exit
REM

```

Once the wait has completed, either through a time expiry or through the location of the file, we check that the file is present, and if not found report back a warning. This warning can be changed to an error by changing the first echo statement to "-2". See the syntax section for more information.

When a trigger file is specified the script looks for a trigger file, and will exit with the specified status if the file is not found. The following code is included if a trigger file is present.

```

REM
REM *****
REM ***** T R I G G E R *****
REM *****
:LABEL_TRIGGER
REM
REM First clear any existing parameters
REM
isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "UPDATE dss_parameter SET dss_parameter_value = NULL WHERE dss_parameter_name like 'FORECAST_%'" -o %FILELOG%
REM
REM Get the first four and all remaining parameters
REM
for /F "tokens=1,2,3,4* delims=" %a in (%TRIG_FILE%) do SET A=%a&SET B=%b&SET C=%c&SET D=%d&SET E=%e
REM
REM For each parameter write it to the parameter table
REM
if defined A isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "EXEC VsParameterWrite 'FORECAST_0','%A%',script load"
if defined B isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "EXEC VsParameterWrite 'FORECAST_1','%B%',script load"
if defined C isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "EXEC VsParameterWrite 'FORECAST_2','%C%',script load"
if defined D isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "EXEC VsParameterWrite 'FORECAST_3','%D%',script load"
if defined E isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "EXEC VsParameterWrite 'FORECAST_4','%E%',script load"
REM

```

Such a file (trigger) contains control information about the main file to be loaded and arrives after the main file to indicate that the main file transfer has completed and that it is OK to load.

This section loads the contents of the trigger file into the Parameters table, so that the table can be validated. See the section on Post Load procedures for an explanation on how trigger files are used to validate a load file.

```

REM *****
REM ***** L O A D   T H E   D A T A *****
REM *****
echo load of %LOAD_TABLE% > %FILEAUD%
SET /A RESULT_CODE=1
SET RESULT_MSG=Load Completed
:LABEL_LOAD
SET FILE_NAME=NO_MORE_FILES
for %%A in (%LOAD_FILE%) do if "!FILE_NAME!"=="NO_MORE_FILES" SET FILE_NAME=%%A
if %FILE_NAME%==NO_MORE_FILES goto LABEL_EXIT
echo loading %FILE_NAME%  >> %FILEAUD%
echo exit( > %FILECTL%
echo   BULK INSERT  >> %FILECTL%
echo   %LOAD_TABLE% >> %FILECTL%
echo   FROM  >> %FILECTL%
echo   '%FILE_NAME%' >> %FILECTL%
echo   WITH >> %FILECTL%
echo   ( >> %FILECTL%
echo       DATAFILETYPE='char' >> %FILECTL%
echo       , CODEPAGE='raw' >> %FILECTL%
echo       , FIELDTERMINATOR = ',' >> %FILECTL%
echo       , FIRSTROW = 2 >> %FILECTL%
echo   ) >> %FILECTL%
echo ) >> %FILECTL%
rem
rem In the following isql statement use either -E for a trusted connection
rem or -Uxxx -Pyty where xxx is the username and ppy the password
rem
isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -i %FILECTL% -o %FILELOG%
SET ERRLEV=%errorlevel%
IF %errorlevel% EQU 0 GOTO LABEL_OKAY
:LABEL_FAIL
echo -2
echo Load failed with return status %ERRLEV% See error log for details
type %FILEAUD% >&2
type %FILELOG% >&2
exit
:LABEL_OKAY
type %FILELOG% >> %FILEAUD%
REM

```

This section calls isql to invoke Bulk Insert to load the file. It makes use of a temporary file to build as a control file and then calls isql to load the data. Note that the load is actually in a for loop. Wild card file names can be used to load multiple files. Each file to be loaded must have the same format.

Note that the data being loaded is appended to the database table. As part of the scheduler run the load table is truncated if the property for truncation is set. In this way multiple files can be loaded into the database table.



TIP: If this script is to be executed outside the control of the QAD Data Warehouse Designer scheduler then a truncate statement may need to be performed on the database load table. This would normally be placed before the 'for loop' and would look something like the following:

```

isql -S %SERVER% -d %DATABASE% -U%USER% -P%PWD% -n -Q "truncate table load_forecast" -o
%FILELOG%

```

This next section handles the rename and potential looping. The first block of code renames the file and also the trigger file if appropriate. This code is only generated if the rename fields in the file attributes are populated.

The goto label_load statement 9 lines from the end can be used if all the files in a wild card file load are required. Simply uncomment this goto statement and the script will load each file in the wild card.

```

REM *****
REM ***** R E N A M E *****
REM *****
:LABEL_RENAME
REM
REM rename the file
move %FILE_NAME% D:\loaded\
echo %FILE_NAME% moved to D:\loaded\ >> %FILEAUD%
REM rename the trigger file
move %TRIG_FILE% D:\loaded\
echo %TRIG_FILE% moved to D:\loaded\ >> %FILEAUD%
REM
REM *****
REM ***** N E X T   F I L E *****
REM *****
REM If multiple files are being processed via a wildcard
REM uncomment the goto LABEL_LOAD statement
REM WARNING: Do not loop back unless the file name contains a wildcard
REM WARNING: You must rename the file that has been loaded if
REM           looping back otherwise the script will loop for
REM           ever loading the same file.
:LABEL_NEXTFILE
REM goto LABEL_LOAD
REM *****
REM ***** E X I T *****
REM *****
:LABEL_EXIT
echo %RESULT_CODE%
echo %RESULT_MSG%
type %FILEAUD%
exit

```

20.9.2 Script Generation (Unix/Oracle)

A sample Unix script for Oracle is as follows. The key components of the script are described below:

```
#!/bin/sh
#*****
#***** Load of /home/dssadm/budget.txt into table load_budget_txt
#*****
#
LOAD_FILE=/home/dssadm/budget.txt
#
#*****
#***** W A I T      T I M E R *****
#*****
# If a wait time specified then loop looking for the file or trigger
# to arrive until the wait period expires.
WAITSECS=0
if [ "$WAITSECS" -gt "0" ]
then
    # Get the current time and work out the end of the wait
    #
    NOW_HH=`date +%H`
    NOW_MM=`date +%M`
    NOW_SS=`date +%S`
    let NOW_HH="$NOW_HH * 3600"
    let NOW_MM="$NOW_MM * 60"
    let NOW_TIME="$NOW_HH + $NOW_MM + $NOW_SS"
    let TILL_TIME="$NOW_TIME + $WAITSECS"
    let START_TIME="$NOW_TIME"
    #
    # Loop checking for the file until the wait is complete
    #
    while [ "$NOW_TIME" -lt "$TILL_TIME" ]
    do
        FCOUNT=`find $LOAD_FILE -print 2>/dev/null | wc -l`
        if [ "$FCOUNT" -gt "0" ]
        then
            let NOW_TIME="$TILL_TIME"
        else
            #
            # if the file is not present sleep 30 seconds
            # and recalculate the time. If less than the start
            # then we have gone past midnight so add 86400
            sleep 30
        fi
    done
fi
```

```

NOW_HH=`date +%H`
NOW_MM=`date +%M`
NOW_SS=`date +%S`
let NOW_HH="$NOW_HH * 3600"
let NOW_MM="$NOW_MM * 60"
let NOW_TIME="$NOW_HH + $NOW_MM + $NOW_SS"
if [ "$NOW_TIME" -lt "$START_TIME" ]
then
    let NOW_TIME="$NOW_TIME + 86400"
fi
done
fi
#
# Finished our wait loop. See if we have the file
#
#*****
#***** F I L E   C H E C K *****
#*****
FCOUNT=`find $LOAD_FILE -print 2>/dev/null | wc -l`
if [ "$FCOUNT" -eq "0" ]
then
    #
    # file not present so exit with the requested return code
    #
    echo "-1"
    echo "File /home/dssadm/budget.txt was not found"
    exit
fi

```

The script makes use of two environmental variables called DSS_USER and DSS_PWD. These variables are established in the environment by the scheduler. If the script is to be executed outside of scheduler control then these two variables will need to be assigned after the LOAD_FILE variable.

The first section of the script defines the load_file variable. The second section provides a timed wait for the load file to arrive. By default the WAITSECS variable is set to zero, so that no wait occurs. This can be set to a number of seconds that the script is to wait for the file to arrive.

Once the wait has completed, either through a time expiry or through the location of the file, we check that the file is present, and if not found report back a warning. This warning can be changed to an error by changing the first echo statement to "-2". See the syntax section for more information.

When the file based load is used instead of the script based load, the scheduler looks for a trigger file if defined, and will exit with the specified status if the file is not found.

```
#####
##### T R I G G E R #####
#####
#
# Clear any existing Trigger file parameters
#
### sqlplus -s <<EOF >/dev/null
### $DSS_USER/$DSS_PWD
### set sqlprompt "";
### set heading off;
### set pagesize 0
### set linesize 256
### set trimspool on
### set echo off;
### update dss_parameter set dss_parameter_value = NULL
### where dss_parameter_name like 'budget.txt_%';
### exit;
### EOF
### if [ "$?" -ne "0" ]
### then
###     echo "-1"
###     echo "Parameter clear Sqlplus returned a non standard return code of $?"
### fi
#
# Load the contents of the trigger file into parameters
#
### cat /home/dssadm/budget.trg | tr "\012" "\012" > /tmp/wsl2.trg
### TRIGNO=`cat /tmp/wsl2.trg | wc -l | tr -d " "`
### if [ "$TRIGNO" != "0" ]
### then
###     ROWNUM=0
###     while [ "$ROWNUM" -lt "$TRIGNO" ]
###     do
###         let ROWNUM="$ROWNUM+1"
###         TRIG_NO="budget.txt_$ROWNUM"
###         TRIG_MSG=`cat /tmp/wsl2.trg | head -$ROWNUM | tail -1 | sed "s/'/'/g"`
###         sqlplus -s <<EOF1 >/dev/null
###         $DSS_USER/$DSS_PWD
###         variable x number;
###         exec :x := WsParameterWrite('$TRIG_NO','$TRIG_MSG','load of /home/dssadm/budget.txt');
###         exit;
###     EOF1
###     done
### fi
```

This section of the script is commented out by default. It is used when a trigger file is present. Such a file contains control information about the main file to be loaded and arrives after the main file to indicate that the main file transfer has completed and that it is OK to load.

This section loads the contents of the trigger file into the Parameters table, so that the table can be validated. See the section on Post Load procedures for an explanation on how trigger files are used to validate a load file.

```
#####
##### L O A D   T H E   D A T A #####
#####
#
# Loop through all files found loading them into the table
# Will need to use append in the sql load in case there are multiple files
#
FLIST=`find $LOAD_FILE -print`
for ACTFILE in $FLIST
do
    # Build the sql loader control script
    echo "load data" >/tmp/wsl2.ctl
    echo "infile '$ACTFILE'" >>/tmp/wsl2.ctl
    echo "badfile '/tmp/wsl2.bad'" >>/tmp/wsl2.ctl
    echo "append" >>/tmp/wsl2.ctl
    echo "into table load_budget_txt" >>/tmp/wsl2.ctl
    echo "fields terminated by '\"','\"'" >>/tmp/wsl2.ctl
    echo "optionally enclosed by '\"'" >>/tmp/wsl2.ctl
    echo "trailing nullcols" >>/tmp/wsl2.ctl
    echo "(" >>/tmp/wsl2.ctl
    echo "order_number," >>/tmp/wsl2.ctl
    echo "order_line_number," >>/tmp/wsl2.ctl
    echo "product_code," >>/tmp/wsl2.ctl
    echo "customer_code," >>/tmp/wsl2.ctl
    echo "budget_quantity," >>/tmp/wsl2.ctl
    echo "budget_sales," >>/tmp/wsl2.ctl
    echo "budget_date date 'yyyy-mm-dd'" >>/tmp/wsl2.ctl
    echo ")" >>/tmp/wsl2.ctl
    ORACLE_SID=0817
    export ORACLE_SID
    sqlldr userid=$DSS_USER/$DSS_PWD control=/tmp/wsl2.ctl skip=1 silent=header,feedback log=/tmp/wsl2.log
    retcode=`echo $?`
    rows=`cat /tmp/wsl2.log| grep Rows | grep success`
done
```

This section calls sql*loader to load the file. It makes use of a temporary file to build as a control file and then calls sqlldr to load the data. Note that the load is actually in a for loop. Wild card file names can be used to load multiple files. Each file to be loaded must have the same format.

Note that the data being loaded is appended to the database table. As part of the scheduler run the load table is truncated if the property for truncation is set. In this way multiple files can be loaded into the database table.



TIP: If this script is to be executed outside the control of the QAD Data Warehouse Designer scheduler then a truncate statement may need to be performed on the database load table. This would normally be placed before the 'for loop' and would look something like the following:

```
echo "truncate table load_budget_txt;" >/tmp/wsl2.sql
echo "commit;" >>/tmp/wsl2.sql
echo "exit" >>/tmp/wsl2.sql
sqlplus $DSS_USER/$DSS_PWD @/tmp/wsl2.sql >/dev/null
```

Note that the first echo has a single output '>' whereas the subsequent lines have two '>>'. The first output command creates or re-creates the file and the subsequent lines append to it. We put the output of the command to the null device as we do not want data in the output stream that does not match our syntax.

```
case "$retcode" in
0) echo "1";
   echo "load_budget_txt completed. $rows from $ACTFILE"
   ;;
2) echo "-1";
   echo "Not all rows loaded. $rows. see error trail" ;
   cat /tmp/wsl2.log| grep Rows
   cat /tmp/wsl2.log>&2
   ;;
1) echo "-2";
   echo "SQL*Loader execution exited with EX_FAIL, see error trail";
   cat /tmp/wsl2.log>&2
   ;;
3) echo "-3";
   echo "SQL*Loader execution encountered a fatal error"
   cat /tmp/wsl2.log>&2
   ;;
*) echo "-3";
   echo "SQL*Loader unknown return code"
   cat /tmp/wsl2.log>&2
   ;;
esac
```


This section of the script checks the return code from the sql*loader command. Depending on the code it either identifies success, a warning or an error. In any non success situation it puts the log file out to the error stream '>&2'. This will result in the information ending up in the Detail/Error log when this script is executed through the scheduler.

```
#
#####
##### R E N A M E #####
#####
#
# If we had a success or a warning then do a rename
### if [ "$retcode" -eq "0" -o "$retcode" -eq "2" ]
### then
#
# Rename the file
#
### mv $ACTFILE /home/dssadm/budget.txt
### echo "$ACTFILE renamed to /home/dssadm/budget.txt"
#
# Rename the trigger
#
### mv /home/dssadm/budget.trg /home/dssadm/budget.trg
### echo "/home/dssadm/budget.trg renamed to /home/dssadm/budget.trg"
### fi
#####
##### E N D   F I L E   L O A D   L O O P #####
#####
#
# Uncomment the break statement if you only wish to process one file at
# a time in a wildcard file load. The break will case the script to finish
# after the first file that matches the wildcard has been loaded
#
# break
done
exit
```

This final section is largely commented out. It ends with the closing of the for loop that processes each file in a wild card file load.

The first block of commented out code renames the file and also the trigger file if appropriate. If this action is required enter the rename path etc. and un-comment this code.

The break statement 3 lines from the end can be used if just the first file in a wild card file load is required. Simply uncomment this break statement and the script will end after the first file has been loaded.

20.9.3 Script Generation (Windows/Oracle)

A sample Windows script for Oracle is as follows. The key components of the script are described below:

```
@echo off
setlocal enabledelayedexpansion
setlocal enableextensions
REM *****
REM ***** Load of D:\forecast.txt into load_forecast.txt
REM *****

REM *****
REM ***** NOTE: The following environment variables will be set
REM ***** WSL_LOAD_TABLE = the load table name
REM ***** WSL_SEQUENCE = a unique sequence number for the scheduler
REM ***** WSL_WORKDIR = the work directory defined in the connection
REM ***** WSL_DBHOME = the database home defined in the connection
REM ***** WSL_DATABASE = the database defined in the connection
REM ***** WSL_USER = the dss user defined in the connection
REM ***** WSL_PWD = the dss password defined in the connection
REM ***** WSL_PARAMnnn = Any parameters that start with the load
REM ***** table name. For example: A table called load_abc has a
REM ***** parameter called load_abc_server defined. In this case
REM ***** a variable called WSL_PARAM_SERVER will be created
REM *****

SET LOAD_FILE=D:\forecast.txt
SET TRIG_FILE=D:\forecast.trg

if defined WSL_LOAD_TABLE (SET LOAD_TABLE=%WSL_LOAD_TABLE%) else SET LOAD_TABLE=load_forecast_txt
if defined WSL_DBHOME (SET DBHOME=%WSL_DBHOME%) else SET DBHOME=
if defined WSL_DATABASE (SET DATABASE=%WSL_DATABASE%) else SET DATABASE=
if defined WSL_USER (SET USER=%WSL_USER%) else SET USER=dssadm
if defined WSL_PWD (SET PWD=%WSL_PWD%) else SET PWD=ws1
if defined WSL_WORKDIR (SET WORKDIR=%WSL_WORKDIR%) else goto LABEL_FILE_DEFAULT
if defined WSL_SEQUENCE (SET SEQUENCE=%WSL_SEQUENCE%) else goto LABEL_FILE_DEFAULT
SET FILECMD=%WORKDIR%\ws1%SEQUENCE%.cmd
SET FILECTL=%WORKDIR%\ws1%SEQUENCE%.ctl
SET FILELOG=%WORKDIR%\ws1%SEQUENCE%.log
SET FILEAUD=%WORKDIR%\ws1%SEQUENCE%.aud
SET FILEBAD=%WORKDIR%\ws1%SEQUENCE%.bad
SET FILELO2=%WORKDIR%\ws1%SEQUENCE%.lo2
goto LABEL_WAIT
:LABEL_FILE_DEFAULT
SET FILECMD=c:\temp\ws122.cmd
SET FILECTL=c:\temp\ws122.ctl
SET FILELOG=c:\temp\ws122.log
SET FILEAUD=c:\temp\ws122.aud
SET FILEBAD=c:\temp\ws122.bad
SET FILELO2=c:\temp\ws122.lo2
:LABEL_WAIT
```

The script makes use of a number of environmental variables. These variables are acquired from both the table and connection properties. These variables are established in the environment by either QAD Data Warehouse Designer or the scheduler. If the script is to be executed outside of QAD Data Warehouse Designer or scheduler control then these variables will need to be assigned.

The first section of the script defines the variables. The second section provides a timed wait for the load file to arrive. By default the WAITSECS variable is set to zero, so that no wait occurs. This can be set to a number of seconds that the script is to wait for the file to arrive.

```

REM *****
REM ***** W A I T       T I M E R *****
REM *****
REM If a wait time specified then loop looking for the file
REM or trigger file to arrive until the wait time expires.
SET /A WAITSECS=0
:LABEL_WAITLOOP
if %WAITSECS% LEQ 0 goto LABEL_FILECHECK
REM see if the file exists and if so skip the wait check
if exist %TRIG_FILE% goto LABEL_FILECHECK
Call WslSleep to wait for 30 seconds. It will return remaining seconds
D:\Pms\Release\WslSleep %WAITSECS% 30
SET /A WAITSECS=%errorlevel%
goto LABEL_WAITLOOP
REM
REM Finished our wait loop. See if we have the file
REM *****
REM ***** F I L E       C H E C K *****
REM *****
:LABEL_FILECHECK
if exist %TRIG_FILE% goto LABEL_TRIGGER
echo -1
echo File %TRIG_FILE% was not found.
exit

```

Once the wait has completed, either through a time expiry or through the location of the file, we check that the file is present, and if not found report back a warning. This warning can be changed to an error by changing the first echo statement to "-2". See the syntax section for more information.

When a trigger file is specified the script looks for a trigger file, and will exit with the specified status if the file is not found. The following code is included if a trigger file is present.

```

REM
REM *****
REM ***** T R I G G E R *****
REM *****
:LABEL_TRIGGER
REM
REM First clear any existing parameters
REM
echo UPDATE dss_parameter SET dss_parameter_value = NULL > %FILECMD%
echo WHERE dss_parameter_name like 'FORECAST_%'; >> %FILECMD%
echo variable X varchar2 >> %FILECMD%
REM
REM Get the first four and all remaining parameters
REM
for /F "tokens=1,2,3,4* delims=," %a in (%TRIG_FILE%) do SET A=%a&SET B=%b&SET C=%c&SET D=%d&SET E=%e
REM
REM For each parameter write it to the parameter table
REM
if defined A echo EXEC :X := WsParameterWrite('FORECAST_0','%A%','script load'); >> %FILECMD%
if defined B echo EXEC :X := WsParameterWrite('FORECAST_1','%B%','script load'); >> %FILECMD%
if defined C echo EXEC :X := WsParameterWrite('FORECAST_2','%C%','script load'); >> %FILECMD%
if defined D echo EXEC :X := WsParameterWrite('FORECAST_3','%D%','script load'); >> %FILECMD%
if defined E echo EXEC :X := WsParameterWrite('FORECAST_4','%E%','script load'); >> %FILECMD%
REM
REM Execute the sql command
REM
echo exit; >> %FILECMD%
sqlplus -s %USER%/PWD@%DATABASE% @%FILECMD% > %FILELO2% 2>&1
REM

```

Such a file (trigger) contains control information about the main file to be loaded and arrives after the main file to indicate that the main file transfer has completed and that it is OK to load.

This section loads the contents of the trigger file into the Parameters table, so that the table can be validated. See the section on Post Load procedures for an explanation on how trigger files are used to validate a load file.

```

REM *****
REM ***** L O A D   T H E   D A T A *****
REM *****
echo load of %LOAD_TABLE% > %FILEAUD%
SET /A RESULT_CODE=1
SET RESULT_MSG=Load Completed
:LABEL_LOAD
SET FILE_NAME=NO_MORE_FILES
for %%A in (%LOAD_FILE%) do if "!FILE_NAME!"=="NO_MORE_FILES" SET FILE_NAME=%%A
if %FILE_NAME%==NO_MORE_FILES goto LABEL_EXIT
echo loading %FILE_NAME% >> %FILEAUD%
echo load data > %FILECTL%
echo infile '%FILE_NAME%' >> %FILECTL%
echo badfile '%FILEBAD%' >> %FILECTL%
echo into table %LOAD_TABLE% >> %FILECTL%
echo fields terminated by "," >> %FILECTL%
echo optionally enclosed by '^"' >> %FILECTL%
echo trailing nullcols >> %FILECTL%
echo ( >> %FILECTL%
echo product_code,>> %FILECTL%
echo customer_code,>> %FILECTL%
echo forecast_quantity,>> %FILECTL%
echo forecast_sales_value,>> %FILECTL%
echo forecast_date date 'dd-mon-yyyy'>> %FILECTL%
echo ) >> %FILECTL%
sqlldr userid=%USER%/%PWD%@%DATABASE% control=%FILECTL% skip=1 silent=header,feedback log=%FILELOG%
SET /A ERRLEV=%errorlevel%

```

This section calls sql*loader (bulk insert for SQL Server) to load the file. It makes use of a temporary file to build as a control file and then calls sqlldr to load the data. Note that the load is actually in a for loop. Wild card file names can be used to load multiple files. Each file to be loaded must have the same format.

Note that the data being loaded is appended to the database table. As part of the scheduler run the load table is truncated if the property for truncation is set. In this way multiple files can be loaded into the database table.



TIP: If this script is to be executed outside the control of the QAD Data Warehouse Designer scheduler then a truncate statement may need to be performed on the database load table. This would normally be placed before the 'for loop' and for Oracle would look something like the following:

```

echo truncate table load_budget_txt; >/tmp/wsl2.sql
echo commit; >>/tmp/wsl2.sql
echo exit >>/tmp/wsl2.sql
sqlplus %USER%/%PWD%@%DATABASE% @/tmp/wsl2.sql > %FILELO2 2>&1

```

Note that the first echo has a single output '>' whereas the subsequent lines have two '>>'. The first output command creates or re-creates the file and the subsequent lines append to it. We put the output of the command to the null device as we do not want data in the output stream that does not match our syntax.

This next section handles the return status from the load. It returns the appropriate status and messages to the scheduler.

```

if %ERRLEV% GTR 3 goto LABEL_BADRESULT
if %ERRLEV% LSS 0 goto LABEL_BADRESULT
if %ERRLEV% EQU 0 goto LABEL_OKAY
if %ERRLEV% EQU 1 goto LABEL_WARNING
if %ERRLEV% EQU 2 goto LABEL_ERROR
if %ERRLEV% EQU 3 goto LABEL_FATAL
:LABEL_BADRESULT
echo -3
echo SQL*Loader execution encountered an unexpected fatal error
type %FILELOG% >&2
exit
:LABEL_ERROR
echo -2
echo SQL*Loader execution exited with EX_FAIL, see error trail
type %FILELOG% >&2
exit
:LABEL_FATAL
echo -3
echo SQL*Loader execution encountered a fatal error
type %FILELOG% >&2
exit
:LABEL_WARNING
SET /A RESULT_CODE=-1
SET RESULT_MSG=WARNING: Not all rows loaded. See error trail
type %FILELOG% >>&2
:LABEL_OKAY
type %FILELOG% >>&2
REM

```

This final section is as follows:

```

REM *****
REM ***** R E N A M E *****
REM *****
:LABEL_RENAME
REM
REM rename the file
move %FILE_NAME% D:\old_data
echo %FILE_NAME% moved to D:\old_data >> %FILEAUD%
REM rename the trigger file
move %TRIG_FILE% D:\old_data
echo %TRIG_FILE% moved to D:\old_data >> %FILEAUD%
REM
REM *****
REM ***** N E X T   F I L E *****
REM *****
REM If multiple files are being processed via a wildcard
REM uncomment the goto LABEL_LOAD statement
REM WARNING: Do not loop back unless the file name contains a wildcard
REM WARNING: You must rename the file that has been loaded if
REM           looping back otherwise the script will loop for
REM           ever loading the same file.
:LABEL_NEXTFILE
REM goto LABEL_LOAD
REM *****
REM ***** E X I T *****
REM *****
:LABEL_EXIT
echo %RESULT_CODE%
echo %RESULT_MSG%
type %FILEAUD%
exit

```

The first block of code renames the file and also the trigger file if appropriate. This code is only generated if the rename fields in the file attributes are populated.

The goto label_load statement 9 lines from the end can be used if all the files in a wild card file load are required. Simply uncomment this goto statement and the script will load each file in the wild card.

20.9.4 Script Generation (Windows/DB2)

A sample Windows script for DB2 is as follows. The key components of the script are described below:

```
@echo off
setlocal enabledelayedexpansion
setlocal enableextensions
REM *****
REM ***** Load of c:\temp\forecast.txt into load_forecast
REM *****

REM *****
REM ***** NOTE: The following environment variables will be set
REM ***** WSL_LOAD_TABLE = the load table name
REM ***** WSL_LOAD_SCHEMA = the load table schema
REM ***** WSL_SEQUENCE = a unique sequence number for the scheduler
REM ***** WSL_WORKDIR = the work directory defined in the connection
REM ***** WSL_SERVER = the server defined in the connection
REM ***** WSL_DATABASE = the database defined in the connection
REM ***** WSL_USER = the dss user defined in the connection
REM ***** WSL_PWD = the dss password defined in the connection
REM ***** WSL_PARAMnnn = Any parameters that start with the load
REM ***** table name. For example: A table called load_abc has a
REM ***** parameter called load_abc_server defined. In this case
REM ***** a variable called WSL_PARAM_SERVER will be created
REM *****
REM ***** If a wild card is used in the file name then %FILE_NAME%
REM ***** in the control file must be enclosed in single quotes,
REM ***** otherwise it must not be enclosed in quotes.

SET LOAD_FILE="c:\temp\forecast.txt"
SET TRIG_FILE="c:\temp\forecast.trg"

if defined WSL_LOAD_TABLE (SET LOAD_TABLE=%WSL_LOAD_TABLE%) else SET LOAD_TABLE=load_forecast
if defined WSL_LOAD_SCHEMA (SET LOAD_SCHEMA=%WSL_LOAD_SCHEMA%) else SET LOAD_SCHEMA=RED
if defined WSL_SERVER (SET SERVER=%WSL_SERVER%) else SET SERVER=
if defined WSL_DATABASE (SET DATABASE=%WSL_DATABASE%) else SET DATABASE=RED
if defined WSL_METABASE (SET METABASE=%WSL_METABASE%) else SET METABASE=RED
if defined WSL_USER (SET USER=%WSL_USER%) else SET USER=
if defined WSL_USER (SET PWD=%WSL_PWD%) else SET PWD=
if defined WSL_WORKDIR (SET WORKDIR=%WSL_WORKDIR%) else goto LABEL_FILE_DEFAULT
if defined WSL_SEQUENCE (SET SEQUENCE=%WSL_SEQUENCE%) else goto LABEL_FILE_DEFAULT
SET FILECTL=%WORKDIR%\wsl%SEQUENCE%.ctl
SET FILELOG=%WORKDIR%\wsl%SEQUENCE%.log
SET FILEAUD=%WORKDIR%\wsl%SEQUENCE%.aud
goto LABEL_WAIT
:LABEL_FILE_DEFAULT
SET FILECTL=c:\temp\wsl74.ctl
SET FILELOG=c:\temp\wsl74.log
SET FILEAUD=c:\temp\wsl74.aud
:LABEL_WAIT
```

The script makes use of a number of environmental variables. These variables are acquired from both the table and connection properties. These variables are established in the environment by either QAD Data Warehouse Designer or the scheduler. If the script is to be executed outside of QAD Data Warehouse Designer or scheduler control then these variables will need to be assigned.

The first section of the script defines the variables. The second section provides a timed wait for the load file to arrive. By default the WAITSECS variable is set to zero, so that no wait occurs. This can be set to a number of seconds that the script is to wait for the file to arrive.

```

REM *****
REM ***** W A I T       T I M E R *****
REM *****
REM If a wait time specified then loop looking for the file
REM or trigger file to arrive until the wait time expires.
SET /A WAITSECS=0
:LABEL_WAITLOOP
if %WAITSECS% LEQ 0 goto LABEL_FILECHECK
REM see if the file exists and if so skip the wait check
if exist %TRIG_FILE% goto LABEL_FILECHECK
REM Call WslSleep to wait for 30 seconds. It will return remaining seconds
"C:\Program Files\WhereScape\WslSleep" %WAITSECS% 30
SET /A WAITSECS=%errorlevel%
goto LABEL_WAITLOOP
REM
REM Finished our wait loop. See if we have the file
REM *****
REM ***** F I L E       C H E C K *****
REM *****
:LABEL_FILECHECK
if exist %TRIG_FILE% goto LABEL_TRIGGER
echo -1
echo File %TRIG_FILE% was not found.
exit

```

Once the wait has completed, either through a time expiry or through the location of the file, we check that the file is present, and if not found report back a warning. This warning can be changed to an error by changing the first echo statement to "-2". See the syntax section for more information.

When a trigger file is specified the script looks for a trigger file, and will exit with the specified status if the file is not found. The following code is included if a trigger file is present.

```

REM *****
REM ***** T R I G G E R *****
REM *****
:LABEL_TRIGGER
REM
REM First clear any existing parameters
REM
REM
SET SQL=UPDATE %METABASE%.dss_parameter SET dss_parameter_value = NULL WHERE dss_parameter_name like 'FORECAST_%';
echo %SQL% > %FILECTL%
REM
REM Get the first four and all remaining parameters
REM
for /F "tokens=1,2,3,4* delims=," %A in ('type %TRIG_FILE%') do SET A=%a&SET B=%b&SET C=%c&SET D=%d&SET E=%e
REM
REM For each parameter write it to the parameter table
REM
if defined A SET SQL=CALL %METABASE%.WsParameterWrite ('FORECAST_0','%A%','script load');
if defined A echo %SQL% >> %FILECTL%
if defined B SET SQL=CALL %METABASE%.WsParameterWrite ('FORECAST_1','%B%','script load');
if defined B echo %SQL% >> %FILECTL%
if defined C SET SQL=CALL %METABASE%.WsParameterWrite ('FORECAST_2','%C%','script load');
if defined C echo %SQL% >> %FILECTL%
if defined D SET SQL=CALL %METABASE%.WsParameterWrite ('FORECAST_3','%D%','script load');
if defined D echo %SQL% >> %FILECTL%
if defined E SET SQL=CALL %METABASE%.WsParameterWrite ('FORECAST_4','%E%','script load');
if defined E echo %SQL% >> %FILECTL%
rem
db2batch -d %DATABASE% -f %FILECTL% -r %FILELOG% -time off -o p 0
SET ERRLEV=%errorlevel%

```


Such a file (trigger) contains control information about the main file to be loaded and arrives after the main file to indicate that the main file transfer has completed and that it is OK to load.

This section loads the contents of the trigger file into the Parameters table, so that the table can be validated. See the section on Post Load procedures for an explanation on how trigger files are used to validate a load file.

```

REM *****
REM ***** L O A D   T H E   D A T A *****
REM *****
echo load of %LOAD_TABLE% > %FILEAUD%
SET /A RESULT_CODE=1
SET RESULT_MSG=Load Completed
:LABEL_LOAD
SET FILE_NAME=NO MORE FILES
for %%A in (%LOAD_FILE%) do if "!FILE_NAME!"=="NO_MORE_FILES" SET FILE_NAME=%%A
if "!FILE_NAME!"=="NO_MORE_FILES" goto LABEL_EXIT
echo loading %FILE_NAME% >> %FILEAUD%
echo CALL SYSPROC.ADMIN_CMD('LOAD FROM %FILE_NAME% OF DEL > %FILECTL%
echo MODIFIED BY COLDEL, timestampformat="DD-MMM-YYYY" >> %FILECTL%
echo METHOD P (1, 2, 3, 4, 5) >> %FILECTL%
echo MESSAGES ON SERVER INSERT INTO %LOAD_SCHEMA%.%LOAD_TABLE%( >> %FILECTL%
echo product_code >> %FILECTL%
echo , customer_code >> %FILECTL%
echo , forecast_quantity >> %FILECTL%
echo , forecast_sales_value >> %FILECTL%
echo , forecast_date >> %FILECTL%
echo ) >> %FILECTL%
echo NONRECOVERABLE'); >> %FILECTL%
rem
rem In the following sql statement no username/password is required for a trusted connection
rem or -axxx/yyy where xxx is the username and ppp the password. The slash is required
rem
db2batch -d %DATABASE% -f %FILECTL% -r %FILELOG% -time off -o p 0
SET ERRLEV=%errorlevel%

```

This section calls the DB2batch command to load the file. It makes use of a temporary file to build as a control file which includes a call to the LOAD statement. It then runs the temporary files using DB2batch to load the data. Note that the load is actually in a for loop. Wild card file names can be used to load multiple files. Each file to be loaded must have the same format.

Note that the data being loaded is appended to the database table. As part of the scheduler run the load table is truncated if the property for truncation is set. In this way multiple files can be loaded into the database table.

This next section handles the return status from the load. It returns the appropriate status and messages to the scheduler.

```

SET ERRLEV=%errorlevel%
IF %errorlevel% EQU 0 GOTO LABEL_OKAY
:LABEL_FAIL
echo -2
echo Load failed with return status %ERRLEV% See error log for details
type %FILEAUD% >&2
type %FILELOG% >&2
exit
:LABEL_OKAY
type %FILELOG% >> %FILEAUD%

```

This final section is as follows:

```

REM *****
REM ***** R E N A M E *****
REM *****
:LABEL_RENAME
rem
SET YYYY=%DATE:~-4%
SET MM=%DATE:~-10,2%
SET DD=%DATE:~-7,2%
rem rename the file
move %FILE_NAME% "c:\temp\loadedforecast_%YYYY%MM%DD%.txt" >> %FILEAUD%
rem
SET ERRLEV=%errorlevel%
rem
IF %ERRLEV% EQU 0 GOTO LABEL_MOVE3
echo -3
echo %FILE_NAME% NOT MOVED >> %FILEAUD%
exit
GOTO LABEL_AFTER_MOVE3
:LABEL_MOVE3
rem
echo %FILE_NAME% moved to c:\temp\loadedforecast_%YYYY%MM%DD%.txt >> %FILEAUD%
:LABEL_AFTER_MOVE3
rem
rem rename the trigger file
move %TRIG_FILE% "c:\temp\loadedforecast_%YYYY%MM%DD%.trg" >> %FILEAUD%
rem
SET ERRLEV=%errorlevel%
IF %ERRLEV% EQU 0 GOTO LABEL_MOVE4
echo -3
rem
echo %TRIG_FILE% NOT MOVED >> %FILEAUD%
exit
GOTO LABEL_AFTER_MOVE4
:LABEL_MOVE4
rem
echo %TRIG_FILE% moved to c:\temp\loadedforecast_%YYYY%MM%DD%.trg >> %FILEAUD%
:LABEL_AFTER_MOVE4
REM
REM *****
REM ***** N E X T   F I L E *****
REM *****
REM If multiple files are being processed via a wildcard
REM uncomment the goto LABEL_LOAD statement
REM WARNING: Do not loop back unless the file name contains a wildcard
REM WARNING: You must rename the file that has been loaded if
REM           looping back otherwise the script will loop for
REM           ever loading the same file.
:LABEL_NEXTFILE
REM goto LABEL_LOAD
REM *****
REM ***** E X I T *****
REM *****
:LABEL_EXIT
echo %RESULT_CODE%
echo %RESULT_MSG%
type %FILEAUD%
exit

```

The first block of code renames the file and also the trigger file if appropriate. This code is only generated if the rename fields in the file attributes are populated.

The goto label_load statement 9 lines from the end can be used if all the files in a wild card file load are required. Simply uncomment this goto statement and the script will load each file in the wild card.

20.10 Script Editing

QAD Data Warehouse Designer includes a script editor which allows the maintenance of any host scripts within the data warehouse. The editor is invoked by double clicking on a script name in the left hand pane or by selecting the 'Edit the script' pop-up menu option when a right mouse menu is activated on the script name.

Indenting code

The tab character inserts four spaces into the text. A shift/tab removes four spaces.

Cut, Copy, Paste and Delete

The normal Windows cut, copy, paste and delete functions are available either through the toolbar or via the right mouse popup menu.

Indenting a block of text

A selected block of text can be indented by four spaces by depressing the tab character. Each tab will indent by a further four spaces. A shift/tab will remove four spaces from the front of each line in the selected block.

Viewing other scripts

During the editing process it is possible to pop up a window containing other scripts. This window allows cut and paste operations. In such a way it can be used as a work area or as a source of code. Select the **Tools/view script or template** menu option to bring the viewer window up. A dialog will appear.

A number of drop down list boxes can be chosen from. Once an item is selected the viewer loads the code and moves to the right hand side of the edit window. The various options are:

- **Version:** A previously saved version of this script. The description and time are shown.
- **Script:** Some other script stored within the QAD metadata.
- **Template:** A template script as defined in the QAD metadata.

Once an item is chosen the viewer appears on the right hand side of the edit window. The viewer or the main edit window can receive the focus by clicking the mouse within the appropriate window. Code can be cut from one window and pasted into the other. Any changes made in the viewer window cannot be saved.

20.11 Script Testing

When a host script is scheduled, it is run in the scheduler environment. Therefore a Unix scheduler must be available to run a Unix script and only a Windows scheduler can run a Windows script.

It is possible to test a script interactively. For a Windows script this is achieved by running the script on the current PC. For a Unix script QAD Data Warehouse Designer will attempt to start a telnet window to the Unix host (as defined in the default connection for the script) and run the script within this telnet window.

A script is invoked via the **Execute/Execute the script** menu option. The output from the script is shown in a pop-up dialog box.

Unix Scripts

Unix scripts have the additional execution option being the menu option **Execute/ Execute and retain**. This option will create a Telnet window to the Unix host, execute the script, display the results and leave the Telnet window up. Additional commands or a review of what occurred can then be undertaken directly in the Telnet window. When completed the Telnet window should be closed to return to the script editor.

Note: A connection must be correctly set-up to support Unix script testing. See the installation manual and the section on Unix connections.

20.12 Script Syntax

There are a number of conventions that must be followed if a host script is to be used by the QAD scheduler. These conventions are:

- 1** The first line of data in 'standard out' must contain the resultant status of the script. Valid values are '1' to indicate success, '-1' to indicate a warning condition occurred but the result is considered a success, '-2' to indicate a handled error occurred and subsequent dependent tasks should be held, -3 to indicate an unhandled Failure and that subsequent dependent tasks should be held.
- 2** The second line of data in 'standard out' must contain a resultant message of no more than 256 characters.
- 3** Any subsequent lines in 'standard out' are considered informational and are recorded in the audit trail. The normal practice is to place a minimum of information in the audit trail. All bulk information should be output to 'standard error'.
- 4** Any data output to 'standard error' will be written to the error/detail log. Both the audit log and detail log can be viewed from the QAD Data Warehouse Designer tool under the scheduler window.

Windows Example for Oracle:

In the following example the first line '@echo off' prevents unwanted information from being reported to standard out. A Sql*loader script file is built up (echo statements). The sqlldr command is then executed with the 'silent-header,feedback' option once again to prevent unwanted output.

