QAD Enterprise Applications

Training Guide

QAD Data Warehouse Designer

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Data Warehouse Designer Version 3.3

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CHAPTER 1

Tutorial 1 - Basic Star Schema Fact Table

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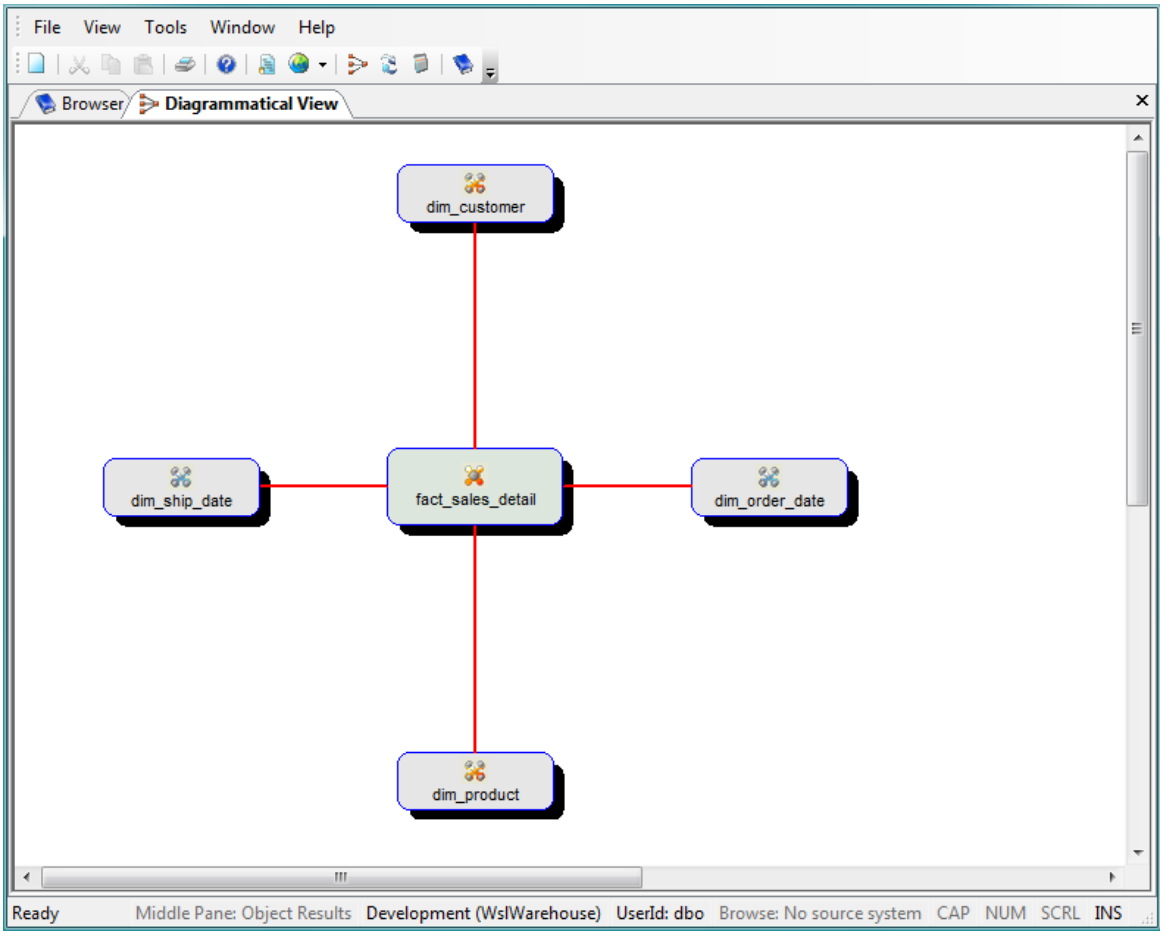
Tutorial 1 - Purpose and Roadmap

Purpose

This tutorial is designed to introduce you to the basic objects used by QAD Data Warehouse Designer. At the end of the tutorial you will have built a simple dimensional analysis area of a data warehouse.

The tutorial will build the star-schema shown below. This star-schema comprises a central fact table, fact_sales_detail, joined to four dimension tables. Data will be loaded from tables in another Sql Server database, Oracle schema or DB2 schema.

In the process of creating this star-schema you will learn to create load, stage, fact and dimension tables. You will also see how data flows from the data source, through the different tables enroute to its fact or dimension table destination.



Tutorial Environment

This tutorial has been completed using Microsoft SQL Server. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

Tutorial Roadmap

This tutorial works through a number of steps. These steps and the relevant section within the chapter are summarized below to assist in guiding you through the tutorial.

Step in Tutorial	Section
Setup the WhereScape tool ▪ Install QAD ▪ Set-up tablespace defaults ▪ Set-up default prefixes for tables ▪ Create connection (to data source)	▪ The First Step ▪ Logging In ▪ Tablespace Defaults ▪ Table Name Defaults ▪ Creating a Connection
Create and load the load tables for ▪ Customer ▪ Product ▪ Order_line ▪ Order_header	Loading Source Tables
Create (and update from load tables) the following dimension tables ▪ Dim_customer ▪ Dim_product	Building Dimensions
Create dimensions for ▪ Dim_order_date ▪ Dim_ship_date These are views on the dim_date table	Creating Dimension Views
Create the stage_sales_detail table ▪ Create stage table using columns from load_order_line and load_order_header ▪ Specify join condition ▪ Include links to the following dimensions (dim_customer, dim_product, dim_order_date, dim_ship_date)	Defining the Staging Table Including Dimension Links
Create the fact_sales_detail table	Creating a Fact Table
View the WhereScape generated documentation	Switching to Diagrammatical View Producing Documentation

The First Step

The first step

To get started you need to follow the steps in the QAD Setup Administrator to create the required environment. The basic steps in this process are:

Oracle and IBM DB2 data warehouse

1. Install the QAD product suite.
2. Create a database schema for the QAD metadata repository.
3. Install the QAD metadata repository.

SQL Server data warehouse

1. Install the QAD product suite onto a PC.
2. Use the Quick Start option in the Setup Administrator utility to load the metadata and repository.

Note: See the Installation and Administration Guide for these procedures. For Oracle this tutorial assumes source data resides in the wtutorial schema and that the metadata has been loaded under the dssadm schema which has select access to the tutorial tables. For SQL Server it assumes that the data warehouse is in the WslWarehouse database and that the source data resides in the WslTutorial database. For DB2 it assumes that the data warehouse is in the QAD Data Warehouse Designer schema.

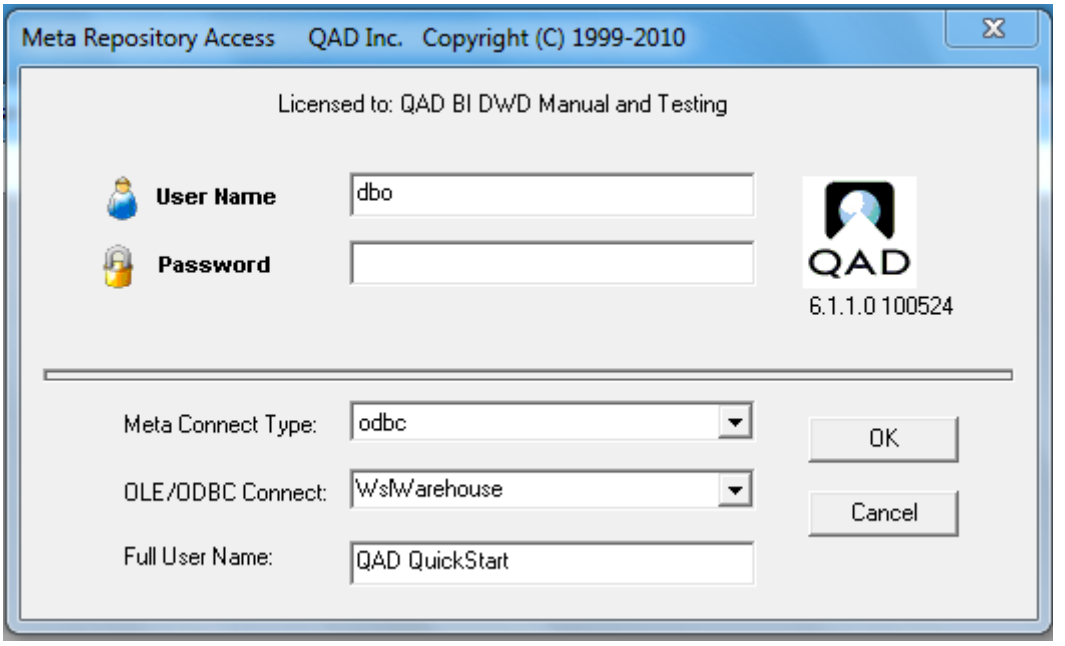
You are now ready to ***log on*** (see "***Logging In***" on page 6) to the repository you have created.

Logging In

Having completed the first step, and using QAD Data Warehouse Designer, you can now log on to the repository you have created .

To log in:

1. Click QAD Data Warehouse Designer from the Start menu. The Access Control screen displays. See sample screen below:



2 For SQL Server, the username and password are those required to logon to the database server. If a trusted connection is being used enter "dbo" as the username and leave the password blank. For Oracle the username and password are those of the user under which the metadata repository has been loaded. See ***Switching Between Databases*** for details on logging into IBM DB2.

Note: The metadata repository and data warehouse tables must reside under the same schema for Oracle and DB2. For SQL Server, the metadata repository and data warehouse tables must reside under dbo.

3 ODBC is the only supported connection method. Enter the ODBC connection for your database. This connection must have been established prior to logon. Refer to the Installation and Administrator Guide if no such connection exists.

4 The Full User Name is the name that will be associated with any procedures, tables, etc, and scheduled jobs that are created from within QAD Data Warehouse Designer. Normally this would be your full name.

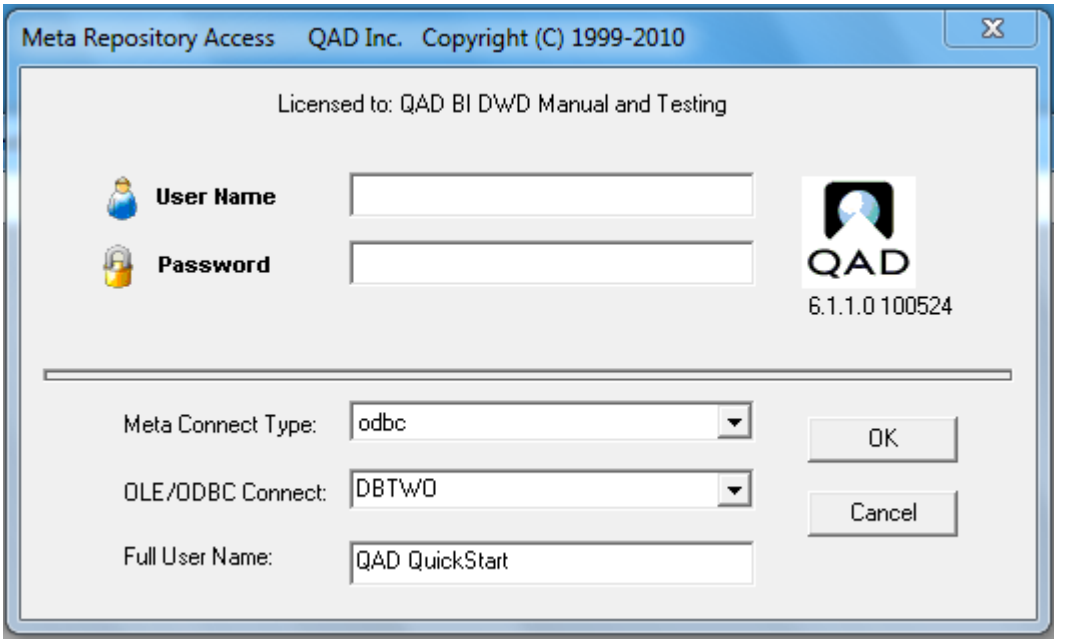
5 Click OK. The Browser screen displays.

You are now ready to proceed to the next step where you define ***Tablespace Defaults*** (see "***Tablespace (FileGroup) Defaults***" on page 10).

Switching Between Databases

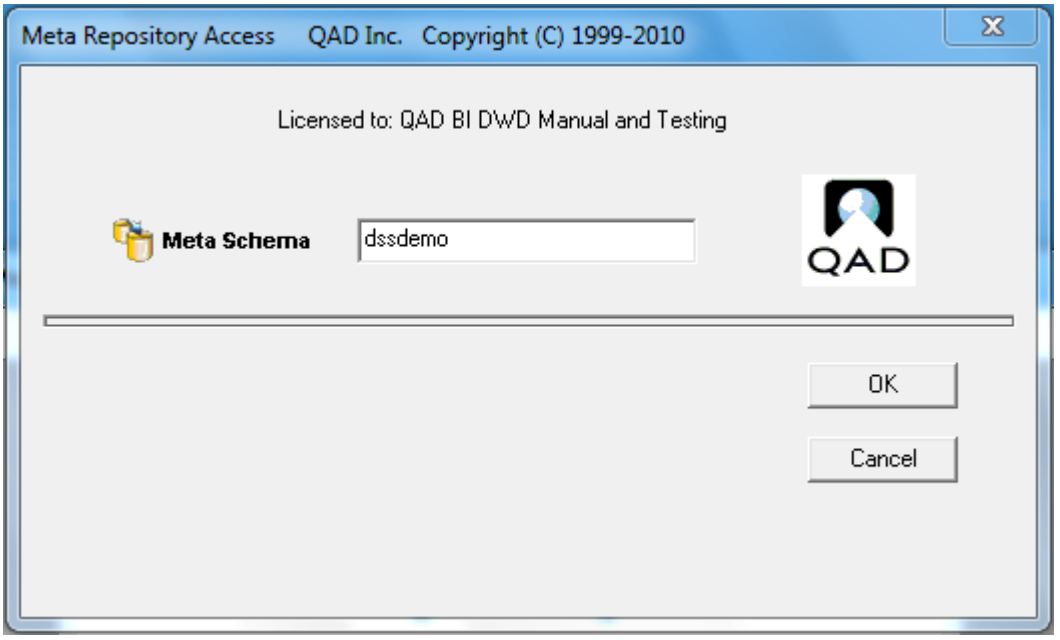
Signing into QAD Data Warehouse Designer for the first time uses the standard logon dialog with User Name and Password but excluding the Metadata Schema. After clicking OK, QAD Data Warehouse Designer connects and determines the type of relational database management system (RDBMS) being connected to. If the RDBMS is IBM DB2 then the Metadata Schema is also required.

The following sample logon screen shows the details entered for IBM DB2 for an operating system authenticated connection:

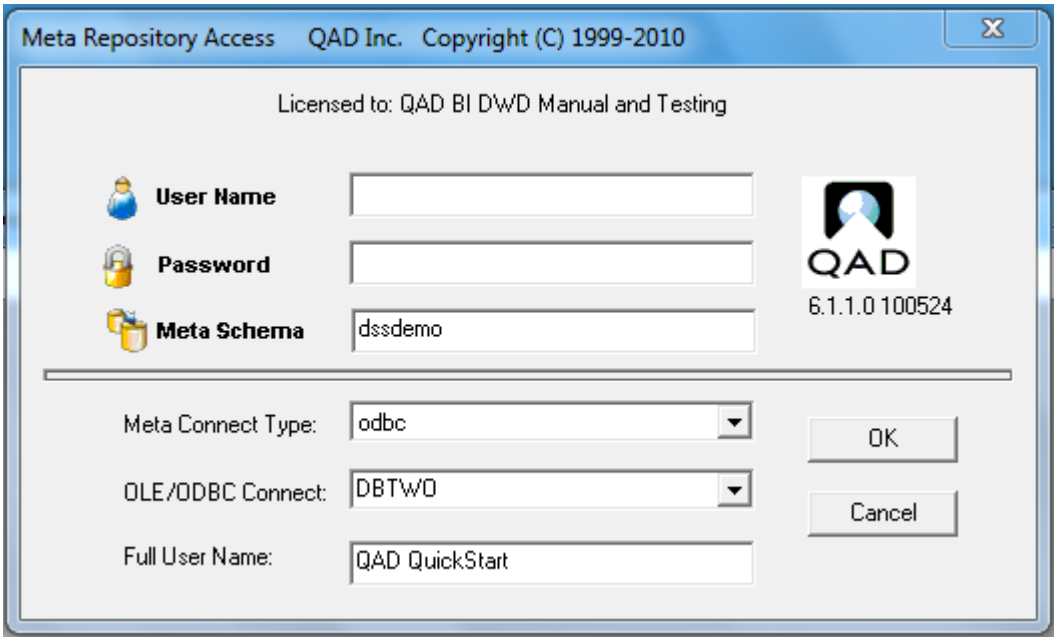


Note: A user name and password will be required if operating system authentication is not being used.

The Metadata Schema will then be requested if DB2 is detected:



Subsequent connections to DB2 will have the Metadata Schema included in the logon dialog:



Ignore the Metadata Schema field if connecting to an Oracle or SQL Server repository after successful connecting to DB2.

Note: QAD Data Warehouse Designer reverts to the standard logon dialog (without the Metadata Repository field) after a successful connection to an Oracle or SQL Server repository.

Tablespace (FileGroup) Defaults

Before you begin to create the data warehouse, you can choose the defaults for the tablespaces (filegroups for SQL Server). There is no need to change the defaults for this tutorial.

1 From the Tools menu, select Options then Filegroup tab, and make the appropriate tablespace/filegroup choice for each option.

Note: The default table space or filegroup for the user will be used if no settings are selected.

You are now ready to proceed to the next step where you define the ***Table Name Defaults*** (on page 10).

Table Name Defaults

Before you begin to create the data warehouse, you can choose the defaults for the table names. There is no need to change the defaults for this tutorial, and the examples given reflect the default naming convention.

1 From the Tools menu, select Options then Naming (Local) or Naming (Global) tab, and alter the default table naming convention if required.

2 If no changes are made, the default table names will be:

- load_ load tables with data copied from a source system
- stage_ tables for manipulating and transforming data prior to publishing
- dim_ dimension tables
- fact_ fact tables, detail, rollup and snapshot
- agg_ aggregate or summary tables built from fact tables
- olap_ Analysis Services Olap cubes built from stage or fact tables

You are now ready to proceed to the next step ***Creating a Connection*** (on page 11).

Creating a Connection

In order to populate the metadata repository, connections need to be made to the source data. There must also be a connection to the data warehouse itself. This section describes how to make two new connections.

Note: The following two connections should have been automatically created. They should however be validated to ensure they are correct for the environment.

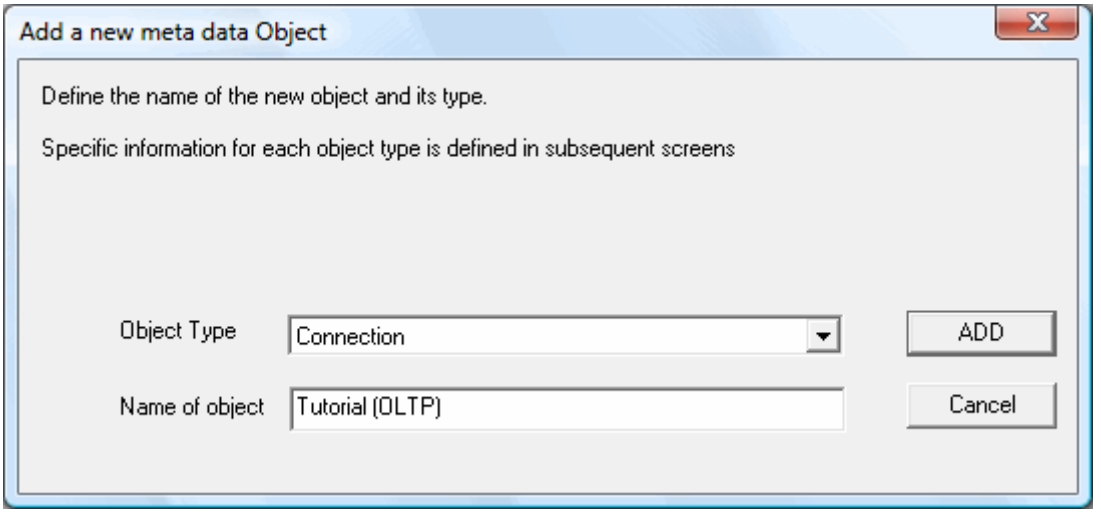
The first connection is to the source system. For Oracle this is the user within your Oracle database, for SQL Server the database, that contains the tutorial tables and for DB2 this is another schema within your database.

The second connection will be to the data warehouse tables.

TIP: In order to utilize the drag and drop features there must always be a connection to the data warehouse itself.

How to make a connection

1. Click on and highlight the Connection object group in the left pane. This selects the object group to be worked on.
2. Select File | New, or use the right mouse button and choose New Object. A dialog box displays with the Object Type defaulted to Connection. Name your connection. In this instance type *Tutorial (OLTP)*, and select Add. A Properties box will display:



SQL Server:
If running a SQL Server data warehouse then proceed as follows.
In the Properties box, complete the details as below, and then select Update:

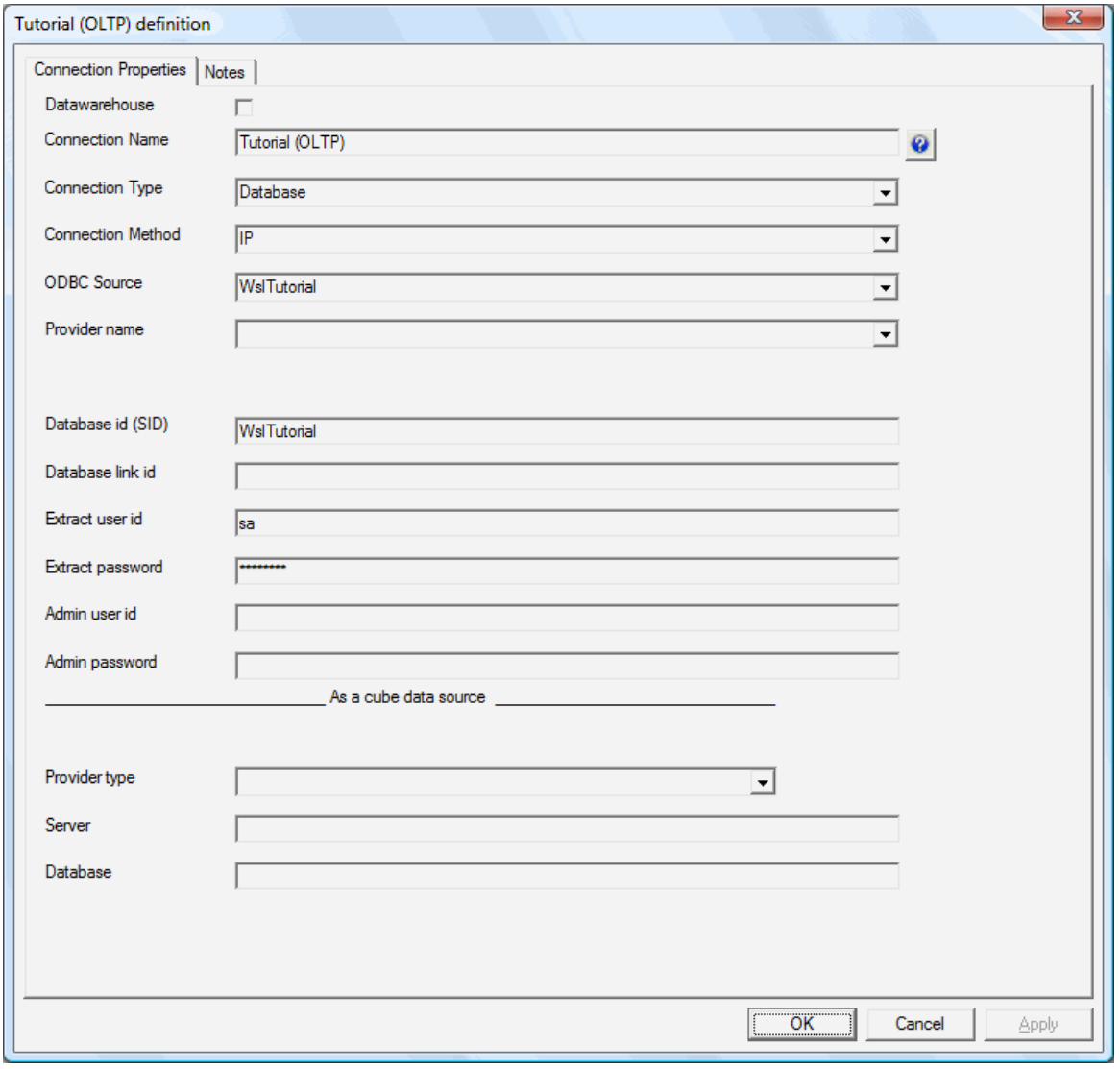
- The Connection Method must always be set to IP.

- The ODBC source is the ODBC connection which has been defined to connect to the database. In this case the ODBC connection to the database that holds the tutorial tables.
- The Provider name identifies the type of connection that SQL Server will make in the case of a linked server. In this case it is not required as we are using tutorial tables in a SQL Server database on the same server.
- The Database ID (SID) is the SQL Server database name of the database being connected to. In this case the SID of the tutorial database.
- The Database Link ID is a SQL Server linked server link to connect from the data warehouse database to the source system database.

Note: This link is only required if the source database is on a different server from the data warehouse database. For the purposes of this tutorial, the database link ID is not required as the tutorial data is usually loaded into a database on the same server as the metadata.

- The Extract User ID and password are the username and password required to logon to the tutorial database. If a trusted connection is being used then set the Extract User ID to "dbo".

- The Admin User ID and password are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.



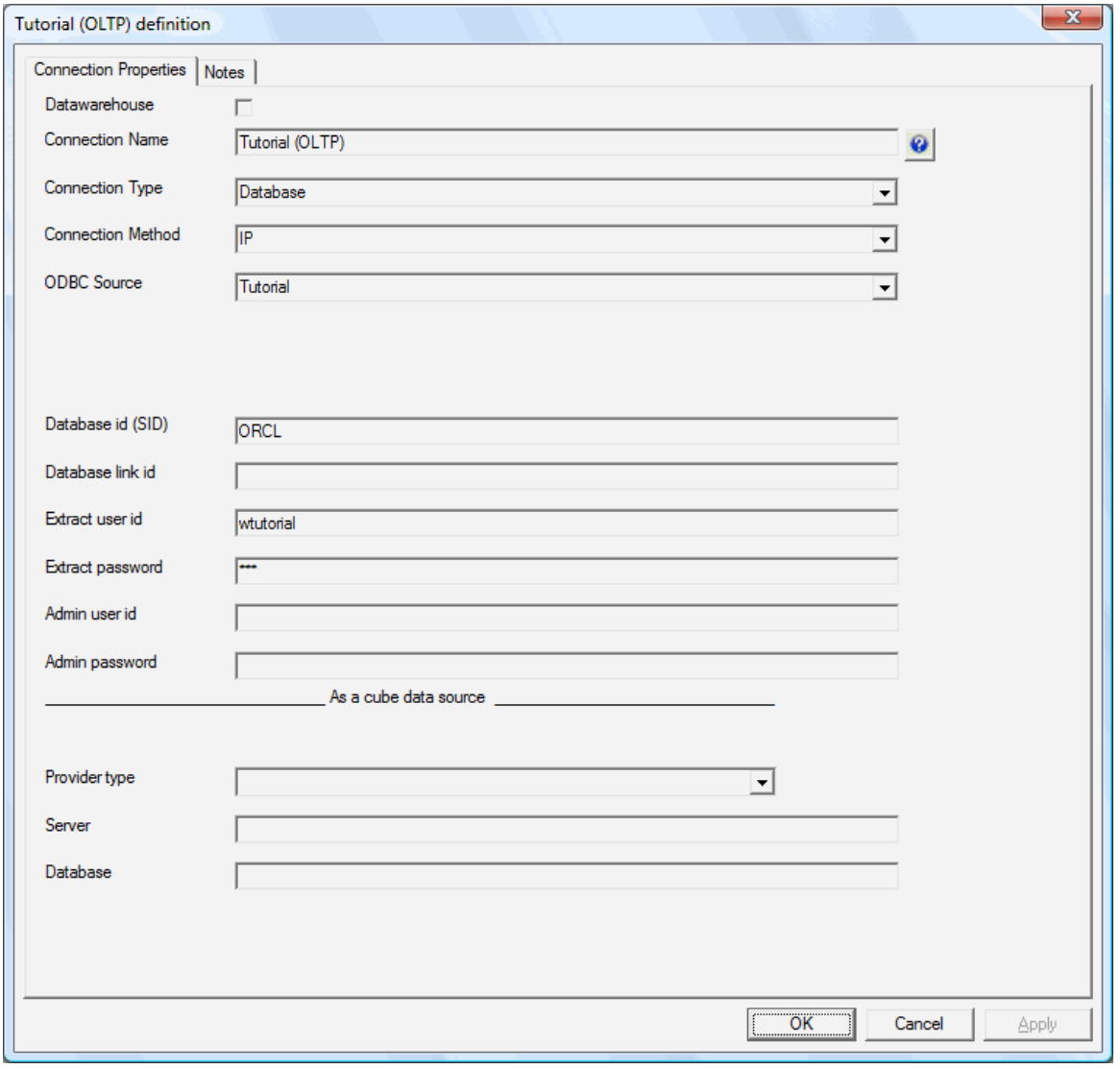
Oracle:
If running an Oracle data warehouse then proceed as follows.
In the Properties box, complete the details as below, and then select Update:

- The Connection Method must always be set to IP.
- The ODBC source is the ODBC connection which has been defined to connect to the database. In this case the ODBC connection to the database that holds the tutorial tables.
- The Database ID (SID) is the Oracle SID of the database being connected to. In this case the SID of the tutorial database.

- The Database Link ID is an Oracle database link to connect from the data warehouse database to the source system database.

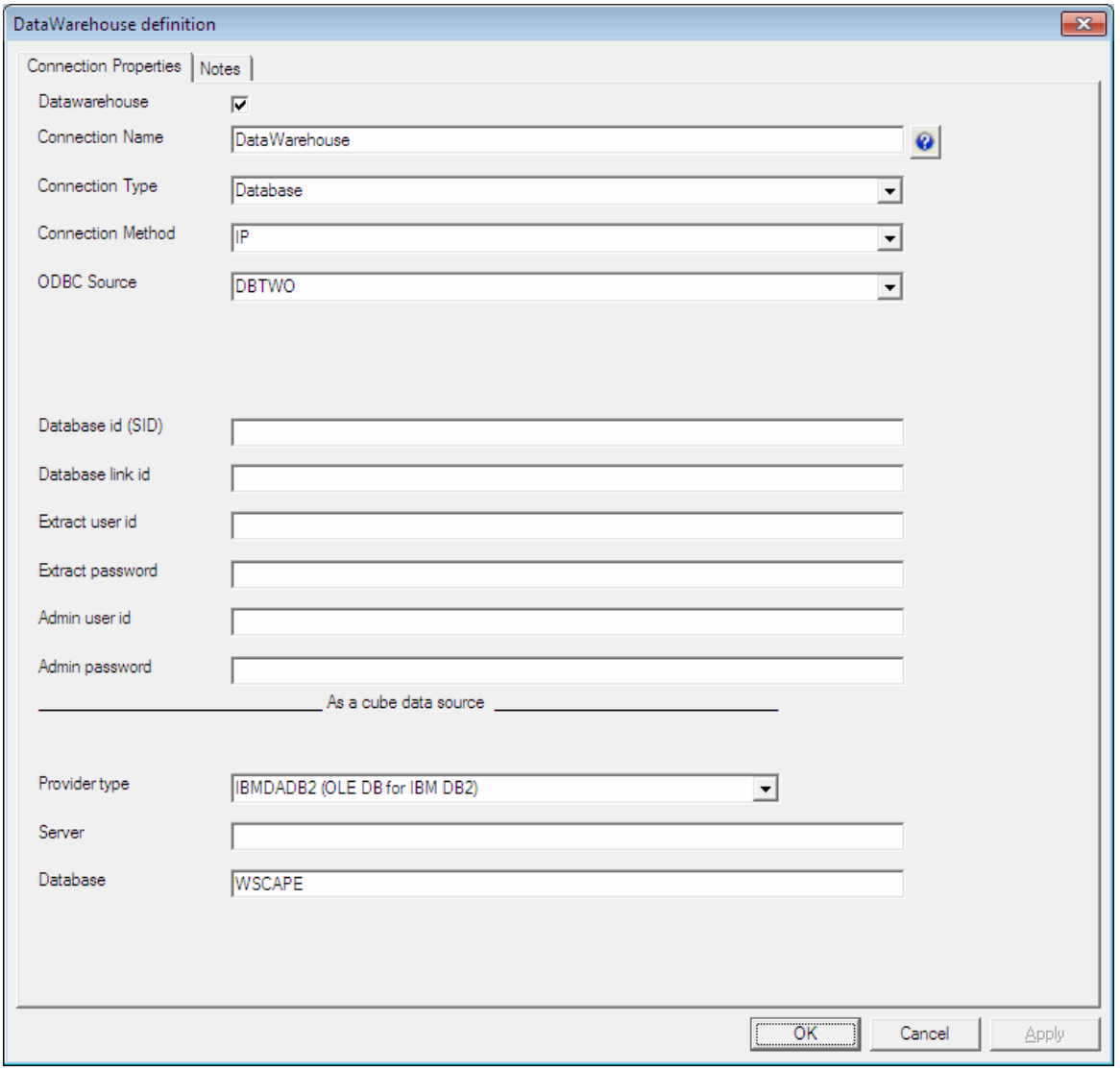
Note: This link is only required if the source database is different to the data warehouse database. For the purposes of this tutorial, the database link ID is not required as the tutorial data is usually loaded into the same database as the metadata.

- The Extract User ID and password are the username and password for the schema where the source tables reside. For the tutorial this is the user where the tutorial files have been loaded.
- The Admin User ID and password are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.



IBM DB2:
If running an IBM DB2 data warehouse then proceed as follows.
In the Properties box, complete the details as below, and then select Update:

- The Connection Method must always be set to IP.
- The ODBC source is the ODBC connection which has been defined to connect to the database. In this case the ODBC connection to the database that holds the tutorial tables.
- The Database ID (SID) is not used.
- The Database Link ID is not used.
- The Extract User ID and password are the username and password required to logon to the tutorial database. If an operating system authenticated connection is being used then leave the Extract User ID and Password blank.
- The Admin User ID and password are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.



3. To confirm that you have connected to the system correctly, select Source Tables from the Browse menu, or click on one of the browse icons from the main tool bar or right hand pane tool bar.
   - Select the connection you want to view, in this instance Tutorial (OLTP), and click OK. For SQL Server the schema must be set to dbo. For Oracle the schema should be the tutorial schema.
   - A third pane on the right hand side, displays showing the tables contained under the tutorial source system.
4. Repeat steps 1 through 3 to create the connection for the Data Warehouse.
   - The Connection name will be Data Warehouse
   - Enter an extract user id (we have used dssadm) and a password (we have used wsl) for the metadata repository. For a SQL Server trusted connection set the extract user id to dbo.

You have now created two database connections, one to the source system (Tutorial), and one to the Data Warehouse.

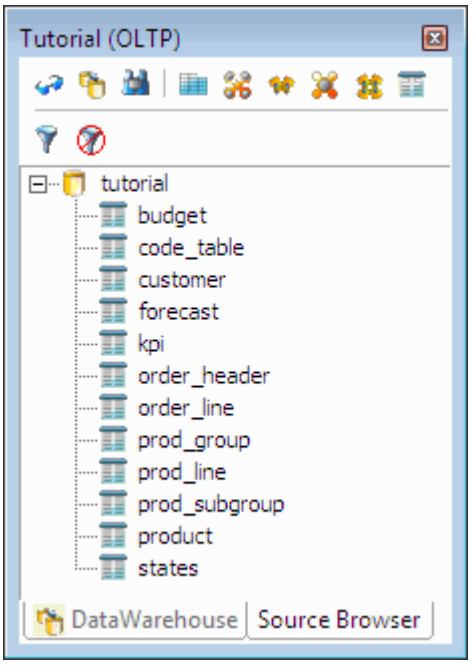
You are now ready to proceed to the next step - ***Loading Source Tables*** (on page 16).

Loading Source Tables

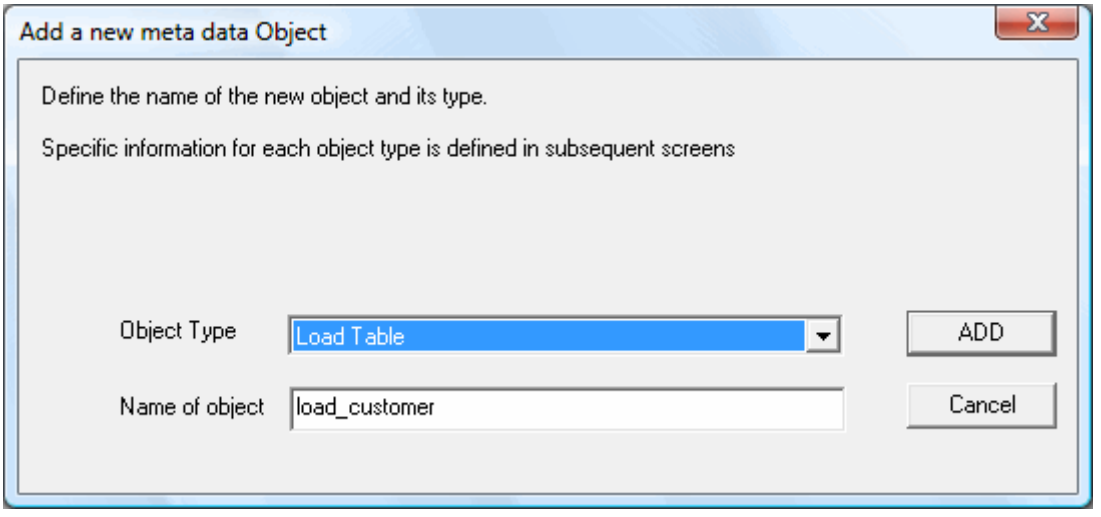
In this step you will load data from the tutorial source system into load tables in the data warehouse. Dragging and dropping from the source system (using the previously defined connection) will create the metadata. You will then be prompted to create and load the tables which will create the physical tables in the data warehouse, and then load the data.

TIP: Ensure that your source system is displayed in the right hand pane of the screen, by selecting Source Tables from the Browse menu, then Tutorial (OLTP) from the Connection List. For SQL Server the schema must be dbo. For Oracle the schema should be the tutorial schema. Click OK.

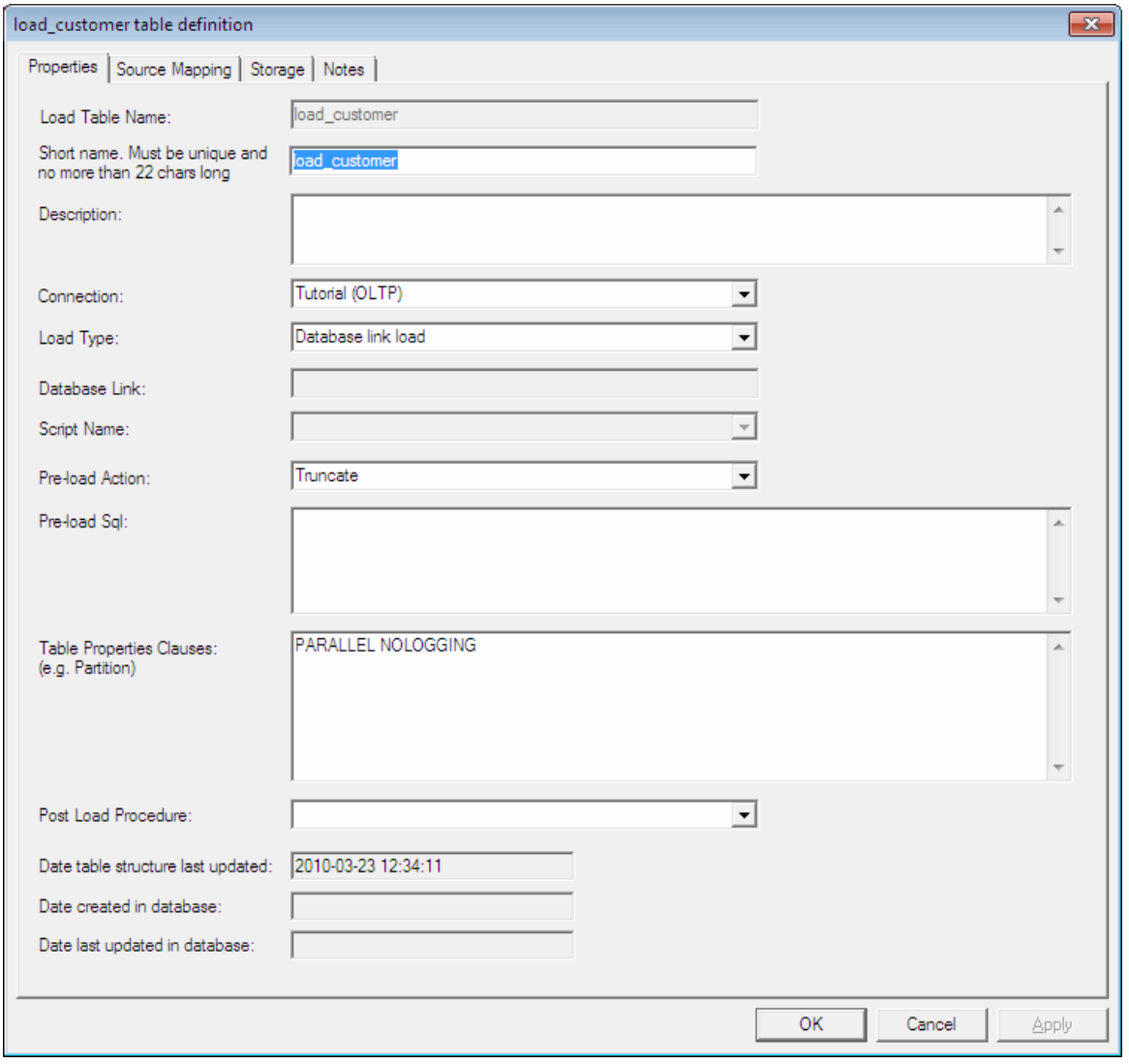
1. Double click on the Load Table object group on the Object Tree in the left pane. The first column heading in the middle pane should read *Load Table Name*.
2. Expand the source table Object Tree in the right pane:



3 Then click on customer and drag this table into the middle pane - placing it anywhere in the pane. A dialog box displays with the name of the object defaulted to load_customer.



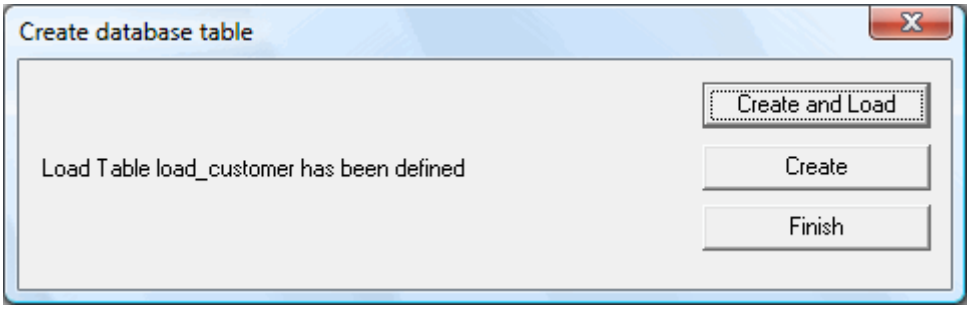
4 Click Add and the following table definition will display:



Note: For the purposes of this tutorial, all the necessary details have been automatically created, so select OK. See the Loading Data chapter for explanations of the load parameters.

Note: In IBM DB2, short names are limited to 12 characters.