```
@echo off
echo load data >c:\temp\wsl1.ctl
echo infile 'C:\Temp\budget.txt' >>c:\temp\wsl1.ctl
echo badfile 'c:\temp\wsl1.bad' >>c:\temp\wsl1.ctl
echo into table load_budget_txt >>c:\temp\wsl1.ctl
echo fields terminated by "," >>c:\temp\wsl1.ctl
echo optionally enclosed by '^"' >>c:\temp\wsl1.ctl
echo trailing nullcols >>c:\temp\wsl1.ctl
echo ( >>c:\temp\wsl1.ctl
echo   product_code,>>c:\temp\wsl1.ctl
echo   customer_code,>>c:\temp\wsl1.ctl
echo   budget_quantity,>>c:\temp\wsl1.ctl
echo   budget_sales_value,>>c:\temp\wsl1.ctl
echo   budget_date date 'dd-mon-yyyy'>>c:\temp\wsl1.ctl
echo ) >>c:\temp\wsl1.ctl
sqlldr userid=dssadm/wsl@ORCL control=c:\temp\wsl1.ctl skip=1
silent=header,feedback log=c:\temp\wsl1.log
goto answer%errorlevel%
:answer0
echo 1
echo Load completed successfully
type c:\temp\wsl1.log >&2
exit
:answer2
echo -1
echo Not all rows loaded.  See error trail
type c:\temp\wsl1.log >&2
exit
:answer1
echo -2
echo SQL*Loader execution exited with EX_FAIL, see error trail
type c:\temp\wsl1.log >&2
exit
:answer3
echo -3
echo SQL*Loader execution encountered a fatal error
type c:\temp\wsl1.log >&2
exit
```

20.13 Templates

Templates serve two main purposes. Firstly they provide a structure for the building of procedures and scripts. Secondly they provide example code to illustrate how to handle a specific application problem.

A simple template editor is provided to allow the maintenance of templates. Templates are normally either procedure or host script examples. The normal practice is to develop the template within either the procedure or script editor and then paste it into the template for storage.

Procedure Structure Templates

These templates are normally only defined at initial setup, and are in fact not visible or accessible in this version of QAD Data Warehouse Designer.

Example Templates

QAD Data Warehouse Designer ships with a number of example templates to illustrate such situations as set based updates, pseudo dimension key generation, and job dependencies. A special template called ToDo is also shipped. This ToDo template provides a To Do list that can be accessed directly from the main browser window via the appropriate icon. Example templates are also available at the QAD web site <http://www.qad.com>

Submitting Example Templates

QAD welcomes the supply of new templates. If you develop custom code that you believe may be of value to other QAD Data Warehouse Designer users, please feel free to email a copy to <http://support.qad.com> Author identities will be acknowledged.

CHAPTER 21

21. Scheduler

The scheduler is accessible by clicking the scheduler button  on the toolbar. It is also available as a stand alone utility. In this way operators can be given access to the scheduler without gaining full access to the data warehouse.

The scheduler runs on either a Unix host or under Windows (as a system service). It processes pre-defined jobs, recording the success, failure or otherwise of the job.

Audit trail

Specific information relating to the tasks in the job are recorded to the audit trail. Generally only summary information is written to this audit trail. The contents of the audit trail are maintained even after a job is deleted.

Error trail

Detail or error information is written to the error trail. The contents of the error trail are deleted when the job is deleted.

Administration Views

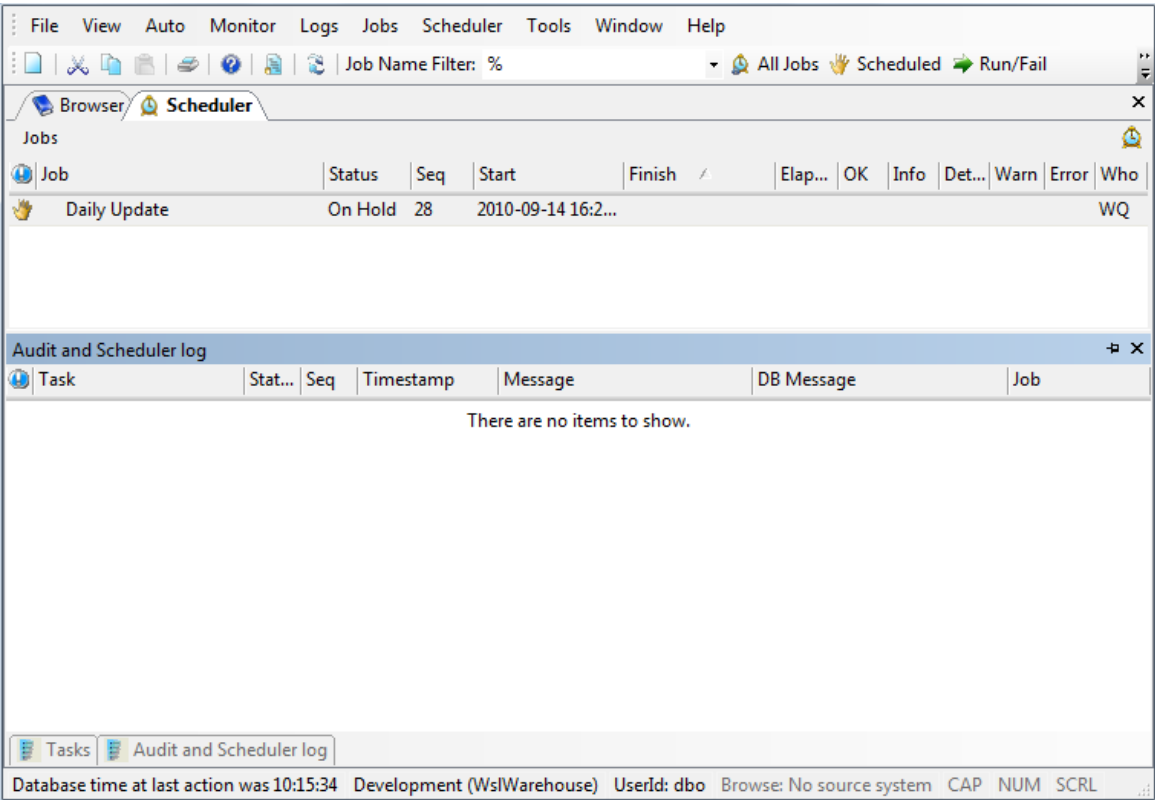
It is possible to view the status of a job without using the QAD Data Warehouse Designer product. Three views are provided to assist in this undertaking. They are ws_admin_v_audit, ws_admin_v_error and ws_admin_v_sched. Queries can be issued using these views to see the results or status of a job.

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21.1 Scheduler Options

An example of the scheduler screen is shown below.



Toolbar/Jobs menu

Quick access to some job categories are in the toolbar. The complete options are listed under the Jobs menu and while most are self-explanatory they are described below:

Object	Description
All jobs	All jobs are listed in the middle pane
Scheduled jobs	In the middle pane lists those jobs that are waiting to run or are on hold.
Last 24 hours	Lists the jobs that have run or started to run during the last 24 hours.
Prior 24 hours	Lists the jobs that ran during the previous 24 hours.
This weeks Jobs	Lists the jobs that have run or are scheduled to run during the current week
Last weeks Jobs	Lists the jobs that ran during the last week.
My Jobs	Lists the jobs you have scheduled or have run.

Object	Description
Job Name Filter	Lists the jobs whose names match the filter supplied. This filter only works as an appended filter to the main filter selected under Jobs . ie first enter a filter for Job Name Filter or select a filter from the drop down list; and then choose your main filter under Jobs - eg All Jobs, Scheduled Jobs etc.
Recent audit trail Today's audit trail	Provides listings from the audit trail. The information is useful when a job fails to start or enters some other unknown state. Generally the audit trail entries for a job can be found by drilling down into the job itself.
Scheduler status	Lists all schedulers and displays their current status. The status is updated every few minutes, and a right menu option allows the polling of a scheduler for status, and the termination of a scheduler.

Top pane

The top pane shows the details of the jobs. Information covers:

Column	Description
Job name	The name given to the job when created.
Status	The status of the job. Refer to the following section for the various status values.
Sequence	This is a unique number assigned to each job iteration and job. If you enter a new job it will acquire a new sequence number. In normal daily processing when no new jobs have been created sequence numbers will be sequential.
Start and Finish times	As the names suggest, the start and finish dates and times for the job.
Elapsed time	The time that elapses from start to finish of a job.
Ok	These are success messages written to the audit trail.
Inf	Informational messages written to the audit trail about the the running of the job.
Det	Lines written to the detail or error logs
Warn	The number of warnings written to the audit trail.
Err	The number of error messages written to the audit trail.
Who	The initials of the person who scheduled the job.

Additional fields can be added via the Tools -> Select Job Report Fields option

Middle pane

The middle pane shows the tasks related to a selected job. Task information available includes:

Column	Description
Task	The object name
Action	The action to be done to the object
Status	Status of the task
Sequence	This is a unique number assigned to each job iteration and job. If you enter a new job it will acquire a new sequence number. In normal daily processing when no new jobs have been created sequence numbers will be sequential.
Start and Finish times	As the names suggest, the start and finish dates and times for the task
Elapsed time	The time that elapses from start to finish of a task.
Info	Informational messages written to the audit trail about the the running of the job.
Detail	Lines written to the detail or error logs
Warning	The number of warnings written to the audit trail.
Result	Result of the task

Additional fields can be added via the Tools -> Select Task Report Fields option

Bottom pane

The bottom pane shows the audit trail of a selected task/job. Audit trail information includes:

Column	Description
Task	The object name
Status	The status of the message
Sequence	This is a unique number assigned to each job iteration and job. If you enter a new job it will acquire a new sequence number. In normal daily processing when no new jobs have been created sequence numbers will be sequential.
Timestamp	Time of message output
Message	The message
DB Message	Message from database
Job	Job relating to this message

21.2 Scheduler States

A scheduled job can have the following states:

- Hold
- Waiting
- Blocked
- Pending
- Running
- Failed
- Failed - Aborted
- Completed

State	Description
Hold	The job is on hold. It can be edited and its state changed in order to release the job.
Waiting	The job is waiting to start, or waiting for its scheduled time to arrive, or waiting for a scheduler to become available.
Blocked	The job is blocked as a previous instance of the same job is still running. When the currently running instance completes this job will start.
Pending	This is the first stage of a running job. The scheduler has identified the job as ready to start and has allocated a thread, or sub task to process the job. A job is in this state until the thread or sub task begins processing. If a job stays in this state then the scheduler thread has failed for some reason. The logs can be checked on either the Unix or Windows server on which the scheduler is running.
Running	The job is currently running. Double click on the job name in the right hand pane to drill down into the specific tasks.
Failed	A failed job is one that had a problem. It can be restarted from the point of failure and is considered to be running unless subsequently aborted.
Failed - Aborted	The job has been aborted after having failed. Once in this state a job cannot be restarted. The job exists then only as a log of what occurred and essentially is now not regarded as a job.
Completed	The job has successfully completed, possibly with warnings. Once in this state a job cannot be restarted. The job exists then only as a log of what occurred and essentially is now not regarded as a job.

Note: When a job fails and drilling down does not show any errors against the tasks, right click the job and "View Audit Trail". The job may have failed because of an error in the JOB level.

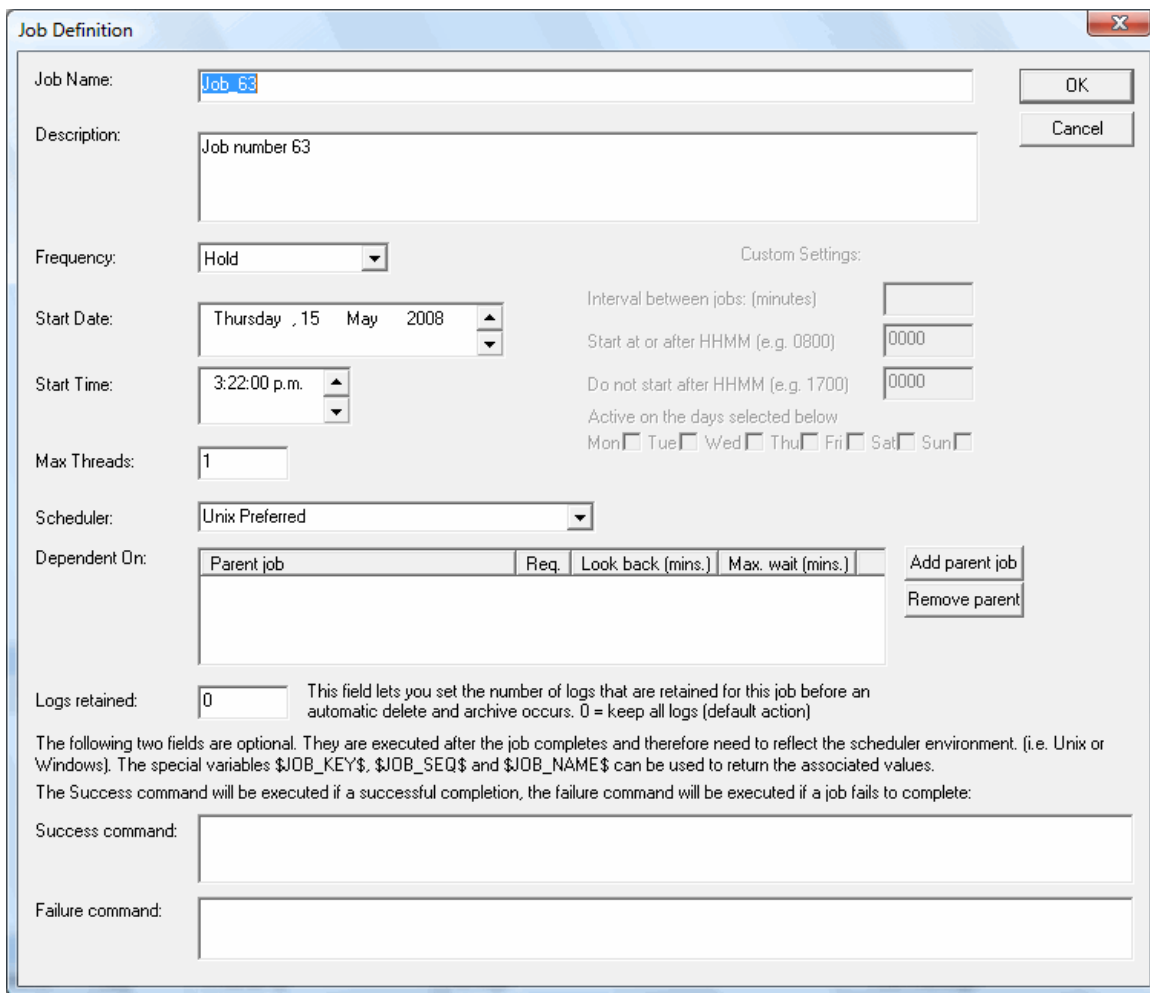
A scheduled **task** can have the following states:

- Waiting or Blank
- Held
- Running
- Failed
- Completed
- Error Completion
- Bad Return Status

State	Description
Held	The task has been held due to a prior dependency failure. The problem must be rectified and the job restarted.
Waiting (Blank)	Tasks that are waiting to run either due to a shortage of threads, or prior dependencies normally have a blank status.
Running	The task is currently running.
Failed	The task has had a fatal error. Any dependencies on this task will be held. Double click on the task to see more detail error information or review the audit and error/detail log for the job.
Completed	The task has completed successfully.
Error Completion	The task has completed with a handled Error. Any dependent tasks will be held, and the job must be restarted when the problem is rectified.
Bad Return Status	The task has returned an unknown status. This normally occurs with script files that produce unexpected information. The rule for scripts is that the first line returned must be a status of either 1, -1, -2, or -3. The second line is a message detailing the result. If the first line does not contain one of these four values then this status will be returned and dependent tasks held. Run the script manually to view the output or check the logs.

21.3 Scheduling a Job

Firstly access the scheduler by clicking the scheduler button  scheduler on the toolbar. Select File | New Job from the menu strip at the top of the screen, or click the New Job button on the toolbar. The following screen displays:



The **Job Definition** dialog box is used to configure a new job. It contains the following fields and controls:

- Job Name:** Text field containing "Job 63".
- Description:** Text area containing "Job number 63".
- Frequency:** Dropdown menu set to "Hold".
- Start Date:** Date picker showing "Thursday, 15 May 2008".
- Start Time:** Time picker showing "3:22:00 p.m.".
 - Custom Settings:**
 - Interval between jobs: (minutes) []
 - Start at or after HHMM (e.g. 0800) [0000]
 - Do not start after HHMM (e.g. 1700) [0000]
 - Active on the days selected below:
 - Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun ☐
- Max Threads:** Text field containing "1".
- Scheduler:** Dropdown menu set to "Unix Preferred".
- Dependent On:**
 - Table with columns: Parent job, Req., Look back (mins.), Max. wait (mins.).
 - Buttons: Add parent job, Remove parent.
- Logs retained:** Text field containing "0".

This field lets you set the number of logs that are retained for this job before an automatic delete and archive occurs. 0 = keep all logs (default action)
- Optional Fields:**

The following two fields are optional. They are executed after the job completes and therefore need to reflect the scheduler environment. (i.e. Unix or Windows). The special variables \$JOB_KEY\$, \$JOB_SEQ\$ and \$JOB_NAME\$ can be used to return the associated values.

The Success command will be executed if a successful completion, the failure command will be executed if a job fails to complete:

 - Success command:** []
 - Failure command:** []

Complete the fields and click the OK button. The main fields are described in the following table:

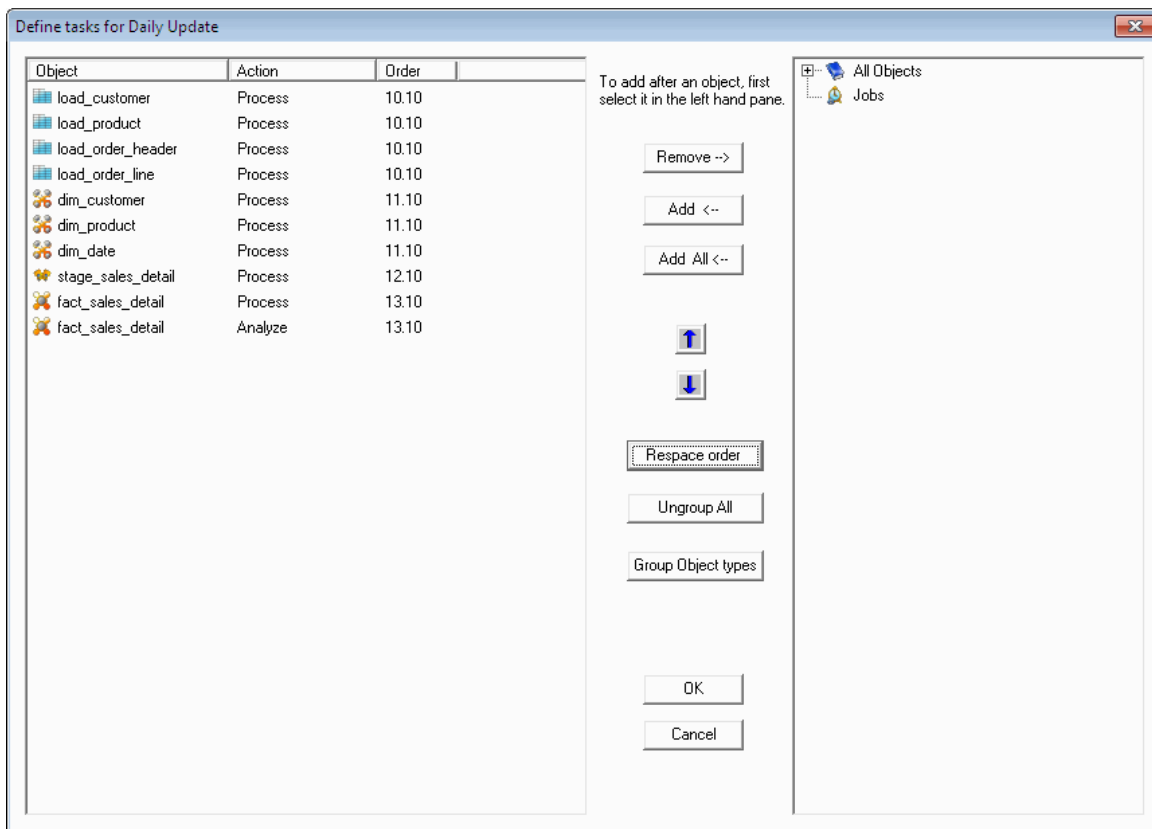
Field	Description
Job Name	<p>The Scheduler defaults to the next job number in the sequence. You can alter this to any alphanumeric.</p> <p>Note: Only alphanumerics, spaces and the underscore are supported in the name.</p> <p>WARNING: on some Unix systems long job names can cause jobs to be cancelled (see Knowledge Base article 67), so where possible keep the name short.</p>
Description	A description of the job
Frequency	<p>When the job runs. The options available in the drop down list box are:</p> <ul style="list-style-type: none"> ▪ Once Only - job is deleted on completion ▪ Once and Hold - runs and puts another copy of the job on hold ▪ Hold - puts the job on hold for manual release ▪ Daily - runs the job daily ▪ Custom - enables custom definition ▪ Weekly - runs the job weekly ▪ Monthly - runs the job monthly ▪ Annually - runs the job annually
Start Date and Start Time	<ul style="list-style-type: none"> ▪ The date and time for the job to start.
Max Threads	The maximum number of threads allocated to run the job, e.g, if some tasks can run in parallel then if more than one thread is allocated then they will run in parallel.
Scheduler	<p>Certain types of job will only run in a specific environment. For example ODBC based loads can only be handled by the Windows' scheduler. It is possible to have multiple schedulers running. Select the desired scheduler from this drop down. The valid options are:</p> <p>Unix Preferred, Unix Only, Windows Preferred, Windows Only, or the name of a specific scheduler can be entered (e.g. WIN0002)</p>
Dependent On	<p>A job can be dependent on the successful completion of one or more other jobs. Click the 'Add Parent Job' button to select a job that this job will be dependent on. The maximum time to look back for parent job completion field prevents older iterations of the parent job as being identified as a completion. The maximum time to wait specifies how long to await a successful completion of the parent job. The action if that wait expires can also be set.</p>
Logs Retained	Specify the number of logs to retain for the job. By default all logs are retained. This field can be used to reduce the build up of scheduler logs by specifying a number of logs to retain.

Field	Description
OK command and Failure command	These are either Unix or Windows shell commands depending on which scheduler is used. They are executed if the condition is met. Typically, these commands would mail or page on success or failure.

The following fields are available if a frequency of **Custom** is chosen:

Field	Description
Interval between jobs (Minutes)	Specify the number of minutes between iterations of the job. For example to run a job every 30 minutes set this value to 30. If a job is to run only once but on selected days set this value to 1440 (daily)
Start at or after HHMM	The time that the job may run from. To run anytime set to 0000.
Do not start after HHMM	If multiple iterations are being done then this is the time after which a new iteration will not be started. For example if a job is running every 10 minutes it will continue until this time is reached. To run till the end of day set to 2400.
Active on the days	Select each day of the week that the custom job is to be active on.

A job has tasks, and those tasks can have specific actions that are to be performed on an object. The Define Tasks window is shown below:



The screen has two main areas. The left pane shows the tasks to be run for this job and the right pane lists all the objects.

To add a task:

Double click on an object to add it to the left pane. Normally objects such as load or fact tables are scheduled rather than procedures.

The default action for **load tables** is *process*. This means that when the task is actioned it will drop any indexes that are due to be dropped, or have **pre-drop** set, then load the table and perform any post-load procedures or transformations and then re-create any dropped indexes.

The default action for all other tables is the same as above, except it will execute the *update* procedure rather than loading the table.

Change the action on an object

You can change the action on an object by right clicking the object in the left pane. The menu options are shown below:

Drop
Create
Truncate
Initial Build
Drop All Indexes
Pre Drop Indexes
Load
Custom
Update
Execute
Process
Process and Statistics
Build Indexes
Build All Indexes
Stats
Quick Stats
Analyze
Quick Analyze
Group selected tasks
Ungroup selected tasks
Sync with item above
Sync with item below
Decrease the order
Increase the order

The task menu options can be used to:

- 1
- Assign an action to a task
- 2
- Change task dependencies

The following task actions are available:

Action	Description
Drop	Drop table, view or index.
Create	Create table, view or index.

Truncate	Delete all rows from the table.
Initial Build	Drop All Indexes then Custom then Build All Indexes.
Drop All Indexes	Drop all indexes on the table.
Pre Drop Indexes	Drop all indexes on the table marked as "Pre Drop".
Load	Load the table (Load tables only).
Custom	Run the custom procedure on the table.
Update	Run the update procedure on the table.
Execute	Execute the procedure or host scripts.
Process	Pre Drop Indexes then Update and then Build Indexes.
Process and Statistics	Process then Default Stats as defined on Table Properties / Statistics / Process and statistics method (DB2 only).
Build Indexes	Build the indexes on the table marked as "Pre Drop".
Build All Indexes	Build all indexes on the table.
DB2: Analyze	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> Table Properties / Statistics / Analyze <p>else for tables performs:</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>tablename</code> WITH DISTRIBUTION AND DETAILED INDEXES ALL <p>otherwise (for indexes):</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>indname</code> FOR INDEXES
DB2: Quick Analyze	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> Table Properties / Statistics / Quick Analyze <p>else for tables performs:</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>tablename</code> <p>otherwise (for indexes):</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>indname</code> FOR INDEXES
DB2: Stats	<p>Performs a custom stats if defined in:</p> <ul style="list-style-type: none"> Table Properties / Statistics / Stats <p>else for tables performs:</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>tablename</code> WITH DISTRIBUTION AND DETAILED INDEXES ALL <p>otherwise (for indexes):</p> <ul style="list-style-type: none"> RUNSTATS ON TABLE <code>indname</code> FOR INDEXES

DB2: Quick Stats	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> ▪ Table Properties / Statistics / Quick Stats <p>else for tables performs:</p> <ul style="list-style-type: none"> ▪ RUNSTATS ON TABLE tabname <p>otherwise (for indexes):</p> <ul style="list-style-type: none"> ▪ RUNSTATS ON TABLE indname FOR INDEXES
Oracle: Analyze	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> ▪ Tools-Options-Statistics-Table/Index Analyze Full <p>otherwise performs:</p> <ul style="list-style-type: none"> ▪ ANALYZE TABLE / INDEX name COMPUTE STATISTICS
Oracle: Quick Analyze	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> ▪ Tools-Options-Statistics-Table/Index Analyze Quick <p>otherwise performs:</p> <ul style="list-style-type: none"> ▪ ANALYZE TABLE / INDEX name ESTIMATE STATISTICS SAMPLE 3 PERCENT
Oracle: Stats	<p>Performs a custom stats if defined in:</p> <ul style="list-style-type: none"> ▪ Tools-Options-Statistics-Table/Index Stats Full <p>otherwise performs:</p> <ul style="list-style-type: none"> ▪ DBMS_STATS.GATHER_ TABLE / INDEX _STATS() using the ownname and tabname / indname parameters with cascade.
Oracle: Quick Stats	<p>Performs a custom analyze if defined in:</p> <ul style="list-style-type: none"> ▪ Tools-Options-Statistics-Table/Index Stats Quick <p>otherwise performs:</p> <ul style="list-style-type: none"> ▪ DBMS_STATS.GATHER_ TABLE / INDEX _STATS() using the ownname and tabname / indname parameters with cascade and estimate_percent = 3.
SQL Server: Analyze	<p>Performs:</p> <ul style="list-style-type: none"> ▪ UPDATE STATISTICS name WITH FULLSCAN
SQL Server: Quick Analyze	<p>Performs:</p> <ul style="list-style-type: none"> ▪ UPDATE STATISTICS name WITH SAMPLE 3 PERCENT
SQL Server: Stats	Same as Analyze.
SQL Server: Quick Stats	Same as Quick Analyze.

Note: Not all actions are available on all object types.

The following task dependency options are available from the menu:

Task Option	Description
Group selected tasks	Groups two or more selected tasks to have the same order value, allowing them to run in parallel if the maximum threads setting allows.
Ungroup selected tasks	Ungroups selected tasks.
Sync with item above	Changes a selected task to have the same order value as the task above it, allowing them to run in parallel if the maximum threads setting allows.
Sync with item below	Changes a selected task to have the same order value as the task below it, allowing them to run in parallel if the maximum threads setting allows.
Decrease the order	Changes a selected task to an order number one less than its current value. The task will now run immediately before it would have previously.
Increase the order	Changes a selected task to an order number one more than its current value. The task will now run immediately after it would have previously.

Order

The order column shows the order in which the tasks are to be run, e.g, 20.20 If the two numbers are the same as another task then those tasks can run in parallel. If the two numbers are different then those tasks run sequentially. This is an initial definition of dependencies. These dependencies can be altered specifically once the job has been created. (An example of dependency editing is provided in Tutorial 3).

Tasks can be moved up or down by selecting the task and clicking the Move Up  or Move Down  buttons.

Respace Order

This button will respace the order numbers. The existing dependency structure and groupings are retained. The purpose of this button is simply to allow room between tasks to fit new tasks. So for example if we have two tasks that have an order of 20.19.5 and 20.20.6 and we want to add a task between these two tasks we can click the 'Respace Order' button to open up a gap between the two tasks.

Ungroup All

This button will remove all groupings and make all tasks sequential. New groupings can be made by selecting a range of sequentially listed tasks in the left hand pane and using the right mouse menu option 'Group selected tasks'. Tasks that are grouped have the same first two numbers in the order and can execute at the same time if the job has multiple threads.

Group Object Types

This option will put all objects of the same type into groups. For example all load tables will be able to run in parallel, all dimensions etc.

Jobs within Jobs

It is possible to schedule one job from another job. There are however some limitations and rules that must be understood when doing this.

- 1** A job that is called from another job is only ever allocated one thread. All tasks within the called job will therefore run sequentially.
- 2** A job can only have one running iteration. Therefore a called job will be blocked if that job is already running independently or as part of another job.
- 3** Any job dependencies for the called job are ignored. The parent's job dependencies are the only ones that are used.
- 4** A called job essentially runs as a separate job, so that if it fails both it and the parent job will show in a failed state. Once the problem is fixed the parent job should be restarted which will restart the called job.

Upon completion of adding tasks click the OK button.

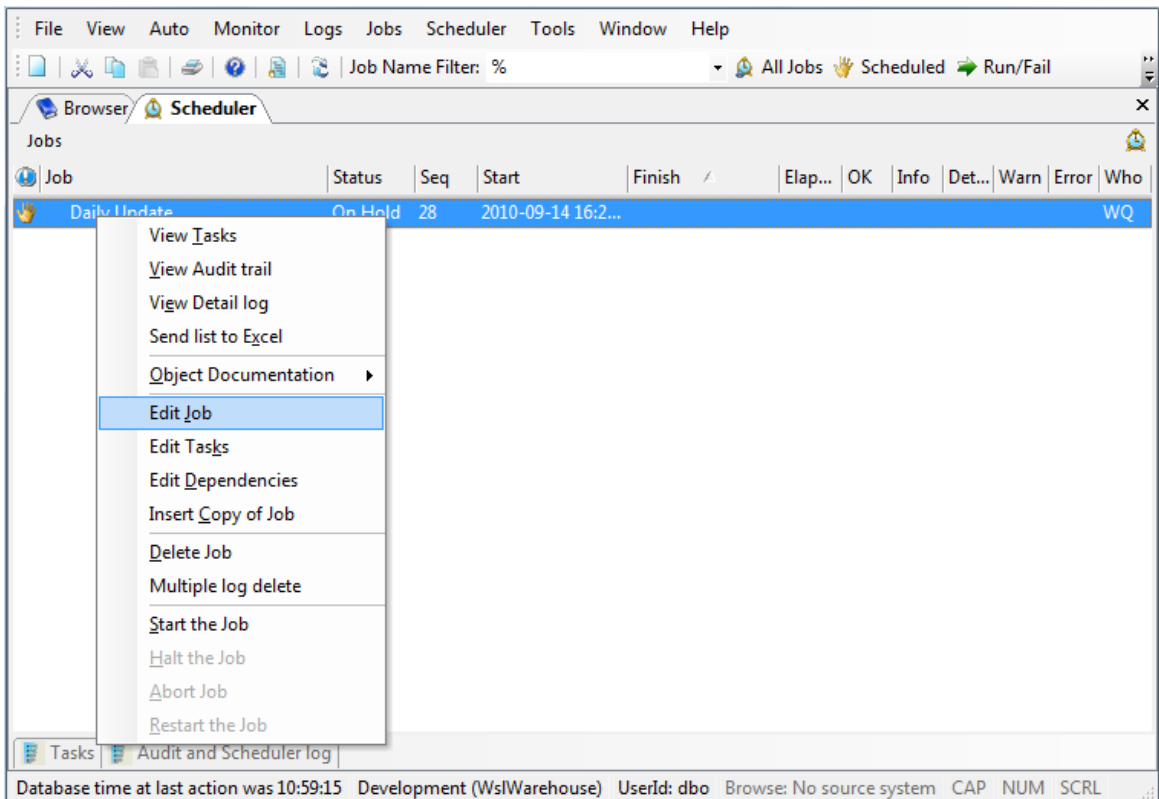
21.4 Editing Jobs

Once jobs have been created they can be edited.

Note: A job can only be edited when it is not in a running state and only if the job is a scheduled job. Completed jobs remain in the list but only logs remain.

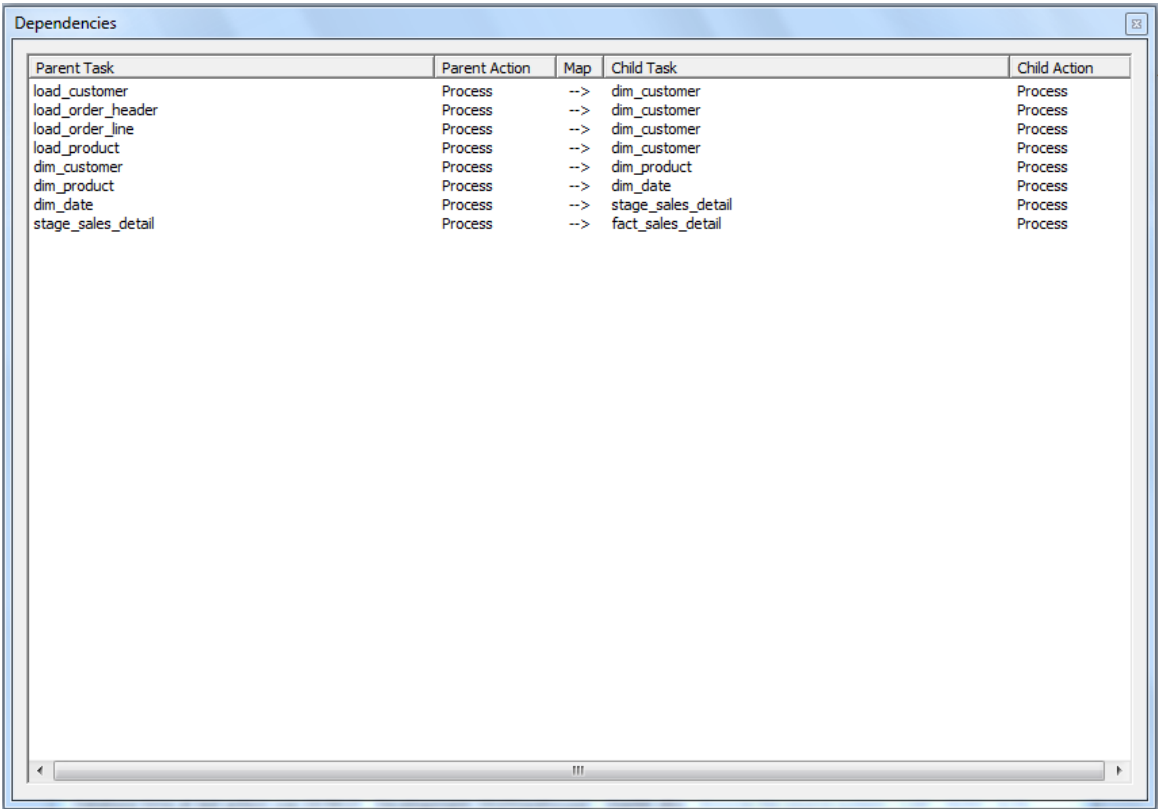
To edit a job

- 1 Select the job from the scheduler middle pane. Right click on the job to view the editing options, as shown below:



- 2 Select an option from the drop down list as shown.

When you select **Edit Dependencies** the following screen displays showing currently defined dependencies.



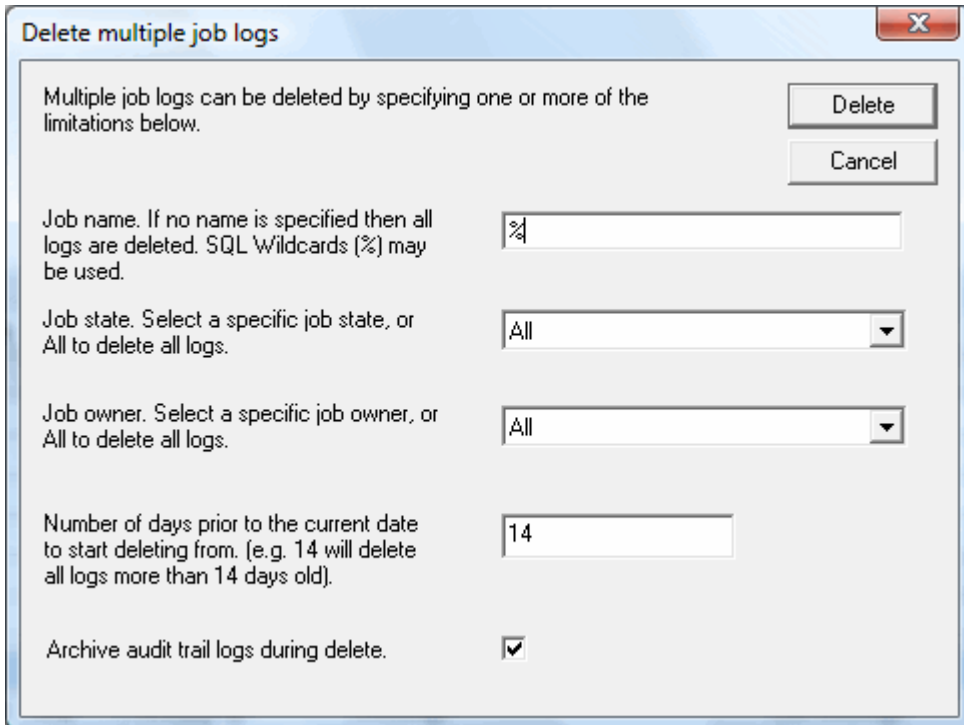
The screenshot shows a window titled "Dependencies" with a table listing task dependencies. The table has five columns: Parent Task, Parent Action, Map, Child Task, and Child Action. The data is as follows:

Parent Task	Parent Action	Map	Child Task	Child Action
load_customer	Process	-->	dim_customer	Process
load_order_header	Process	-->	dim_customer	Process
load_order_line	Process	-->	dim_customer	Process
load_product	Process	-->	dim_customer	Process
dim_customer	Process	-->	dim_product	Process
dim_product	Process	-->	dim_date	Process
dim_date	Process	-->	stage_sales_detail	Process
stage_sales_detail	Process	-->	fact_sales_detail	Process

Complex network dependencies can be built. A right mouse menu allows dependencies to be added, deleted or modified. As a change is made QAD Data Warehouse Designer attempts to ascertain if a circular or non functional structure has occurred.

21.5 Deleting Job Logs

Job logs can be deleted by displaying them in the right hand pane and then selecting a log or a group of logs and using the delete key. Multiple job logs can be deleted by choosing the 'multiple log delete' right mouse menu option when positioned over a job log. The following dialog will be displayed.



The dialog box is titled "Delete multiple job logs" and has a close button (X) in the top right corner. It contains the following fields and controls:

- A message: "Multiple job logs can be deleted by specifying one or more of the limitations below."
- Two buttons: "Delete" and "Cancel".
- Job name: "Job name. If no name is specified then all logs are deleted. SQL Wildcards (%) may be used." with a text input field containing "%".
- Job state: "Job state. Select a specific job state, or All to delete all logs." with a dropdown menu showing "All".
- Job owner: "Job owner. Select a specific job owner, or All to delete all logs." with a dropdown menu showing "All".
- Number of days: "Number of days prior to the current date to start deleting from. (e.g. 14 will delete all logs more than 14 days old)." with a text input field containing "14".
- Archive audit trail logs: "Archive audit trail logs during delete." with a checked checkbox.

Select or enter the appropriate options to delete the range of job logs required.

21.6 Stand Alone Scheduler Maintenance

QAD Data Warehouse Designer includes a stand alone scheduler maintenance screen. This screen provides all the scheduler control functionality found in the main QAD Data Warehouse Designer utility, but with no access to the main metadata repository.

Scheduler maintenance login

The login screen differs in that the user name and password do not have to be that of a valid metadata repository. This user name / password combination can be any valid database user. There is an additional entry required being **Meta database**. This is the schema of the metadata repository that you wish to connect to in terms of scheduler maintenance.

Meta Repository Access WhereScape Software Limited. Copyright (C) 1999-2010

Licensed to: WhereScape Limited

User Name: dssuser

Password: xxxx

Meta Database: dbo

QAD 6.5.3.1 101214

Meta Connect Type: odbc

OLE/ODBC Connect: DataWarehouse

Full User Name: User Name

OK Cancel

For SQL Server the Meta database must be set to **dbo**.

For Oracle data warehouses the 'Meta database' owner must have made the following grants to the specified user before the scheduler maintenance utility can be used.

Scheduler maintenance grants

Repository access grants:

- grant select on ws_meta to dsssched;
- grant select on ws_meta_tables to dsssched;
- grant select on ws_obj_type to dsssched;
- grant select,insert on ws_user_adm to dsssched;
- grant select,insert,update on ws_user_adm to dsssched;
- grant select,alter on ws_wrk_job_dependency_seq to dsssched;

Object access (job create) grants:

- grant select on ws_obj_object to dsssched;
- grant select on ws_obj_pro_map to dsssched;
- grant select on ws_obj_project to dsssched;
- grant select on ws_obj_group to dsssched;
- grant select on ws_pro_gro_map to dsssched;

Scheduler status grants:

- grant select on ws_wrk_audit_log to dsssched;

Scheduler status, and job deletion grants:

- grant select,delete on ws_wrk_error_log to dsssched;

Scheduler status, poll grants:

- grant select,update on ws_wrk_scheduler to dsssched;

Job creation grants:

- grant select,insert,update,delete on ws_wrk_dependency to dsssched;
- grant select,insert,update,delete on ws_wrk_job_ctrl to dsssched;
- grant select,alter on ws_job_seq to dsssched;
- grant select,alter on ws_task_seq to dsssched;

Job maintenance grants:

- grant select,insert,delete on ws_wrk_job_log to dsssched;
- grant select,update,delete on ws_wrk_job_run to dsssched;
- grant select,insert,update,delete on ws_wrk_dependency to dsssched;
- grant select,insert,update,delete on ws_wrk_job_dependency to dsssched;
- grant select,delete on ws_wrk_job_thread to dsssched;

Task maintenance grants:

- grant select,insert,update,delete on ws_wrk_task_ctrl to dsssched;
- grant select,update,delete on ws_wrk_task_run to dsssched;
- grant select,insert,delete on ws_wrk_task_log to dsssched;

- grant select,insert,update on dss_parameter to dsssched;

Right mouse 'used by' option in parameters listing grants:

- grant select on ws_pro_header to dsssched;
- grant select on ws_pro_line to dsssched;
- grant select on ws_scr_header to dsssched;
- grant select on ws_scr_line to dsssched;
- grant select on ws_load_tab to dsssched;
- grant select on ws_load_col to dsssched;
- grant select on ws_stage_tab to dsssched;
- grant select on ws_stage_col to dsssched;
- grant select on ws_dim_tab to dsssched;
- grant select on ws_dim_col to dsssched;
- grant select on ws_fact_tab to dsssched;
- grant select on ws_fact_col to dsssched;
- grant select on ws_agg_tab to dsssched;
- grant select on ws_agg_col to dsssched;

A sample script to grant these privileges is shipped with QAD Data Warehouse Designer. This script is called 'grant_sched_access.sql' and can be found in the QAD program directory.

The scheduler maintenance utility does not require a QAD license key. The QAD Data Warehouse Designer software can be installed onto a PC, and this utility utilized without having to use the QAD 'Setup Administrator' utility.

21.7 Monitoring the Database and Jobs

Note: Oracle on Unix and Linux only.

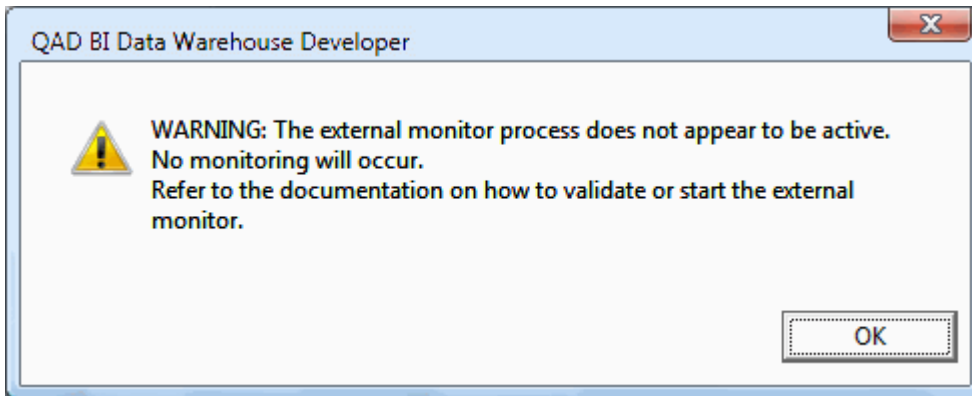
QAD Data Warehouse Designer provides a methodology for monitoring both the database and selected jobs. In the event that a job fails or the database is not available a notification message can be sent to an administrator. The monitoring process requires the establishment of an external process. This process must run on a Unix platform. It does not have to run on the data warehouse database platform, and in fact it is often preferable that it runs on a separate system. The monitor requires network access to the database. Refer to the Setup / Administrator guide for information on how to establish the external monitor process. This external monitor process must be running in order to utilize the features discussed in the following sections.

The following sections cover both database monitoring and job monitoring. The normal practice would be to setup database monitoring to cover those times when critical jobs are running. The individual monitoring of critical jobs is then defined.

Note: Although it is possible to setup job monitoring without database monitoring this is not recommended. If database monitoring is not in place and the database fails, then no job monitoring will occur and no notifications regarding the jobs will be issued. Therefore, database monitoring is required to provide a comprehensive job monitoring regime.

21.7.1 Database Monitoring

Database monitoring is defined by selecting the **Monitor / Database monitoring** menu option from the scheduler window, or from the stand-alone scheduler maintenance program. When this menu option is selected a check is made to ensure that the external monitor process is active. If the external process has not reported in the last 24 hours the following dialog will appear:



In such a case the external monitoring process on the Unix platform needs to be checked or started. Refer to the **Setup / Administrator** guide for instructions on how to maintain the external monitoring process.

The following example dialog will then appear:

	HHMM			Scheduler			HHMM			Scheduler			HHMM			Scheduler		
	From	Until	Database	Windows	Unix	From	Until	Database	Windows	Unix	From	Until	Database	Windows	Unix			
Monday:	2100	2400	☒	☐	☐	0	900	☒	☐	☐	0	0	☐	☐	☐			
Tuesday:	2100	2400	☒	☐	☐	0	900	☒	☐	☐	0	0	☐	☐	☐			
Wednesday:	2100	2400	☒	☐	☐	0	900	☒	☐	☐	0	0	☐	☐	☐			
Thursday:	2100	2400	☒	☐	☐	0	900	☒	☐	☐	0	0	☐	☐	☐			
Friday:	0	0	☐	☐	☐	0	900	☒	☐	☐	0	0	☐	☐	☐			
Saturday:	0	0	☐	☐	☐	0	0	☐	☐	☐	0	0	☐	☐	☐			
Sunday:	2100	2400	☒	☐	☐	0	0	☐	☐	☐	0	0	☐	☐	☐			

	Script name	Period 1 Parameter	Period 2 Parameter	Period 3 Parameter
Database down:	<input type="text" value="monitor_db_mail"/>	<input "database="" available"="" dssadm"="" not="" type="text" value='"database not available" dssadm"/></td> <td><input type="text" value='/>	<input type="text"/>	
Windows scheduler down:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unix scheduler down:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Database Monitoring help

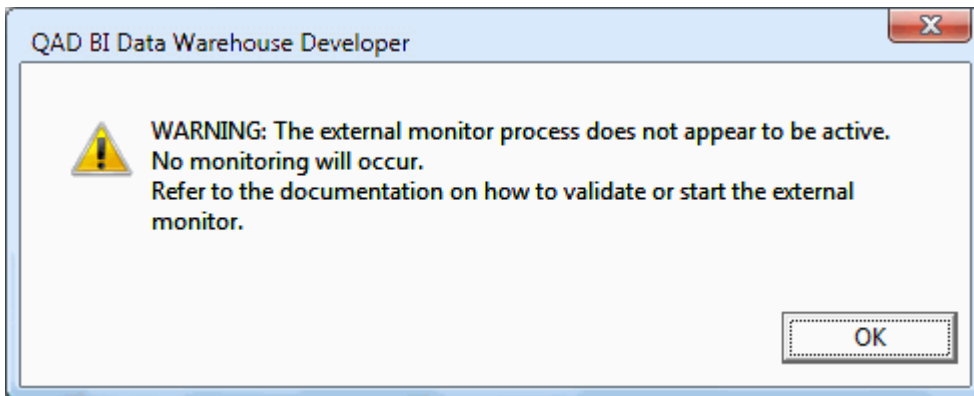
In this example the database is being monitored between the hours of 9:00pm and 9:00am to cover processing for business days monday through friday. If the database is not available during these times the host script called 'monitor_db_mail' will be called and it will be passed two positional parameters. The first parameter being "database not available" and the second being "dssadm". The parameters required are specific to the script being invoked.

In this example we have defined two monitoring periods. The first is for 9:00pm until midnight and the second is from midnight to 9:00am. As a result there are two sets of parameters defined for a database notification, one for the first period and one for the second period. In this case both are the same.

21.7.2 Job Monitoring

The external monitoring process regularly monitors jobs running in the scheduler and provides notifications when certain conditions occur. By default the interval between the monitoring of jobs is 15 minutes. This interval can be overridden during the setup of the external job monitor. See the Setup / Administration guide.

Job monitoring is defined by selecting the **Monitor / Job monitoring** menu option from the scheduler window, or from the stand-alone scheduler maintenance program. When this menu option is selected a check is made to ensure that the external monitor process is active. If the external process has not reported in the last 24 hours the following dialog will appear:



In such a case the external monitoring process on the Unix platform needs to be checked or started. Refer to the Setup / Administrator guide for instructions on how to maintain the external monitoring process.

The following example dialog will then appear:

Define job monitoring parameters

Job Name: ☒ Mon ☒ Tue ☒ Wed ☒ Thu ☒ Fri ☐ Sat ☐ Sun ☐ 1st Month ☐ Last day of Month

Nominal start time (HHMM): Earliest possible start before nominal start time. Number of minutes before (e.g. 120 is 2 hours before nominal start time). (minutes):

Periodicity of job (HHMM):

	Action script	Parameter to script (or command)	Active
----- Notification on failure to start or failure to finish within specified time frame -----			
Must start within (minutes): <input type="text" value="60"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Failed to start on time" dssadm	☒
Must finish in (minutes): <input type="text" value="240"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Failed to finish on time" dssadm	☒
----- Notification on warning or error messages occurring while a job is running -----			
Notify on RUN warning count > <input type="text" value="0"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Errors during run" dssadm	☒
Notify on RUN error count > <input type="text" value="0"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Errors during run" dssadm	☒
----- Notification on warning or error messages at the completion of a job -----			
Notify on FINISH warning count > <input type="text" value="0"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Failed with errors" dssadm	☒
Notify on FINISH error count > <input type="text" value="0"/>	<input type="text" value="monitor_db_mail"/>	"Daily Update""Failed with errors" dssadm	☒
Notify on FINISH Success <input type="text" value=""/>	<input type="text" value=""/>		☐
----- Notification on failure to reach a specified number of actions by a checkpoint time -----			
Checkpoint 1 by (minutes): <input type="text" value="0"/>	<input type="text" value=""/>		☐
Completed task count >= <input type="text" value="0"/>	OK + Information message count >= <input type="text" value="0"/>		
Checkpoint 2 by (minutes): <input type="text" value="0"/>	<input type="text" value=""/>		☐
Completed task count >= <input type="text" value="0"/>	OK + Information message count >= <input type="text" value="0"/>		
Checkpoint 3 by (minutes): <input type="text" value="0"/>	<input type="text" value=""/>		☐
Completed task count >= <input type="text" value="0"/>	OK + Information message count >= <input type="text" value="0"/>		

Job monitoring help

In this example the job called 'Sales Daily' is being monitored. The days Monday through Friday are checked, so monitoring will occur on these days. The nominal start time is 04:00am. Notifications will occur if the following conditions occur.

- 1 The job fails to start within 60 minutes of this nominal start time.
- 2 The job fails to finish within 240 minutes (4 hours) of the nominal start time.
- 3 Errors occur while the job is running
- 4 The job fails with errors.

In all conditions that could cause a notification we will invoke the host script 'monitor_job_mail'. This script requires three parameters. The first parameter is the job name, the second a message, and the third the user or users to mail.

Monitor Days

When defining monitoring for a job one or more days need to be selected. As well as the normal week days there is also the first and last day of the month. Using these two special days it is possible to monitor a job that is critical at the end or start of a month. If Monday through Sunday are checked then it would not be necessary to set the special days. The monitoring day is the day on which the job starts (or could start).

Note: The monitoring day is the day of the absolute minimum start time of a job. For example if we wish to monitor a job that starts at 00:01, and which has an earliest possible start of 5 minutes earlier (i.e. 23:56) then we need to set monitoring for the day of the earliest possible start. Therefore to monitor the Monday morning run we would need to have the Sunday check box set.

Nominal Start Time

The nominal start time is the time at which the job will normally start. This field must be populated for all jobs being monitored even if not used. Monitoring is optimized for daily jobs, so this field is normally set to the start time of the job.

Earliest Possible Start

The earliest possible start field allows for the setting of a possible start time before the nominal start time. In most situations this field will be set to 0. When setting to a value other than zero the impact of the potential start time on the days being monitored needs to be considered. See the note under the Monitor Days section above. The nominal start time less the earliest possible start time provides an '**absolute minimum start time**' which is used by most of the notification conditions, as well as the monitor days.

Periodicity of Job

The periodicity defines the interval between iterations of the job. For a daily job this would be 24 hours and 0 minutes or 2400. This periodicity is used by the monitoring software to ascertain if a job being examined is the current iteration of the job or a previous iteration.

Notification Order

Notifications are processed in the following order. If a notification is sent for a job then no further notification checks are made for that job.

- 1 Finish Error
- 2 Finish Warning
- 3 Finish Success
- 4 Must Finish In
- 5 Run Error
- 6 Run Warning
- 7 Checkpoint 3
- 8 Checkpoint 2
- 9 Checkpoint 1
- 10 Must Start Within

To fully cover all possible events it is usually necessary to set multiple notifications.

Must Start Within (Notification)

The 'must start within' notification allows notification when a job fails to start within a specified number of minutes of the absolute minimum start time. In the example dialog above the job must start within 60 minutes of the start time.

If this criteria is not met then the monitoring software will look at the 'Action script' and 'Parameter to script' fields to ascertain how to process the notification. If an action script has been defined then this script will be executed in the Unix environment and will be passed the defined parameters. If no script is defined then the 'Parameter to script' field will be executed in the Unix environment.

An example notification script is included as a template called 'unix_mon_job_mail'.

Must Finish In (Notification)

The 'must finish in' notification allows notification when a job fails to finish within a specified number of minutes of the absolute minimum start time. In the example dialog above the job must finish within 4 hours of the start time. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Run Warning Count (Notification)

The 'run warning count' notification allows notification when a job exceeds a specified number of warning messages whilst running. This notification *will only occur when a job is running*. If the job has failed to start, has finished or failed before the external monitor checks the number of warnings this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Run Error Count (Notification)

The 'run error count' notification allows notification when a job exceeds a specified number of error messages whilst running. This notification *will only occur when a job is running*. If the job has failed to start, has finished or failed before the external monitor checks the number of errors this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Finish Warning Count (Notification)

The 'finish warning count' notification allows notification when a job has exceeded a specified number of warning messages and has completed or failed. This notification *will only occur when a job has completed or failed*. If the job has failed to start or is still running when the external monitor checks the number of warnings this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Finish Error Count (Notification)

The 'finish error count' notification allows notification when a job has exceeded a specified number of error messages and has failed. This notification *will only occur when a job has failed*. If the job is still running when the external monitor checks the number of warnings, this notification will be ignored. If the job has been restarted and gone on to complete normally, this notification will be ignored even when errors have occurred. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Finish Success (Notification)

The 'finish success' notification allows notification when a job completes. This notification can be used for example to mail a log of the completed job to a specified user. See the notes under 'Must Start Within' for the action taken if the criteria is met.

Checkpoint 1 (Notification)

The 'checkpoint 1' notification allows notification when a job fails to achieve either a specified number of task completions, or a specified number of information/OK messages within a specified elapsed time. The elapsed time is the time from the absolute minimum start time. This notification *will only occur when the job is running*. If the job has failed to start, completed or failed when the external monitor checks the checkpoint, this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is not met.

Checkpoint 2 (Notification)

The 'checkpoint 2' notification allows notification when a job fails to achieve either a specified number of task completions, or a specified number of information/OK messages within a specified elapsed time. The elapsed time is the time from the absolute minimum start time. This notification *will only occur when the job is running*. If the job has failed to start, completed or failed when the external monitor checks the checkpoint, this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is not met.

Checkpoint 3 (Notification)

The 'checkpoint 3' notification allows notification when a job fails to achieve either a specified number of task completions, or a specified number of information/OK messages within a specified elapsed time. The elapsed time is the time from the absolute minimum start time. This notification *will only occur when the job is running*. If the job has failed to start, completed or failed when the external monitor checks the checkpoint, this notification will be ignored. See the notes under 'Must Start Within' for the action taken if the criteria is not met.

CHAPTER 22

22. Indexes

Indexes may exist on any table defined in QAD Data Warehouse Designer. By default QAD Data Warehouse Designer will auto-generate a number of indexes during the drag and drop process and when building procedures. These indexes can be altered or deleted. New indexes can be created as desired.

Note: The maintenance of the indexes is performed as part of the normal scheduler processing.

In the left pane right click on a table to:

- Display indexes
- Add indexes

In This Chapter

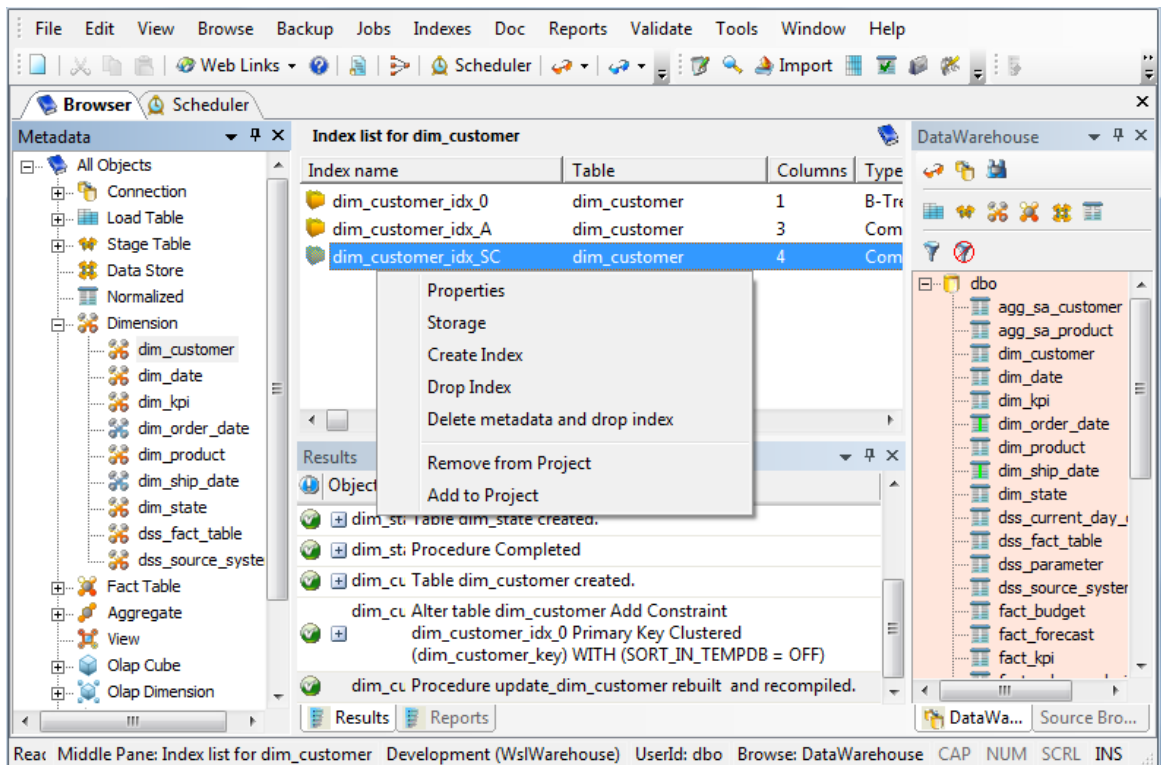
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22.1 Index Definition

By right clicking on a table in the left pane and selecting Display Indexes the middle pane will display the indexes for that table.

In the middle pane, right click on an index and the following options are available:

- Properties
- Storage
- Create Index
- Drop Index
- Delete metadata and drop Index
- Remove from Project
- Add to Project



Properties

The properties screen (see example below) can be selected via the right mouse menu when positioned on an index name in the middle pane.

- SQL Server example:

dim_customer_idx_SC index definition

Index Definition | Included columns | Storage

Table Name: dim_customer

Index Name: dim_customer_idx_SC

Index Description: Slowly Changing Business key

Rebuild Frequency: Never

☒ Active

☐ Artificial Key

☒ Business Key

☒ Unique

☐ Drop before Update

NOTE: A Unique Artificial Key will be assumed to be the Primary Key constraint

Degree of Parallelism. 0=default, 1=disable, nn=use nn processors, max of 64

0

☐ Clustered Index

Filter Expression

Index Columns

code
name
dss_current_flag
dss_version

Table Columns

address
city
code
dim_customer_key
dss_current_flag
dss_end_date
dss_start_date
dss_update_time
dss_version
name
state

<- Add

Remove ->

OK Cancel Apply

An additional option is also available in SQL Server for adding **Include Columns**. Click on the Included columns table and select the required columns:

dim_customer_idx_SC index definition

Index Definition | **Included columns** | Storage

Table Name: dim_customer

Index Name: dim_customer_idx_SC

Index Description: Slowly Changing Business key

Select nonkey columns to include in the index

Index Include Columns		Table Columns
address	<div><-- Add</div> <div>Remove --></div>	address
city		city
		code
		dim_customer_key
		dss_current_flag
		dss_end_date
		dss_start_date
		dss_update_time
		dss_version
		name
		state

OK Cancel Apply

- Oracle example:

dim_customer_idx_SC index definition

Index Definition | Storage

Table Name:

Index Name:

Index Description:

Rebuild Frequency:

☒ Active

☐ Artificial Key

☒ Business Key

☒ Unique

☐ Bitmap

☐ Drop before Update

☐ Compute Statistics

☐ Function Index

Parallel build degree
0 = no parallelism
1 = parallel
n = parallel n

☐ Compressed Index

NOTE: A Unique Artificial Key will be assumed to be the Primary Key constraint

Index Columns

CODE
NAME
dss_current_flag
dss_version

Table Columns

ADDRESS
CITY
CODE
dim_customer_key
dss_current_flag
dss_end_date
dss_start_date
dss_update_time
dss_version
NAME
STATE

<- Add

Remove ->

OK Cancel Apply

▪ IBM DB2 example:

dim_customer_idx_SC index definition

Index DefinitionStorageStatistics

Table Name:

dim_customer

Index Name:

dim_customer_idx_SC

Index Description:

Slowly Changing Business key

Rebuild Frequency

Never

☒ Active

☐ Artificial Key

☒ Business Key

☒ Unique

☐ Drop before Update

NOTE: A Unique Artificial Key will be assumed to be the Primary Key constraint

Index Columns

code
name
dss_current_flag
dss_version

Table Columns

address
city
code
dim_customer_key
dss_current_flag
dss_end_date
dss_start_date
dss_update_time
dss_version
name
state

Up

Down

☐ Clustered Index

<- Add

Remove ->

OK

Cancel

Apply

The fields are described below:

Field	Description
Index name	Typically the table short name followed by: <ul style="list-style-type: none">▪ _idx_0 indicating primary key▪ _idx_n where n = any number from 1 indicating dimensional keys▪ _idx_x where x = any letter a thru z indicating business keys.
Index description	<ul style="list-style-type: none">▪ Free flow description of the index

Field	Description
Rebuild frequency	<p>When the index is rebuilt by the scheduler. Select an option from the drop down list box:</p> <ul style="list-style-type: none"> ▪ Never (default) ▪ Daily ▪ End Month ▪ Start Month ▪ Saturday ▪ Sunday ▪ Monday ▪ Tuesday ▪ Wednesday ▪ Thursday ▪ Friday
Active checkbox	<ul style="list-style-type: none"> ▪ When checked means the index is in use. ▪ When unchecked means the index is not managed by the scheduler.
Artificial Key	When checked indicates that this is the surrogate (artificial) key generated by the system.
Business Key	Denotes a business key.
Unique	<p>Specifies that the index is a unique index</p> <p>Note: If both unique and artificial are set it is assumed to be a primary key constraint and it is added as such.</p>
Bitmap	<p>Oracle only: When checked indicates an Oracle bitmap index. Typically this is set for dimensional join keys.</p> <p>Note: Generally requires the drop before update option to be checked also as bitmap indexes do not grow gracefully.</p>
Drop before Update	The index is dropped before the update procedure runs on the table and is reinstated after the update is completed.
Parallel	<p>Oracle only: Defines the degree of parallelism used during the index build</p> <ul style="list-style-type: none"> ▪ 0 = no parallelism ▪ 1 = parallel build where the database server decides how many parallel threads to use ▪ n = parallel n where the server will use n parallel threads in the build.
Compressed Index	Oracle only: If checked the index will be created compressed. The compression level edit box will also become visible.
Compression level	Oracle only: Sets the number of prefix columns to compress. This value must be between 1 and one less than the number of columns in the index. The default (blank) is one less than the column count.
Clustered Index	SQL Server and DB2 only: If checked the index will be created as a clustered index.

Field	Description
Index columns	Shows the columns in the order they will be applied to the index. The order can be changed using the up/down buttons at the left.
Table columns	Shows all columns in the table that can be indexed. These table columns can be added or removed by highlighting the column and checking the appropriate button.
Filter Expression	Filter expression enabled for SQL2008+. Define an Index filter to be applied during Index Create. This limits the size of an index by only indexing rows matching the filter conditions.

If an oracle table is partitioned, two additional check boxes are visible:

- Local - when checked creates a local index on the partition table
- Global - this option not supported.

Indexes are normally managed by the scheduler as part of the normal processing of a table.

Refer to **Ws_Maintain_Indexes** (see "**29.17 Ws_Maintain_Indexes**" on page 704). This function allows the control of index drop and creation from within a procedure. Typically this function is called when using partitioned tables.

22.2 Index Storage Properties

The fields on the **Storage** tab of the Properties screen for index are described below. The properties available depend on the data warehouse database environment.

- For a SQL Server example, see **Index Storage Screen - SQL Serve** (see "**22.2.1 Index Storage Screen - SQL Server**" on page 515)r.
- For an Oracle example, see **Index Storage Screen - Oracle** (see "**22.2.2 Index Storage Screen - Oracle**" on page 516).
- For a DB2 example, see **Index Storage Screen - DB2** (see "**22.2.3 Index Storage Screen - DB2**" on page 517).

22.2.1 Index Storage Screen - SQL Server

The screenshot shows a dialog box titled "stage_budget_idx_A index definition" with a close button (X) in the top right corner. The dialog has three tabs: "Index Definition", "Included columns", and "Storage", with the "Storage" tab currently selected. The "Storage" tab contains the following fields and controls:

- Filegroup name:** A dropdown menu.
- Fill Factor (0 to 100):** A text input field containing the value "75".
- Sort in tempdb::** A checkbox that is checked.
- Additional build options:** A text input field containing the value "ALLOW_ROW_LOCKS = ON".

At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

Filegroup name

Select a name from the drop down list box. If no filegroup name is selected for SQL Server, the default for the database is used.

Fill Factor (0 to 100)

The amount of space to use in each leaf level page with creating or rebuilding the index. The default is 0 - use the database default.

Note: This option is available from SQL Server 2005 onwards.

Sort in tempdb

If this check box is on QAD Data Warehouse Designer will tell SQL Server to use tempdb to store intermediate sort results when creating or rebuilding the index. If this check box is off, QAD Data Warehouse Designer does not tell SQL Server to use tempdb (so SQL Server uses the filegroup the index resides in). The default is **off**.

Note: This option is available from SQL Server 2005 onwards.

Additional build options

Enter any additional index creation options valid in SQL Server. The example above uses `ALLOW_ROW_LOCKS = ON`, an option that enables the use of row locks when accessing the index.

22.2.2 Index Storage Screen - Oracle

The storage properties for an Oracle index are the same as the storage properties for an Oracle table. Refer to **Table Storage Screen - Oracle** (see "7.1.2 Table Storage Screen - Oracle" on page 105) for more information.

22.2.3 Index Storage Screen - DB2

The screenshot shows a dialog box titled "dim_date_idx_A index definition" with a close button (X) in the top right corner. The dialog has three tabs: "Index Definition", "Storage", and "Statistics". The "Storage" tab is currently selected. Inside the dialog, there is a "Table space name:" label followed by a text input field. Below this, there are three more input fields: "Percent Free:" with the value "10", "Level 2 Percent Free:" with the value "15", and "Minimum Percent Used:" with the value "80". At the bottom right of the dialog, there are three buttons: "OK", "Cancel", and "Apply".

dim_date_idx_A index definition

Index Definition Storage Statistics

Table space name:

Percent Free:

Level 2 Percent Free:

Minimum Percent Used:

OK Cancel Apply

Percent Free

The amount of free space to leave in each page. The default is **blank** - use the database default.

Level 2 Percent Free

The amount of free space to leave in each index level 2 page. The default is **blank** - use the database default.

Minimum Percent Used

The threshold of the minimum percentage of space used on an index leaf page. The default is **blank** - use the database default.

22.3 Index Menu Options

The main Browser window has a menu section labelled 'Indexes'. Under this menu are a number of options for dealing with indexes in bulk. Care should be taken when using these options, and an understanding of what will occur is important.

Enable all foreign constraints

If an index has been defined as a foreign key constrain then this operation will enable the foreign constraint. By default no auto generated indexes are created with foreign key constraints enabled.

Remove all foreign constraints

The index metadata is searched and any index that has a foreign key constraint enabled will have that constraint removed from the database. On a large database this may be a very large operation.

CHAPTER 23

23. Documentation and Diagrams

QAD Data Warehouse Designer includes the ability to document the data warehouse based on the information stored against the metadata for all the tables and columns in the data warehouse.

The documentation will only be meaningful if information is stored in the metadata. The business definition and a description should be stored against all columns that will be visible to end users.

The following sections describe how to **generate** (see "**23.1 Creating Documentation**" on page 520) and **read** (see "**23.3 Reading the Documentation**" on page 524) the documentation.

Also included is a section on information that is available to assist in the connection of end user **query tools** (see "**23.5 Query Tool Access**" on page 539).

In This Chapter

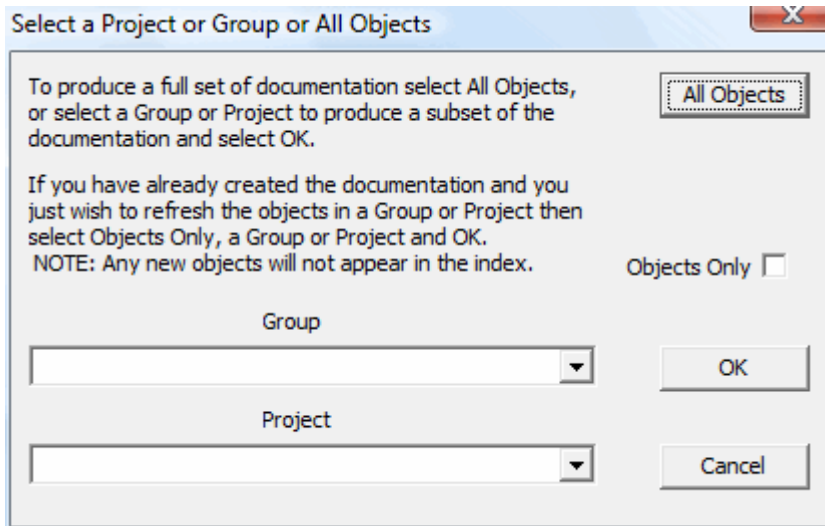
23.1 Creating Documentation	520
23.2 Batch Documentation Creation.....	523
23.3 Reading the Documentation.....	524
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23.5 Query Tool Access.....	539

23.1 Creating Documentation

Create documentation

To create the documentation for the components of the data warehouse, select **Doc** from the browser menu bar, then **Create Documentation**.

If the repository has projects or groups in use then the following dialog will appear to allow the selection of a specific group or project. The default is all objects in the repository.



A file dialog will appear next. Select a file path (directory) under which to save the HTML files that will be produced.

A style sheet called **mainstyle.css** is created if it does not exist. If this style sheet exists then it is not overwritten. The style sheet can therefore be modified to match an existing intranet standard.

The next screen allows for the inclusion of a banner and user defined links. It also provides some build options:

Documentation Creation Options

User and technical documentation will be created in HTML format in the destination directory.

To use a custom look and feel add your own MainStyle.css file into the destination directory.

Documentation title (e.g. Data Warehouse):

Do you want to link in any custom HTML pages? ☐ Links

Do you want to include current table space usage?
It will take longer to create the documentation. ☒ Sizes

How would you like the columns sorted? ☒ Column Order ☐ Column Name ☐ Business Name

Do you want to include shadows on the diagram boxes? ☒ Shadow

Do you want to create impact analysis on load tables?
It will take longer to create the documentation. ☒ Impact

Do you want to replace the existing style sheet?
Do not tick this box if you utilize a custom style sheet. ☐ Replace Style Sheet

Do you wish to limit the complexity of the diagrams?
Select the maximum number of process steps to display in
the source diagrams. ▼

The size check box instructs the documentation generator to examine the size of all tables and indexes in the database. This process may be slow in some situations, thus should normally be used only for final documentation.

The sorted check box sorts the columns within the tables into alphabetical order. By default the columns are in the order in which they appear within the tables.

Creating a header

If you check the banner frame option then a banner (heading) will be created at the top of each page in the documentation. You will be prompted for height of the banner frame in pixels (default is 60), an image file (jpg or gif) and any banner text. It is recommended that any image be relatively small (60 pixels high or approximately 1/2 an inch) as it will appear on every page.

Adding Links

Custom information can be linked into the generated documentation.

This means that every time the documentation is regenerated, custom information will be included. In this way the complete documentation for the data warehouse can be viewed in one location.

If you check the add links option then you will be prompted to include personalized links from index pages. These links must be to previously created HTML files.

Index pages (linkage points) are available at three points:

- index - initial page
- techindex - technical documentation initial page
- indexuser - user documentation initial page

Multiple links can be added to each index page by using the More option.

Adding glossary elements

As part of the user documentation a glossary is produced defining all the business terms and column names used in the data warehouse. This glossary is primarily based on the columns in the dimension and fact tables. Additional information can, however, be added via the 'Ws_Api_Glossary' procedure defined in the procedures chapter. This procedure allows the manual inclusion of glossary elements that will be stored in the metadata repository and added to the glossary whenever the documentation is recreated.

23.2 Batch Documentation Creation

QAD Data Warehouse Designer includes the ability to document the data warehouse based on the information stored against the metadata for all the tables and columns in the data warehouse. In a larger environment, it may be a good idea to generate documentation in batch mode.

The following syntax chart illustrates the options available:

```
med.exe /BD { /U UserName { /P Password } } /C OdbcSource { /M Schema }
{ /N FullName } /D Directory { /G GroupName | ProjectName } /S NumHops
```

Note: {} indicates an optional parameter and | indicates alternative values.

Parameter Descriptions

The following parameters are available:

Parameter	Specify Value?	Mandatory?	Description
BD	No	Yes	Indicates batch documentation mode.
U	Yes	Sometimes *1	Username parameter.
P	Yes	Sometimes *1	Password parameter.
C	Yes	Yes	ODBC data source parameter.
M	Yes	Sometimes *2	Metadata schema parameter.
N	Yes	No	Full user name parameter, only for logging purposes.
D	Yes	Yes	Directory name where documentation is created.
G	Yes	No	Group or Project name if specified. All Objects if not included.
S	Yes	Yes	Number of processes/ hops in the source diagrams.

Notes:

1. User Name and Password are not required when using a trusted connection or operating system authentication.
2. Metadata Schema is required for DB2, but is not required for Oracle and SQL Server.

Example

The following example connects to a SQL Server repository called WslWarehouse, using a trusted connection into the C:\Temp\my_doco directory with 4 hops in diagrams:

```
med /BD /C "wslWarehouse" /D "C:\Temp\my_doco" /S "4"
```

23.3 Reading the Documentation

To read the documentation you have created, select **Doc** from the browser menu bar, then **Display Documentation**. This will launch a browser and display the contents of index.html. Alternatively you can access the HTML pages directly from their saved location.

23.4 Diagrams

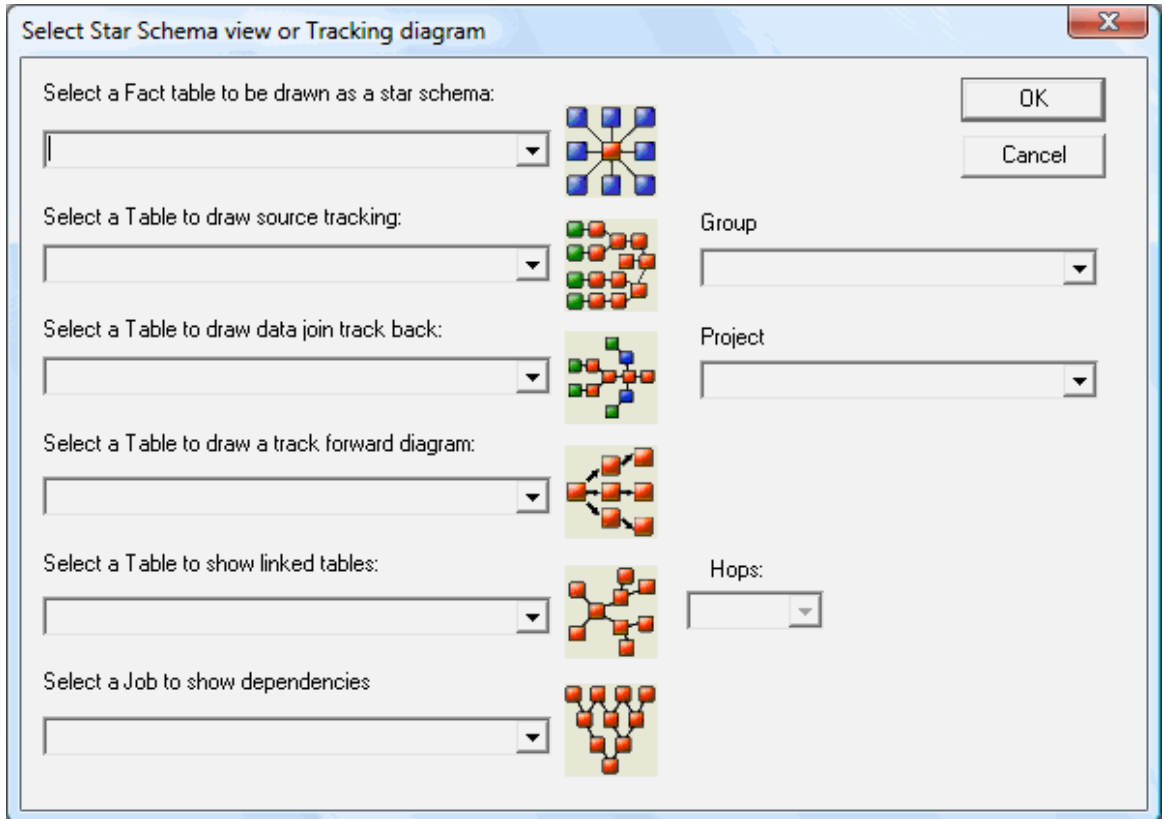
Six types of diagrams are provided to give visual representation of what has been created. These are

- The **star schema** diagram
- The **track back** diagram
- The **track back with data joins** diagram
- The **track forward** diagram
- The **linked tables** diagram
- The **job dependencies** diagram

These diagrams are accessed through the diagrammatical pane which is activated when the switch to diagrammatical view button is clicked.



With the diagrammatical pane displayed clicking this button again or using the right mouse in the main window will cause the following dialog box to appear:



A different drop down box is provided for each diagram type. You may choose to limit a diagram to only include objects within a group or project. Choosing a Group and/or project will also reduce the tables in the drop down lists for each diagram type.

To create a new diagram:

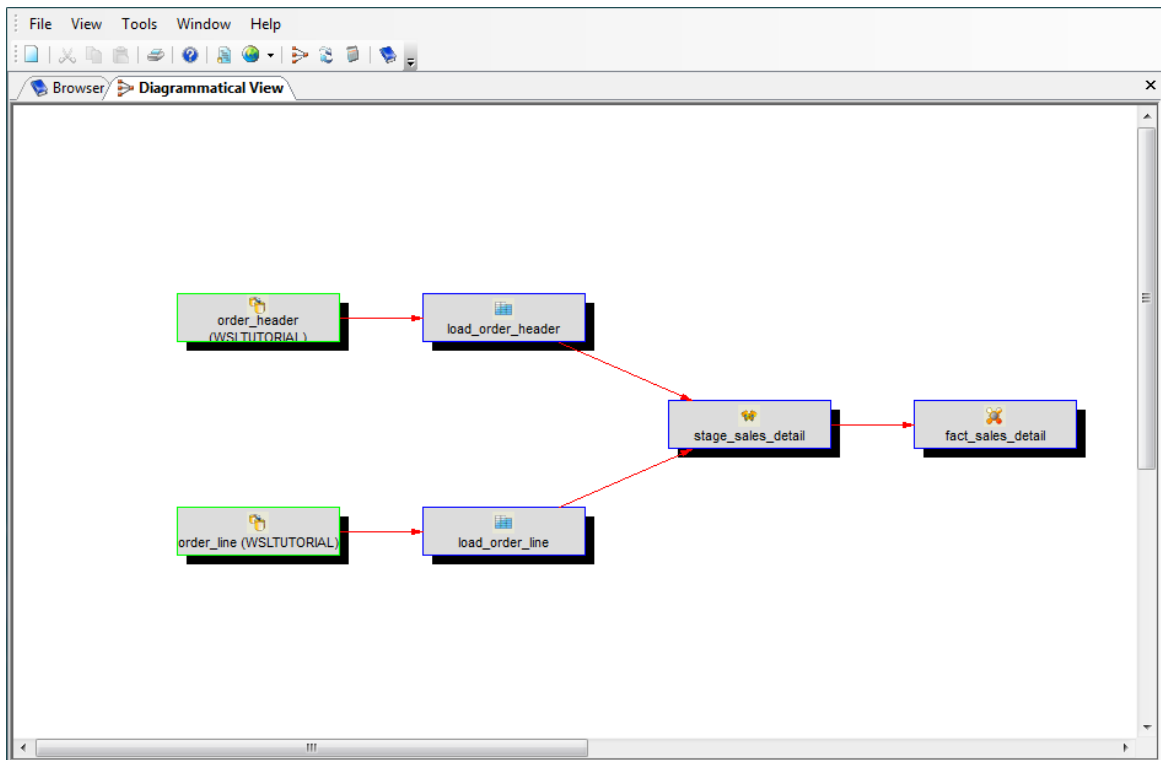
- 1 Optionally choose the **Group** to limit the diagram by
- 2 Optionally choose the **Project** to limit the diagram by
- 3 Choose the **table name** from the drop down list for the required diagram
- 4 Click OK.

Once displayed there are two modes for diagram display. The default mode is that of a series of linked dialog boxes, which can be expanded to view the column name contents. The second mode is the printable mode. Switch to the printable view by selecting the menu option *Printable Diagram / Standard Diagram (toggle)* which is located in the File menu, or pressing the toggle button as shown below:



The diagram display in the printable view can be altered, saved and restored; and printed. See the section on printable diagrams for further details.

Once a diagram has been displayed, it can be refreshed by choosing **Refresh Diagram** from the Tools menu, or by pressing F5.



Printable diagram editing

The printable diagram can be edited, saved and restored. When a printable diagram is displayed the various boxes can be edited or moved, new connection lines can be added, and new boxes can be added or removed. A grid is available to make positioning of boxes easier. The grid is toggled with the grid button:



- Editing a box or line

To edit a box or line position the cursor over the object. Click the right mouse button. A dialog box will appear displaying the options available in terms of altering the object.

- Moving a box or line

To move a box or line position the cursor over the object. Hold down the left mouse button and while still holding the button down drag the object to the desired location and release the button.

- Hiding a box or line

To hide a box or line position the cursor over the object. Click the right mouse button. A dialog box will appear displaying the options available in terms of altering the object. To hide the object choose the 'Hidden' flag in the 'Flags' tab.

- Creating a new box

To create a new box position over a blank area of the screen. Hold down the left mouse button and drag the cursor to create the desired shape. Release the button to create.

- Creating a new line

To create a new line between two boxes, left mouse click on one of the boxes. The box will be highlighted and a central focus point is shown. Position the mouse over the central focus point of the box. Hold down the left mouse button and while still holding the button down move the cursor to the middle of the box you want to join to and release the button.

Printable diagram save

The diagram can be saved either as a meta file or as a jpeg image. If saved as a meta file it can be subsequently reloaded and re-edited. A jpeg cannot be reloaded into QAD Data Warehouse Designer.

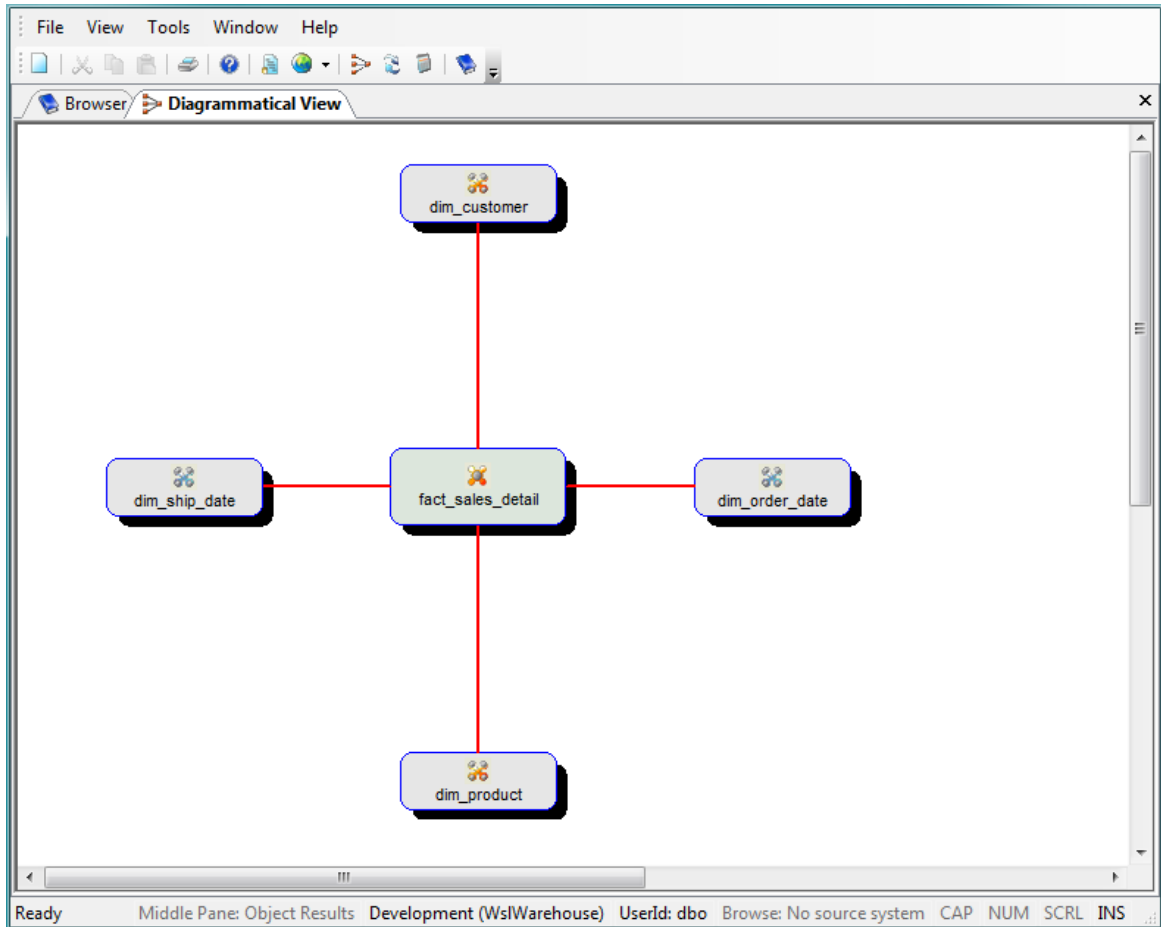
To save the diagram select the menu option *File/Save as* and enter a valid file name in the subsequent dialog box. By default the diagram is saved as a meta file.

Printable diagram load

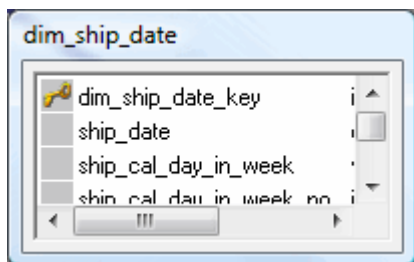
If a printable diagram has been saved as a meta file it can be reloaded. To reload a saved meta file switch to diagrammatical view and select the menu option *File/Load diagram*. A dialog box will allow you to choose a windows meta file (*.wmf). If the meta file had previously been saved from QAD Data Warehouse Designer then the diagram will be loaded.

23.4.1 Star Schema diagram

A star schema diagram can be displayed for a fact table or aggregate table. It shows the central table with the outlying dimensions. An example of a star schema diagram both in standard (dialog) format and printable format are as follows:



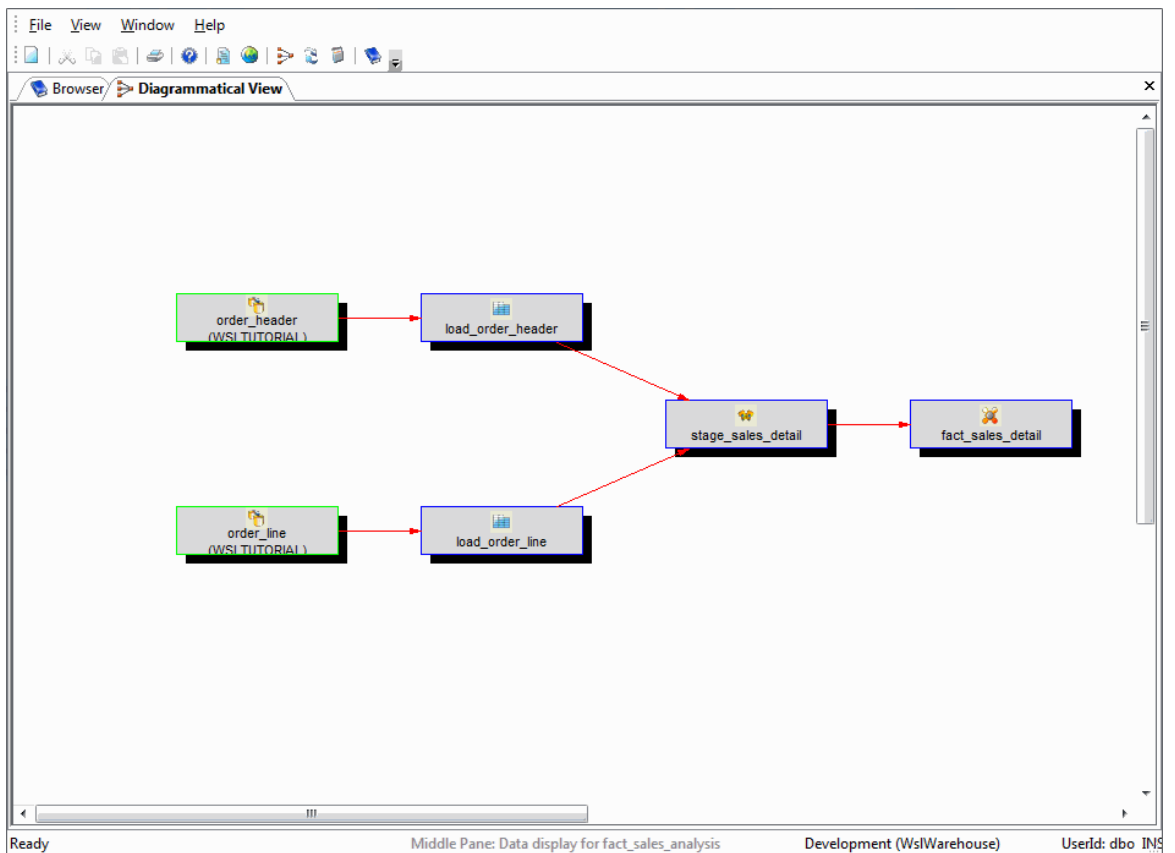
The printable version as displayed below has been modified from the standard produced, by dragging the dimensions into new positions. See the section on printable diagrams for more details.



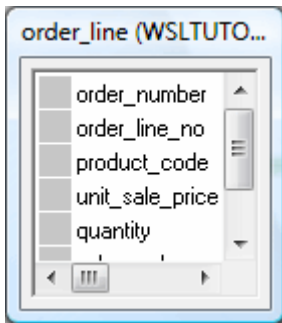
The printable versions of the star schema diagrams are produced as part of the user and technical documentation when the menu option Doc / Create documentation is chosen from the main browser window.

23.4.2 Track Back diagram

A track back diagram can be shown for any table. It shows connections back from the chosen table to the source tables from which information was derived. In the standard (dialog) view the blue lines denote links within the data warehouse database and the green lines show links to data outside of the data warehouse. Hovering the cursor over a line shows additional information. For blue lines the procedure used to move data between the two tables is displayed. For green lines additional information on the source of the data is displayed. If red lines, or boxes appear in a track back diagram they indicate a loop situation. If a table is found to be a child of itself then the link or box is colored red and the track back for that branch stops. Sample track back diagrams are as follows:



In the printable version the data sources outside of the data warehouse are colored green and those tables inside the data warehouse are colored blue.

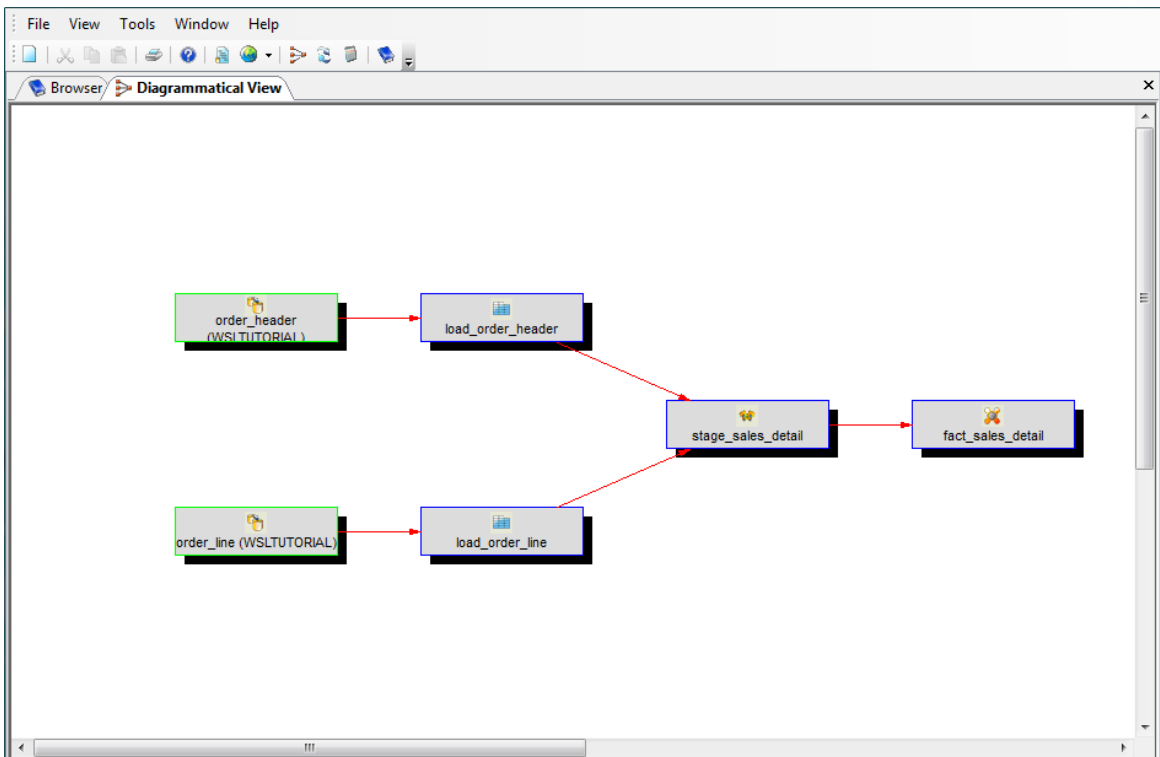


The printable versions of the track back diagrams are produced as part of the technical documentation when the menu option Doc / Create documentation is chosen from the main browser window.

Creating a Job from a Track Back Diagram

Once a track back diagram has been created for a table, a scheduler job can be generated from the diagram. This job will be called `Process_to_table_name`, where `table_name` is the name of the table the track back diagram was run for.

To create a Job, choose **Create Job** from the Tools menu after the diagram is displayed:



The job properties are then displayed:

Job Definition

Job Name:

Process to fact sales detail

OK

Description:

Job created from QAD source diagram for object fact_sales_detail

Cancel

Frequency:

Hold

Custom Settings:

Start Date:

Thursday , 25 March 2010

Interval between jobs: (minutes)

Start Time:

10:26:00 a.m.

Start at or after HHMM (e.g. 0800)

0000

Max Threads:

1

Do not start after HHMM (e.g. 1700)

0000

Scheduler:

Windows Only

Active on the days selected below

☐ Mon
 ☐ Tue
 ☐ Wed
 ☐ Thu
 ☐ Fri
 ☐ Sat
 ☐ Sun

Dependent On:

Parent job	Req.	Look back (mins.)	Max. wait (mins.)

Add parent job

Remove parent

Logs retained:

0

This field lets you set the number of logs that are retained for this job before an automatic delete and archive occurs. 0 = keep all logs (default action)

The following two fields are optional. They are executed after the job completes and therefore need to reflect the scheduler environment. (i.e. Unix or Windows). The special variables \$JOB_KEY\$, \$JOB_SEQ\$ and \$JOB_NAME\$ can be used to return the associated values.

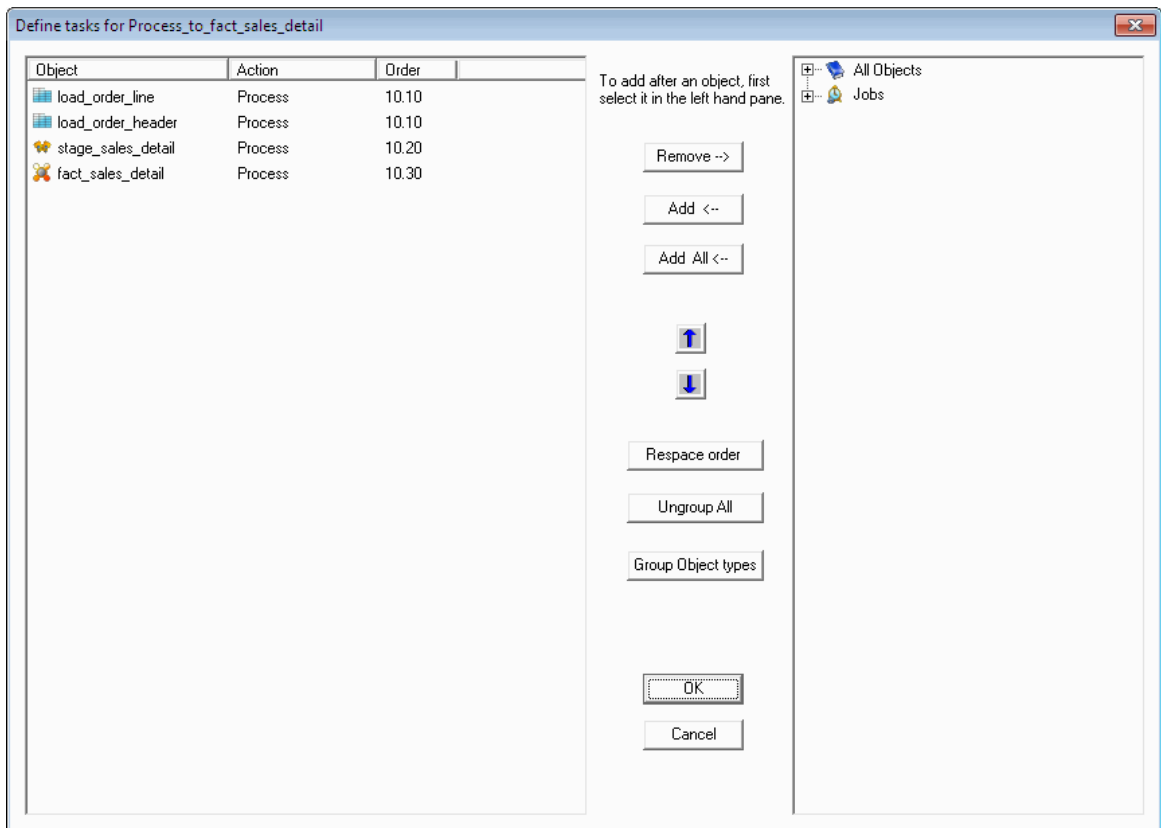
The Success command will be executed if a successful completion, the failure command will be executed if a job fails to complete:

Success command:

Failure command:

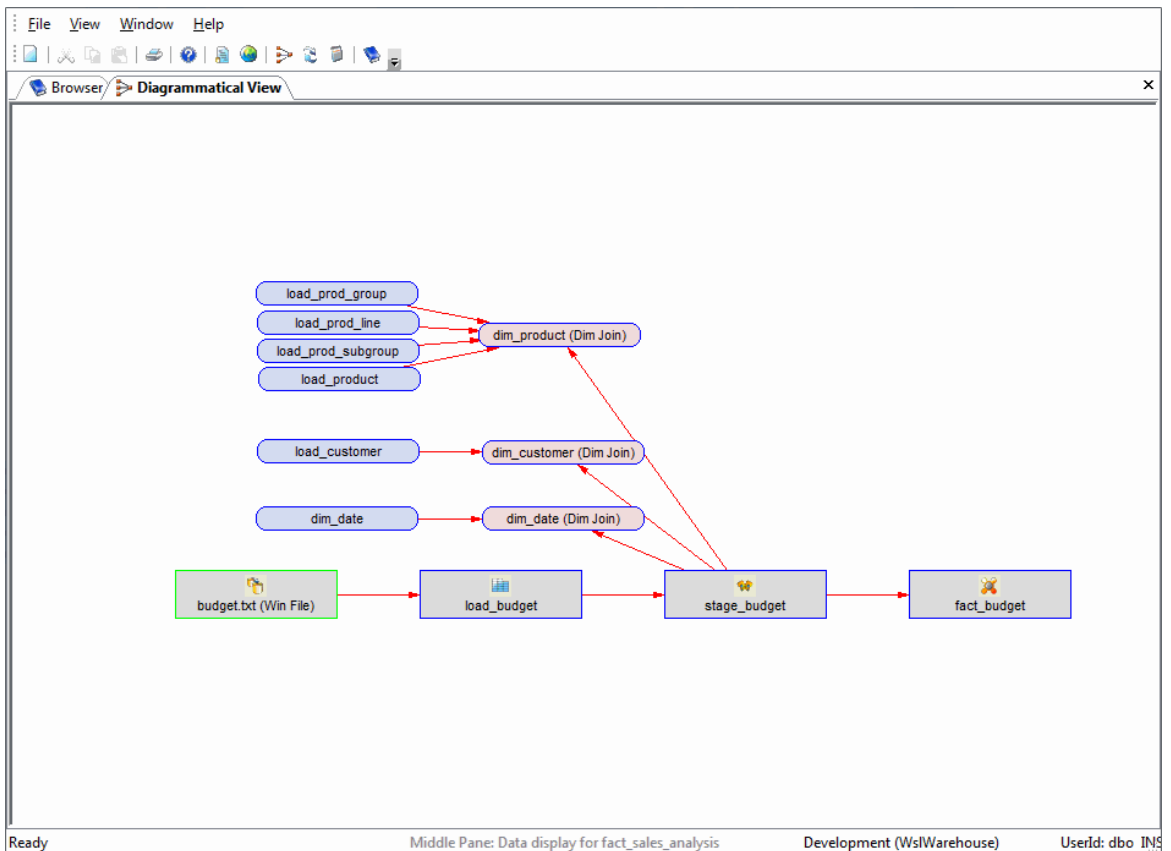
Make any changes here that are required and click OK.

For the diagram above, a job is created with the following tasks:



23.4.3 Data Join Track Back diagram

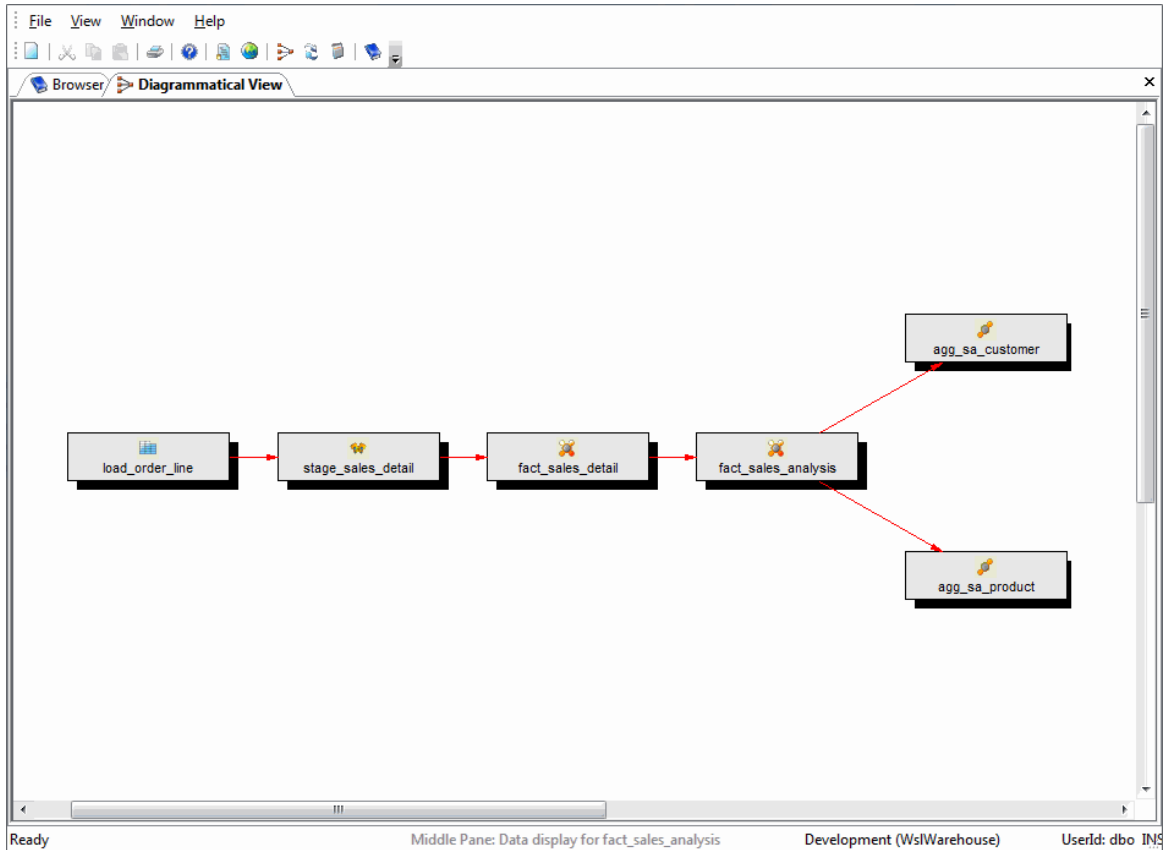
A data join track back diagram can be shown for any table. It shows connections back from the chosen table to the source tables from which information was derived and includes dimension table join. In the standard (dialog) view the blue lines denote links within the data warehouse database and the green lines show links to data outside of the data warehouse. Hovering the cursor over a line shows additional information. For blue lines the procedure used to move data between the two tables is displayed. For green lines additional information on the source of the data is displayed. If red lines, or boxes appear in a track back diagram they indicate a loop situation. If a table is found to be a child of itself then the link or box is colored red and the track back for that branch stops. A sample data join track back diagrams are as follows:



In the printable version the data sources outside of the data warehouse are colored green and those tables inside the data warehouse are colored blue.

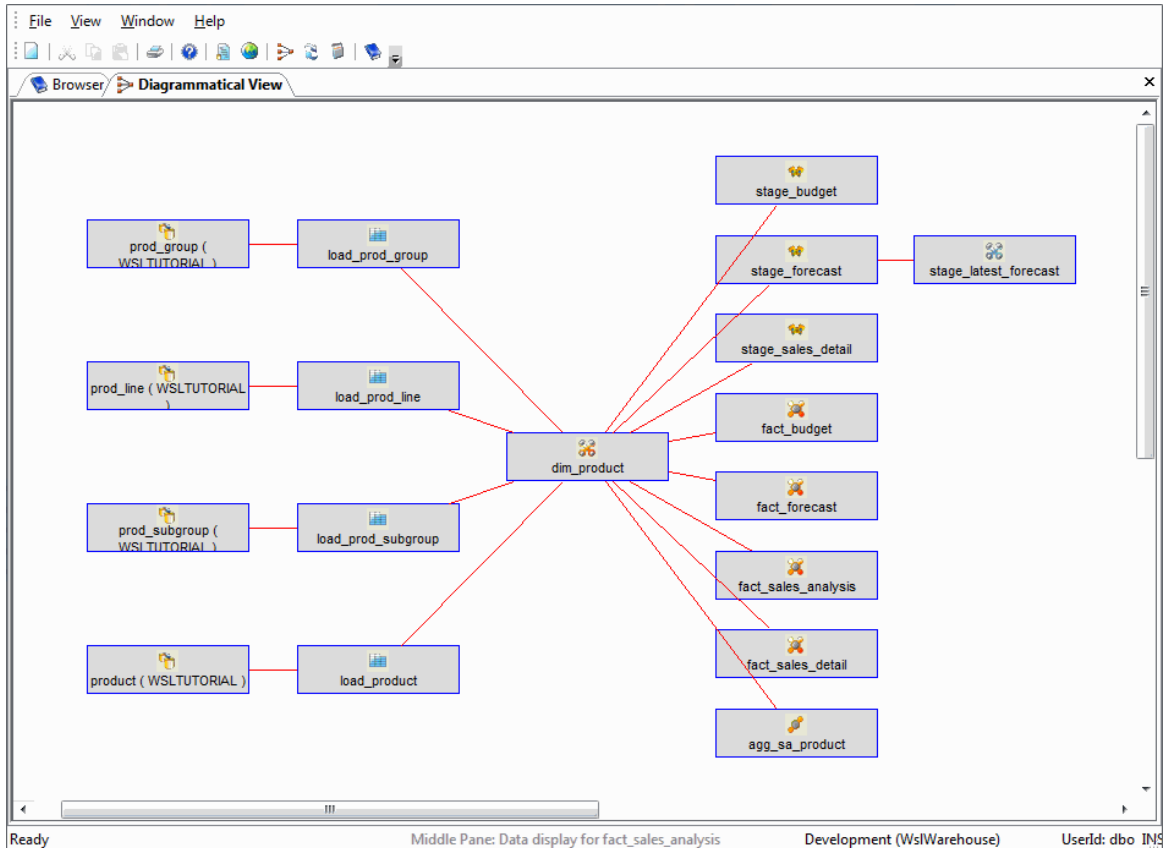
23.4.4 Track Forward diagram

A track forward diagram can be shown for any table. It shows connections forward from the chosen table to the subsequent tables built with columns from this table. This diagram relies on the source table and source column fields in each table type. If these fields do not reflect all of the base tables then the track back and track forward diagrams will not return the correct results. A sample track forward diagrams is as follows:



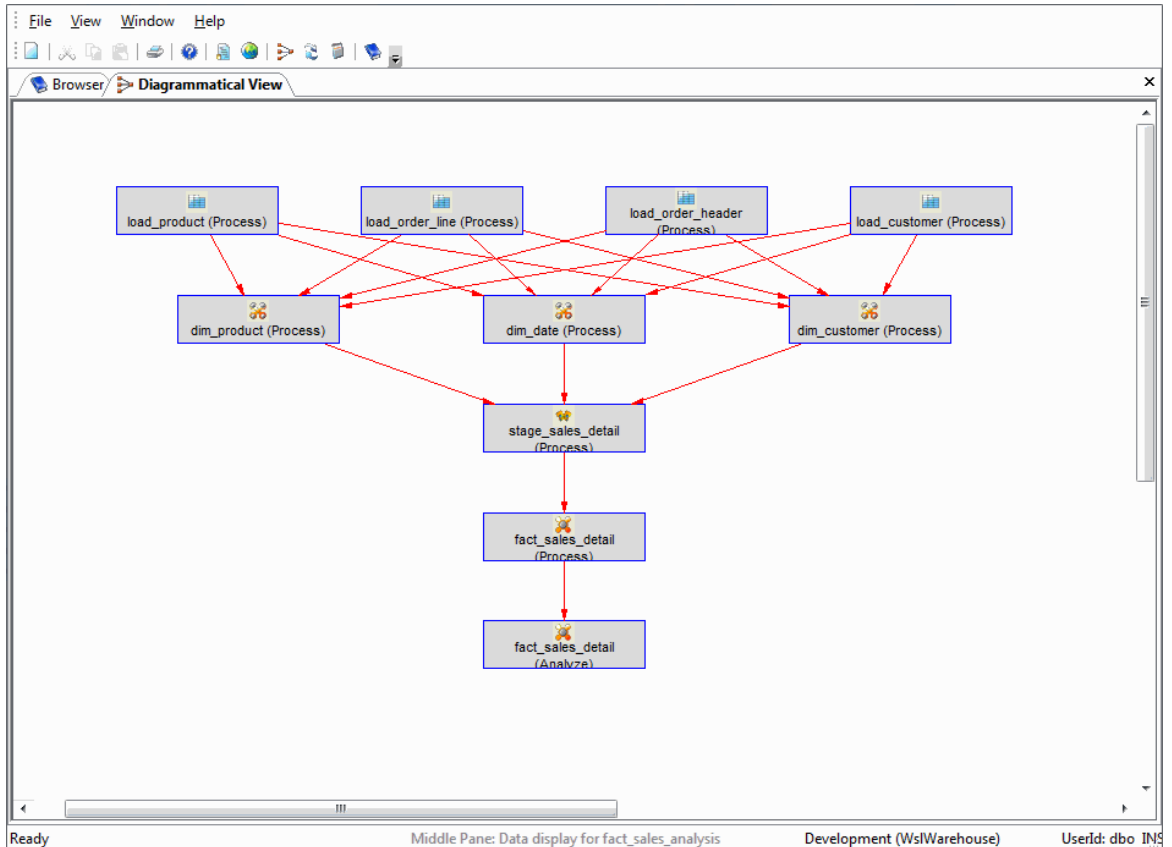
23.4.5 Linked Tables diagram

A linked tables diagram can be shown for any table. It shows relationships between tables, looking out from the chosen table a selected number of hops. The number of hops is determined by table relationships and source and target relationships. A sample linked tables diagrams is as follows:



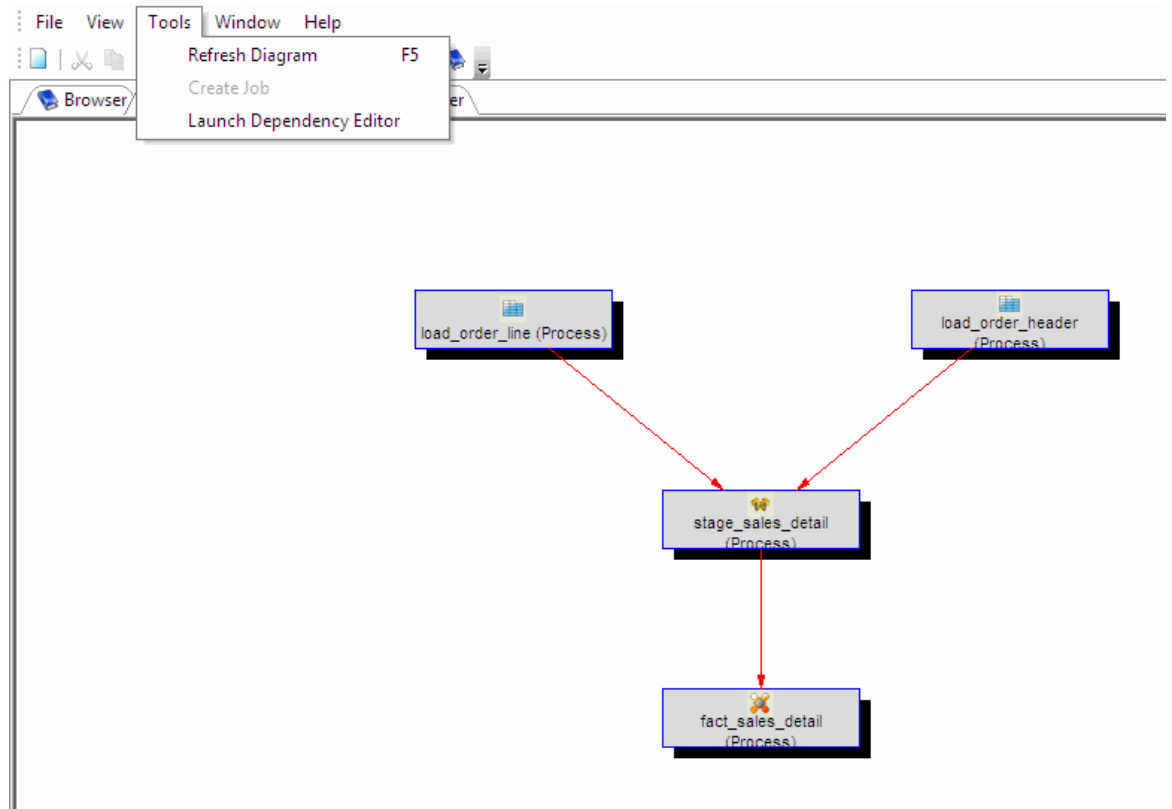
23.4.6 Job Dependencies diagram

A job dependencies diagram can be shown for any job defined in the QAD Data Warehouse Designer scheduler. It shows the parent and child relationships between tasks within a job.table. A sample job dependencies diagram is as follows:

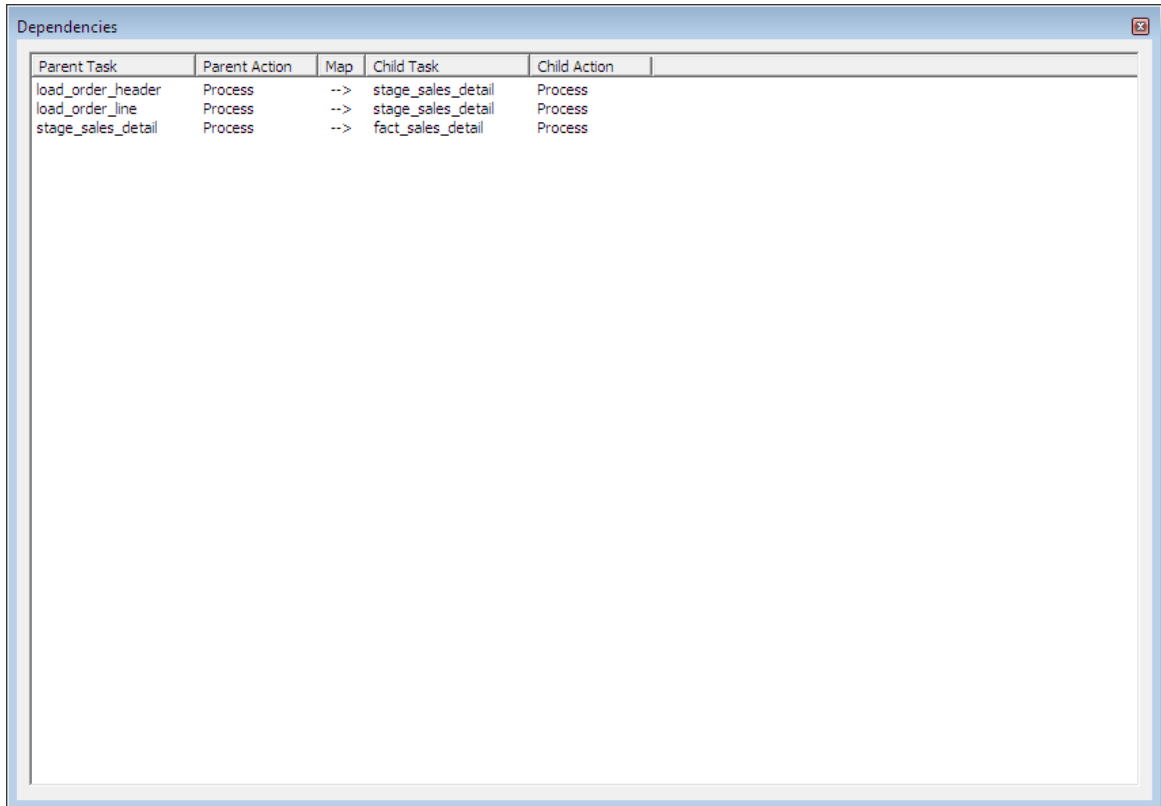


Editing a Job's Dependencies from a Job Dependencies diagram

Once a Job Dependencies diagram has been created for a job, its dependencies can be edited from the diagram. To do this, choose **Launch Dependency Editor** from the Tools menu:



This displays the following dialog:

A screenshot of a 'Dependencies' dialog box. It features a table with five columns: 'Parent Task', 'Parent Action', 'Map', 'Child Task', and 'Child Action'. The table contains three rows of data. The first row shows 'load_order_header' as the parent task, 'Process' as the parent action, a double arrow as the map, 'stage_sales_detail' as the child task, and 'Process' as the child action. The second row shows 'load_order_line' as the parent task, 'Process' as the parent action, a double arrow as the map, 'stage_sales_detail' as the child task, and 'Process' as the child action. The third row shows 'stage_sales_detail' as the parent task, 'Process' as the parent action, a double arrow as the map, 'fact_sales_detail' as the child task, and 'Process' as the child action. The dialog box has a standard Windows-style title bar and a close button in the top right corner.

Parent Task	Parent Action	Map	Child Task	Child Action
load_order_header	Process	-->	stage_sales_detail	Process
load_order_line	Process	-->	stage_sales_detail	Process
stage_sales_detail	Process	-->	fact_sales_detail	Process

23.5 Query Tool Access

Where the business definition has been set in the properties of either a fact or dimension column QAD Data Warehouse Designer will attempt to record this information in the database. For the Oracle database this business definition is stored as a column comment. Many end user query tools can make use of these Oracle column comments. They can also be examined via the Oracle database system views `all_col_comments` and `user_col_comments`. For the SQL Server database the business definition is also stored as a column comment via the `sp_addextendedproperty` procedure with a property name of 'Comment'.

In addition a number of metadata views exist to make the task of connecting an end user query tool to the data warehouse simpler. Many end user tools can make use of external data to populate their end-user-layer (eul) definitions. Using these views end user query tools can utilize QAD Data Warehouse Designer's business metadata. The views supplied are:

Dimension tables and columns

The view `ws_admin_v_dim_col` provides a listing of all columns in all dimensions that have the 'Eul visible' flag set. Included in the information provided is the business definition and description of the column as defined within QAD Data Warehouse Designer.

Fact tables and columns

The view `ws_admin_v_fact_col` provides a listing of all columns in all fact tables that have the 'Eul visible' flag set. Included in the information provided is the business definition and description of the column as defined within QAD Data Warehouse Designer.

Fact - Dimension Joins

The view `ws_admin_v_fact_join` provides a listing of all fact tables and all the dimensions that each fact table joins to. Both the fact table dimension key column and the dimension key column are included in the view.

CHAPTER 24

24. Reports

QAD Data Warehouse Designer includes reports for analyzing columns, tables, procedures, indexes, objects and jobs.

When these reports are run, the results are displayed in a separate tab in the bottom pane of the Data Warehouse Designer screen.

The following sections describe the purpose, parameters and results for each report.

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24.1 Dimension-Fact Matrix

This report shows dimension tables used by each fact and aggregate table in the metadata as a matrix.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Dimension Tables
- Fact Tables
- Aggregate Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of refreshed objects in the metadata repository with the following columns:

- Dimensions (*the dimension name*)
- Fact / Aggregate Table 1
- Fact / Aggregate Table 2
- ...
- Fact / Aggregate Table *n*

The cells in the crosstab have a 1 to indicate the dimension is used by the fact or aggregate table and blank otherwise. The result set is not sortable.

Report Example

Report: Fact to Dimension cross reference						
Dimensions	fact_budget	fact_forecast	fact_sales_analysis	fact_sales_detail	agg_sa_customer	agg_sa_product
 dim_customer	1	1	1	1	1	
 dim_date	1	1				
 dim_kpi						
 dim_order_date				1		
 dim_product	1	1	1	1		1
 dim_ship_date			1	1	1	1

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

24.2 OLAP Dimension-Cube Matrix

This report shows the relationships between cube measure groups and OLAP dimensions in the metadata as a matrix.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- OLAP Dimensions
- OLAP Measure Groups

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of refreshed objects in the metadata repository with the following columns:

- Dimensions (*the dimension name*)
- Measure Group 1
- Measure Group 2
- ...
- Measure Group *n*

The cells in the crosstab have a value to indicate the relationship else 'No Relationship' if no relationship exists between the Measure Group and the OLAP Dimension. The result set is not sortable.

Report Example

Report: Cube(Measure group) to Dimension cross reference			
Dimensions	sales_analysis (sales_detail)	sales_analysis (budget)	
 dim_customer	dim_customer	dim_customer	
 dim_order_d...	dim_order_date	No Relationship	
 dim_product	dim_product	dim_product	
 dim_ship_date	dim_ship_date	No Relationship	
 Date dimens...	No Relationship	Date dimension	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** to send the results of this report to Microsoft Excel.

24.3 Dimension Views of a Specified Dimension

This report shows dimension views built on a specified dimension table.

Objects Included

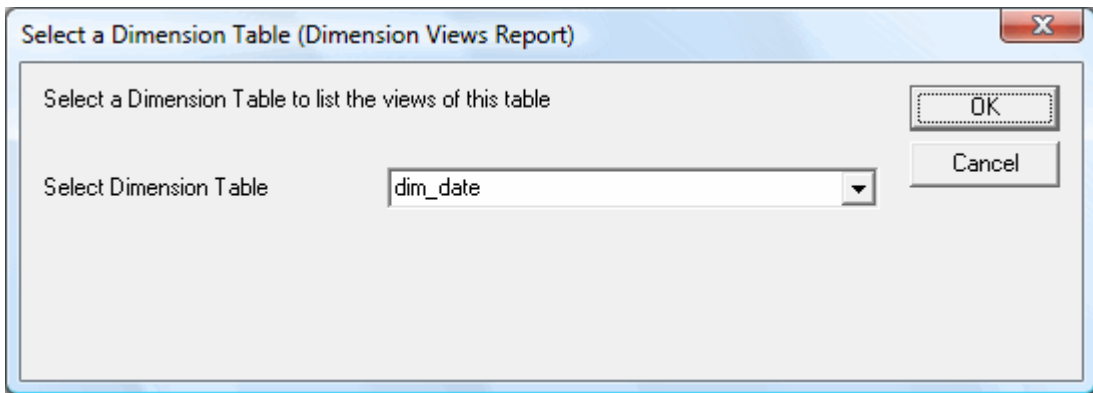
The following QAD Data Warehouse Designer object types are included in this report:

- Dimensions (Dimension View table type only)

Parameters

This report has one parameter:

- Dimension table name



Results

The results of this report are displayed as a list of objects in the metadata repository with the following columns:

- Dimension Name *(the name of the dimension table)*
- Dimension View Names

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Views of a dimension	
Dimension Name	Dimension View Names
 dim_date	dim_order_date
 dim_date	dim_ship_date

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

24.4 Column Reports

There are four reports for analyzing Columns:

- Columns without Comments
- All Column Transformations
- Re-Usable Column Transformations
- Column Track-Back

24.4.1 Columns without Comments

This report shows user facing **table** objects columns in the metadata that don't have descriptions.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Dimension Tables and Views
- Fact Tables
- Aggregate Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects and columns in the metadata missing comments with the following columns:

- Table name (*the name of the table*)
- Column Name
- Table type

Report Example

Report: Columns with no comments			
Table Name	Column Name	Table Type	
 agg_sa_customer	budget_quantity	Aggregate	
 agg_sa_customer	budget_sales_value	Aggregate	
 agg_sa_customer	dim_customer_key	Aggregate	
 agg_sa_customer	dim_ship_date_key	Aggregate	
 agg_sa_customer	forecast_quantity	Aggregate	
 agg_sa_customer	forecast_sales_value	Aggregate	
 agg_sa_customer	quantity	Aggregate	
 agg_sa_customer	sales_value	Aggregate	
 agg_sa_customer	tax	Aggregate	
 agg_sa_product	budget_quantity	Aggregate	
 agg_sa_product	budget_sales_value	Aggregate	
 agg_sa_product	dim_product_key	Aggregate	
 agg_sa_product	dim_ship_date_key	Aggregate	
 agg_sa_product	forecast_quantity	Aggregate	
 agg_sa_product	forecast_sales_value	Aggregate	
 agg_sa_product	quantity	Aggregate	
 agg_sa_product	sales_value	Aggregate	
 agg_sa_product	tax	Aggregate	
 dim_customer	address	Dimension	
 dim_customer	city	Dimension	
 dim_customer	code	Dimension	
 dim_customer	dim_customer_key	Dimension	
 dim_customer	dss_current_flag	Dimension	
 dim_customer	dss_end_date	Dimension	
 dim_customer	dss_start_date	Dimension	
 dim_customer	dss_update_time	Dimension	
 dim_customer	dss_version	Dimension	
 dim_customer	name	Dimension	
 dim_customer	state	Dimension	
 dim_date	cal_day_in_month	Dimension	
 dim_date	cal_day_in_week	Dimension	
 dim_date	cal_day_in_week_no	Dimension	
 dim_date	cal_day_in_year	Dimension	
 dim_date	cal_month	Dimension	

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

24.4.2 All Column Transformations

This report shows all columns that have a column transformation on them and the details of the transformation.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Exports

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata repository with the following columns:

- Table name (*the name of the table*)
- Column name
- Transformation

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Columns with transformations		
Table Name	Column Name	Transformation
 dim_product	description	UPPER(load_product.description)

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

24.4.3 Re-Usable Column Transformations

This report shows all reusable transformations as defined via tools/Reusable transformations.

Parameters

There are no parameters for this report.

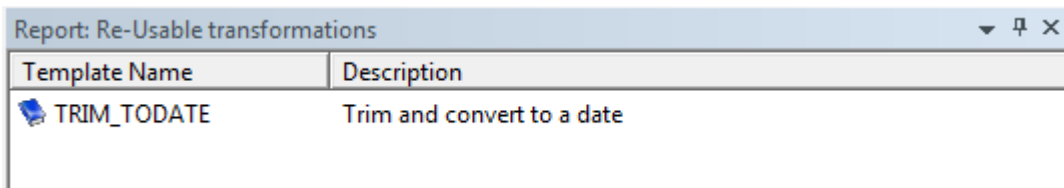
Results

The results of this report are displayed as a list of Re-Usable transformations with the following columns :

- Template Name
- Description

The result set is not sortable.

Report Example



Report: Re-Usable transformations	
Template Name	Description
 TRIM_TODATE	Trim and convert to a date

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.4.4 Column Track-Back

This report shows the lineage of a specified column in a specified table, including any transformations.

Objects Included

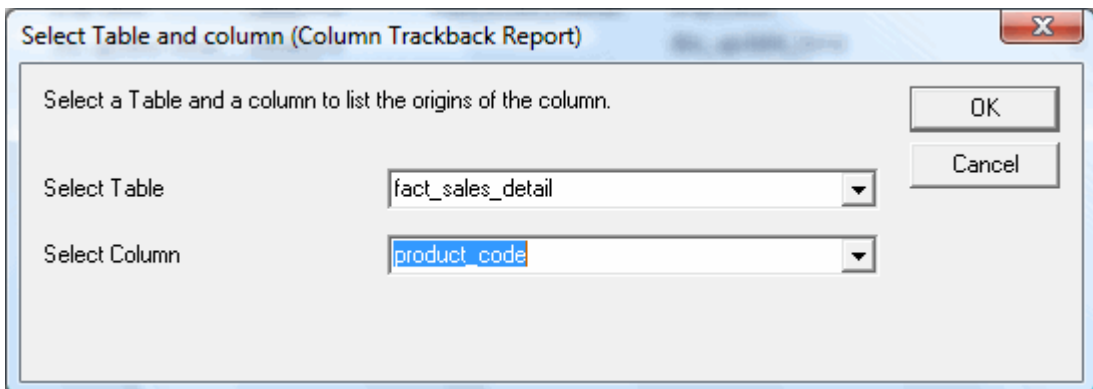
The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Exports

Parameters

This report has two parameters:

- Table (Object) name
- Column Name



Select Table and column (Column Trackback Report)

Select a Table and a column to list the origins of the column.

Select Table: fact_sales_detail

Select Column: product_code

OK Cancel

Results

The results of this report are displayed as a list of source tables and columns, the order of the result set determining the immediate lineage. It includes the following columns:

- Source table name (*the name of the table*)
- Source column
- Transform Code (*the SQL for column transformations*)

The result set is NOT sortable, as the order of the result set determines the immediate lineage.

Report Example

Report: Column track back		
Source table (fact_sales_detail)	Source column (product_code)	Transform Code
 fact_sales_detail	product_code	
 stage_sales_detail	product_code	TRIM(load_order_line.product_code)
 load_order_line	product_code	
 order_line	product_code	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.5 Table Reports

There are four reports for analyzing Tables:

- Tables without Comments
- Load Tables by Connection
- Records that failed a Dimension Join
- External source table/files

24.5.1 Tables without Comments

This report shows user facing **table** objects in the metadata that don't have descriptions.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Dimension Tables and Views
- Fact Tables
- Aggregate Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata missing comments with the following columns:

- Table name (*the name of the table*)
- Table type

Report Example

Report: Tables with no comments	
Table Name	Table Type
 agg_sa_customer	Aggregate
 agg_sa_product	Aggregate
 dim_customer	Dimension
 dim_date	Dimension
 dim_kpi	Dimension
 dim_order_date	Dimension View
 dim_product	Dimension
 dim_ship_date	Dimension View
 dss_fact_table	Dimension
 dss_source_system	Dimension
 fact_budget	Fact Table
 fact_forecast	Fact Table
 fact_kpi	Kpi Fact Table
 fact_sales_analysis	Fact Table
 fact_sales_detail	Fact Table

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.5.2 Load Tables by Connection

This report shows load tables in the metadata repository with their Connection and Source schema or database.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata repository with the following columns:

- Load table *(the name of the load table)*
- Connection
- Source schema *(the name the database or schema the load table is source from - blank for files)*

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Load tables			
Load table	Connection	Db Link	Source schema
 load_states	Retail Model		dbo
 load_kpi	Tutorial (OLTP)		dbo
 load_order_header	Tutorial (OLTP)		dbo
 load_order_line	Tutorial (OLTP)		dbo
 load_prod_group	Tutorial (OLTP)		dbo
 load_prod_line	Tutorial (OLTP)		dbo
 load_prod_subgroup	Tutorial (OLTP)		dbo
 load_product	Tutorial (OLTP)		dbo
 load_budget	Windows		
 load_forecast	Windows		

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

24.5.3 Records that failed a Dimension Join

This report shows the dimension business key(s) that could not be found in a specified dimension when a specified staging table was last updated.

Objects Included

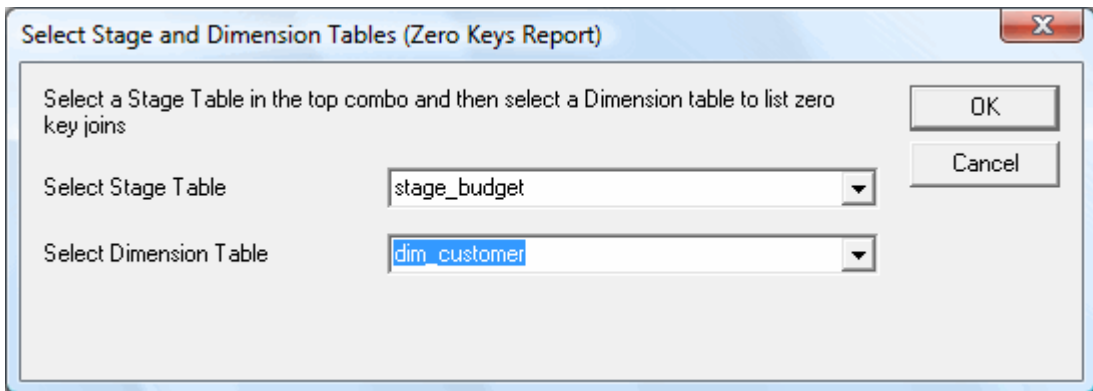
The following QAD Data Warehouse Designer object types are included in this report:

- Stage Tables

Parameters

This report requires two parameters to be specified:

- Stage Table Name (*the staging table to be checked*)
- Dimension Table Name (*the dimension table of the dimension key in the staging table selected first*)



Select Stage and Dimension Tables (Zero Keys Report)

Select a Stage Table in the top combo and then select a Dimension table to list zero key joins

Select Stage Table: stage_budget

Select Dimension Table: dim_customer

OK Cancel

Results

The results of this report are displayed as a list of refreshed objects in the metadata repository with the following columns:

- Business Key Column 1 (from staging table)
- Business Key Column 2, if applicable (from staging table)
- ...
- Business Key Column *n*, if applicable (from staging table)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Zero key joins						
budget_quantity	budget_sales_value	dim_customer_key	dim_date_key	dim_product_key	dss_update_time	custome
 185	409.92	0	20000602	2	2007-11-23 00:2...	228
 80	978.58	0	20000602	8	2007-11-23 00:2...	228
 62	572.42	0	20010430	3	2007-11-23 00:2...	227
 98	766.17	0	20010430	7	2007-11-23 00:2...	227
 40	218.00	0	20011105	4	2007-11-23 00:2...	226
 40	618.00	0	20011105	6	2007-11-23 00:2...	226
 74	940.24	0	20020404	9	2007-11-23 00:2...	225
 74	163.97	0	20020404	2	2007-11-23 00:2...	225
 40	618.00	0	20020404	6	2007-11-23 00:2...	225
 98	766.17	0	20020404	7	2007-11-23 00:2...	225
 74	402.54	0	20020404	4	2007-11-23 00:2...	225
 15	134.85	0	20011115	3	2007-11-23 00:2...	224
 15	177.34	0	20011115	8	2007-11-23 00:2...	224
 15	159.50	0	20011115	1	2007-11-23 00:2...	224
 74	812.46	0	20000813	1	2007-11-23 00:2...	223
 29	369.17	0	20000813	9	2007-11-23 00:2...	223
 80	622.52	0	20000813	7	2007-11-23 00:2...	223
 29	269.70	0	20000813	3	2007-11-23 00:2...	223

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.5.4 External Source Table/files

This report shows external sources for load tables in the metadata repository.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata repository with the following columns:

- Source name *(the name of the object's source)*
- Object name *(the name of the object)*
- Type *(the type of object the source is: Table or File)*
- Connection
- Other information *(for tables, the source schema/database.source table; for files, the file name)*

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Source object listing.				
Source name	Object name	Type	Connection	Other information
 budget.txt	load_budget	File	Windows	..budget.txt
 forecast.txt	load_forecast	File	Windows	..forecast.txt
 kpi	load_kpi	Table	Tutorial (OLTP)	[WslTutorial].dbo.kpi kpi
 order_header	load_order_header	Table	Tutorial (OLTP)	[WslTutorial].dbo.order_header order_header
 order_line	load_order_line	Table	Tutorial (OLTP)	[WslTutorial].dbo.order_line order_line
 prod_group	load_prod_group	Table	Tutorial (OLTP)	[WslTutorial].dbo.prod_group prod_group
 prod_line	load_prod_line	Table	Tutorial (OLTP)	[WslTutorial].dbo.prod_line prod_line
 prod_subgroup	load_prod_subgroup	Table	Tutorial (OLTP)	[WslTutorial].dbo.prod_subgroup prod_subgroup
 product	load_product	Table	Tutorial (OLTP)	[WslTutorial].dbo.product product
 states	load_states		Retail Model	.dbo.states states

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

24.6 Procedure Reports

There are two reports for analyzing Procedures:

- Modified Procedures
- Custom Procedures

24.6.1 Modified Procedures

This report shows modified procedures in the metadata repository with their creation and modification dates.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Procedures

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of modified procedures in the metadata repository with the following columns:

- Name (*the name of the object*)
- Dated Created
- Date Modified (*last modification date*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Modified procedures		
Procedure Name	Date Created	Date Modified
 update_stage_budget	2006-01-05 14:24:44.000	2007-11-22 23:58:25.460
 update_dim_customer	2006-01-05 14:23:41.000	2007-11-22 23:57:49.513

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

24.6.2 Custom Procedures

This report shows **custom** procedures in the metadata repository with their creation and modification dates.

Note: Custom procedures are procedures attached to any table object as a **Custom Procedure**.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Procedures

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of custom procedures in the metadata repository with the following columns:

- Name *(the name of the object)*
- Table Name *(the table object the procedure is attached to)*
- Dated Created
- Date Modified *(last modification date)*

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Custom procedures			
Procedure Name	Table Name	Date Created	Date Modified
 custom_dim_product	dim_product	2007-11-22 23:59:20.800	2007-11-22 23:59:20.800
 daily_date_roll	dim_date	2006-01-05 13:55:03.000	2006-01-05 13:55:03.000

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.7 Index Reports

There is one report for analyzing Indexes:

- Modified Indexes

24.7.1 Modified Indexes

This report shows indexes in the metadata repository with their creation and modification dates.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Indexes

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of indexes in the metadata repository with the following columns:

- Name (*the name of the index*)
- Dated Created
- Date Modified (*last modification date*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Modified index dates

Index Name	Date Created	Date Modified
 fact_kpi_idx_1	2006-01-05 15:05:43.000	2006-01-05 15:05:43.000
 fact_kpi_idx_B	2006-01-05 15:05:43.000	2006-01-05 15:05:43.000
 dim_kpi_idx_0	2006-01-05 14:40:41.000	2006-01-05 14:40:41.000
 dim_kpi_idx_A	2006-01-05 14:40:41.000	2006-01-05 14:40:41.000
 dim_product_idx_0	2006-01-05 14:28:51.000	2006-01-05 14:28:51.000
 dim_product_idx_A	2006-01-05 14:28:51.000	2006-01-05 14:28:51.000
 stage_forecast_idx_A	2006-01-05 14:25:01.000	2006-01-05 14:25:01.000
 stage_budget_idx_A	2006-01-05 14:24:44.000	2006-01-05 14:24:44.000
 stage_sales_detail_idx_A	2006-01-05 14:24:25.000	2006-01-05 14:24:25.000
 dim_customer_idx_0	2006-01-05 14:23:41.000	2006-01-05 14:23:41.000
 dim_customer_idx_A	2006-01-05 14:23:41.000	2006-01-05 14:23:41.000
 dim_customer_idx_SC	2006-01-05 14:23:41.000	2006-01-05 14:23:41.000
 agg_sa_customer_idx_1	2006-01-05 14:17:59.000	2006-01-05 14:17:59.000
 agg_sa_customer_idx_2	2006-01-05 14:17:59.000	2006-01-05 14:17:59.000
 agg_sa_product_idx_1	2006-01-05 14:16:42.000	2006-01-05 14:16:42.000
 agg_sa_product_idx_2	2006-01-05 14:16:42.000	2006-01-05 14:16:42.000
 fact_sales_analysis_idx_1	2006-01-05 14:15:19.000	2006-01-05 14:15:19.000
 fact_sales_analysis_idx_2	2006-01-05 14:15:19.000	2006-01-05 14:15:19.000
 fact_sales_analysis_idx_3	2006-01-05 14:15:19.000	2006-01-05 14:15:19.000
 fact_forecast_idx_1	2006-01-05 14:12:57.000	2006-01-05 14:12:57.000
 fact_forecast_idx_2	2006-01-05 14:12:57.000	2006-01-05 14:12:57.000
 fact_forecast_idx_3	2006-01-05 14:12:57.000	2006-01-05 14:12:57.000
 fact_forecast_idx_A	2006-01-05 14:12:57.000	2006-01-05 14:12:57.000
 fact_budget_idx_1	2006-01-05 14:12:37.000	2006-01-05 14:12:37.000
 fact_budget_idx_2	2006-01-05 14:12:37.000	2006-01-05 14:12:37.000
 fact_budget_idx_3	2006-01-05 14:12:37.000	2006-01-05 14:12:37.000
 fact_budget_idx_A	2006-01-05 14:12:37.000	2006-01-05 14:12:37.000
 fact_sales_detail_idx_1	2006-01-05 14:05:50.000	2006-01-05 14:05:50.000
 fact_sales_detail_idx_2	2006-01-05 14:05:50.000	2006-01-05 14:05:50.000
 fact_sales_detail_idx_3	2006-01-05 14:05:50.000	2006-01-05 14:05:50.000
 fact_sales_detail_idx_4	2006-01-05 14:05:50.000	2006-01-05 14:05:50.000
 fact_sales_detail_idx_A	2006-01-05 14:05:50.000	2006-01-05 14:05:50.000
 dim_date_idx_0	1900-01-01 00:00:00.000	1900-01-01 00:00:00.000
 dim_date_idx_A	1900-01-01 00:00:00.000	1900-01-01 00:00:00.000

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

24.8 Object Reports

There is four reports for analyzing Objects:

- Objects-Project Matrix
- Modified Objects (excluding indexes)
- Objects Checked-out
- Loaded or Imported Objects

24.8.1 Objects-Project Matrix

This report shows all objects that exist in one or more projects (other than **All Objects**) and the project(s) in which they exist.

Objects Included

All object types are included in this report.

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata repository that are in one or more projects (other than **All Objects**) with the following columns as a grid:

- Objects (*the name of the object*)
- Project Name 1 (*heading is the name of the first project, value is a 1 to indicate the object is in this project, blank otherwise*)
- Project Name 2 (*heading is the name of the second project, value is a 1 to indicate the object is in this project, blank otherwise*)
- ...
- Project Name n (*heading is the name of the nth project, value is a 1 to indicate the object is in this project, blank otherwise*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Object to Project cross reference

Objects	Dimensions	Sales Analysis	Sales Loading
 agg_sa_customer		1	
 agg_sa_product		1	
 cube_budget		1	
 cube_combined		1	
 cube_sales_detail		1	
 dim_customer	1		1
 dim_date	1		
 dim_kpi	1		
 dim_order_date			1
 dim_product	1		1
 dim_ship_date			1
 exp_customer		1	
 fact_budget		1	
 fact_forecast		1	
 fact_sales_analysis		1	
 fact_sales_detail		1	
 load_budget			1
 load_forecast			1
 load_kpi			1
 load_order_header			1
 load_order_line			1
 load_prod_group			1
 load_prod_line			1
 load_prod_subgroup			1
 load_product			1
 load_states			1
 stage_budget			1
 stage_forecast			1
 stage_sales_detail			1

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.8.2 Modified Objects (excluding indexes)

This report shows objects in the metadata repository with their creation and modification dates and indicates if they have been modified.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Exports
- Procedures
- Host Scripts

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata repository with the following columns:

- Name (*the name of the object*)
- Object Type
- Dated Created
- Date Modified (*last modification date*)
- Modified (*a star for modified objects, blank for objects that have not been modified*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Modified object dates

Name	Object type	Date Created	Date Modified	Modified
 exp_customer	Export table	2007-11-22 23:26:48.190	2007-11-22 23:26:48.190	
 load_states	Load table	2007-11-22 23:20:47.370	2007-11-22 23:20:47.370	
 update_fact_kpi	Procedure	2006-01-05 15:05:43.000	2006-01-05 15:05:43.000	
 fact_kpi	Fact table	2006-01-05 14:41:25.000	2006-01-05 14:46:54.000	*
 get_dim_kpi_key	Procedure	2006-01-05 14:40:41.000	2006-01-05 14:40:41.000	
 update_dim_kpi	Procedure	2006-01-05 14:40:41.000	2006-01-05 14:40:41.000	
 dim_kpi	Dimension table	2006-01-05 14:40:34.000	2006-01-05 14:40:34.000	
 load_kpi	Load table	2006-01-05 14:40:11.000	2006-01-05 14:40:11.000	
 get_dim_product_key	Procedure	2006-01-05 14:28:50.000	2006-01-05 14:28:50.000	
 update_dim_product	Procedure	2006-01-05 14:28:50.000	2006-01-05 14:28:50.000	
 dim_product	Dimension table	2006-01-05 14:02:04.000	2006-01-05 14:27:12.000	*
 load_prod_subgroup	Load table	2006-01-05 14:25:51.000	2006-01-05 14:25:51.000	
 load_prod_line	Load table	2006-01-05 14:25:45.000	2006-01-05 14:25:45.000	
 load_prod_group	Load table	2006-01-05 14:25:38.000	2006-01-05 14:25:38.000	
 update_stage_forecast	Procedure	2006-01-05 14:25:01.000	2006-01-05 14:25:01.000	
 update_stage_budget	Procedure	2006-01-05 14:24:44.000	2006-01-05 14:24:44.000	
 update_stage_sales_detail	Procedure	2006-01-05 14:24:25.000	2006-01-05 14:24:25.000	
 get_dim_customer_key	Procedure	2006-01-05 14:23:41.000	2006-01-05 14:23:41.000	
 update_dim_customer	Procedure	2006-01-05 14:23:41.000	2006-01-05 14:23:41.000	
 update_agg_sa_customer	Procedure	2006-01-05 14:17:59.000	2006-01-05 14:17:59.000	
 agg_sa_customer	Aggregate table	2006-01-05 14:16:07.000	2006-01-05 14:17:51.000	*
 update_agg_sa_product	Procedure	2006-01-05 14:16:42.000	2006-01-05 14:16:42.000	
 agg_sa_product	Aggregate table	2006-01-05 14:16:07.000	2006-01-05 14:16:24.000	*
 update_fact_sales_analysis	Procedure	2006-01-05 14:15:19.000	2006-01-05 14:15:19.000	
 fact_sales_analysis	Fact table	2006-01-05 14:13:30.000	2006-01-05 14:14:48.000	*
 update_fact_forecast	Procedure	2006-01-05 14:12:57.000	2006-01-05 14:12:57.000	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.8.3 Objects Checked-out

This report lists all objects currently checked out.

Objects Included

All object types and data warehouse tables can be included in this report.

Parameters

There are no parameters for this report.

Results

The results of this report are displayed with the following columns:

- Object Name *(The name of the object)*
- Object Type *(The type of the object, e.g. Fact, Dimension, etc)*
- Checked until *(The date the object will be automatically checked back in)*
- Checked by *(The name of the QAD Data Warehouse Designer user who checked out the object)*
- Reason *(The reason provided for checking out the object)*
- Contact *(The contact details provided when the object was checked out)*

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Objects Checked Out

Name	Object type	Checked until	Checked by	Reason	Contact
 fact_budget	Fact Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 fact_forecast	Fact Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 load_budget	Load Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 load_forecast	Load Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 script_load_budget	Host Script	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 script_load_forecast	Host Script	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 stage_budget	Stage Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 stage_forecast	Stage Table	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 update_fact_budget	Procedure	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 update_fact_forecast	Procedure	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 update_stage_budget	Procedure	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	
 update_stage_forecast	Procedure	2009-07-05 00:00:00.000000	WhereScape QuickStart	Changes to file load facts	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.8.4 Loaded or Imported Objects

This report shows objects in the metadata repository that have been refreshed or imported from another repository.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Join Indexes
- Views
- Cubes
- Exports
- Procedures
- Host Scripts

Note: Indexes are not included.

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of refreshed objects in the metadata repository with the following columns:

- Object Name
- Date (*of last refresh or import*)
- Description (*the kind of import or refresh*)
- Detail (*not currently used*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Refreshed Objects			
Object Name	Date	Description	Detail
 daily_date_roll	2007-11-22 23:16:05.207	Auto version on delete/upgrade by Application load	
 dim_date	2007-11-22 23:16:06.220	Auto version on delete/upgrade by Application load	
 dss_fact_table	2007-11-22 23:16:07.020	Auto version on delete/upgrade by Application load	
 dss_source_system	2007-11-22 23:16:07.097	Auto version on delete/upgrade by Application load	
 get_dim_customer_key	2007-11-22 23:15:53.940	Auto version on delete/upgrade by Application load	
 get_dim_date_key	2007-11-22 23:15:54.677	Auto version on delete/upgrade by Application load	
 get_dim_date_key	2007-11-22 23:15:54.880	Auto version on delete/upgrade by Application load	
 get_dim_kpi_key	2007-11-22 23:15:56.067	Auto version on delete/upgrade by Application load	
 get_dim_product_key	2007-11-22 23:15:56.940	Auto version on delete/upgrade by Application load	
 ToDo	2007-11-22 23:16:05.393	Auto version on delete/upgrade by Application load	
 update_dim_date	2007-11-22 23:15:55.457	Auto version on delete/upgrade by Application load	
 update_dss_fact_table	2007-11-22 23:15:57.753	Auto version on delete/upgrade by Application load	
 update_dss_source_system	2007-11-22 23:15:57.910	Auto version on delete/upgrade by Application load	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.9 Job Reports

There is six reports for analyzing Jobs:

- Object-Job Matrix
- Jobs with an Object
- Tasks of a Job
- Object Performance History
- Job Performance History
- Task Performance History

24.9.1 Object-Job Matrix

This report shows all jobs and objects as well as the object actions. Table and Cube objects not in any jobs also appears with **No Job** as their job.

Objects Included

All object types are included in this report.

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of jobs with the following columns:

- Table Name (*the name of the table or cube*)
- Action
- Job Name (*the name of the job*)
- Job Status
- Job Last Run
- Job Next Run

Report Example

Report: All Tables and associated jobs

Table Name	Action	Job Name	Job St...	Job Last Run	Job Next Run
 fact_budget	Process	Daily Update	On Hold		2008-07-05 15:03:00
 dim_customer	Process	Daily Update	On Hold		2008-07-05 15:03:00
 dim_product	Process	Daily Update	On Hold		2008-07-05 15:03:00
 stage_budget	Process	Daily Update	On Hold		2008-07-05 15:03:00
 stage_forecast	Process	Daily Update	On Hold		2008-07-05 15:03:00
 stage_sales_detail	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_budget	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_customer	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_forecast	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_order_header	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_order_line	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_prod_group	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_prod_line	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_prod_subgroup	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_product	Process	Daily Update	On Hold		2008-07-05 15:03:00
 load_states	Process	Daily Update	On Hold		2008-07-05 15:03:00
 fact_kpi		No Job			
 fact_forecast		No Job			
 fact_sales_analysis		No Job			
 fact_sales_detail		No Job			
 dim_date		No Job			
 dim_kpi		No Job			
 dim_state		No Job			
 dss_fact_table		No Job			
 dss_source_system		No Job			
 load_kpi		No Job			
 agg_sa_customer		No Job			
 agg_sa_product		No Job			
 dim_order_date		No Job			
 dim_ship_date		No Job			
 cube_budget		No Job			
 cube_combined		No Job			
 cube_sales_detail		No Job			

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

24.9.2 Jobs with an Object

This report shows all jobs a specified object appears in and its action.

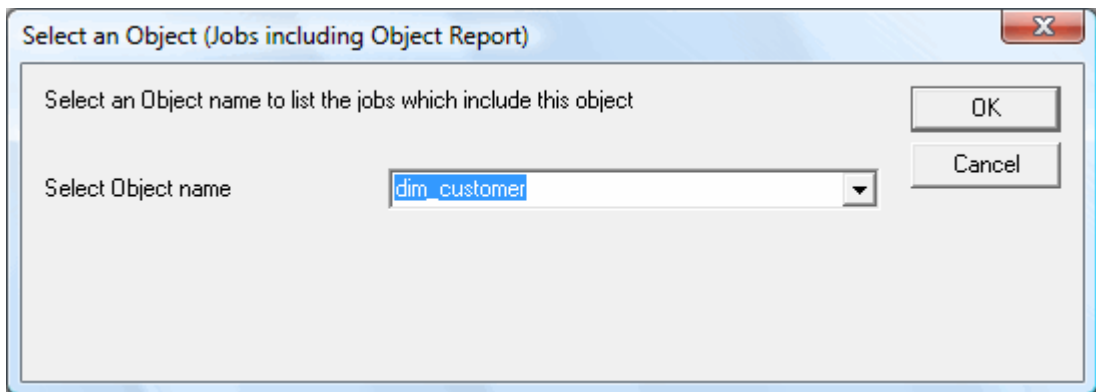
Objects Included

All object types are included in this report.

Parameters

This report has one parameter:

- Object Name



Results

The results of this report are displayed as a list of jobs with the following columns:

- Jobs including object_name
- Action

Report Example

Report: Jobs which include an object	
Jobs including dim_customer	Action
 Daily Update	Process
 Dimension_Refresh	Process

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.9.3 Tasks of a Job

This report shows all tasks for a selected job including dependencies.

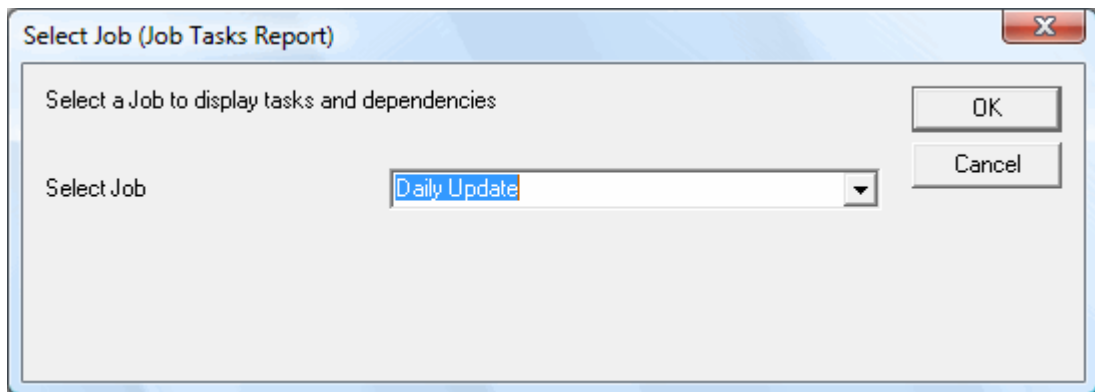
Objects Included

All object types are included in this report.

Parameters

This report has one parameter:

- Job Name



The screenshot shows a Windows-style dialog box titled "Select Job (Job Tasks Report)". Inside the dialog, there is a label "Select a Job to display tasks and dependencies" at the top. Below this, there is a label "Select Job" followed by a text box containing "Daily Update" and a dropdown arrow. To the right of the text box are two buttons: "OK" and "Cancel". The dialog has a standard Windows window border with a close button (X) in the top right corner.

Results

The results of this report are displayed as a list of task dependencies with the following columns:

- Task name *(the table, Index, procedure or script name)*
- Action
- Order *(the order number as shown in the edit tasks dialog in the scheduler)*
- Depends On *(the task(s) and order number this task depends on)*

Report Example

Report: Tasks within a job			
Task Name	Action	Order	Depends On
 load_order_header	Process	10.10.2	
 load_order_line	Process	10.10.3	
 load_product	Process	10.10.4	
 dim_customer	Process	11.10.5	load_order_header (10.10.2)
 dim_customer	Process	11.10.5	load_order_line (10.10.3)
 dim_customer	Process	11.10.5	load_product (10.10.4)
 dim_date	Process	11.10.6	load_order_header (10.10.2)
 dim_date	Process	11.10.6	load_order_line (10.10.3)
 dim_date	Process	11.10.6	load_product (10.10.4)
 dim_product	Process	11.10.7	load_order_header (10.10.2)
 dim_product	Process	11.10.7	load_order_line (10.10.3)
 dim_product	Process	11.10.7	load_product (10.10.4)
 stage_sales_detail	Process	12.10.8	dim_customer (11.10.5)
 stage_sales_detail	Process	12.10.8	dim_date (11.10.6)
 stage_sales_detail	Process	12.10.8	dim_product (11.10.7)
 fact_sales_detail	Process	13.10.9	stage_sales_detail (12.10.8)
 fact_sales_detail	Analyze	13.10.10	fact_sales_detail (13.10.9)

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.9.4 Object Performance History

This report shows the audit trail for a selected object from the scheduler logs.

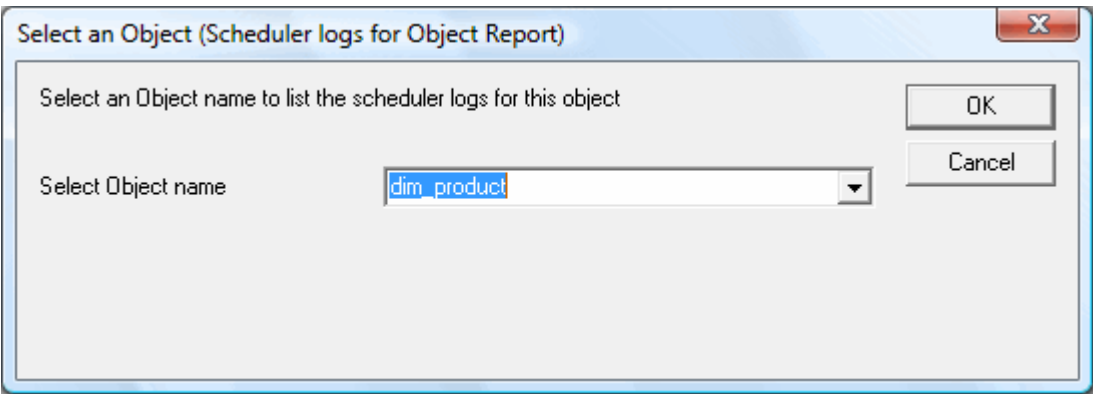
Objects Included

All object types are included in this report.

Parameters

This report has one parameter:

- Object Name



Results

The results of this report are displayed as a list of audit log entries with the following columns:

- Sta (the type of audit log entry)
- Time (the date and time the audit log entry was written)
- Seq (the job sequence of the job writing the audit log entry)
- Message (the message in the Audit log)
- Task (the object name)
- Job (the name of the job that ran the task)

Report Example

Report: Scheduler logs for an object							
Sta	Time	Seq	Message	Task	Database ...	Db Code	Job
I	2007-11-23 00:...	17	No indexes to drop.	dim_product			Daily Update
I	2007-11-23 00:...	17	No indexes rebuilt	dim_product			Daily Update
S	2007-11-23 00:...	17	dim_product updated. 0 new records. 9 records updated.	dim_product			Daily Update
I	2007-11-23 00:...	18	No indexes to drop.	dim_product			Daily Update
I	2007-11-23 00:...	18	No indexes rebuilt	dim_product			Daily Update
S	2007-11-23 00:...	18	dim_product updated. 0 new records. 9 records updated.	dim_product			Daily Update

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.9.5 Job Performance History

This report shows the performance (duration) of a specified job over time.

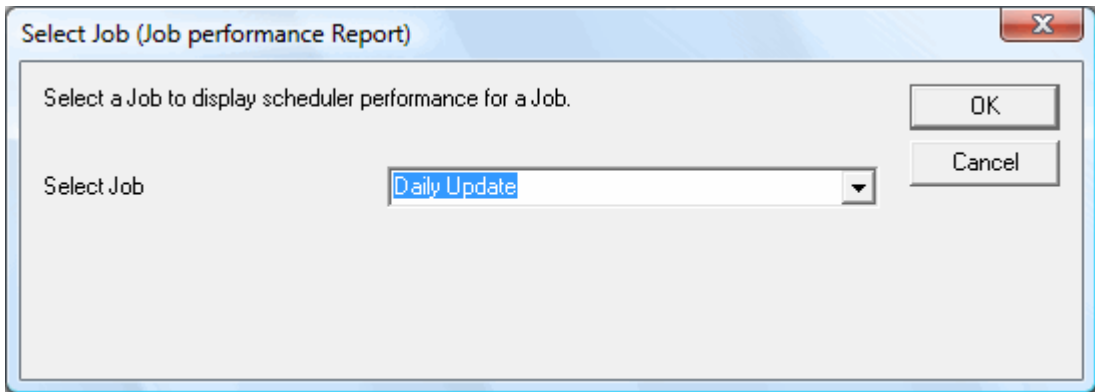
Objects Included

All object types are included in this report.

Parameters

This report has one parameter:

- Job Name



Results

The results of this report are displayed as a list of job instances with the following columns:

- Job name *(the name of the job)*
- Start time *(the date and time the job started)*
- Elapsed hh:mi *(the duration of the job)*

Report Example

Report: Job performance.			
Job Name	Start time	Elapsed hh:mi	
 Daily Update	2007-11-23 00:23:37.493	00:01	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

24.9.6 Task Performance History

This report shows the performance (duration) of a specified task within a specified job over time.

Objects Included

All object types are included in this report.

Parameters

This report has two parameters:

- Job Name
- Task Name (including action)

Results

The results of this report are displayed as a list of task instances for the selected job with the following columns:

- Task name *(the table, Index, procedure or script name)*
- Action
- Start time *(the date and time the task started)*
- Elapsed hh:mi *(the duration of the task)*

Report Example

Report: Task performance.			
Task Name	Action	Start time	Elapsed hh:mi
 dim_customer	Process	2007-11-23 00:23:37.667	00:00

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

C H A P T E R 2 5

25. Validate

When these Validate processes are run, the results are displayed in the centre pane of the Data Warehouse Designer screen; the results of the other reports are displayed in a separate tab in the bottom pane of the Data Warehouse Designer screen.

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25.1 Validate Meta-data

This process validates the Meta data. If problems are encountered, the results are displayed in the centre pane.

Use the right mouse option against each identified issue to apply a repair.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.2 Validate Workflow Data

This process validates the Workflow data. If problems are encountered, the results are displayed in the centre pane.

Use the right mouse option against each identified issue to apply a repair.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.3 Validate Table Create Status

This process validates a table structure in the meta data against the table in the database. Select one or more tables and use the **Validate Selected** button or **Validate ALL** tables.

If a table is found to be different then it can be altered by using the right mouse menu option when positioned over the table name.

If the update date and the modified in database date imply a change that is not apparent then these dates can be re-synced in the same way.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.4 Validate Load Table Status

This process compares a load table in the meta data with the table in the source system. It compares the columns and column data types.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.5 Validate Index Status

This process validates an index structure in the meta data against the index in the database. Select one or more indexes and use the **Validate Selected** button or **Validate ALL** indexes.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.6 Validate Procedure Status

This process compares a procedure in the meta data with the compiled version of the same procedure stored within the database. The subsequent display will report either a match or a difference.

If a procedure is found to differ then you can use the procedure editor to examine the exact differences by selecting the Tools/Compare to user_source option.

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

25.7 List Meta-data Tables not in the Database

This report shows database **table** objects in the metadata that don't exist in the data warehouse database.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Retro Copies (but not Retro Definitions)

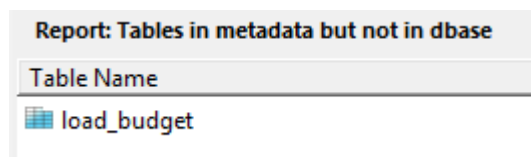
Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the metadata not in the data warehouse database.

Report Example



Report: Tables in metadata but not in dbase	
Table Name	
 load_budget	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

25.8 List Database Tables not in the Meta-data

This report shows database **table** objects that exist in the data warehouse database but not in the metadata.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables
- Retro Copies (but not Retro Definitions)

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of objects in the data warehouse database not in the metadata.

Report Example

Report: Tables in dbase but not in metadata	
Table Name	
 load_customer	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.9 List Tables with no related Procedures or Scripts

This report shows all table objects (certain types of objects only - see below) in the metadata repository that don't have an associated update procedure.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Load Tables (*script based loads only*)
- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables

Parameters

There are no parameters for this report.

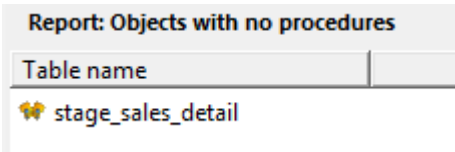
Results

The results of this report are displayed as a list of table objects in the metadata repository with the following columns:

- Table name

The result set is sortable by clicking on the appropriate column heading.

Report Example



Report: Objects with no procedures	
Table name	
 stage_sales_detail	

Sending Results to Microsoft Excel

Right click on the result set and click Excel it to send the results of this report to Microsoft Excel.

25.10 List Procedures not related to a Table

This report shows all procedures and host scripts in the metadata repository that aren't associated with a table object.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Procedures
- Host Scripts

Parameters

There are no parameters for this report.

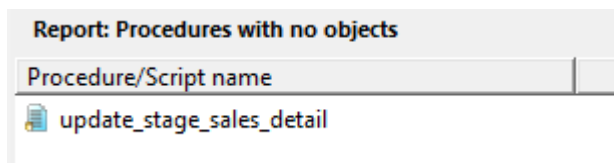
Results

The results of this report are displayed as a list of code objects in the metadata repository with the following columns:

- Procedure / Script name

The result set is sortable by clicking on the appropriate column heading.

Report Example



Report: Procedures with no objects	
Procedure/Script name	
 update_stage_sales_detail	

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

25.11 Compare Meta-data Repository to another

This report compares the current metadata repository to a remote repository.

Objects Included

All object types are included in this report.

Parameters

This report requires connection information for the remote repository to be entered. Specifically:

- Odbc Connect (*the odbc source for the other repository*)
- User Name (*user name for the remote repository*)
- Password (*password for the remote repository*)
- Meta Repository (*database/user the remote repository metadata is stored in*)

Four additional parameters may be specified:

- Optional filter on Local Groups
- Optional filter on Local Projects
- Do detail report
- Only validate procedures that have been modified

COMPARE REPOSITORY

Compare the current metadata repository with the repository selected below. Enter the connection and logon information for the repository to be compared and press OK.

Odbc Connect wslw/warehouse

User Name dbo

Password

Meta Repository dbo

Local Groups

Local Projects

This is usually a two pass process. The first pass will report each object with validation errors. A more detailed report for listed objects can be obtained by selecting the objects and right clicking detail.

You can however go straight to the detail report by selecting the detail option below.

Do detail report only. ☐

Only validate procedures that have been modified. ☐

NOTE: No sizing, tablespace, file group, date, description or documentation comparisons are performed.

WARNING: This will take a very long time for large repositories.

Results

The results of this report are displayed as a list of differences with the following columns:

- Object Name
- Comments (*Summary difference between current and selected repository*)

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Validate meta repository (Summary)

Object Name	Comments
 DataWarehouse	2 validation errors
 Retail Model	Connection name not found
 Tutorial (OLTP)	2 validation errors
 Windows	1 validation error
 load_budget	Load table not found in remote repository
 load_forecast	Load table not found in remote repository
 load_kpi	Load table not found in remote repository
 load_order_header	Load table not found in remote repository
 load_order_line	Load table not found in remote repository
 load_prod_group	Load table not found in remote repository
 load_prod_line	Load table not found in remote repository
 load_prod_subgroup	Load table not found in remote repository
 load_product	Load table not found in remote repository
 load_states	Load table not found in remote repository
 stage_budget	Stage table not found in remote repository
 stage_forecast	Stage table not found in remote repository
 stage_sales_detail	Stage table not found in remote repository
 dim_customer	Dimension table not found in remote repository
 dim_kpi	Dimension table not found in remote repository
 dim_order_date	Dimension table not found in remote repository
 dim_product	Dimension table not found in remote repository
 dim_ship_date	Dimension table not found in remote repository
 fact_budget	Fact table not found in remote repository
 fact_forecast	Fact table not found in remote repository
 fact_kpi	Fact table not found in remote repository
 fact_sales_analysis	Fact table not found in remote repository
 fact_sales_detail	Fact table not found in remote repository
 fact_kpi	Fact Kpi 'Sales' not found in remote repository
 fact_kpi	Fact Kpi 'Activity' not found in remote repository
 agg_sa_customer	Aggregate table not found in remote repository
 agg_sa_product	Aggregate table not found in remote repository
 exp_customer	Export table not found in remote repository
 dim_customer_idx_0	Index not found in remote repository
 dim_customer_idx_A	Index not found in remote repository
 dim_customer_idx_SC	Index not found in remote repository

Note: Right clicking on an object and choosing **Detail** will rerun the report for just the selected object, returning more detail in the **Comments** column

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.12 Compare Meta-data Indexes to Database

This report shows database indexes existing in the data warehouse database that don't exist in metadata.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Indexes

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of indexes in the data warehouse database not in the metadata with the following columns:

- Index Name *(the name of the index)*
- Table Name

Report Example

Report: Indexes not in metadata	
Index Name	Table Name
 dim_customer_idx_a	dim_customer
 fact_budget_idx_2	fact_budget

Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

25.13 List Duplicate Business Key Columns

This report shows any columns that are the business (natural) key of more than one table.

Objects Included

The following QAD Data Warehouse Designer object types are included in this report:

- Stage Tables
- Dimension Tables and Views
- Fact Tables
- Aggregate Tables

Parameters

There are no parameters for this report.

Results

The results of this report are displayed as a list of table columns with the following columns:

- Table name
- Column name

The result set is sortable by clicking on the appropriate column heading.

Report Example

Report: Duplicate business key column names	
Table name	Column name
 dim_product	code
 dim_customer	code
 fact_budget	customer_code
 fact_forecast	customer_code
 fact_forecast	product_code
 fact_budget	product_code

Sending Results to Microsoft Excel

Right click on the result set and click **Excel** it to send the results of this report to Microsoft Excel.

25.14 Query Data Warehouse Objects

This report allows SQL queries to be run as the user signed into the repository.

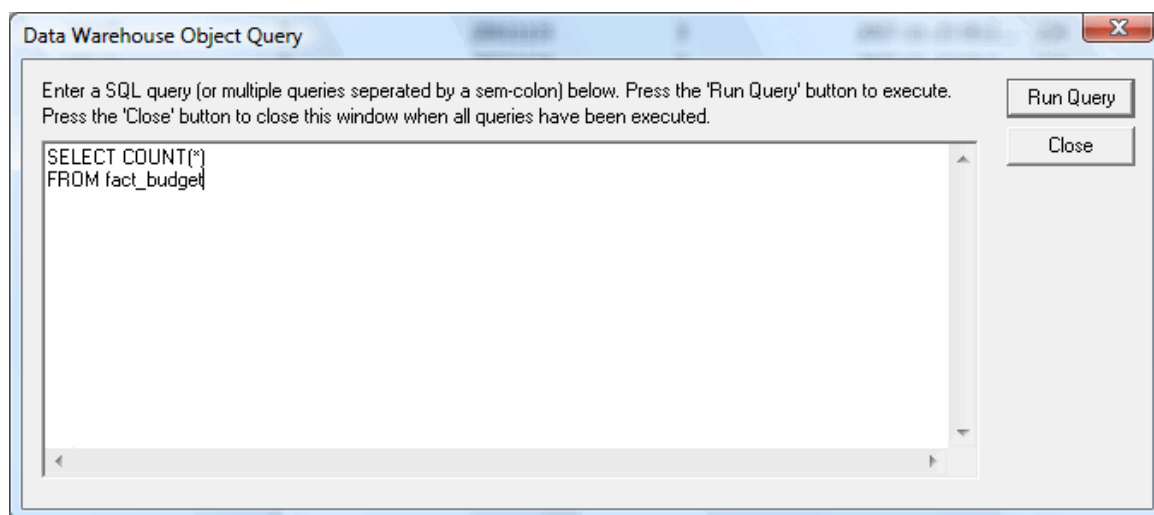
Objects Included

All object types and data warehouse tables can be included in this report.

Parameters

This report has one parameter:

- The SQL Query



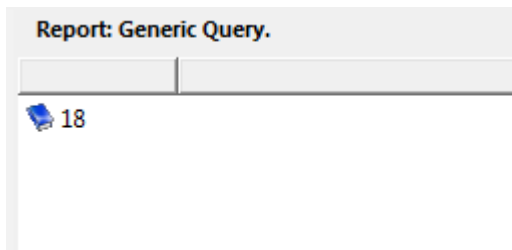
Results

The results of this report are displayed with the following columns:

- First SQL column SELECTed
- Second SQL column SELECTed
- ...
- nth SQL column SELECTed

The result set is sortable by clicking on the appropriate column heading.

Report Example



Sending Results to Microsoft Excel

Right click on the result set and click **Excel it** to send the results of this report to Microsoft Excel.

CHAPTER 26

26. Promoting Between Environments

This chapter covers the promotion of metadata objects between environments. Various methods exist for getting new or changed metadata from one repository into another repository.

It is of course possible and in fact desirable to have multiple metadata repositories. At the very least we would normally have a development and a production environment.

In some situations it may also be desirable to have multiple child development repositories with one master repository where all elements are brought together. QAD Data Warehouse Designer supports this type of structure but does not include source control or co-ordination of the repositories. It is up to the data warehouse manager to manually ensure that the various objects are kept in sync and coordinated.

As with any software system there are issues around how code is moved from a development environment into a testing or production environment.

This promotion of objects can be achieved via a number of different methods. Each is discussed below. In summary they are:

- 1 Updating a repository with an application or application patch.
- 2 Importing objects from another repository.
- 3 Restoring a full metadata set into a repository (see **Backup and Restore** (see "27. Backing Up and Restoring Metadata" on page 609)).

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26.1 Applications

The definition of an application is discussed in the following section on applications and the loading and updating of applications is discussed at some length in the Installation and Administration Guide. Only the concepts of the use of applications will be covered here.

An application is defined for our purposes as a group of objects. An application is a method of loading objects into a metadata repository. It can be used to upgrade or provide patches to an existing metadata repository. As such an application can be used to distribute and remotely maintain a specific data warehousing solution.

An application consists of a series of Windows' files, which can be distributed to remote sites.

A list of the applications that have been applied to the metadata repository can be acquired via the **Tools / List installed applications** menu option.

An application is created through the **Tools/Build application tables** menu option. This application can then update a metadata repository through the Setup / Administration utility. In this manner the application model can be used to update a metadata repository in an ordered and controlled fashion. Loading an application inserts various objects into the chosen metadata repository. An application is best defined as a set of objects that are shipped to allow inclusion of those objects in a remote repository.

Note: An application can only be loaded into a metadata repository running on the same database type as that of the application creator. (e.g. An Oracle application cannot be loaded into a SQL Server metadata repository, etc).

26.1.1 Application Creation

Creating an Application

An application is created by selecting the **Tools/Build application tables** menu option. The following dialog box is displayed. Once the application is defined and the objects selected, the application files are generated when the OK button is clicked. If procedures are compiled as part of the subsequent application load, the compiles occur in the order in which they are listed in the application. If procedure dependencies exist, ensure that their ordering in the application object list is correct.

There are three tabs in the 'Define and build an Application Distribution' screen. The first tab defines the application, the second lists the objects to add or replace in the destination repository and the third tab lists the objects to delete in the destination repository.

Define an Application distribution

Define and build an Application Distribution

Define an Application distribution | Objects to Add or Replace | Objects to Delete

This process builds the files necessary to allow the distribution of a data warehouse solution. These files are read and processed by the Setup Administrator utility. Specify an identifier, version and name for this application and select all the tables and ancillary procedures etc. required.

Output Directory: C:\ProgramData\QAD\Application\ Browse

Application Identifier: DEMO Version: 1.9

Application Name: Application Creation

Application Description: Documentation of Application Creation

Pre application load SQL. (the following optional SQL statement will be issued before the application load commences.)

Post application load SQL. (the following optional SQL statement will be issued after the application load completes.)

OK Cancel Apply

Output Directory

The directory to which the application files will be written. By default this will be the QAD program directory.

Application Identifier

The application identifier is a four character code used to uniquely identify the application. This identifier is used in the naming of the files that are created to contain the application data.

Version

The version is a character string that provides a version number for reference purposes. This version number is displayed when applications are being loaded, and is used in the naming of the files that are created to contain the application data. As such it must contain characters that are valid in a Windows file name.

Application Name

The name by which the application is known. This name is displayed during the choosing of an application to load and is recorded in the metadata of the repository into which an application is loaded. It is not used apart from documentation purposes.

Application Description

This description is displayed during the choosing of an application to load. It is not used at any other point apart from documentation purposes.

Application Files

When an application is created the following files are built, where XXXX is the application identifier and NNNNN is the application version.

File	Purpose
App_data_XXXX_NNNNN.wst	This file contains the scripts and data required to rebuild the objects in the new metadata repository.
App_id_XXXX_NNNNN.wst	This control file identifies the application and its version.
App_obj_XXXX_NNNNN.wst	This file contains control information and each object in the application.
App_con_XXXX_NNNNN.wst	A list of all the connections either in the application or used by objects in the application.
App_map_XXXX_NNNNN.wst	A list of all the project and group mappings for the objects in the application.

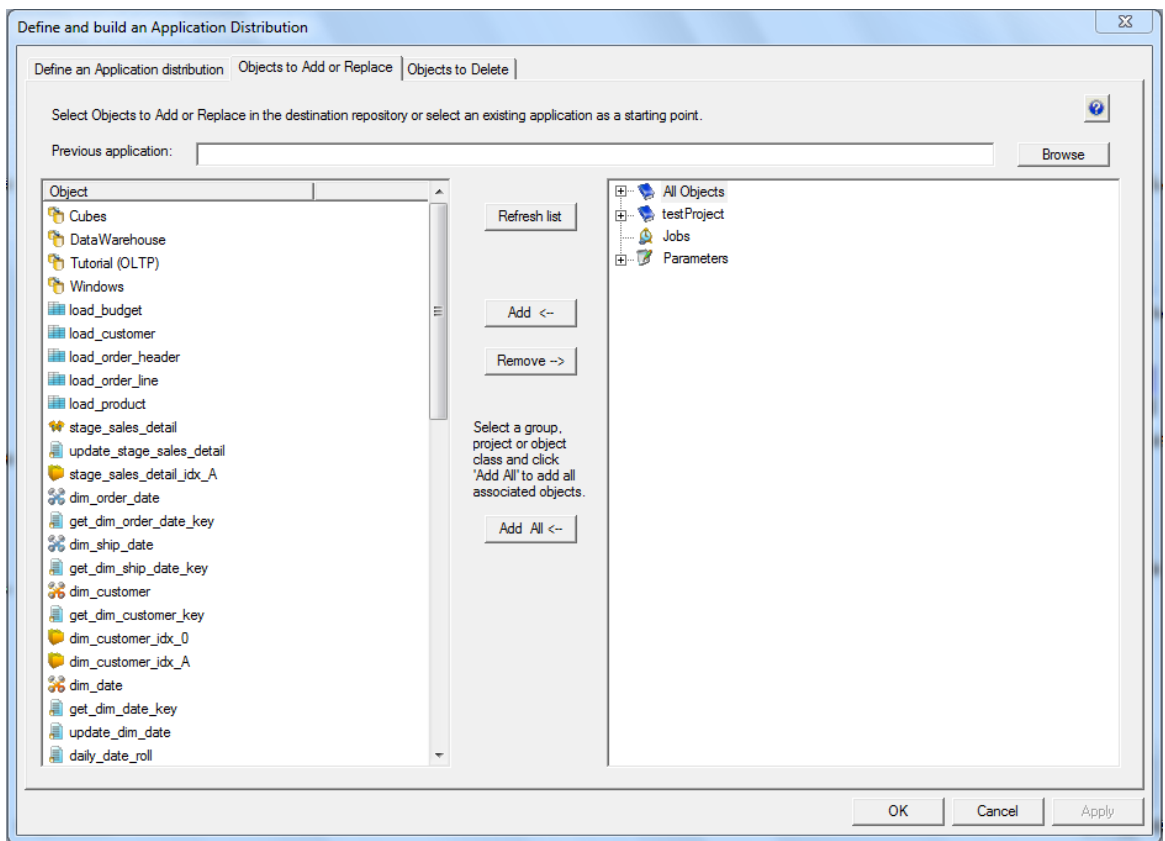
Pre application load SQL

This box allows the entry of a SQL Statement that will be executed before the application is loaded. For example we may wish to drop the date dimension before loading the application because we have changed the primary key constraint. In such a case we would enter 'drop table dim_date' in this field to have the table dropped before the application is loaded.

Post application load SQL

This box allows the entry of a SQL Statement that will be executed after the application is loaded. For example we could execute a function to populate a table.

Objects to Add or Replace

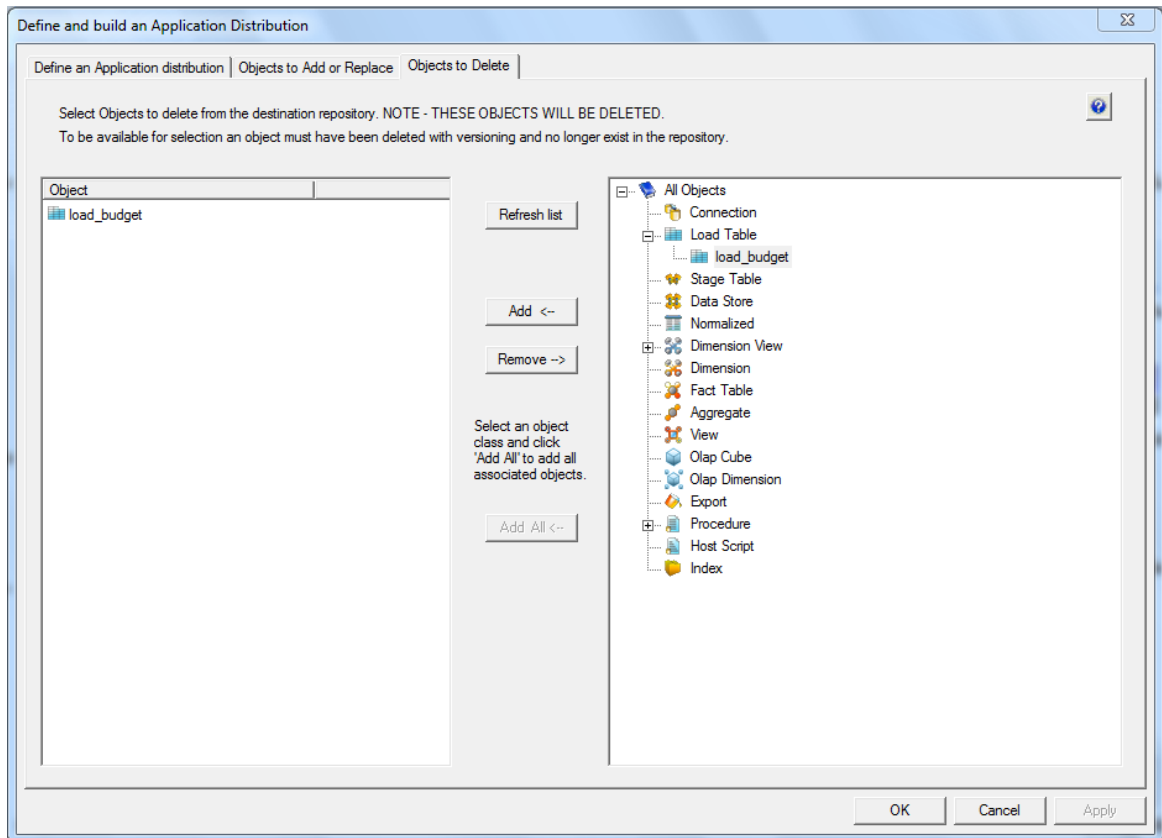


Previous Application

Click on the **Browse** button next to **Previous application** to choose a previously built application to use as a list of objects to include in the new application. After using a previous application, additional objects can be added or removed from the application.

Objects can be moved from the right hand object tree by double clicking on an object name or by using the Add buttons. This tab allows you to select the objects to add or replace in the destination repository.

Objects to Delete



Objects can be moved from the right hand object tree by double clicking on an object name or by using the Add buttons. This tab allows you to select the objects to delete in the destination repository.

Note: To be available for selection an object must have been deleted and no longer exist in the repository.

26.1.2 Application Loading

Note: Applications can only be loaded into the same relational database type from which they were created. (For Example an Oracle application can only be loaded into an Oracle database).

Applications are loaded via the Setup Administrator utility. The normal process for implementing an application would be as follows:

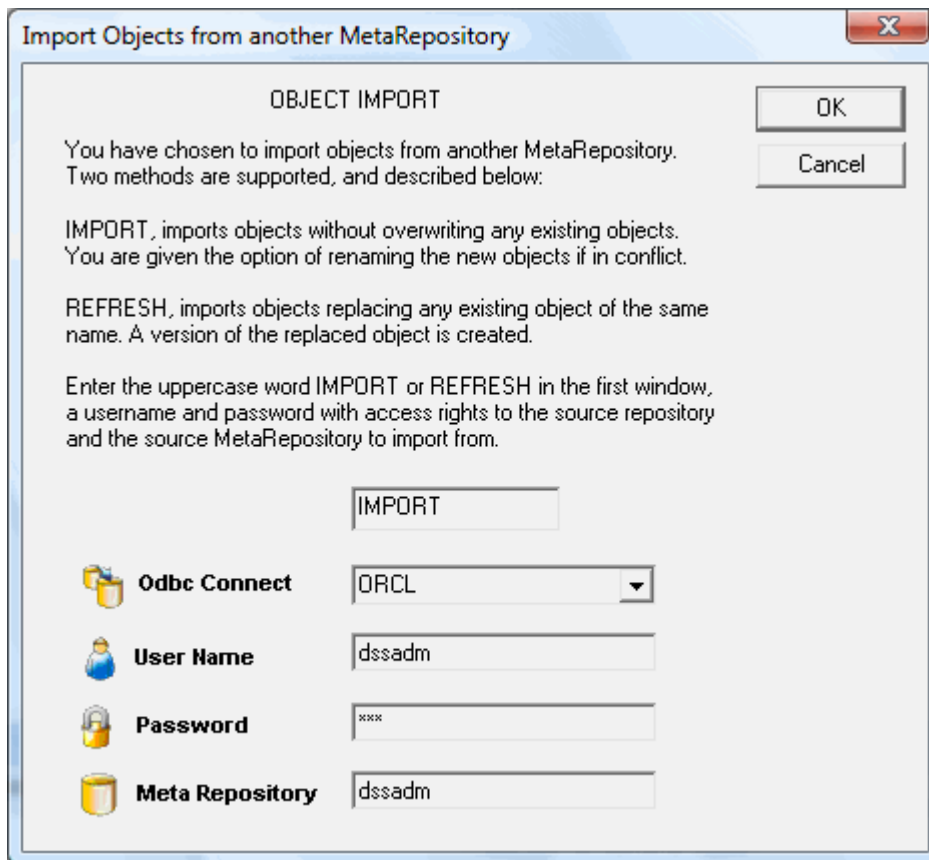
- 1** Run the Setup Administrator utility.
- 2** Change the application directory to the application's location.
- 3** Turn on logging in the Setup Administrator utility using Tools / Start logging.
- 4** Load the application via the Setup Administrator utility.
- 5** Choose the level of metadata application. There are several levels, from load metadata only thru to load metadata and apply changes to all tables.
- 6** Resolve any connections and tablespaces/filegroups to those present in the target environment.
- 7** Create/Re-create/Alter database tables, if selected in (5).
- 8** Compile database procedures, if selected in (5).
- 9** Turn off logging.
- 10** Review the output in the Setup Administrator utility.
- 11** Review the log file.

Refer to the Setup Administrator manual for more information about loading an application.

26.2 Importing Object Metadata

Any group of objects can be imported into the current metadata repository from another repository. If an object already exists in the target repository then it is either skipped or replaced depending on the type of import undertaken. If an object is to be replaced as part of an import, a version of the object is created prior to its replacement.

To import an object or group of objects select the Tools / Import Metadata menu option. A dialog as below will appear. The two options are IMPORT or REFRESH. An import will not replace an existing object of the same name. A refresh will version and replace any existing object of the same name.



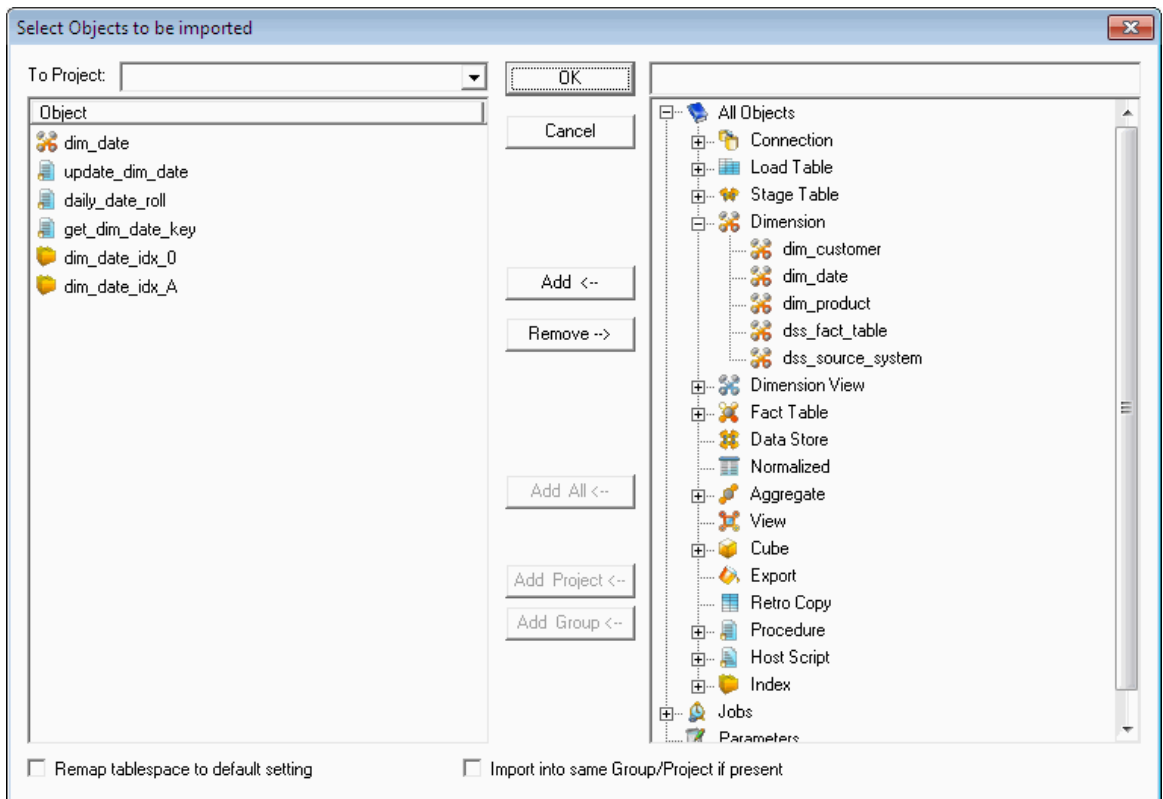
The dialog box is titled "Import Objects from another MetaRepository" and contains the following elements:

- OBJECT IMPORT** section with **OK** and **Cancel** buttons.
- Text: "You have chosen to import objects from another MetaRepository. Two methods are supported, and described below:"
- IMPORT**: imports objects without overwriting any existing objects. You are given the option of renaming the new objects if in conflict.
- REFRESH**: imports objects replacing any existing object of the same name. A version of the replaced object is created.
- Text: "Enter the uppercase word IMPORT or REFRESH in the first window, a username and password with access rights to the source repository and the source MetaRepository to import from."
- A text input field containing **IMPORT**.
- Odbc Connect** dropdown menu showing **ORCL**.
- User Name** text input field containing **dssadm**.
- Password** text input field containing **xxx**.
- Meta Repository** text input field containing **dssadm**.

Enter the connection, and a database user name and password that has access to the source metadata repository. Finally, enter the user name of the metadata repository you want to import from. In most situations the 'user name' and 'meta repository' would be the same. However, if you only have read access to a meta repository then it may be necessary to login to the database under a different user name from that of the repository you are trying to import from.

You are not permitted to select the current meta repository in the 'Meta Repository' field, but are permitted to login using the existing repository username. Once a successful logon is completed the contents of the source repository are loaded and the following dialog appears.

Select an object by double clicking on it or by selecting and using the Add button. If an object such as a table is chosen then any related scripts, procedures and indexes are also selected. They can be removed if required. A target project can be selected.



In the example above the dim_date table was added. Note that its procedures and indexes have also been included. Once all required objects are selected the import will commence when the OK button is clicked.

On completion a dialog box will appear notifying of the number of each type of object imported, and skipped.

Note: The repository from which you are importing should be the same metadata version as the target repository.

26.3 Importing Language Files

Note: Applications can only be loaded into the same relational database type from which they were created. (For Example an Oracle application can only be loaded into an Oracle database).

Language Files are loaded via the Setup Administrator utility. The normal process for implementing a Language file would be as follows:

- 1** Run the **Setup Administrator** utility.
- 2** Go to the Languages menu item in the top command bar and choose 'Load Languages'.
- 3** Right click on the Language file to be loaded and select 'Install Language'.
- 4** Select the ODBC data source and Log on to the target meta repository.
- 5** Select the language to be updated.
- 6** Review the output in the Setup Administrator utility.

Refer to the Setup Administrator manual for more information about loading a Language File.

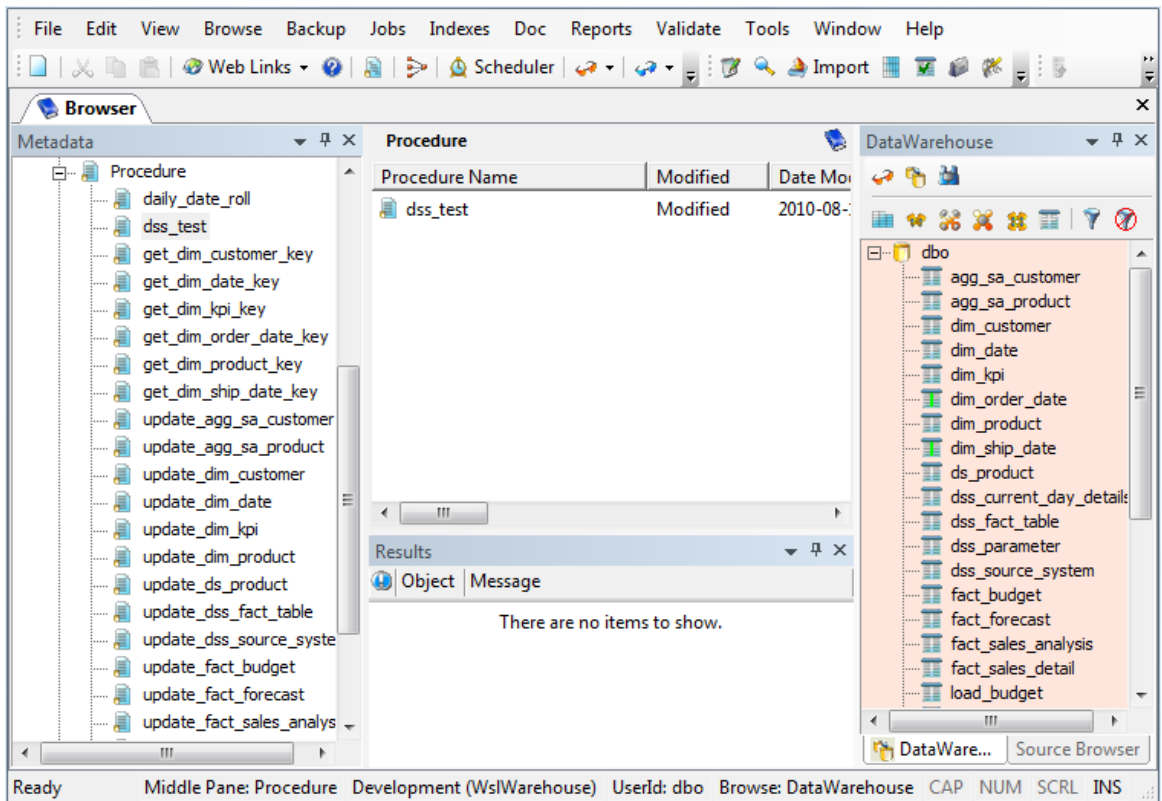
26.4 Data Warehouse Testing

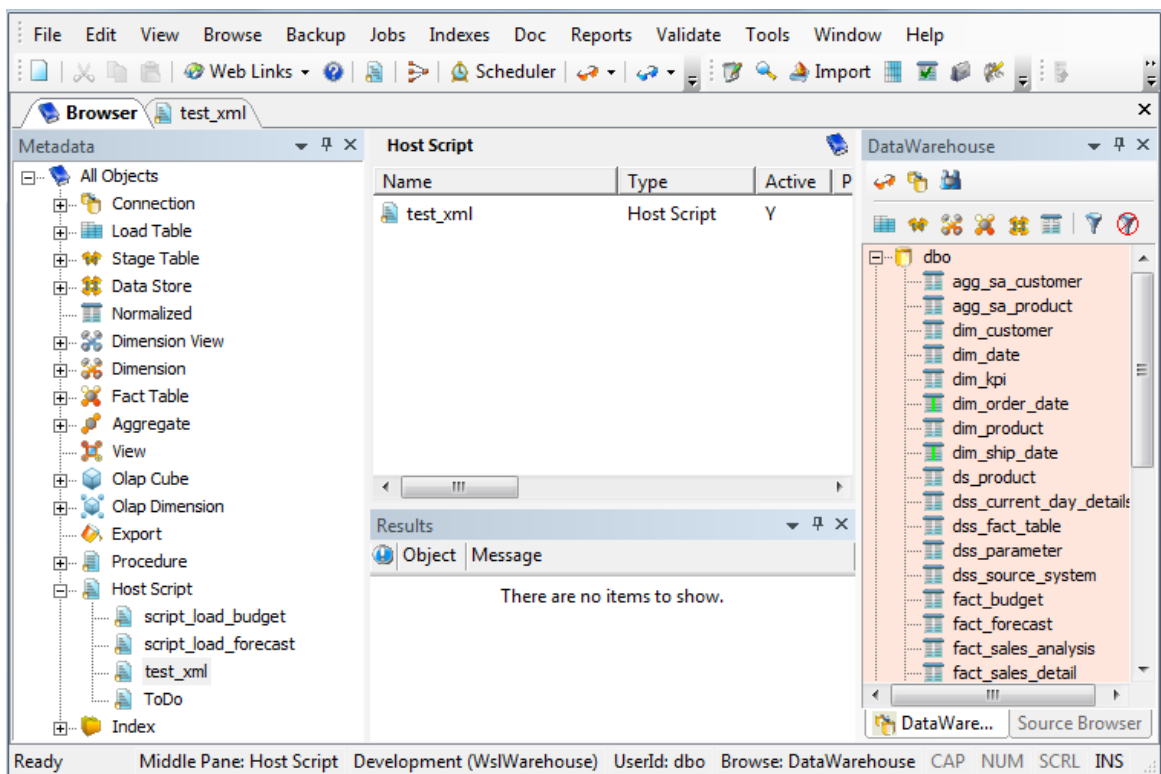
Note: Applications can only be loaded into the same relational database type from which they were created. (For Example an Oracle application can only be loaded into an Oracle database).

Testing applications are loaded via the Setup Administrator utility. Refer to the Setup Administrator manual for more information on how to load an application.

A testing application set consists of a Procedure and an XML script and provides the ability to define a series of tests against data warehouse objects; either comparing them to an expected value or to the results of a query.

Once the application set has been loaded, the Procedure and the XML script will be visible in the left hand pane.





The XML script contains the test definitions. Each test is a new XML node in the comparison query. The procedure simply runs the test and determines whether the tests are passed or not. This is most likely to be run as a scheduled job within QAD Data Warehouse Designer. To create a job

- 1 Choose the Scheduler Button.
- 2 Choose File and then New Job.

3 Enter the definition of the job.

Job Definition

Job Name:

testing

Description:

This job runs a procedure to perform a series of tests on the Data Warehouse

Frequency:

Once and Hold

Start Date:

Thursday , 18 August 2011

Start Time:

4:42:00 p.m.

Max Threads:

2

Inactive wait interval (seconds):

30

Scheduler:

Windows Only

Dependent On:

Parent job	Req.	Look back (mins.)	Max. wait (mins.)

Logs retained:

0

This field lets you set the number of logs that are retained for this job before an automatic delete and archive occurs. 0 = keep all logs (default action)

Success command:

Failure command:

Custom Settings:

Interval between jobs: (minutes)

Start at or after HHMM (e.g. 0800)

0000

Do not start after HHMM (e.g. 1700)

0000

Active on the days selected below

Mon

Tue

Wed

Thu

Fri