5 A dialog box displays showing that the load table load_customer has been defined and asks if you want to create and load the table:



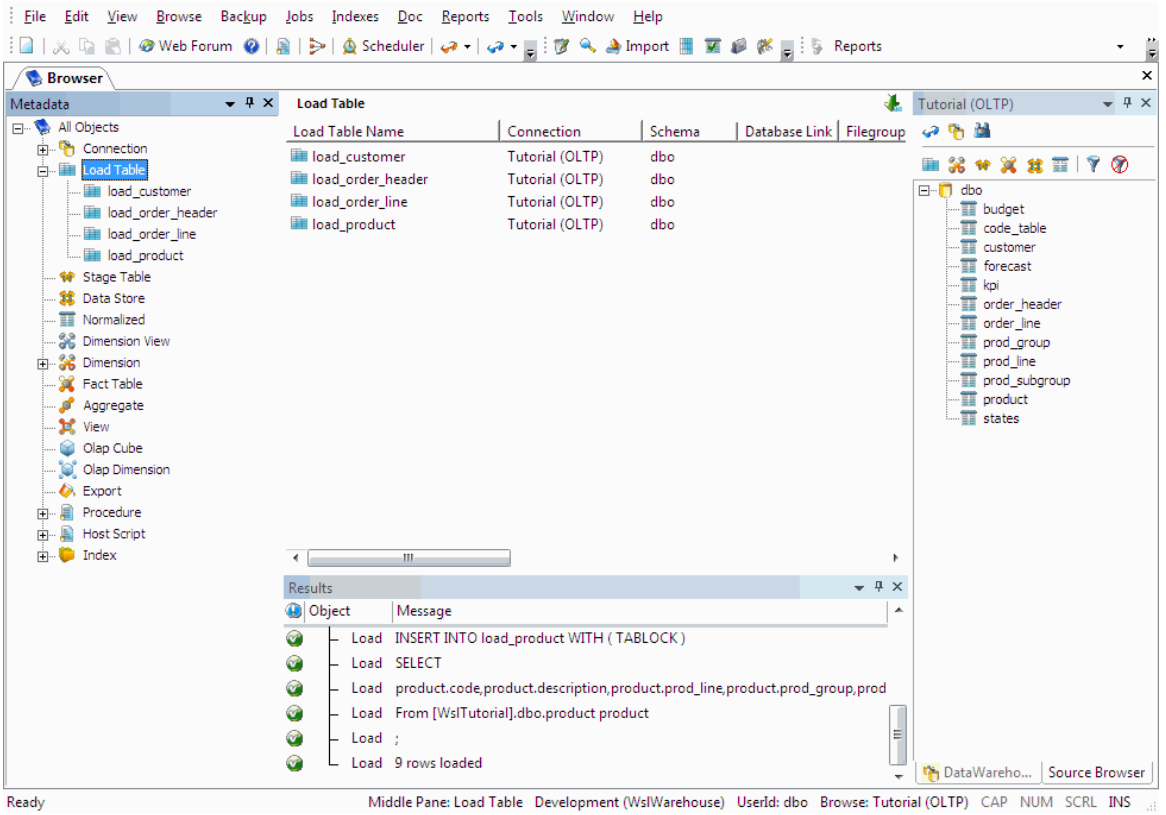
6 Select Create and Load. This will create the physical tables in the data warehouse and load the data.

7 Results will be posted in the results pane. Note that the Load Table object group in the left pane now has a dependent/child.

TIP: Remember to double click on the left pane Load Table object group between loading each of the source tables to ensure that you are reassigning the target, rather than adding to the columns in the middle pane.

8 Repeat this process (steps 2 - 7) for the source tables product, order_header, and order_line.

Double click the Load Table group in the left hand pane. Your QAD Data Warehouse Designer screen should look like this when you have finished:



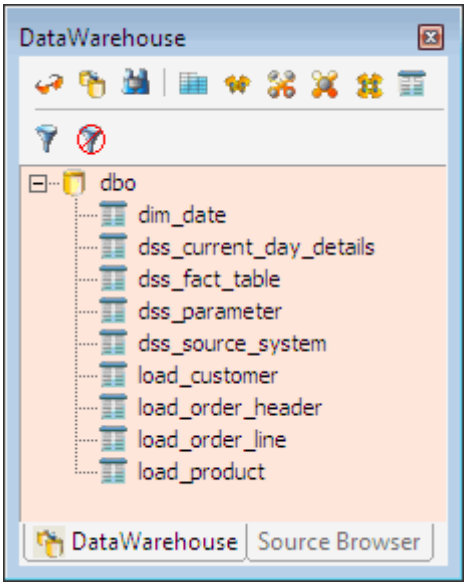
You are now ready to proceed to the next step - ***Building Dimensions*** (on page 20).

Building Dimensions

The necessary source tables have been loaded into the data warehouse. Now the dimensions of the data warehouse can be built. When building dimensions you will be prompted for how you would like the dimension managed. QAD Data Warehouse Designer generates code for normal, slowly changing, previous value and date ranged dimensions. You will also be prompted for the business (or natural) key of the dimension. This is needed so QAD Data Warehouse Designer knows when to add new dimensional records.

1 Change the source table view to be the Data Warehouse itself by selecting Source Tables from the Browse menu. Select Data Warehouse and click OK.

Note: For SQL Server the Data Warehouse schema must be dbo.

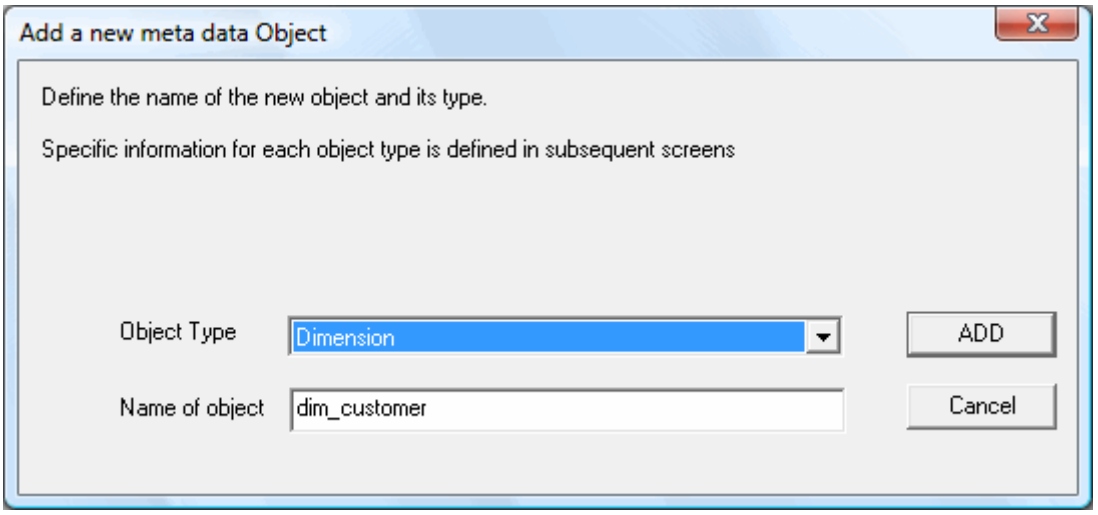


Note: From this point on, all work is performed within the data warehouse.

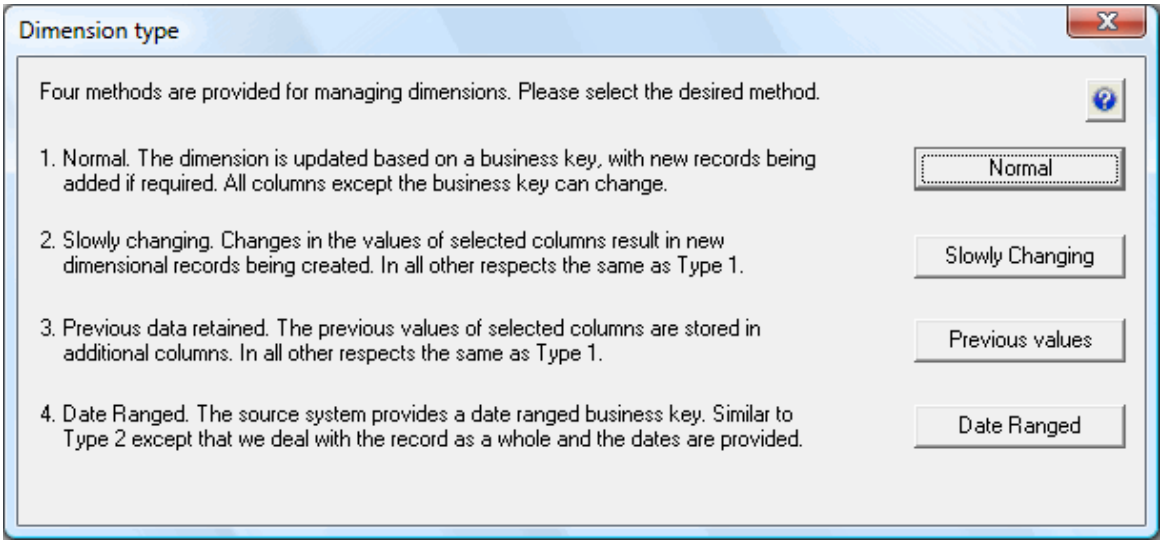
2 Double click on the Dimension object group in the object tree in the left pane. The first column of the middle pane now reads *Dimension Name*.

Note: You will see that some dimensions have already been created for you.

3 Click and drag the load_customer table from the data warehouse schema in the right pane into the middle pane. A dialog box displays defaulting the name of the object to dim_customer:

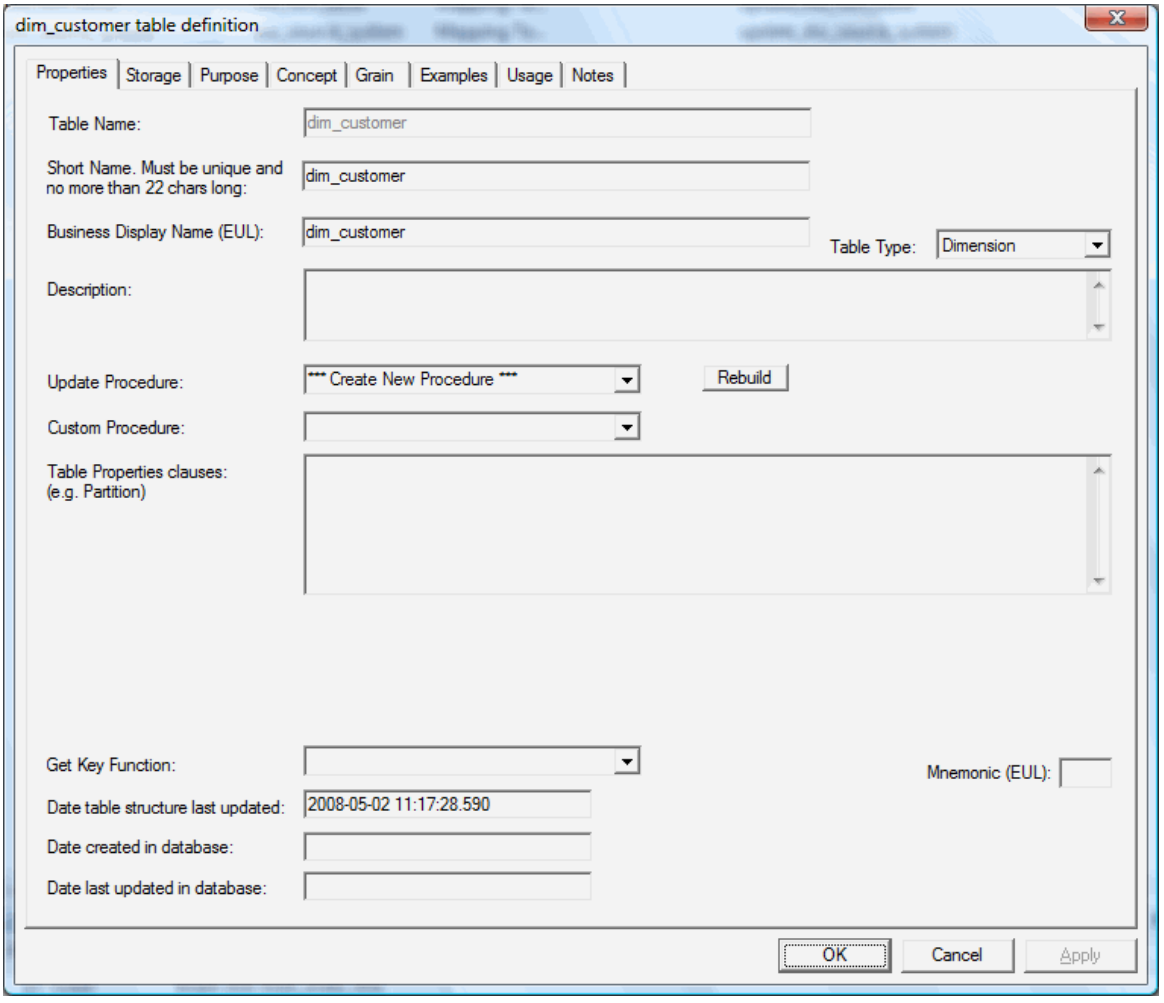


4 Click **Add**. A dialog box displays asking how you want the dimension managed. Select **Normal**:

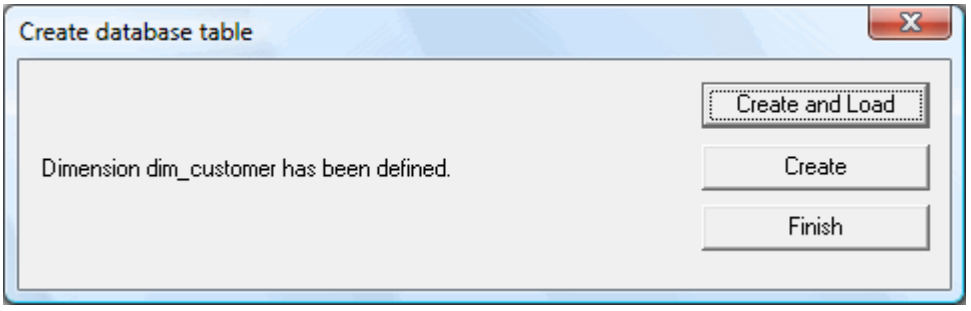


5 A table definition displays with all the necessary defaults completed.

- Make one change - Select *** **Create New Procedure** *** from the **Update Procedure** drop-down list box. This will generate procedures to get surrogate (artificial) keys based on the business key and to update the dimension.

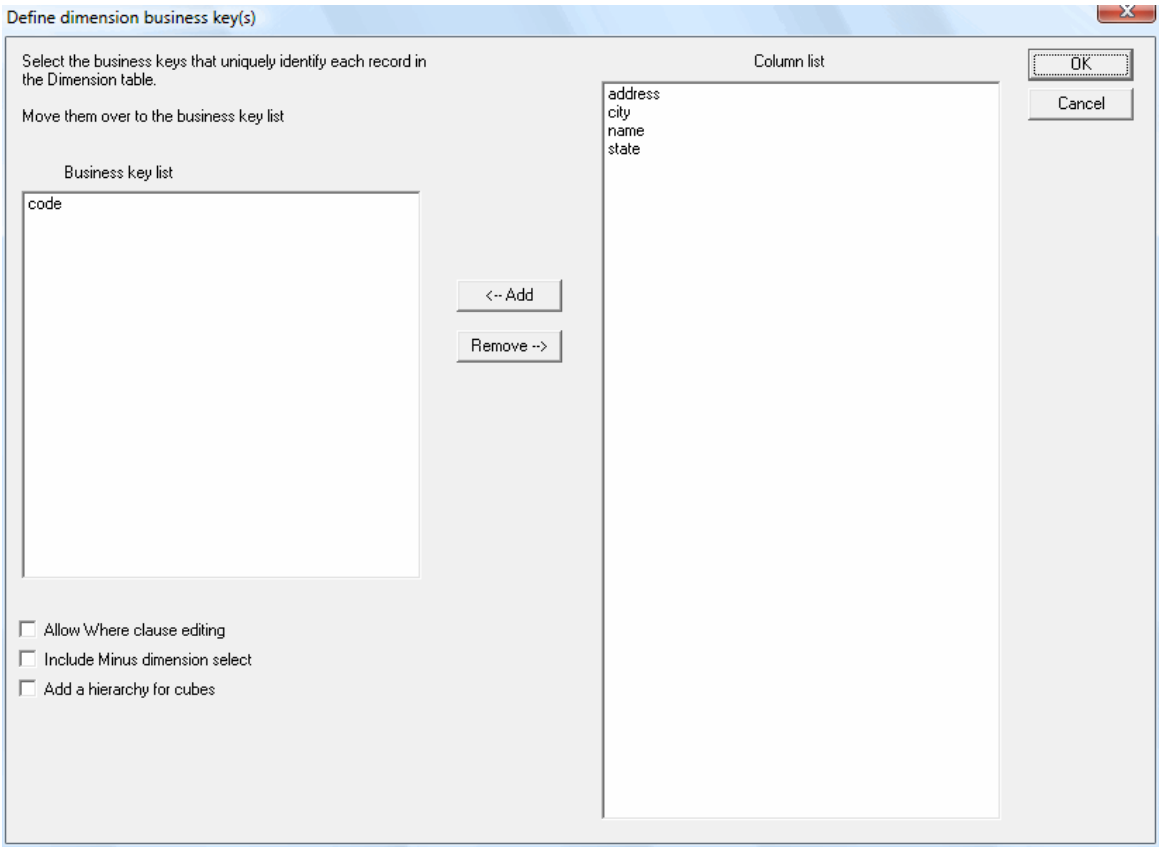


6 Select OK. A dialog box displays confirming the dimension table dim_customer has been defined and asking if you want to create and load the table.



7 Select Create and Load.

8 Define the Business Key (see below). The business (natural) key is the unique identifier for the dimensional record. Select Code, <--Add, and click OK.



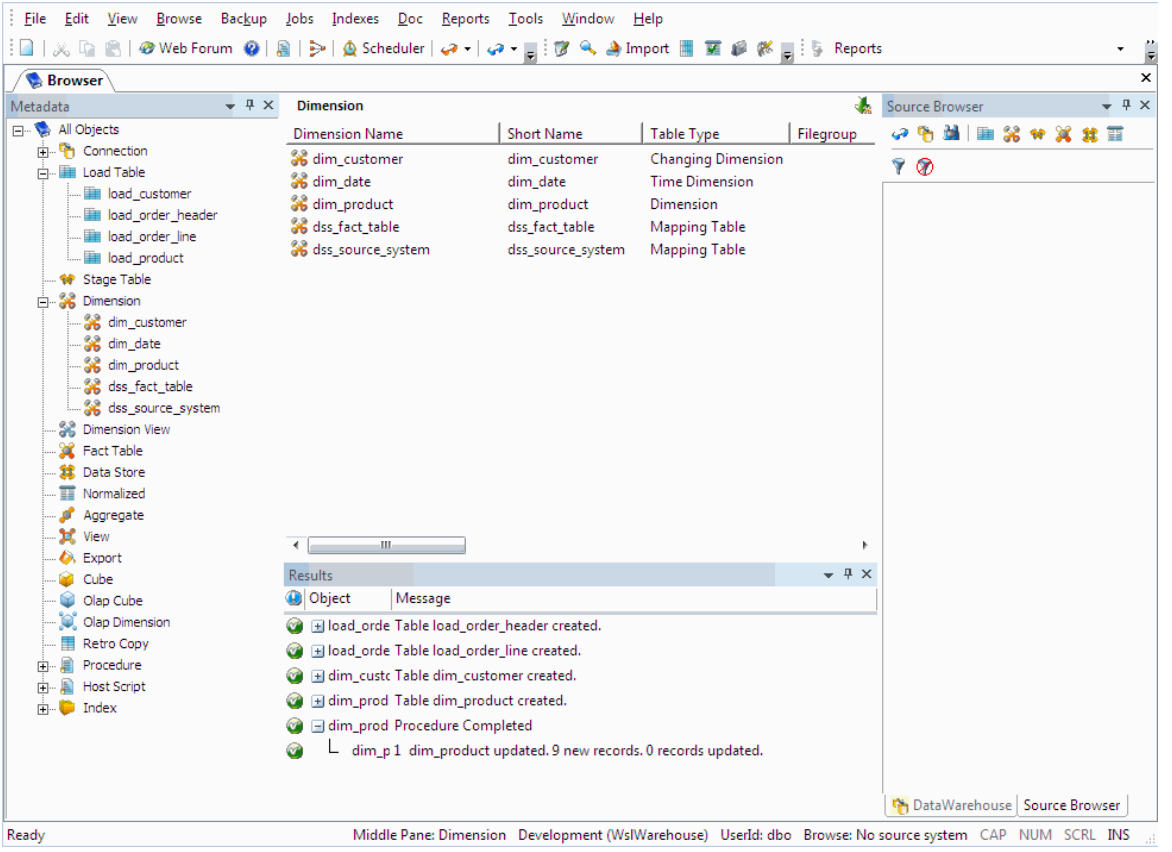
9 The procedure results display and can be reviewed.

Note: The Dimension Table object group in the left pane now has added dim_customer as a dependent/child.

10 Repeat this same process (steps 2 through 9) for the load table load_product. The business key will be 'code'.

TIP: Remember to double click on the left pane Dimension Table object group between loading each of the above dimension tables.

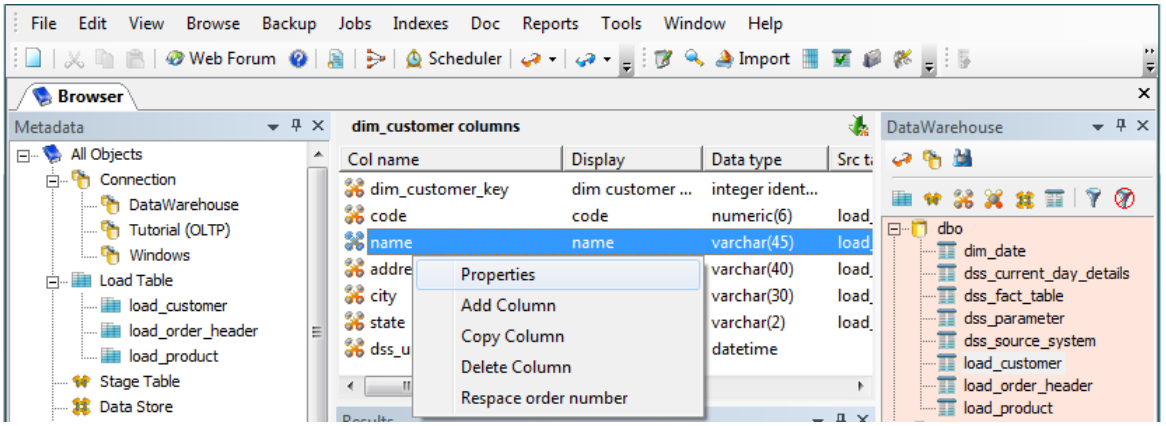
Double click Dimension in the left pane. The QAD Data Warehouse Designer screen should look like this:



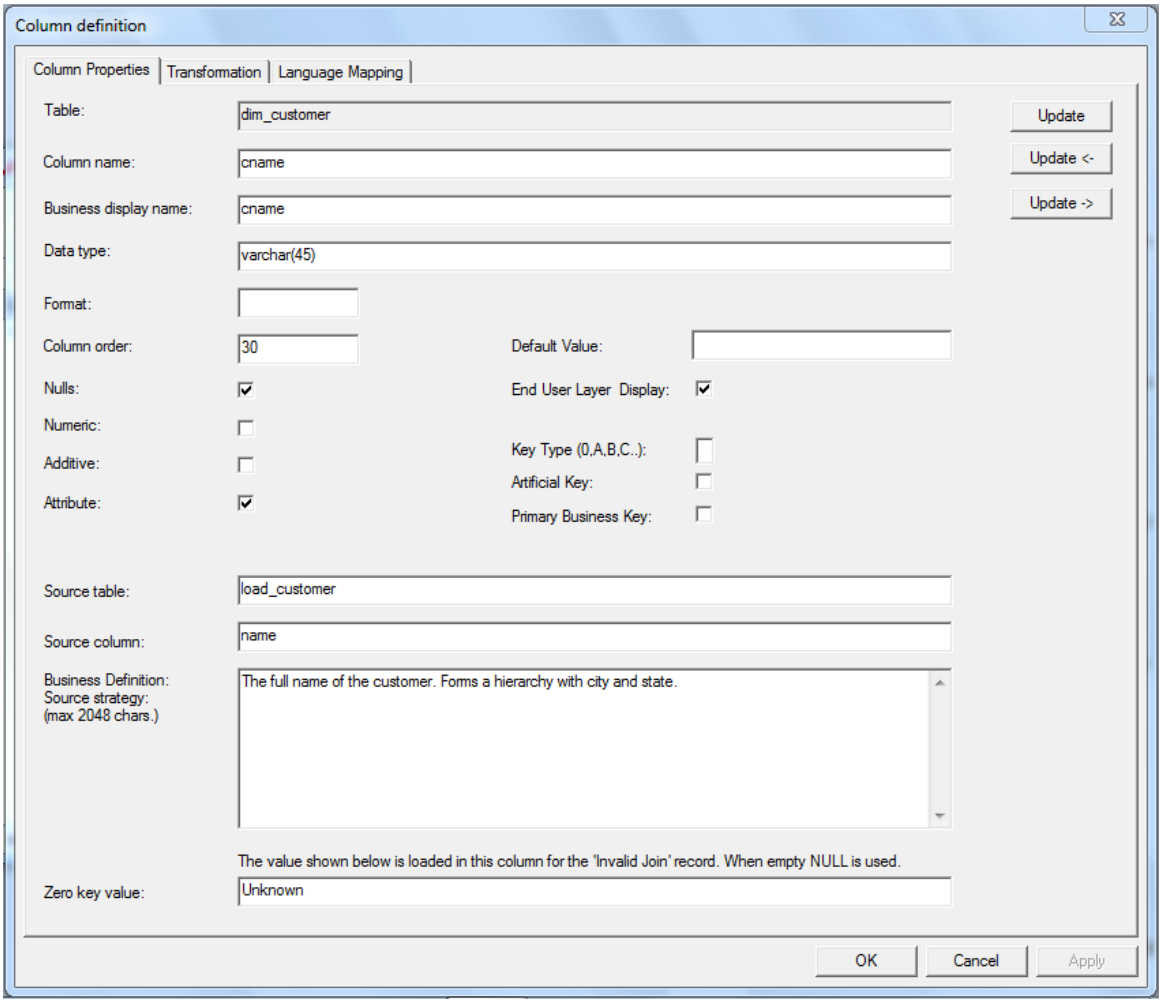
Note: Analysis Services does not like 'name' as a column name. For dim_customer it will therefore be necessary to change the column name from 'name' to 'cname'.

1 Click on the dim_customer object in the left hand pane to display the dim_customer columns in the middle pane.

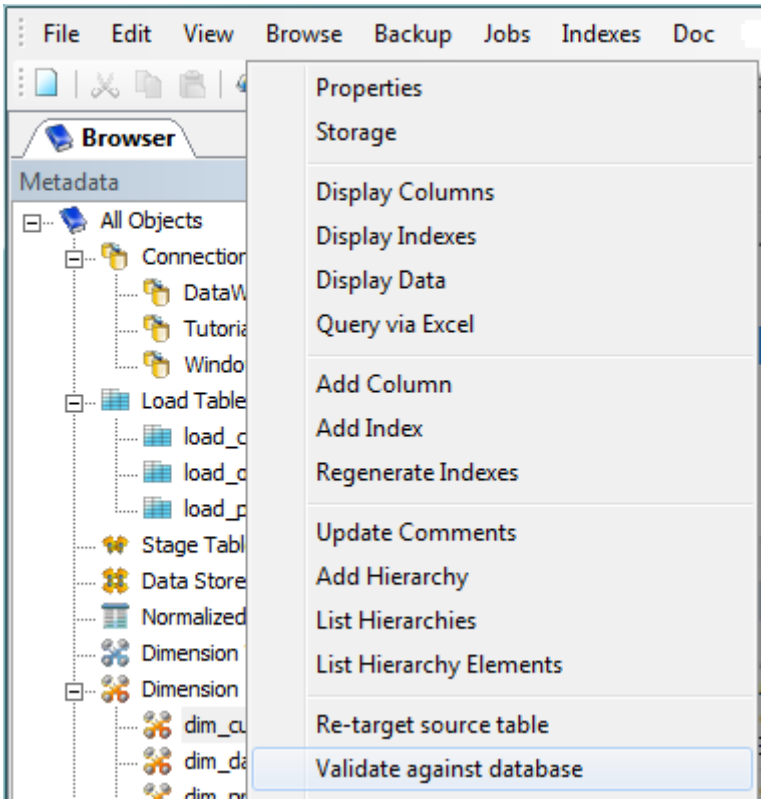
2 When positioned on the column 'name' in the middle pane, right click and select 'Properties' from the drop down menu.



3 Change the column name from 'name' to 'cname' as shown below. Click OK to leave the properties page.

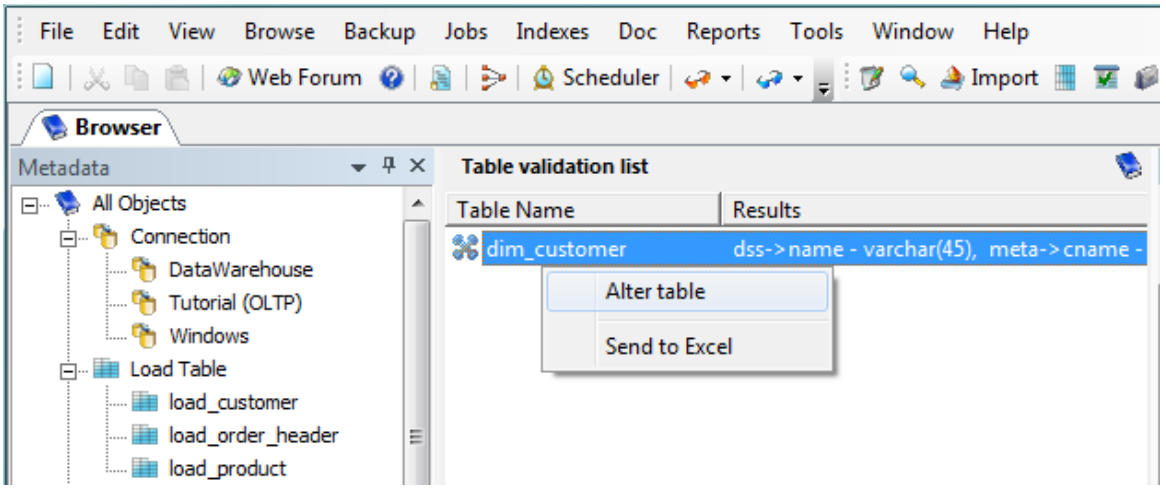


4 Right click on the dim_customer object in the left hand pane and choose 'Validate against Database'.



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.

You are now ready to proceed to the next step - ***creating dimension views*** (on page 28).

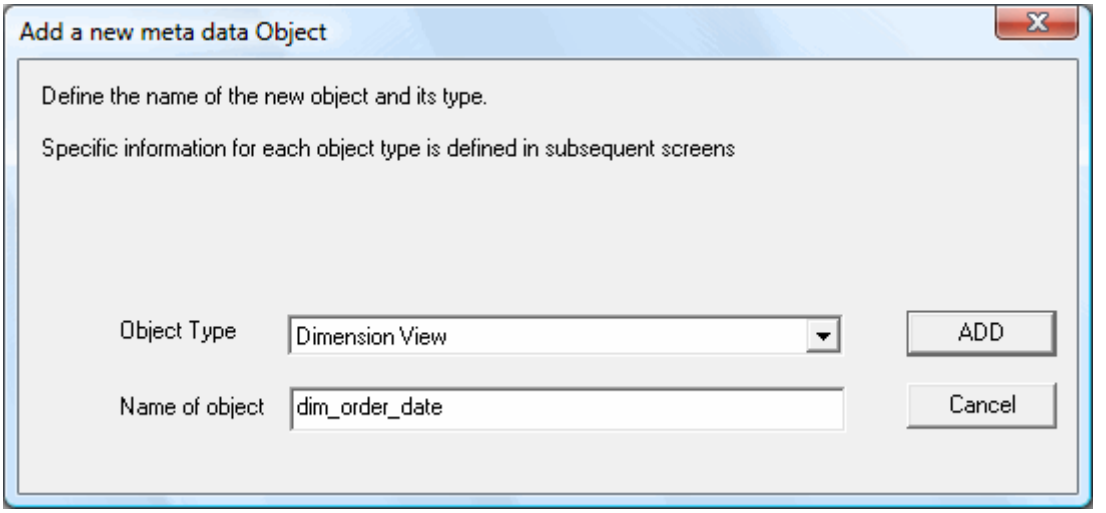
Creating Dimension Views

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 this step you will create dimension views from an existing dimension. In many cases 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. This process is essentially the same as creating a dimension, but you are creating a view of an existing dimension, in this instance, dim_date.

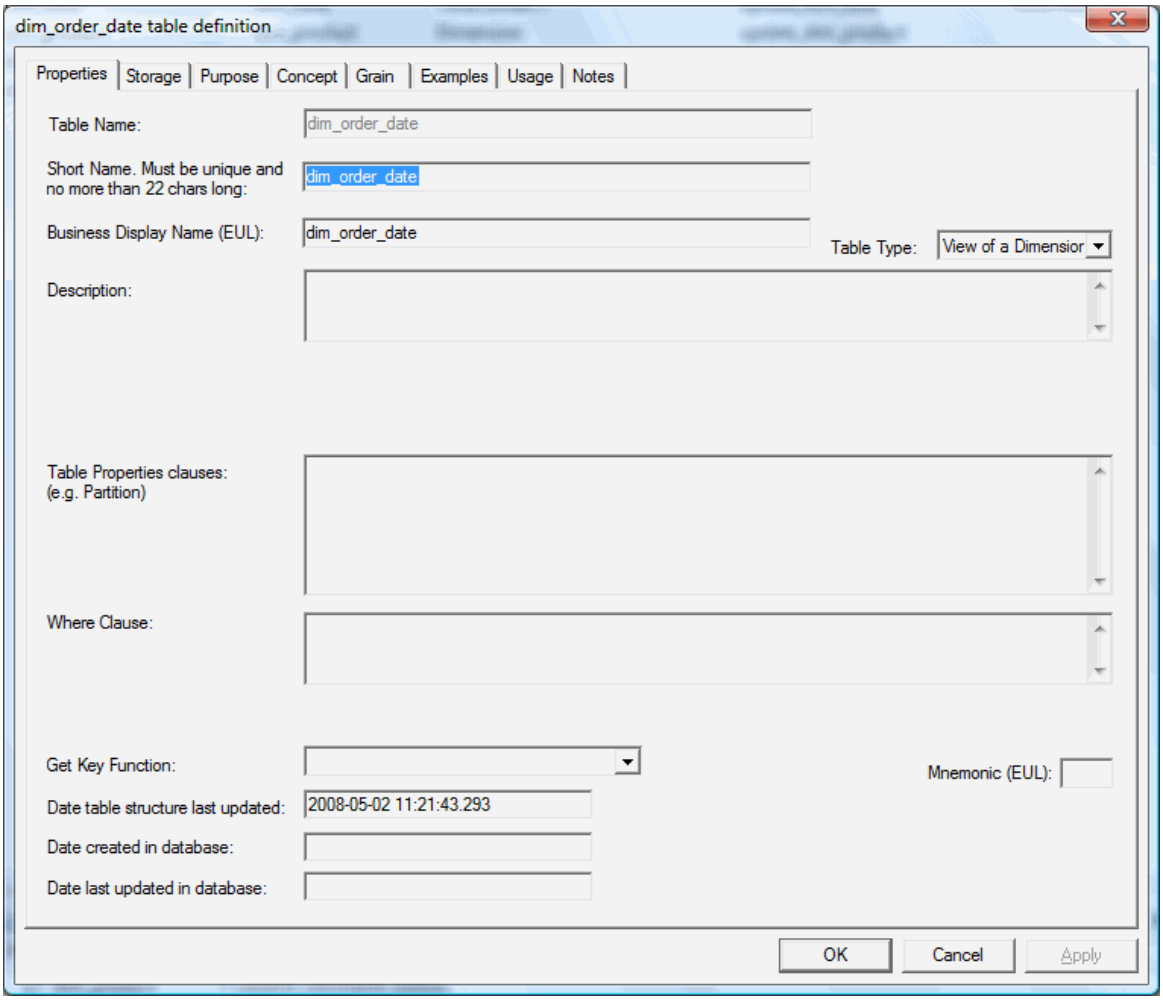
1 After double clicking on Dimension in the left pane, click and drag dim_date from the right pane into the center pane.

- The dialog box that displays defaults the object type to a dimension view, and names the dimension view dim_date_view.
- Because we want to create two dimension views from the same source, dim_date, we need to change this dimension view name to one that is more meaningful, specifically dim_order_date:

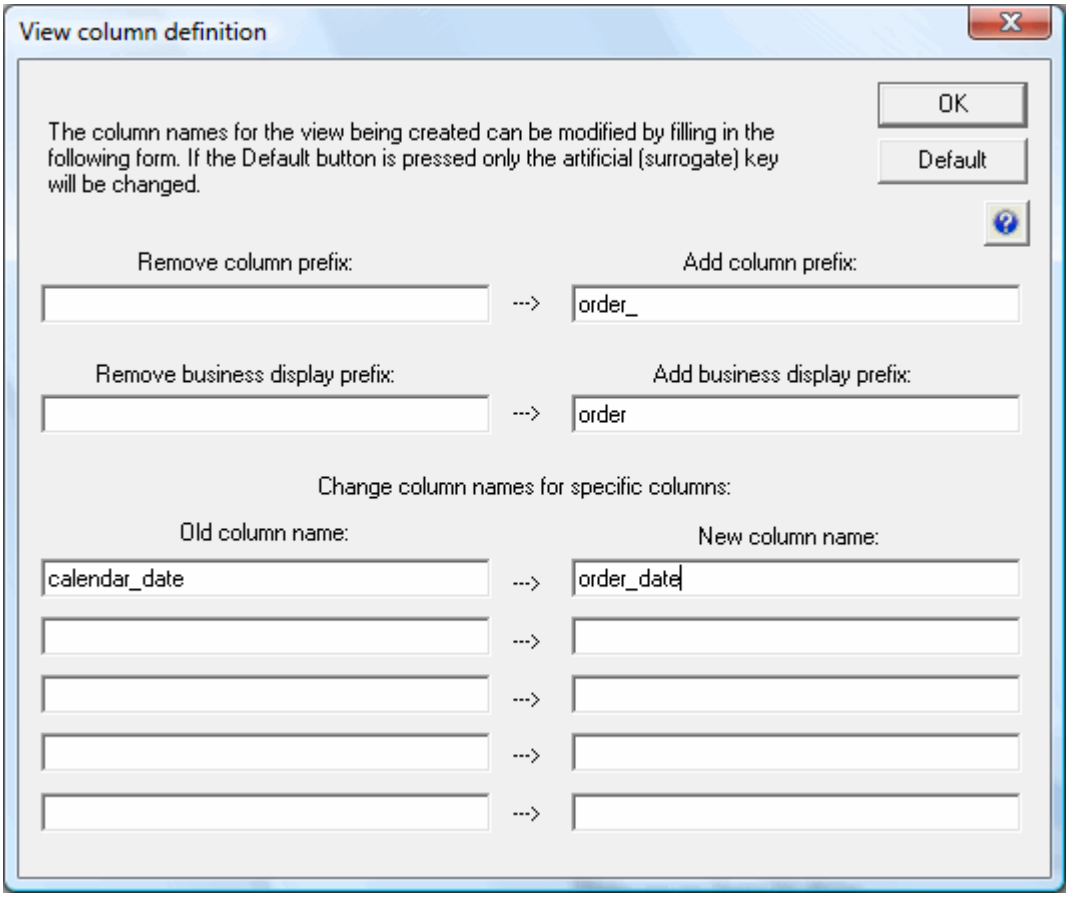


- Make this change, and click Add.

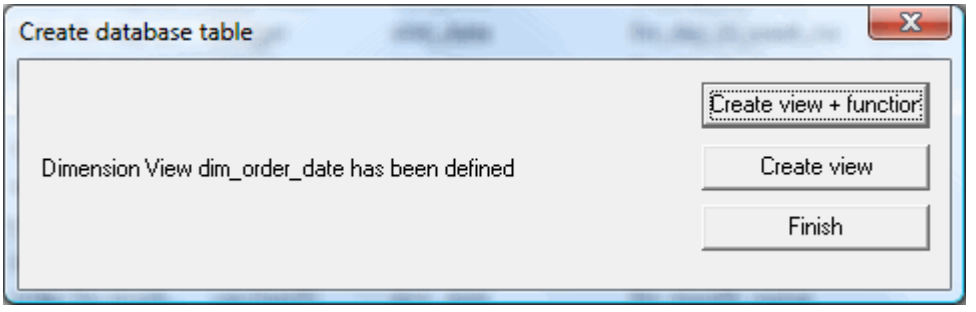
2 The dim_order_date view property defaults have all been completed as necessary so click OK.


dim_order_date table definition
Properties
Storage
Purpose
Concept
Grain
Examples
Usage
Notes
Table Name:
dim_order_date
Short Name. Must be unique and no more than 22 chars long:
dim_order_date
Business Display Name (EUL):
dim_order_date
Table Type:
View of a Dimensior
Description:
Table Properties clauses: (e.g. Partition)
Where Clause:
Get Key Function:
Mnemonic (EUL):
Date table structure last updated:
2008-05-02 11:21:43.293
Date created in database:
Date last updated in database:
OK
Cancel
Apply

3 A dialog box displays to provide a means of re-mapping some of the column names in the view if required. Ensure calendar_date is being renamed to order_date. Click the OK button.

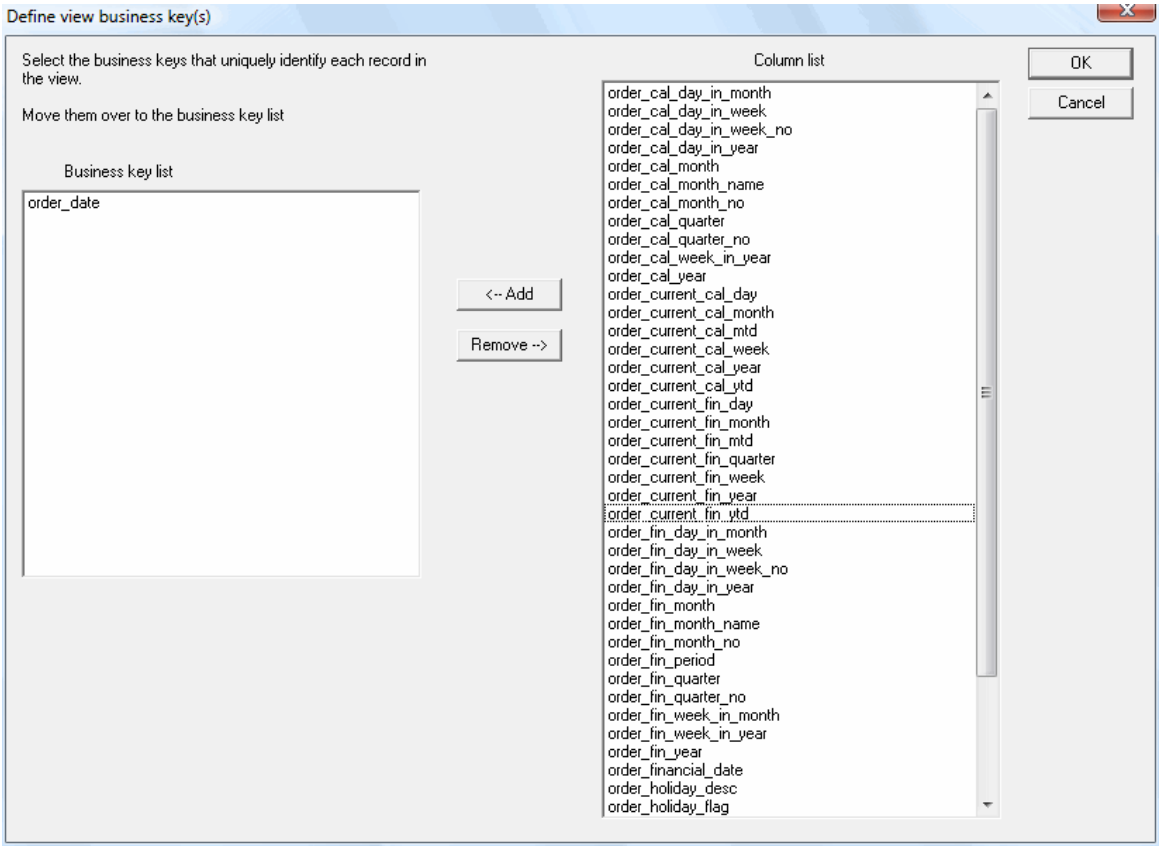


4 A dialog box displays indicating that the dimension view dim_order_date has been defined and asks if you want to create the view now:



Select Create view + function. A dialog box will confirm that view dim_order_date has been created.

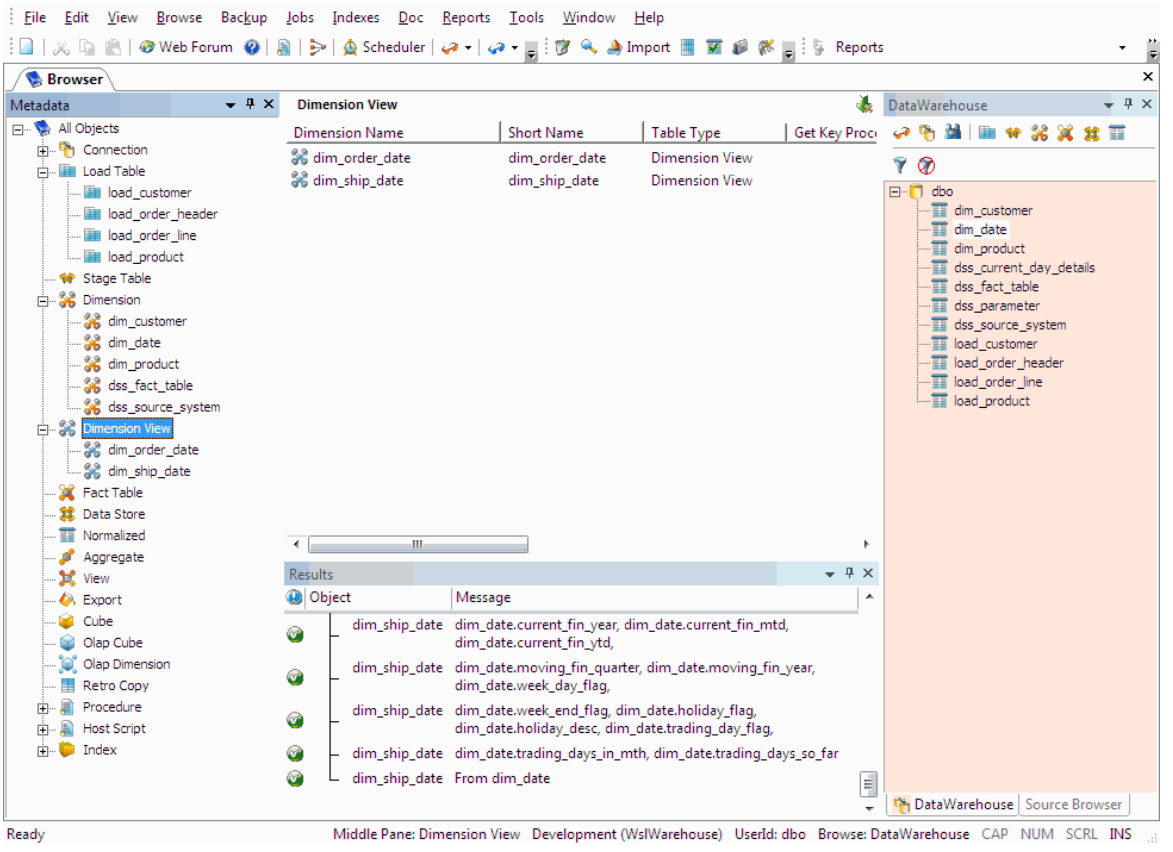
5 Select a business (natural) key for the dimension view dim_order_date. Choose order_date as below, and click <--Add. Click OK.



Note: The Dimension Table object group dim_order_date icon in the left pane is a slightly different color to denote that this is a dimension view.

6 Repeat steps (1) to (5) to create the dimension view dim_ship_date.

In the left pane, double click on Dimension. The QAD Data Warehouse Designer screen should look like this:



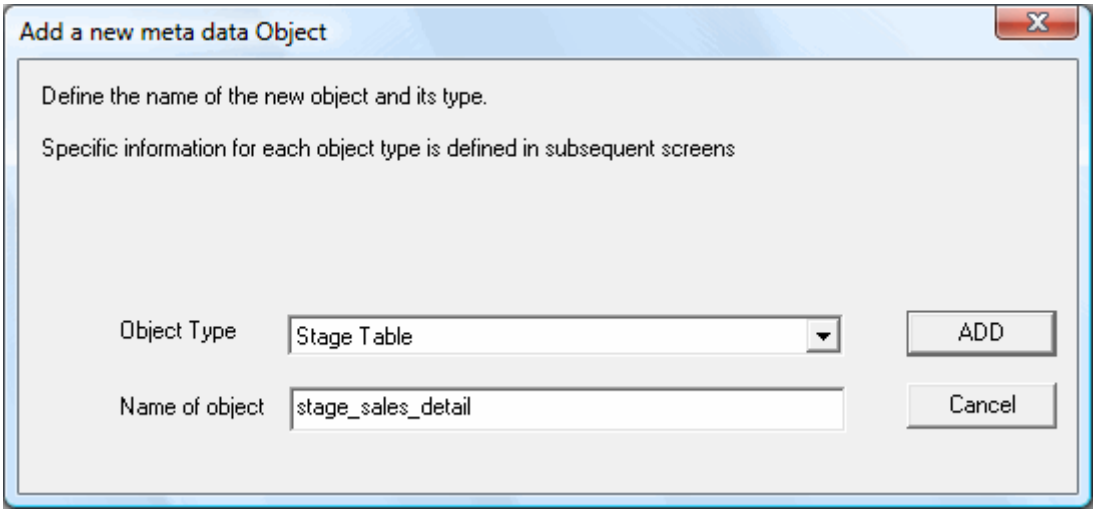
You are now ready to proceed to the next step - ***Defining the Staging Table*** (on page 32).

Defining the Staging Table

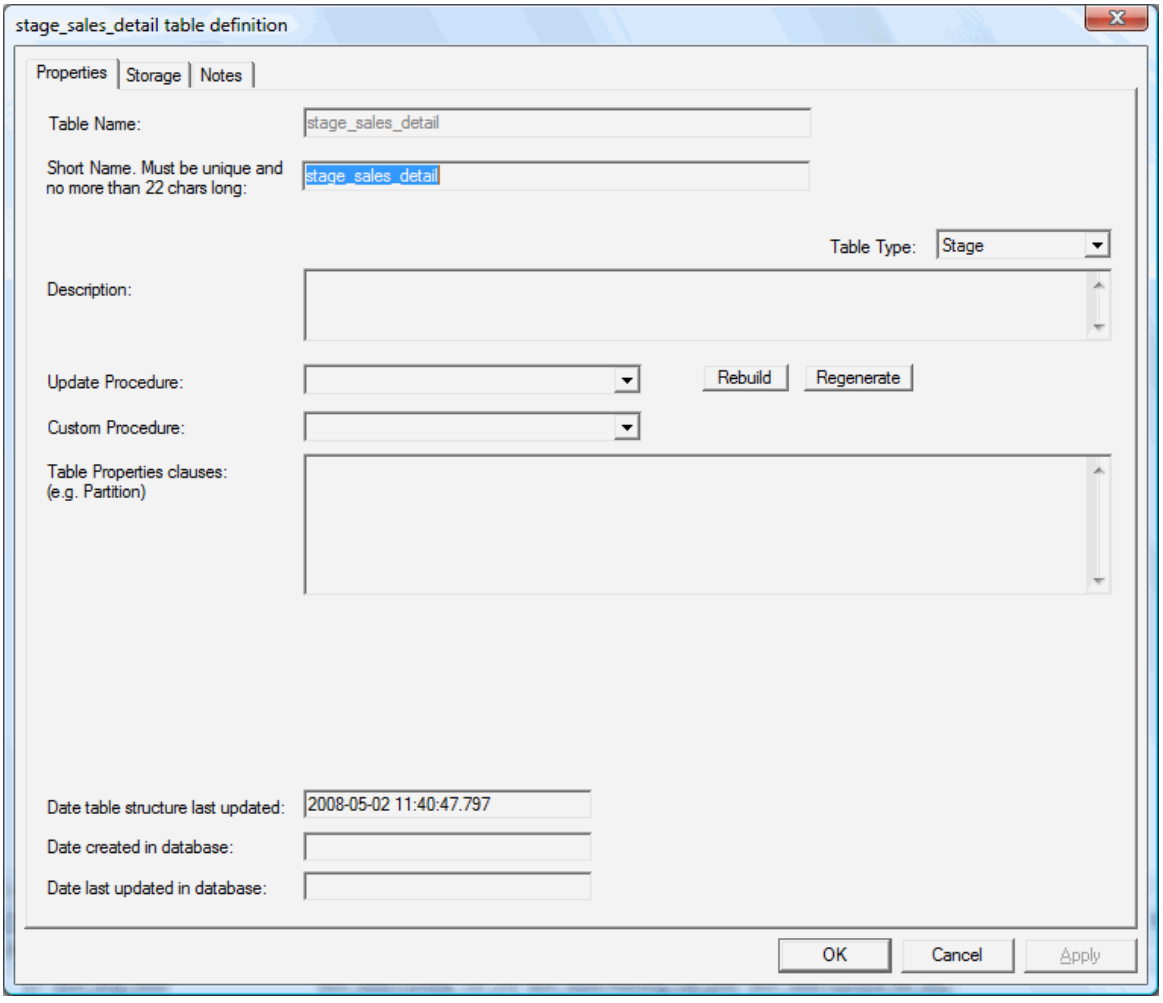
In this step you will create a stage table from two load tables. A stage table is used to build the format of the fact table, and generally contains changed or new data that will be added to the fact table. As stage tables contain dimensional keys, they should be defined after the dimensions.

Note: The source of data for the stage table will be the load tables load_order_line and load_order_header.

1. Double click on the Stage Table object group in the object tree in the left pane to create a stage table target. The first column heading in the middle pane reads *Stage Table Name*.
2. Click and drag the load_order_line table from the right hand pane data warehouse schema. Drop it in the middle pane. A dialog box displays defaulting the name of the object to stage_order_line. To make it a more meaningful name, change the name of the object to stage_sales_detail and click Add.



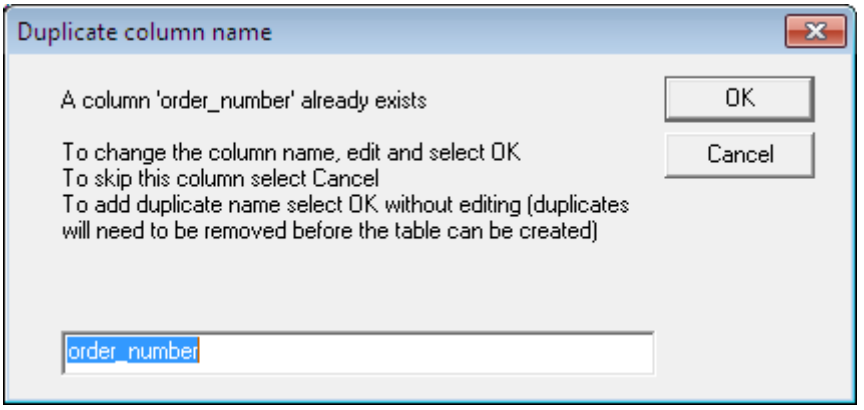
3 A table definition displays with all the necessary defaults completed.



4 Select OK.

Note: The Stage Table object group in the left pane now has a dependent/child.

5 Add the remaining information from the second load table by double clicking on stage_sales_detail in the left pane. Then drop load_order_header into the middle pane. QAD Data Warehouse Designer detects duplicated columns. As both load_order_header and load_order_line have the *order number* field, the following is displayed:

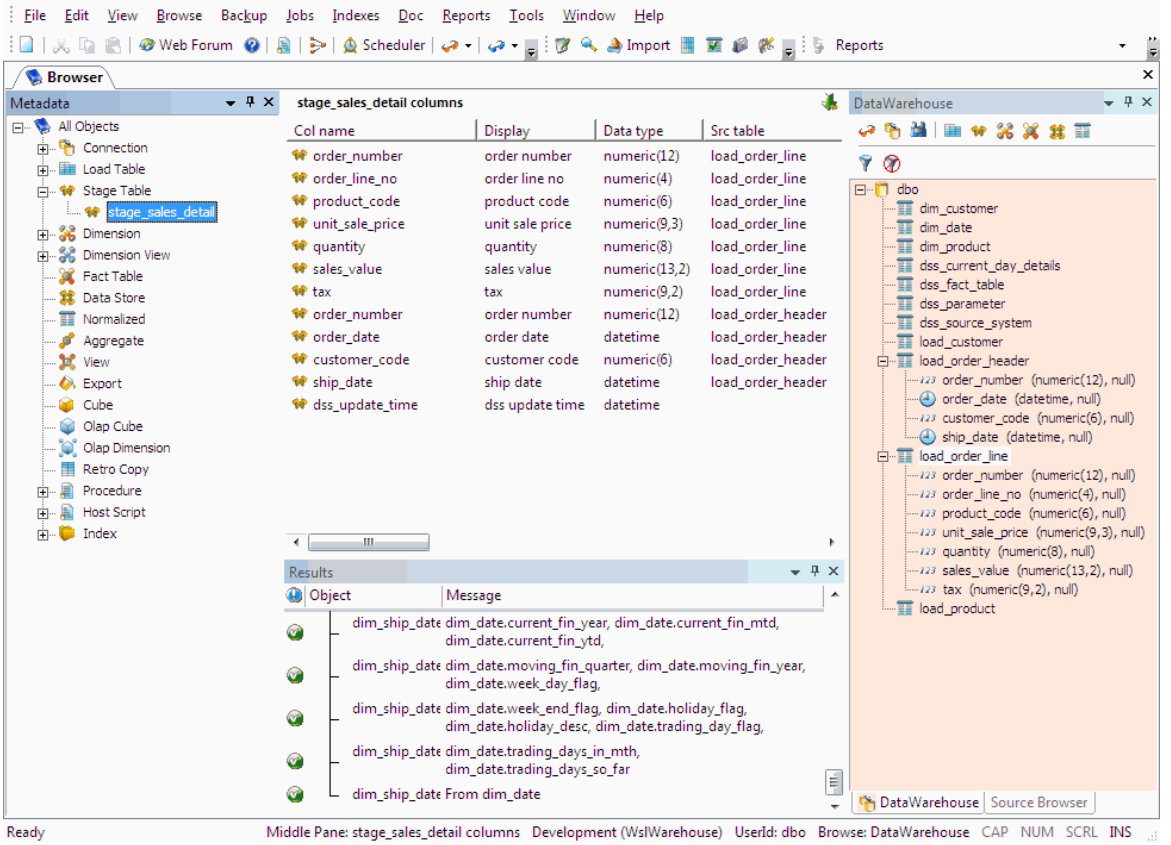


Click Cancel to exclude the second instance of order_number.

Note: If the second instance of order_number is required, then click OK.

This combines data from two load tables (load_order_header and load_order_line) into one stage table.

The QAD Data Warehouse Designer screen should now look like the sample below. In the center pane under *Src Table* you can see the source of each of the columns.



You are now ready to proceed to the next step - ***Including Dimension Links*** (on page 36).

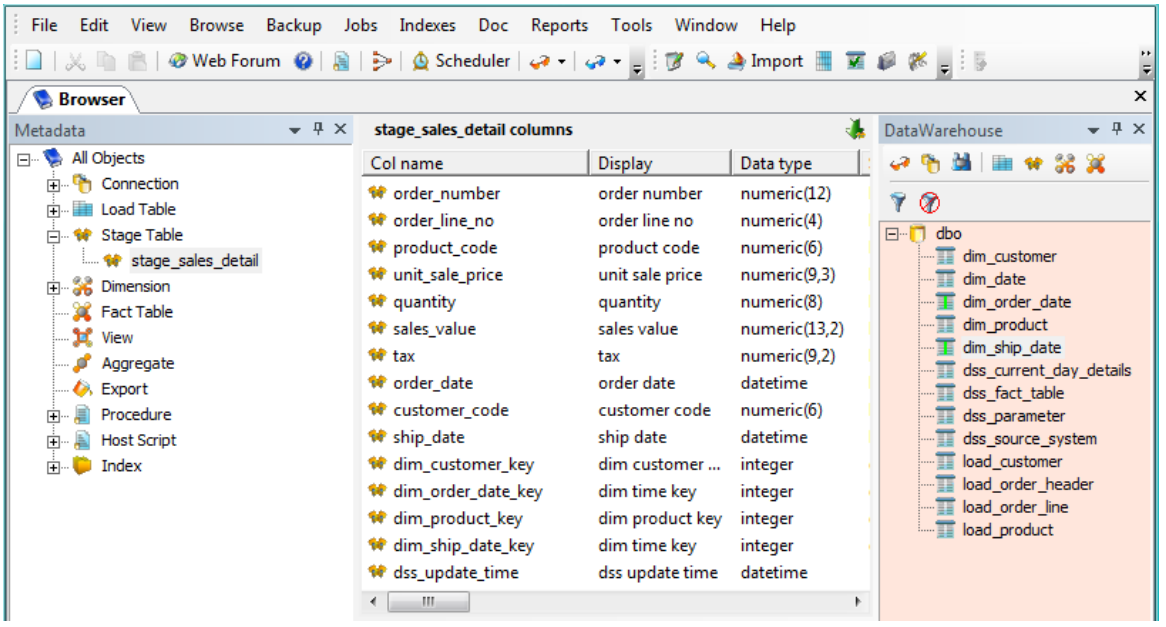
Including Dimension Links

The dimension links that allow us to create the fact-like star schema now need to be included:

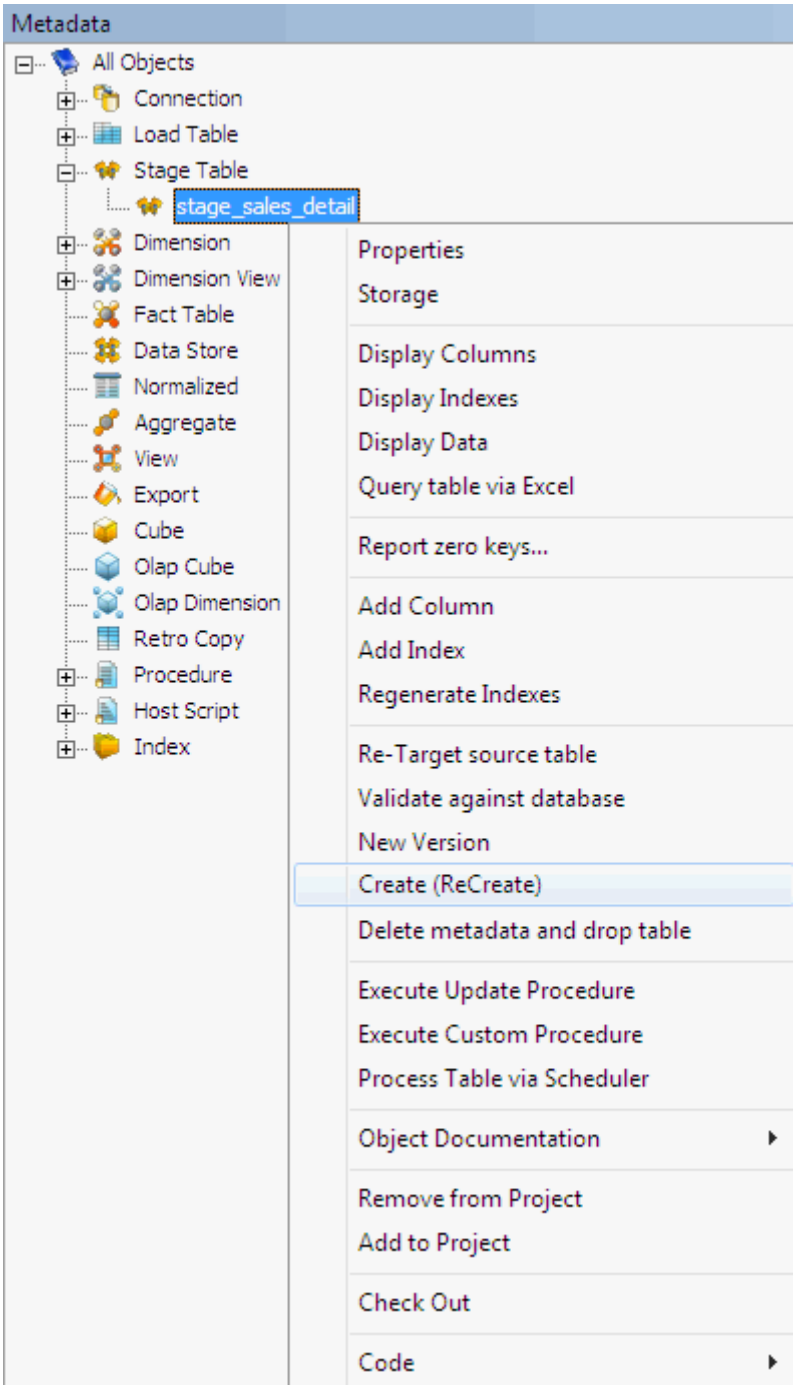
TIP: Because changes have been made within the data warehouse, you need to refresh the source table view in the right pane. Click the Browse menu then Refresh, or position the cursor in the right most pane and press F5 or Ctrl-R (^R), or click on one of the tool bar refresh buttons.

1. In the left pane, double click on the stage_sales_detail table in the Stage Table object group. The middle pane should display the contents of this stage table.
2. Drag each of the following dimensions from the right pane into the stage table in the center pane:
   - dim_customer
   - dim_order_date
   - dim_product
   - dim_ship_date

   This adds the dimension keys from each dimension to the stage table. The QAD Data Warehouse Designer screen should now look like this:

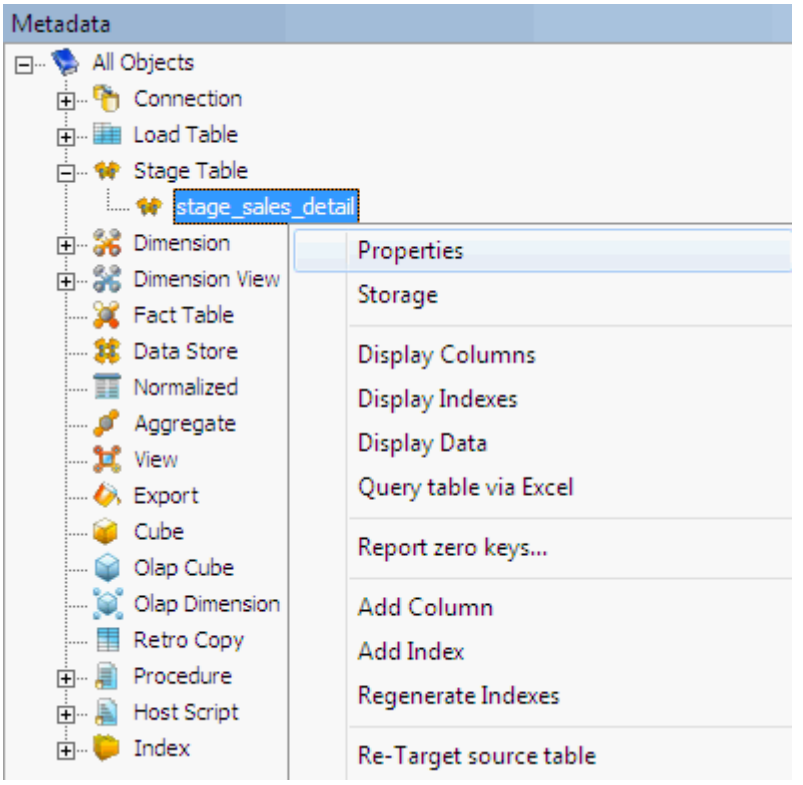


3. The stage table metadata has been defined, but the stage tables has not been created. To create the stage table in the data warehouse, click on the stage table stage_sales_detail, then right click the mouse, select Create (ReCreate):

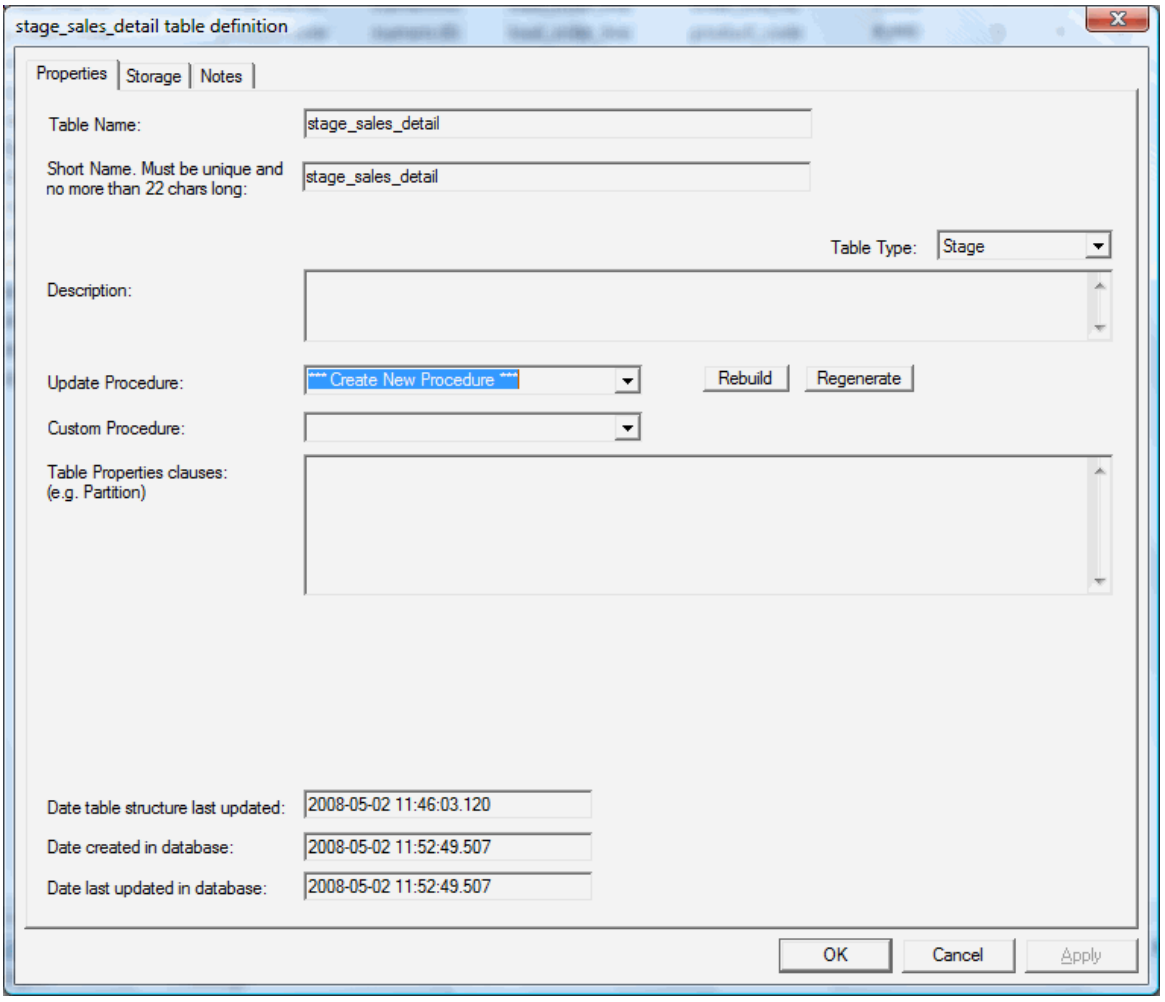


Note: The table must exist in the data warehouse before we can proceed to the next step. If the table has not been physically created then the procedure in step 5 will fail to compile.

4 After clicking on the stage table again, right click again, and select Properties:

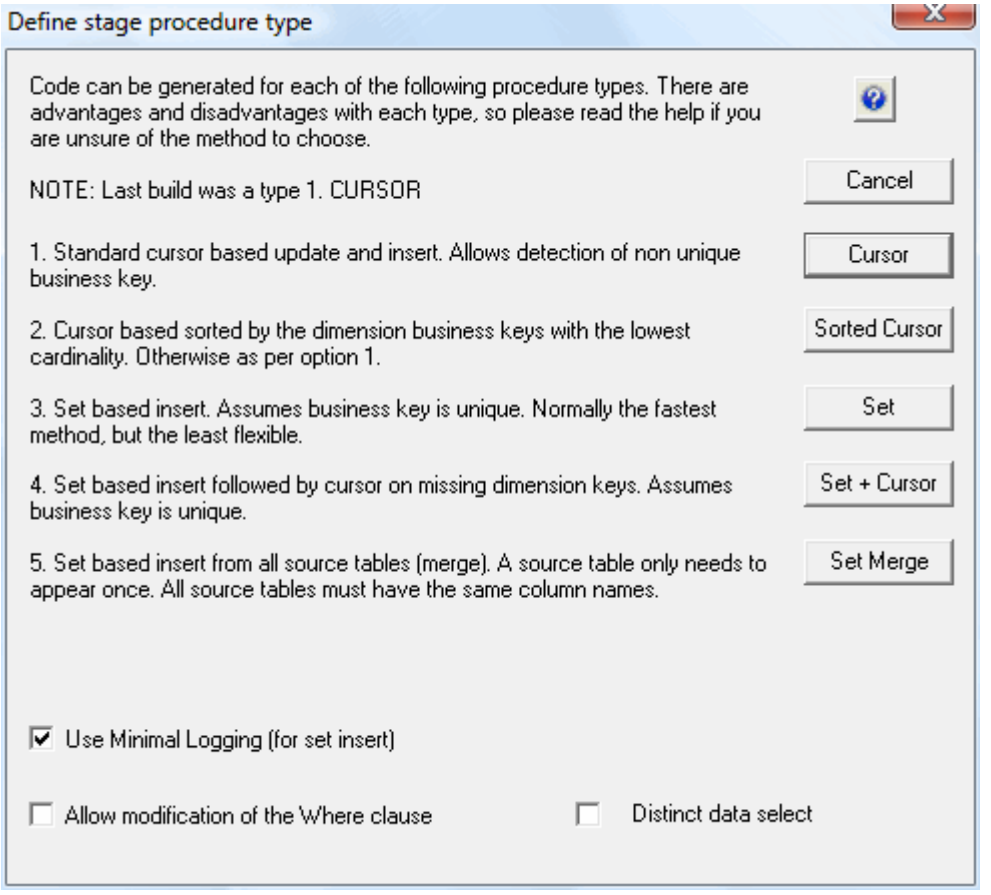


5 Under *Update Procedure*, choose *** Create New Procedure ***:



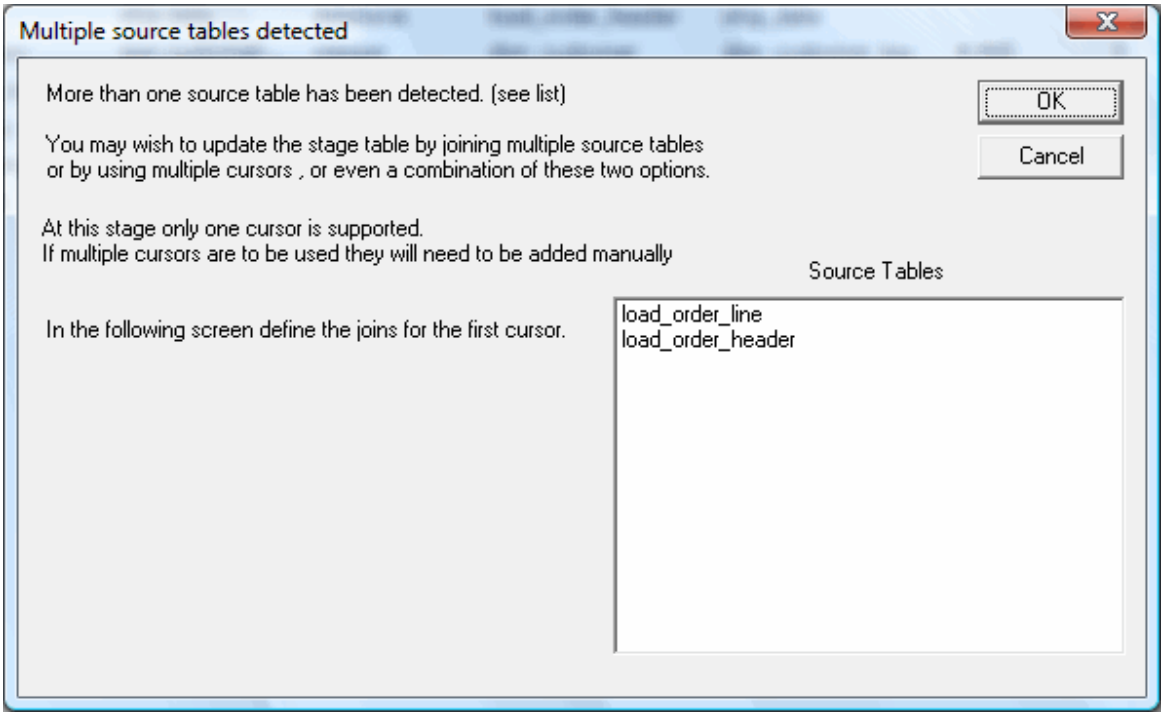
6 This will create an update stage procedure. Click OK.

7 Select the Cursor based procedure generation from the stage procedure type dialog box:



Note: When building an Oracle data warehouse, this dialog has an additional option for bulk bind procedures. See Staging generating the update procedure for more information.

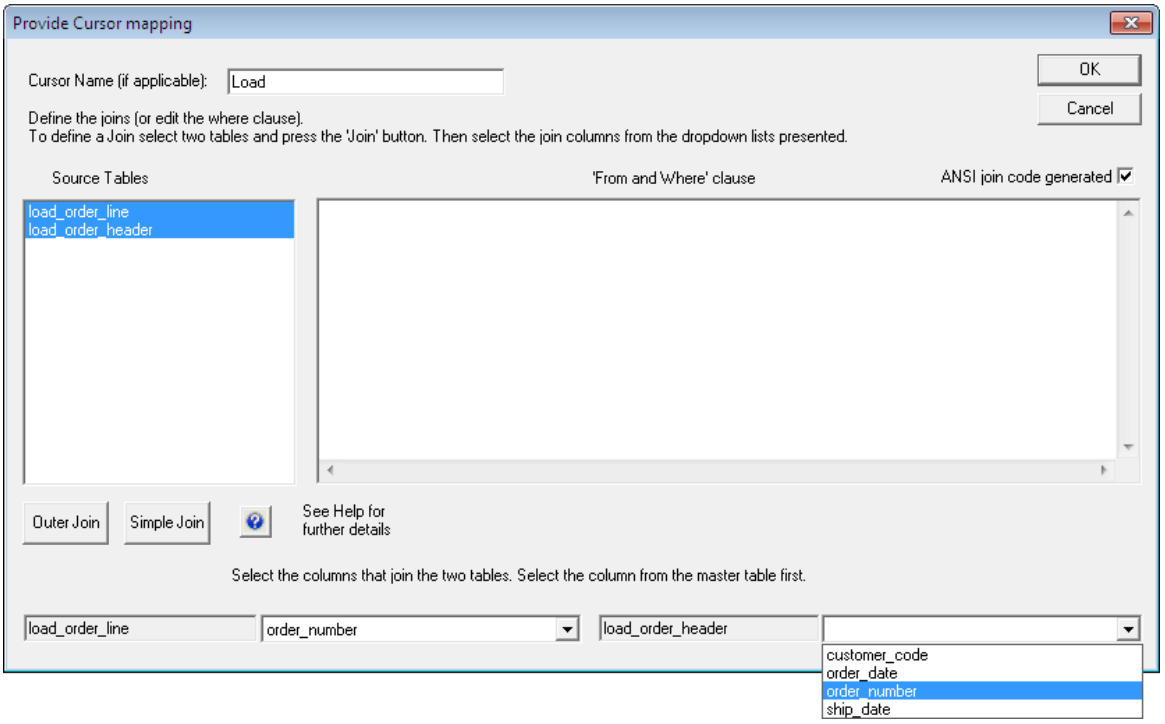
8 A dialog box will display indicating that multiple source tables have been detected.



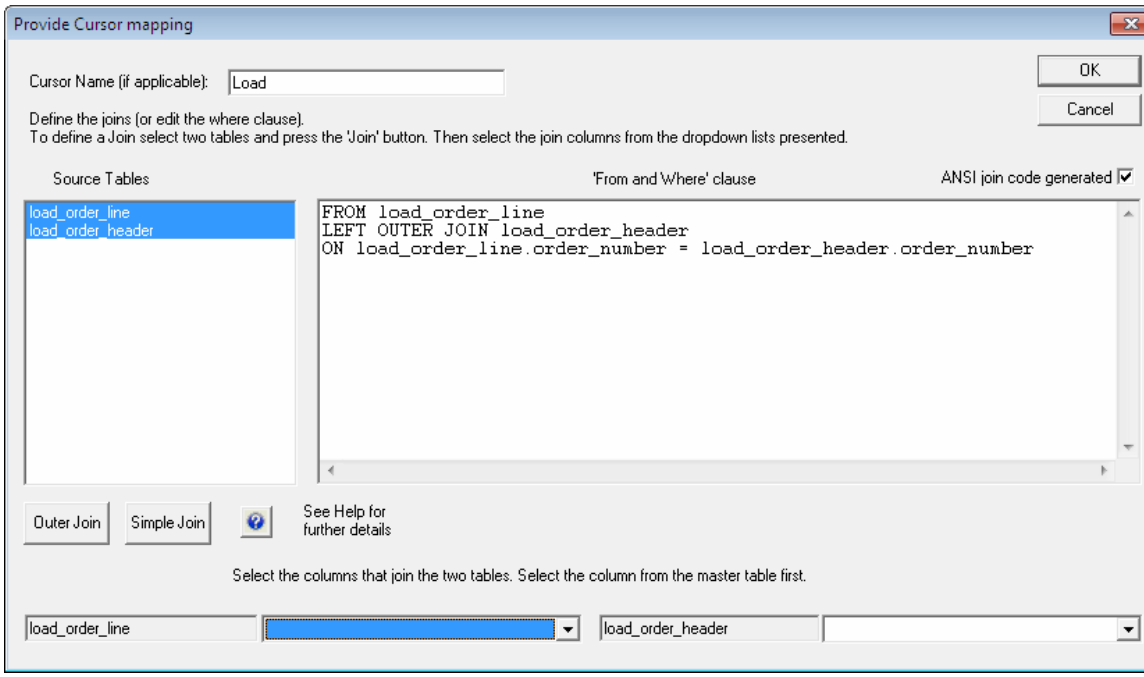
9 Select OK and then highlight the source tables load_order_line and load_order_header which are to be joined by order_number.

- With the two tables highlighted click Outer Join. See the chapter on Staging data for an explanation of the join types and options.

- Select **order number** from the **load_order_line** empty drop-down list box at the bottom of the screen. Then select order number from the **load_order_header** drop-down list box.



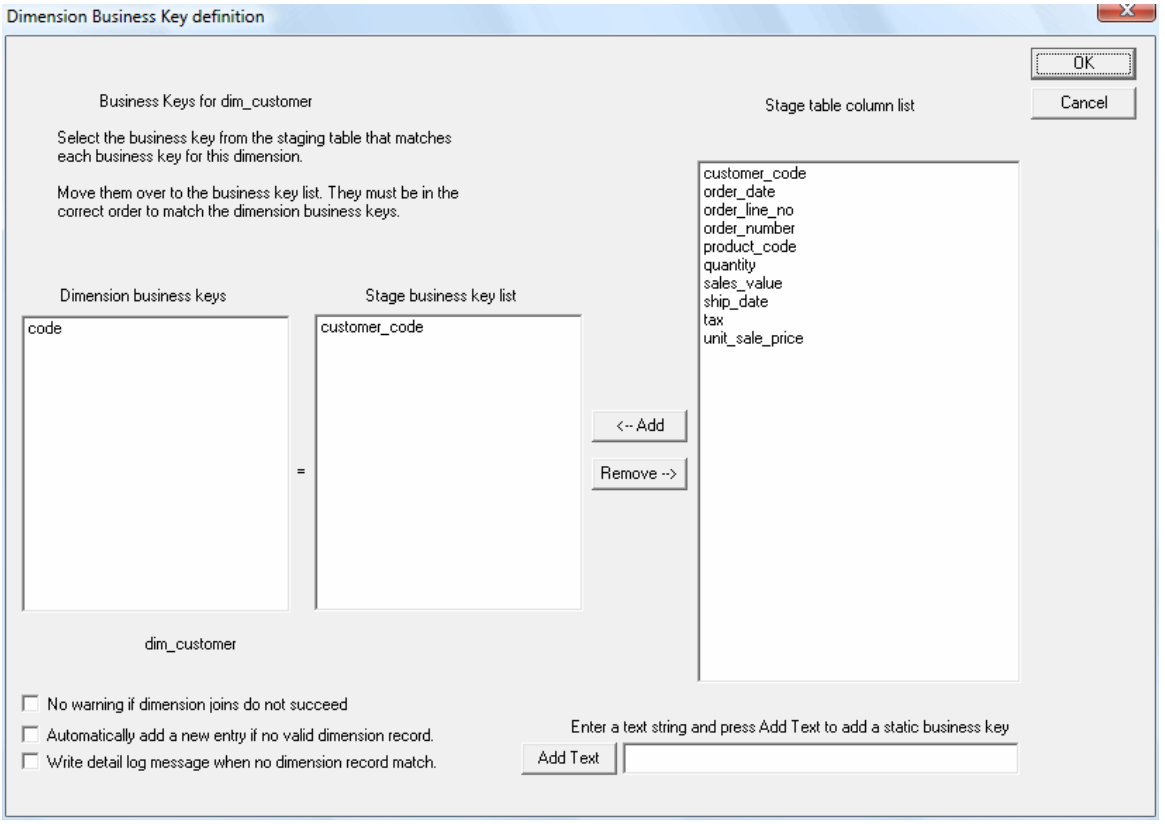
- This will create a join statement in the right hand window:



- Click OK.