Sat

Sun

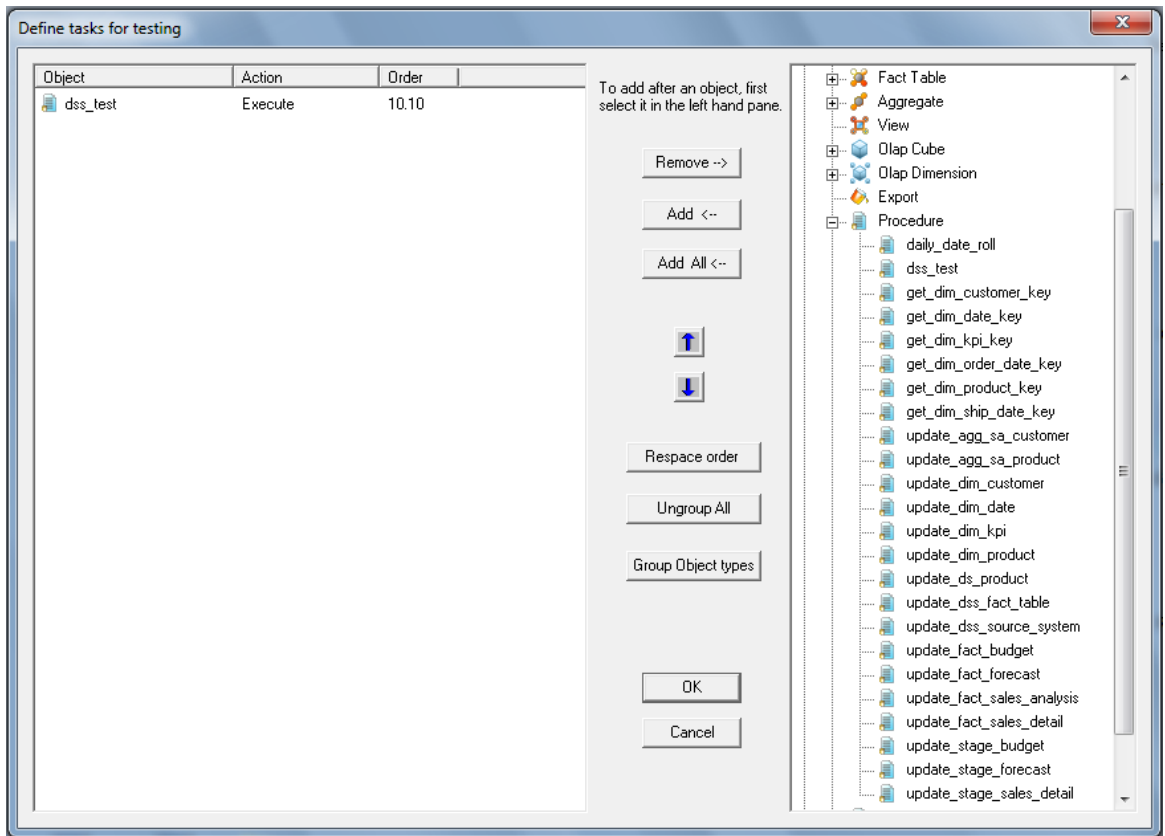
Add parent job

Remove parent

OK

Cancel

- 4 To select the test procedure as a task, open the Procedure object heading in the right hand pane. Choose `dss_test` and the Add button. Choose OK.



- 5 To run the job, click on the **All Jobs** button and then right click on the job and choose **Start the Job**.

26.5 Creating and Loading Applications from the Command Line

It is possible to create and load applications from the command line by running a bat file. The QAD Data Warehouse Designer Application directory contains an example bat file `WSL_Application_Create_Restore_Point_and_Load.bat` for creating and loading.

If you right mouse on this file and choose **Edit** you will see the steps outlined as well as the details on the options available.

The first step **creates** a restore point application (R) based on objects about to be loaded. This process calls the command line functionality of Data Warehouse Designer and creates the application file.

The second step **loads** an application (A) into a test QAD Data Warehouse Designer repository. It uses an xml file to specify various options, calls the command line automation functionality of Setup Administrator and loads the application (A). The QAD Data Warehouse Designer Application directory contains example xml files:

- `WSL_Application_Load_SQL.xml` for SQL Server
- `WSL_Application_Load_DB2.xml` for DB2
- `WSL_Application_Load_ORA.xml` for Oracle

The tags in the xml file need to be edited as the login/connection details etc need setting.

The Batch Application Create options and the Batch Application Load options are listed at the end of the bat file. The values for these variables will also need to be customized before running this file.

The process typically involves the following steps:

- 1** Create an application (A) in Data Warehouse Designer containing your data warehouse changes.
- 2** RUN `WSL_Application_Create_Restore_Point_and_Load.bat` from the command line; which creates a restore point application (R) and applies application (A) to a test QAD Data Warehouse Designer repository.
- 3** If the changes are incorrect, they can be undone by loading the restore point application (R).

Note: You can only create a RESTORE application through the command line; deployment applications are still built through Data Warehouse Designer.

CHAPTER 27

27. Backing Up and Restoring Metadata

This chapter covers the saving and reloading of metadata repository objects. The backup section describes the methods for backing up the metadata repository. It can also be backed up via normal database backup procedures. The restore section covers the metadata restoration functions available.

QAD Data Warehouse Designer provides two different methods for backing up and restoring metadata:

- 1 Backup and Restore using the native backup tools available in the data warehouse database.
- 2 QAD Data Warehouse Designer unload and load.

In This Chapter

27.1 Backup using DB Routines	610
27.2 Restoring DB Backups	613
27.3 Unloading Metadata	617
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27.1 Backup using DB Routines

The backup of the metadata repository can be undertaken as a separate exercise from the general backup of the data warehouse. The metadata backup does not backup any of the actual data warehouse tables. It only saves the table definitions, index definitions, procedures etc., so is not normally large.

The backup includes any tables that begin with "dss_". In this way key metadata tables such as dss_parameter, dss_source_system and dss_fact_table are included in the backup. These tables are required if the restored metadata is to function correctly.

It is recommended that the metadata is backed up at least daily when possible. There are two methods for backing up the meta repository. These are through a scheduled Unix task, and through the main QAD Data Warehouse Designer tool.

Unix Backups

Where the data warehouse database is running on a Unix server, it is possible to schedule a regular backup of the metadata. The Unix scripts shipped with QAD Data Warehouse Designer include a script called from cron to daily backup the metadata. These backups are in turn compressed and saved for 60 days by default. Refer to the installation manual for details on these scripts and their setup.

Windows Backups

Two main methods of Windows backup exist within QAD Data Warehouse Designer. The first is a database independent backup which is designed purely for moving the meta repository, and should not be used for regular backups. The other method is the database specific backup. See the following sections for the appropriate database.

Oracle Windows Backups

An Oracle export based backup can be taken from the QAD Data Warehouse Designer tool by selecting the **Backup/Export the metadata (Oracle Export)** menu option. This option assumes that the Oracle Client on the PC is the same version as that of the Oracle database where the QAD Data Warehouse Designer meta repository is stored. The backup may not work if the versions differ.

When executed this menu option attempts to locate the Oracle export utility. This utility is normally called 'exp' and resides in the Oracle bin directory. If QAD Data Warehouse Designer cannot locate this utility or it has not been loaded onto the PC then the export does not proceed and an error message will be displayed.

A pop-up window asks for a file name for the export. A directory should be chosen and a name entered. When the save button is clicked the export will start. The following files are created (where 'file' is the name of the chosen file). A dialog box appears to show the results of the backup.

File name	Purpose
file.bat	Windows command file containing the export command.
file.dbl	Command file for the re-creation of any database links.
file.drp	Command file for dropping all metadata tables. (Used in the restore prior to a reload).
file.exp	Oracle export file.

File name	Purpose
file.log	Log file of the export.
file.par	Parameter file for the export. Contains an entry for each meta table to be exported.
file.pro	A file containing each procedure stored in the metadata.
file.seq	Command file to re-create the sequences used by both the metadata and the data warehouse tables.

If problems are encountered with the backup it may be possible to manually run the generated .bat script file to ascertain what has gone wrong.

SQL Server Windows Backups

A SQL Server bcp based backup can be taken from the QAD Data Warehouse Designer tool by selecting the **Backup/Export the metadata (Sql server bcp)** menu option. This option assumes that the SQL Server bcp utility is available on the PC.

When executed this menu option attempts to locate the SQL Server bcp utility. This utility is normally called 'bcp' and resides in the SQL Server bin directory. If QAD Data Warehouse Designer cannot locate this utility or it has not been loaded onto the PC then the export does not proceed and an error message will be displayed.

A pop-up window asks for a directory name for the export. A directory should be chosen or created. When the save button is clicked the export will start. The following files are created. A dialog box appears to show the results of the backup.

File name	Purpose
wsl_bcp_out.bat	Windows batch file used to run all the bcp table exports
wsl_bcp_out.err	Errors from the bcp export of each table
wsl_bcp_out.log	Log file of the bcp table exports
*.bcp	Each metadata table is stored with a .bcp extension. This is the export of each table.
wsl_bcp.par	Parameter file for the export. Contains an entry for each meta table to be exported. Unused by SQL Server.
wsl_bcp.drp	Command file for dropping all metadata tables. (Used in the restore prior to a reload).
wsl_bcp.pro	A file containing each procedure stored in the metadata.
wsl_bcp.seq	Unused by SQL Server.
wsl_bcp.dbl	Command file for the rebuild of all the linked servers. Used during the restore.
wsl_bcp.bld	Basis of the command file that will be used to restore the metadata. This file is modified to include the target directory prior to restore.

If problems are encountered with the backup it may be possible to manually run the generated .bat script file to ascertain what has gone wrong.

DB2 Windows Backups

A DB2 IMPORT based backup can be taken from the QAD Data Warehouse Designer tool by selecting the **Backup/Export the metadata (DB2 export)** menu option. This option assumes that the IBM DB2 EXPORT command is available on the PC.

When executed this menu option attempts to locate the SQL Server bcp utility. This utility is normally called 'bcp' and resides in the SQL Server bin directory. If QAD Data Warehouse Designer cannot locate this utility or it has not been loaded onto the PC then the export does not proceed and an error message will be displayed.

A pop-up window asks for a directory name for the export. A directory should be chosen or created. When the save button is clicked the export will start. The following files are created. A dialog box appears to show the results of the backup.

File name	Purpose
Data Warehouse Designer.bat	Windows batch file used to run the DB2 EXPORT for each metadata table.
Data Warehouse Designer.cmd	Control file for the export. Contains an entry for each meta table to be exported.
Data Warehouse Designer.log	Log file of the EXPORT.
Data Warehouse Designer.pro	A file containing each procedure stored in the metadata.
*.ixf	Each metadata table is stored in a file with a ixf extension. This is the export of each table.
restore.drp	Command file for dropping all metadata tables. (Used in the restore prior to a reload).
restore.lst	Basis of the command file that will be used to restore the metadata. This file is modified to include the target directory prior to restore.

If problems are encountered with the backup it may be possible to manually run the generated Data Warehouse Designer.bat script file to ascertain what has gone wrong.

27.2 Restoring DB Backups

QAD Data Warehouse Designer metadata can be restored from a prior backup. For Oracle data warehouses the restore can take place either from Unix or through the QAD Data Warehouse Designer tool. The same set of files as defined in the backup section are used for both restores and can be moved between the Windows and Unix environments. For SQL Server data warehouses the restore must take place in a Windows environment either through the QAD Data Warehouse Designer tool or manually.

Note: If transferring the export files via ftp, ensure that the file.exp and .bcp files are transferred in binary mode and that the other files are transferred in ASCII mode.

Restoring metadata

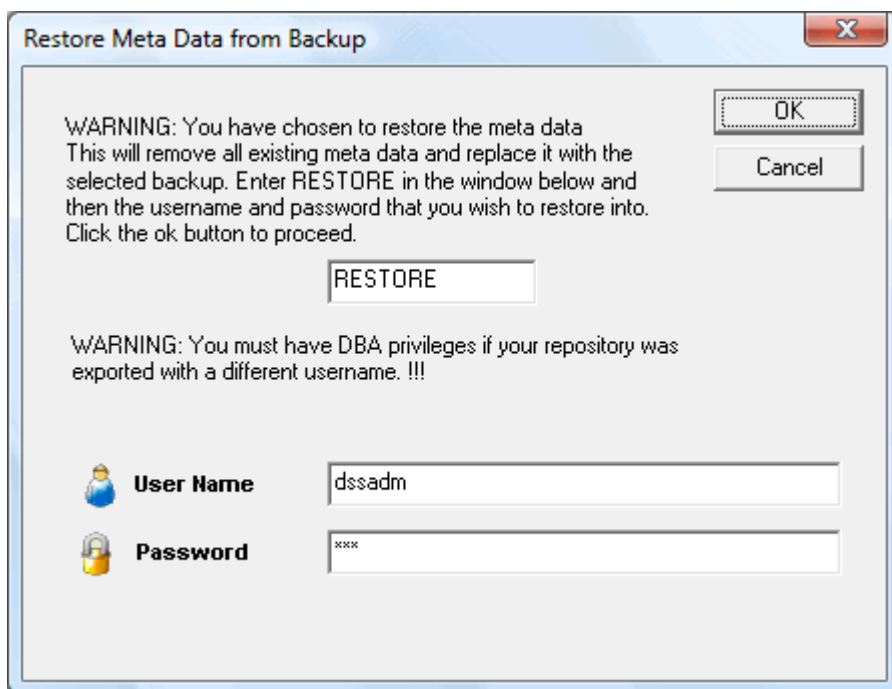
A backup of a metadata repository can be restored over the top of an existing repository. This action replaces the existing repository in its entirety. The restore of repositories is covered in an earlier section, but its uses in the promoting of code are discussed here. This restore process does not affect any existing database tables or any compiled procedures, so it can be used as a means of updating a metadata repository, albeit by replacing that repository. It is often a good method to choose when first establishing a new repository. For example if we have a development repository and want to create a production environment the steps may be:

- 1 Backup the development repository, using either the Unix or Windows repository backup. See the previous sections.
- 2 Create a new repository using the Setup / Administrator utility.
- 3 Log on to the newly created repository.
- 4 Restore the backup of the development repository into the new repository. For Oracle this requires the database privilege 'imp_full_database', or the dba role.
- 5 Modify any connections, set any default values, alter any table sizes or extents.
- 6 Create the tables.
- 7 Compile all procedures.

Oracle Windows Restore

Select the menu option **Backup / Restore metadata (from Oracle export)** to begin the restore process.

A dialog box will appear. The word **RESTORE** needs to be entered along with the username and password where the metadata is to be restored to. The username does not have to be that of the current metadata repository, but it must be a valid repository. If a restore is being performed to a repository that differs from that of the backup then the 'imp_full_database' database privilege may be required.



Restore Meta Data from Backup

WARNING: You have chosen to restore the meta data
This will remove all existing meta data and replace it with the
selected backup. Enter **RESTORE** in the window below and
then the username and password that you wish to restore into.
Click the ok button to proceed.

RESTORE

WARNING: You must have DBA privileges if your repository was
exported with a different username. !!!

 **User Name**

 **Password**

Once the OK button is clicked a new dialog box will appear asking for a selection of the export file. Browse to the directory where the export is located and select the export file. Once the export file is selected the import will begin. A dialog box will appear to show the results of the import.

Oracle Unix restore

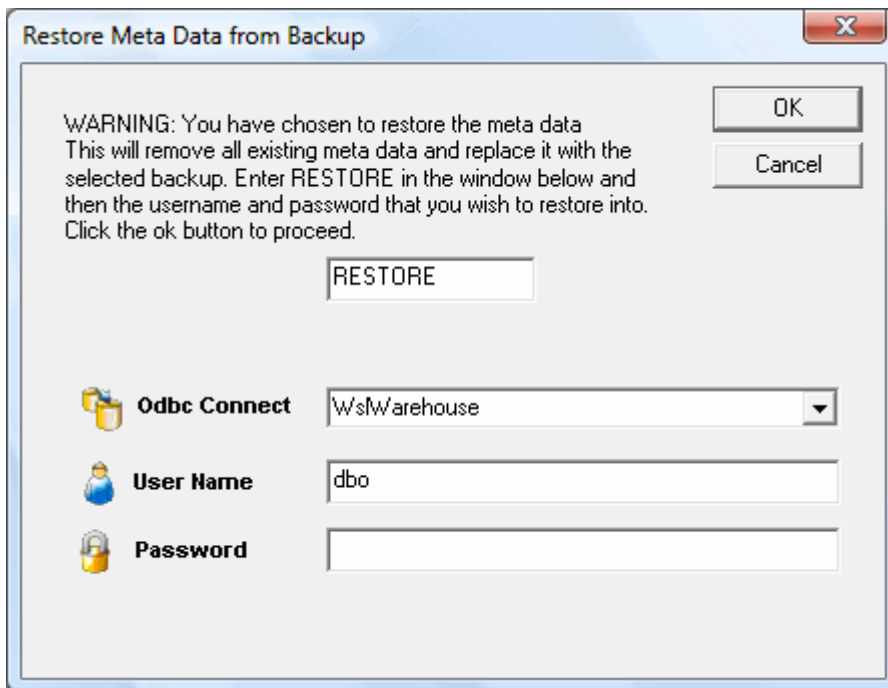
The Unix restore is actioned via the `meta_restore_010.sh` shell script. This script expects the export file to be located in the `wsl/export` directory, so it may need to be un compressed and moved to this directory if not already present.

Execute the `meta_restore_010.sh` shell script. You will be prompted to enter the backup file name. Once successfully entered a username and password to be restored into are requested and the restore commences.

SQL Server Windows Restore

Select the menu option **Backup / Restore metadata (from Sql server bcp)** to begin the restore process.

A dialog box will appear. The word **RESTORE** needs to be entered along with the connection, username and password where the metadata is to be restored to. The metadata will always be restored to the `dbo` schema. The connection does not have to be that of the current metadata repository, but it must be a valid repository.



The image shows a Windows-style dialog box titled "Restore Meta Data from Backup". It contains a warning message, a text input field with "RESTORE", and three labeled input fields: "Odbc Connect" with "wsl/warehouse", "User Name" with "dbo", and "Password" which is empty. There are "OK" and "Cancel" buttons in the top right.

Restore Meta Data from Backup

WARNING: You have chosen to restore the meta data
This will remove all existing meta data and replace it with the
selected backup. Enter RESTORE in the window below and
then the username and password that you wish to restore into.
Click the ok button to proceed.

Odbc Connect

User Name

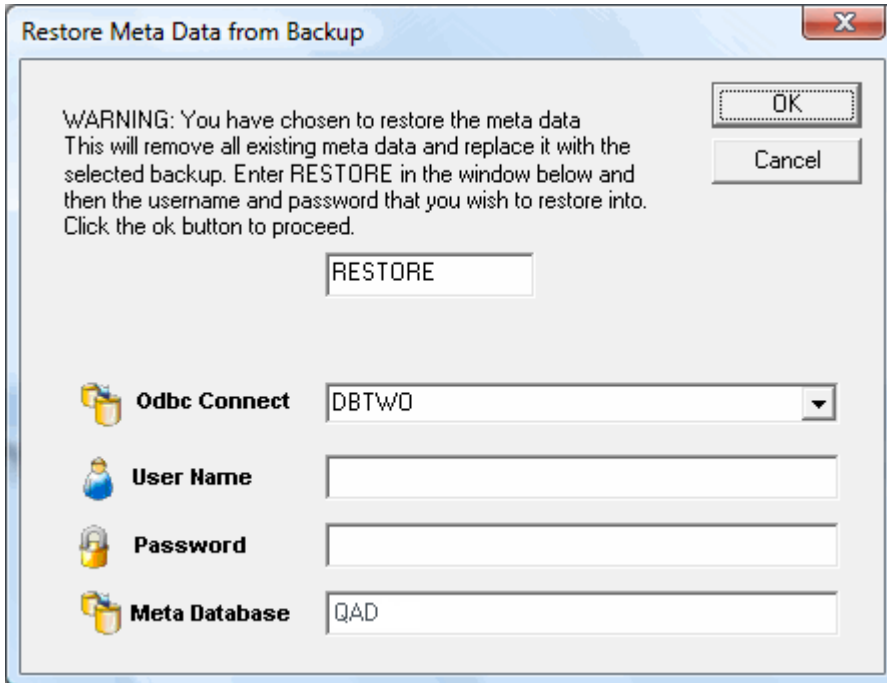
Password

Once the OK button is clicked a new dialog box will appear asking for a selection of the export directory. Browse to the contents of the directory where the export is located. Once the export directory is selected the import will begin. A dialog box will appear to show the results of the import.

DB2 Windows Restore

Select the menu option **Backup / Restore metadata (from DB2 export)** to begin the restore process.

A dialog box will appear. The word **RESTORE** needs to be entered with the username and password for DB2. If using a trusted connection to DB2, the username and password should be left blank. The metadata schema should also be entered. The schema does not have to be that of the current metadata repository, but it must contain a valid repository.



Restore Meta Data from Backup

WARNING: You have chosen to restore the meta data
This will remove all existing meta data and replace it with the
selected backup. Enter RESTORE in the window below and
then the username and password that you wish to restore into.
Click the ok button to proceed.

RESTORE

Odbc Connect DBTWO

User Name

Password

Meta Database QAD

Once the OK button is clicked a new dialog box will appear asking for a selection of the export file. Browse to the directory where the export is located and select the export file. Once the export file is selected the import will begin. A dialog box will appear to show the results of the import.

27.3 Unloading Metadata

QAD Data Warehouse Designer provides a generic unload utility for backing up the metadata. The advantage of this backup is that it is database, and database version independent. It can be used to backup the metadata regardless of the version of the database client running on the PC. It is possible to transport the metadata from one database platform to another using unload and load. For example, the metadata from a SQL Server unload can be loaded into an Oracle database.

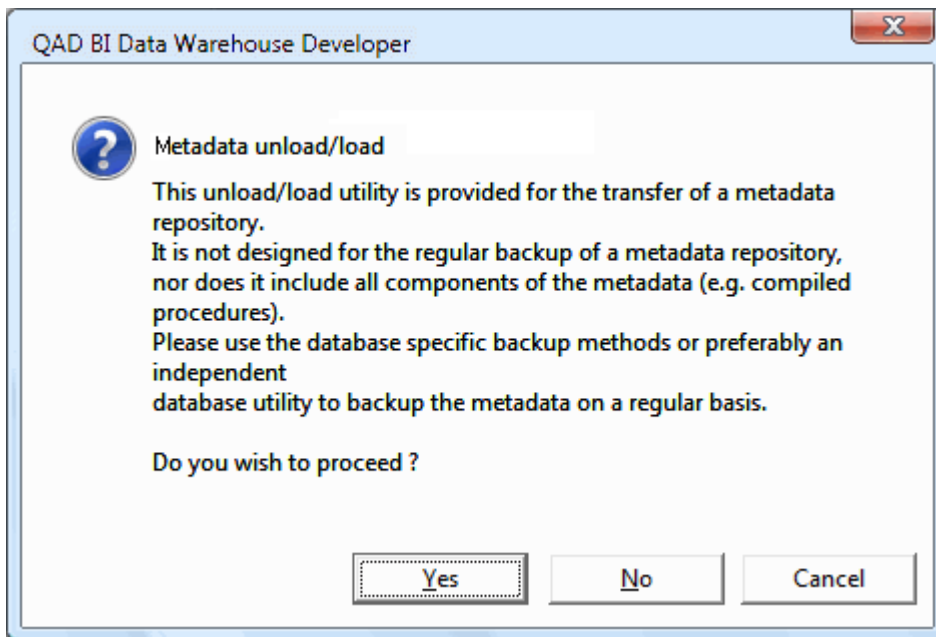
After performing a cross platform unload and load:

- Transformations must be altered manually to use the correct syntax for the new database.
- Generated procedures regenerated.
- Modified and custom procedures must be changed to use the procedure language of the new database platform.

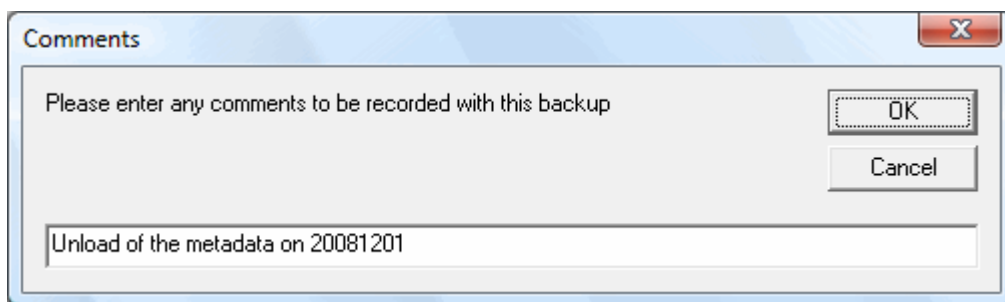
Performing an Unload

An unload can be performed within the QAD Data Warehouse Designer tool by selecting the Backup/Unload the metadata to disk menu option.

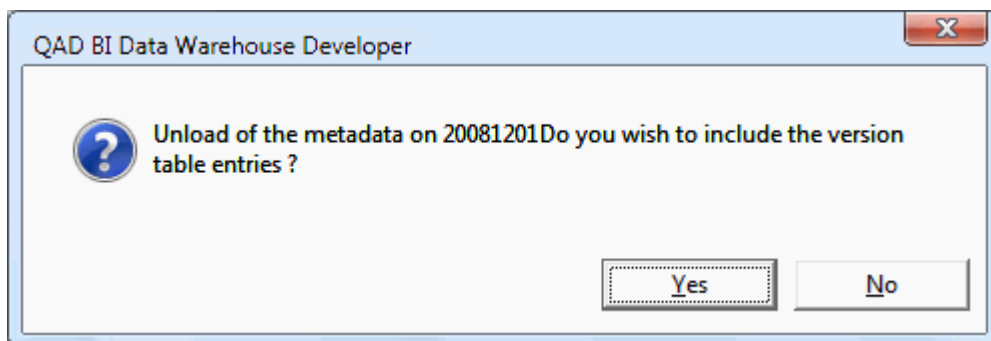
A popup window asks for confirmation to proceed with the unload. Click Yes.



An additional pop-up window asks for a file name for the export. A directory should be chosen and a name entered. When the save button is clicked, enter a comment for the unload and click OK.



Finally, click Yes or No on the include version history dialog:



This either includes or excludes version history metadata in the unload.

The unload starts, and indicates progress with a progress bar.

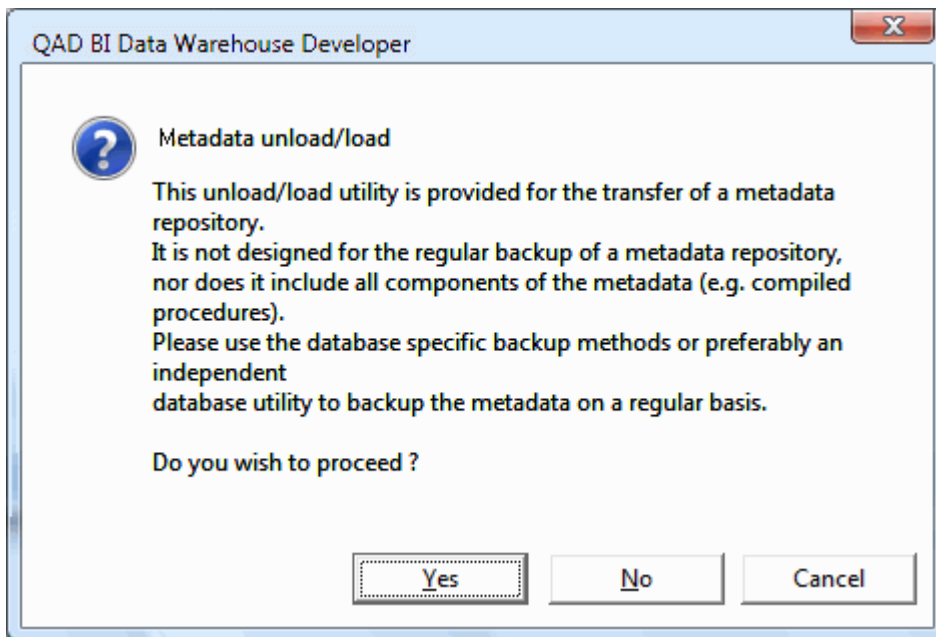
27.4 Loading an Unload

QAD Data Warehouse Designer metadata can be restored from a prior unload.

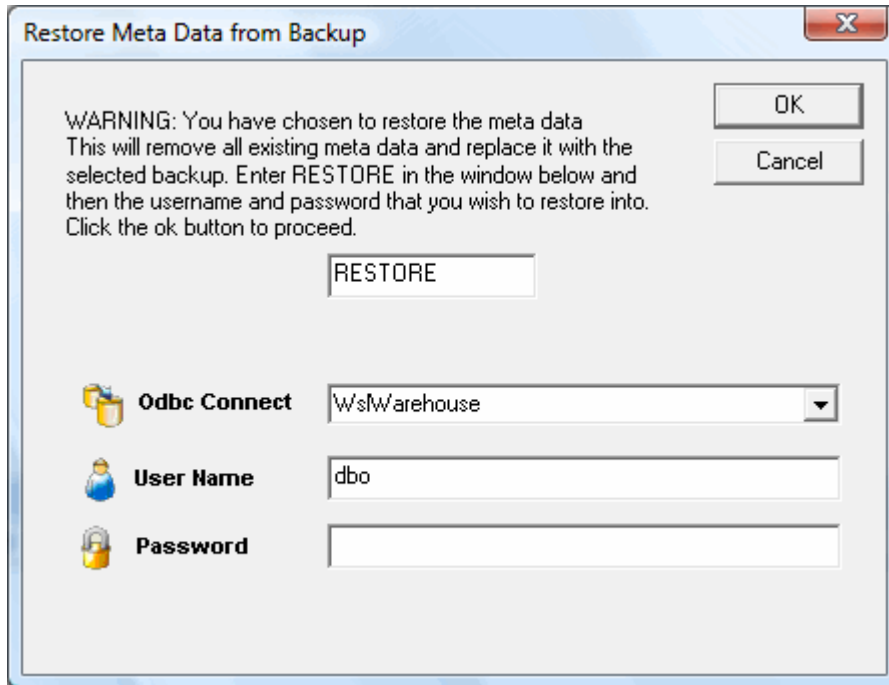
Performing a Load

An unload of a metadata repository can be loaded over the top of an existing repository. This action replaces the existing repository in its entirety. To load an unload, select the menu option **Backup / Load the metadata from disk** to begin the load process.

A popup window asked for confirmation a load is intended. Click Yes.

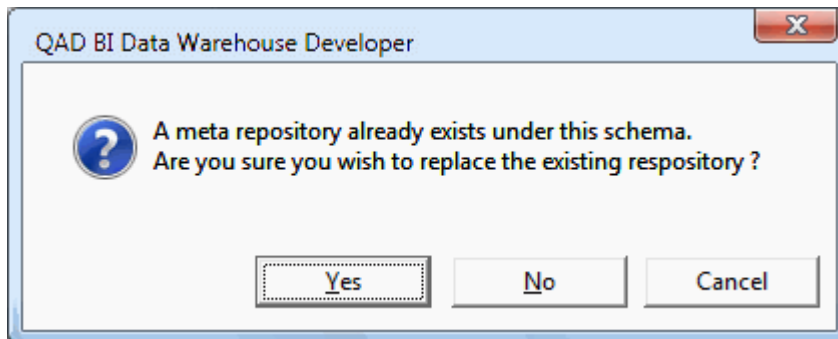


A dialog box appears. The word RESTORE needs to be entered. The odbc connection needs to be chosen, along with the username and password where the metadata is to be restored to. The username does not have to be that of the current metadata repository, but it must be a valid repository.

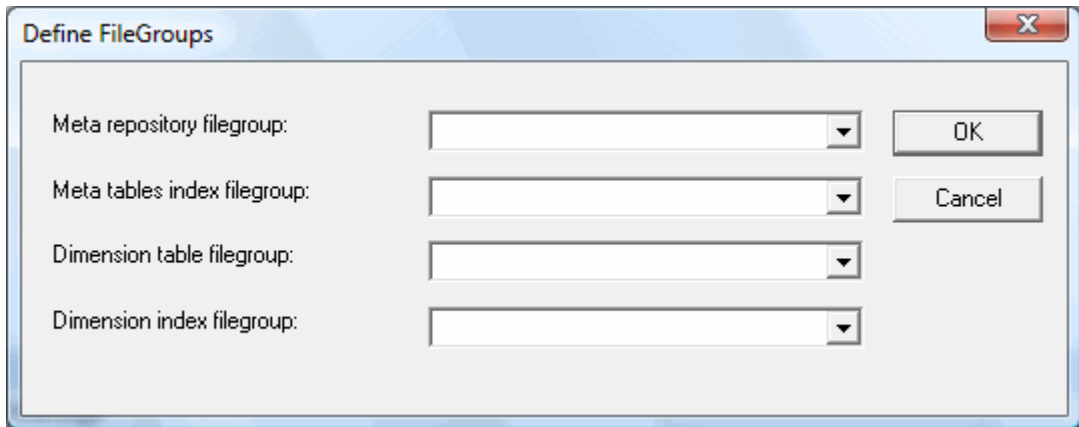


Note: The dialog box above will include an additional field for *Schema* if loading into DB2.

Once the OK button is clicked, a new dialog box will appear asking for a selection of the unload directory. Browse to the contents of the directory where the unload is located and click Open. Again, confirm the load will overwrite the existing repository by clicking Yes:

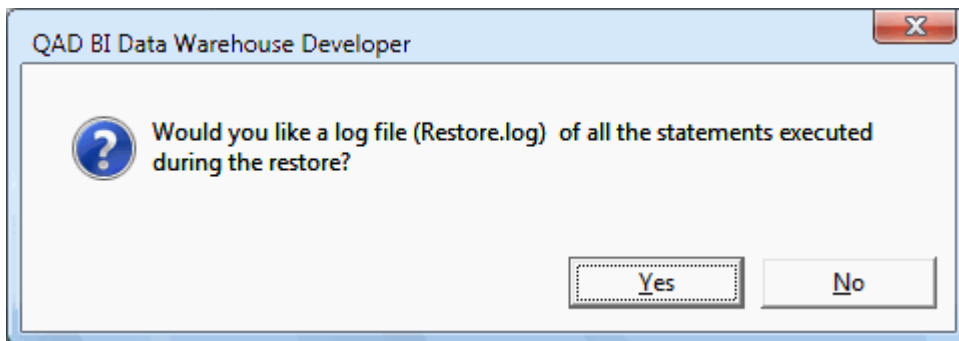


Confirm the metadata and dimension tablespaces/filegroups for the metadata load and click OK:

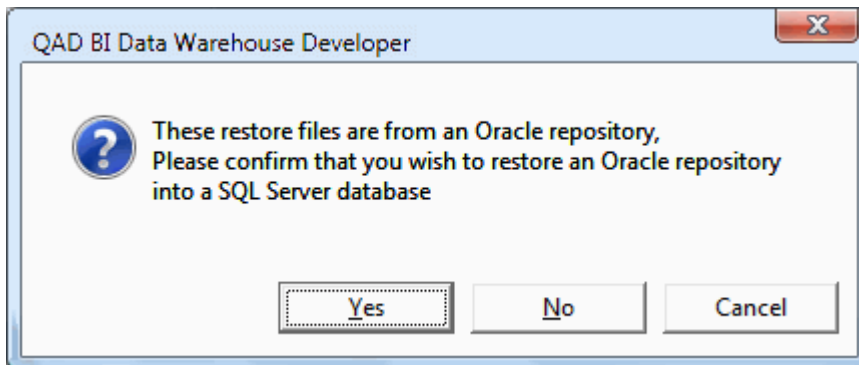


Note: The dialog above was displayed when loading into SQL Server. It may differ slightly if loading into Oracle or DB2.

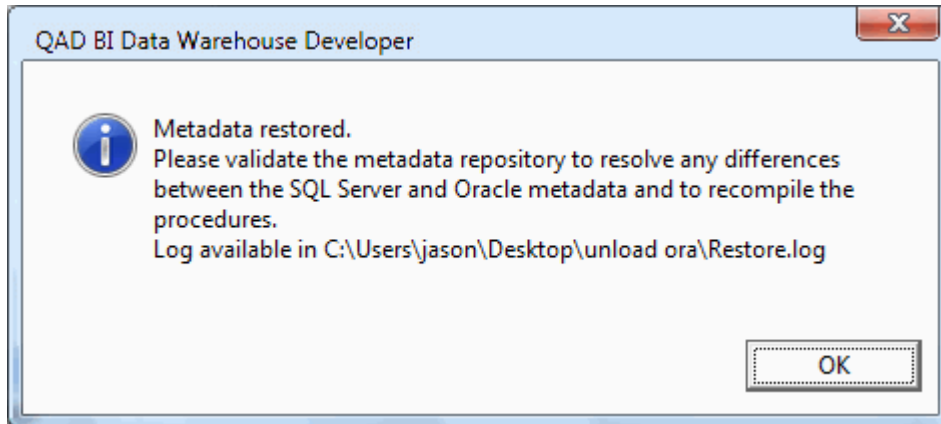
A pop-up window asks if a restore log is required. Click Yes for a log, or No otherwise.



If a cross platform load is being performed, the following dialog is displayed. Click Yes.



The metadata load now runs. Once the load has completed, a dialog is displayed:



Start the QAD Administrator and validate the metadata repository that has just been loaded.

CHAPTER 28

28. Altering Metadata

This chapter provides information on how to change and manipulate the data warehouse once it has been established.

New source columns or changes to the source systems from which the data warehouse is built will require modifications to both the metadata and the data warehouse tables and procedures.

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28.1 Validating Tables

The metadata as stored and maintained by QAD Data Warehouse Designer does not necessarily reflect the actual tables and procedures in use in the data warehouse. For example if a new column is added to the metadata for a table then that change is not automatically made in the actual physical table residing in the data warehouse. Likewise if a column is deleted from the metadata then that column may still exist in the physical database table.

This situation may be particularly apparent after an application patch or upgrade. The menu option **Tools / Validate table create status**, and the right mouse menu options in either the left hand or middle panes all provide a means of comparing the metadata to the physical tables in the database. A table, range of tables or all tables can be chosen. Each chosen table is a table in the metadata and it is compared against the physical database table if it exists.

The following example is the output from a validation.

Table Name	Results
 dim_customer	meta->STATE - varchar2(2),
 dim_date	Validates OK - but different column order
 dim_kpi	Validates OK
 dim_product	dss->PROD_MASTER_GROUP - varchar2(64),
 fact_budget	Validates OK
 fact_forecast	Validates OK
 fact_kpi	Validates OK
 fact_sales_analysis	Validates OK
 fact_sales_detail	Validates OK
 load_budget	Validates OK - but different column order
 load_customer	Validates OK
 load_forecast	Validates OK
 load_kpi	Validates OK
 load_order_header	Validates OK
 load_order_line	Table:dss->load_order_line not found,
 load_prod_group	Validates OK
 load_prod_line	Validates OK
 load_prod_subgroup	Validates OK
 load_product	Validates OK
 stage_budget	Validates OK
 stage_forecast	Validates OK
 stage_sales_detail	Validates OK

In this example we see five different scenarios.

The metadata for table `dim_date` matches the physical table in the database.

The metadata for the table `dim_customer` does not match the physical table. The metadata has an additional column called 'State'. This column was not found in the physical table. The table can be altered if desired. See the next section on Altering Tables.

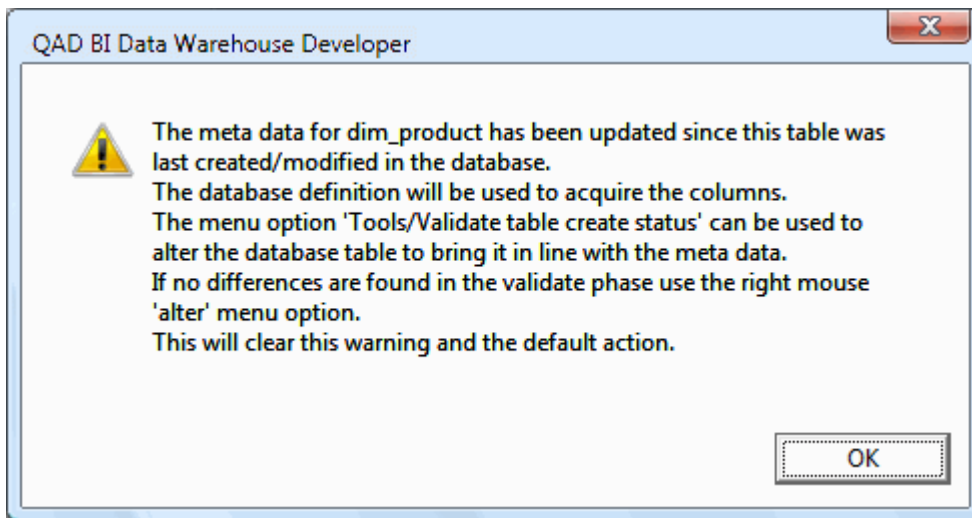
The physical database table `dim_product` has an additional column not found in the metadata. The column is 'prod_master_group'. The table can be altered if desired. See the next section on Altering Tables.

The table `load_budget` has the same columns in both the metadata and the physical table, but the column order is different. This is probably not an issue for most tables, but may be a problem for some type of load tables, where the column order is important. This could be the result of a previous altering of the table. The table must be re-created if the order is important.

The table `load_order_line` is defined in the metadata but has not been physically created in the database. The table can be created in the normal manner.

Using outdated metadata in drag and drop

When dragging from a data warehouse table to create another data warehouse table (e.g. load table to create dim table) a check is made to ensure that the metadata matches the database table. If the two are found to be out of sync the following message will appear



If a subsequent validate of the table in question shows that it validates, this message will mean that the dates are somehow out of sync. This can occur for example after an import where the metadata has been replaced, but the underlying table still matches the metadata. Another common occurrence is where a new column is added and then deleted. To prevent the message from reoccurring in such a situation proceed as follows. Use the right mouse menu and select 'alter table' when positioned on the table name in the validate results screen (event though the table validates OK). The metadata update time will be set back to that of the last database table create.

28.2 Validating Source (Load) Tables

Changes to the source systems from which the data warehouse is built can be detected to a limited degree. The menu option **Tools / Validate load table status** allows a comparison between load tables and the source tables from which they were built. This comparison is not available for flat file or script based loads. A load table or group of load tables are selected and the results are displayed in the middle pane. An example screen from a load table validate is as follows:

Load table name	Results
 load_budget	Source is non database, unable to validate;
 load_customer	Validates OK
 load_forecast	Source is non database, unable to validate;
 load_kpi	Validates OK
 load_order_header	Validates OK
 load_order_line	Validates OK
 load_prod_group	Validates OK
 load_prod_line	Validates OK
 load_prod_subgroup	Validates OK
 load_product	Validates OK

The tables load_budget and load_forecast are Windows file loads and as such cannot be validated.

The table load_customer shows additional columns in the source table. Such a scenario will not cause problems for the continued operation of the data warehouse. It simply means that more columns are present in the source table than have been loaded into the data warehouse. This may have been the result of an initial partial selection or as a result of new columns. Further investigation of the source table would be required to ascertain if there was new information available.

The table load_product reflects a problem for the continued operation of the data warehouse. The source table does not have a column that was previously identified as having come from that table. This will probably cause the load of that table to fail. This scenario would also require an investigation into the source table. The resolution may be to delete the column. The potential impact on later tables (dimension, stage and fact) and procedures in the data warehouse can be ascertained by using the right mouse menu when positioned over a load table name.

28.3 Validating Procedures

The menu option **Tools / Validate procedure status** compares procedures as stored in the metadata with those compiled and running in the data warehouse. This option provides a listing in the middle pane of each selected procedure and its status. The status will be 'Validates OK', 'Not compiled', or 'Compare failed'.

Where a procedure is marked as 'Not compiled' this means that the procedure exists in the metadata but has not been compiled into the database.

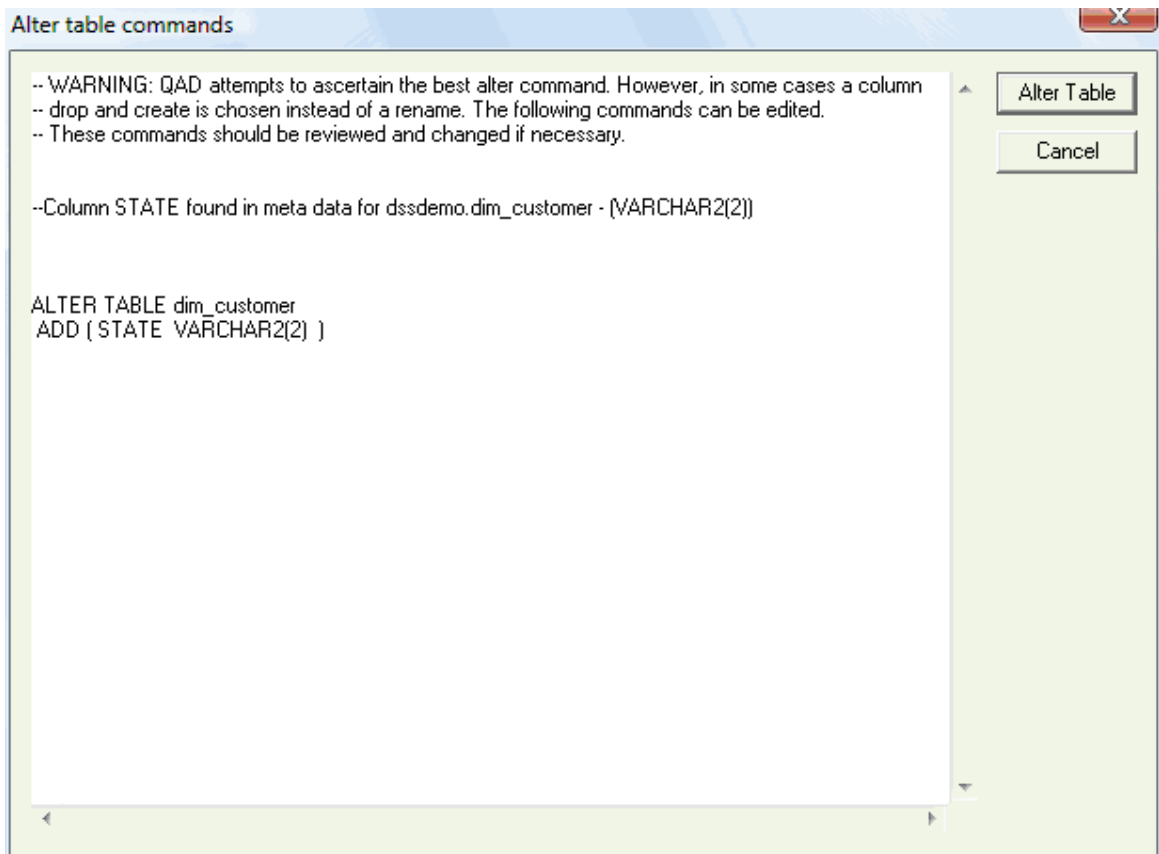
Where a procedure fails to compare the Procedure Editor must be used to find the actual differences. Start the editor by double clicking on the procedure name in the left hand pane. Use the **Tools / Compare to user source** menu option to display the differences between the procedure in the metadata and that compiled in the database.

28.4 Altering Tables

The previous section covered the process of validating a table as defined in the metadata with the physical table as defined in the database. If a table is found to be different it is possible to alter the table.

Note: Care should be taken when altering large data warehouse tables. A number of factors such as the time required to perform the alter, access to the table and the optimum storage of the table come into play.

To alter a table first validate the table through the **Tools/ Validate table create status** menu option, or the right mouse menu option from the object name. Then in the middle pane (the validation listing) select the table that has not validated. Position on the table name and using the right mouse, select the 'Alter table' pop-up menu option. A screen similar to the one below will appear advising of the planned changes.



In this example the dim_customer table is to be altered. The new column 'State' will be added to the table. Comments at the top of the screen shown the reason(s) for the alteration and the actual alter command(s) follow.

The alter table window is an edit window. The command to be executed can be changed or additional commands entered. The command may also be cut to be executed in some other environment or at some later stage.

Pressing the 'Alter Table' button will proceed to alter the table. In effect it will execute any command in the window.

28.5 Validating Indexes

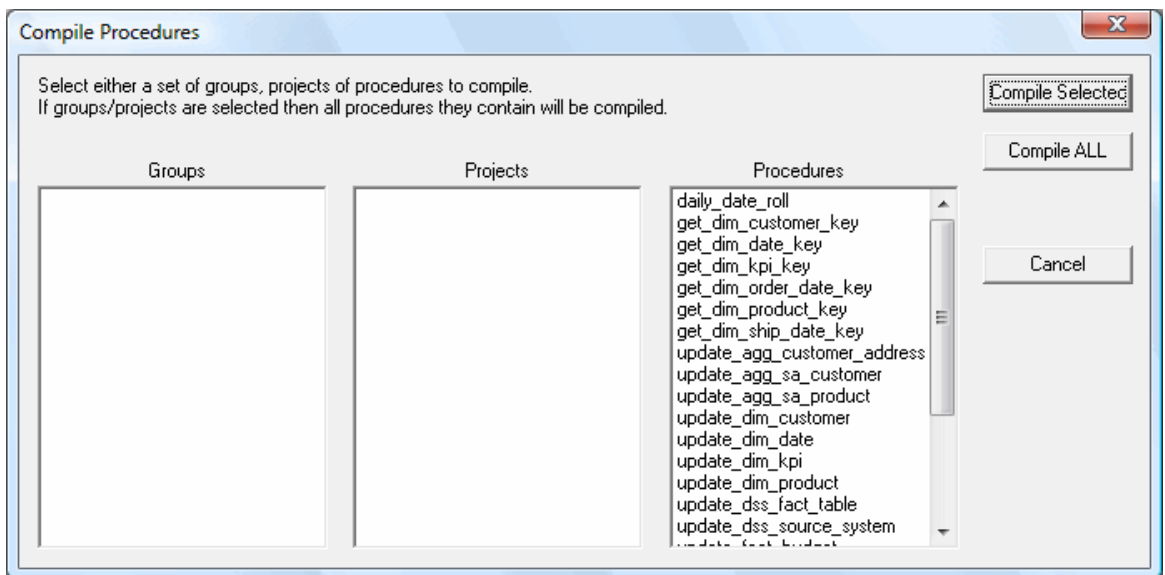
The menu option **Tools / Validate indexes** checks the metadata definition of an index against that in use in the database. It checks to ensure that the index exists and that the index type and columns are the same.

The results are listed in the middle pane with the status of each selected index shown.

If an index differs, then the only option provided is to drop and create the index either via the scheduler or through the right mouse menu options for the index.

28.6 Recompiling Procedures

Procedures can be invalidated as a result of changes to underlying tables, or child procedures. A procedure can be recompiled through the procedure editor or via the menu option **Tools / Compile all procedures**. This menu option will load the following dialog box:



All procedures in the metadata can be compiled, or a selected group of procedures may be compiled. Selection is done via standard Windows multi selection using the shift and CTRL keys. By selecting a project or group it is possible to compile all procedures associated with the project or group.

As each procedure is compiled it is displayed in the middle pane of the browser window. If a procedure fails to compile a failure message is displayed along side the procedure name. Procedures that fail to compile will need to be investigated through the procedure editor, as no specific error information is provided by this bulk compiler.

Re-validate Procedures (Oracle only)

The menu option **Tools/Re-compile invalid procedures** will attempt to validate the procedure by issuing an 'alter procedure xxx compile' command. This command will be executed for any procedure or function that is in an invalid state in the schema. Any procedures or functions that are still invalid after the commands have been completed are shown in the results dialog. QAD Data Warehouse Designer does not drop procedures from the database even when their metadata is deleted. Therefore, there may be old procedures present that are in an invalid state. These procedures may be redundant.

CHAPTER 29

29. Callable Procedures

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29.1 Introduction to Callable Procedures

Callable procedures and functions provide a means of interacting with the QAD Data Warehouse Designer metadata from within a stored procedure. In many situations the use of the `WsWrkAudit`, `WsWrkError` and `WsWrkTask` procedures are used to provide additional information on the results of a procedures execution. The QAD Data Warehouse Designer callable procedures are an application program interface (API) for the QAD metadata.

The `WsParameterRead` and `WsParameterWrite` functions can be used to coordinate processing and pass information between procedures.

The following callable procedures are available:

Name	Description
<code>Ws_Api_Glossary</code> (see "29.4 <code>Ws_Api_Glossary</code> " on page 635)	Allows adding of entries to the documentation glossary.
<code>Ws_Connect_Replace</code> (see "29.4 <code>Ws_Api_Glossary</code> " on page 635)	Allows copying of connection details.
<code>Ws_Job_Clear_Archive</code> (see "29.6 <code>Ws_Job_Clear_Archive</code> " on page 642)	Removes the job archive logs.
<code>Ws_Job_Clear_Logs</code> (see "29.7 <code>Ws_Job_Clear_Logs</code> " on page 648)	Removes and archives old job logs.
<code>Ws_Job_Clear_Logs_By_Date</code> (see "29.7 <code>Ws_Job_Clear_Logs</code> " on page 648)	Removes and archives old job logs by number of days.
<code>Ws_Job_Create</code> (see "29.9 <code>Ws_Job_Create</code> " on page 658)	Creates a new job based on an existing job to run immediately.
<code>Ws_Job_CreateWait</code> (see "29.10 <code>Ws_Job_CreateWait</code> " on page 664)	Creates a new job based on an existing job to run at specified time.
<code>Ws_Job_Dependency</code> (see "29.11 <code>Ws_Job_Dependency</code> " on page 670)	Allows the caller to add or remove job dependencies
<code>Ws_Job_Release</code> (see "29.12 <code>Ws_Job_Release</code> " on page 676)	Allows the automated release of a held or waiting job.
<code>Ws_Job_Restart</code> (see "29.13 <code>Ws_Job_Restart</code> " on page 681)	Allows the automated restarting of a failed job.
<code>Ws_Job_Schedule</code> (see "29.15 <code>Ws_Job_Status</code> " on page 691)	Allows the automated rescheduling of a hold or waiting job.

Name	Description
Ws_Job_Status (see "29.15 Ws_Job_Status" on page 691)	Returns the current status of a job.
Ws_Load_Change (see "29.16 Ws_Load_Change" on page 698)	Allows the changing of either the connection or the schema of a load table.
Ws_Maintain_Indexes (see "29.17 Ws_Maintain_Indexes" on page 704)	Drops and builds metadata defined indexes.
Ws_Version_Clear (see "29.19 Ws_Version_Clear" on page 710)	Removes version entries from metadata.
WsParameterRead (see "29.20 WsParameterRead" on page 714)	Reads a parameter value.
WsParameterReadG (see "29.21 WsParameterReadG" on page 717)	Reads a global parameter (i.e. table or source table name).
WsParameterReadJ (see "29.22 WsParameterReadJ" on page 720)	Reads job information and attributes.
WsParameterWrite (see "29.23 WsParameterWrite" on page 723)	Updates or adds a new parameter value.
WsWrkAudit (see "29.24 WsWrkAudit" on page 726)	Used to log information to the Audit log.
WsWrkAuditBulk (see "29.25 WsWrkAuditBulk" on page 729)	Allows a bulk write to the audit trail.
WsWrkError (see "29.26 WsWrkError" on page 733)	Allows a bulk write to the detail/error log.
WsWrkErrorBulk (see "29.27 WsWrkErrorBulk" on page 736)	Updates the counters stored against a scheduled job task.
WsWrkTask (see "29.28 WsWrkTask" on page 741)	Used to log information to the detail/error log.

29.2 Terminology

Some relational databases provide for SQL user defined functions that are able to perform complex tasks. The QAD Data Warehouse Designer APIs exist as database procedures in some databases and database functions in others. In one case, both a procedure and function version of the same API exist in Microsoft SQL Server. To avoid confusion, this chapter refers to all APIs as procedures, even if they are functions. At the beginning of each section, a tables shows the form of the API in each supported relational database.

29.3 Common Parameters

All of the QAD Data Warehouse Designer APIs have input and output parameters.

The following input parameters are common to most of the QAD Data Warehouse Designer APIs, primarily for scheduler integration:

Parameter	Description
Sequence	Unique integer sequence number to assist in identifying messages. If being executed manually or externally to the scheduler, then any number may be entered. In Oracle, the number can be acquired from the ws-job-seq sequence. If under scheduler control, then the procedure will have been passed the sequence parameter.
Job Name	Maximum 64 character code that is the name of the job, when running under the scheduler. If being executed manually, any name may be entered. If under scheduler control, then the procedure will have been passed the job name parameter.
Task Name	Maximum 64 character code that is the name of the task, when running under the scheduler. If being executed manually, any name may be entered. If under scheduler control, then the procedure will have been passed the task name parameter.
Job Key	Integer key of the job, when running under the scheduler. If being executed manually, then this key should be set to zero (0). If under scheduler control, then the procedure will have been passed the job id parameter.
Task Key	Integer key of the task, when running under the scheduler. If being executed manually, then this key should be set to zero (0). If under scheduler control, then the procedure will have been passed the task id parameter.

In the sections that follow, each API using one or more of the parameters above includes the parameter name without descriptions.

29.4 Ws_Api_Glossary

This procedure allows for the manual inclusion of glossary elements. These glossary elements once included will appear in all subsequent documentation produced by QAD Data Warehouse Designer.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Api_Glossary @v_object_name, @v_term, @v_comments, @v_option, @v_result OUTPUT

Oracle: v_result := Ws_Api_Glossary(v_object_name, v_term, v_comments, v_option);

DB2: CALL [METABASE].Ws_Api_Glossary(v_object_name, v_term, v_comments, v_option, v_result);

Parameters

The following parameters are required:

Parameter	Description
Object_name	This is the value that appears in the left hand column of the glossary. It is normally defined as the business name for a column in a fact or dimension table. This value must be less than or equal to 64 characters in length.
Term	This is the value that will appear under the analysis area heading in the glossary. It normally represents the dimension or fact table name, but can be used for other purposes. This value must be less than or equal to 256 characters in length.
Comments	This is the value that will appear under the heading in the glossary. It provides an in depth description of the business term being defined. This value must be less than or equal to 4000 characters in length.
Option	The only valid options are ADD or DELETE to either add a new glossary entry or remove a previously added entry.

Parameter	Description
Result	A message indicating either a successful ADD or DELETE , or in the event of an error a description of the problem encountered. The maximum length of the message returned is 256 characters.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          varchar(256)
```