10 You need to match the dimension business keys with the business keys in the stage table. This associates the correct dimensional record to each stage table record. A dialog box displays for each dimensional join:

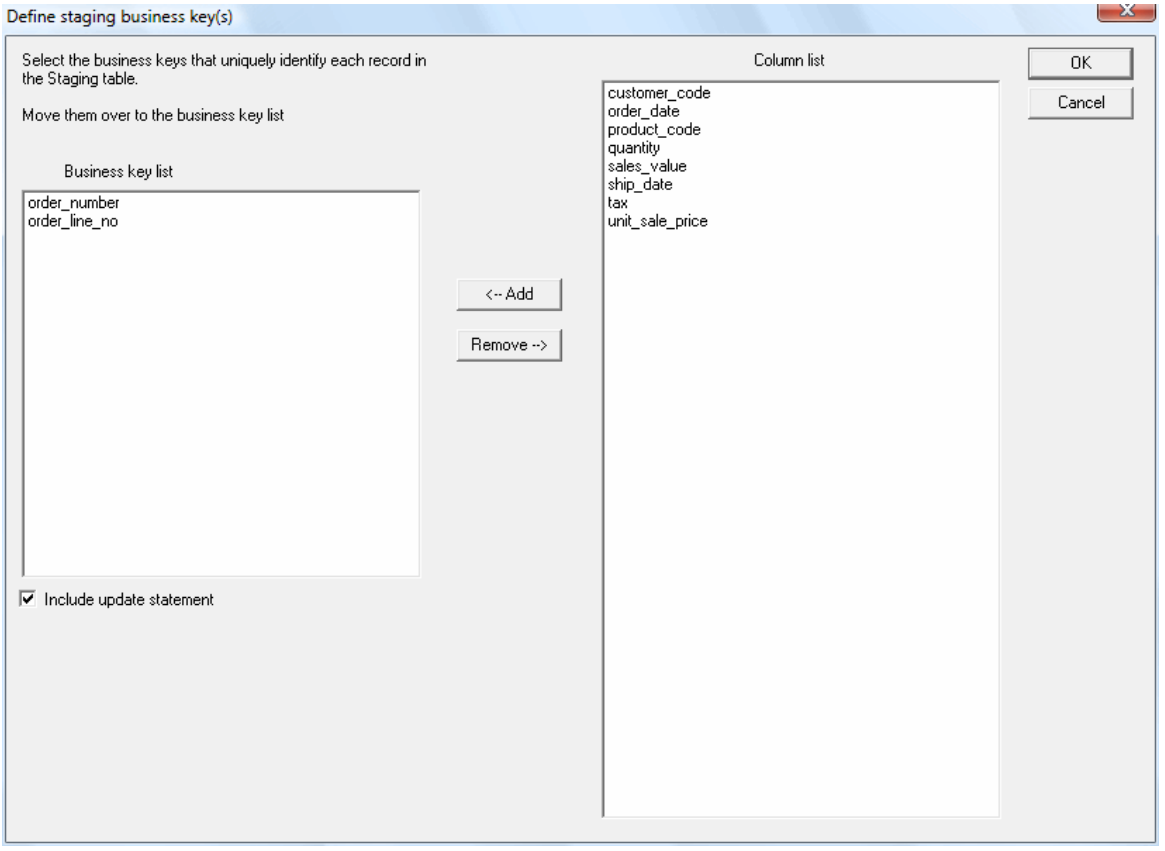
- For the dim_customer, select customer_code. Click <--Add:



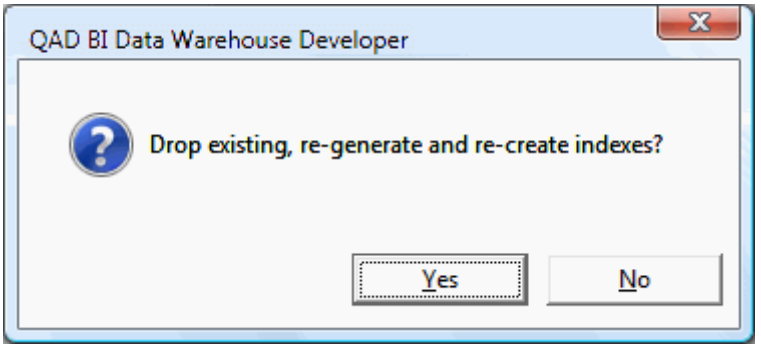
Click OK.

- For dim_product, select product_code. Click <--Add. Click OK.
- The business key for dim_ship_date has the same column name in the stage table and the dimension view, allowing QAD Data Warehouse Designer to automatically move ship_date to the left hand side. Click OK to progress to dim_order_date, where order_date has also been automatically chosen. Click OK again.

11 You must now select the business keys to uniquely identify each record in the staging table itself. This essentially defines the business key we will be using in the fact table, and as such defines the grain of the fact table. For this example the grain is order line. Select order_number and order_line_no. Click <--Add. Click OK. (See sample screen below.)

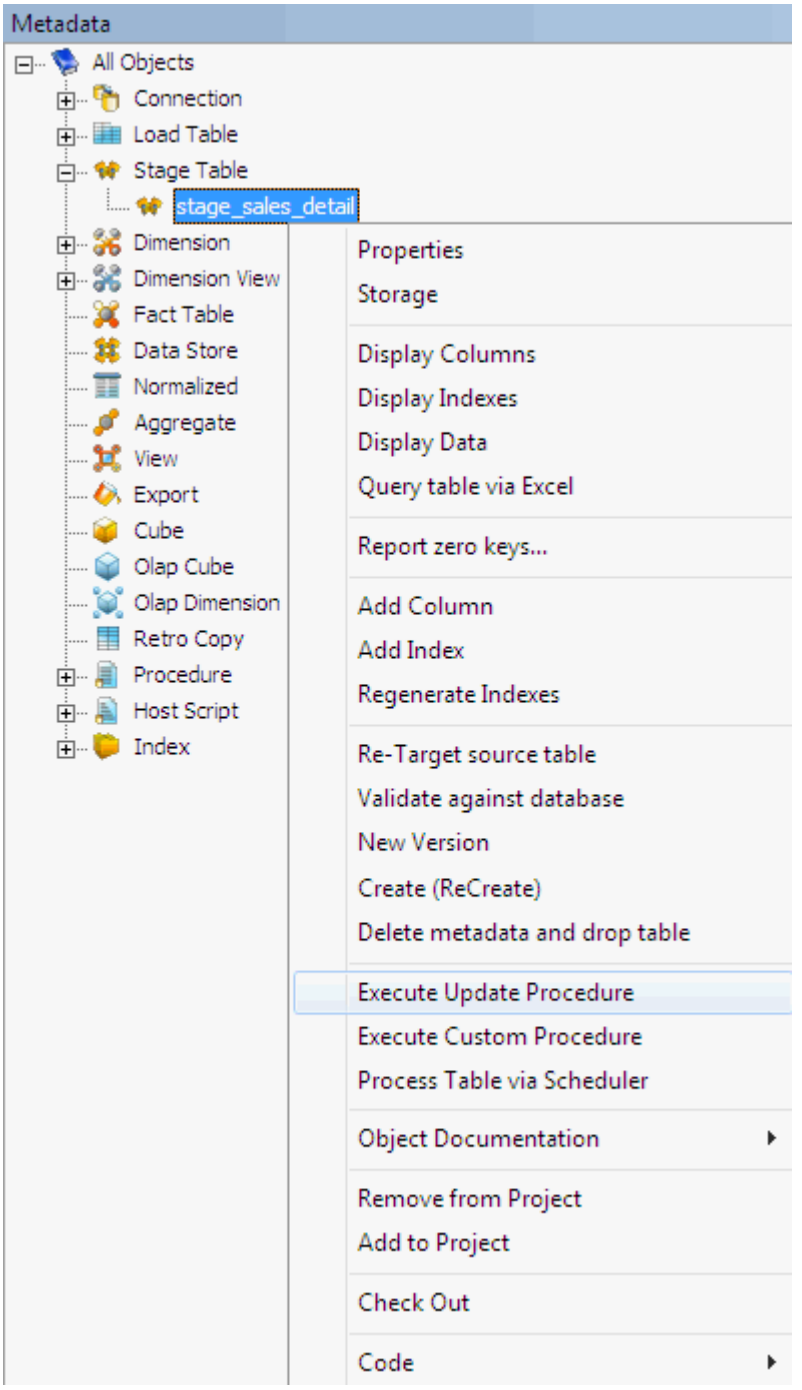


12 You must now choose between dropping and re-create any indexes defined on the table and leaving existing indexes in place. Click Yes to drop and re-create, No to leave existing indexes in place.

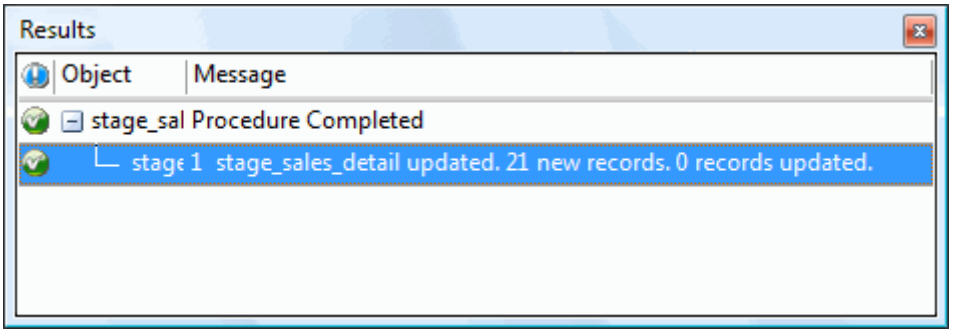


QAD Data Warehouse Designer now builds and compiles the update procedure. The results pane shows any indexes that where created.

13 The final step is the population of the stage table. Click on the stage table stage_sales_detail, right click and select Update:



14 Output from the stage table has being updated can now be seen in the Results window:



You are now ready to proceed to the next step - ***Creating a Fact Table*** (on page 47).

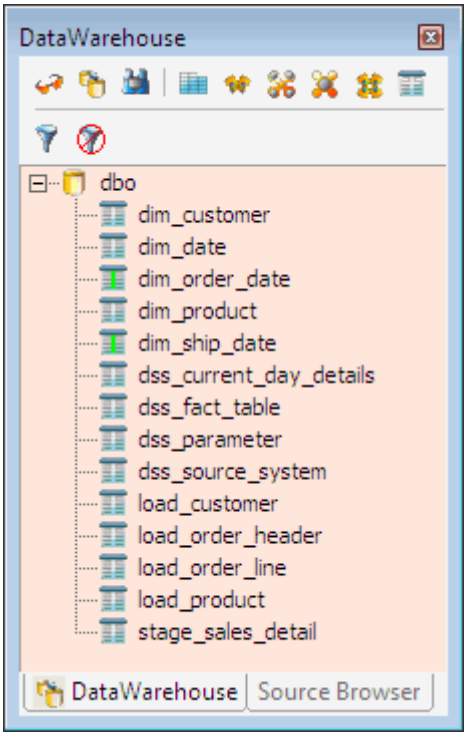
Creating a Fact Table

In this step you will create a fact table.

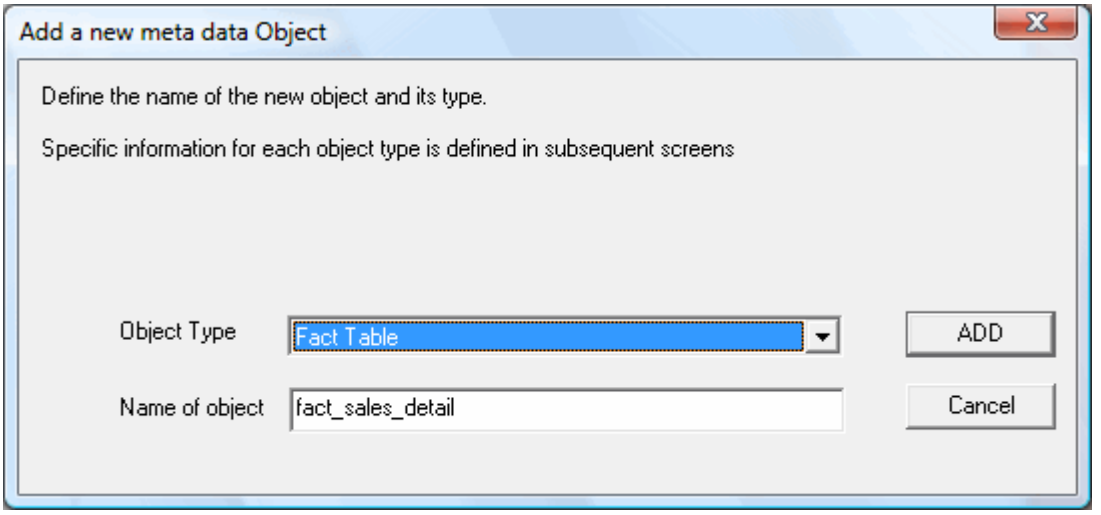
Create a drop target by double clicking on the Fact Table object group in the left pane, then refresh the source table browser (right hand pane).

To create the fact table:

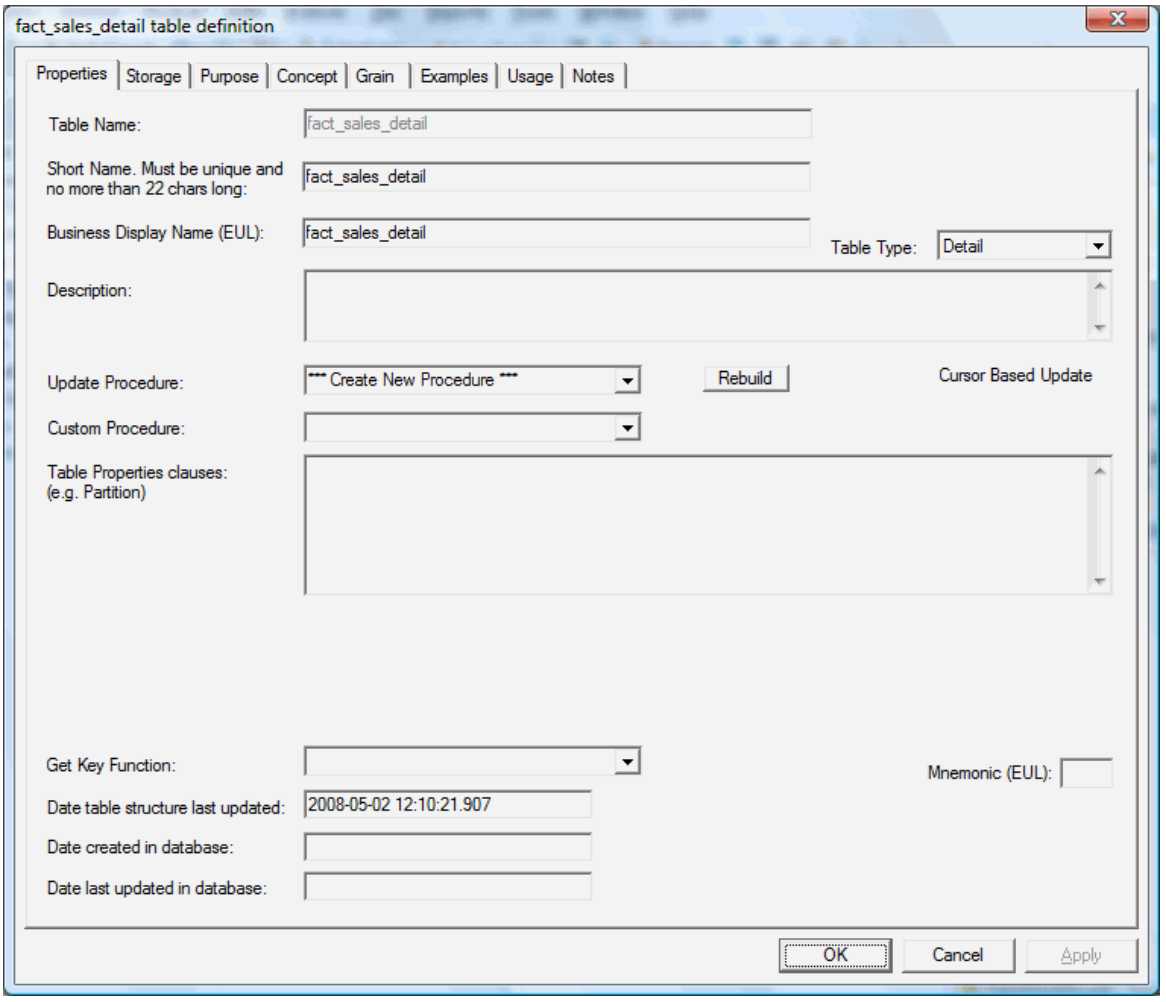
1 Browse the data warehouse connection again (or refresh the data warehouse connection):



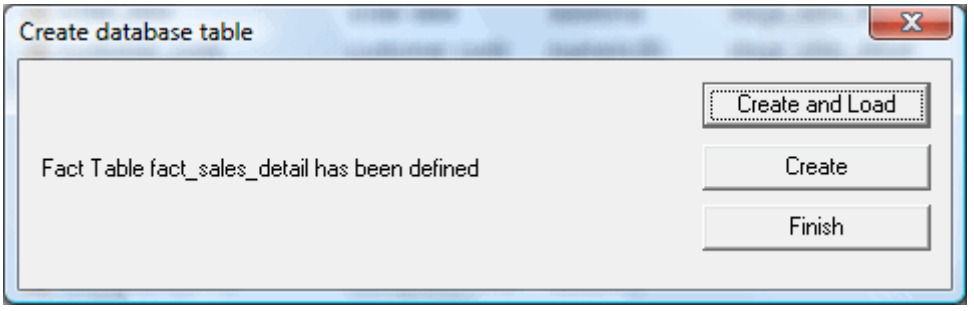
2 Drag the stage table stage_sales_detail over from the right pane into the middle pane. The following dialog is displayed:



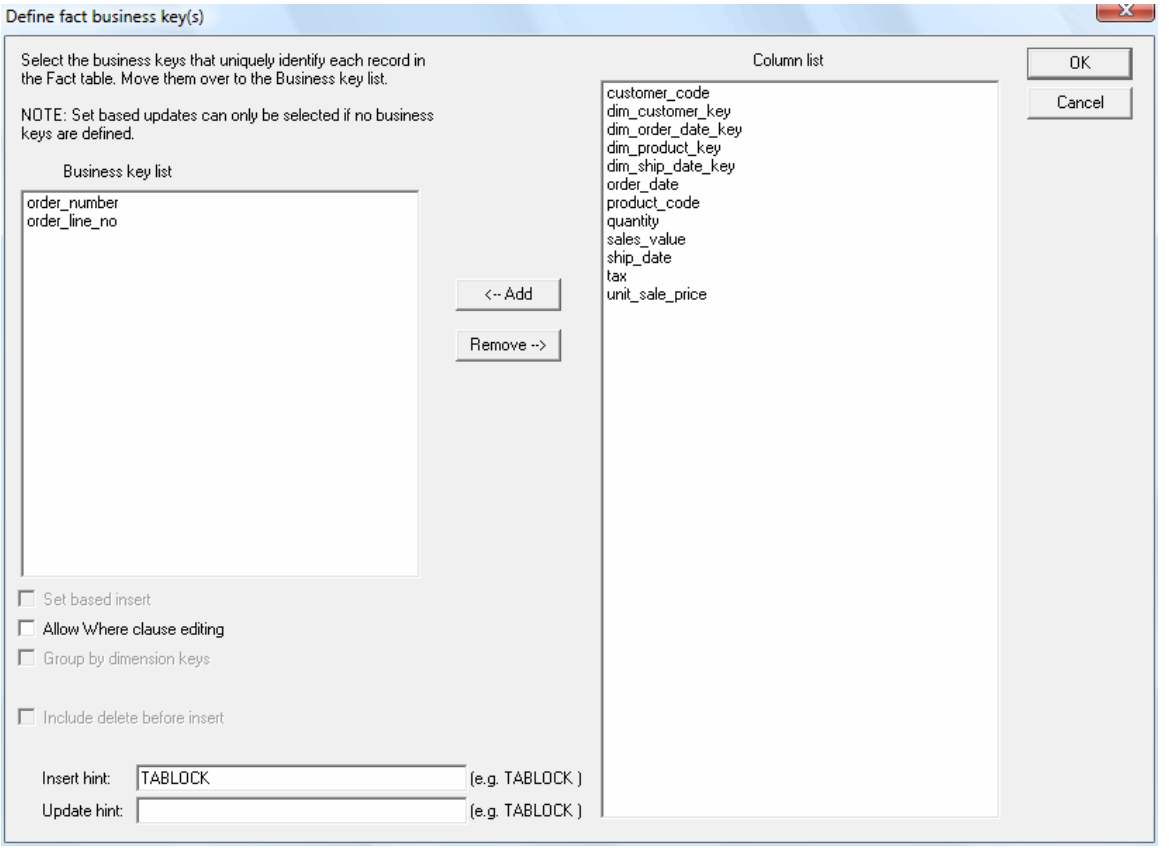
3 Click Add. The fact_sales_detail table properties screen will appear. Select ***Create New Procedure*** in the update procedure drop down and click OK:



4 Select **Create and Load** to create and load the table now:

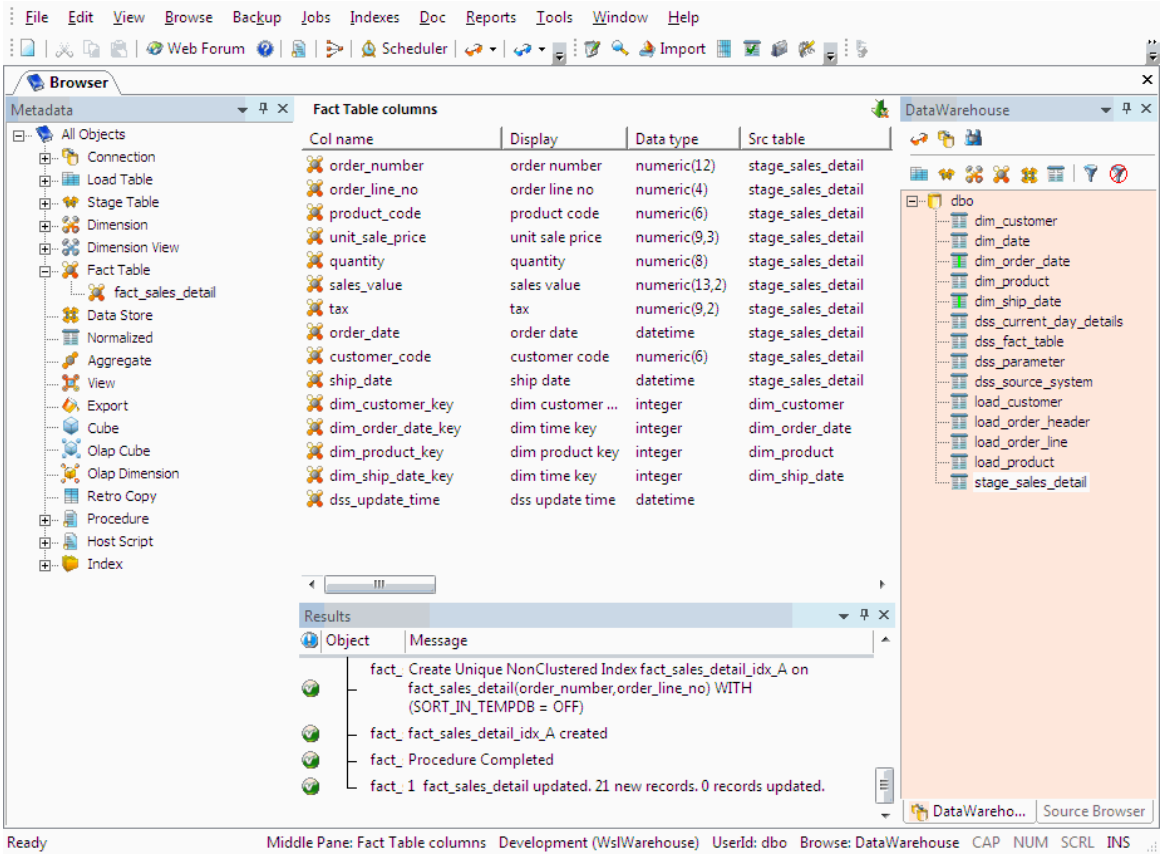


5 Select the Business Key for the fact table. Choose **order_number** and **order_line_number**. Click **<--Add** then **OK**:



6 Output from the fact table being created and updated can now be seen in the Results window.

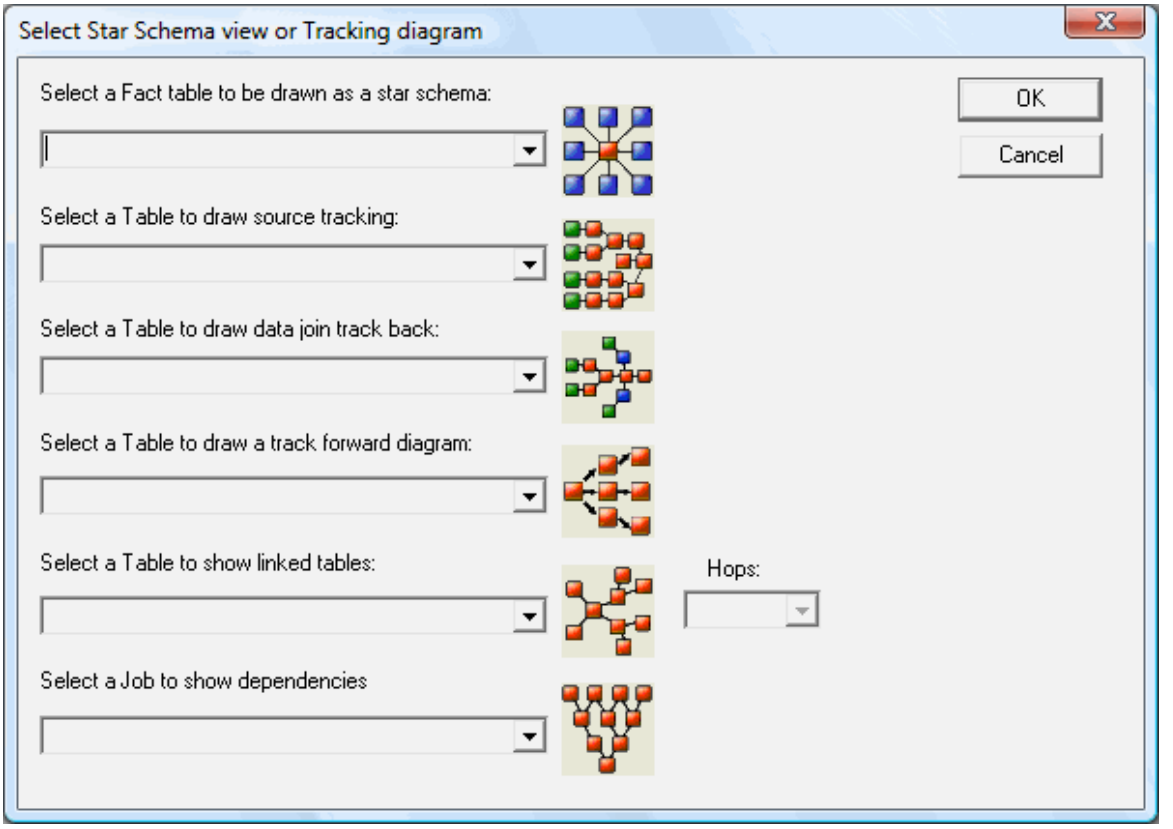
Your QAD Data Warehouse Designer screen should look something like this:



You are now ready to proceed to the next step - ***Switching to Diagrammatical View*** (on page 52).

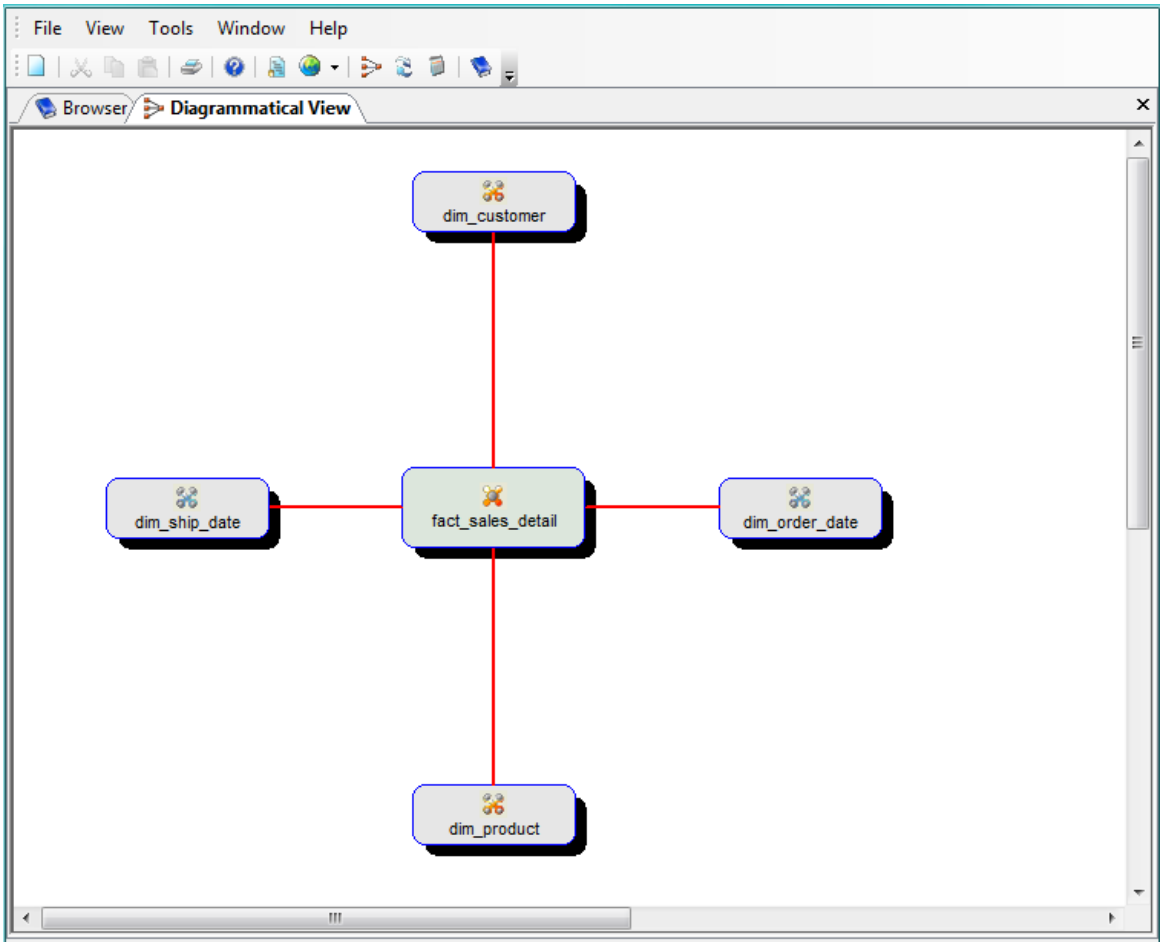
Switching to Diagrammatical View

QAD Data Warehouse Designer provides the ability to diagrammatically view the data warehouse you have created. To switch to the diagrammatical view, click on the button. Click the button again to bring up the diagram selector box. Select a fact table to be drawn as a star schema from the drop-down list box – in this instance fact_sales_detail:



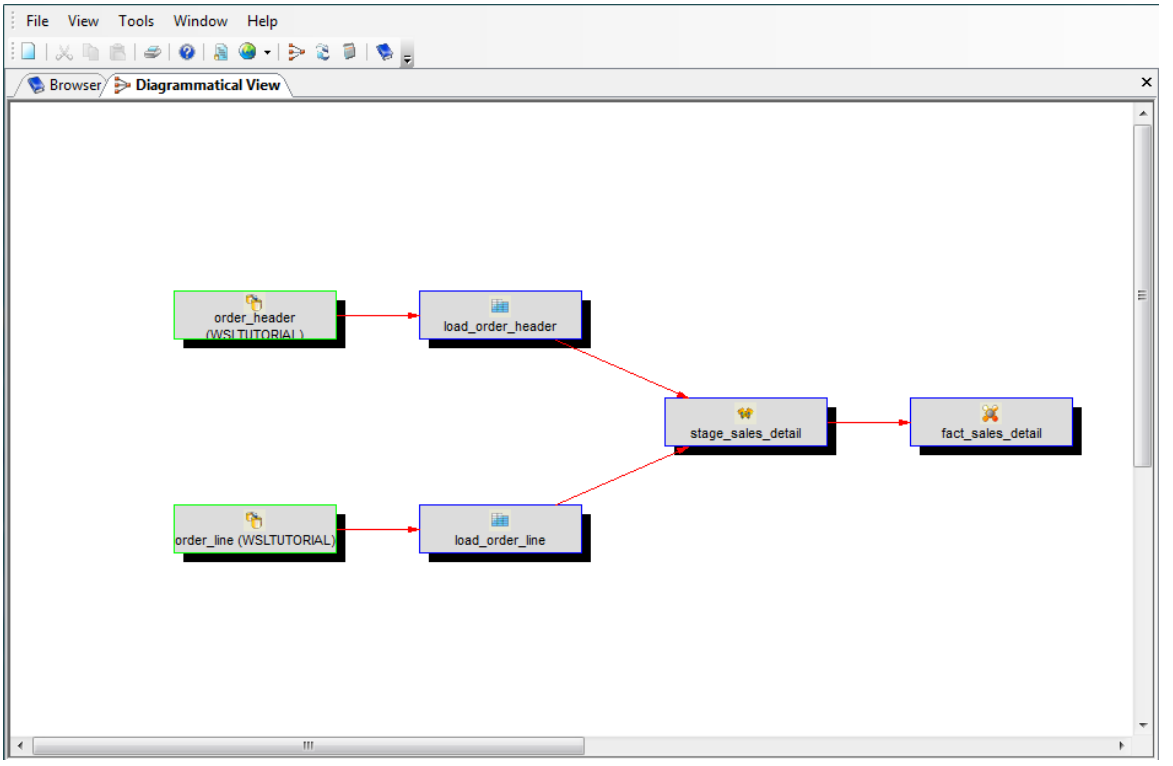
Click OK.

The diagram looks like this:



TIP: To view the source tracking of the **fact_sales_detail** table, click once more on the button, and choose the **fact_sales_detail** table from the second drop-down list box.

The diagram looks like this:



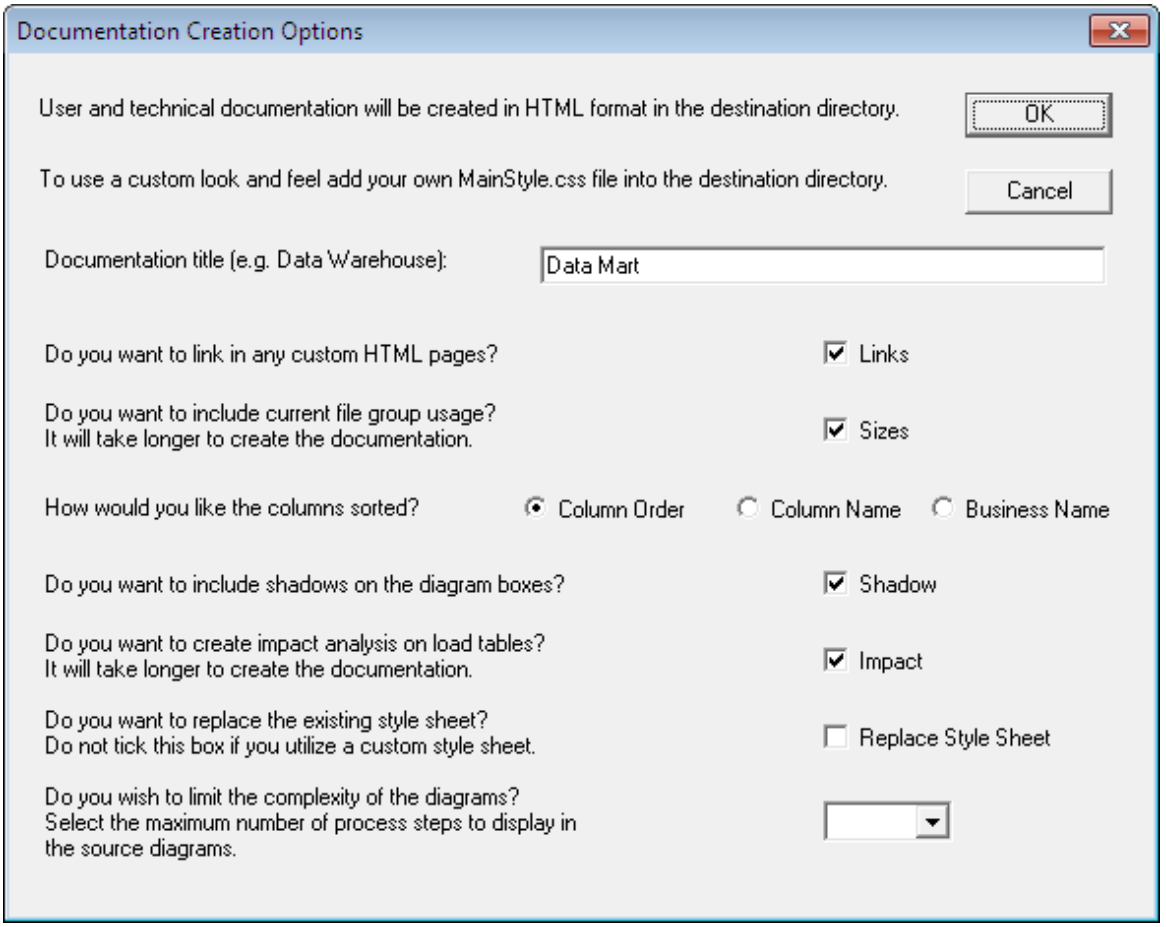
TIP: To close the diagrammatic view click on the Browser Window icon at the right-hand end of the toolbar.

You are now ready to proceed to the next step - ***Producing Documentation*** (on page 55).

Producing Documentation

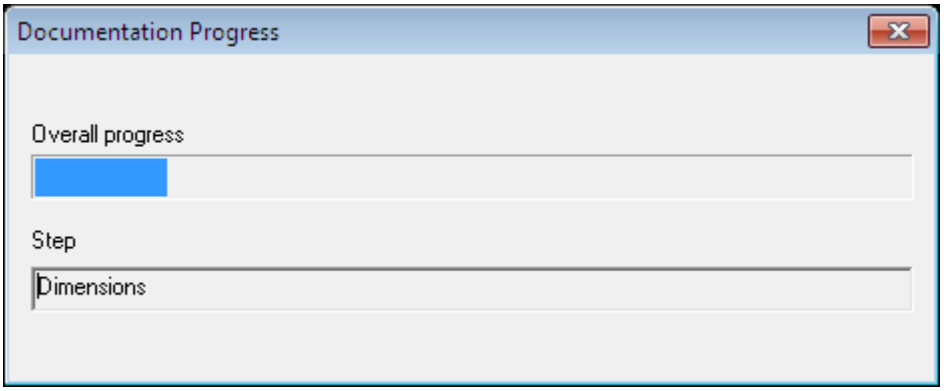
QAD Data Warehouse Designer also provides the ability to produce user and technical documentation. This is obviously of more value if the descriptive data has been entered against the columns and tables in the data warehouse, which we have not done during this tutorial.

To view the documentation for the components of the data warehouse, select Doc from the menu, then Create Documentation. Select a file path (directory) under which to save the HTML files that will be produced. The next screen allows for the inclusion of a banner and user defined links:

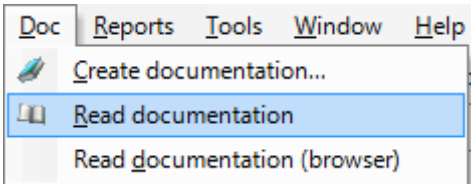


Leave these options unchecked and click OK to proceed.

The documentation runs:



TIP: To view the documentation select **Doc**, **Read Documentation**:



CHAPTER 2

Tutorial 2 - Rollup Fact Tables, ASCII File Loads, Aggregates

Before you start on this chapter you should have:

- Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (on page 3)
- Successfully completed ***Creating a Fact Table*** (on page 47)

This chapter deals with fine tuning the data warehouse by creating roll-up fact tables and aggregates. It also includes loading an ascii file into a new load table.

In This Chapter

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Creating Stage Tables....69
Creating Fact Tables....71
Rollup / Combined Fact Table....73
Aggregate Tables....76
Creating a Customer Aggregate....78

Purpose and Roadmap

Purpose

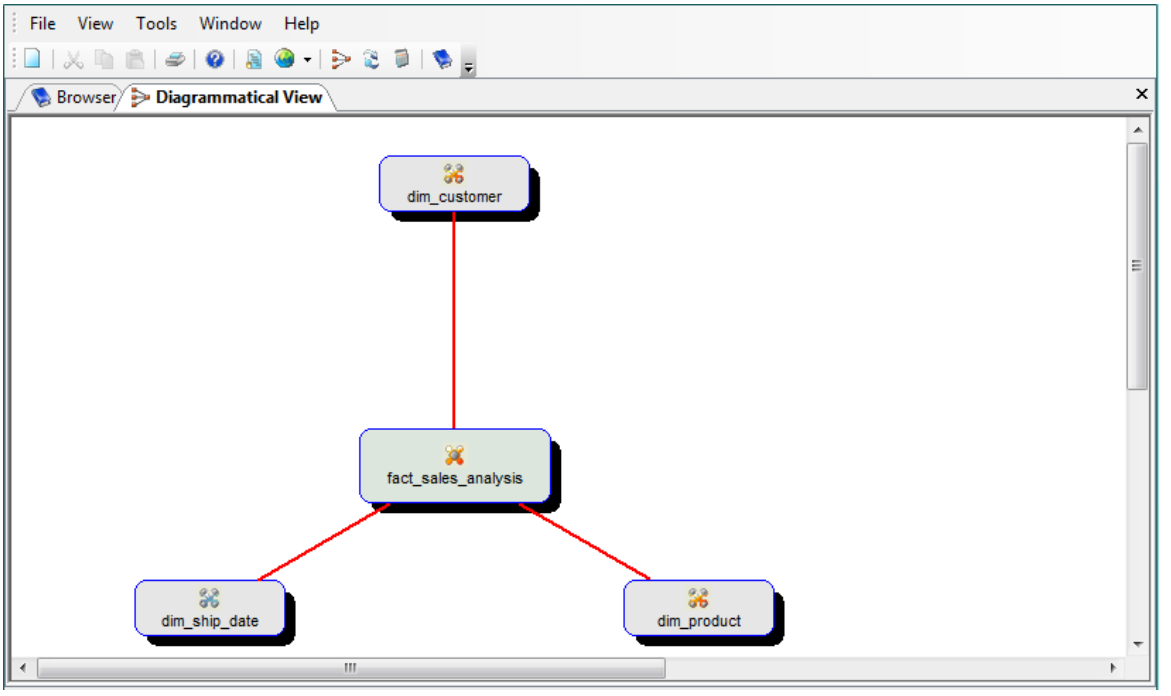
This tutorial will walk you through the process to:

- Load data from flat files (in Tutorial 1 source data was obtained via database links)
- Create a rollup fact table that allows users to see budgeted, forecast, and actual sales amounts and quantities broken down by customer, product and month
- Create separate aggregate tables that summarize data in the rollup table by (i) product and (ii) customer

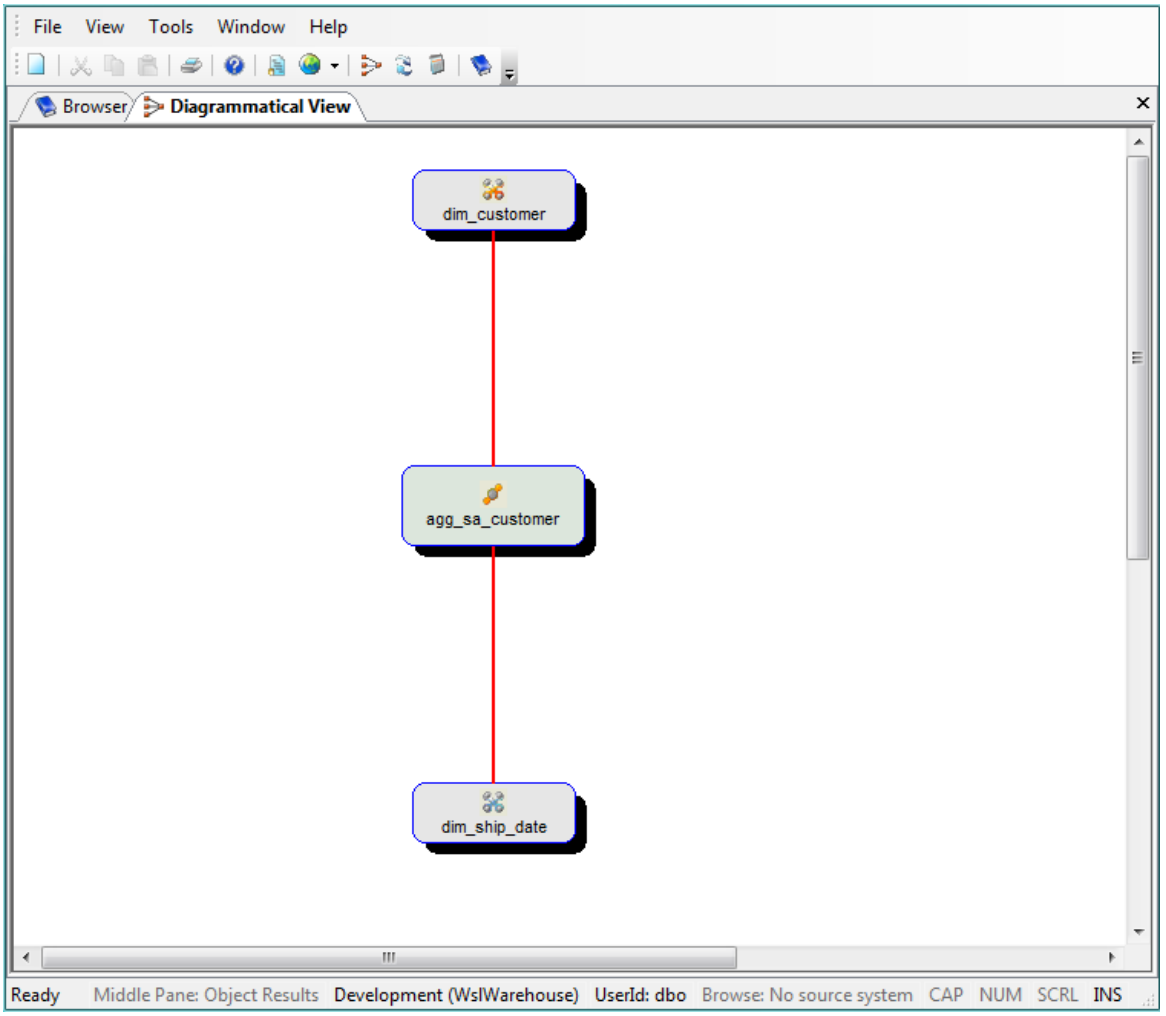
In short, this tutorial loads budget and forecast data from flat files into their own load, stage and fact tables. This data is then combined with data from the fact_sales_detail table (created in Tutorial 1) and summarized to create a new rollup fact table, fact_sales_analysis. Further summarization is done on the rollup table to create two separate aggregate tables.