Then add the call to the Procedure:

```
EXEC Ws_Api_Glossary 'Data Warehouse', 'Overview', 'A repository of
business information', 'ADD', @v_result OUTPUT
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -WslWarehouse -E -Q"DECLARE @res varchar(50); EXEC
Ws_Api_Glossary 'Data Warehouse', 'Overview', 'A repository of business
information', 'ADD', @res OUTPUT; SELECT @res"
```

The following out is typical:

```
-----
Data Warehouse element inserted
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Api_Glossary('Data Warehouse', 'Overview', 'A repository of
business information', 'ADD', ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          varchar2(256);
```

Then add the call to Ws_Api_Glossary:

```
v_result := Ws_Api_Glossary('Data Warehouse', 'Overview', 'A repository
of business information', 'ADD');
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res varchar2(256);
exec :res:=Ws_Api_Glossary('Data Warehouse', 'Overview', 'A repository
of business information', 'ADD');
print :res;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

Data Warehouse element inserted

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          VARCHAR(256);
```

Then add the call to the Procedure:

```
CALL [METABASE].Ws_Api_Glossary('Data Warehouse','Overview','A repository of business information', 'ADD',v_result);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Api_Glossary('Data Warehouse','Overview','A repository of business information','ADD',?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name   : P_RESULT
Parameter Value  : Data Warehouse element inserted

Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.Ws_Api_Glossary('Data Warehouse','Overview','A repository of business information','ADD',?)}
```

29.5 Ws_Connect_Replace

This procedure allows the caller to replace the contents of a connection from another connection.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Connect_Replace @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_action, @v_source, @v_target, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Connect_Replace(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_source, v_target, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Connect_Replace(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_source, v_target, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Action	The action must be set to REPLACE.
Source	The name of the source connection.
Target	The name of the target connection (i.e. the connection to be changed).
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The load table was successfully changed. The function result is 1.
E	An error occurred while attempting to change the load table. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function changed the load table.
- -2 will be returned if the load table could not be changed.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Connect_Replace @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'REPLACE', 'CONN_TEST2', 'CONN_TEST1'
, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to replace connection details. Return
Code was ' +@v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(77);EXEC Ws_Connect_Replace
0, 'Change Conn', 'Conn', 0, 0, 'REPLACE', 'CONN_TEST2', 'CONN_TEST1', @RET
OUTPUT, @MSG OUTPUT, @RES OUTPUT; SELECT @RET, @MSG"
```

The following out is typical:

```
- -----
-----
S Connection information for CONN_TEST1 replaced from CONN_TEST2
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Connect_Replace(0, 'Change
Conn', 'Conn', 0, 0, 'REPLACE', 'CONN_TEST2', 'CONN_TEST1', ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := ws_Connect_Replace(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
        , 'REPLACE', 'CONN_TEST2', 'CONN_TEST1'
        , v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to replace connection details. Return Code
was ' || v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_Connect_Replace(0,'Change
Conn','Conn',0,0,'REPLACE','CONN_TEST2','CONN_TEST1',:rcode, :rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Connection information for CONN_TEST1 replaced from CONN_TEST2
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].ws_Connect_Replace(p_sequence, p_job_name,
p_task_name, p_job_id, p_task_id
        , 'REPLACE', 'CONN_TEST2', 'CONN_TEST1'
```

```

, v_return_code, v_return_msg, v_result);

```

Perhaps add a check of the result:

```

IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to replace connection details. Return
Code was ' || RTRIM(v_return_code);
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;

```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse Designer.Ws_Connect_Replace(0, 'Change
Conn', 'Conn', 0, 0, 'REPLACE', 'CONN_TEST2', 'CONN_TEST1', ?, ?, ?)

```

The following out is typical:

```

Value of output parameters
-----
Parameter Name   : P_RETURN_CODE
Parameter Value  : S

Parameter Name   : P_RETURN_MSG
Parameter Value  : Connection information for CONN_TEST1 replaced from
CONN_TEST2

Parameter Name   : P_RESULT
Parameter Value  : 1

Return Status = 0

```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```

{Call Data Warehouse Designer.Ws_Connect_Replace(0, 'Change
Conn', 'Conn', 0, 0, 'REPLACE', 'CONN_TEST2', 'CONN_TEST1', ?, ?, ?)}

```

29.6 Ws_Job_Clear_Archive

This procedure allows the removal of old job archive logs generated by the callable procedure Ws_Job_Clear_Logs and Ws_Job_Clear_Logs_By_Date. The number of days of logs to retain is specified and all older logs are deleted. If zero is specified all logs are deleted. For example if 90 is specified then logs older than 90 days old are removed.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	

RDBMS Platform	Procedure	Function
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Clear_Archive @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_day_count, @v_job_to_clean, @v_options @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: p_result := Ws_Job_Clear_Archive(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_day_count, v_job_to_clean, v_option, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Clear_Archive(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_day_count, v_job_to_clean, v_option, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Day count	The number of days to retain. If 90 is entered then all logs more than 90 days old are deleted.
Job to clean	The name of the job that is to have logs removed. This can be the name of the current job if required. Wild cards are allowed, if % is entered for the job name then all job logs are examined.
Options	If set to "TRUNCATE" the audit tables will be truncated irrespective of the job name or the number of days requested to be kept.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The job logs were successfully removed. The function result is 1.
E	An error occurred while attempting to remove the logs. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function cleared the job logs.
- -2 will be returned if the job logs could not be removed..
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Clear_Archive @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 90, 'Daily Run', '', @v_return_code OUTPUT,
@v_return_msg OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to clear Job archive. Return Code was '
+ @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Clear_Archive
0, 'ClearArch', 'Clear', 0, 0, 90, 'Daily Run', '', @RET OUTPUT, @MSG OUTPUT, @RES
OUTPUT; SELECT @RES, @RET, @MSG"
```

The following out is typical:

```
-----
-----
1 S 70 audit archive logs removed and 20 detail archive logs
removed.
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Clear_Archive(0, 'ClearArch', 'Clear', 0, 0, 90, 'Daily
Run', '', ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code      varchar2(1);
v_return_msg       varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_job_clear_archive(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
    , 90, 'Daily Run', ''
    , v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to clear Job archive. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_job_clear_archive(0, 'ClearArch', 'Clear', 0, 0, 90, 'Daily
Run', '', :rcode, :rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
10 audit archive logs removed and 3 detail archive logs removed.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code      VARCHAR(1);
DECLARE v_return_msg       VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Job_Clear_Archive(p_sequence, p_job_name,
p_task_name, p_job_id, p_task_id
, 90, 'Daily Run', '', v_return_code, v_return_msg,
v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to clear Job archive. Return Code was '
|| v_return_code;
  SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse
Designer.Ws_Job_Clear_Archive(0, 'ClearArch', 'Clear', 0, 0, 90, 'Daily
Run', '', ?, ?, ?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name  : P_RETURN_CODE
Parameter Value : S

Parameter Name  : P_RETURN_MSG
Parameter Value : 0 audit archive logs removed and 0 detail archive
logs removed.

Parameter Name  : P_RESULT
Parameter Value : 1

Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse
Designer.Ws_Job_Clear_Archive(0, 'ClearArch', 'Clear', 0, 0, 90, 'Daily
Run', '', ?, ?, ?)}
```

29.7 Ws_Job_Clear_Logs

This procedure allows the removal of old job logs and the archiving of the associated audit trail. The number of logs to retain is specified and all older logs are deleted. If zero is specified all logs are deleted. For example if 3 is specified then the latest 3 logs are retained and all older logs are removed.

Note: The functionality that this function provides is also provided via the scheduler. Set the number of logs to keep in the job properties and the scheduler will automatically call this function to clear out the old logs.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Clear_Logs @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_job_to_clean, @v_keep_count, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Clear_Logs(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_job_to_clean, v_keep_count, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Clear_Logs(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_job_to_clean, v_keep_count, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)

Parameter	Description
Task Key	See Common Parameters (see " 29.3 Common Parameters " on page 634)
Job to clean	The name of the job that is to have logs removed. This can be the name of the current job if required.
Keep count	The number of logs to keep. The oldest logs will be removed leaving the latest (keep count) logs.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The job logs were successfully removed. The function result is 1.
E	An error occurred while attempting to remove the logs. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function cleared the job logs.
- -2 will be returned if the job logs could not be removed..
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Clear_Logs @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'Daily Run', 10, @v_return_code OUTPUT, @v_return_msg
OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to clear Job logs.  Return Code was '
+@v_return_code
    SET @p_return_msg = @p_return_msg + '.  ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Clear_Logs
0,'ClearJob','Clear',0,0,'Daily Run',10,@RET OUTPUT,@MSG OUTPUT,@RES
OUTPUT; SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
1 S Job Daily Run had 140 logs removed.
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Clear_Logs(0,'ClearJob','Clear',0,0,'Daily Run',10,?,?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_job_clear_logs(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', 10, v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to clear Job logs. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_job_clear_logs(0,'ClearJob','Clear',0,0,'Daily
Run',10,:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run had 20 logs removed.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].ws_job_clear_logs(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', 10, v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```

IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to clear Job logs. Return Code was ' ||
v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;

```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse
Designer.Ws_Job_Clear_Logs(0, 'ClearJob', 'Clear',0,0, 'Daily
Run',10,?,?,?)

```

The following out is typical:

```

Value of output parameters
-----
Parameter Name   : P_RETURN_CODE
Parameter Value  : S

Parameter Name   : P_RETURN_MSG
Parameter Value  : Job Daily Run had 0 logs removed.

Parameter Name   : P_RESULT
Parameter Value  : 1

Return Status = 0

```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```

{Call Data Warehouse
Designer.Ws_Job_Clear_Logs(0, 'ClearJob', 'Clear',0,0, 'Daily
Run',10,?,?,?)}

```

29.8 Ws_Job_Clear_Logs_By_Date

This procedure allows the removal of old job logs and the archiving of the associated audit trail. The number of days of logs to retain is specified and all older logs are deleted. If zero is specified all logs are deleted. For example if 90 is specified then logs older than 90 days old are removed.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X

RDBMS Platform	Procedure	Function
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Clear_Logs_By_Date @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_job_to_clean, @v_day_count, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Clear_Logs_By_Date(p_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_job_to_clean, v_day_count, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Clear_Logs_By_Date(p_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_job_to_clean, v_day_count, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job to clean	The name of the job that is to have logs removed. This can be the name of the current job if required. Wild cards are allowed, if % is entered for the job name then all job logs are examined.
Day count	The number of days to retain. If 90 is entered then all logs more than 90 days old are deleted.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The job logs were successfully removed. The function result is 1.
---	---

E	An error occurred while attempting to remove the logs. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function cleared the job logs.
- -2 will be returned if the job logs could not be removed..
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Clear_Logs_By_Date @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'Daily Run', 0, @v_return_code OUTPUT, @v_return_msg
OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to clear Job logs. Return Code was '
+@v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(256);EXEC Ws_Job_Clear_Logs_By_Date
0, 'ClearJob', 'Clear', 0, 0, 'Daily Run', 0, @RET OUTPUT, @MSG OUTPUT, @RES
OUTPUT; SELECT @RES, @RET, @MSG"
```

The following out is typical:

```
-----
-----
          1 S Job Daily Run had 120 logs removed.
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Clear_Logs_By_Date(0, 'ClearJob', 'Clear', 0, 0, 'Daily
Run', 0, ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code      varchar2(1);
v_return_msg       varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_job_clear_logs_by_date(p_sequence, v_job_name,
v_task_name, v_job_id, v_task_id
, 'Daily Run', 0, v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to clear Job logs. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_job_clear_logs_by_date(0, 'ClearJob', 'Clear', 0, 0, 'Daily
Run', 0, :rcode, :rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run had 0 logs removed.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code      VARCHAR(1);
DECLARE v_return_msg       VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].ws_job_clear_logs_by_date(p_sequence, p_job_name,
p_task_name, p_job_id, p_task_id
, 'Daily Run', 0, v_return_code, v_return_msg, v_result);
```


Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to clear Job logs. Return Code was ' ||
v_return_code;
  SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse
Designer.Ws_Job_Clear_Logs_By_Date(0, 'ClearJob', 'Clear', 0, 0, 'Daily
Run', 0, ?, ?, ?)
```

The following out is typical:

Value of output parameters

Parameter Name : P_RETURN_CODE

Parameter Value : S

Parameter Name : P_RETURN_MSG

Parameter Value : Job Daily Run had 0 logs removed.

Parameter Name : P_RESULT

Parameter Value : 1

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse
Designer.Ws_Job_Clear_Logs_By_Date(0, 'ClearJob', 'Clear', 0, 0, 'Daily
Run', 0, ?, ?, ?)}
```

29.9 Ws_Job_Create

This procedure allows the automated creating of a new job from an existing job that is in either a holding or waiting state. The intended use of this function is to allow the creation of a job from within another job. Only jobs that are in a Hold state (i.e. Once and Hold jobs), or in a Waiting state can be used as a template for the new job. When a job is created via this function *the start time is set to the current time*, to allow immediate start.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Create @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_template_job, @v_new_job, @v_description, @v_state, @v_threads, @v_scheduler, @v_logs, @v_okay, @v_fail, @v_att1, @v_att2, @v_att3, @v_att4, @v_att5, @v_att6, @v_att7, @v_att8,, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Create(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_template_job, v_new_job, v_description, v_state, v_threads, v_scheduler, v_logs, v_okay, v_fail, v_att1, v_att2, v_att3, v_att4, v_att5, v_att6, v_att7, v_att8, v_return_code, v_return_msg);

DB2: CALL [METABASE].v_result := Ws_Job_Create(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_template_job, v_new_job, v_description, v_state, v_threads, v_scheduler, v_logs, v_okay, v_fail, v_att1, v_att2, v_att3, v_att4, v_att5, v_att6, v_att7, v_att8, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)

Parameter	Description
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Template Job	The name of the job that is to be used as the template for the new job. This name must exactly match the job name as seen in the scheduler job display. The job must be in a 'Hold' or 'Waiting' state in order to be used as a template.
New Job	The name of the job to be created. This name must not already be in use as a job name.
Description	A description for the new job. If set to NULL then the description from the template job will be used.
State	The new state of the job. Can be HOLD, ONCE or ONCE+HOLD. If HOLD then the job is put into a hold state. If ONCE then the job is set for immediate running as a once only job. If ONCE+HOLD then the job is set as a Once and Hold job set for immediate start.
Threads	The number of threads for the new job. If set to NULL then the number of threads defined for the template job will be used.
Scheduler	A scheduler designation or specific scheduler for the new job. If set to NULL then the scheduler designation from the template job will be used. Refer to the job creation section of this manual for more information.
Logs	The number of log files to keep for the new job. If set to NULL then the log value from the template job will be used.
Okay	A command action on successful completion for the new job. If set to NULL then the okay command from the template job will be used.
Fail	A command action on failure for the new job. If set to NULL then the failure command from the template job will be used.
Att1 - Att8	Attributes associated with the new job. These attributes can be acquired by tasks running under the job through the WsParameterReadJ callable procedure.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

N	The job is not in a hold or waiting state, No action. The function result is -1.
P	The new job name was already in use and hence the new job could not be created. No action. The function result is -1
S	The job was successfully created. The function result is 1.

E	An error occurred while attempting to create the job. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function created the job.
- -1 will be returned if the template job was not in a hold or waiting state, or the new job already existed.
- -2 will be returned if the job could not be created.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Create @p_sequence, @p_job_name, @p_task_name, @p_job_id,
@p_task_id
, 'Daily Run', 'New Daily Run', 'This is the New Daily Run
job.', 'ONCE'
, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL
, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to create the Job. Return Code was '
+ @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Create
0,'CreateJob','Create',0,0,'Daily Run','New Daily Run','This is the New
Daily Run
job.', 'ONCE', NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, @RET OUTPUT, @MSG OUTPUT, @RES OUTPUT; SELECT @RES, @RET, @MSG"
```

The following out is typical:

```
-----
-----
1 S Job New Daily Run created.
```

(1 rows affected)

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Create(0,'CreateJob','Create',0,0,'Daily Run','New Daily Run','This is the New Daily Run job.', 'ONCE',NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result      integer;  
v_return_code varchar2(1);  
v_return_msg  varchar2(256);
```

Then add the call to the procedure:

```

        v_result := ws_job_create(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
        , 'Daily Run', 'New Daily Run', 'This is the New Daily Run
job.', 'ONCE'
        , NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL
        , v_return_code, v_return_msg);

```

Perhaps add a check of the result:

```

IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to create the Job. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;

```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```

set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=Ws_Job_Create(0,'CreateJob','Create',0,0,'Daily Run','New
Daily Run','This is the New Daily Run
job.','ONCE',NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,
NULL,:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;

```

Execute the file from sqlplus (using @FileName). The following out is typical:

S
Job New Daily Run created.

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Job_Create(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', 'New Daily Run', 'This is the New Daily Run
job.', 'ONCE'
, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL
, v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to create the Job. Return Code was ' ||
v_return_code;
  SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse
Designer.Ws_Job_Create(0,'CreateJob','Create',0,0,'Daily Run','New Daily
Run','This is the New Daily Run
job.','ONCE',NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,
,NULL,?,?,?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name  : P_RETURN_CODE
Parameter Value : S

Parameter Name  : P_RETURN_MSG
Parameter Value : Job New Daily Run created.

Parameter Name  : P_RESULT
Parameter Value : 1

Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse
Designer.Ws_Job_Create(0, 'CreateJob', 'Create',0,0, 'Daily Run', 'New Daily
Run','This is the New Daily Run
job.', 'ONCE', NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, ?, ?, ?)}
```

29.10 Ws_Job_CreateWait

This procedure allows the automated creating of a new job from an existing job that is in either a holding or waiting state. The intended use of this function is to allow the creation of a job from within another job. Only jobs that are in a Hold state (i.e. Once and Hold jobs), or in a Waiting state can be used as a template for the new job. When a job is created via this function the release time is controllable.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_CreateWait @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_template_job, @ v_new_job, @v_description, @v_state, @v_release_time, @v_threads, @v_scheduler, @v_logs, @v_okay, @v_fail, @v_att1, @v_att2, @v_att3, @v_att4, @v_att5, @v_att6, @v_att7, @v_att8, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_CreateWait(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_template_job, v_new_job, v_description, v_state, v_release_time, v_threads, v_scheduler, v_logs, v_okay, v_fail, v_att1, v_att2, v_att3, v_att4, v_att5, v_att6, v_att7, v_att8, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_CreateWait(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_template_job, v_new_job, v_description, v_state, v_release_time, v_threads, v_scheduler, v_logs, v_okay, v_fail, v_att1, v_att2, v_att3, v_att4, v_att5, v_att6, v_att7, v_att8, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Template Job	The name of the job that is to be used as the template for the new job. This name must exactly match the job name as seen in the scheduler job display. The job must be in a 'Hold' or 'Waiting' state in order to be used as a template.
New Job	The name of the job to be created. This name must not already be in use as a job name.
Description	A description for the new job. If set to NULL then the description from the template job will be used.
State	The new state of the job. Can be HOLD, ONCE or ONCE+HOLD. If HOLD then the job is put into a hold state. If ONCE then the job is set for immediate running as a once only job. If ONCE+HOLD then the job is set as a Once and Hold job set for immediate start.
Release Time	The date-time that the new job is to be run.

Parameter	Description
Threads	The number of threads for the new job. If set to NULL then the number of threads defined for the template job will be used.
Scheduler	A scheduler designation or specific scheduler for the new job. If set to NULL then the scheduler designation from the template job will be used. Refer to the job creation section of this manual for more information.
Logs	The number of log files to keep for the new job. If set to NULL then the log value from the template job will be used.
Okay	A command action on successful completion for the new job. If set to NULL then the okay command from the template job will be used.
Fail	A command action on failure for the new job. If set to NULL then the failure command from the template job will be used.
Att1 - Att8	Attributes associated with the new job. These attributes can be acquired by tasks running under the job through the WsParameterReadJ callable procedure.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

N	The job is not in a hold or waiting state, No action. The function result is -1.
P	The new job name was already in use and hence the new job could not be created. No action. The function result is -1
S	The job was successfully created. The function result is 1.
E	An error occurred while attempting to create the job. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function created the job.
- -1 will be returned if the template job was not in a hold or waiting state, or the new job already existed.
- -2 will be returned if the job could not be created.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
DECLARE @v_run_date        datetime
```

Then add the call to the procedure:

```
SET @v_run_date = GETDATE() + 365
EXEC Ws_Job_CreateWait @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'Daily Run', 'New Daily Run2', 'This is the New Daily
Run job.', 'ONCE'
, @v_run_date
, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL
, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
SET @p_status = @v_result
SET @p_return_msg = 'Failed to create the Job. Return Code was '
+ @v_return_code
SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_CreateWait
0, 'CreateJob', 'Create', 0, 0, 'Daily Run', 'New Daily Run', 'This is the New
Daily Run job.', 'ONCE', '2009-01-01
11:30:59', NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NU
LL, @RET OUTPUT, @MSG OUTPUT, @RES OUTPUT; SELECT @RES, @RET, @MSG"
```

The following out is typical:

```
-----  
-----  
          1 S Job New Daily Run created.  
(1 rows affected)  
  
3. SQL Server example of a call from QAD SQL Admin  
{Call Ws_Job_CreateWait(0, 'CreateJob', 'Create', 0, 0, 'Daily Run', 'New  
Daily Run', 'This is the New Daily Run job.', 'ONCE', '2009-01-01  
11:30:59', NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NU  
LL, ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;  
v_return_code     varchar2(1);  
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := Ws_Job_CreateWait(p_sequence, p_job_name, p_task_name,  
p_job_id, p_task_id  
          , 'Daily Run', 'New Daily Run', 'This is the New Daily Run  
job.', 'ONCE'  
          , TO_DATE('20090101113059', 'YYYYMMDDHH24MISS')  
          , NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,  
NULL, NULL, NULL, NULL  
          , v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN  
    p_status := v_result;  
    p_return_msg := 'Failed to create the Job. Return Code was ' ||  
v_return_code;  
    p_return_msg := p_return_msg || '. ' || v_return_msg;  
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off  
variable res number;  
variable rcode varchar2(1);  
variable rmsg varchar2(256);  
exec :res:=Ws_Job_CreateWait(0, 'CreateJob', 'Create', 0, 0, 'Daily  
Run', 'New Daily Run'  
          , 'This is the New Daily Run  
job.', 'ONCE', TO_DATE('20090101113059', 'YYYYMMDDHH24MISS')
```

```
,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,:rcode
,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using @FileName). The following out is typical:

```
1
S
Job New Daily Run created.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code      VARCHAR(1);
DECLARE v_return_msg       VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Job_CreateWait(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', 'New Daily Run2', 'This is the New Daily
Run job.', 'ONCE'
, (CURRENT TIMESTAMP + 1 YEAR)
, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
NULL, NULL, NULL, NULL
, v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to create the Job. Return Code was ' ||
v_return_code;
  SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse
Designer.Ws_Job_CreateWait(0,'CreateJob','Create',0,0,'Daily Run','New
Daily Run','This is the New Daily Run job.','ONCE', (CURRENT TIMESTAMP +
1
YEAR),NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,NULL,?,?
,?,?)
```

The following out is typical:

```
Value of output parameters
-----
```

Parameter Name : P_RETURN_CODE
Parameter Value : S

Parameter Name : P_RETURN_MSG
Parameter Value : Job New Daily Run2 created.

Parameter Name : P_RESULT
Parameter Value : 1

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse  
Designer.Ws_Job_CreateWait(0, 'CreateJob', 'Create', 0, 0, 'Daily Run', 'New  
Daily Run', 'This is the New Daily Run job.', 'ONCE', CURRENT TIMESTAMP + 1  
YEAR, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, ?,  
?, ?)}
```

29.11 Ws_Job_Dependency

This procedure allows the caller to add or remove job dependencies.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Dependency @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v v_action, @v_parent, @v_child, @v_required, @v_look_back, @v_max_wait, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Dependency(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_parent, v_child, v_required, v_look_back, v_max_wait, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Dependency(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_parent, v_child, v_required, v_look_back, v_max_wait, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Action	This parameter informs the procedure what is to be done. Either 'ADD' or 'DELETE' the job dependency .
Parent Job Name	The job that the Child Job will depend on.
Child Job Name	The job that will be dependent on the Parent Job.
Required	Indicates if Child job is to be failed if parent job does not complete successfully in the required time.
Look Back	The maximum time to look back for parent job completion (in minutes).
Max Wait	Specifies how long (in minutes) to wait for successful completion of the parent job.

Parameter	Description
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

W	Dependency already exists for an ADD action, or does not exist for a DELETE action. Check message for reason. The function result is -1.
S	The job was successfully released. The function result is 1.
E	Invalid action parameter passed. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function added or removed a job dependency
- -1 will be returned if the dependency already exists for and add or does not exist for a delete .
- -2 will be returned if the dependency could not be maintained.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Dependency @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'ADD', 'Daily Run', 'Daily Run Part2', 'Y', 60, 60
, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
```

OUTPUT

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to add Job dependency. Return Code was
' +@v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Dependency
0, 'AddDep', 'Add', 0, 0, 'ADD', 'Daily Run', 'Daily Run Part2', 'Y', 60, 60, @RET
OUTPUT, @MSG OUTPUT, @RES OUTPUT; SELECT @RES, @RET, @MSG"
```

The following out is typical:

```
-----
-----
          1 S Job Daily Run Part2 dependent on Job Daily Run ADDED
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Dependency(0, 'AddDep', 'Add', 0, 0, 'ADD', 'Daily Run', 'Daily
Run Part2', 'Y', 60, 60, ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_job_dependency(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'ADD', 'Daily Run', 'Daily Run Part2', 'Y', 60, 60
, v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  p_status := v_result;
  p_return_msg := 'Failed to add Job dependency. Return Code was ' ||
v_return_code;
  p_return_msg := p_return_msg || '. ' || v_return_msg;
END;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_job_dependency(0,'AddDep','Add',0,0,'ADD','Daily
Run','Daily Run Part2','Y',60,60,:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run Part2 dependent on Job Daily Run ADDED
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Job_Dependency(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
    , 'ADD', 'Daily Run', 'Daily Run Part2', 'Y', 60, 60
    , v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to add Job dependency. Return Code was '
|| v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse
Designer.Ws_Job_Dependency(0, 'AddDep', 'Add', 0, 0, 'ADD', 'Daily Run', 'Daily
Run Part2', 'Y', 60, 60, ?, ?, ?)
```

The following out is typical:

Value of output parameters

Parameter Name : P_RETURN_CODE

Parameter Value : S

Parameter Name : P_RETURN_MSG

Parameter Value : Job Daily Run Part2 dependent on Job Daily Run ADDED

Parameter Name : P_RESULT

Parameter Value : 1

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse
Designer.Ws_Job_Dependency(0, 'AddDep', 'Add', 0, 0, 'ADD', 'Daily Run', 'Daily
Run Part2', 'Y', 60, 60, ?, ?, ?)}
```

29.12 Ws_Job_Release

Ws_Job_Release allows the automated release of a holding or waiting job. The intended use of this routine is to allow the release of a job from within another job or external scheduler. Only jobs that are in a **Hold** state (*Hold* or *Once and Hold* jobs), or in a **Waiting** state can be released. When a job is released via this routine the start time is set to the current time, to allow immediate start.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Release @v_sequence, @v_job_name, @v_task_name, @v_job_id, @v_task_id, @v_release_job, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Release(v_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_release_job, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Release(v_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_release_job, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)

Parameter	Description
Release Job	The name of the job that is to be released. This name must exactly match the job name as seen in the scheduler job display. The job must be in a 'Hold' or 'Waiting' state in order to be released.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.
Result	Integer that indicates the status of the call to Ws_Job_Release. See below for the possible values of Result.

Valid Return Codes

N	The job is not in a hold or waiting state, No action. The function result is -1.
S	The job was successfully released. The function result is 1.
E	An error occurred while attempting to release the job. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function released the job.
- -1 will be returned if the job was not in a hold or waiting state.
- -2 will be returned if the job could not be released.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Release @p_sequence, @p_job_name, @p_task_name, @p_job_id,
@p_task_id
                , 'Daily Run', @v_return_code OUTPUT, @v_return_msg
OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to release Job Daily Run. Return Code
was ' +@v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Release 1,'Release
Job','Release',0,0,'Daily Run',@RET OUTPUT,@MSG OUTPUT,@RES OUTPUT;
SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
1 S Job Daily Run released.
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Release(1, 'Release Daily Job','Release',0,0,'Daily
Run',?,?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to Ws_Job_Release:

```
v_result := Ws_Job_Release(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to release Job Daily Run. Return Code was '
|| v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
set pages 0 feed off heading off
exec :res:=Ws_Job_Release(1,'Release Job','Release',0,0,'Daily
Run',:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run released.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to Ws_Job_Release:

```
CALL
[METABASE].Ws_Job_Release(p_sequence,p_job_name,p_task_name,p_job_id,p_t
ask_id
                        , 'Daily Run',v_return_code,v_return_msg,v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to release Daily Run. Return Code was
' || v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Job_Release(0, 'Release
Job', 'Release', 0, 0, 'Daily Run', ?, ?, ?)
```

The following out is typical:

Value of output parameters

Parameter Name : P_RETURN_CODE

Parameter Value : S

Parameter Name : P_RETURN_MSG

Parameter Value : Job Daily Run released.

Parameter Name : P_RESULT

Parameter Value : 1

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{call Data Warehouse Designer.Ws_Job_Release(1, 'Release Daily
Job', 'Release', 0, 0, 'Daily Run', ?, ?, ?)};
```


29.13 Ws_Job_Restart

Ws_Job_Restart allows the automated restarting of a failed job. The intended use of this routine is as part of a database startup to restart any job that may have been stopped as the result of a prior database shutdown. It can be called in any event and will restart the specified job if the job has *Failed*, or will take no action if the job is in a *Wait*, *Hold*, *Running*, *Completed*, or *Failed - Aborted* state.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Restart @v_sequence, @v_job_name, @v_task_name, @v_job_id, @v_task_id, @v_restart_job, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Restart(v_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_restart_job, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Restart(v_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_restart_job, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)

Parameter	Description
Restart Job	The name of the job that is to be restarted. This name must exactly match the job name as seen in the scheduler job display. The job must be in a 'Failed' state in order to be restarted.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.
Result	Integer that indicates the status of the call to Ws_Job_Restart. See below for the possible values of Result.

Valid Return Codes

N	The job is not running or is in a failed state, No action. The function result is -1.
R	The job is currently running. No action. The function result is -1.
U	The job is in an unusual state. It is classed as a running job, but is not running or failed. This can happen if the scheduler has failed and the job is in a pending state. The function result is -2.
S	The job was successfully restarted. The function result is 1.
E	An error occurred while attempting to restart the job. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function restarted the job.
- -1 will be returned if the job was not in a failed state.
- -2 will be returned if the job could not be restarted.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all restart a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Restart @p_sequence, @p_job_name, @p_task_name, @p_job_id,
@p_task_id
                , 'Daily Run', @v_return_code OUTPUT, @v_return_msg
OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to restart Job Daily Run. Return Code
was ' + @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Restart 1,'Restart
Job','Restart',0,0,'Daily Run',@RET OUTPUT,@MSG OUTPUT,@RES OUTPUT;
SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
                1 S Job Daily Run sequence 6 restarted.
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Restart(1, 'Restart Daily Job','Restart',0,0,'Daily
Run',?,?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code      varchar2(1);
v_return_msg       varchar2(256);
```

Then add the call to Ws_Job_Restart:

```
v_result := Ws_Job_Restart(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to restart Job Daily Run. Return Code was '
|| v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
set pages 0 feed off heading off
exec :res:=Ws_Job_Restart(1,'Restart Job','Restart',0,0,'Daily
Run',:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run restarted.
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code      VARCHAR(1);
DECLARE v_return_msg       VARCHAR(256);
```

Then add the call to Ws_Job_Release:

```

CALL
[METABASE].Ws_Job_Restart(p_sequence,p_job_name,p_task_name,p_job_id,p_t
ask_id
                        , 'Daily Run',v_return_code,v_return_msg,v_result);

```

Perhaps add a check of the result:

```

IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to restart Daily Run. Return Code was
' || v_return_code;
  SET p_return_msg = p_return_msg || '. ' || v_return_msg;
  RETURN 0;
END IF;

```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse Designer.Ws_Job_Restart(0, 'Restart
Job', 'Restart', 0, 0, 'Daily Run', ?, ?, ?)