The following are diagrams showing (i) the rollup table, fact_sales_analysis and (ii) the customer aggregate table, agg_sa_customer that will be created as part of this tutorial.

Rollup:



Aggregate:


File View Tools Window Help
Browser
Diagrammatical View
dim_customer
agg_sa_customer
dim_ship_date
Ready
Middle Pane: Object Results
Development (WslWarehouse)
UserId: dbo
Browse: No source system
CAP
NUM
SCRL
INS

Tutorial Environment

This tutorial has been completed using IBM DB2. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

Tutorial Roadmap

This tutorial works through a number of steps. These steps and the relevant section within the chapter are summarized below to assist in guiding you through the tutorial.

Step in Tutorial	Section
Create a new connection to allow data to be loaded in from flat files on C: drive.	Making a Connection to Windows
Create (and load) the data for ▪ load_budget ▪ load_forecast Note: Data is loaded from flat files on C: drive	Loading Tables from Flat Files
Create the following stage tables ▪ stage_budget ▪ stage_forecast Stage table creation entails using corresponding load tables and including links to the following dimensions: (dim_customer, dim_product, dim_date)	Creating Stage Tables
Create the following fact tables ▪ fact_budget ▪ fact_forecast	Creating Fact Tables
Create the rollup fact table, fact_sales_analysis This rollup combines forecast, budget and sales data from fact_budget, fact_forecast and fact_sales_detail tables respectively. The data is rolled-up (grouped) by product, customer and month. Note that dimension keys are used for the rollup.	Rollup/Snapshot Fact Tables
Create product aggregate (agg_sa_product) table. This aggregate summarizes fact_sales_analysis data by product	Aggregate Tables
Create customer aggregate (agg_sa_customer) table. This aggregate summarizes fact_sales_analysis data by customer.	Creating a Customer Aggregate

This tutorial starts with the section ***Making a Connection to Windows*** (on page 61).

Making a Connection to Windows

This follows a similar process to the earlier ***connections*** (see "***Creating a Connection***" on page 11) made, but differs in that the connection is within the PC.

Note: The following connection should have been automatically created. It should however be validated to ensure that it is correct for the environment.

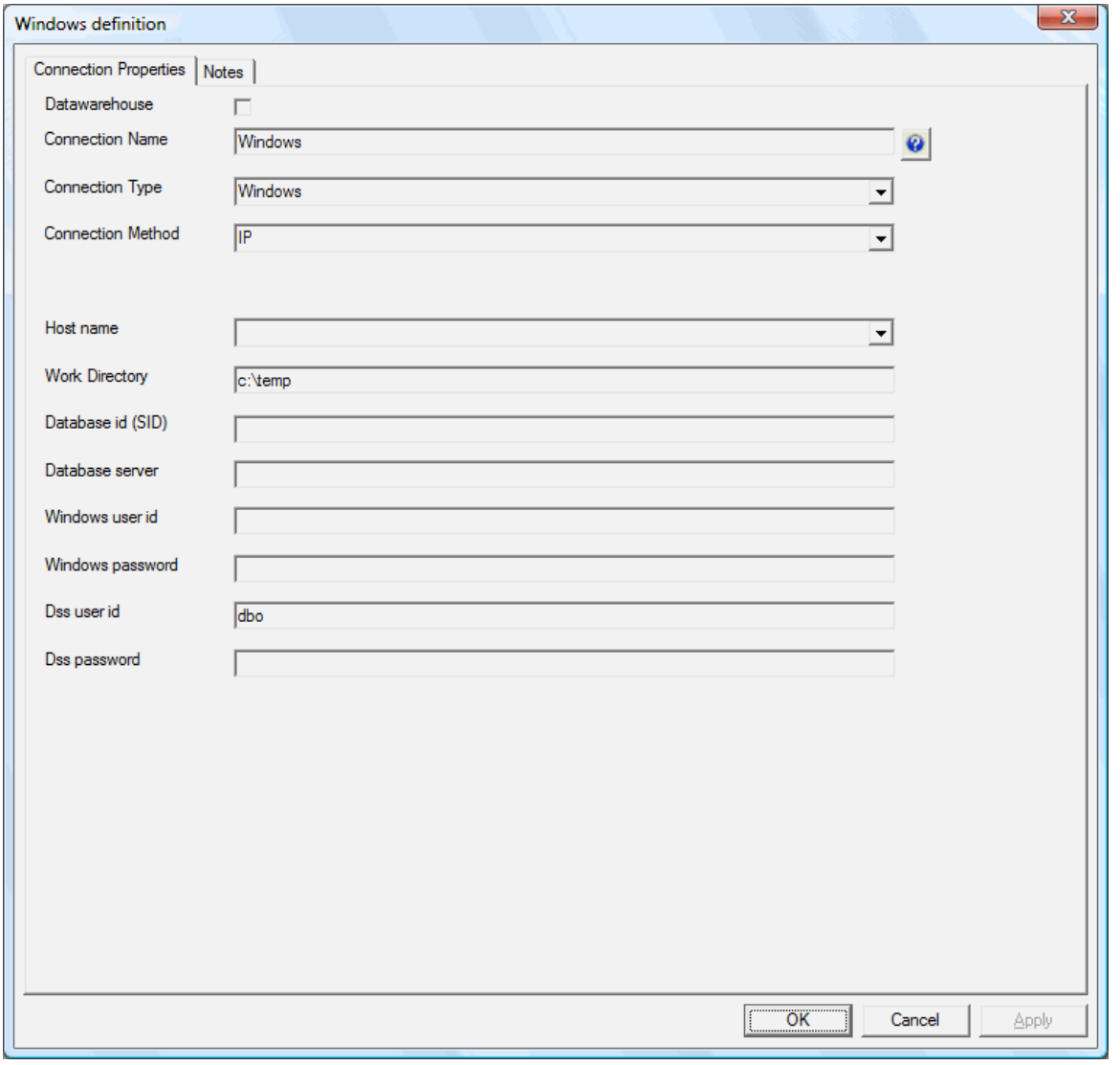
1. Log on to QAD Data Warehouse Designer.
2. In the left pane, double click on the Connection object group.
3. Select File | New, or right click the Connection object and select New Object.
4. Enter Windows in the 'Name of Object' text box and select Add.
5. Enter the Connection properties as below:

Connection properties

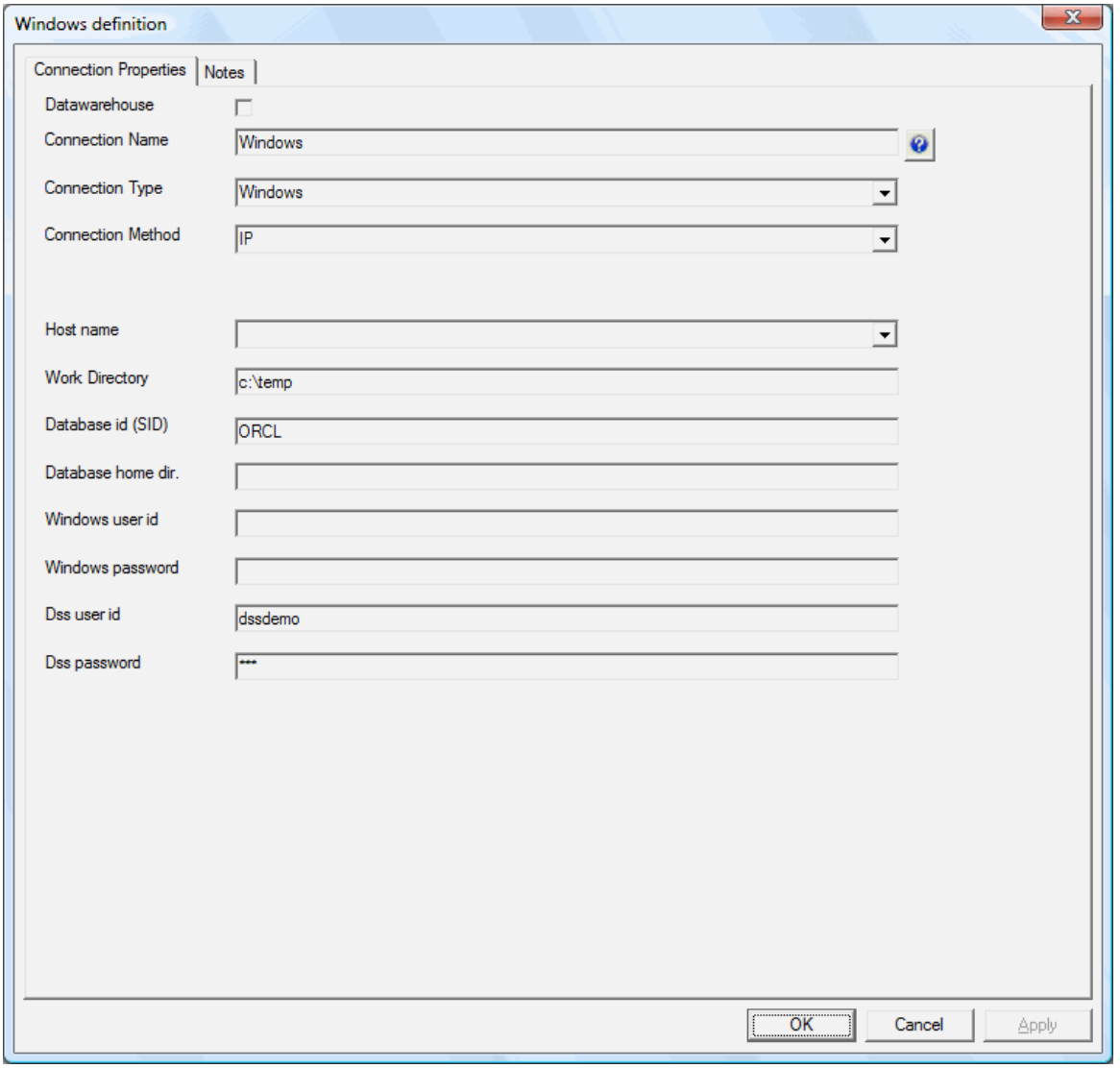
Field	Description
Connection Name	Windows
Connection Type	Windows
Connection Method	IP
Host Name	Not required
Work Directory	Required. Must be an existing valid directory on the PC, e.g, c:\temp
Database id (SID)	For Oracle, the appropriate SID for your metadata installation, e.g, ORCL. For SQL Server and DB2 leave this field blank.
Database home directory	This is only required for Oracle and if the Database SID is in a non-default directory
Windows User ID	Leave blank
Windows Password	Leave blank
Dss User ID	For Oracle, this is dssadm (the data warehouse username). This is the database logon for SQL Server and DB2. It should be dbo if a trusted connection is being used for SQL Server. If an OS authenticated user is being used for DB2 this should be left blank.

Dss password	For Oracle, this is wsl (the data warehouse password). This is the database password for SQL Server and DB2. It should be left blank if a trusted connection is being used for SQL Server or if an OS authenticated user is being used for DB2.

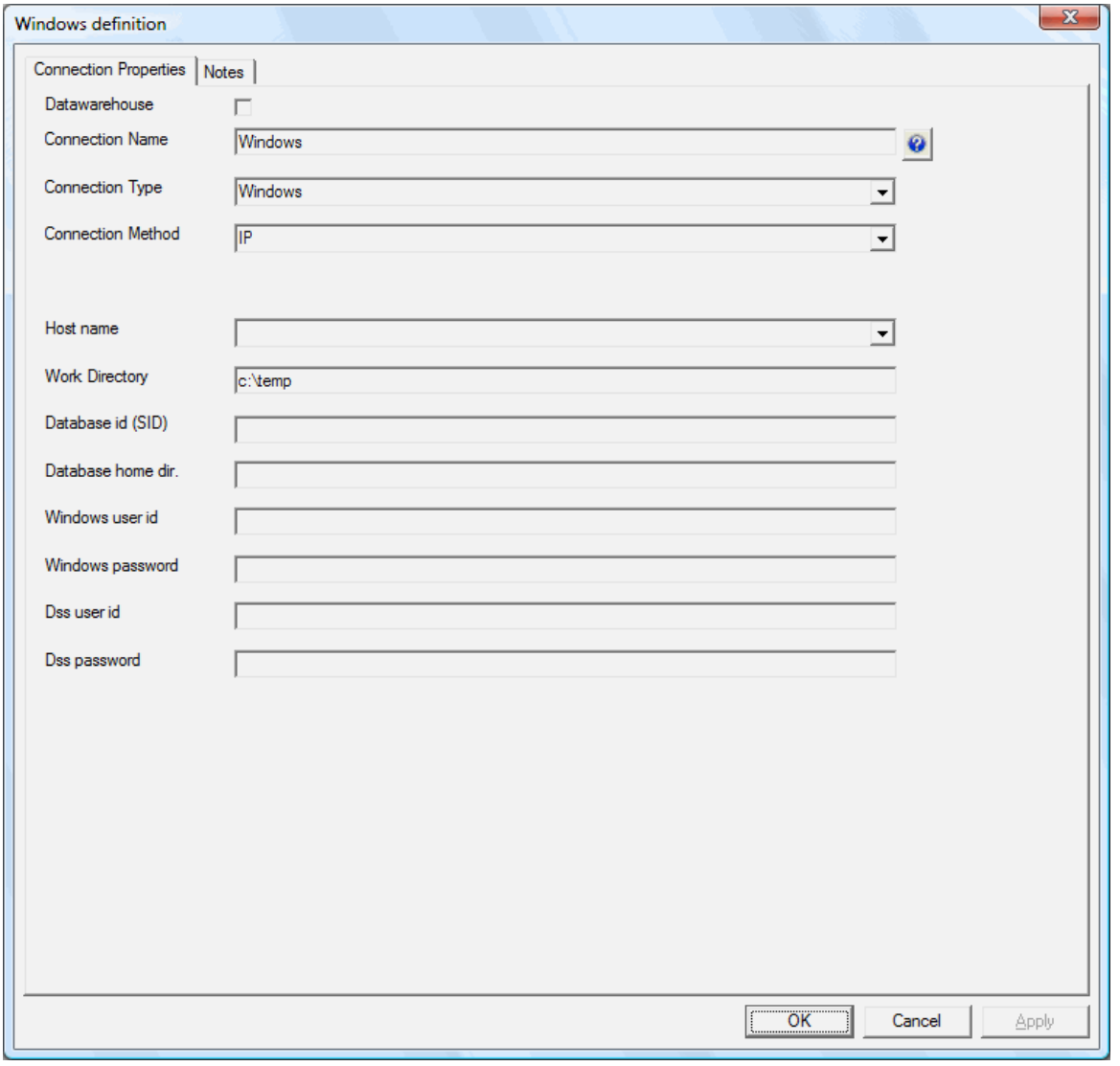
Sample SQL Server properties:



Sample Oracle properties:



Sample DB2 properties:



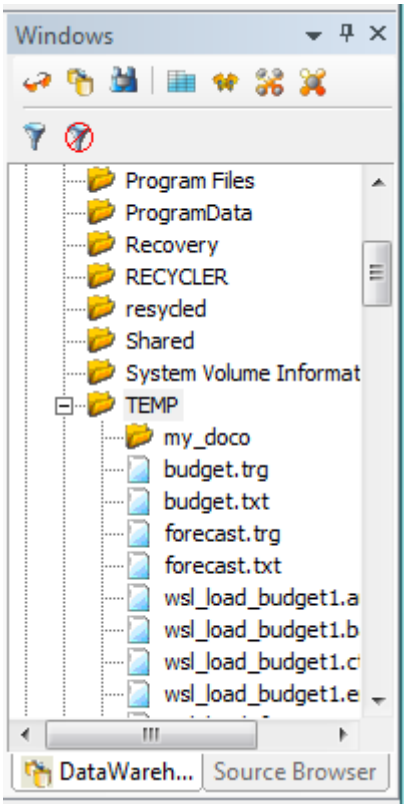
You are now ready to proceed to ***Loading Tables from Flat Files*** (on page 64).

Loading Tables from Flat Files

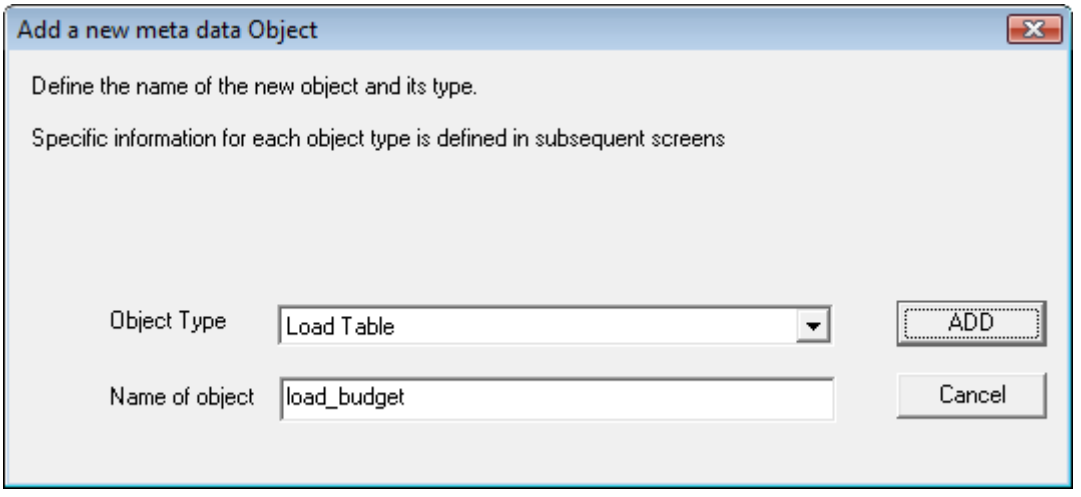
In this step you will parse and load a file from Windows into a load table in the data warehouse.

1 Double click on the Load Table object group in the left pane. This will list all load tables in the middle pane and make the middle pane a drop target for new load tables.

2 Browse to the Windows connection in the right pane by selecting Browse | Source Tables from the menu strip at the top of the screen. Select Windows as the Connection. Leave the Schema field blank. Click OK.



3 Navigate to c:\Program Files\QAD\Tutorial folder, click on budget.txt and drag it into the middle pane. Rename the object load_budget (i.e. remove the _txt suffix):



4 Click ADD.

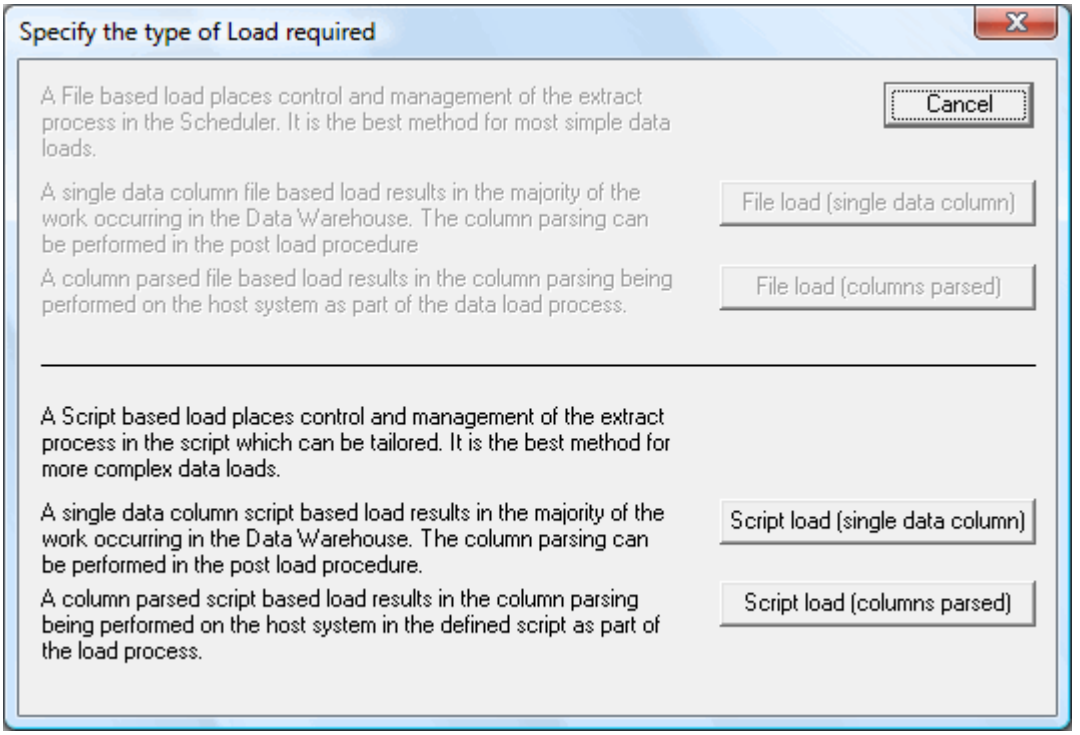
Specifying the load type

You must now specify the type of load you require from the four options given:

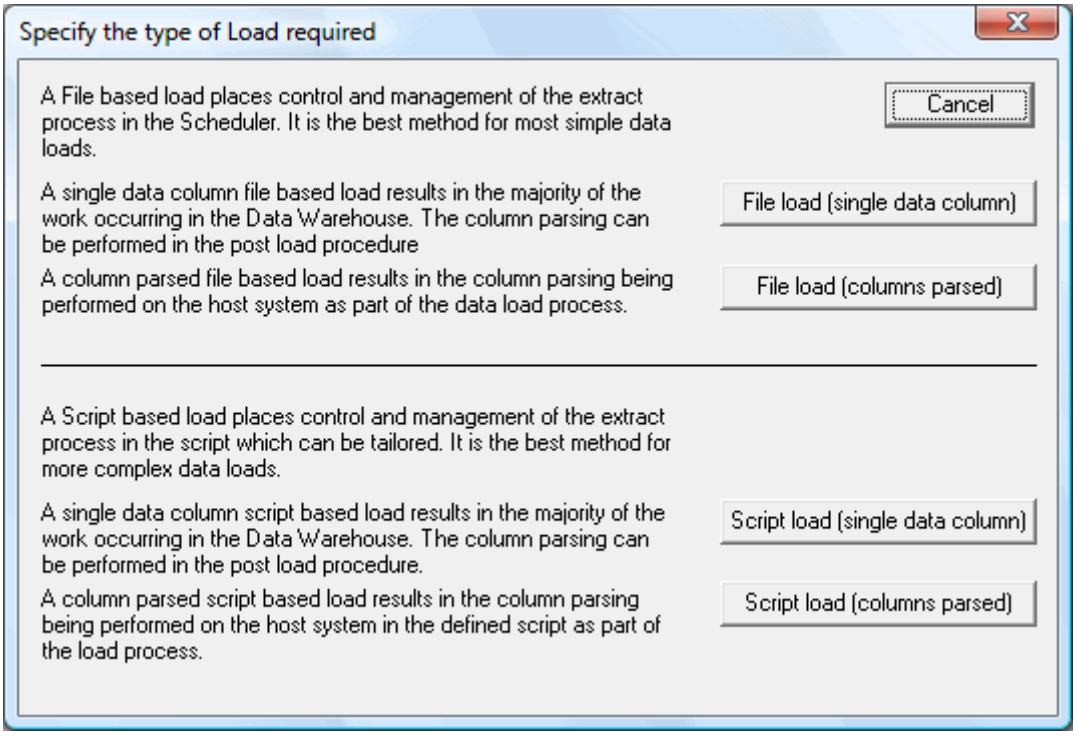
- File load (single data column)
- File load (columns parsed)
- Script load (single data column)
- Script load (columns parsed)

For more information on load types see the section on flat file loads in the loading data chapter.

1 For this tutorial select Script Load Columns Parsed:



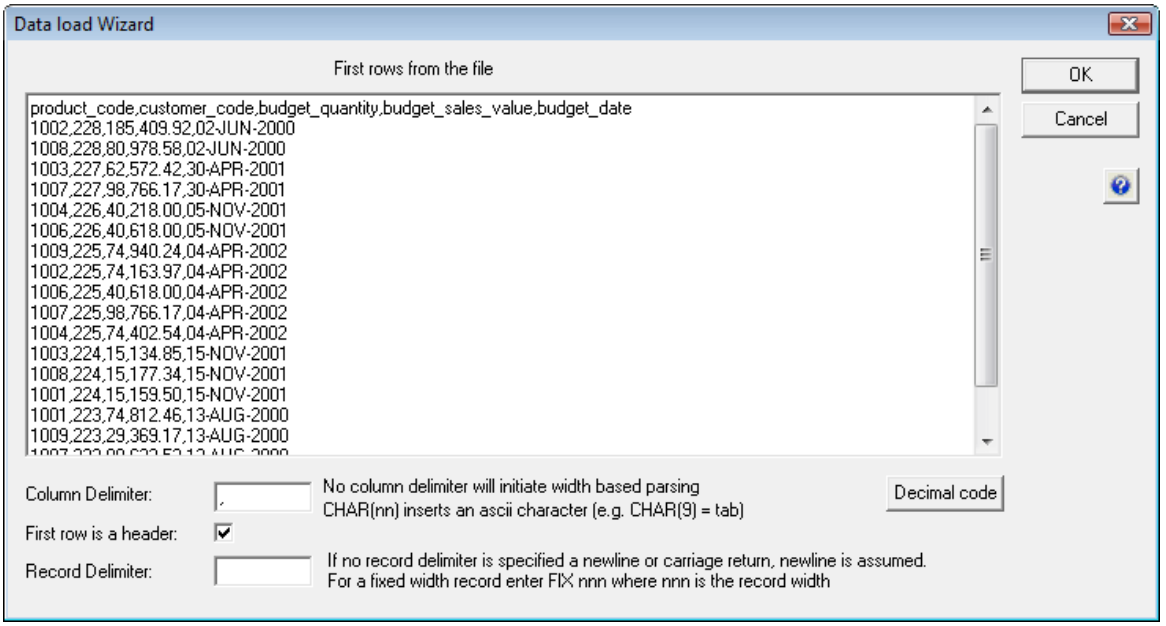
Note: For SQL Server and Oracle, file loads are also available in this dialog:



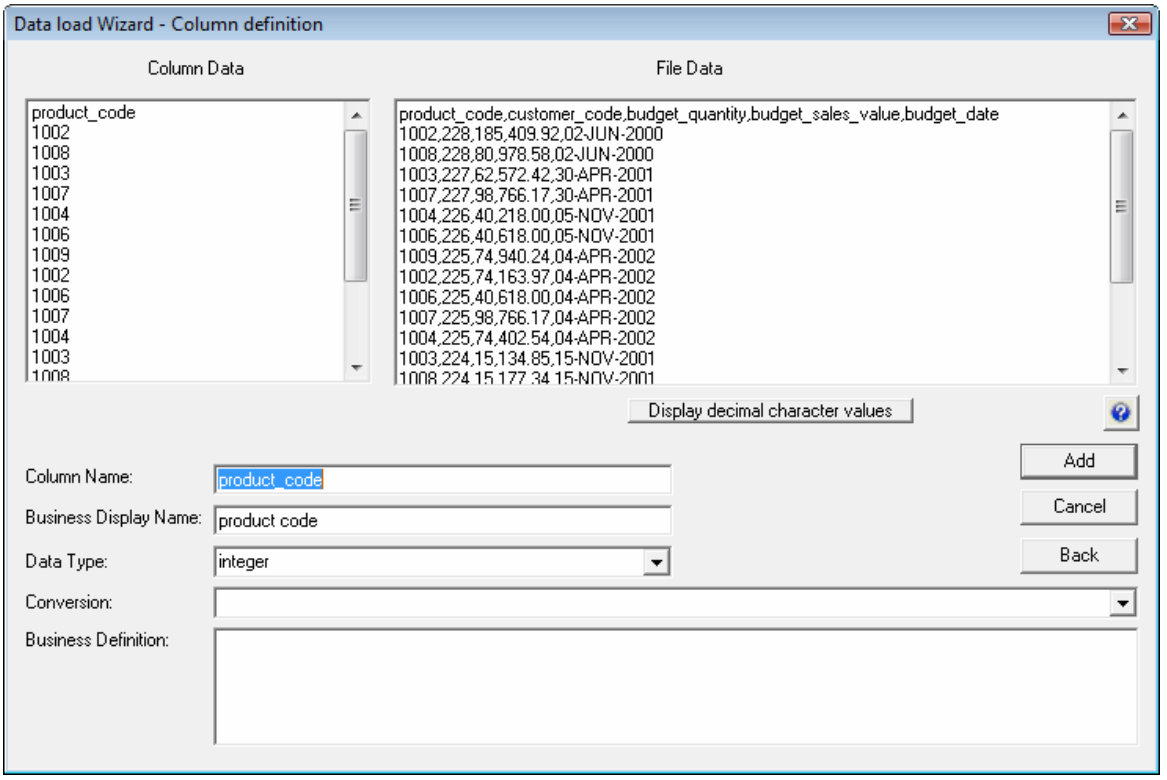
2 From the definition dialog that displays select OK.

3 From the data load wizard enter a comma (,) in the Column Delimiter field

4 As the first row is a header, place a check in the box and click OK:



5 QAD Data Warehouse Designer uses the header row as suggested column names. For each column confirm the name and data type:



6 You may have to change it to a more appropriate value. Click Add.

7 Click OK for the DB2 Load cannot skip header rows dialog.

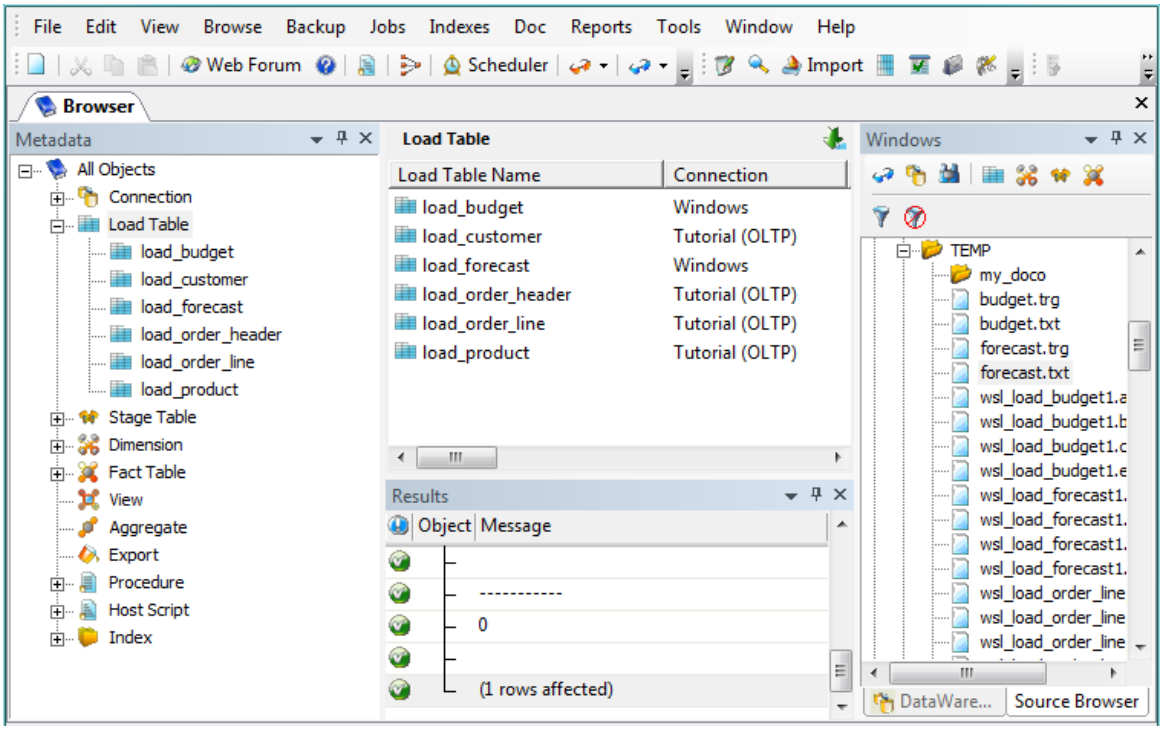
8 Click OK for the New Script Create dialog.

9 Select Yes on the prompt to create and load the table now.

Note: Loading files with a header row into DB2 will result in an error message.

10 Repeat steps (1) to (9) for the forecast.txt file to create and load the table load_forecast.

11 The results display:



You are now ready to move to the procedure for ***Creating Stage Tables*** (on page 69).

Creating Stage Tables

Two separate stage tables need to be created for load_budget and load_forecast. This is the same as the procedure from the first tutorial for ***Defining the Staging Table*** (on page 32).

1 Double click the stage table object group in the left hand pane. This will list the existing stage table in the middle pane.

2 Browse to the data warehouse Browse/Source Tables or click on the orange glasses in the toolbar.

3 Drag the table load_budget from the right hand pane to the middle pane and drop.

4 Click Add to add the stage table called stage_budget. Click OK on the properties screen.

5 Repeat steps (1) through (4) for the table load_forecast to create stage_forecast.

Once the stage tables have been defined, bring the following keys from the right pane into both new tables. Double click the stage table name in the left hand pane to list the stage table columns in the middle pane. This also makes the middle pane a drop target for new columns:

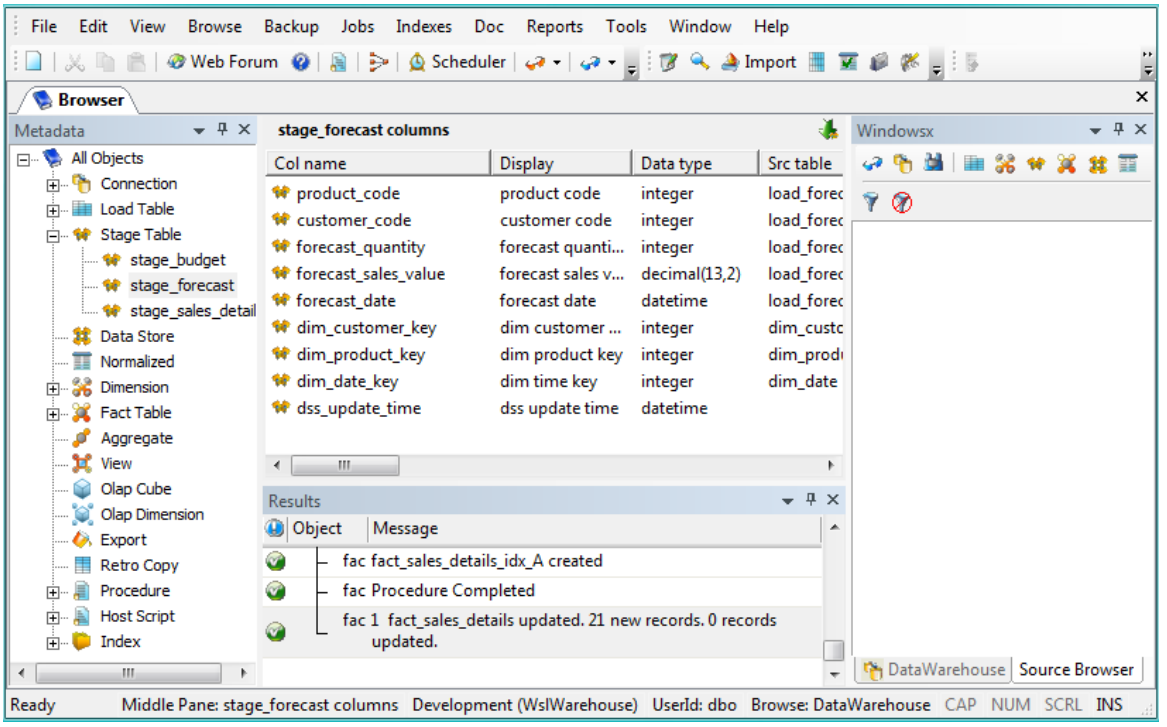
Note: Repeat the following procedure for stage_budget and stage_forecast.

- dim_customer_key
- dim_product_key
- dim_date_key

1. Now in the left pane, right click on stage_budget, then select Create (ReCreate).
2. Again, in the left pane, right click on stage_budget, then select Properties.
3. In the Update Procedure field select ***Create New Procedure***. Click OK.
4. Select Cursor as the update procedure type.
5. SQL Server data warehouse users will now see an additional join screen. This screen is presented even though no joins are required. This screen allows the selection of either a 'Where' based join or an ANSI standard join. The default will be ANSI standard join. Click OK to proceed.
6. Select the dimension keys:
   - dim_customer - customer code
   - dim_product - product code
   - dim_date - budget/forecast date (depending on which stage table you are working on).

   Click <--Add, then OK for each one.
7. Now define the business keys. Add customer_code, product_code, and budget/forecast_date to the business key list, and click OK.
8. For each stage table, right click in the left pane, and select Update.

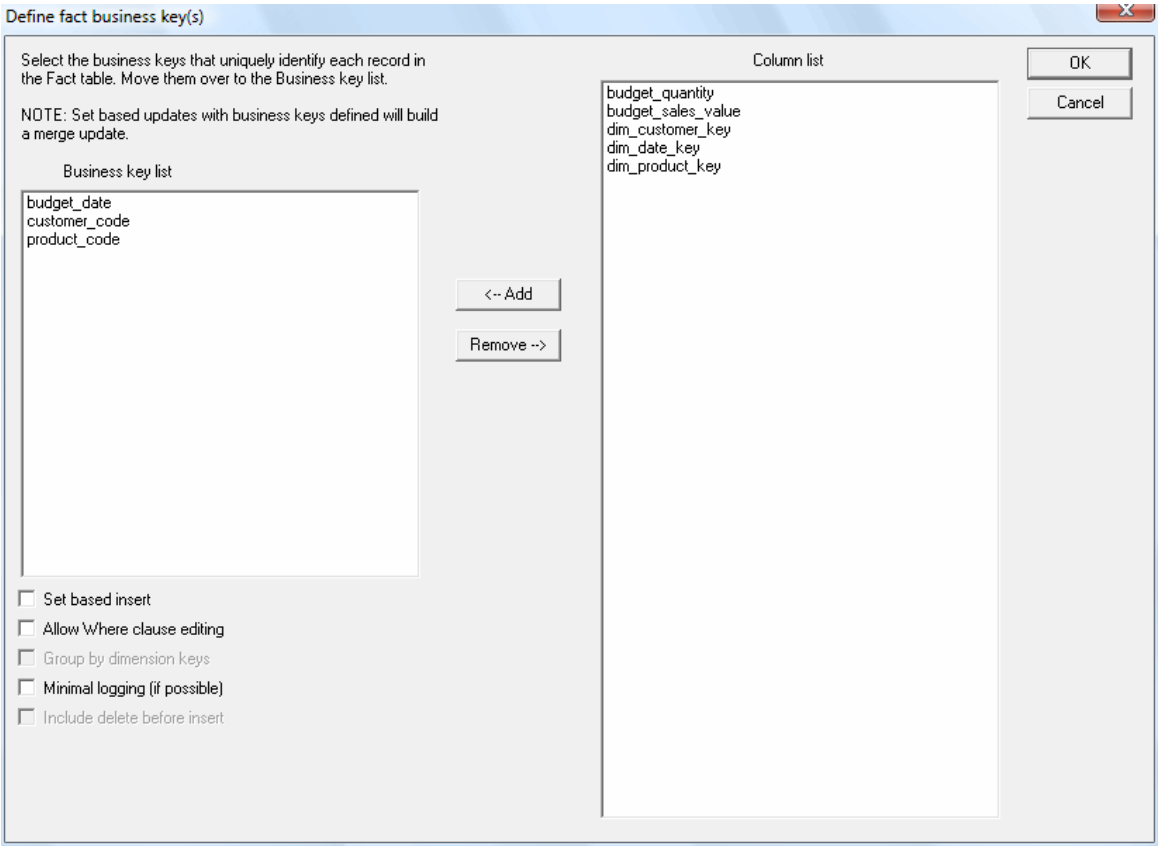
Your QAD Data Warehouse Designer screen should look like this when you have finished:



You are now ready to move to the procedure for ***Creating Fact Tables*** (on page 71) for these two new stage tables.

Creating Fact Tables

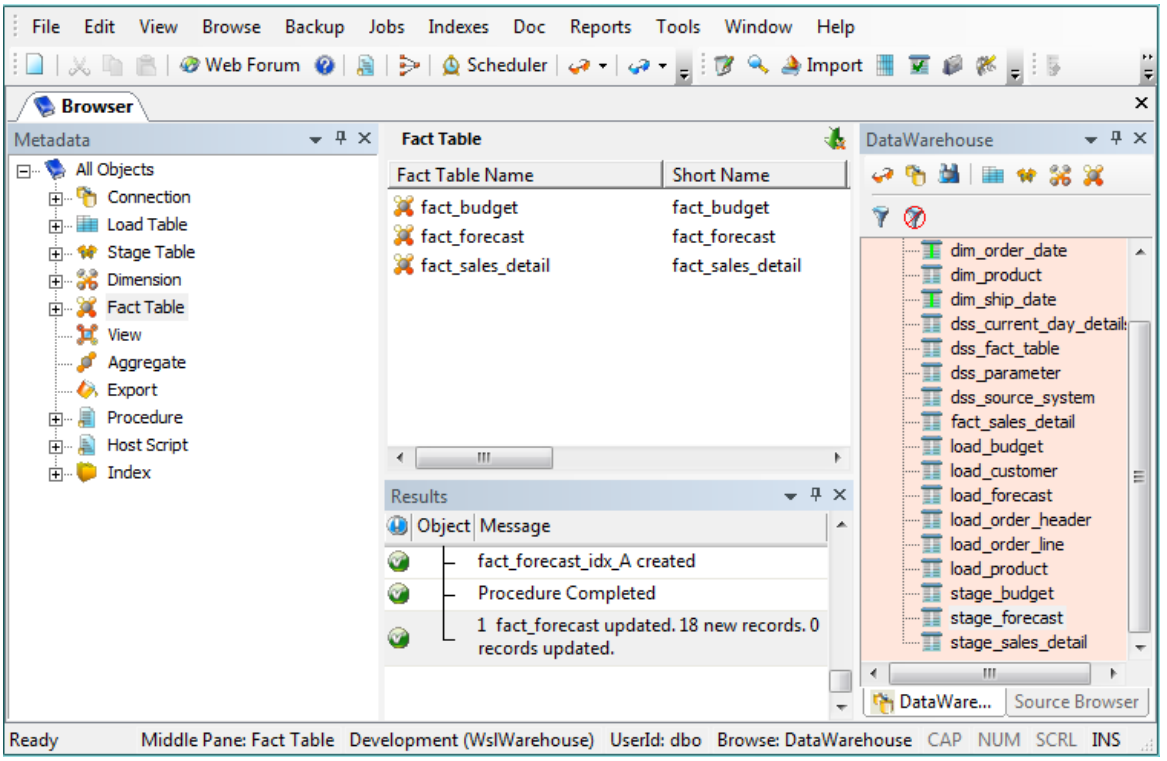
1. Double click the Fact Table object group in the left pane.
2. Refresh the Data Warehouse source tables in the right pane (F5).
3. Click and drag stage_budget into the middle pane. Accept the name fact_budget. Click Add.
4. Choose ***Create New Procedure*** from the update procedure drop down list and click OK.
5. Click Create and Load when asked if you wish to create and load the table now.
6. Select the Business Key definitions. Add customer_code, product_code, and budget_date.