```

The following out is typical:

```

Value of output parameters
-----
Parameter Name  : P_RETURN_CODE
Parameter Value : S

Parameter Name  : P_RETURN_MSG
Parameter Value : Job Daily Run restart.

Parameter Name  : P_RESULT
Parameter Value : 1

Return Status = 0

```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```

{call Data Warehouse Designer.Ws_Job_Restart(1, 'Restart Daily
Job', 'Restart', 0, 0, 'Daily Run', ?, ?, ?)};

```

29.14 Ws_Job_Schedule

This procedure allows the automated rescheduling of a holding or waiting job. The intended use of this function is to allow the scheduling of a job from within another job. Only jobs that are in a Hold state (i.e. Once and Hold jobs), or in a Waiting state can be rescheduled.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Schedule @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_release_job, @v_release_time, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Job_Schedule(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_release_job, v_release_time, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Job_Schedule(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_release_job, v_release_time, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)

Parameter	Description
Release Job	The name of the job that is to be rescheduled. This name must exactly match the job name as seen in the scheduler job display. The job must be in a 'Hold' or 'Waiting' state in order to be rescheduled.
Release Time	The date and time that the job is to be rescheduled to. In Oracle this is an oracle date field. In SQL Server it is a datetime.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

N	The job is not in a hold or waiting state, No action. The function result is -1.
S	The job was successfully rescheduled. The function result is 1.
E	An error occurred while attempting to reschedule the job. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function rescheduled the job.
- -1 will be returned if the job was not in a hold or waiting state.
- -2 will be returned if the job could not be rescheduled.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
DECLARE @v_run_date        datetime
```

Then add the call to the procedure:

```
SET @v_run_date = GETDATE() + 1
EXEC Ws_Job_Schedule @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
, 'Daily Run', @v_run_date, @v_return_code OUTPUT,
@v_return_msg OUTPUT, @v_result OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to schedule the Job. Return Code was '
+ @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Job_Schedule 1,'Sched
Job','Sched',0,0,'Daily Run','2009-01-01 11:30:59',@RET OUTPUT,@MSG
OUTPUT,@RES OUTPUT; SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
1 S Job Daily Run rescheduled to Jan  1 2009 11:30AM
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Schedule(1,'Sched Job','Sched',0,0,'Daily Run','2009-01-01
11:30:59',?,?,?)};
```


Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_job_schedule(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'Daily Run', SYSDATE+1, v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to schedule the Job. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_job_schedule(1,'Sched Job','Sched',0,0,'Daily
Run',SYSDATE+1,:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Job Daily Run rescheduled. It Will start at 11-JUN-08
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Job_Schedule(p_sequence, p_job_name, p_task_name,  
p_job_id, p_task_id  
    , 'Daily Run', CURRENT_TIMESTAMP + 1 DAY, v_return_code,  
v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN  
    SET p_status = v_result;  
    SET p_return_msg = 'Failed to schedule the Job. Return Code was '  
|| v_return_code;  
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);  
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Job_Schedule(1, 'Sched  
Job', 'Sched', 0, 0, 'Daily Run', CURRENT_TIMESTAMP + 1 DAY, ?, ?, ?)
```

The following out is typical:

```
Value of output parameters  
-----  
Parameter Name  : P_RETURN_CODE  
Parameter Value : S  
  
Parameter Name  : P_RETURN_MSG  
Parameter Value : Job Daily Run rescheduled. It Will start at 2008-06-  
23-22.45.02  
  
Parameter Name  : P_RESULT  
Parameter Value : 1  
  
Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.Ws_Job_Schedule(1, 'Sched  
Job', 'Sched', 0, 0, 'Daily Run', CURRENT_TIMESTAMP + 1 DAY, ?, ?, ?)}
```

29.15 Ws_Job_Status

This procedure returns the current status of a job in the QAD Data Warehouse Designer scheduler. The intended use of this function is to allow other scheduling software and other QAD Data Warehouse Designer procedures to poll for the status of a QAD Data Warehouse Designer job.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Job_Status @v_sequence, @v_job_name, @v_task_name, @v_job_id, @v_task_id, @v_check_sequence, @v_check_job, @v_started_in_last_mi, @v_started_after_dt, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT, @v_job_status_simple OUTPUT, @v_job_status_standard OUTPUT, @v_job_status_enhanced OUTPUT

Oracle: v_result := Ws_Job_Status(p_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_check_sequence, v_check_job, v_started_in_last_mi, v_started_after_dt, v_return_code, v_return_msg, v_job_status_simple, v_job_status_standard, v_job_status_enhanced);

DB2: CALL [METABASE].Ws_Job_Status(p_sequence, v_job_name, v_task_name, v_job_id, v_task_id, v_check_sequence, v_check_job, v_started_in_last_mi, v_started_after_dt, v_return_code, v_return_msg, v_job_status_simple, v_job_status_standard, v_job_status_enhanced, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)

Parameter	Description
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Check Sequence	The unique integer identifier of the job that is to be checked for its status. This parameter is optional. If this parameter is specified, the <i>Started in Last MI</i> and <i>Started After</i> parameters should not be specified.
Check Job	The name of the job that is to be checked for its status. This name must exactly match the job name as seen in the scheduler job display.
Started in Last MI	The number of minutes back from now the job instance started in. This parameter is optional. If this parameter is specified, the <i>Check Job</i> parameter must also be specified and the <i>Check Sequence</i> and <i>Started After</i> parameters should not be specified. This value must be between 0 and 148599. Note: if multiple instances of the same job have started in the specified time window, the the last job to start is returned (identified by <i>Sequence</i>).
Started After	The date and time the job instance started after. This parameter is optional. If this parameter is specified, the <i>Check Job</i> parameter must also be specified and the <i>Check Sequence</i> and <i>Started in Last MI</i> parameters should not be specified. Note: if multiple instances of the same job have started in the specified time window, the the last job to start is returned (identified by <i>Sequence</i>).
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the success of the status check, or the reason for the status check not being successful.
Result	The returned result (see below)
Job Status Simple	The simplified job status. See the table below for the simple status codes.
Job Status Standard	The QAD Data Warehouse Designer standard job status. See the table below for the standard status codes.
Job Status Enhanced	The enhanced job status. See the table below for the enhanced status codes.

Valid Return Codes

N	The job exists, but not in the time window specified.
S	The job status check was successful.
E	Invalid parameters or no such job.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the procedure successfully check the job status.
- -1 will be returned if the job name or sequence could not be found or was not found in the time window specified.
- -2 will be returned if parameters were specified incorrectly.
- -3 will be returned if an unhandled error occurred.

Job Status - Simple

N	Not Running
R	Running
F	Failed
C	Completed

Job Status - Standard

H	On Hold - The job is on hold. It can be edited and its state changed in order to release the job.
W	Waiting - The job is waiting to start, or waiting for its scheduled time to arrive, or waiting for a scheduler to become available.
B	Blocked - The job is blocked as a previous instance of the same job is still running.
P	Pending - This is the first stage of a running job. The scheduler has identified the job as ready to start and has allocated a thread, or sub task to process the job. If a job stays in this state then the scheduler thread has failed for some reason. Check logs.
R	Running - The job is currently running.
F	Failed - A failed job is one that had a problem.
C	Completed - The job has successfully completed, possibly with warnings. Once in this state a job cannot be restarted.
G	Failed - Aborted - The job has been aborted after having failed. Once in this state a job cannot be restarted.
E	Error Completion - Internal error.

Job Status - Enhanced

1	On Hold - The job is on hold. It can be edited and its state changed in order to release the job.
2	Waiting - The job is waiting to start, or waiting for its scheduled time to arrive, or waiting for a scheduler to become available.
3	Blocked - The job is blocked as a previous instance of the same job is still running.

4	Pending - This is the first stage of a running job. The scheduler has identified the job as ready to start and has allocated a thread, or sub task to process the job. If a job stays in this state then the scheduler thread has failed for some reason. Check logs.
5	Running - The job is currently running, no tasks have failed and there are no warnings.
6	Running with Errors - The job is currently running and some completed tasks have failed. When all tasks not dependent on the failed tasks have completed, the job will fail.
7	Running with Warnings - The job is currently running and some tasks have warnings.
8	Failed - A failed job is one that had a problem.
9	Completed - The job has successfully completed, without warnings. Once in this state a job cannot be restarted.
10	Completed with Warnings - The job has successfully completed, with warnings. Once in this state a job cannot be restarted.
11	Failed - Aborted - The job has been aborted after having failed. Once in this state a job cannot be restarted.
12	Error Completion - Internal error.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result            integer
DECLARE @v_return_code       varchar(1)
DECLARE @v_return_msg        varchar(256)
DECLARE @v_job_status_simple  varchar(1)
DECLARE @v_job_status_standard varchar(1)
DECLARE @v_job_status_enhanced varchar(2)
```

Then add the call to the procedure:

```
EXEC Ws_Job_Status @p_sequence, @p_job_name, @p_task_name, @p_job_id,
@p_task_id
, NULL, 'Daily Run', 10, NULL
, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
OUTPUT
, @v_job_status_simple OUTPUT, @v_job_status_standard
OUTPUT, @v_job_status_enhanced OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to check job status. Return Code was '
+ @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(55);DECLARE @STAT
varchar(1);DECLARE @STAND varchar(1);DECLARE @ENH varchar(2);EXEC
Ws_Job_Status 1, 'Check Job', 'Stat', 0, 0, NULL, 'Daily Run', 10, NULL, @RET
OUTPUT, @MSG OUTPUT, @RES OUTPUT, @STAT OUTPUT, @STAND OUTPUT, @ENH OUTPUT;
SELECT @RES, @RET, @MSG, @STAT, @STAND, @ENH"
```

The following out is typical:

```
-----
- --
1 S Job Sequence 6 Failed F
F 8
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Job_Status(1, 'Check Job', 'Stat', 0, 0, NULL, 'Daily  
Run', 10, NULL, ?, ?, ?, ?, ?, ?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;  
v_return_code      varchar2(1);  
v_return_msg       varchar2(256);  
v_job_status_simple varchar2(1);  
v_job_status_standard varchar2(1);  
v_job_status_enhanced varchar2(2);
```

Then add the call to the procedure:

```
v_result := Ws_Job_Status(p_sequence, p_job_name, p_task_name,  
p_job_id, p_task_id  
    , NULL, 'Daily Run', 10, NULL  
    , v_return_code, v_return_msg  
    , v_job_status_simple, v_job_status_standard,  
v_job_status_enhanced);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN  
    p_status := v_result;  
    p_return_msg := 'Failed to check job status. Return Code was ' ||  
v_return_code;  
    p_return_msg := p_return_msg || '. ' || v_return_msg;  
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off  
variable res number;  
variable rcode varchar2(1);  
variable rmsg varchar2(256);  
variable stat1 varchar2(1);  
variable stat2 varchar2(1);  
variable stat3 varchar2(2);  
exec :res:=Ws_Job_Status(1, 'Check Job', 'Stat', 0, 0, NULL, 'Daily  
Run', 10, NULL, :rcode, :rmsg, :stat1, :stat2, :stat3);  
print :res;  
print :rcode;  
print :rmsg;  
print :stat1;  
print :stat2;  
print :stat3;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:


```

1
S
Job Sequence 58 Completed
C
C
9

```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```

DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg     VARCHAR(256);
DECLARE v_job_status_simple VARCHAR(1);
DECLARE v_job_status_standard VARCHAR(1);
DECLARE v_job_status_enhanced VARCHAR(2);

```

Then add the call to the procedure:

```

CALL [METABASE].Ws_Job_Status(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
    , NULL, 'Daily Run', 10, NULL
    , v_return_code, v_return_msg, v_result
    , v_job_status_simple, v_job_status_standard,
v_job_status_enhanced);

```

Perhaps add a check of the result:

```

IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to check job status. Return Code was '
|| v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;

```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse Designer.Ws_Job_Status(1, 'Check
Job', 'Stat', 0, 0, NULL, 'Daily Run', 10, NULL, ?, ?, ?, ?, ?, ?)

```

The following out is typical:

```

Value of output parameters
-----
Parameter Name  : P_RETURN_CODE
Parameter Value : S

Parameter Name  : P_RETURN_MSG
Parameter Value : Job Sequence 63 Completed

Parameter Name  : P_RESULT
Parameter Value : 1

```

Parameter Name : P_JOB_STATUS_SIMPLE
Parameter Value : C

Parameter Name : P_JOB_STATUS_STANDARD
Parameter Value : C

Parameter Name : P_JOB_STATUS_ENHANCED
Parameter Value : 9

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.Ws_Job_Status(1, 'Check  
Job', 'Stat', 0, 0, NULL, 'Daily Run', 10, NULL, ?, ?, ?, ?, ?, ?)}
```

29.16 Ws_Load_Change

This procedure allows the caller to change either the connection or the schema of a load table.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Load_Change @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_action, @v_table, @v_new_value, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Load_Change(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_table, v_new_value, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Load_Change(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_action, v_table, v_new_value, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Action	The action must be either SCHEMA or CONNECTION. Either the schema or connection may be changed. Two calls must be made if both the schema and connection are to be changed.
Table	The load table name that is to be altered.
New Value	The new value. Either the new schema or the new connection depending on the Action.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The load table was successfully changed. The function result is 1.
E	An error occurred while attempting to change the load table. See the return message for more details. The function result is -2.

F	An unexpected error occurred. The function result is -3.
---	--

Returned result

- 1 will be returned if the function changed the load table.
- -2 will be returned if the load table could not be changed.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Load_Change @p_sequence, @p_job_name, @p_task_name, @p_job_id,
@p_task_id
                , 'CONNECTION', 'load_customer', 'CONN_TEST1'
                , @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
```

OUTPUT

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status = @v_result
    SET @p_return_msg = 'Failed to replace load table connection
details. Return Code was ' + @v_return_code
    SET @p_return_msg = @p_return_msg + '. ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(80);EXEC Ws_Load_Change 1,'Check
Job','Stat',0,0,'CONNECTION','load_customer','CONN_TEST1',@RET
OUTPUT,@MSG OUTPUT,@RES OUTPUT; SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
```

```
        NULL S CONNECTION changed from CONN_TEST1 to CONN_TEST1 for load
table load_customer
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Load_Change(1,'Check
Job','Stat',0,0,'CONNECTION','load_customer','CONN_TEST1',?,?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_Load_Change(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
                        , 'CONNECTION', 'load_customer', 'CONN_TEST1'
                        , v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to replace load table connection details.
Return Code was ' || v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_Load_Change(1,'Check
Job','Stat',0,0,'CONNECTION','load_customer','CONN_TEST1',:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
CONNECTION changed from Tutorial (OLTP) to CONN_TEST1 for load table
load_customer
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Load_Change(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
    , 'CONNECTION', 'load_customer', 'CONN_TEST1'
    , v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to replace load table connection details.
Return Code was ' || v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Load_Change(1, 'Check
Job', 'Stat', 0, 0, 'CONNECTION', 'load_customer', 'CONN_TEST1', ?, ?, ?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name  : P_RETURN_CODE
Parameter Value : S

Parameter Name  : P_RETURN_MSG
Parameter Value : CONNECTION changed from Tutorial (OLTP) to
CONN_TEST1 for load table load_customer

Parameter Name  : P_RESULT
Parameter Value : 1

Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{call Data Warehouse Designer.Ws_Load_Change(1, 'Check
Job', 'Stat', 0, 0, 'CONNECTION', 'load_customer', 'CONN_TEST1', ?, ?, ?)}
```

29.17 Ws_Maintain_Indexes

This procedure performs the dropping and building of indexes that are normally maintained by the QAD scheduler. It is called by procedures wishing to manually control the dropping and creation of indexes. For example a procedure that exchanges partitions may wish to drop and create indexes on an exchange table as part of a partition update loop.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Maintain_Indexes @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_table_name, @v_parameter, @v_index_name, @v_option, @v_result OUTPUT

Oracle: v_result := Ws_Maintain_Indexes(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_table_name, v_parameter, v_index_name, v_option);

DB2: CALL [METABASE].Ws_Maintain_Indexes(v_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_table_name, v_parameter, v_index_name, v_option, v_result);

Parameters

The following parameters are required:

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Table name	The name of the table that has the indexes to be manipulated. <ul style="list-style-type: none"> If a specific index is being specified in the subsequent parameter, then this table name should be NULL.
Parameter	Parameter field. For ORACLE only entering TABLESPACE=XXX in this field will override the default tablespace name with the value XXX.

Parameter	Description
Index name	The index name when dealing with a specific index. <ul style="list-style-type: none">▪ If this name is specified then the table name should be NULL.▪ If all indexes associated with a table are to be processed, then this field should be NULL.
Option	This parameter informs the procedure what is to be done to the index or indexes. See below for valid options:

Valid options

DROP	drops a specific index (index name parameter must be used)
DROP ALL	drops all indexes associated with a table
PRE DROP	drops any indexes associated with a table that has the pre-drop flag set or that is ready for a rebuild
BUILD	builds a specific index if an index name is passed. Otherwise builds all indexes that were pre-dropped
BUILD ALL	builds all indexes

Note: Under normal scheduler processing, a PRE DROP is performed before a table update followed by a BUILD after the update.

Returned result

- 1 will be returned on successful completion.
- -1 will be returned if there was a warning generated during the processing. It would be acceptable to continue processing.
- -2 will be returned if a handled error occurred. This would normally indicate that the calling procedure should fail, unless it is not concerned about the state of the indexes.
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
```

Then add the call to the procedure:

```
EXEC Ws_Maintain_Indexes @p_sequence, @p_job_name, @p_task_name,  
@p_job_id, @p_task_id  
                , 'load_customer', NULL, NULL, 'DROP ALL', @v_result  
OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1  
BEGIN  
    SET @p_status =@v_result  
    SET @p_return_msg = 'Failed to maintain indexes.'  
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"DECLARE @RES integer;EXEC  
Ws_Maintain_Indexes 1,'Maintain  
Ind','Ind',0,0,'load_customer',NULL,NULL,'DROP ALL',@RES OUTPUT; SELECT  
@RES"
```

The following out is typical:

```
(1 rows affected)  
-----  
1  
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Maintain_Indexes(1,'Maintain  
Ind','Ind',0,0,'load_customer',NULL,NULL,'DROP ALL',?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_maintain_indexes(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
, 'load_customer', NULL, NULL, 'DROP ALL');
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  p_status := v_result;
  p_return_msg := 'Failed to maintain indexes.';
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
exec :res:=ws_maintain_indexes(1,'Maintain
Ind','Ind',0,0,'load_customer',NULL,NULL,'DROP ALL');
print :res;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
```

Then add the call to the procedure:

```
CALL [METABASE].ws_maintain_indexes(p_sequence, p_job_name,
p_task_name, p_job_id, p_task_id
, 'load_customer', NULL, NULL, 'DROP ALL', v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  SET p_status = v_result;
  SET p_return_msg = 'Failed to maintain indexes.';
```

END IF;

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Maintain_Indexes(1, 'Maintain
Ind', 'Ind', 0, 0, 'load_customer', NULL, NULL, 'DROP ALL', ?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name : P_RESULT
Parameter Value : 1
```

```
Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.Ws_Maintain_Indexes(1, 'Maintain
Ind', 'Ind', 0, 0, 'load_customer', NULL, NULL, 'DROP ALL', ?)}
```

29.18 Ws_Sched_Status

This procedure returns the current status of a QAD Data Warehouse Designer scheduler, starts or stops a scheduler. The intended use of this function is to allow other scheduling software and other QAD Data Warehouse Designer procedures to poll for the status, start or stop a QAD Data Warehouse Designer scheduler.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: `Exec Ws_Sched_Status @v_action, @v_sched_type, @v_sched_name, @v_sched_host, @v_sched_msg, @v_sched_username, @v_sched_interval, @v_sched_version, @v_sched_job_count, @v_result OUTPUT`

Oracle: `v_result := Ws_Sched_Status (v_action, v_sched_type, v_sched_name, v_sched_host, v_sched_msg, v_sched_username, v_sched_interval, v_sched_version, v_sched_job_count);`

DB2: `CALL [METABASE].Ws_Sched_Status (v_action, v_sched_type, v_sched_name, v_sched_host, v_sched_msg, v_sched_username, v_sched_interval, v_sched_version, v_sched_job_count, v_result);`

Parameters

The following parameters are required:

Parameter	Description
Action	The action required, one of: START, STOP or STATUS
Sched Type	The type of scheduler, one of UNIX or WINDOWS
Sched Name	The name of the scheduler.
Sched Host	The host name of the scheduler.
Sched Msg	The message for the start or stop.
Sched Username	The database user name used by the scheduler.
Sched Interval	The poll interval of the scheduler (used when starting a scheduler).
Sched Version	The version of the scheduler (used when starting a scheduler).
Sched Job Count	Not currently used.
Sched Status	The result returned by Ws_Sched_Status.

Returned result

- 1 will be returned if the function completed successfully.
- -3 will be returned if an unhandled error occurred.

29.19 Ws_Version_Clear

This function performs the removal of old version entries. The number of days is specified and all older versions are deleted, so long as number of versions is also maintained. If days to keep is specified then deletes based on today - days to keep being on or after the version creation date. If no days to keep specified then the test is that the retention date on the version record is prior to today.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: Exec Ws_Version_Clear @v_sequence, @v_job_name, @v_task_name, @v_job_key, @v_task_key, @v_day_count, @v_keep_count, @v_options, @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result OUTPUT

Oracle: v_result := Ws_Version_Clear(p_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_day_count, v_keep_count, v_options, v_return_code, v_return_msg);

DB2: CALL [METABASE].Ws_Version_Clear(p_sequence, v_job_name, v_task_name, v_job_key, v_task_key, v_day_count, v_keep_count, v_options, v_return_code, v_return_msg, v_result);

Parameters

The following parameters are required:

Note: In the event of an unexpected failure an entry is inserted in the audit log. The Sequence, Job Name and Task Name are added as part of this entry along with the error message.

Parameter	Description
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)

Parameter	Description
Day count	The number of days to retain. If 90 is entered then all versions created 90 days prior are deleted.(subject to keep count). If not set then deleted if retention date on the version record is past
Keep count	The minimum number of version records to keep for each object. If 5 is entered then the last 5 versions are kept irrespective of the Day count entered.
Options	Not used at this time.
Return code	This code indicates the result of the call. See the table below for the return codes.
Return message	A message indicating the action taken, or the reason for no action.

Valid Return Codes

S	The job logs were successfully removed. The function result is 1.
E	An error occurred while attempting to remove the logs. See the return message for more details. The function result is -2.
F	An unexpected error occurred. The function result is -3.

Returned result

- 1 will be returned if the function cleared the version records.
- -2 will be returned if the version records could not be removed..
- -3 will be returned if an unhandled error occurred.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_result          integer
DECLARE @v_return_code     varchar(1)
DECLARE @v_return_msg      varchar(256)
```

Then add the call to the procedure:

```
EXEC Ws_Version_Clear @p_sequence, @p_job_name, @p_task_name,
@p_job_id, @p_task_id
                , 90, 5, NULL
                , @v_return_code OUTPUT, @v_return_msg OUTPUT, @v_result
OUTPUT
```

Perhaps add a check of the result:

```
IF @v_result <> 1
BEGIN
    SET @p_status =@v_result
    SET @p_return_msg = 'Failed to clear old versions.  Return Code was
' +@v_return_code
    SET @p_return_msg = @p_return_msg + '.  ' + RTRIM(@v_return_msg)
END
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"DECLARE @RES integer;DECLARE
@RET varchar(1);DECLARE @MSG varchar(65);EXEC Ws_Version_Clear 1,'Clear
Versions','Clear',0,0,90,5,NULL,@RET OUTPUT,@MSG OUTPUT,@RES OUTPUT;
SELECT @RES,@RET,@MSG"
```

The following out is typical:

```
-----
-----
          1 S Version Records deleted:  0
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call Ws_Version_Clear(1,'Clear Versions','Clear',0,0,90,5,NULL,?,?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code     varchar2(1);
v_return_msg      varchar2(256);
```

Then add the call to the procedure:

```
v_result := ws_Version_Clear(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
                        , 90, 5, NULL
                        , v_return_code, v_return_msg);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to clear old versions. Return Code was ' ||
v_return_code;
    p_return_msg := p_return_msg || '. ' || v_return_msg;
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
variable rcode varchar2(1);
variable rmsg varchar2(256);
exec :res:=ws_Version_Clear(1,'Clear
Versions','Clear',0,0,90,5,NULL,:rcode,:rmsg);
print :res;
print :rcode;
print :rmsg;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
S
Version Records deleted: 1022
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_result          INTEGER;
DECLARE v_return_code     VARCHAR(1);
DECLARE v_return_msg      VARCHAR(256);
```

Then add the call to the procedure:

```
CALL [METABASE].Ws_Version_Clear(p_sequence, p_job_name, p_task_name,
p_job_id, p_task_id
    , 90, 5, NULL
    , v_return_code, v_return_msg, v_result);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    SET p_status = v_result;
    SET p_return_msg = 'Failed to clear old versions. Return Code was '
|| v_return_code;
    SET p_return_msg = p_return_msg || '. ' || RTRIM(v_return_msg);
END IF;
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.Ws_Version_Clear(1, 'Clear
Versions', 'Clear', 0, 0, 90, 5, NULL, ?, ?, ?)
```

The following out is typical:

Value of output parameters

Parameter Name : P_RETURN_CODE

Parameter Value : S

Parameter Name : P_RETURN_MSG

Parameter Value : Version Records deleted 0

Parameter Name : P_RESULT

Parameter Value : 1

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.Ws_Version_Clear(1, 'Clear
Versions', 'Clear', 0, 0, 90, 5, NULL, ?, ?, ?)}
```

29.20 WsParameterRead

This procedure reads a parameter value. It is called by procedures wishing to retrieve information stored in parameters external to the procedure. These parameters can be maintained from QAD Data Warehouse Designer or from other procedures.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	X

RDBMS Platform	Procedure	Function
Oracle		X
IBM DB2	X	

Note: In SQL Server, both a procedure and function are provided. See the calling syntax below. The procedure is called `WsParameterRead` and the function `WsParameterReadF`. In Oracle, the provided function is called `WsParameterRead`. There is no function in DB2.

Call Syntax

The calling syntax is:

SQL Server Function: `SELECT dbo.WsParameterReadF(@v_parameter_name);`

SQL Server Procedure: `Exec WsParameterRead @v_parameter_name, @v_parameter_value OUTPUT, @v_parameter_comment OUTPUT`

Oracle: `v_data := WsParameterRead(v_parameter_name);`

DB2 Procedure: `CALL [METABASE].WsParameterRead(v_parameter_name, v_parameter_value, v_parameter_comment);`

Parameters

The following parameters are required:

Parameter	Description
Parameter Name	The parameter name identifies the parameter to be retrieved. The name must correspond to an existing parameter, otherwise a NULL value is returned. The name is case sensitive.
Parameter Value	returned parameter value for SQL Server procedure only.
Parameter Comment	returned parameter comment for SQL Server procedure only.

Returned data

The parameter value is returned.

- If the parameter could not be found a null is returned.
- If found the value is returned to a maximum of 2000 characters.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_current_date          varchar(4000)
```

Then add the call to the procedure:

```
SELECT @v_current_date = dbo.WsParameterReadF('CURRENT_DATE')
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"SELECT  
CAST(dbo.WsParameterReadF('CURRENT_DATE') AS CHAR(79))"
```

The following out is typical:

```
-----  
-----  
2009-01-10  
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call WsParameterRead('CURRENT_DATE',?,?)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_current_date          varchar2(256);
```

Then add the call to the procedure:

```
v_current_date := WsParameterRead('CURRENT_DATE');
```

2. Oracle example of a call from sqlplus:

Place the following code in a text file called **FileName.sql**:

```
set pages 0 feed off heading off  
SELECT WsParameterRead('CURRENT_DATE')  
FROM DUAL;
```

Execute the file from sqlplus (using @FileName). The following out is typical:

```
29-MAY-09
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_current_date      varchar(256);
DECLARE v_comment           varchar(256);
```

Then add the call to the procedure:

```
CALL
[METABASE].WsParameterRead('CURRENT_DATE',v_current_date,v_comment);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WsParameterRead('CURRENT_DATE',?,?,?)
```

The following out is typical:

```
Value of output parameters
```

```
-----
```

```
Parameter Name   : P_VALUE
```

```
Parameter Value  : 2009-01-12
```

```
Parameter Name   : P_COMMENT
```

```
Parameter Value  : This is the current date for processing
```

```
Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{call Data Warehouse Designer.WsParameterRead('CURRENT_DATE',?,?,?)}
```

29.21 WsParameterReadG

This function reads a global parameter value. It is called by procedures wishing to retrieve information from the metadata.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server		X
Oracle		X
IBM DB2		X

Call Syntax:

The calling syntax is:

SQL Server: Exec @v_parameter_value = dbo.WsParameterReadG(@v_option, @v_job_id, @v_task_id);

Oracle: v_parameter_value := WsParameterReadG(v_option, v_job_id, v_task_id);

DB2: SELECT [METABASE].WsParameterReadG(v_option, v_job_id, v_task_id) FROM sysibm.sysdummy1;

Parameters

The following parameters are required:

Parameter	Description
Option	The valid global parameters are: \$\$TABLE_NAME which returns the table name that this procedure is being execute against. This parameter is only available for load tables. \$\$SOURCE_TABLE which returns the maximum value in the source_table field of the column properties for the specified tale. This parameter is only available for load tables.
Job id	Integer key of the job, when running under the scheduler. If being executed manually, then this key should be set to zero (0). If under scheduler control, then the procedure will have been passed the job id parameter.
Task Id	Integer key of the task, when running under the scheduler. If being executed manually, then this key should be set to the object key. If under scheduler control, then the procedure will have been passed the task id parameter.

Returned data

The parameter value is returned.

- If the option is invalid or a manual call then an empty string is returned.
- If found the value is returned to a maximum of 2000 characters.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_source_name          varchar(64)
```

Then add the call to the procedure:

```
SELECT @v_source_name = dbo.WsParameterReadG('$$SOURCE_TABLE',
@p_job_id, @p_task_id)
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"SELECT
CAST(dbo.WsParameterReadG('$$SOURCE_TABLE',1,5) AS CHAR(30))"
```

The following out is typical:

```
-----
load_customer
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
SELECT dbo.WsParameterReadG('$$TABLE_NAME',1,5);
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_source_name          varchar2(64);
```

Then add the call to the procedure:

```
v_source_name := WsParameterReadG('$$TABLE_NAME', p_job_id,
p_task_id);
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
SELECT WsParameterReadG('$$TABLE_NAME',0,0)
```

FROM DUAL;

Execute the file from sqlplus (using @FileName). The following out is typical:

load_customer

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

DECLARE v_table_name VARCHAR(256);

Then add the call to the procedure:

CALL [METABASE].WsParameterReadG('\$\$TABLE_NAME', p_job_id, p_task_id, v_table_name);

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

call Data Warehouse Designer.WsParameterReadG('\$\$TABLE_NAME',0,0,?)

The following out is typical:

Value of output parameters

Parameter Name : P_VALUE
Parameter Value : load_customer

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

{Call Data Warehouse Designer.WsParameterReadG('\$\$TABLE_NAME',0,0,?)}

29.22 WsParameterReadJ

This function reads job information and attributes. It is called by procedures wishing to retrieve information stored against the job that is executing them.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server		X
Oracle		X
IBM DB2		X

Call Syntax

The calling syntax is:

SQL Server: Exec @v_parameter_value = WsParameterReadJ @v_parameter_name, @v_job_id

Oracle: v_parameter_value := WsParameterReadJ(v_parameter, v_job_id);

DB2: SELECT [METABASE].WsParameterReadJ(v_parameter, v_job_id) FROM sysibm.sysdummy1;

Parameters

The following parameters are required:

Parameter	Description
Parameter Name	The parameter name identifies the parameter to be retrieved. Valid options are: NAME which returns the job name DESCRIPTION which returns the job description ATTRIBUTE1 which returns the first job attribute ... ATTRIBUTE2 - ATTRIBUTE7 ATTRIBUTE8 which returns the eight attribute (See NOTE: above. only available in 4.1.1.0 or later)
Job Id	The job id for the job. Passed to the procedure by the job.

Returned data

The parameter value is returned.

- If the parameter could not be found a null is returned.
- If found the value is returned to a maximum of 2000 characters.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE @v_job_name          varchar(256)
```

Then add the call to the procedure:

```
SELECT @v_job_name = dbo.WsParameterReadJ('NAME', @p_job_id)
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"SELECT  
CAST(dbo.WsParameterReadJ('NAME',1) AS CHAR(64))"
```

The following out is typical:

```
-----  
Daily Run  
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
SELECT dbo.WsParameterReadJ('NAME',1);
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_job_name          varchar2(256);
```

Then add the call to the procedure:

```
v_job_name := WsParameterReadJ('NAME', p_job_id);
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off  
SELECT WsParameterReadJ('NAME',60)  
FROM DUAL;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

New Daily Run

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
DECLARE v_job_name          varchar(256);
```

Then add the call to the procedure:

```
CALL [METABASE].WsParameterReadJ('NAME', p_job_id, v_job_name);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WsParameterReadJ('NAME',60,?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name  : P_RESULT
Parameter Value : New Daily Run
```

```
Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.WsParameterReadJ('NAME',60,?)}
```

29.23 WsParameterWrite

This procedure writes a parameter value, or adds a new parameter. It is called by procedures wishing to store information external to the procedure. These parameters can be maintained from QAD Data Warehouse Designer or from other procedures.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: `Exec WsParameterWrite @v_parameter_name, @v_parameter_value, @v_parameter_comment`

Oracle: `v_result := WsParameterWrite(v_parameter_name, v_parameter_value, v_parameter_comment);`

DB2: `CALL [METABASE].WsParameterWrite(v_parameter_name, v_parameter_value, v_parameter_comment);`

Parameters

The following parameters are required:

Parameter	Description
Parameter Name	The parameter name identifies the parameter to be updated or added. The name is case-sensitive and may be a maximum of 64 characters long.
Parameter Value	The parameter value is the contents of the parameter. It may contain any data relevant to the application, including SQL code. A maximum length of 2000 characters is supported.
Parameter Comment	The parameter comment is a 256-character field that provides information about the parameter. The parameter comments will not be modified if NULL is entered.

Returned result

- 1 is returned if the parameter was updated
- 2 is returned if a new parameter was added
- -3 is returned if there was an unhandled exception.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC WsParameterWrite 'LAST_INVOICE_ID', '1234', 'The last invoice id loaded'
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslwarehouse -E -Q"EXEC WsParameterWrite 'LAST_INVOICE_ID', '1234', 'The last invoice id loaded'"
```

The following out is typical:

```
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call WsParameterWrite('LAST_INVOICE_ID', '123456', 'The last invoice id loaded')};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
v_return_code      varchar2(1);
v_return_msg       varchar2(256);
```

Then add the call to the procedure:

```
v_result := WsParameterWrite('LAST_INVOICE_ID', '123456', 'The last invoice id loaded');
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
exec :res:=WsParameterWrite('LAST_INVOICE_ID', '123456', 'The last invoice id loaded');
```

```

print :res;

```

Execute the file from sqlplus (using @FileName). The following out is typical:

```

1

```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```

DECLARE v_last_invoice_id          varchar(256);

```

Then add the call to the procedure:

```

CALL [METABASE].WsParameterWrite('LAST_INVOICE_ID', v_last_invoice_id,
'The last invoice id loaded');

```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse Designer.WsParameterWrite('LAST_INVOICE_ID',
'123456', 'The last invoice id loaded')

```

The following out is typical:

```

Return Status = 1

```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```

{Call Data Warehouse Designer.WsParameterWrite('LAST_INVOICE_ID',
'123456', 'The last invoice id loaded')}

```

29.24 WsWrkAudit

This procedure writes a row to the audit log ws_wrk_audit_log. It is called by procedures wishing to log audit information.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: EXEC @v_result = WsWrkAudit @v_status_code, @v_job_name, @v_task_name, @v_sequence, @v_message, @v_rdbms_code, @v_rdbms_msg, @v_task_key, @v_job_key

Oracle: v_result := WsWrkAudit(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_task_key, v_job_key);

DB2: CALL [METABASE].WsWrkAudit(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_task_key, v_job_key);

Parameters

The following parameters are required:

Parameter	Description
Status Code	1 character code denoting the type of message. Normal codes for usage with this table would be: <ul style="list-style-type: none"> ▪ B = Beginning of a task or job ▪ I = Information ▪ S = Success ▪ W = Warning ▪ E = Error ▪ F = Fatal error
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Message	Message to be recorded into the audit log - a maximum of 256 characters in length. This message may contain any information relevant to the application.
Rdbms Code	Maximum 10 character code that identifies an rdbms error or informational message. Under Oracle this code is available from the special variable SQLCODE. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Rdbms Message	Maximum 256 character message that contains an rdbms error or informational message. Under Oracle this message is available from the special variable SQLERRM. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Task key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Job key	See Common Parameters (see "29.3 Common Parameters" on page 634)

Returned result

If there was a failure during the add of the message a negative 3 (-3) will be returned. Otherwise the add was successful.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC @v_result = WSwrkAudit 'I', @p_job_name, @p_task_name,  
@p_sequence  
        , 'This is an Audit Message', NULL, NULL, @p_task_id,  
@p_job_id
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"EXEC WSwrkAudit 'I','Audit  
Msg','Audit',1,'The task has started.',NULL,NULL,0,0"
```

The following out is typical:

(1 rows affected)

3. SQL Server example of a call from QAD SQL Admin

```
{Call WSwrkAudit('I','Audit Msg','Audit',1,'This is a  
Message.',NULL,NULL,0,0)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := WSwrkAudit('I',p_job_name, p_task_name, p_sequence,  
        'The task has started.',NULL,NULL,p_task_id, p_job_id);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN  
    p_status := v_result;  
    p_return_msg := 'Failed to write audit message.';  
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:


```

set pages 0 feed off heading off
variable res number;
exec :res:=WSWrkAudit('I', 'Audit Msg', 'Audit', 1, 'The task has
started.', NULL, NULL, 0, 0);
print :res;

```

Execute the file from sqlplus (using @FileName). The following out is typical:

```
1
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the call to the procedure:

```
CALL [METABASE].WSWrkAudit('I', p_job_name, p_task_name, p_sequence
, 'This is a Message', NULL, NULL, p_task_id, p_job_id);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WSWrkAudit('I', 'Audit
Msg', 'Audit', 1, 'This is a Message.', NULL, NULL, 0, 0)
```

The following out is typical:

```
Return Status = 1
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.WSWrkAudit('I', 'Audit
Msg', 'Audit', 1, 'This is a Message.', NULL, NULL, 0, 0)}
```

29.25 WsWrkAuditBulk

This procedure writes a number of message rows to the audit log `ws_wrk_audit_log`. It is called by procedures wishing to log audit information in bulk. The normal practice however is to record detailed information in the audit trail. It is recommended that entries are restricted to a maximum of 10 rows per job. Detailed information should be written to the detail/error log `ws_wrk_error_log`.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax for this function is:

SQL Server: EXEC @v_result = WsWrkAuditBulk @v_status_code, @v_job_name, @v_task_name, @v_sequence, @v_message, @v_rdbms_code, @v_rdbms_msg, @v_job_key, @v_task_key

Oracle: v_result := WsWrkAuditBulk(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_job_key, v_task_key);

DB2: CALL [METABASE].WsWrkAuditBulk(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_job_key, v_task_key, v_result);

Parameters

The following parameters are required:

Parameter	Description
Status Code	1 character code denoting the type of message. Normal codes for usage with this table would be: <ul style="list-style-type: none"> ▪ B = Beginning of a task or job ▪ I = Information ▪ S = Success ▪ W = Warning ▪ E = Error ▪ F = Fatal error
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Message	Messages to be recorded into the audit log. Each individual message must be no more than 256 characters in length. The individual messages must be separated by either the new-line character (ASCII decimal character 10) or the tilde character (~). A maximum size of 32767 bytes is permitted. For example the message line1~line2~line3 would result in 3 rows being added to the ws_wrk_audit_log table.
Rdbms Code	Maximum 10 character code that identifies an rdbms error or informational message. Under Oracle this code is available from the special variable SQLCODE. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Rdbms Message	Maximum 256 character message that contains an rdbms error or informational message. Under Oracle this message is available from the special variable SQLERRM. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Job Key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)

Parameter	Description
Result	Integer that indicates the status of the call to this procedure. See below for the possible values of Result. DB2 only.

Returned result

-3 will be returned if there was a failure during the add of the message. Otherwise the add was successful.

Examples

The following examples all release a job called **Daily Run**

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC @v_result = WsWrkAuditBulk 'I', @p_job_name, @p_task_name,  
@p_sequence  
    , 'Message1~Message2~Message3~', NULL, NULL, @p_job_id,  
@p_task_id
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"EXEC WsWrkAuditBulk 'I','Audit  
Msg','Audit',1,'Message1~Message2~Message3',NULL,NULL,0,0"
```

The following out is typical:

```
(1 rows affected)  
(1 rows affected)  
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call WsWrkAuditBulk('I','Audit  
Msg','Audit',1,'Message1~Message2~Message3~',NULL,NULL,0,0)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := WsWrkAuditBulk('I', p_job_name, p_task_name, p_sequence  
    , 'Message1~Message2~Message3', NULL, NULL, p_job_id,  
p_task_id);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN  
    p_status := v_result;  
    p_return_msg := 'Failed to write audit messages.';  
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
exec :res:=WsWrkAuditBulk('I','Audit
Msg','Audit',1,'Message1~Message2~Message3',NULL,NULL,0,0);
print :res;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

```
1
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the call to the procedure:

```
CALL [METABASE].WsWrkAuditBulk('I', p_job_name, p_task_name,
p_sequence
, 'Message1~Message2~Message3~', NULL, NULL, p_job_id,
p_task_id, v_result);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WsWrkAuditBulk('I','Audit
Msg','Audit',1,'Message1~Message2~Message3~',NULL,NULL,0,0,?)
```

The following out is typical:

```
Return Status = 1
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.WsWrkAuditBulk('I','Audit
Msg','Audit',1,'Message1~Message2~Message3~',NULL,NULL,0,0,?)}
```

29.26 WsWrkError

This procedure writes a row to the error log `ws_wrk_error_log`. It is called by procedures wishing to log either detailed or error information.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: EXEC @v_result = WsWrkError @v_status_code, @v_job_name, @v_task_name, @v_sequence, @v_message, @v_rdbms_code, @v_rdbms_msg, @v_task_key, @v_job_key, @v_msg_type

Oracle: v_result := WsWrkError(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_task_key, v_job_key, v_msg_type);

DB2: CALL [METABASE].WsWrkError(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_task_key, v_job_key, v_msg_type);

Parameters

The following parameters are required:

Parameter	Description
Status Code	1 character code denoting the type of message. Normal codes for usage with this table would be: <ul style="list-style-type: none"> ▪ I = Information ▪ W = Warning ▪ E = Error
Job Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Task Name	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Sequence	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Message	Message to be recorded into the error log - a maximum of 256 characters in length. This message may contain any information relevant to the application.
Rdbms Code	Maximum 10 character code that identifies an rdbms error or informational message. Under Oracle this code is available from the special variable SQLCODE. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Rdbms Message	Maximum 256 character message that contains an rdbms error or informational message. Under Oracle this message is available from the special variable SQLERRM. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Task key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Job key	See <i>Common Parameters</i> (see "29.3 Common Parameters" on page 634)
Message type	Maximum 10 character code that identifies the type of message. For application usage. This has no meaning within the QAD metadata.

Returned result

If there was a failure during the add of the message a negative 3 (-3) will be returned. Otherwise the add was successful.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC @v_result = WSWrkError 'I', @p_job_name, @p_task_name,
@p_sequence
, 'This is an Error Message', NULL, NULL, @p_task_id,
@p_job_id, NULL
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"EXEC WSWrkError 'I','Error
Msg','Error',1,'The task has started.',NULL,NULL,0,0,NULL"
```

The following out is typical:

```
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call WSWrkError('I','Error Msg','Error',1,'This is a
Message.',NULL,NULL,0,0,NULL)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := WSWrkError('I',p_job_name, p_task_name, p_sequence,
'The task has started.',NULL,NULL,p_task_id, p_job_id,
NULL);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
  p_status := v_result;
  p_return_msg := 'Failed to write error message.';
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning exec ... and end with ; must be one line.

Place the following code in a text file called `FileName.sql`:

```

set pages 0 feed off heading off
variable res number;
exec :res:=WSWrkError('I', 'Error Msg', 'Error',1, 'The task has
started.',NULL,NULL,0,0,NULL);
print :res;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

1

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the call to the procedure:

```

CALL [METABASE].WSWrkError('I', p_job_name, p_task_name, p_sequence
, 'This is a Message', NULL, NULL, p_task_id, p_job_id,
NULL);
```

2. DB2 example of a call from the DB2 Command Line Processor (`db2.exe`):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```

call Data Warehouse Designer.WSWrkError('I','Error
Msg','Error',1,'This is a Message.',NULL,NULL,0,0,NULL)
```

The following out is typical:

Return Status = 1

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```

{Call Data Warehouse Designer.WSWrkError('I','Error
Msg','Error',1,'This is a Message.',NULL,NULL,0,0,NULL)}
```

29.27 WSWrkErrorBulk

This procedure writes a number of message rows to the error log `ws_wrk_error_log`. It is called by procedures wishing to log either detailed or error information.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: EXEC @v_result = WsWrkErrorBulk @v_status_code, @v_job_name, @v_task_name, @v_sequence, @v_message, @v_rdbms_code, @v_rdbms_msg, @v_job_key, @v_task_key, @v_msg_type

Oracle: v_result := WsWrkErrorBulk(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_job_key, v_task_key, v_msg_type);

DB2: CALL [METABASE].WsWrkErrorBulk(v_status_code, v_job_name, v_task_name, v_sequence, v_message, v_rdbms_code, v_rdbms_msg, v_job_key, v_task_key, v_msg_type, v_result);

Parameters

The following parameters are required:

Parameter	Description
Status Code	1 character code denoting the type of message. Normal codes for usage with this table would be: <ul style="list-style-type: none"> ▪ I = Information ▪ W = Warning ▪ E = Error
Job Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Name	See Common Parameters (see "29.3 Common Parameters" on page 634)
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Message	Messages to be recorded into the error log. Each individual message must be no more than 256 characters in length. The individual messages must be separated by either the new-line character (ASCII decimal character 10) or the tilde character (~). A maximum size of 32767 bytes is permitted. For example the message line1~line2~line3 would result in 3 rows being added to the ws_wrk_error_log table.
Rdbms Code	Maximum 10 character code that identifies an rdbms error or informational message. Under Oracle this code is available from the special variable SQLCODE. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Rdbms Message	Maximum 256 character message that contains an rdbms error or informational message. Under Oracle this message is available from the special variable SQLERRM. The normal practice is to populate this field when an error occurs otherwise leaving it as a null.
Job key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task Key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Message Type	Maximum 10 character code that identifies the type of message. For application usage. This has no meaning within the QAD metadata

Parameter	Description
Result	Integer that indicates the status of the call to this procedure. See below for the possible values of Result. DB2 only.

Returned result

-3 will be returned if there was a failure during the add of the message. Otherwise the add was successful.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC @v_result = WSWrkErrorBulk 'I', @p_job_name, @p_task_name,
@p_sequence
, 'MessageW1~MessageW2~MessageW3~', NULL, NULL, @p_job_id,
@p_task_id, NULL
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"EXEC WSWrkErrorBulk 'I','Error
Msg','Error',1,'Message1~Message2~Message3',NULL,NULL,0,0,NULL"
```

The following out is typical:

```
(1 rows affected)
(1 rows affected)
(1 rows affected)
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call WSWrkErrorBulk('I','Error
Msg','Error',1,'Message1~Message2~Message3~',NULL,NULL,0,0,NULL)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := WSWrkErrorBulk('I',p_job_name, p_task_name, p_sequence,
'Message1~Message2~Message3', NULL, NULL, p_job_id,
p_task_id, NULL);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to write error message.';
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
variable res number;
exec :res:=WSWrkErrorBulk('I', 'Error
Msg', 'Error', 1, 'Message1~Message2~Message3', NULL, NULL, 0, 0, NULL);
print :res;
```

Execute the file from sqlplus (using `@FileName`). The following out is typical:

1

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the call to the procedure:

```
CALL [METABASE].WSWrkErrorBulk('I', p_job_name, p_task_name,
p_sequence
, 'Message1~Message2~Message3~', NULL, NULL, p_job_id,
p_task_id, NULL
, v_result);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WSWrkErrorBulk('I', 'Error
Msg', 'Error', 1, 'Message1~Message2~Message3~', NULL, NULL, 0, 0, NULL, ?)
```

The following out is typical:

```
Value of output parameters
-----
Parameter Name   : P_RESULT
Parameter Value  : 1
```

Return Status = 0

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.WSWrkErrorBulk('I', 'Error
Msg', 'Error', 1, 'Message1~Message2~Message3~', NULL, NULL, 0, 0, NULL, ?)}
```

29.28 WsWrkTask

This procedure updates the counters stored against a task. These counters are visible in the views provided of the task and audit information. This procedure should only be called by a scheduled task, as it must have a valid job, task and sequence number which are provided by the scheduler.

Callable Procedure Type

RDBMS Platform	Procedure	Function
SQL Server	X	
Oracle		X
IBM DB2	X	

Call Syntax

The calling syntax is:

SQL Server: EXEC @v_result = WsWrkTask @v_job_key, @v_task_key, @v_sequence, @v_inserted, @v_updated, @v_replaced, @v_deleted, @v_discarded, @v_rejected, @v_errored

Oracle: v_result := WsWrkTask(v_job_key, v_task_key, v_sequence, v_inserted, v_updated, v_replaced, v_deleted, v_discarded, v_rejected, v_errored);

DB2: CALL [METABASE].WsWrkTask(v_job_key, v_task_key, v_sequence, v_inserted, v_updated, v_replaced, v_deleted, v_discarded, v_rejected, v_errored);

Parameters

The following parameters are required:

Parameter	Description
Job key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Task key	See Common Parameters (see "29.3 Common Parameters" on page 634)
Sequence	See Common Parameters (see "29.3 Common Parameters" on page 634)
Inserted	The number of rows inserted by the task.
Updated	The number of rows updated by the task.
Replaced	The number of rows replaced by the task.
Deleted	The number of rows deleted by the task.
Discarded	The number of rows discarded by the task.
Rejected	The number of rows rejected by the task.

Parameter	Description
Errored	The number of rows errored by the task.

Returned result

If run interactively then a warning (-1) will be returned to indicate that the procedure is not within a job. If there was a failure during the update of the counters then a negative 3 (-3) will be returned. Otherwise the update was successful.

Examples

The following examples all release a job called Daily Run

SQL Server Examples:

1. SQL Server example of a call from a Stored Procedure:

Add the call to the procedure:

```
EXEC wSwrkTask @p_job_id, @p_task_id, @p_sequence
              , 27, 30, 0, 0, 0, 0, 0
```

2. SQL Server example of a call from the command line using sqlcmd (all one line):

```
sqlcmd -S"SQL SERVER" -wslWarehouse -E -Q"EXEC wSwrkTask
1,5,6,28,12,0,0,0,0,0"
```

The following out is typical:

```
(1 rows affected)
```

3. SQL Server example of a call from QAD SQL Admin

```
{Call wSwrkTask(62,42,60,28,12,0,0,0,0,0)};
```

Oracle Examples:

1. Oracle example of a call from a Stored Procedure:

Add the following to the declaration section of the stored procedure:

```
v_result          integer;
```

Then add the call to the procedure:

```
v_result := wSwrkTask(p_job_id, p_task_id, p_sequence,
                     v_insert_count,v_update_count,0,0,0,0,0);
```

Perhaps add a check of the result:

```
IF ( v_result <> 1 ) THEN
    p_status := v_result;
    p_return_msg := 'Failed to update task details.';
END IF;
```

2. Oracle example of a call from sqlplus:

Note: the line beginning `exec ...` and end with `;` must be one line.

Place the following code in a text file called `FileName.sql`:

```
set pages 0 feed off heading off
```

```
variable res number;  
exec :res:=WSWrkTask(62,42,60,28,12,0,0,0,0,0);  
print :res;
```

Execute the file from sqlplus (using @FileName). The following out is typical:

```
1
```

DB2 Examples:

1. DB2 example of a call from a Stored Procedure:

Add the call to the procedure:

```
CALL [METABASE].WSWrkTask(p_job_id, p_task_id, p_sequence  
                           , 27, 30, 0, 0, 0, 0, 0);
```

2. DB2 example of a call from the DB2 Command Line Processor (db2.exe):

Enter the following after connecting (the metadata is in a schema called QAD Data Warehouse Designer):

```
call Data Warehouse Designer.WSWrkTask(62,42,60,28,12,0,0,0,0,0)
```

The following out is typical:

```
Return Status = 0
```

3. DB2 example of a call from QAD SQL Admin (the metadata is in a schema called QAD Data Warehouse Designer):

```
{Call Data Warehouse Designer.WSWrkTask(62,42,60,28,12,0,0,0,0,0)}
```


C H A P T E R 30

30. Retrofitting

QAD Data Warehouse Designer includes an advanced retrofit capability that can be used to:

- 1 Migrate an existing data warehouse from one relational database to another (known as fork-lifting).
- 2 Load a data model from a modelling tool.

Retrofitting is achieved using the **Retro Copy** object type in QAD Data Warehouse Designer and the **Retrofit tables wizard**.

Retrofitting (see "**30. Retrofitting**" on page 745, "**16.8 Retrofitting an OLAP Object**" on page 406)

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30.4 Retro Copy Column Properties 762

30.1 Migrating the Data Warehouse Database Platform

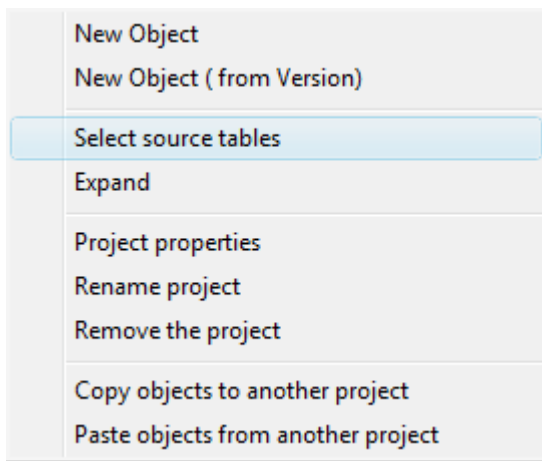
QAD Data Warehouse Designer has an advanced retrofitting wizard for migrating an existing data warehouse from one relational database to another.

The steps to use this wizard are:

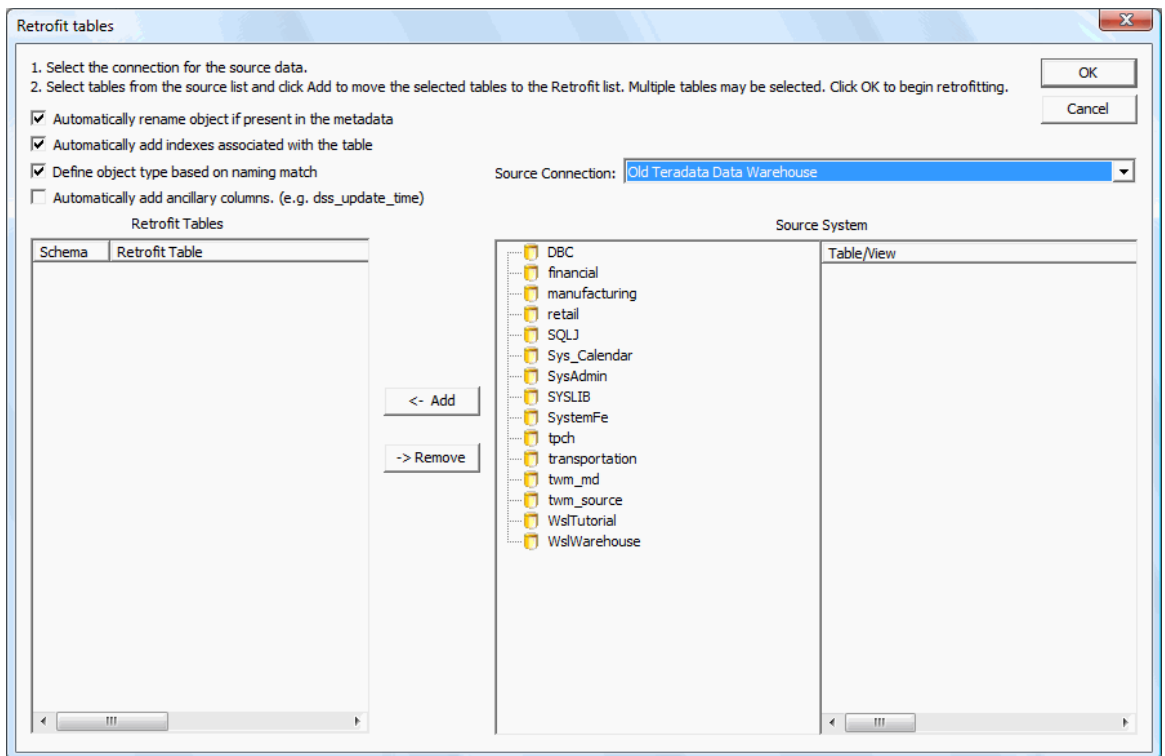
- 1 Create a connection object for the old data warehouse database, populating the following fields:
 - Connection Name
 - Connection Type => ODBC
 - ODBC Source
 - Work Directory
 - Extract user name
 - Extract password

Note: The extract user must be able to select from all tables to be migrated.