7 Click OK.

8 Repeat steps (1) to (7) stage_forecast to create fact_forecast (with a business key of customer_code, product_code, and forecast_date).

Your QAD Data Warehouse Designer screen should look like this when you have finished:



Proceed to ***Rollup / Snapshot Fact Table*** (see "***Rollup / Combined Fact Table***" on page 73)

Rollup / Combined Fact Table

A rollup table enables the viewing and combining of different levels of granularity in the data, such as sales, budget and forecast detail. The result is that the end user can compare, for example, sales against budget against forecast on a monthly basis.

1 Click on the Fact Table object in the left pane and refresh the Data Warehouse connection in the right pane.

2 Click and drag fact_sales_detail to the middle pane, and change the new object name to fact_sales_analysis.

Note: Do not make any changes to the table definition and click Finish when asked if you want to create and load the table now.

3 Because this level of granularity is no longer required, *delete* the following columns:

- customer_code
- product_code
- order_date
- ship_date

- dim_order_date_key
- unit_sale_price
- order_number
- order_line_no

Note: A new column has appeared - dss_fact_table_key. This is used to identify which fact table has populated a row in the rollup fact table and should not be removed.The dss_update_time field must also be present to record the time that the record was updated in the data warehouse

---

4 In the left pane double click the **fact_sales_analysis** table. In the right pane open fact_budget and drag **budget_quantity** and **budget_sales_value** into the middle pane (within fact_sales_analysis).

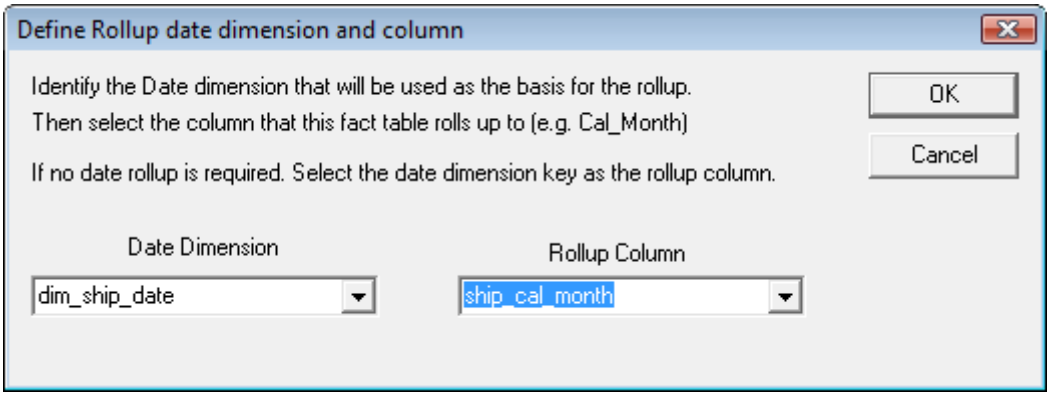
5 In the left pane double click the **fact_sales_analysis** table. In the right pane open fact_forecast and drag **forecast_quantity** and **forecast_sales_value** into the middle pane (within fact_sales_analysis).

6 In the left pane, right click on **fact_sales_analysis** and select **Create (ReCreate)**.

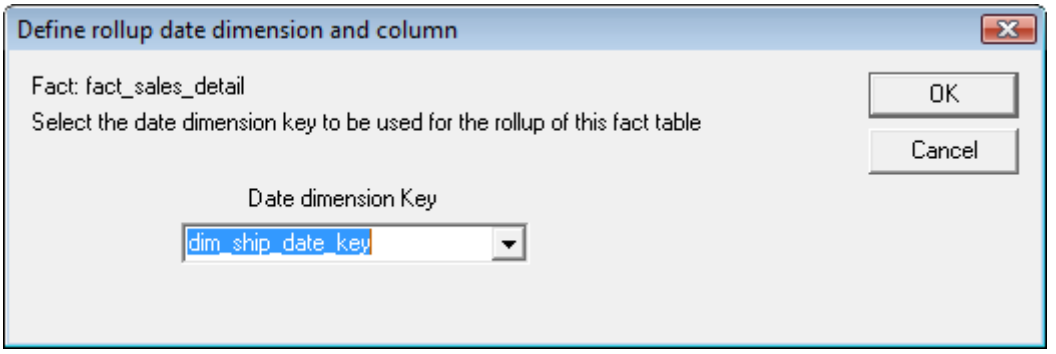
7 In the left pane, again right click on **fact_sales_analysis** and select **Properties**. In the Update Procedure field select ***Create New Procedure*** and then click **OK**.

8 Rollup tables are rolled up via a dimensional hierarchy. You will be given the opportunity to specify what to roll up on. From the dialog "Define rollup date dimension and column" select the following then click **OK**:

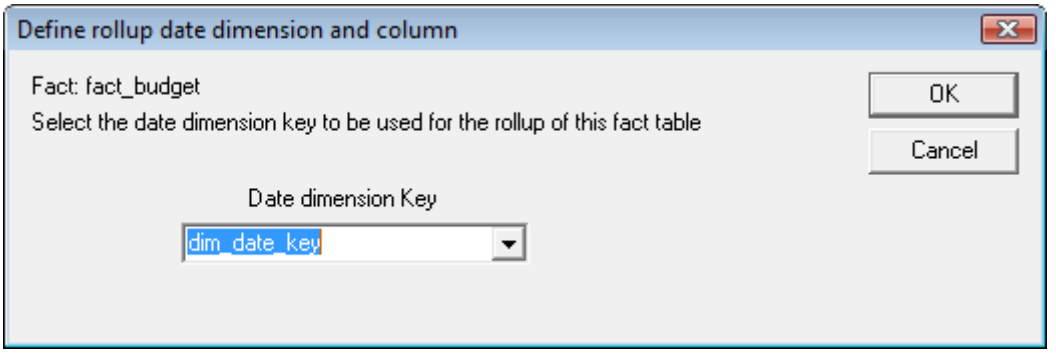
- Date dimension - **dim_ship_date**
- Rollup column - **ship_cal_month**:



9 Now select the date dimension for each of the detail tables. For fact_sales_detail, choose **dim_ship_date_key** and click **OK**:



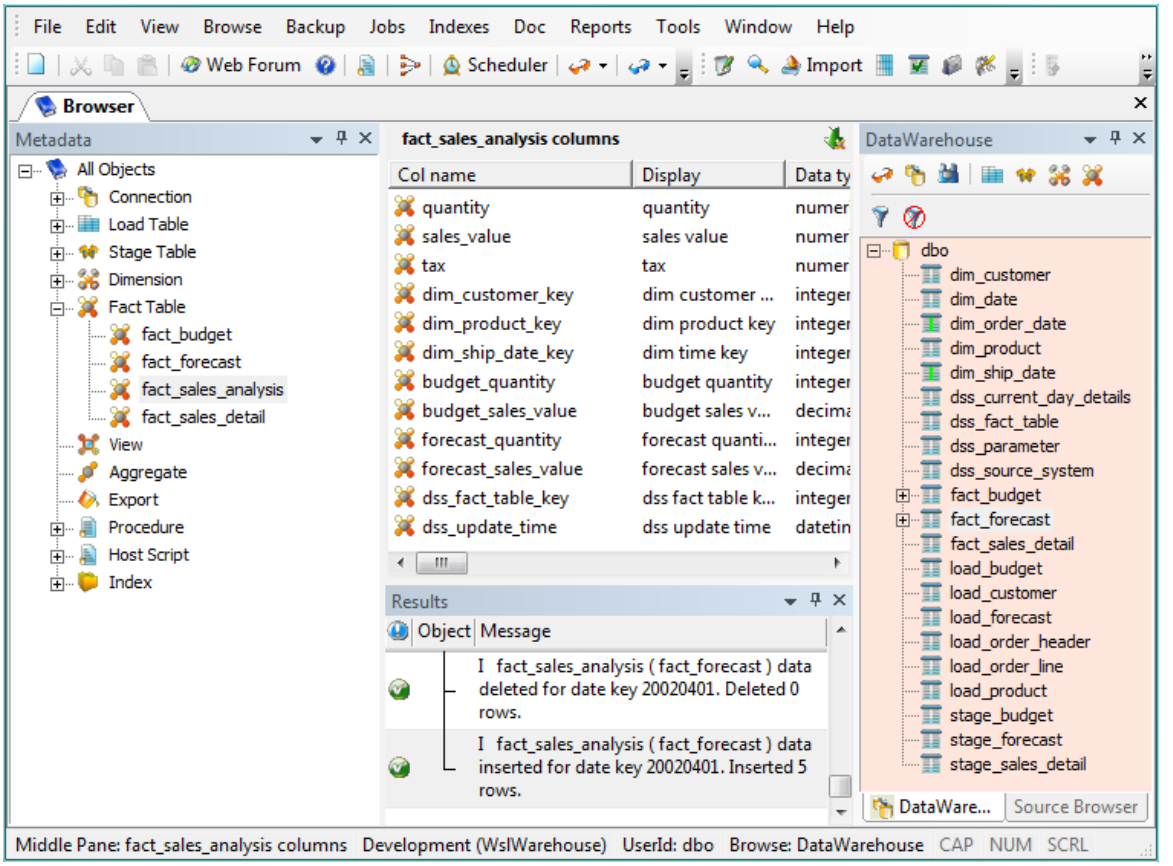
For fact_budget choose dim_date_key and click OK:



Finally for fact forecast again choose dim_date_key and click OK. This is required so QAD Data Warehouse Designer knows which dimension to use to rollup each of these detail fact tables.

10 Populate the fact rollup table by clicking the right mouse button on fact_sales_analysis and choosing Update.

Your QAD Data Warehouse Designer screen should look like this when you have finished:



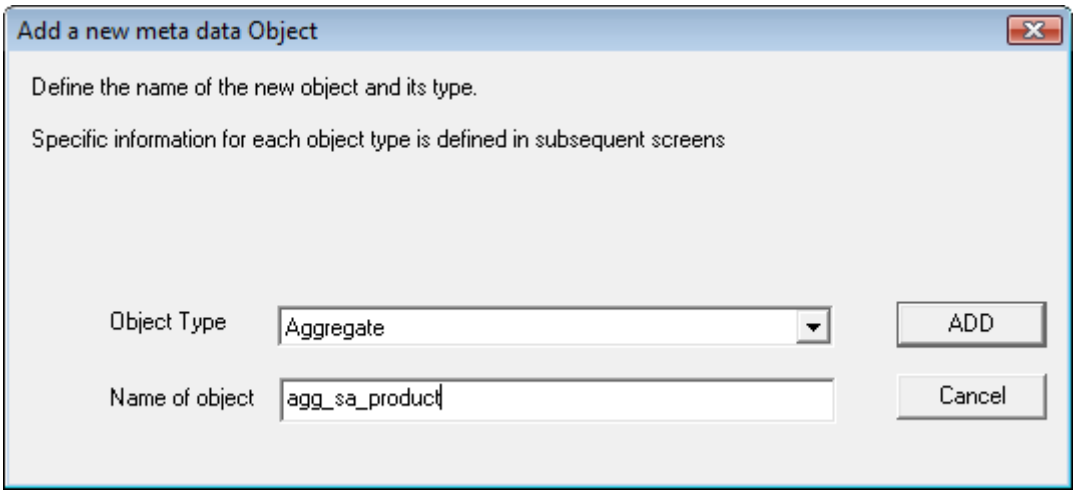
Proceed to ***Aggregate Tables*** (on page 76)

Aggregate Tables

Aggregate tables are used to improve performance. They provide a subset of the main fact table which the end user tools can navigate for a faster query time. An aggregate is typically created by the deletion of items that don't make sense when summarized and by deleting one or more of the dimension keys.

TIP: It is common practice to create two or more aggregate tables for large fact tables.

1. Double Click on the Aggregate object group in the left pane. Refresh the Data Warehouse source table in the right pane (F5).
2. From the right pane drag fact_sales_analysis into the middle pane, changing the name to agg_sa_product.



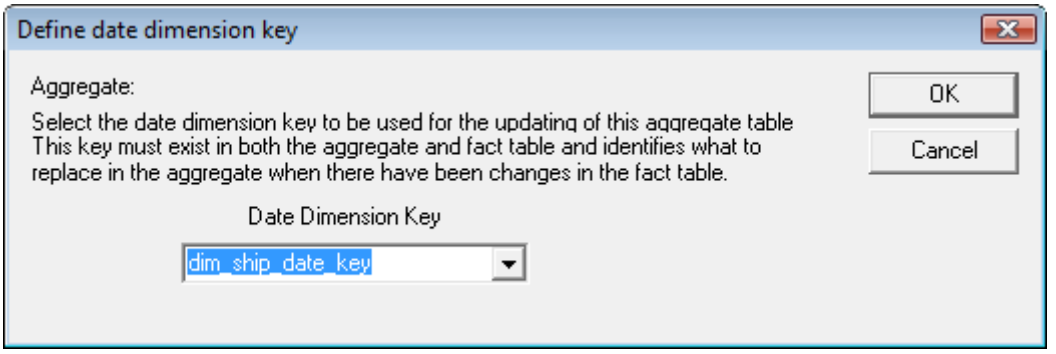
3 Click Add, then click OK from the Properties dialog.

4 Delete dss_fact_table_key so that data can be summarized from various source fact tables. Also delete dim_customer_key and dss_update_time.

5 Create the aggregate table.

6 In the left pane right click agg_sa_product and select Properties. Select ***Create New Procedure*** in the Update Procedure field.

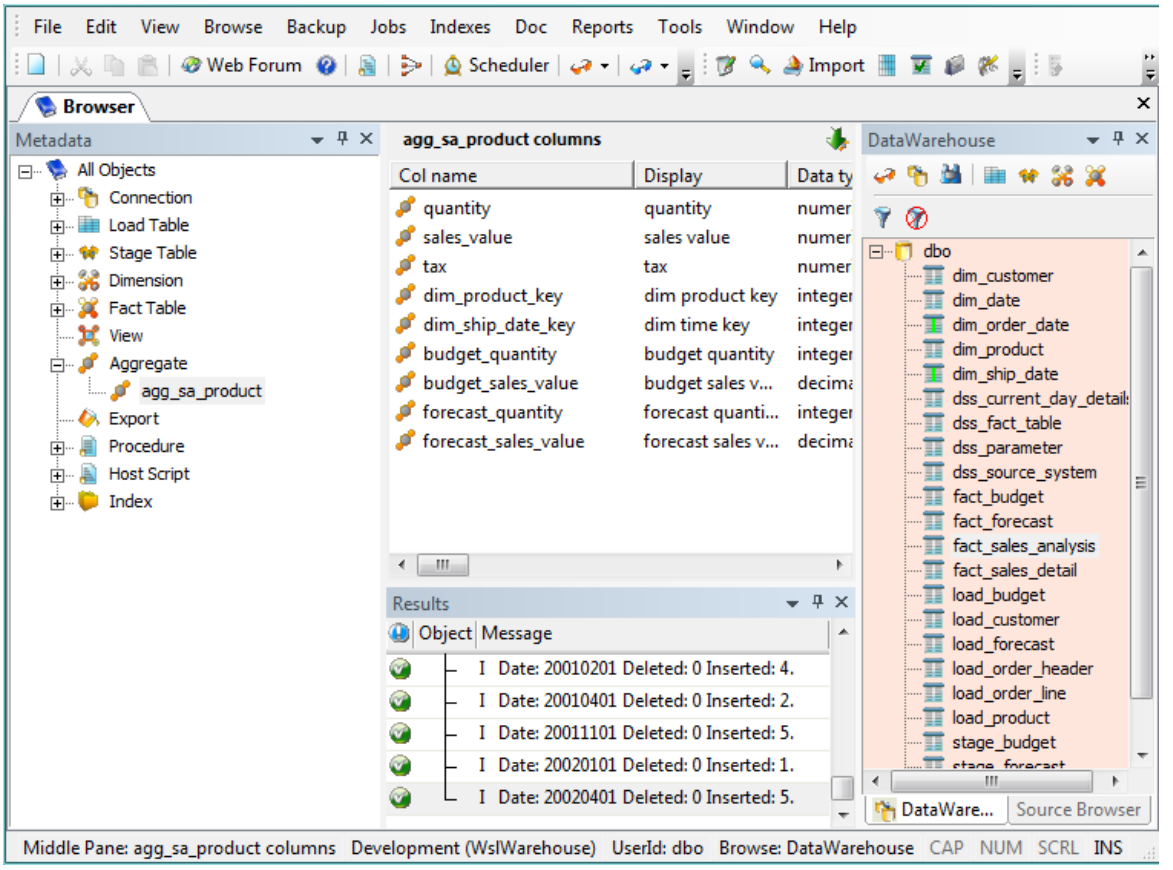
7 Select dim_ship_date_key as the date dimension key



8 Click OK and update the table.

TIP: For Oracle data warehouses. If you receive an "insufficient privileges" notification in the Procedure Results, you need to grant the following privileges to the data warehouse user:
* Create materialized view
* Query rewrite
If you are unable to do this for any reason, contact your database administrator.

Your QAD Data Warehouse Designer screen should look like this when you have finished:



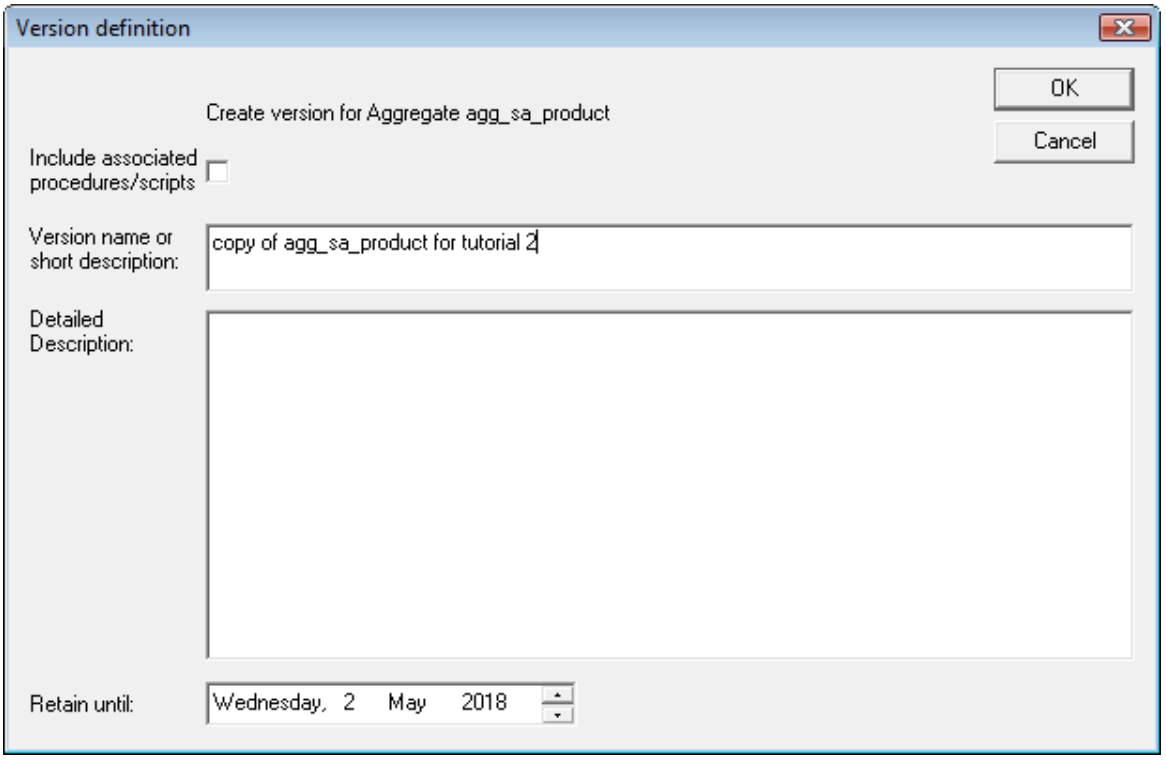
Proceed to ***Creating a Customer Aggregate*** (on page 78)

Creating a Customer Aggregate

This aggregate uses an alternative process to that described in Aggregate Tables. For this process we will create a version of the product aggregate table's metadata and create a new aggregate from this version.

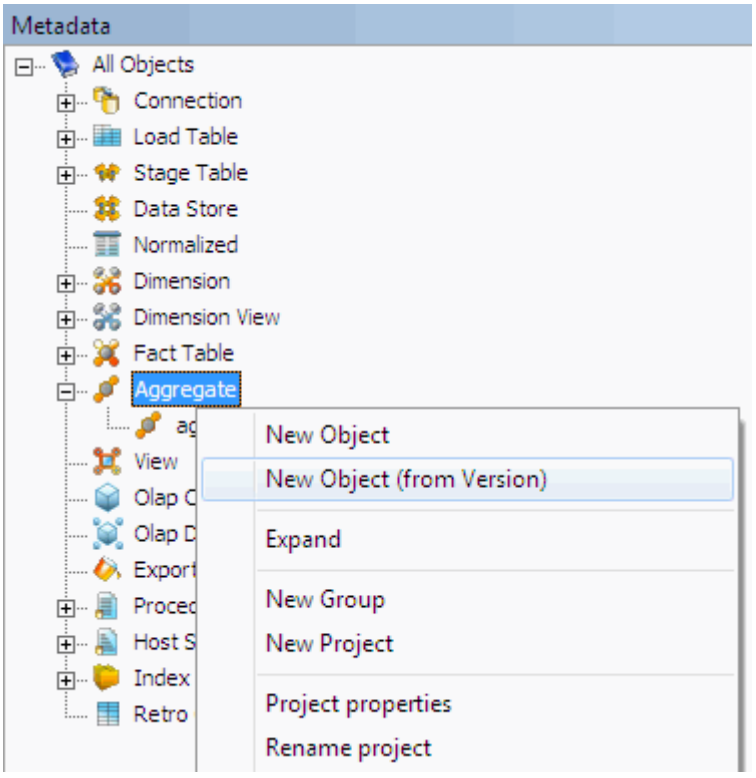
1 With the right mouse button, click on agg_sa_product and select New Version.

2 The following screen displays.

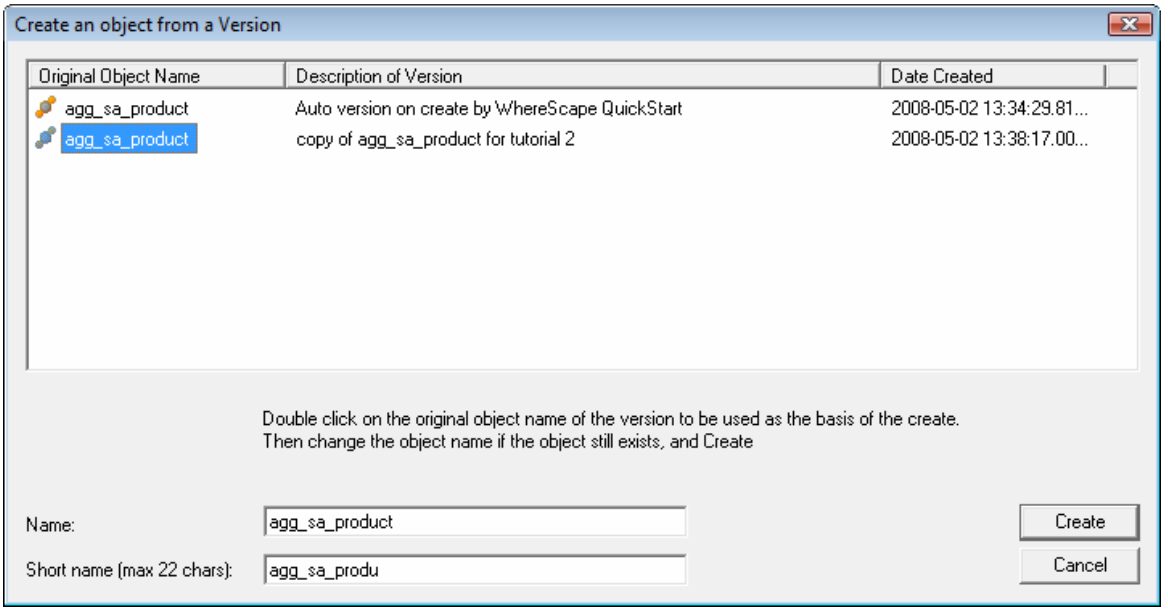


3 Enter a name for the new version and click OK.

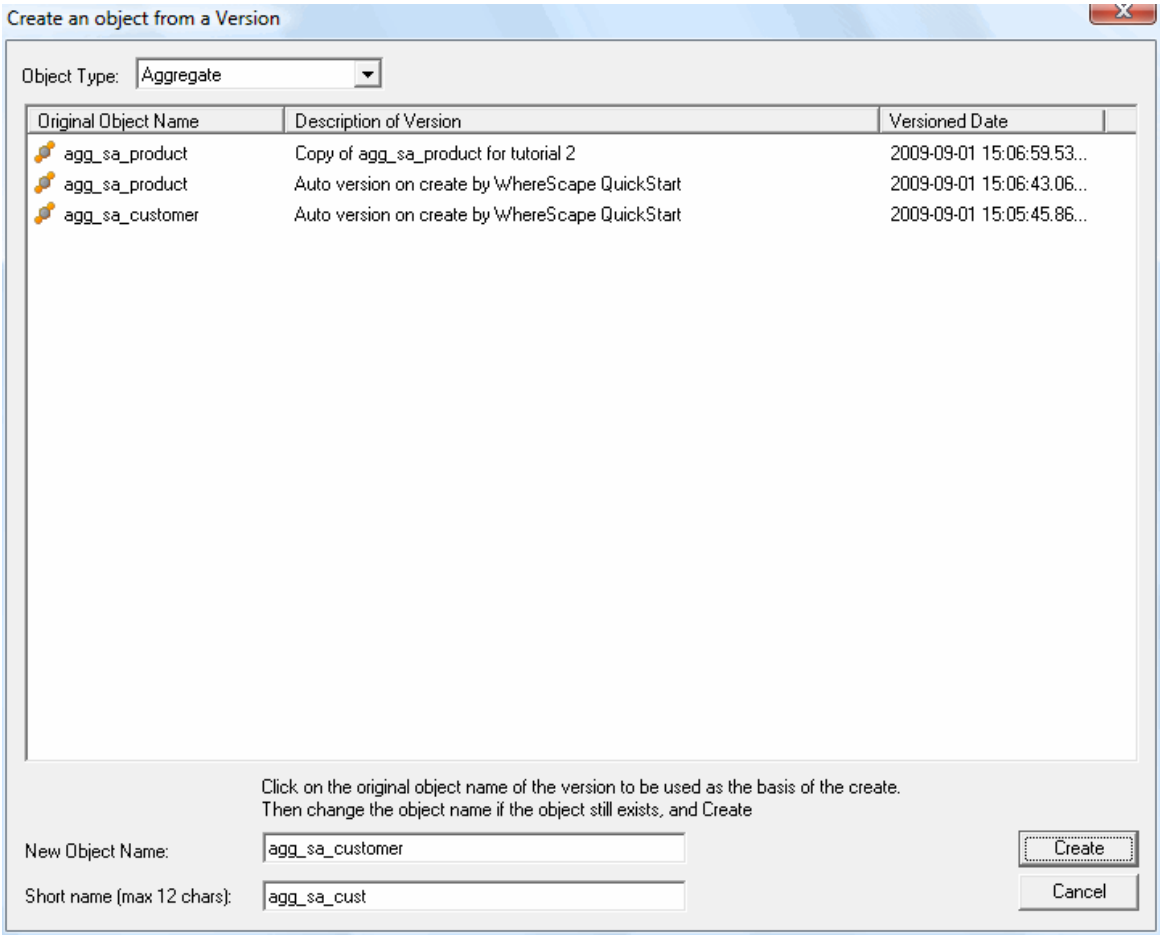
4 In the left pane, right click on Aggregate and select New Object (from Version):



5 Double click on the name agg_sa_product to select it.



6 Change the name and short name to agg_sa_customer:



Note: Short names are used by QAD Data Warehouse Designer to derive names for associated objects (such as index, procedures, cursor, etc). The table short name is limited in size to 22 characters in Oracle and SQL Server and to twelve characters in DB2. It must be unique.

7 Double click on the new agg_sa_customer table in the left pane.

8 Delete the dim_product_key column, as this will be a customer and not a product based aggregate.

9 Browse to the Data Warehouse and from the fact_sales_analysis table, drag dim_customer_key into the middle pane.

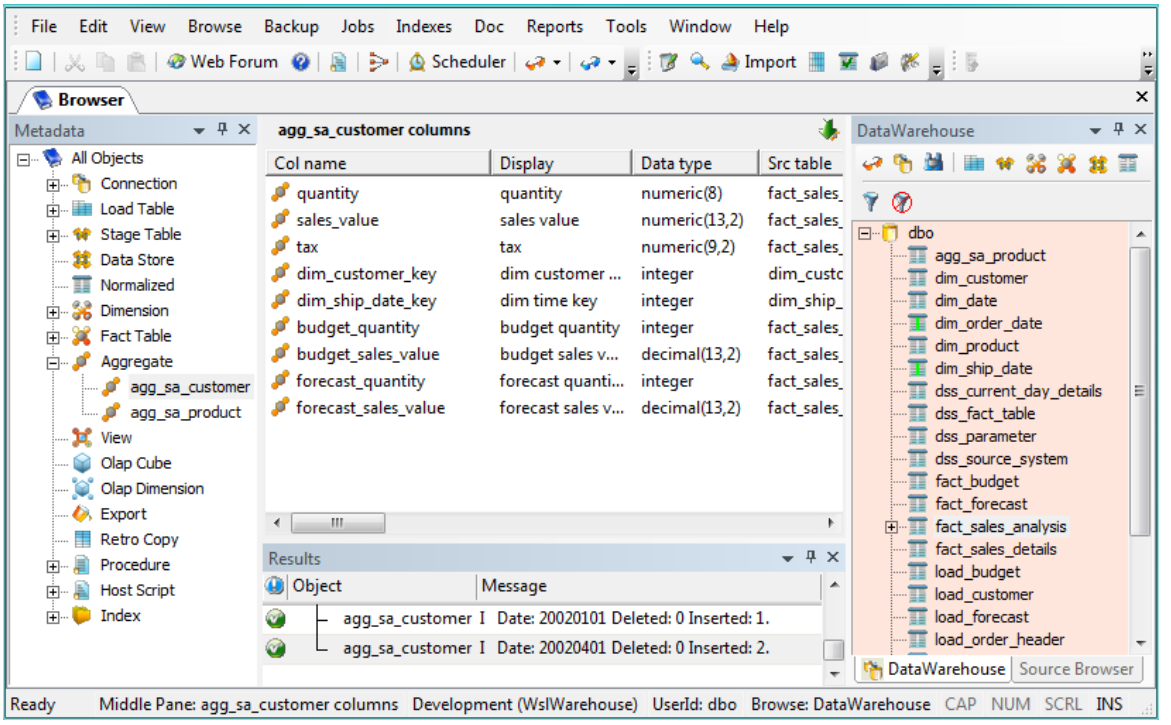
10 In the left pane right click agg_sa_customer and select Create (ReCreate).

11 In the left pane right click agg_sa_customer and select Properties. For the Update Procedure field select ***Create New Procedure ***.

12 Select dim_ship_date_key as the date dimension and click on OK.

13 Update the table using the right mouse menu from the table name.

Your QAD Data Warehouse Designer screen should look like this when you have finished:



CHAPTER 3

Tutorial 3 - Scheduling and Dependencies

Before you start on this chapter you should have:

- Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (on page 3)
- Successfully completed ***Creating a Fact Table*** (on page 47)

This chapter deals with the scheduling of the data warehouse objects created in the first tutorial.

We will cover the scheduling of a job and the editing of both the dependencies and the job.

In This Chapter

Purpose and Roadmap 84
Creating and Scheduling a Job 85
Adding Tasks 86
Task Dependencies 89
Editing a Scheduled Job 90
Job Results 92
Diagrammatical View for Jobs 94

Purpose and Roadmap

Purpose

The scheduler allows jobs (e.g. data loads and updates) to be run in background mode and/or at a pre-determined time.

In this tutorial you will learn (i) how to set-up jobs and their associated job tasks (ii) create task dependencies, and (iii) view job results.

This tutorial focuses on creating a job to update the fact_sales_detail star-schema created in Tutorial 1.

Tutorial Environment

This tutorial has been completed using Oracle. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

Tutorial Roadmap

Step in Tutorial	Section
Create a new job for 'Daily Update'.	Creating and Scheduling a Job
Add tasks to ▪ Load load_customer ▪ Load load_order_header ▪ Load load_order_line ▪ Load load_product ▪ Update dim_customer ▪ Update dim_date ▪ Update dim_product ▪ Update stage_sales_detail ▪ Update fact_sales_detail ▪ Analyze fact_sales_detail.	Creating and Scheduling Tasks
Setup task dependencies so that an analyze of fact_sales_detail occurs after the table has been updated.	Task Dependencies
Modify scheduling and runtime options (that is, edit the job properties).	Editing a Scheduled Job
Check job results.	Job Results

The tutorial starts with the ***Creating and Scheduling a Job*** (on page 85) section.

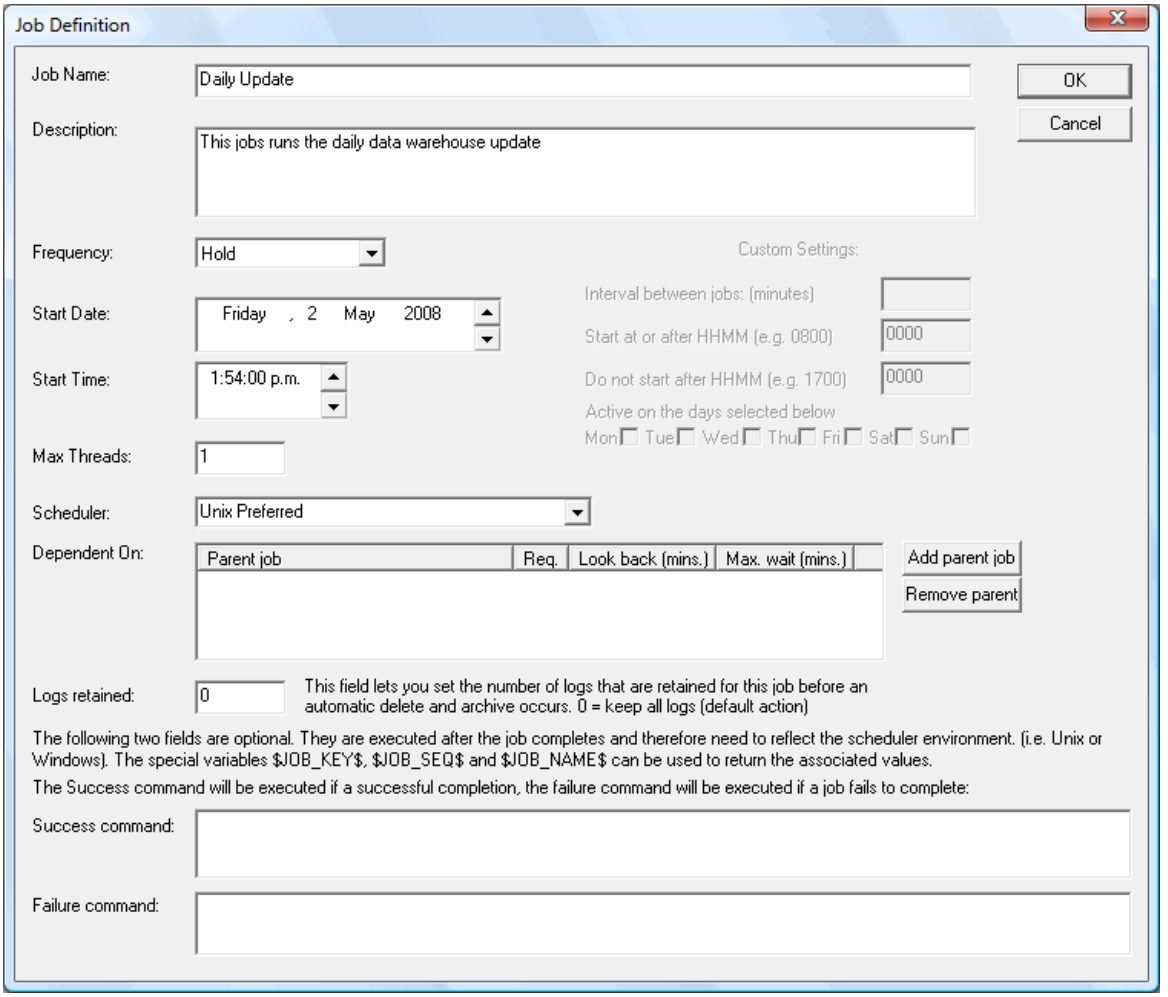
Creating and Scheduling a Job

To schedule a job click on the scheduler window button

. This will open the scheduler window. A new job can be initiated by selecting the File / New Job menu option, by clicking on the white page in the top left hand of the screen or by using the right mouse menu when in the white area of the left hand pane.

The new job dialog will appear.

1 Change the job name to 'Daily Update'

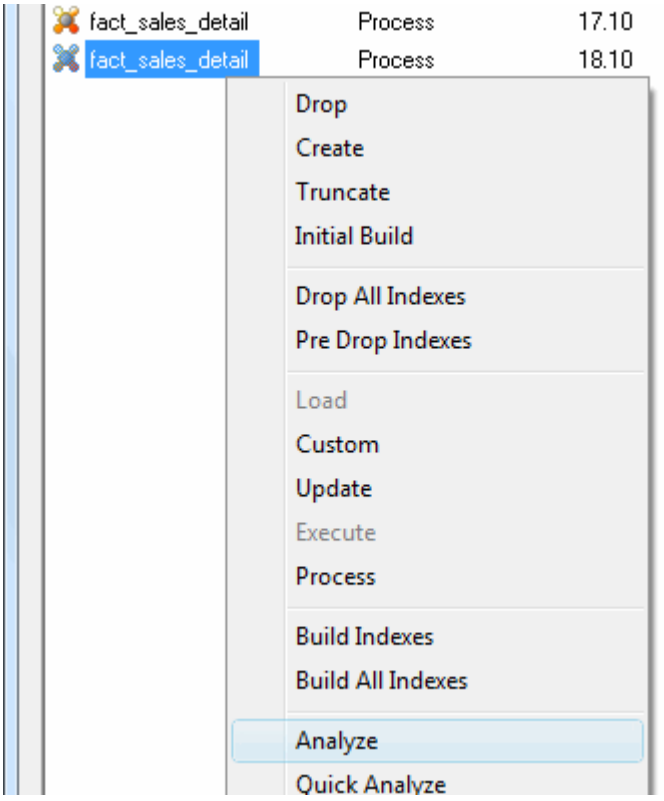


2 Click OK to proceed to ***task selection*** (see "***Adding Tasks***" on page 86).

Adding Tasks

The task selection window contains an object tree in the right hand pane. Objects are selected from this tree and added to the scheduled list of tasks in the left hand pane. Perform the following actions to schedule an update of our fact table and dimensions.

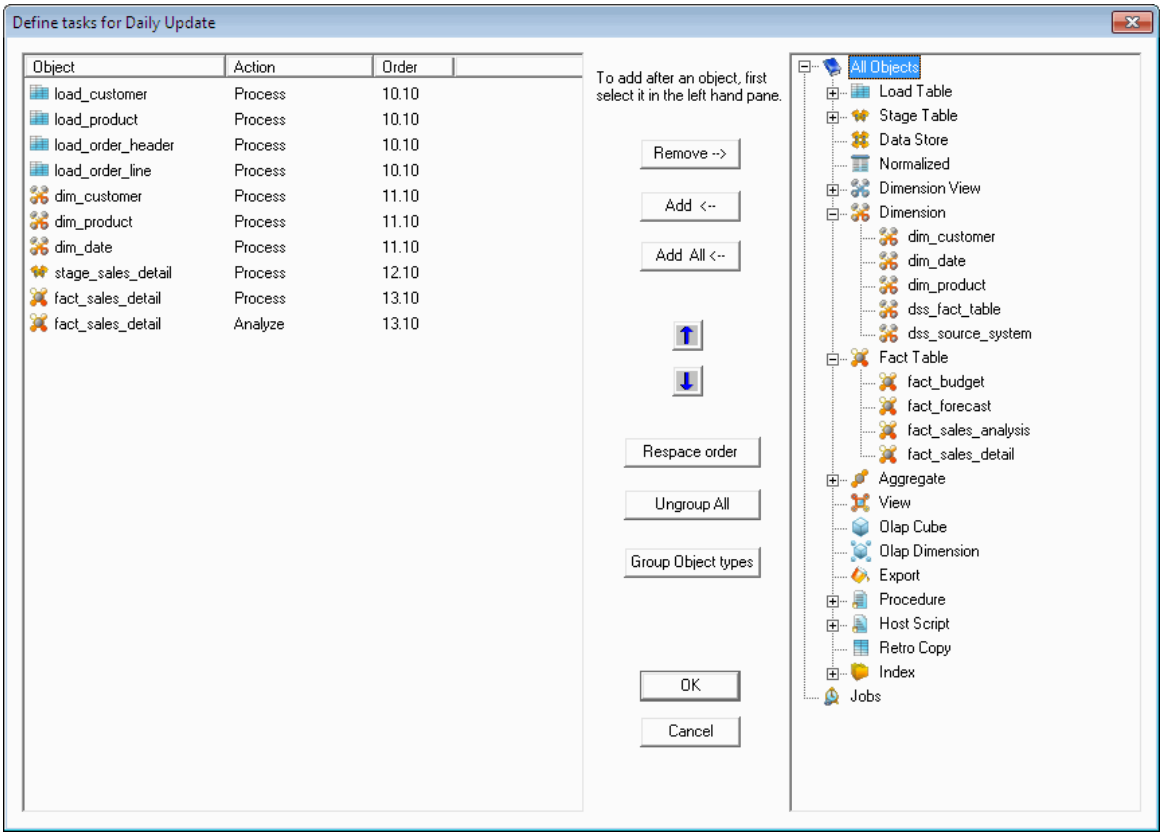
1. Open the object tree by double clicking on the All Objects project in the right hand pane.
2. Double click on the Load Table object group.
3. Double click on load_product, load_customer, load_order_line and load_order_header. Note that as each object is double clicked it is added to the left hand pane.
4. Double click on the Dimensions object group.
5. Double click on dim_customer, dim_date and dim_product. As each object is double clicked it is added to the left hand pane. We do not add the date views since they do not alter, only the underlying date dimension does.
6. Double click on the Stage Table object group to expand it and then double click on stage_sales_detail to add this object to the left hand pane.
7. Double click on the Fact Table object group to expand it and then double click on fact_sales_detail to add this object to the left hand pane.
8. Double click again on fact_sales_detail to add a second copy of this object to the left hand pane.
9. Position on the second fact_sales_detail object in the left hand pane and use the right mouse to bring up the pop-up menu. Select the Analyze option from this menu:


fact_sales_detail Process 17.10
fact_sales_detail Process 18.10
Drop
Create
Truncate
Initial Build
Drop All Indexes
Pre Drop Indexes
Load
Custom
Update
Execute
Process
Build Indexes
Build All Indexes
Analyze
Quick Analyze

The 'Order' column defines the basic dependencies of the tasks. If the two numbers are the same, then the tasks can run at the same time. In this example no tasks will run at the same time. The job will process the tasks sequentially.