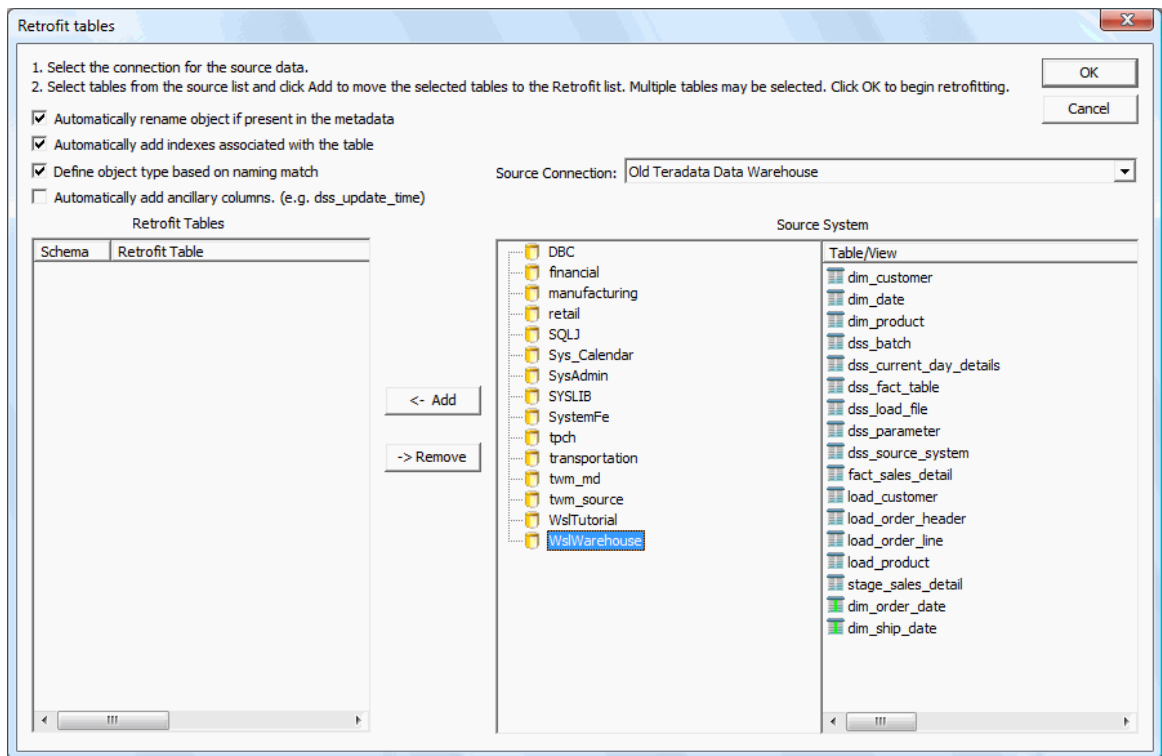
- 2 Ensure all naming standards in Tools / Options are set to match the objects being retrofitted. This saves work later.
- 3 Right click on the Retro Copy object group in the object tree in the left pane and choose **Select source tables**:



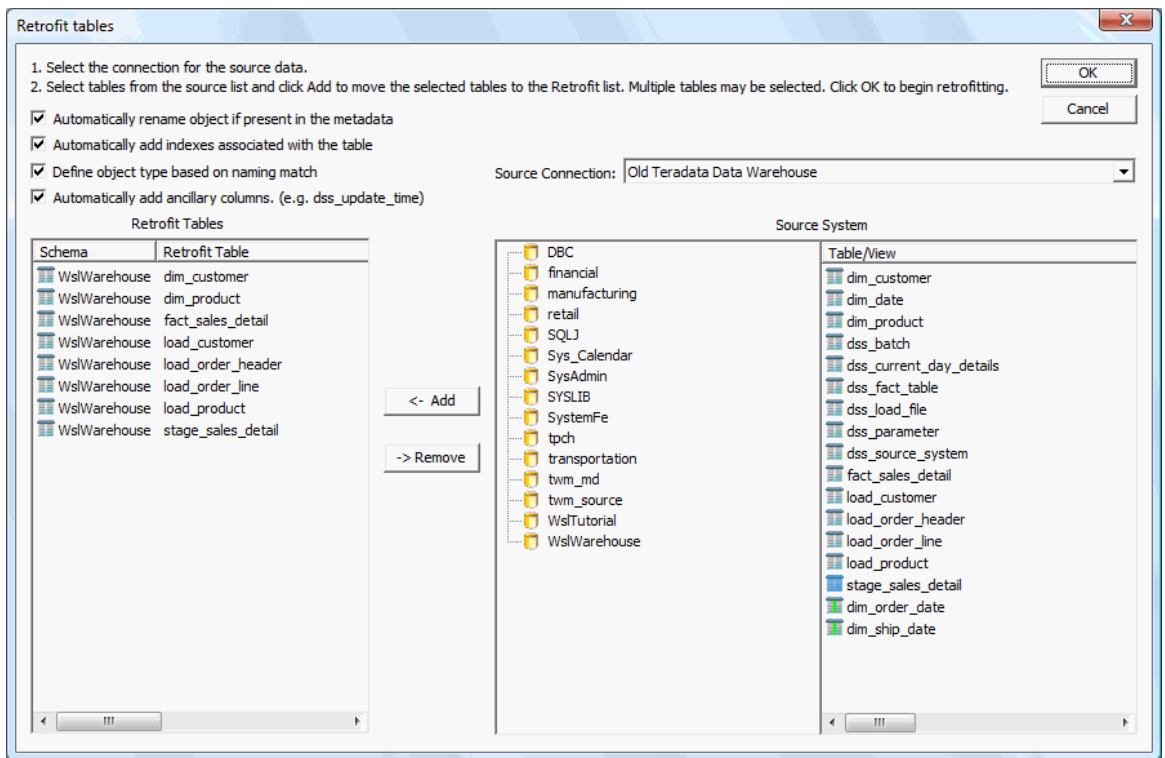
- 4 The Retrofit tables dialog appears. In the Source Connection drop down list choose the connection set up in step (1). A list of **databases** appears in the middle pane:



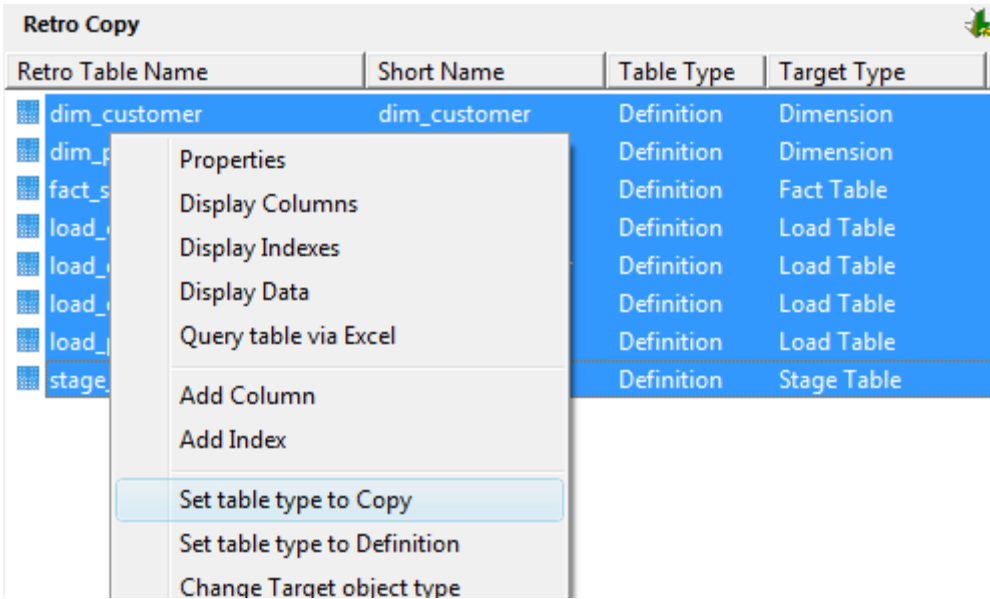
- 5 Double click on the database/user/schema in the middle pane list. A list of **tables** in the database is displayed in the right hand pane:



- 6 Select all the required tables from the right hand pane list and click on <- Add to move them to the left hand pane. Then click the **Automatically add ancillary columns (e.g. dss_update_time)** check box and click OK.



- 7 QAD Data Warehouse Designer now acquires the metadata for the tables being migrated and creates a new QAD Data Warehouse Designer Retro Copy object for each.
- 8 Double click on the Retro Copy object group in the left hand pane. Select all retro copies in the middle pane. Right click and choose **Change table type to Copy**. This allows the data in the legacy data warehouse to be copied across to the new data warehouse:



- 9 Click on the scheduler button on the toolbar:  scheduler
- 10 Create a new job to run straight away:

Job Definition [X]

Job Name: OK

Description: Cancel

Frequency: Custom Settings:

Start Date: Interval between jobs: (minutes)

Start Time: Start at or after HHMM (e.g. 0800)

Max Threads: Do not start after HHMM (e.g. 1700)

Scheduler: Active on the days selected below

Dependent On:

Parent job	Req.	Look back (mins.)	Max. wait (mins.)

Add parent job
Remove parent

Logs retained: This field lets you set the number of logs that are retained for this job before an automatic delete and archive occurs. 0 = keep all logs (default action)

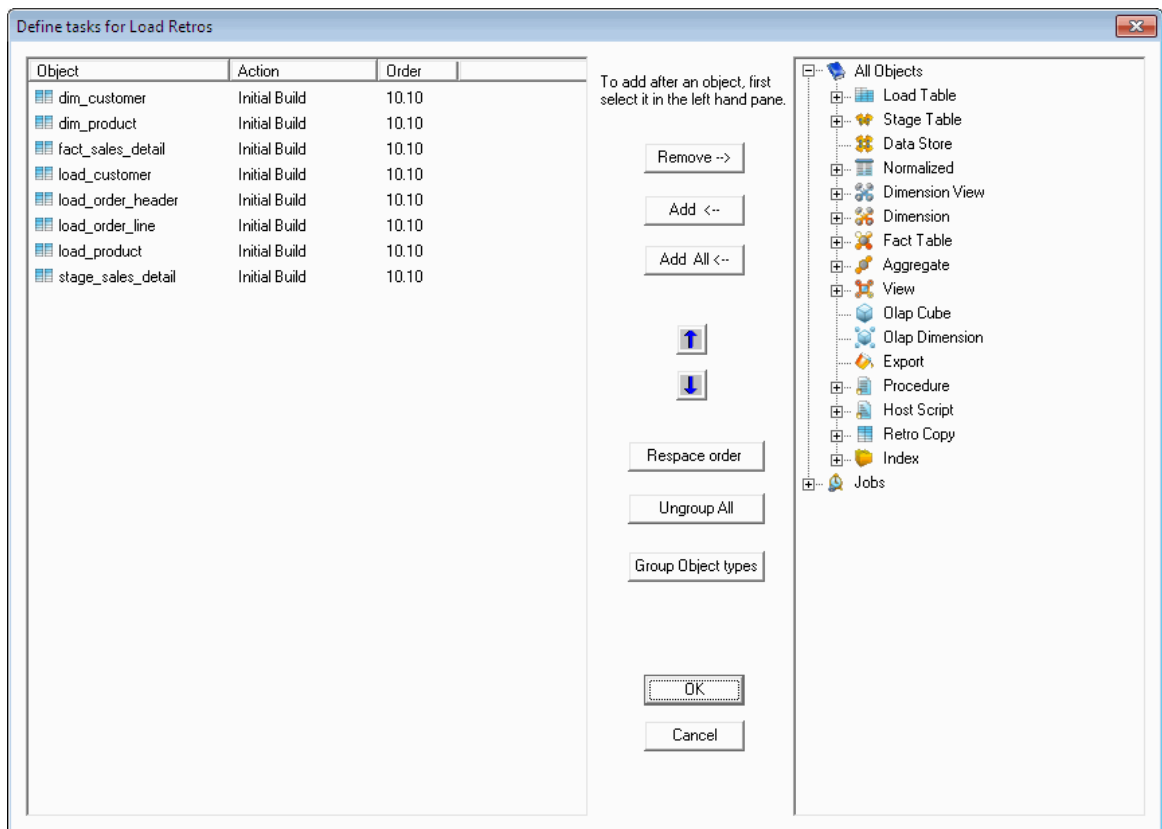
The following two fields are optional. They are executed after the job completes and therefore need to reflect the scheduler environment. (i.e. Unix or Windows). The special variables \$JOB_KEY\$, \$JOB_SEQ\$ and \$JOB_NAME\$ can be used to return the associated values.

The Success command will be executed if a successful completion, the failure command will be executed if a job fails to complete:

Success command:

Failure command:

11 Add all Retro Copy objects created in steps (3) to (8) and click on Group Object Types:

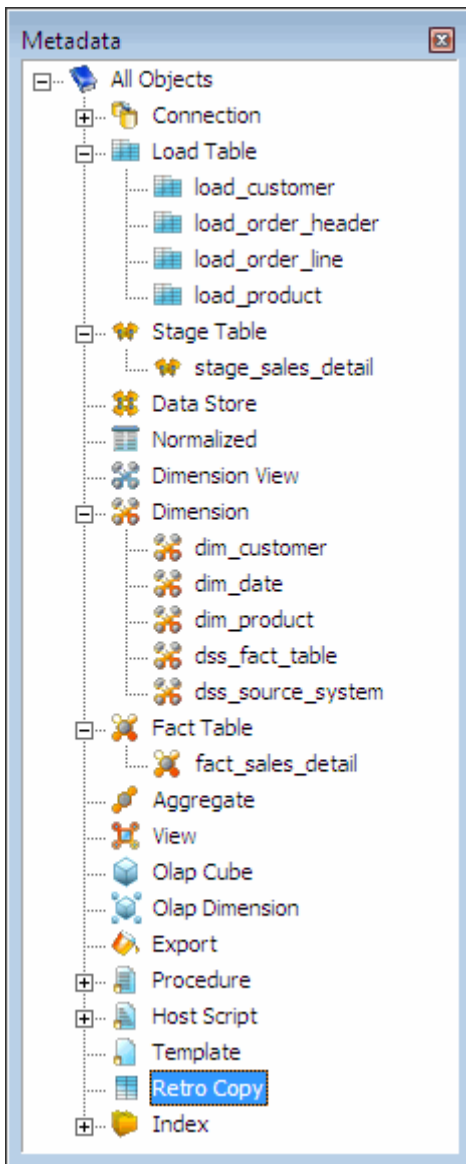


- 12 Once the job has completed, return to the QAD Data Warehouse Designer browser. Double click on the Retro Copy object group. Then select all objects in the middle pane and from the right click menu choose **Set table type to Definition**.
- 13 In the middle pane, select all objects. Right click and choose **Convert to Target object**. QAD Data Warehouse Designer now converts the **Retro Copy** objects to the appropriate object types:

Retro Copy			
Retro Table Name	Short Name	Table Type	Target Type
dim_customer	dim_customer	Definition	Dimension
dim_p		Definition	Dimension
fact_s		Definition	Fact Table
load_v		Definition	Load Table
load_v		Definition	Load Table
load_v		Definition	Load Table
load_v		Definition	Load Table
stage		Definition	Stage Table

Properties
 Display Columns
 Display Indexes
 Display Data
 Query table via Excel
 Add Column
 Add Index
 Set table type to Copy
 Set table type to Definition
 Change Target object type
 Convert to Target object
 New Version

- 14** There are no longer any Retro copy objects. They have been converted to Load, Stage, Dimension and Fact objects:



- 15 Change the source table and source column values on all of the retrofitted objects using either the Re-target source table dialog, or by editing column properties. See **Re-target source tables** (see "30.3 Re-Target Source Tables" on page 760) for more information.
- 16 Convert the old data warehouses code to QAD Data Warehouse Designer procedure in the new data warehouse database. See **Integrate Procedures** (see "31.2.4 Integrate, Procedures" on page 775) for more information.
- 17 If necessary, create new connections to be used with any migrated load tables. Attach a connection to each load table. See **Loading Data** (see "8. Loading Data" on page 113) for more information.

30.2 Importing a Data Model

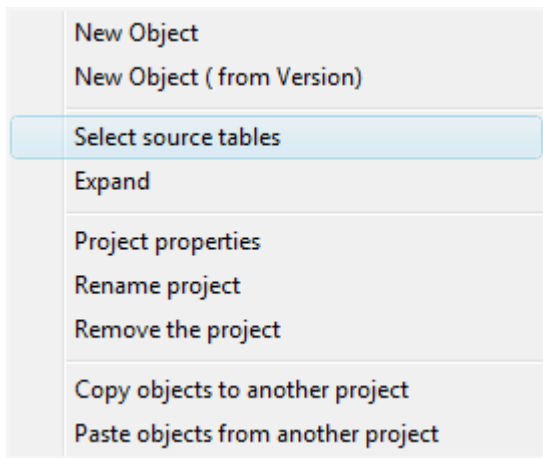
QAD Data Warehouse Designer provides functionality for importing data models from modeling tools.

The process to import a model is:

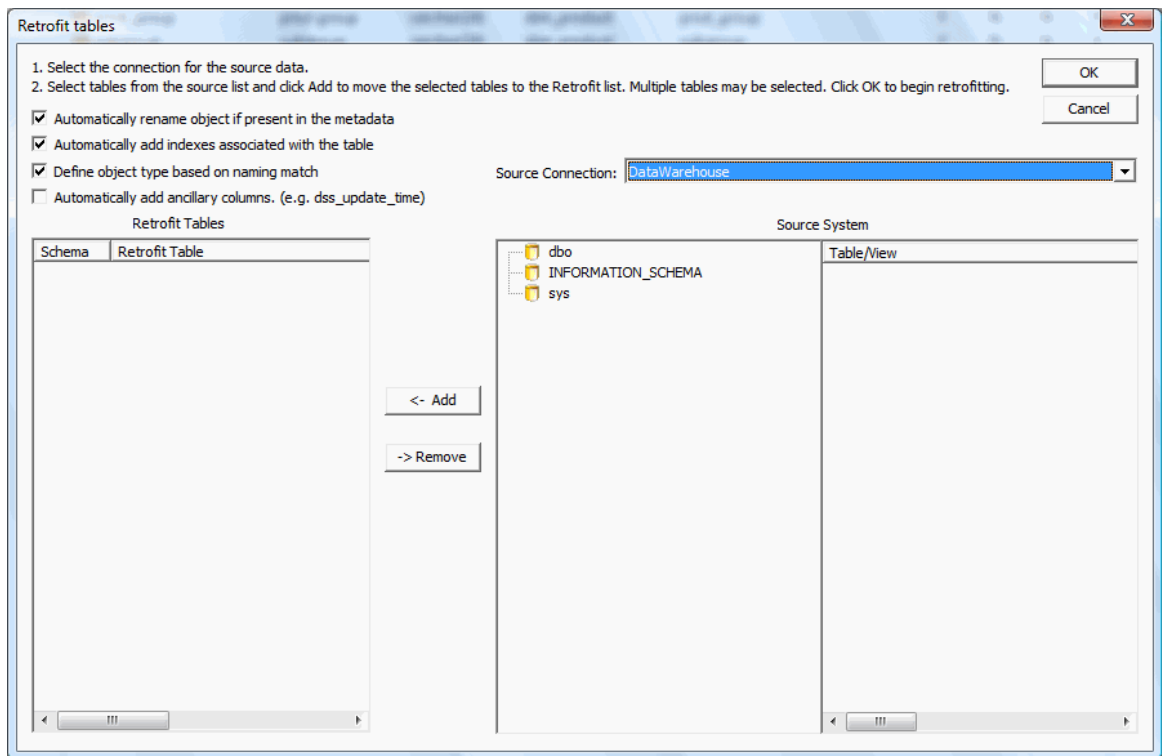
- 1 Create the physical data model in the modelling tool.
- 2 Generate DDL for the physical model in the modelling tool.
- 3 Run the DDL in the data warehouse database to create empty versions of the model tables.
- 4 Retrofit the tables in the dummy database into the QAD Data Warehouse Designer metadata as Retro Copy objects.
- 5 Convert the Retro Copy objects to Dimensions and Facts.

The following instructions outline steps 4 and 5 above:

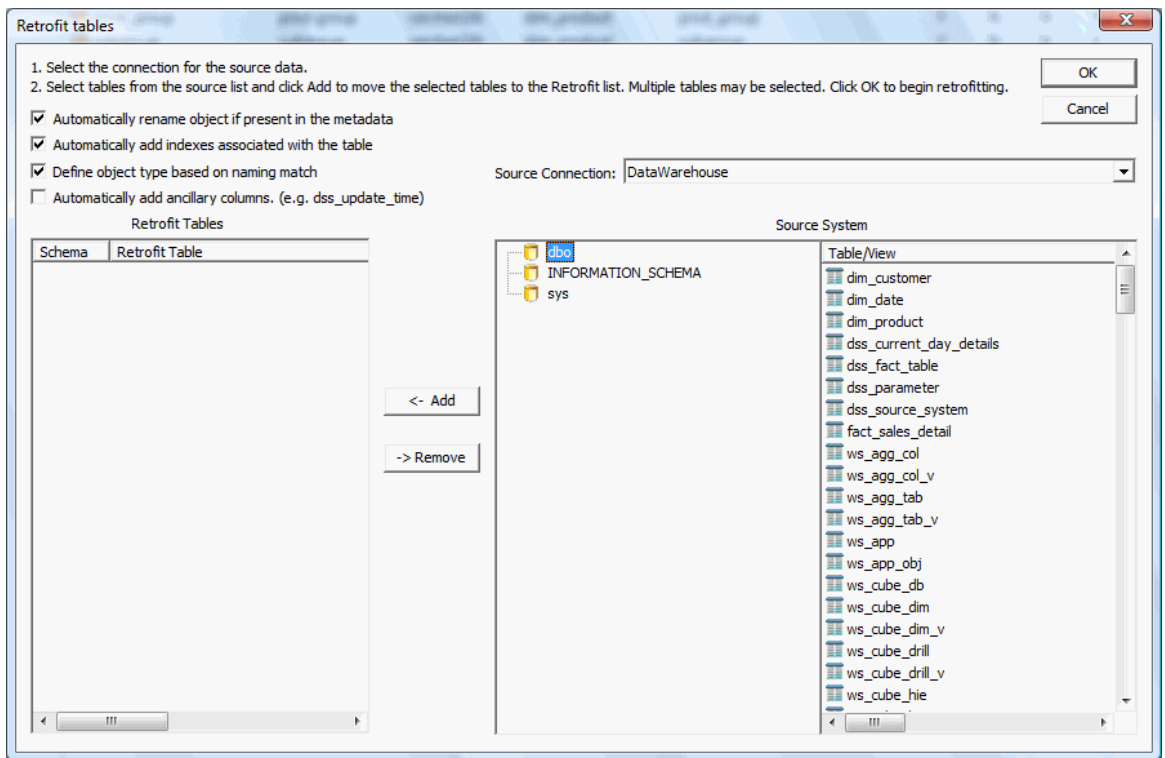
- 1 Right click on the Retro Copy object group in the object tree in the left pane and choose **Select source tables**:



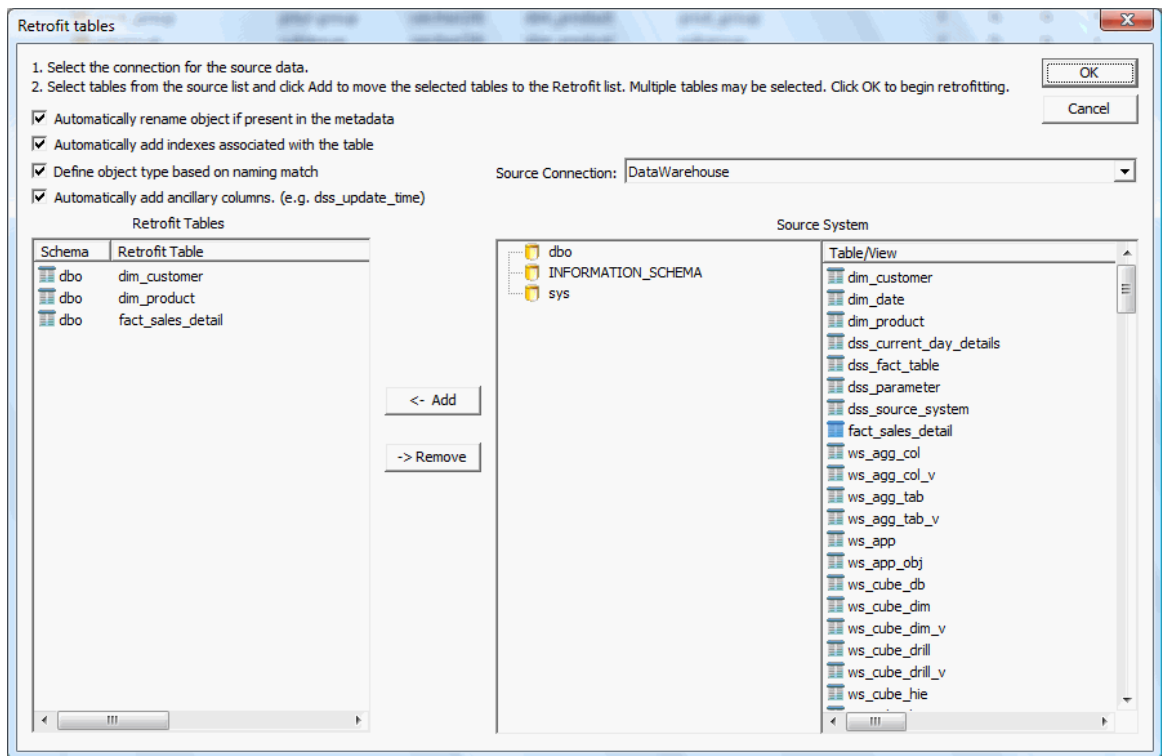
- 2 The Retrofit tables dialog is displayed. In the **Source Connection** drop down list choose the *Data warehouse* connection. A list of **databases** appears in the middle pane (yours list will be different).



- 3 Double click on the data warehouse database/schema in the middle pane list. A list of tables in the database is displayed in the right hand pane.



- 4 Click on the required tables in the right hand pane list and click on <- Add to move it to the left hand side. Then click the Automatically add ancillary columns (e.g. dss_update_time) check box. Click OK.



- 5 Double click on the Retro Copy object group in the object tree in the left pane. Select all objects in the middle pane and right click select **Convert to Target object**.

Retro Copy			
Retro Table Name	Short Name	Table Type	Target Type
dim_customer	dim_customer	Definition	Dimension
dim_p		Definition	Dimension
fact_s		Definition	Fact Table

Properties

Display Columns

Display Indexes

Display Data

Query table via Excel

Add Column

Add Index

Set table type to Copy

Set table type to Definition

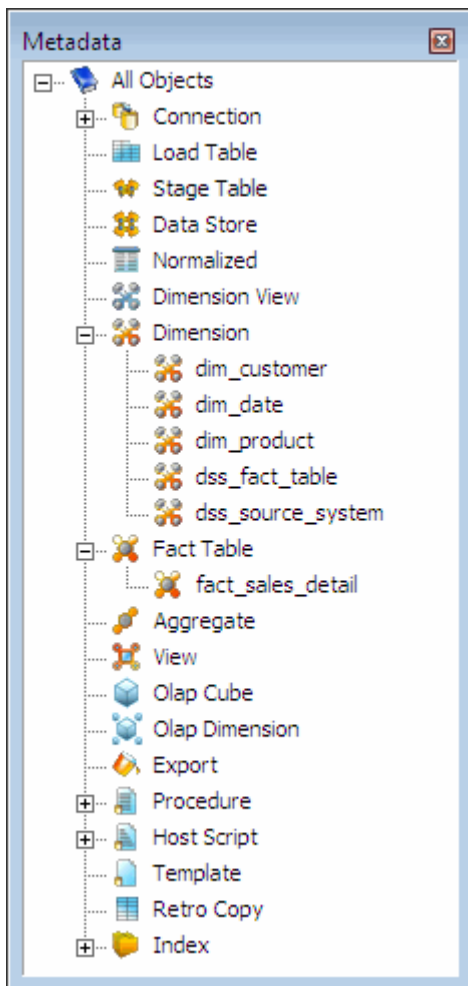
Change Target object type

Convert to Target object

New Version

Delete metadata

There new dimensions and a fact have been imported. Your QAD Data Warehouse Designer screen should look like this when you've finished:



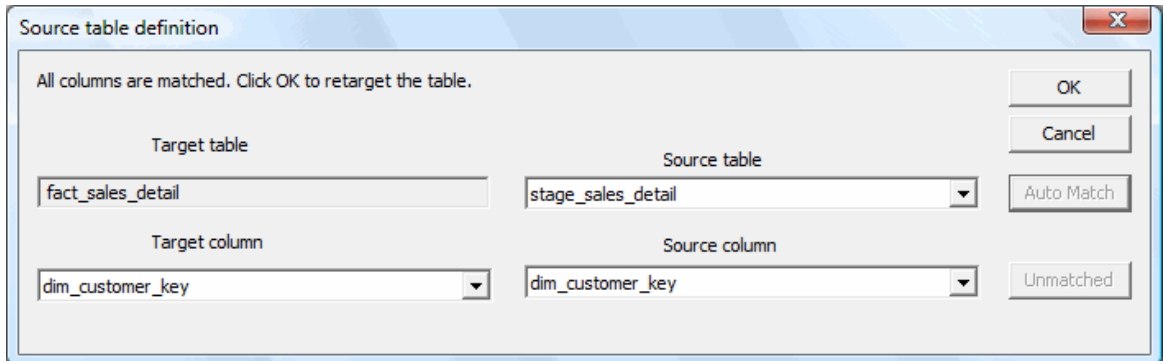
30.3 Re-Target Source Tables

Objects that have been retrofitted into the QAD Data Warehouse Designer metadata have themselves as their source table:

dim_customer columns		
Col name	Src table	Src column
 dim_customer_key	dim_customer	dim_customer_key
 customer_code	dim_customer	customer_code
 customer_name	dim_customer	customer_name
 customer_address	dim_customer	customer_address
 customer_city	dim_customer	customer_city
 customer_state	dim_customer	customer_state
 dss_update_time		

They can be re-targeted to the correct source table(s) using the QAD Data Warehouse Designer re-target wizard as follows.

- 1 Right click on a table object in the left hand pane and choose **Re-target source table**.
- 2 From the **Source table** drop down list choose the first source table and click **Auto Match**. The **Unmatched** button is grayed out if all columns in the target object exist in the source object:



- 3 The **Unmatched** button can be used to iterate through the columns in the target object and match them to those columns not yet chosen in the source table. For each, choose the appropriate source column or select ***** No Source *****; then click on **Unmatched** to move to the next column.

Source table definition

NOTE: Some columns could not be matched. Click Unmatched to step through these columns and match them manually, or press OK to retarget.

Target table:

Source table:

Target column:

Source column:

Buttons: OK, Cancel, Auto Match, Unmatched

- 4 When all columns have been matched, click OK.
- 5 Click on the table in the left hand pane to check the source table and column values are correct:

dim_customer columns			
Col name	Data type	Src table	Src column
 dim_customer_key	int identity		
 customer_code	numeric(6)	load_customer	code
 customer_name	varchar(45)	load_customer	name
 customer_address	varchar(40)	load_customer	address
 customer_city	varchar(30)	load_customer	city
 customer_state	varchar(2)	load_customer	state
 dss_update_time	datetime		

30.4 Retro Copy Column Properties

Each Retro Copy column has a set of associated properties. The definition of each property is defined below.

If the **Column name** or **Data type** is changed for a column then the metadata will differ from the table as recorded in the database. Use the **Tools/Validate table create status** menu option to compare the metadata to the table in the database. A right mouse menu option of 'Alter table' is available when positioned on the table name after the validate has completed. This option will alter the database table to match the metadata definition.



TIP: If a database table's definition is changed in the metadata then the table will need to be altered in the database. Use the **Tools/Validate table create status** to compare metadata definitions to physical database tables. The option also provides the ability to alter the database table, through a pop-up menu option from the validated table name.

Table

The table to which the column belongs. Read only.

Column name

The database name of the column. This name must conform to database column naming standards. Typically such standards exclude the use of spaces etc. A good practice is to only use alphanumerics and the underscore character. Changing this field alters the table's definition.

Business display name

This defines how the business refers to this column. Although it would not be normal practise to provide end user access to Retro Copy tables, the contents of this field are passed through to the fact table during the drag and drop operation, so this field can be commented for later use in the fact table if desired. This field does not affect the physical table definition.

Data type

This is the database specific data type. It must be a valid data type for the data warehouse database platform. Typical Oracle data types are number, char(), varchar2() and date. SQL Server databases often have integer, numeric, varchar(), and datetime data types. See the database documentation for a description of the data types available. Changing this field alters the table's definition.

Format

This field is to allow the definition of a format mask for end user tools. It does not affect the physical table definition. This field would not normally be populated.

Column order

This numeric field provides the ordering of the columns in the database table create statement. The lowest numbered column will appear first in the table. Although this affects the physical table definition no action will be taken unless the table is re-created in the database. The columns can be re-numbered based on the existing order by choosing the 'Respace order number' pop-up menu option when positioned over any column in the table. This action will number the columns in increments of 10 starting at 10. In addition to a simple change of the order field, the column order can be changed by first displaying the columns in the middle pane and then using drag and drop to move the columns around. This drag and drop process will automatically renumber the columns as required.

Nulls

This checkbox when set allows nulls to exist in this column. If cleared then nulls are not permitted in the column. Although this affects the physical table definition no action or comparison is made on this field. If you wish to change this attribute for a column in an existing table then the only supported way is to re-create the table, which may not be desirable.

Numeric

This checkbox indicates that the column in question is numeric when set. This is normally only relevant for fact tables and would not normally be used for Retro Copy tables.

Additive

This checkbox indicates that the column in question is additive when set. This is normally only relevant for fact tables and would not normally be used for Retro Copy tables.

Attribute

This checkbox indicates that the column in question is an attribute when set. This is normally only relevant for fact tables and would not normally be used for Retro Copy tables.

Source table

Indicates the table from which the column was sourced. This source table is normally a load table, or a dimension table within the data warehouse. If the column was sourced from multiple tables, then the normal practice is to record one of the tables in this field and a comment listing all of the other tables in the 'Source strategy' field. This field is used when generating a procedure to update the Retro Copy table. It is also used in the track back diagrams and in the documentation.

Source column

Indicates the column in the 'Source table' from which the column was sourced. Such a column is normally a load table column, which in turn may have been a transformation or the combination of multiple columns. This may also be a dimensional key where a dimension is being joined.

Business definition / Source strategy

Normally this field will contain the strategy for acquiring or populating a column. It is a useful place to record specific problems with the source data.

In the case of dimension keys this field is used to show the join between the Retro Copy table and the dimension, once it has been defined as part of the Retro Copy table update procedure generation.

Dimension Join

This checkbox is set by QAD Data Warehouse Designer during the building of the update procedure and should not normally be altered. It indicates that the column in question provides a join to a dimension table. The 'Source table' and 'Source column' fields will provide the dimension table's side of the join.

Manual Dimension Join

This checkbox can be set to change the way the dimension table is looked up during the staging table update procedure build. Enabling this option allows you to join to the dimension manually in the Cursor mapping dialog (where the **Where** clause is built). The usual dialog for matching the dimension business key to a column or columns in the staging table is not displayed if this option is enabled.

Key Type

The key type is used internally by QAD Data Warehouse Designer in the building of the update procedure and the generation of indexes. It can be altered here, but this should only be done if the consequences are fully understood and tested. The supported values are:

Key type	Meaning
0	The artificial key. Set when the key is added during drag and drop table generation.
1	Component of all business keys. Indicates that this column is used as part of any business key. For example: By default the <code>dss_source_system_key</code> is added to every dimension table. It is considered part of any lookup on that table and has the key type set to 1. Set when the column is added during drag and drop table generation.
2	Indicates that this column is a dimensional join. Used on fact tables to indicate the dimension keys. Results in bitmap indexes being built for the columns. Set during the update procedure generation for a fact table, based on information from the staging table.
3	Slowly changing column indicator. Used on dimension tables to indicate that the column is being managed as a slowly changing column within the context of a slowly changing dimension. Set when a column is identified during the dimension update procedure generation.
4	Previous value column indicator. Used on dimension tables to indicate that the column is being managed as a previous value column. The source column identifies the parent column. Set during the dimension creation.
A	Indicates that the column is part of the primary business key. Set whenever a business key is defined as part of an update procedure generation.
B-Z	Indicates that the column is part of a secondary business key. Only used during index generation and not normally set.

Artificial Key

This checkbox has no effect for Retro Copy tables and should be left unchecked.

Primary Business Key

This checkbox indicates that the column is part of the primary business key when set. Multiple columns can form the primary business key. This indicator is set and cleared by QAD Data Warehouse Designer during the Retro Copy update procedure generation process. This checkbox should not normally be altered.

Transformation Tab

It is possible to do transformations on Retro Copy table columns. It is recommended that transformations are not performed on columns that are dimension keys or the business keys for the table. The transformation screen is as follows:

30.4.1 Retro Copy Column Properties Screen

Column definition

Column Properties | Transformation

Table:

Column name:

Business display name:

Data type:

Format: Column Type (KPIs only):

Column order: Default Value (KPIs)

Nulls: ☒ End User Layer Display: ☐

Numeric: ☒ Dimension Join: ☐ Manual Dimension Join: ☐

Additive: ☒ Key Type (D,A,B,C..): ☐

Attribute: ☐ Artificial Key: ☐

Primary Business Key: ☐

Note: When the Dimension Join flag is set then the contents of Source column denotes the foreign key. Business definition denotes the join.

Source table:

Source column:

Business Definition:
Source strategy:
(max 2048 chars.)

The value shown below is loaded in this column for the 'Invalid Join' record. When empty NULL is used.

Zero key value:

CHAPTER 31

31. Integrating QAD Data Warehouse Designer into an Existing Warehouse

Two main options exist in terms of bringing QAD Data Warehouse Designer into an existing data warehouse environment:

- 1 Rebuild tables and procedures with QAD Data Warehouse Designer.
- 2 Integrating existing tables and procedures into QAD Data Warehouse Designer.

Both options require manual coding changes to stored procedures. The main advantages and disadvantages of these two options are discussed below, and in detail in the following sections.

Rebuilding

The rebuild option is essentially a redevelopment of the existing data warehouse utilizing the knowledge acquired in the initial development and the rapid development capabilities of QAD Data Warehouse Designer. A rebuild will take more time and effort than just integrating existing tables and procedures but will provide a better platform on which to extend the data warehouse. See the **Rebuild** (see "31.1 Rebuild" on page 768) section for the approach to achieve this option.

Integrate

Existing data warehouse tables can be identified to QAD Data Warehouse Designer. The tables are seen and can be managed to a degree. The main disadvantage is the increased difficulty in utilizing these tables when trying to extend the data warehouse. This option is however significantly quicker and easier than a rebuild. It is discussed in detail in the **Integrate** (see "31.2 Integrate" on page 768) section of this chapter.

The decision as to which option to choose will depend on the size and complexity of the existing data warehouse. Another important factor is the degree to which the existing data warehouse is to be extended. If future enhancements revolve around new analysis areas that have little overlap with the existing environment then a integrate may be the best answer. If the data warehouse is small and relatively simple then a rebuild may be worth considering. In any event the best plan may be to do a test integrate and then re-evaluate the situation.

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31.1 Rebuild

The rebuild process essentially is a total re-creation of the data warehouse. One of the major impacts of such an approach is the 'end user layer', or rather the effect on the end user tools and saved queries and reports that are currently in use. The redesign or redeployment of this interface to the end users of the data warehouse may be too large a task to undertake. The problem can be circumvented to some degree though the use of views to make the new data warehouse environment look the same as the previous. But it is this impact and the subsequent re-testing process that must be considered when deciding to undertake a rebuild.

The advantages of a rebuild is the seamless integration of future analysis areas into the data warehouse and the single point of management that is provided. The major steps in the rebuild process will depend very much on the environment being replaced. As a guideline the following steps may be worth considering.

The rebuild process

- 1 Load a copy of the QAD metadata repository into an otherwise empty test environment. See the Installation and Administration Guide for instructions on how to load a metadata repository.
- 2 Ensure there are no public synonyms that point to existing table names, if the rebuild process is to use the same names as some or all of the existing tables.
Working within the QAD Data Warehouse Designer tool proceed to:
- 3 Create connections to the new test data warehouse and to all the source systems.
- 4 Using the source system knowledge from the existing data warehouse, create the appropriate load tables in the data warehouse based on the existing extract or load methodology.
- 5 Build up the dimension, stage and fact tables using the same column and table names where possible.
- 6 Examine the existing procedures or update methodology and include this into the generated stored procedures.
- 7 Test the new environment.
- 8 Work out a plan to convert the existing data into the new data warehouse. Where possible it is best to keep existing key values and re-assign sequences to match these existing key values where appropriate.
- 9 Convert and test the old data warehouse data in the new environment.
- 10 Redeploy the end user tool access.

31.2 Integrate

The integrate process

The steps in the integrate process are:

- 1 Create a test environment (database user) with the existing data warehouse tables loaded.
- 2 Load a copy of the QAD metadata repository into this test environment. See the Installation and Administration Guide for instructions on how to load a metadata repository.
Working within the QAD Data Warehouse Designer tool proceed to:
- 3 Create any connections to Unix or Windows servers where host scripts are currently executed. See either **creating a Windows connection** (see "**6.6 Connections to Windows**" on page 94) or **creating a Unix connection** (see "**6.5 Connections to Unix**" on page 90).

- 4 Create a Data Warehouse connection mapping back to the test environment. See ***creating a connection to the data warehouse*** (see "**6.2 Connection to the Data Warehouse**" on page 71).
- 5 Incorporate any Host system scripts currently used. See ***incorporating host scripts*** (see "**31.2.1 Integrate, Host Scripts**" on page 769).
- 6 Browse the Data Warehouse connection (Browse/Source Tables).
- 7 Drag and drop each existing data warehouse table into an appropriate object type. See ***Selecting an appropriate table type*** (see "**31.2.2 Integrate, Selecting a Table Type**" on page 771).
- 8 Answer the retrofit questions, and build any required procedures. See ***integrate questions*** (see "**31.2.3 Integrate, Questions**" on page 771).
- 9 Edit and amend all generated procedures, or create new procedures to handle the existing processing methodology. See ***procedure changes*** (see "**31.2.4 Integrate, Procedures**" on page 775).
- 10 Test the new environment.

Removing the metadata for a table

It is possible to delete the metadata for a table without deleting the table itself. For example if the integrate process is incorrectly undertaken, the metadata for the specific table can be removed. To delete the metadata only: First select the table and using the right mouse menu select 'Delete'. A dialog box will ask if you wish to delete the object and drop the table. Answer NO. A second dialog box will now appear asking if just the metadata is to be deleted. Answer Yes to this question and only the metadata will be removed.

31.2.1 Integrate, Host Scripts

Existing host scripts (either Unix or Windows) can be brought into the QAD Data Warehouse Designer metadata. To incorporate an existing script the process is as follows:

- 1 Create a 'Host Script' object using QAD Data Warehouse Designer. In the left hand pane click on a project or the 'All Objects' project and using the right mouse menu select 'Create Object'. The new object dialog box will appear. From the Object Type drop down select 'Host Script' and enter a name for the new script.
- 2 The following properties dialog will appear. Select the script type. Either Unix or Windows script. Select the appropriate connection from the 'Default Connect' drop down. Fill in the purpose field to define the role of the script and then click Update to store the changes.

monitor_db_mail definition

Procedure/ Script Properties | Notes

Name: monitor_db_mail

Purpose:

Owner: dssdemo

Created: 23-MAR-2010 12:12:1 Type: Unix script

Compiled: Delete Lock: ☐

Last Update: Last Update by:

Default Connect:

Checked out by:

Checkout reason: or Last Update New Script

OK Cancel Apply

- 3 Select the new script in the 'Host Script' object group and using the right mouse menu edit the new script by selecting 'Edit the script', or double click on the script name.
- 4 Within the script editor, either paste the script or if it is available on the PC, select the 'File/Insert from file' option and load the file.
- 5 The script will need to be modified to handle the standards required by the scheduler. See **Loading via a host script** (see "8.7.2 Host Script Loads" on page 152) for more details.

31.2.2 Integrate, Selecting a Table Type

When integrating existing tables there may not be a clear decision as to which table type to use. As a guideline the following groupings can be considered.

Temporary tables:

- Load tables
- Stage tables

Permanent tables:

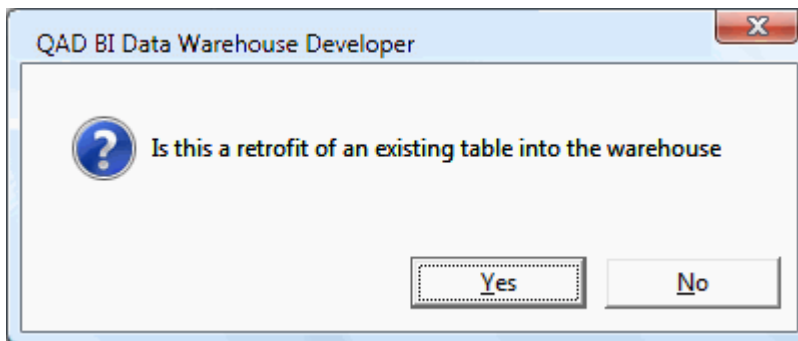
- Dimension tables
- Fact tables
- Aggregate tables

Although these table groups have very distinct names in terms of data warehousing, they do not impose any restrictions on the types of tables they contain. The table groupings are most relevant in the automatic generation of procedures, and in the sequencing for the scheduler.

Typically a mapping table may be stored in the Dimension table group.

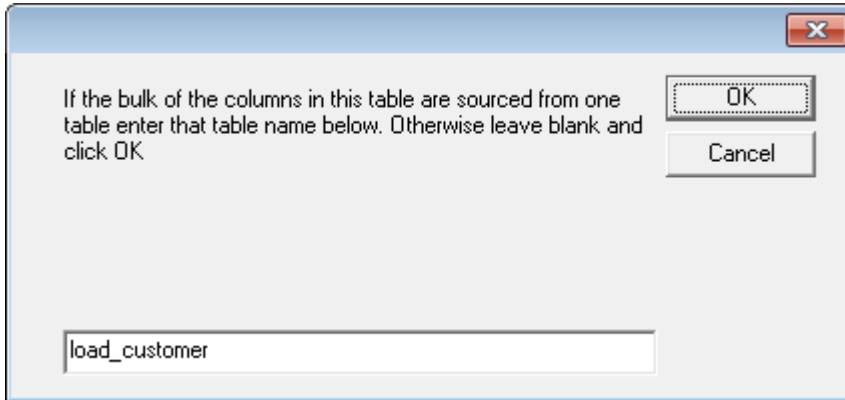
31.2.3 Integrate, Questions

When a table within the data warehouse schema, that is unknown to QAD Data Warehouse Designer, is dropped onto a table target the following dialog appears.



If this is a integrate then click Yes to proceed with the integrate process. The standard 'New Object' dialog will appear and it would be advisable to leave the name of the object unchanged so that it matches the existing table.

A dialog will ask if the bulk of the columns in this table are derived from another table. If they are enter the table from which these columns derive at this stage. The purpose of this dialog is simply to set the 'source table' field against each of the columns for the table.



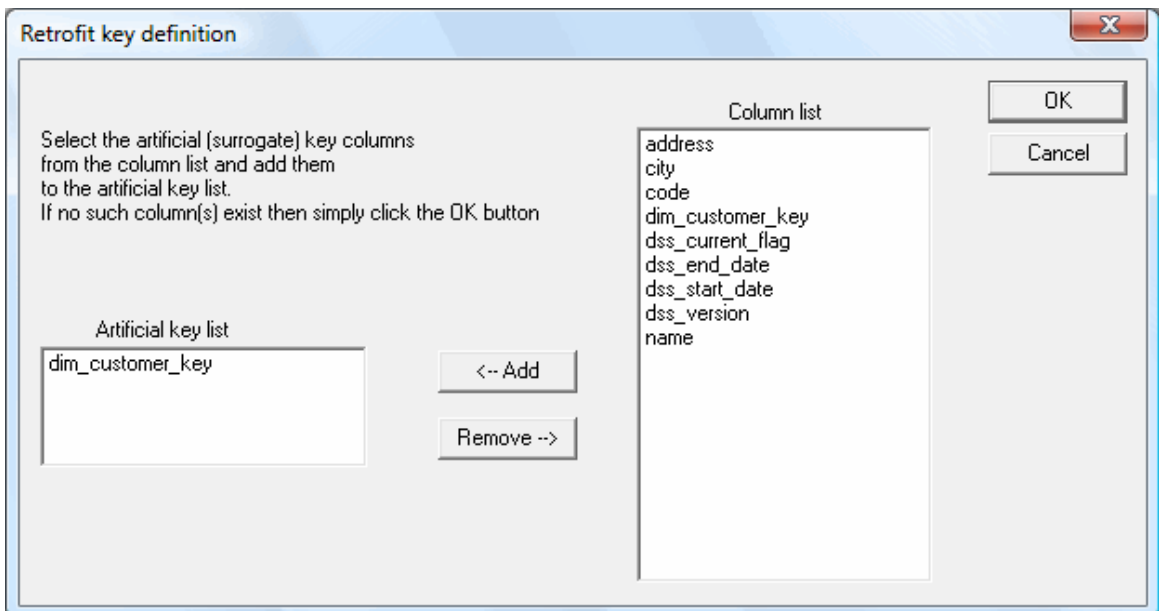
If the bulk of the columns in this table are sourced from one table enter that table name below. Otherwise leave blank and click OK

load_customer

OK Cancel

Artificial Key definition

If the table target is a dimension or fact table then the following dialog will appear to enable the definition of any artificial or surrogate key. If no such key exists then simply proceed to the next question.



Retrofit key definition

Select the artificial (surrogate) key columns from the column list and add them to the artificial key list.
If no such column(s) exist then simply click the OK button

Artificial key list

dim_customer_key

<-- Add Remove -->

Column list

address
city
code
dim_customer_key
dss_current_flag
dss_end_date
dss_start_date
dss_version
name

OK Cancel

Get Key Function

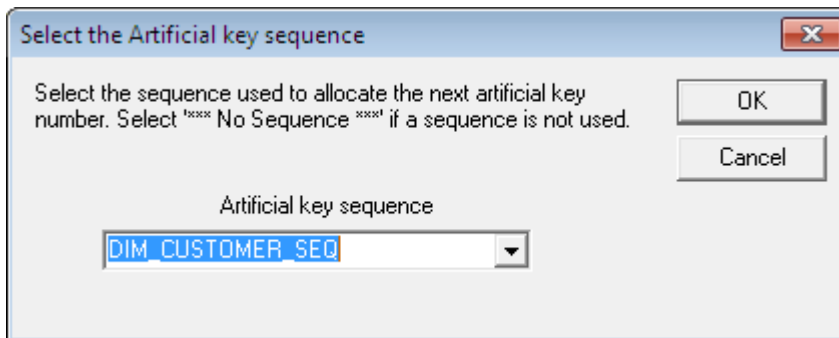
If the target table is a dimension you will be asked if you want to generate a get key function. The get key function is used by QAD Data Warehouse Designer for rapid prototyping. It returns the artificial key when passed the business key. Although this function is possibly not necessary in the existing environment it is useful if the dimension is to be used in any expansion of the data warehouse. If an existing get key type function exists, then this can be used, although changes will probably need to be made to the generated procedures to utilize this existing get key function.

Update Procedure

If the target table is a dimension, stage, fact or aggregate a dialog box will ask if an update procedure or update template is required. If selected a subsequent dialog will define the structure and content of this procedure. If an existing procedure is to be modified to include the scheduler imposed procedure standards it is best to select this option and use the existing procedure name to cut down on the amount of work required. The existing procedure can then be loaded into the generated procedure using the procedure editor.

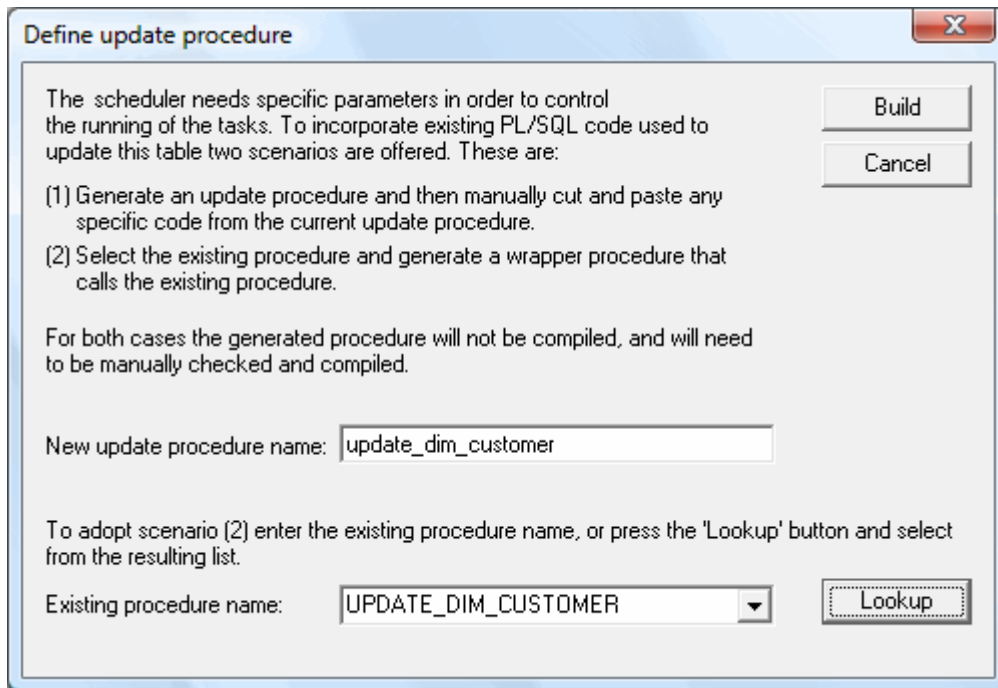
Artificial Key Sequence

If a get key function or update procedure is to be built and an artificial key is in use for the table then a dialog will prompt for the artificial key sequence. A drop down list provides all the sequences defined for this database user. This sequence is an Oracle sequence that is used in the automatic generation of the artificial key. If no such sequence is used then select the *** no sequence *** option.



Update Procedure Definition

If an update procedure was selected then the following dialog will display to help define how the update procedure is generated.



The scheduler needs specific parameters in order to control the running of the tasks. To incorporate existing PL/SQL code used to update this table two scenarios are offered. These are:

- (1) Generate an update procedure and then manually cut and paste any specific code from the current update procedure.
- (2) Select the existing procedure and generate a wrapper procedure that calls the existing procedure.

For both cases the generated procedure will not be compiled, and will need to be manually checked and compiled.

New update procedure name:

To adopt scenario (2) enter the existing procedure name, or press the 'Lookup' button and select from the resulting list.

Existing procedure name:

As defined in this dialog box the scheduler needs specific parameters in order to control and run a procedure. An existing procedure will not have these parameters. There are basically two forms of generated procedure. The first option is to generate a procedure that looks much like a standard QAD Data Warehouse Designer procedure and then manually insert the changes from the existing procedure. The second option is to generate a wrapper procedure that calls the existing procedure. This second option will still require manual changes to the procedure to return a valid return code and message.

Business Key definition

If a get key or update procedure has been selected a dialog will now prompt for the selection of the business key from the table. Multiple columns may constitute the business key, but they must uniquely identify each record in the table.

Index definition

Any indexes associated with the table will now be automatically defined and loaded into the metadata. Changes may need to be made in terms of when the indexes are dropped and to set the 'Drop before update' check box if appropriate and the scheduler is to be used to manage these indexes.

Procedure creation

If defined the get key and update procedures will now be generated. They will need to be manually edited and compiled. See the section on *integrating procedures* (see "*31.2.4 Integrate, Procedures*" on page 775).

31.2.4 Integrate, Procedures

The procedures managed by the QAD scheduler require the following standards.

Parameters

The procedure must have the following parameters in the following order:

Parameter name	Input/Output	Oracle Type	SQL Server / DB2 Type
p_sequence	Input	Number	Integer
p_job_name	Input	Varchar2	Varchar(256)
p_task_name	Input	Varchar2	Varchar(256)
p_job_id	Input	Number	Integer
p_task_id	Input	Number	Integer
p_return_msg	Output	Varchar2	Varchar(256)
p_status	Output	Number	Integer

The input parameters are passed to the procedure by the scheduler. If the procedure is called outside the scheduler then the normal practice is to pass zero (0) in the sequence, job_id and task_id. A description of the run can be passed in the job name and the task name is typically the name of the procedure.

The output parameters must be populated by the procedure on completion. The return_msg can be any string up to 256 characters long that describes the result of the procedures execution. The status must be one of the following values:

Status	Meaning	Description
1	Success	Normal completion
-1	Warning	Completion with warnings
-2	Error	Hold subsequent tasks dependent on this task
-3	Fatal Error	Hold all subsequent tasks

The major task in integrating a procedure will be in adapting it to the QAD scheduler standards and work flow.

31.2.5 Integrate, Views

When integrating views an additional step is required if you want QAD Data Warehouse Designer to be able to recreate the view.

The view will be mapped correctly and the 'Get Key' function can still be built. This step is only required if the view is to be re-created.

Change the source column on the artificial key to match the artificial key in the table from which the view was created.

31.2.6 Integrate, QAD Tables

When integrating QAD generated tables and views a number of additional considerations need to be taken.

The Dimension tables and views make use of secondary business key columns such as `dss_source_system_key`, `dss_current_flag`, `dss_end_date`, `dss_version` to assist in handling various forms of slowly changing dimensions and non conformance. These secondary business keys need to be flagged as such against the dimension.

Change the properties of all such columns. The key type should be set to 1, and the primary business key check box should be set.

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