Click the 'Group object types' button. You will note that the order number for tasks of the same type now have the same two numbers. This will allow objects of the same type to run concurrently. (i.e. all the load tables can be processed at the same time if there are sufficient processing threads).

Your task selection window should now look like the following:



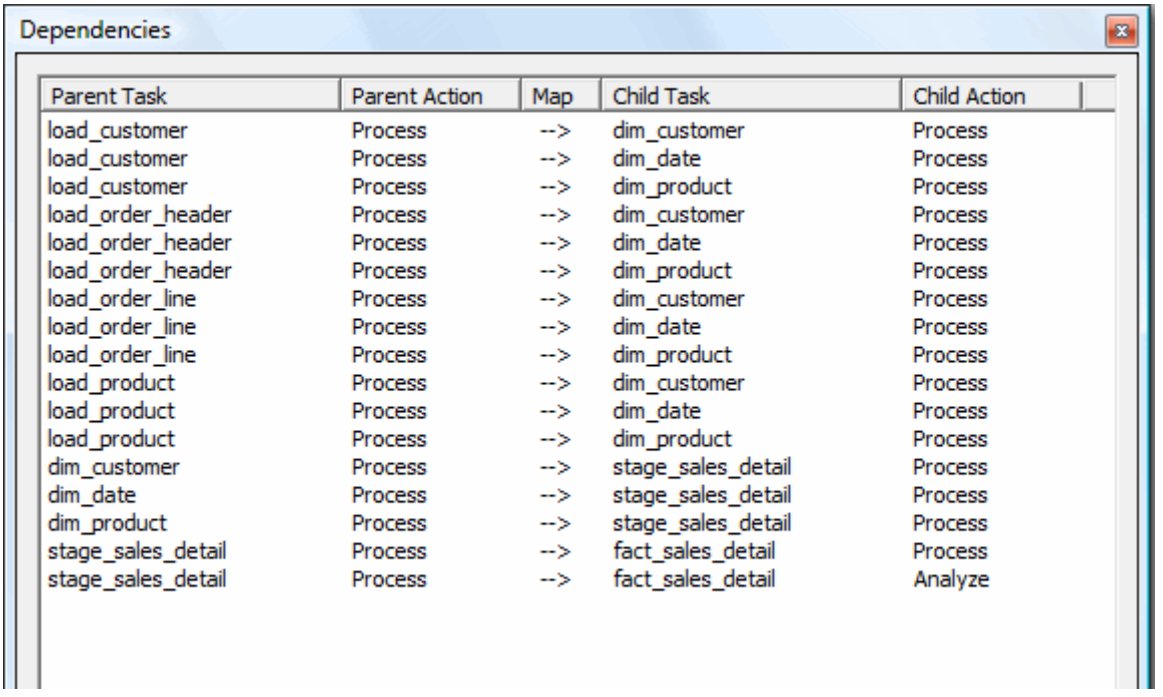
Notice that the tasks all have an action of Process with the exception of the last task which is set to 'Analyze'.

The fact table fact_sales_detail has two actions. The first will process and update the table, the second will analyze the table. At present these two actions can run at the same time. They should however be sequential. We could alter the order of the second task by using the right mouse menu option 'Increase the order'. This would be the normal method, but we will leave these two tasks with the same order and address the sequence of events in the next section ***Task Dependencies*** (on page 89).

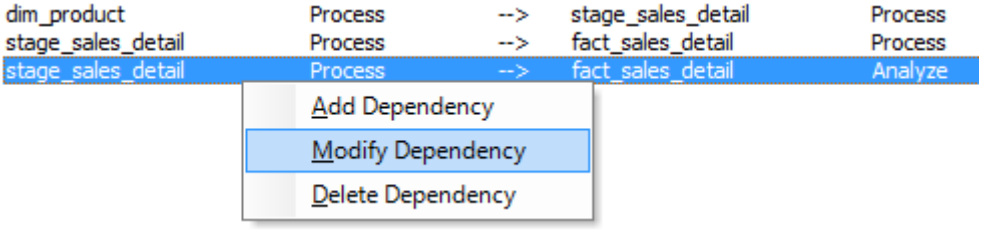
Task Dependencies

A scheduled job that is in a 'Hold' or 'Waiting' state can have its task dependencies altered. To alter the dependencies for our newly defined job proceed as follows:

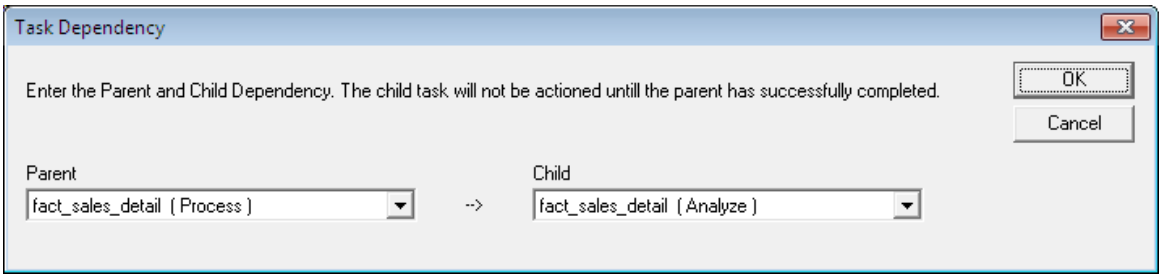
1. Click on the 'All Jobs' button in the toolbar. Our daily update job will be displayed in the top pane.
2. Position over the job name 'Daily Update' and using the right mouse pop-up menu select Edit Dependencies. A list of the current task dependencies will be displayed. You will see that the final two dependencies are from stage_sales_detail to each of the fact table tasks:



3. Position on the 'Parent task' for the last dependency and using the pop-up right mouse menu select Modify Dependency:



4 Change the Parent task from stage_sales_detail (Process) to fact_sales_detail (Process). Click OK to record the change. An example of this change is shown in the screen shot below:



5 Examine the new dependency list and see that the fact processing will now occur after the stage processing and the fact analyze will occur after the fact processing.

We are now ready to release the job. This is done by ***Editing a Scheduled Job*** (on page 90).

Editing a Scheduled Job

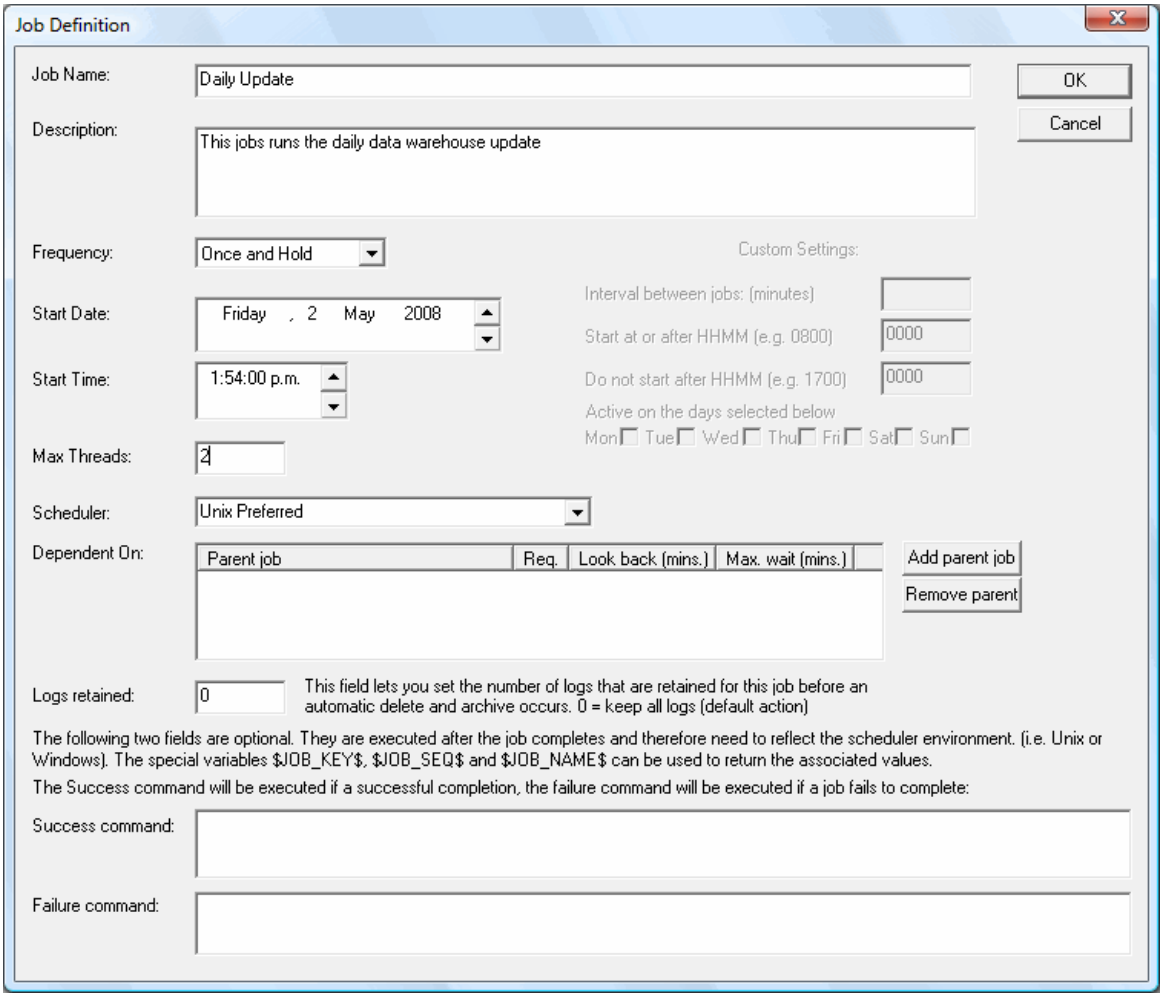
Our job is now all set-up and ready to be released. We need to edit the job and change it from a held job to one that the scheduler can action. Proceed as follows:

1 Click on the 'All Jobs' button in the toolbar. Our daily update job will be displayed in the top pane. Note that it is in an 'On Hold' state.

2 Position over the job name 'Daily Update' and using the right mouse pop-up menu select Edit Job. The job definition screen will re-appear.

3 Change the Frequency to 'Once and Hold'. This will result in the job being run and then a copy of the job being placed back in an 'On Hold' state so that it may be rescheduled for some future processing. Note that other options exist under Frequency including 'Daily', 'Custom' etc.

4 Change the Max Threads counter to 2. This will allow two tasks to run concurrently. This may not be a big help here, as the run should be very quick.

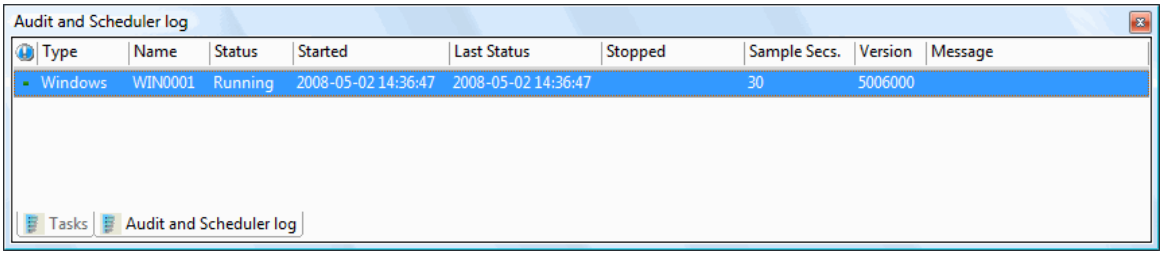


5 Click OK to save the changes.

6 Click on the 'All Jobs' button in the toolbar. Our daily update job will be displayed in the top pane. Note that its state should now be 'Waiting' or maybe 'Running'. If the job is in the 'Running' state we can double click on the Job name to see the state of the individual tasks.

TIP: If you don't need to change a job and wish to run it immediately, choose Start the Job from the job's popup menu.

7 If the job does not go into a 'Running' state after 30 seconds, check that a scheduler is running by clicking on the 'Scheduler Status' in the scheduler menu:



8 If no schedulers are running, refer to the Setup and Administration Guide on how to start a scheduler.

Proceed to the next section to analyze the ***job results*** (on page 92).

Job Results

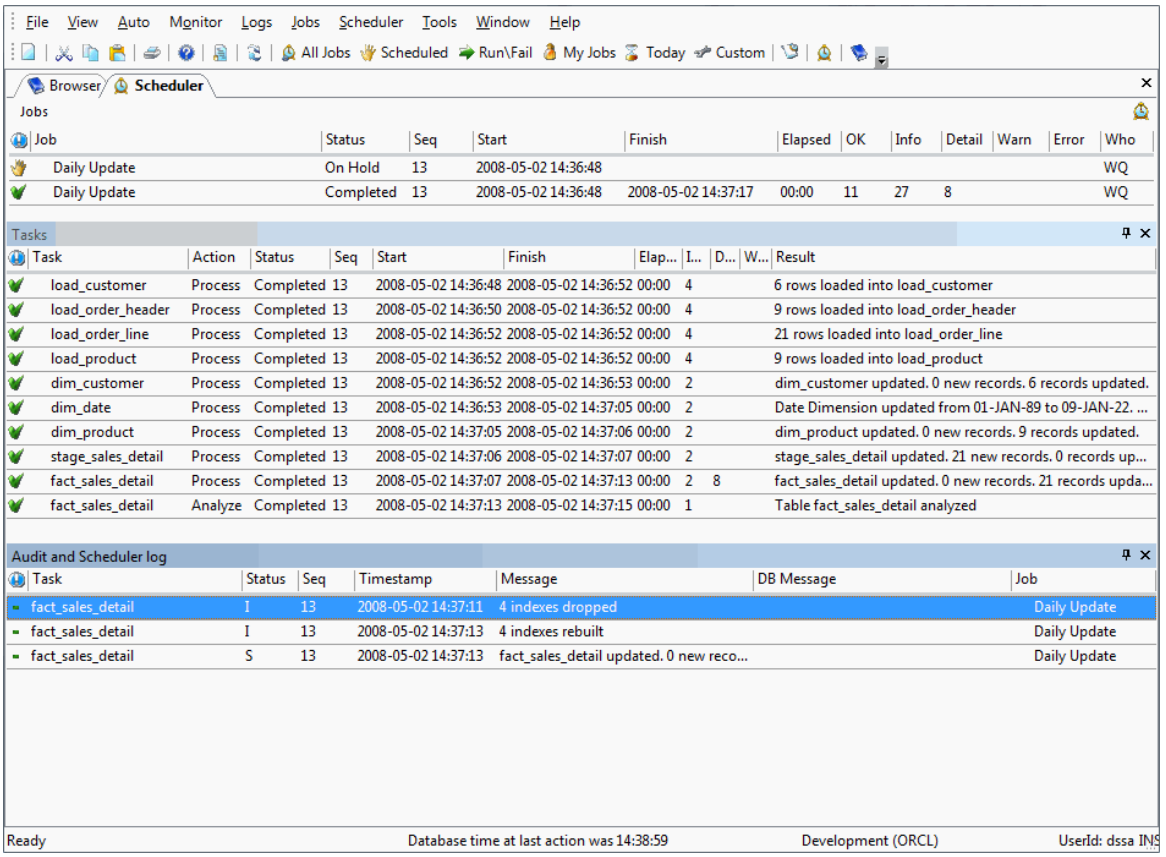
Once a job has completed, or in fact while it is running, we can check on the results of each of the tasks by proceeding as follows:

1 Click on the 'All Jobs' button in the toolbar. Our daily update job will be displayed in the top pane. Note that if the job has started or is completed there will be two entries. One is in an 'On Hold' state and one is in a 'Completed', 'Running' or 'Failed' state.

2 Position over the job with name 'Daily Update' and in a 'Completed', 'Running' or 'Failed' state and double click the left mouse button. The individual tasks within the job will be displayed.

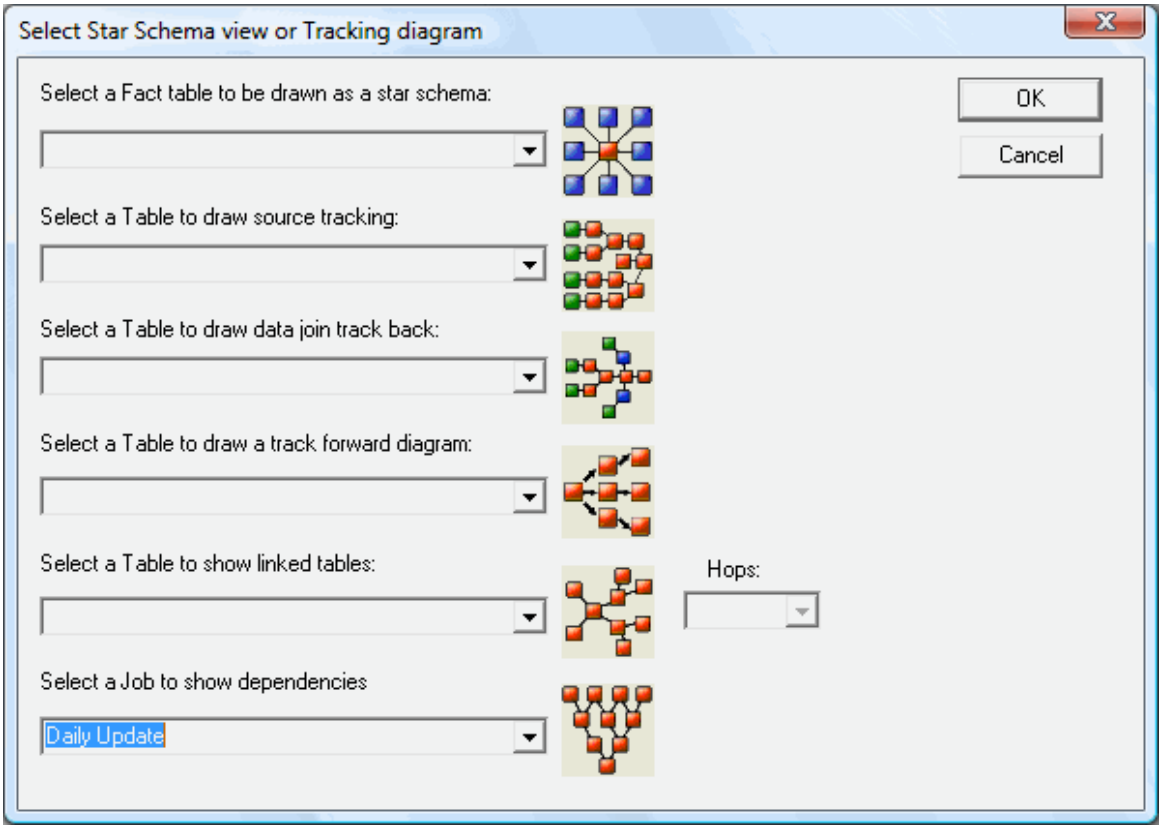
3 Position on the fact_sales_detail task with action Process and double click the left mouse button. The messages returned from this task will now be displayed. These messages should include information on any indexes dropped and created.

Your QAD Data Warehouse Designer screen should look like this when you have finished:



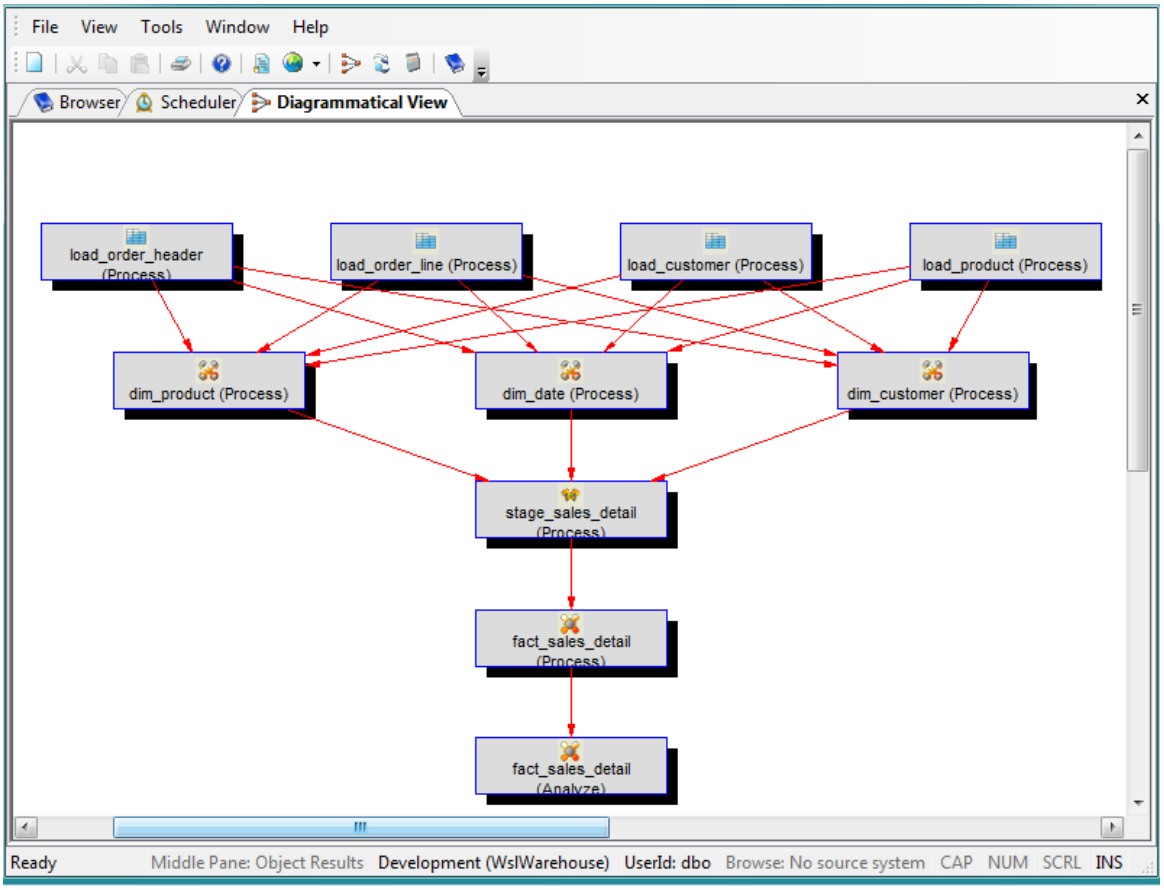
Diagrammatical View for Jobs

QAD Data Warehouse Designer provides the ability to diagrammatically view the job dependencies for the job you have created. To switch to the diagrammatical view, click on the button. Click the button again to bring up the diagram selector box. Select a the job name from the Select a Job to show dependencies drop-down list box – in this instance Daily Update:



Click OK.

The diagram looks like this:


File View Tools Window Help
Browser Scheduler Diagrammatical View
load_order_header (Process)
load_order_line (Process)
load_customer (Process)
load_product (Process)
dim_product (Process)
dim_date (Process)
dim_customer (Process)
stage_sales_detail (Process)
fact_sales_detail (Process)
fact_sales_detail (Analyze)
Ready
Middle Pane: Object Results
Development (WslWarehouse)
UserId: dbo
Browse: No source system
CAP NUM SCRL INS

CHAPTER 4

Tutorial 4 - Complex Dimensions and Hierarchies

Before you start on this chapter you should have:

- Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (on page 3)
- Successfully completed ***Creating a Fact Table*** (on page 47)

This chapter deals with fine tuning the data warehouse by creating complex dimensions and hierarchies.

In This Chapter

Tutorial 4 - Purpose and Roadmap..... 98
Creating a Slowly Changing Dimension..... 99
Multiple Source Table Dimension..... 106
Creating a Dimension Hierarchy..... 112

Tutorial 4 - Purpose and Roadmap

Purpose

This tutorial will walk you through the process to:

- Create a slowly changing dimension
- Creating a complex dimension with multiple table sources
- Adding hierarchies to a dimension for external maintenance and for use in Analysis Services cubes.

In short, this tutorial alters the existing customer and product dimensions. The customer dimension is converted to a slowly changing dimension and the product dimension has its content enriched from additional data sources. Hierarchies are built on all dimensions that will be used in the next tutorial.

Tutorial Environment

This tutorial has been completed using Oracle. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

Tutorial Roadmap

This tutorial works through a number of steps. These steps and the relevant section within the chapter are summarized below to assist in guiding you through the tutorial.

Step in Tutorial	Section
Convert the customer dimension to a slowly changing dimension.	Creating a slowly changing dimension
Add additional data sources to the product dimension	Multiple source table dimension
Create hierarchies for the following tables: ▪ dim_date ▪ dim_customer ▪ dim_product	Creating a dimension hierarchy

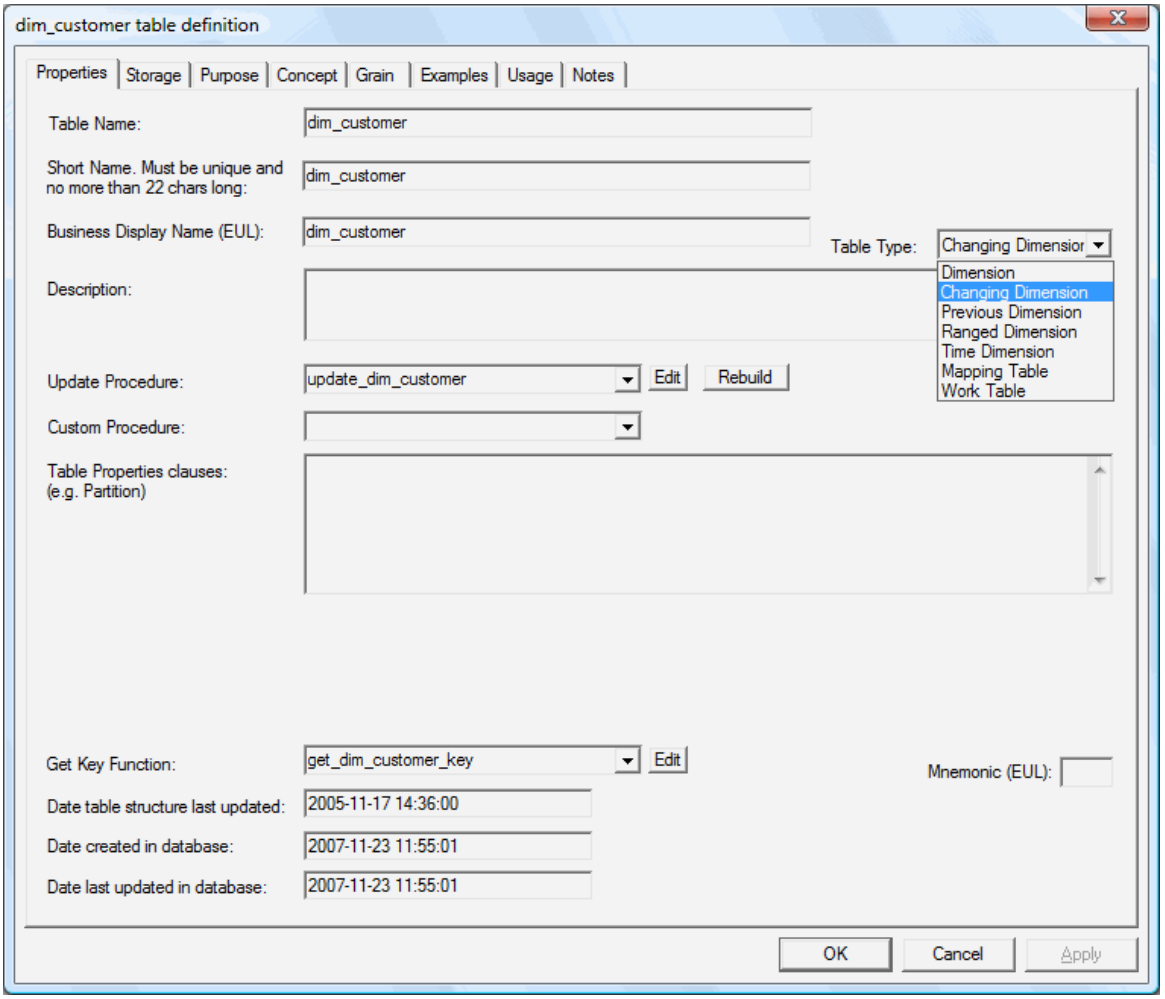
This tutorial starts with the section ***Creating a slowly changing dimension*** (on page 99)

Creating a Slowly Changing Dimension

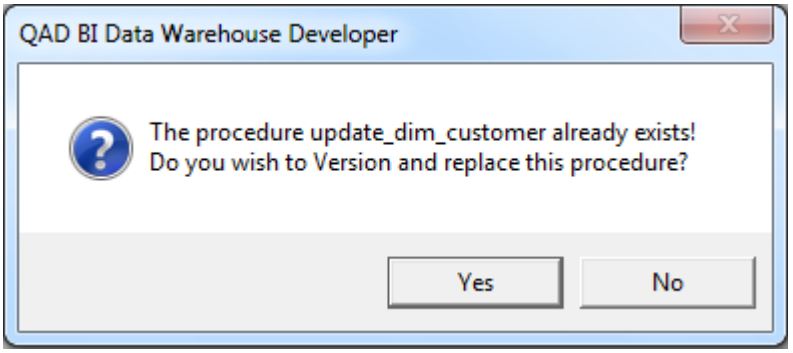
The process of creating a slowly changing dimension is largely the same as creating a normal dimension. Two additional questions are asked during the dimension creation process when the 'Slowly changing dimension' button is chosen during the dimension create. In this section we will cover the more common scenario of changing an existing normal dimension to a slowly changing dimension.

The dimension dim_customer created in tutorial one will be changed to a slowly changing dimension.

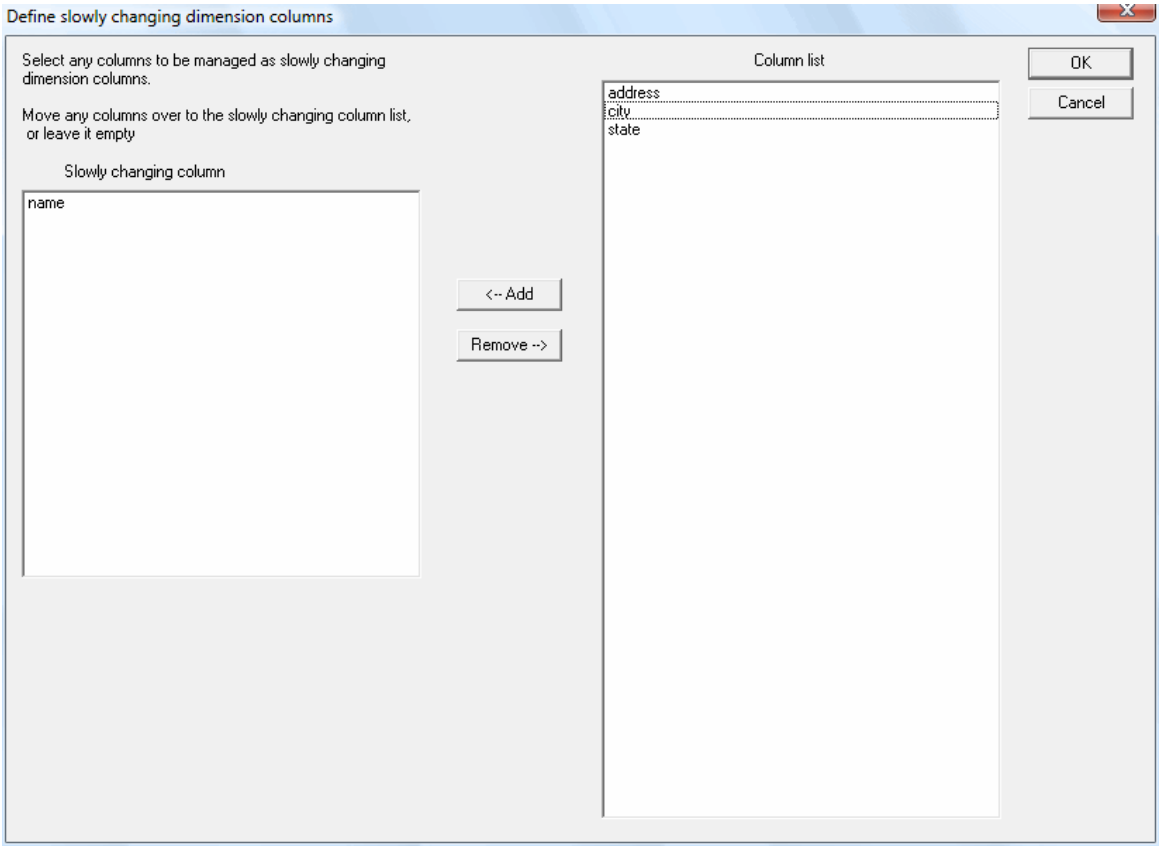
1. Using the right mouse menu when positioned on the object dim_customer select Properties.
2. On the dimension properties change the 'Update procedure' drop down to select '*** Create New Procedure ***'.
3. Use the 'Table Type' drop down to select 'Changing Dimension':



4. Click OK to leave the properties page.
5. You will be asked if you wish to version and replace the update and get key procedures. Answer Yes to both prompts.

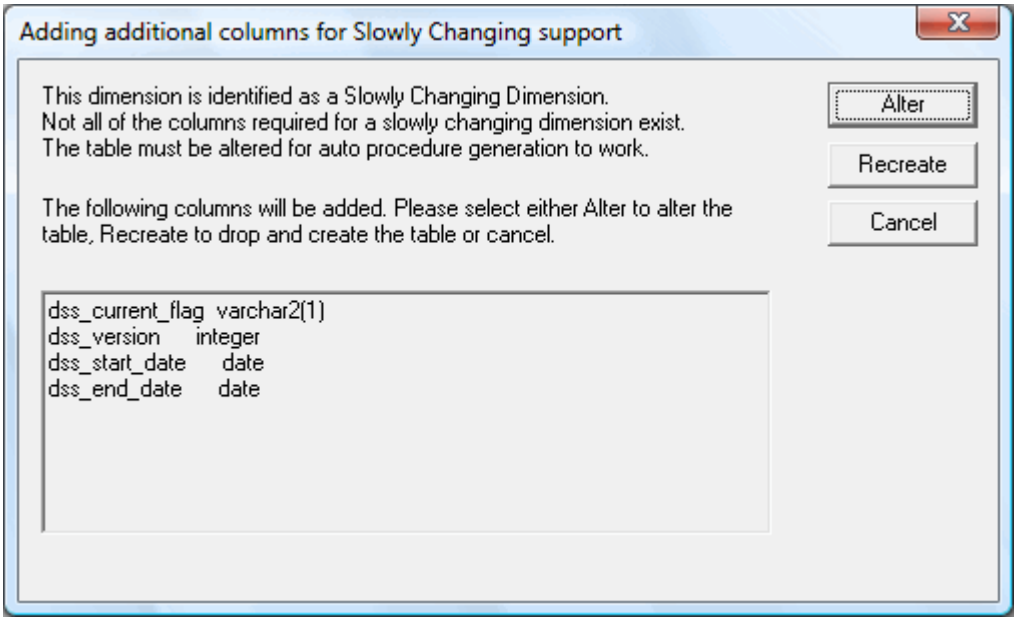


6. The 'Define dimension business key(s)' dialog will be presented. The existing business key 'code' should already be the default value so click OK to proceed to the next screen.
7. The 'Define slowly changing dimension columns' dialog will now be presented. Multiple columns can be selected to be handled as slowly changing. Select 'name' and add it to the list of slowly changing columns. Double click on the column 'name':

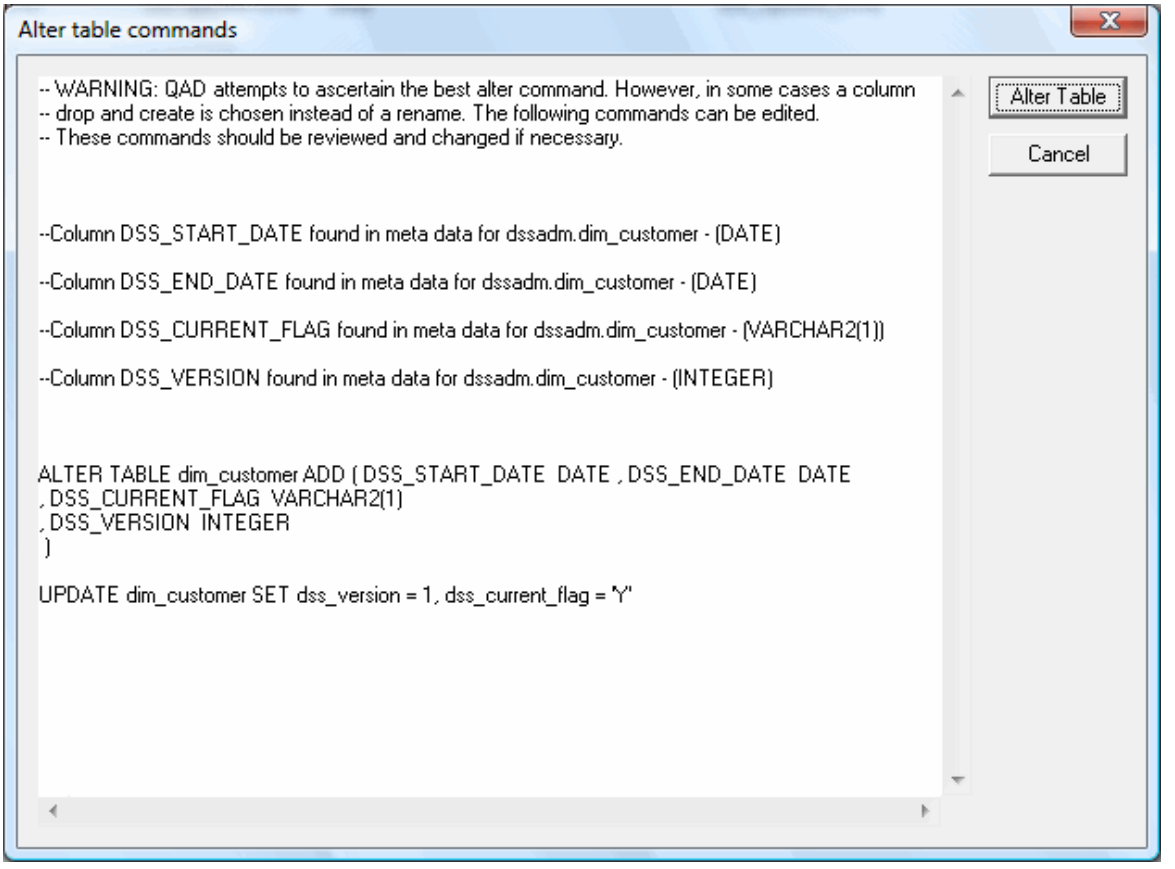


8 Click OK. Refer to the Dimensions chapter for an explanation of slowly changing dimensions.

9 A dialog box will appear indicating that a number of additional columns will need to be added to the dimension table in order to support a slowly changing model. The table can be Altered (i.e. the columns added to the table) or re-created. As we have fact tables that use this dimension we cannot re-create the table. To do so would make all of the joins in the fact tables to this dimension invalid. Therefore we will alter the dimension. Click the 'Alter' button.

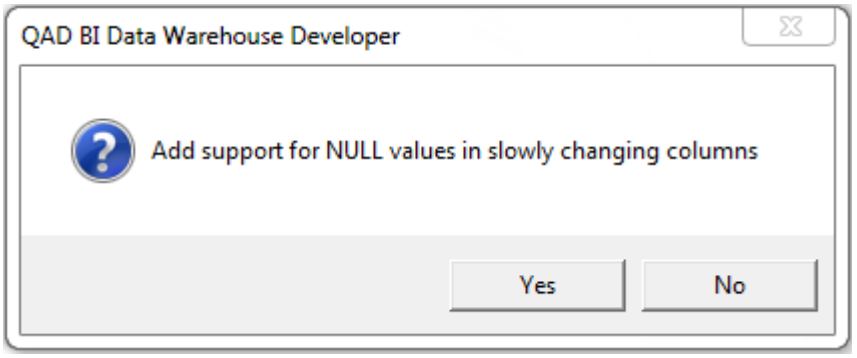


10 A dialog will now be presented with the SQL commands that will be executed to add the new columns and set default values for the dss_version and dss_current_flag columns. Click the 'Alter Table' button to alter the table in the database. It is worth noting that whenever a database table is altered from within QAD Data Warehouse Designer the SQL commands should be reviewed. These commands can be changed if a different result is required.



11 A message box will appear informing you that the table was altered in the database. Click OK.

12 A dialog box will appear asking if you want to allow NULL support for the slowly changing columns. The normal response would be No. Refer to the Dimensions chapter for a detailed explanation. Click the 'No' button.

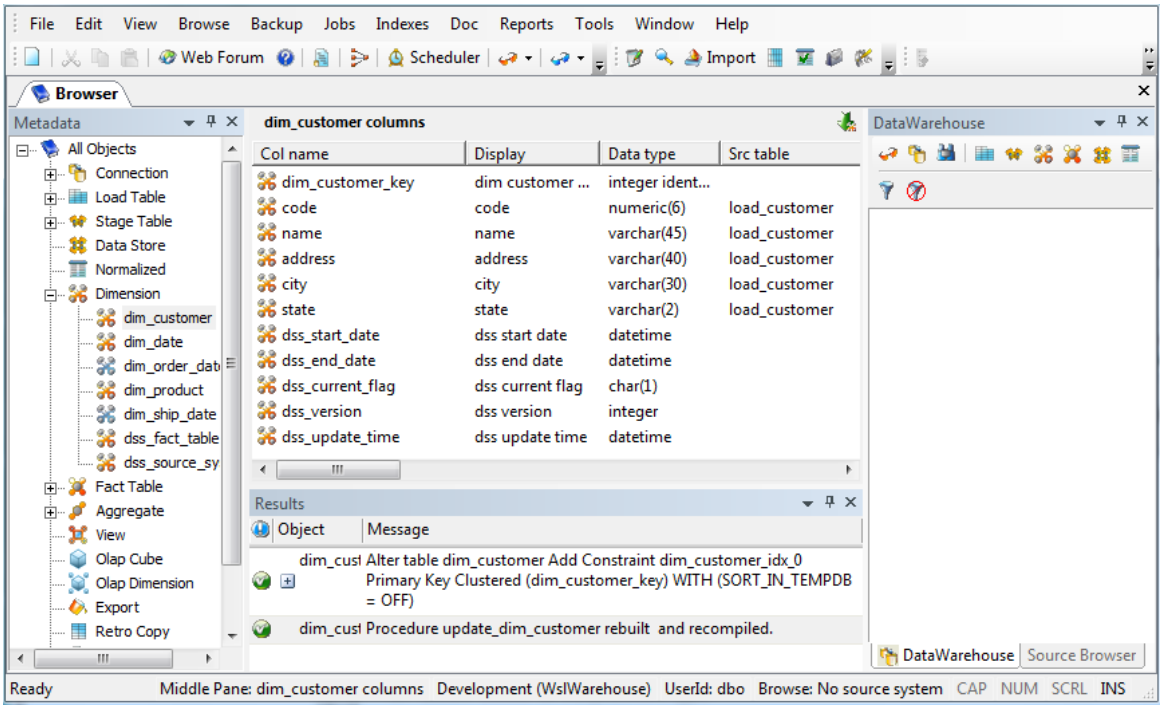


13 The results dialog will show the indexes that were created / re-created for the dimension.

Note: there is a new index with a suffix of _SC to support the slowly changing dimension.

The dimension has now been converted to a slowly changing dimension. If a customer now has a name change a new version of the customer record will be created to allow the tracking of the customer by both the old and new name.

Your QAD Data Warehouse Designer screen should look like this when you have finished:



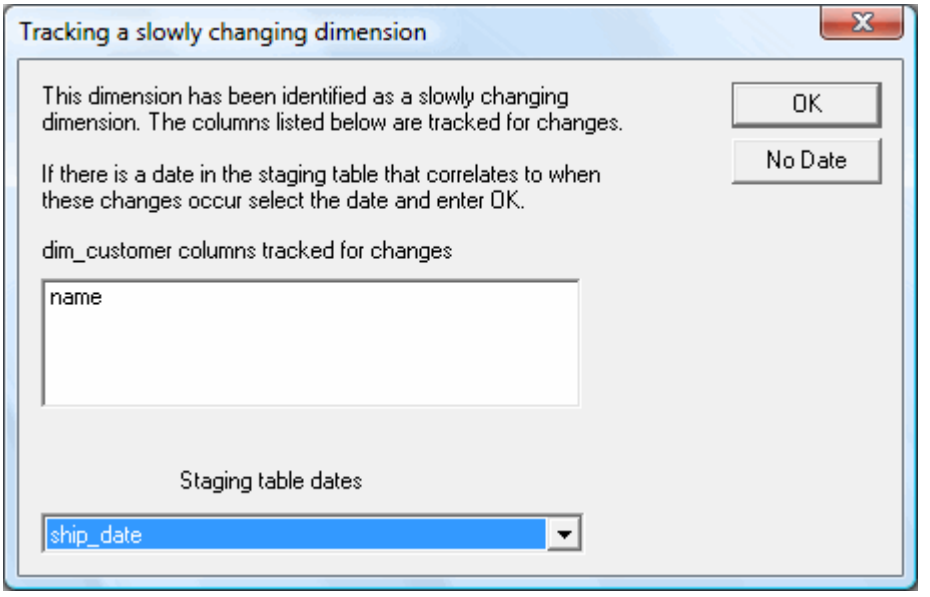
Note: This conversion to a slowly changing dimension has changed the get key function for the dimension. This function is called from the stage tables that use this dimension. We must now rebuild the update procedures for the stage tables that use this dimension.

Rebuild Stage Update Procedures

As the customer dimension is used in the stage tables stage_sales_detail, stage_budget and stage_forecast we will need to rebuild these procedures. Proceed as follows:

1. Select the stage_sales_detail table and using the right mouse menu choose Properties.
2. Use the 'Update procedure' drop down to select '*** Create New Procedure ***'.
3. Click OK to leave the properties page.
4. Answer YES to the procedure versioning question.
5. Select Cursor for the procedure type.
6. Click OK on the screen informing of multiple source tables.
7. Accept the previous entries by clicking OK on the cursor mapping screen.
8. Click OK on the business key join for each of the dimensions. The previously chosen business key should be the default value provided.

9 An additional dialog will appear after the customer dimension join. Select ship_date from the date list and click OK.



10 Click OK on any other dimension joins and the business key from the stage table.

11 The update procedure will now be rebuilt to handle the fact that the customer dimension is now slowly changing. Repeat steps (1) through (10) for the other stage tables stage_budget and stage_forecast. Use the dates budget_date and forecast_date to track the dimension changes.

You have now successfully converted the dimension dim_customer to a slowly changing dimension, and made all dependent changes.

Multiple Source Table Dimension

Dimensions typically get their information from multiple sources. A common scenario is to have a series of codes that relate to the dimension. The description of these codes are often stored in a code lookup table. The following example will clarify the practice of producing a dimension from multiple source tables.

The dimension dim_product created in tutorial one will be enhanced to provide additional descriptions for the code values already present.

1 Browse to the tutorial connection that was created in tutorial one. Click on the blue glasses or select the Browse/Source tables menu option. The tutorial tables should now be shown in the right hand pane.

2 We need to acquire a number of additional source tables from the tutorial database. Double click on the Load Table object group in the left hand pane. This will list all the load tables in the middle pane and make the middle pane a drop target for additional load tables.

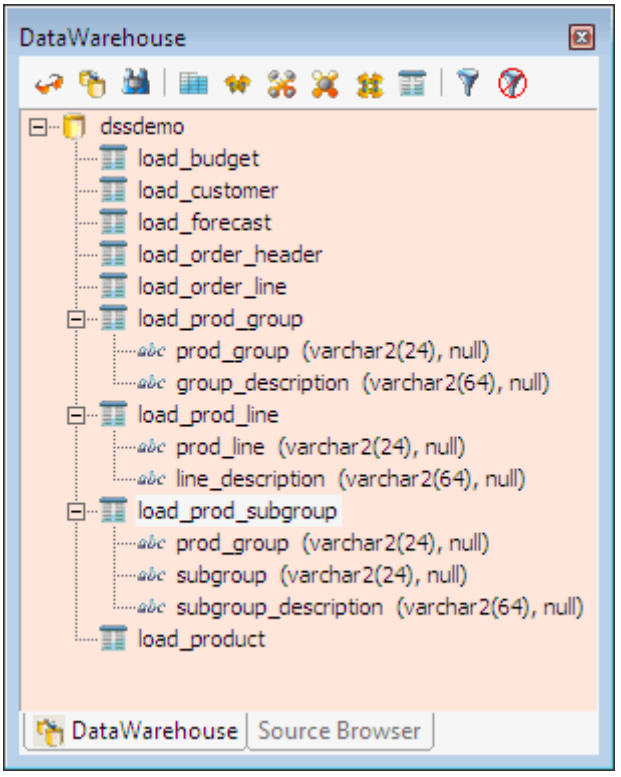
3 Select the prod_group table from the right hand pane and holding the left mouse down drag to the middle pane. Click Add to add the new object and then OK on the properties screen. Select the 'Create and Load' button.

4 Repeat steps (2) and (3) above to bring in and load from the prod_subgroup and prod_line tables.

5 In the left hand pane double click on dim_product. This will display all of the dimension columns in the middle pane and make the middle pane a drop target for additional dimension columns. We will be adding descriptions to it.

6 Browse to the Data Warehouse connection. The right hand pane should now show the data warehouse tables. You can position the mouse in this right hand pane and select the right menu option 'Filter - Load' to restrict the display to just load tables.

7 Expand load_prod_group, load_prod_subgroup and load_prod_line by double clicking on each table name.

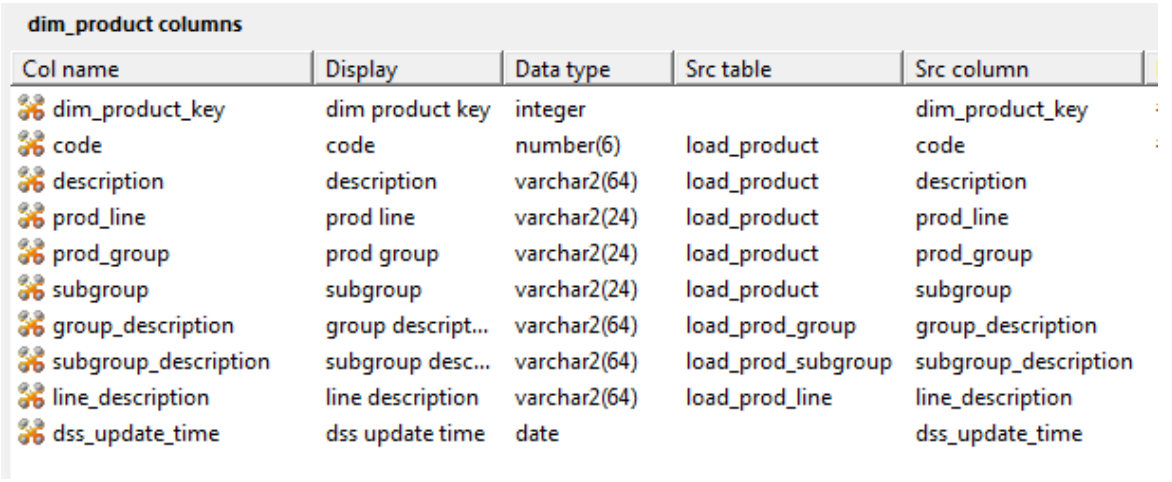


8 Drag group_description from load_prod_group into the middle pane. This will add it to the product dimension columns.

9 Drag subgroup_description from load_prod_subgroup into the middle pane. This will add it to the product dimension columns.

10 Drag line_description from load_prod_line into the middle pane. This will add it to the product dimension columns.

11 Review the product columns displayed in the middle pane. Expand the 'source table' column to see that we now have four different tables that contribute to the dimension:



dim_product columns

Col name	Display	Data type	Src table	Src column
dim_product_key	dim product key	integer		dim_product_key
code	code	number(6)	load_product	code
description	description	varchar2(64)	load_product	description
prod_line	prod line	varchar2(24)	load_product	prod_line
prod_group	prod group	varchar2(24)	load_product	prod_group
subgroup	subgroup	varchar2(24)	load_product	subgroup
group_description	group descript...	varchar2(64)	load_prod_group	group_description
subgroup_description	subgroup desc...	varchar2(64)	load_prod_subgroup	subgroup_description
line_description	line description	varchar2(64)	load_prod_line	line_description
dss_update_time	dss update time	date		dss_update_time

12 Using the right mouse menu when positioned on the object dim_product in the left hand pane select Validate against database. This option will compare the metadata as displayed within QAD Data Warehouse Designer with the physical table dim_product as it exists in the database. We have added new columns to the metadata in the steps above, but the physical table has not been changed. A message will appear in the middle pane as follows:

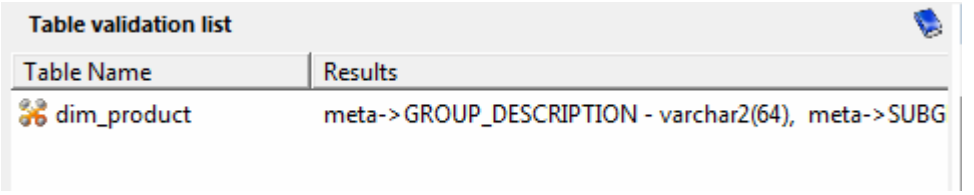
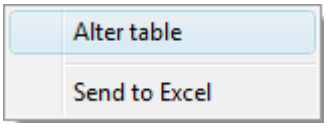


Table validation list

Table Name	Results
dim_product	meta->GROUP_DESCRIPTION - varchar2(64), meta->SUBG

13 We now need to alter the physical table in the database. The message in the middle pane shows that the metadata has additional columns not present in the dss table. We alter the table by positioning on the dim_product name in the middle pane and using the right mouse 'Alter Table' menu option:



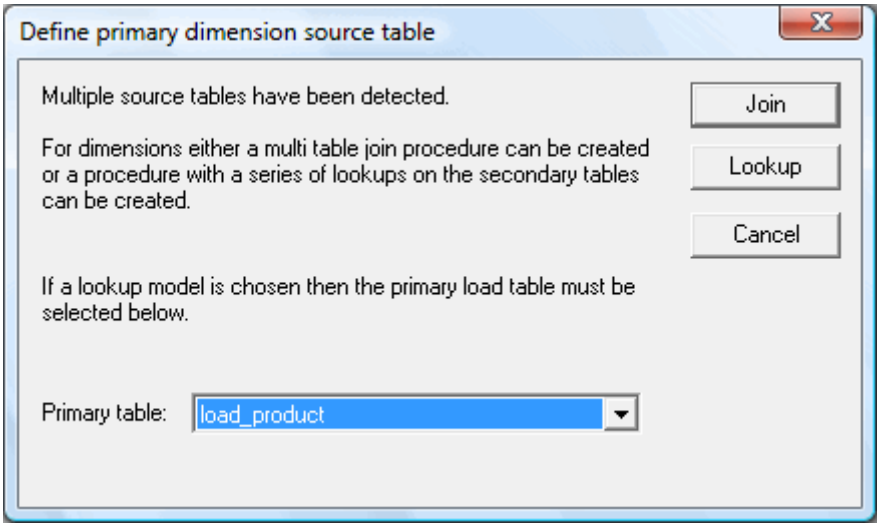
14 An alter table commands dialog will appear with the SQL commands that will be used to alter the database table. Click the 'Alter Table' button.

15 A message will display advising that the table was altered. Click OK to clear the message.

16 Using the right mouse menu when positioned on the object dim_product in the left hand pane select Properties.

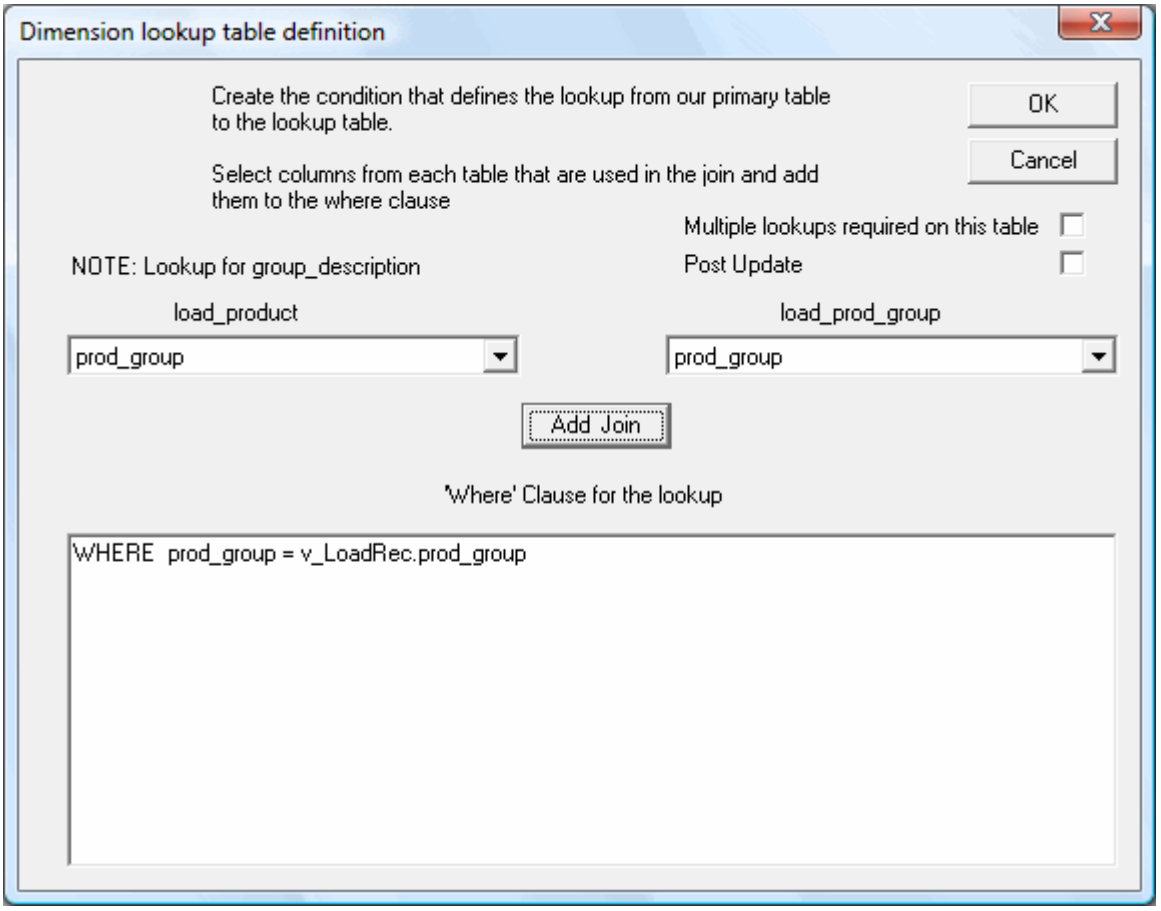
17 Click Rebuild.

18 A dialog will now appear asking you to define the primary source table and to choose between a join of the source tables or a series of lookups. Refer to the Dimensions chapter for an explanation on these two choices. The load_product should have been selected as the primary source table. If it has not been, then select it. Click the Lookup button.



19 The 'Define dimension business key(s)' dialog will be presented. The existing business key 'code' should already be the default value so click OK to proceed to the next screen.

20 The Dimension lookup definition screen should now appear. Two drop down boxes are available. The left hand drop down shows the columns for the table chosen as the primary source table. The right hand drop down shows the columns for the source table we wish to lookup. There is a reminder above the left hand drop down informing you which table is being looked up.



Although not being used at this point there are a number of features in this dialog which are worth noting. The first is that there is a check box to allow a table to be the source of multiple lookups. This would be used where a generic code table was used to lookup descriptions and we would need to make multiple lookups on the same table to get different descriptions. The second is that procedure variables are available in the drop down list of the primary load table. Using this feature it is possible to make lookups that are dependent on the results from previous lookups. This is done by selecting the columns that would have been populated by the earlier lookups.

The lookups require that a join be defined for the two tables involved. The relevant joins for our example are as follows. Step through the dialog boxes making these joins. First select the column from each drop down list and then click the '**Add Join**' button.

Lookup table	Primary src (load_product)	Lookup column
load_prod_group	prod_group	prod_group
load_prod_subgroup	prod_group prod_subgroup	prod_group prod_subgroup
load_prod_line	prod_line	prod_line

Note: The load_prod_subgroup lookup will require two joins. After each join is made click the OK button to move to the next dialog.

21 Once the lookups have been completed the procedure will be generated and the results dialog will show the indexes that were created / re-created.

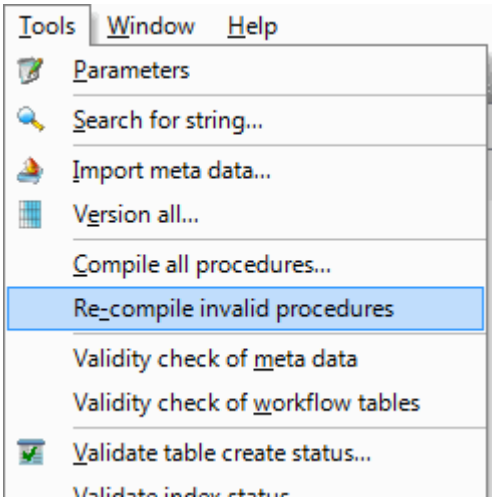
22 Using the right mouse menu when positioned on the object dim_product in the left hand pane select Update. The dimension will now be refreshed.

23 Using the right mouse menu when positioned on the object dim_product in the left hand pane select Display Data. Provided the lookups when done correctly the descriptions should now be populated.

Oracle Procedure Invalidation

If running this as a tutorial in an *Oracle Data Warehouse* then the procedures update_stage_sales_detail, update_stage_budget and update_stage_forecast will have been invalidated. These procedures all use the function get_dim_product_key. This function was re-compiled as part of the process above, but has not changed in structure.

Select the menu option Tools/Re-compile invalid procedures:



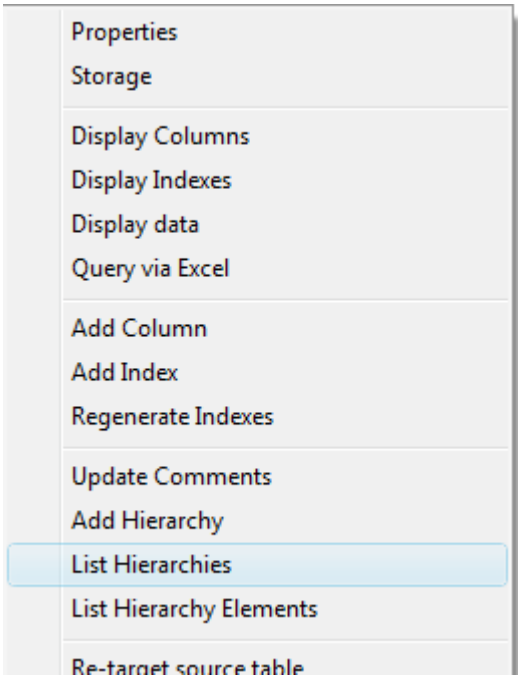
Click Yes to proceed. The three procedures will be re-validated and the results shown in the middle pane.

Creating a Dimension Hierarchy

Dimensions often have a number of hierarchical levels. An example is the date dimension which has a natural hierarchy of year, month and day. QAD Data Warehouse Designer allows the definition of a hierarchy against a dimension. A dimension may have multiple hierarchies defined. These dimension hierarchies are used in the generation of Analysis Services cubes. Every dimension in a cube must have a hierarchy with at least one element in it. Hierarchies can also be accessed and the underlying data maintained with the Hierarchy maintenance utility shipped with the enterprise version of QAD Data Warehouse Designer. This utility allows a user to maintain a hierarchy structure in a different database or schema so that the data warehouse can use this structure as input to the dimension. See the hierarchy section in the Dimension chapter for more details.

We will add a hierarchy to the dimensions dim_product and dim_customer created in the first tutorial. We will also check that a hierarchy exists for the date dimension and if not present add one.

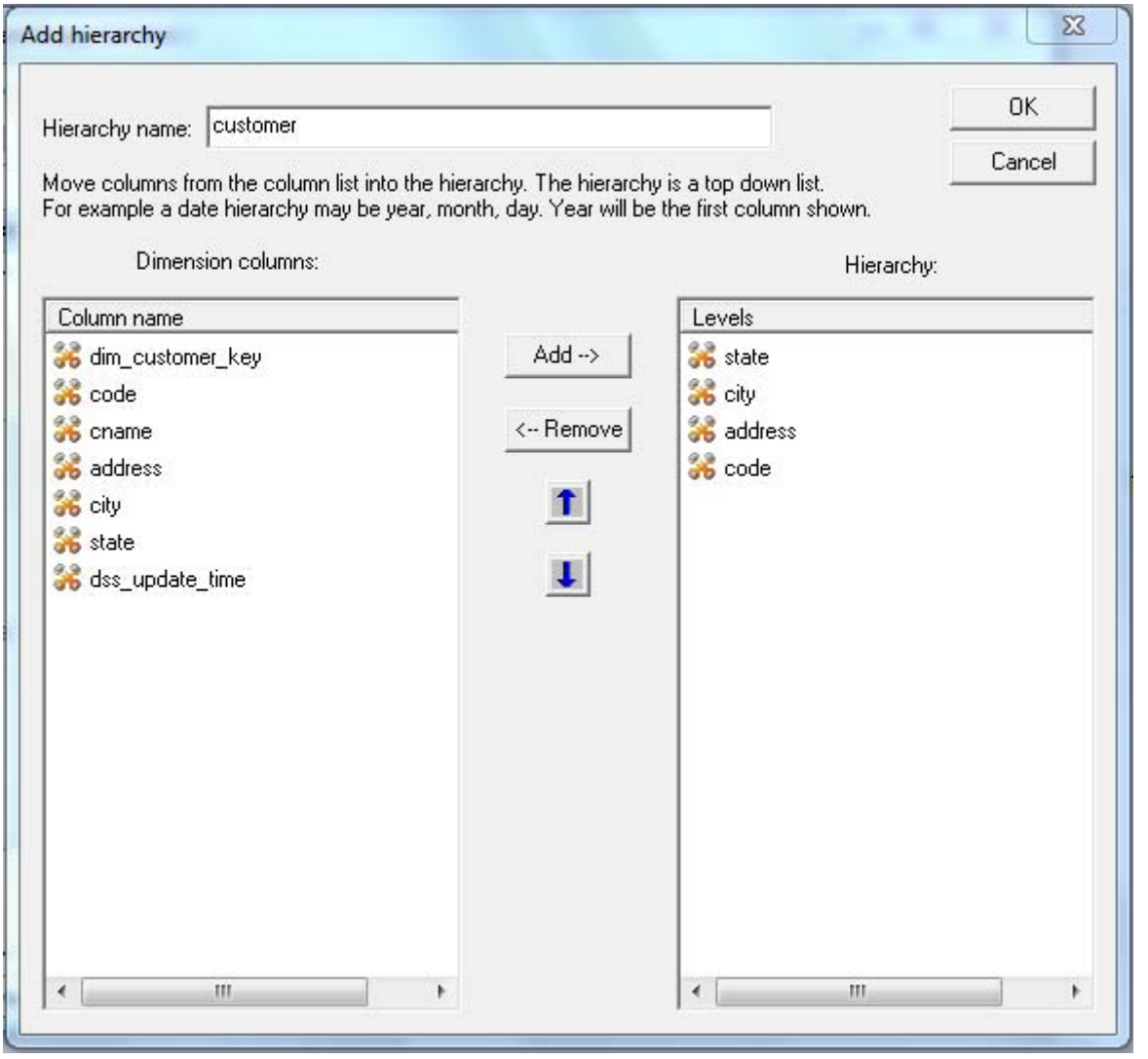
1 Using the right mouse menu when positioned on the object dim_customer in the left hand pane and select List Hierarchies.



2 A list of any existing hierarchies will be shown in the middle pane. Initially there are no hierarchies defined.

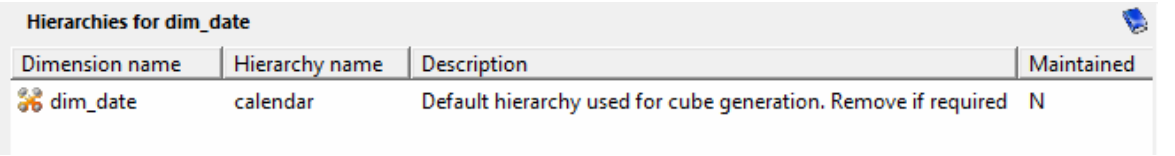
3 Using the right mouse menu when positioned on the object dim_customer in the left hand pane and select Add Hierarchy.

4 A dialog will appear asking for a hierarchy name and the hierarchy elements. Enter customer for the name and add state, city, address and code as hierarchy elements. Click OK to exit the add hierarchy dialog.



5 Repeat steps (1) through (4) for dim_product defining a top down hierarchy of line_description, then group_description, subgroup_description, and code.

6 Check to see if a hierarchy exists for dim_date. If no hierarchy exists then add a top down hierarchy of cal_year, cal_month and calendar_date.



As mentioned above these hierarchies are utilized by other processes within the data warehouse. In this case we will use the hierarchies created in the building of Analysis Services cubes in the next tutorial.

CHAPTER 5

Tutorial 5 - Analysis Services Cubes

Before you start on this chapter you should have:

- Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (on page 3)
- Completed ***Tutorial 2 - Rollup Fact Tables, ASCII File Loads, Aggregates*** (on page 57)
- Completed ***Tutorial 4 - Complex Dimensions and Hierarchies*** (on page 97)

This chapter deals with fine tuning the data warehouse by adding Analysis Services cubes.

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Adding a Measure Group..... 142
Cube Connections for Other Databases 154

Tutorial 5 - Purpose and Roadmap

Purpose

This tutorial will walk you through the process to:

- Create an analysis services cube.

In short, this tutorial uses existing fact tables to generate a "multi-measure group cube" based on fact_sales_detail and fact_budget. It also shows you how to query the cube.

Tutorial Environment

This tutorial has been completed using Microsoft SQL Server. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated) using Analysis Services Cubes. Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted. Refer to ***Cube Connections for Other Databases*** for more information on configuring the DataWarehouse connection for Oracle or DB2 data warehouses.

Tutorial Roadmap

This tutorial works through a number of steps. These steps and the relevant section within the chapter are summarized below to assist in guiding you through the tutorial.

Step in Tutorial	Section
Create an Analysis Services cube from fact_sales_detail	Creating a Cube Object
Add a measure group to the cube based on fact_budget	Adding a Measure Group object

This tutorial starts with the section ***Creating an OLAP Cube Object*** (on page 117)

Creating an OLAP Cube Object

The process of creating a cube object is largely the same as creating any other data warehouse object. By dragging a fact or aggregate table into an OLAP Cube drop target an OLAP Cube and OLAP Dimensions are defined.

OLAP Cubes are more complex than some other objects in QAD Data Warehouse Designer, primarily due to the functionality available in Microsoft Analysis Services.

This tutorial covers creating a basic cube. Refer to the chapter on Analysis Services Cubes in the QAD Data Warehouse Designer User Guide for more information.

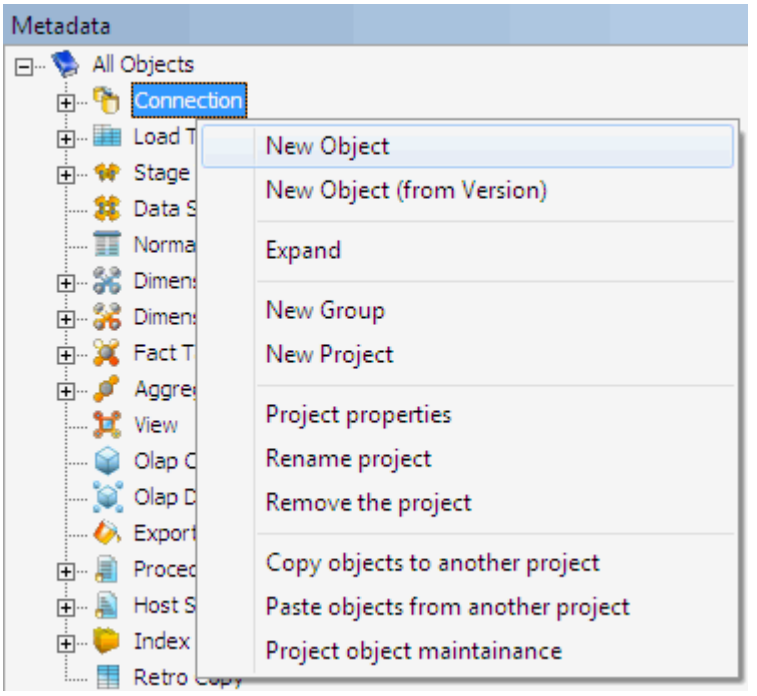
In this step we will create an OLAP Cube from the *fact_sales_detail* table. Before we start we need to have access to a Microsoft Analysis Services server with appropriate security rights to create an OLAP database.

Analysis Services is supplied with Microsoft SQL Server. You will also need to know the name of this server.

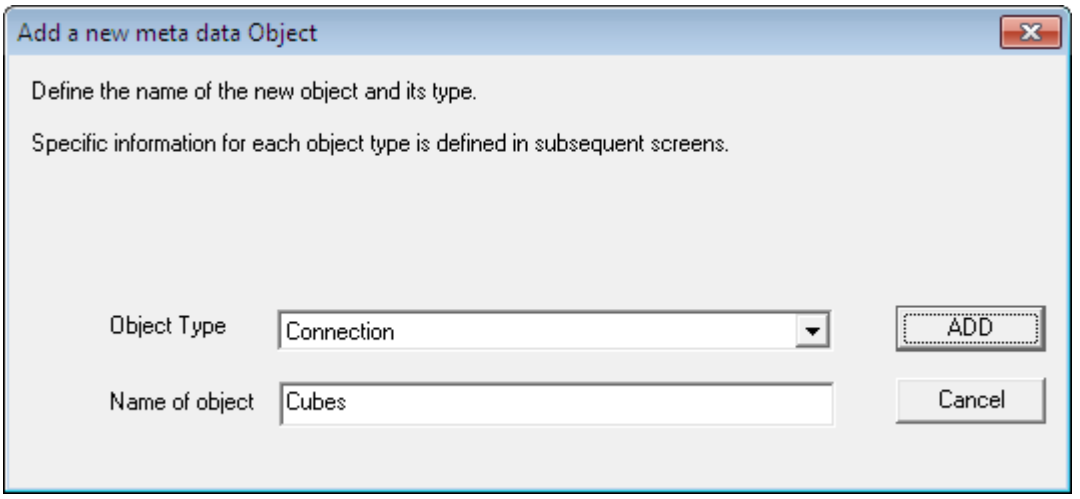
NOTE: This tutorial is only possible if an Analysis Services server is available

If the Analysis Services server is located on another machine then the Analysis Services client software will need to be loaded onto the computer running QAD Data Warehouse Designer.

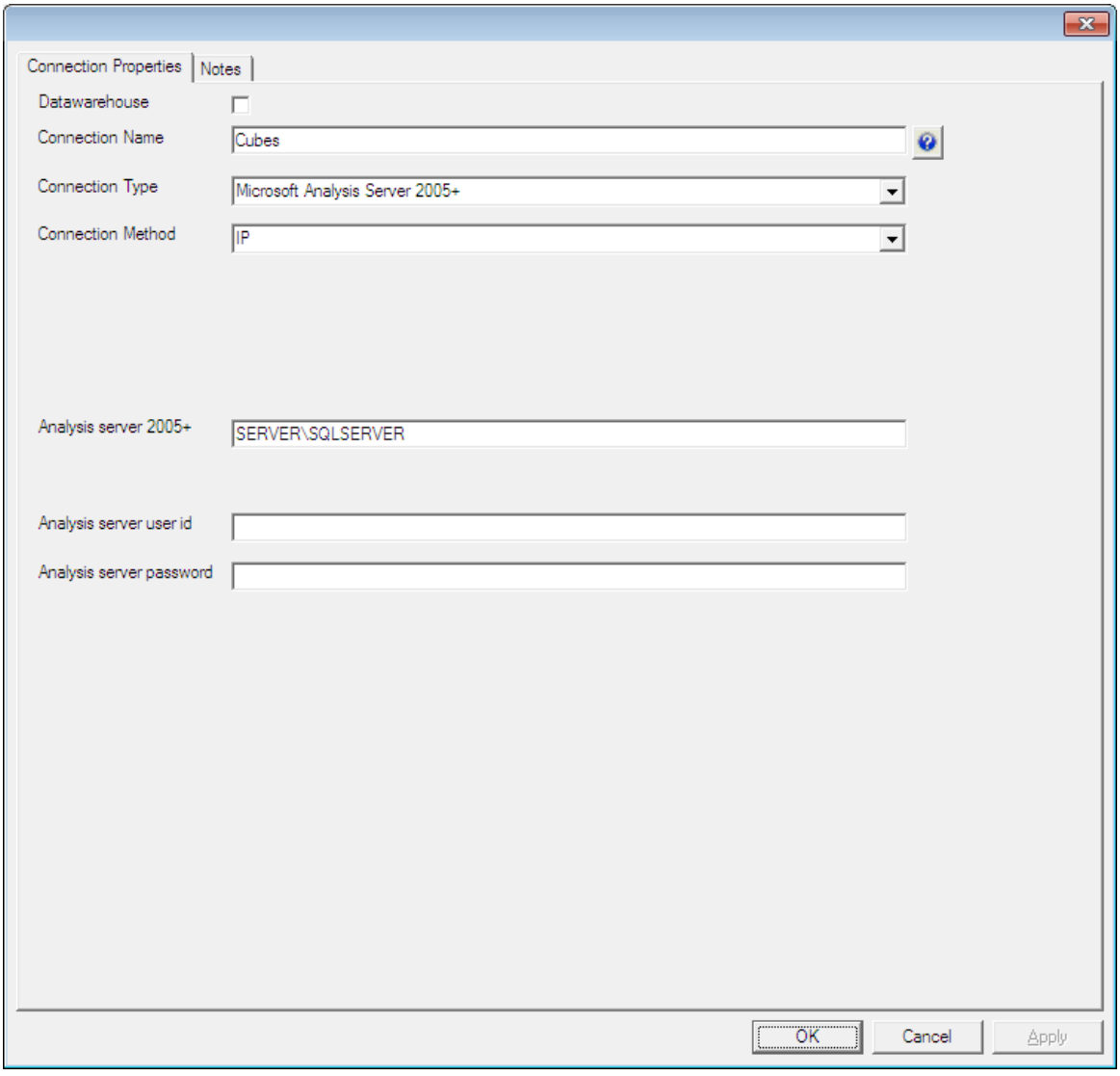
1 Create a new connection for the Analysis Services server. Position on the 'Connection' object group in the left hand pane and using the right mouse menu select New Object as follows:



Enter a name of *Cubes* for the connection and click Add:



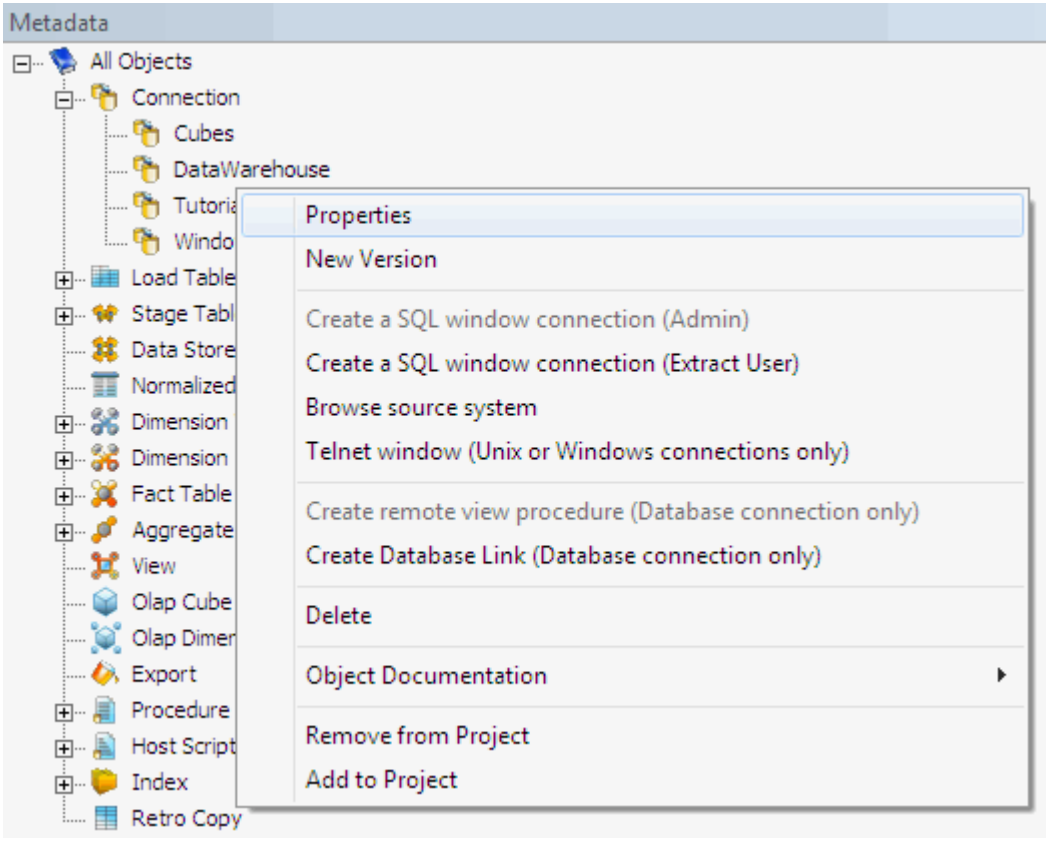
2 The connection properties screen will now appear. Select the connection type: Microsoft Analysis Server 2005+. Then select IP as the connection method and enter the name of the server for the Analysis Server. Leave the username and password blank. Enter the server and database details for your Analysis Services server. A sample is shown next:



Then click OK.

NOTE: Microsoft Analysis Services 2005 and 2008 use "Microsoft Analysis Server 2005+".

3 Expand the Connection object group in the left hand pane and using the right mouse menu select Properties for the *DataWarehouse* connection:



4 The properties dialog will now show 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:

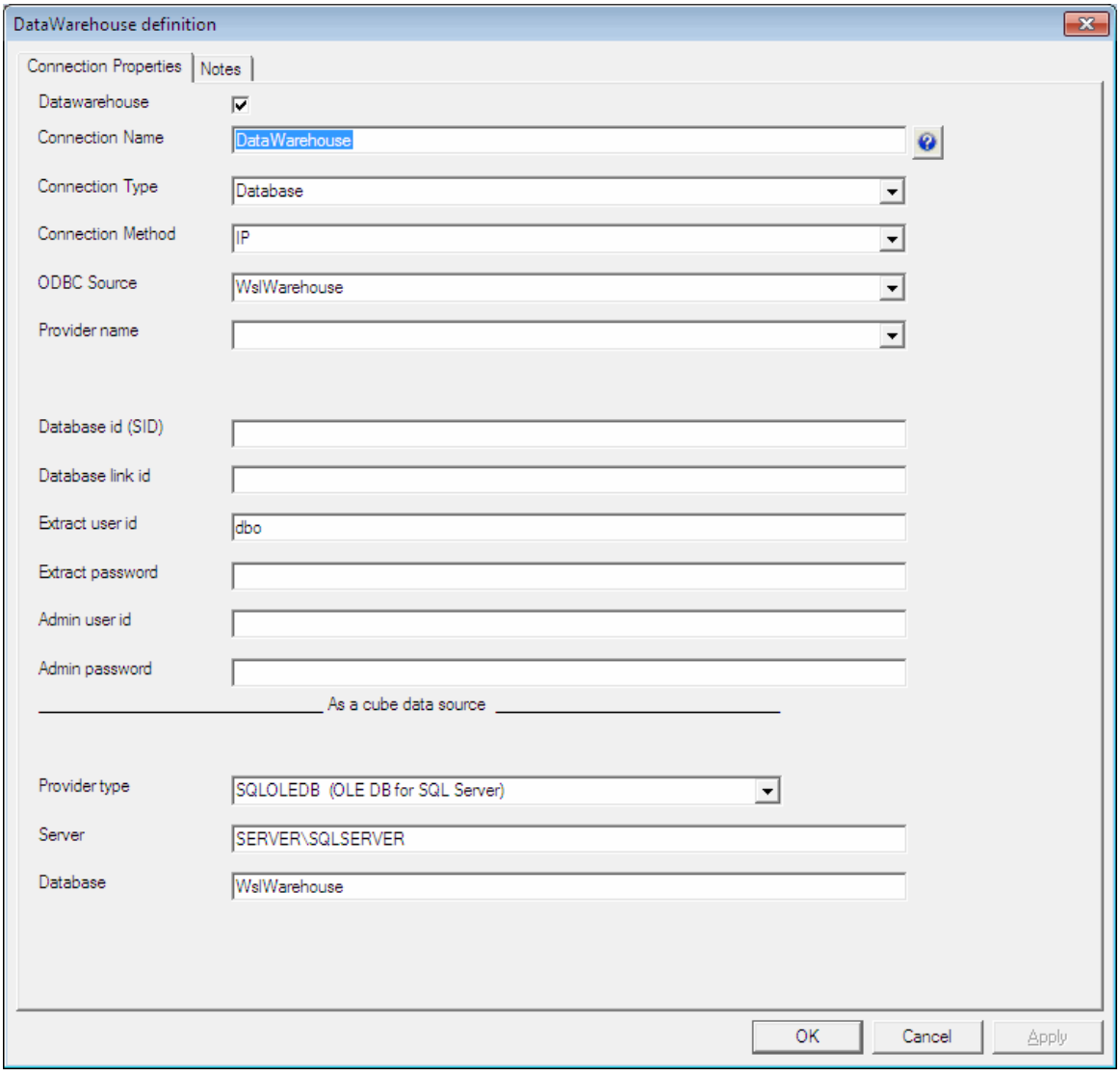
- Provider type
- Server
- Database

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*

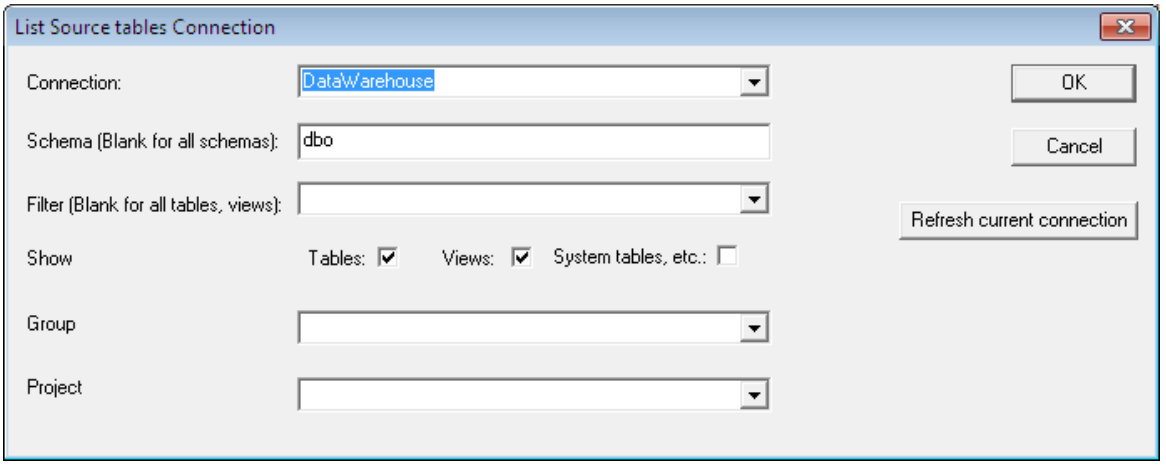
See ***Cube Connections for Other Databases*** for more details on Oracle and DB2.

A SQL Server sample is shown next:



Then click OK.

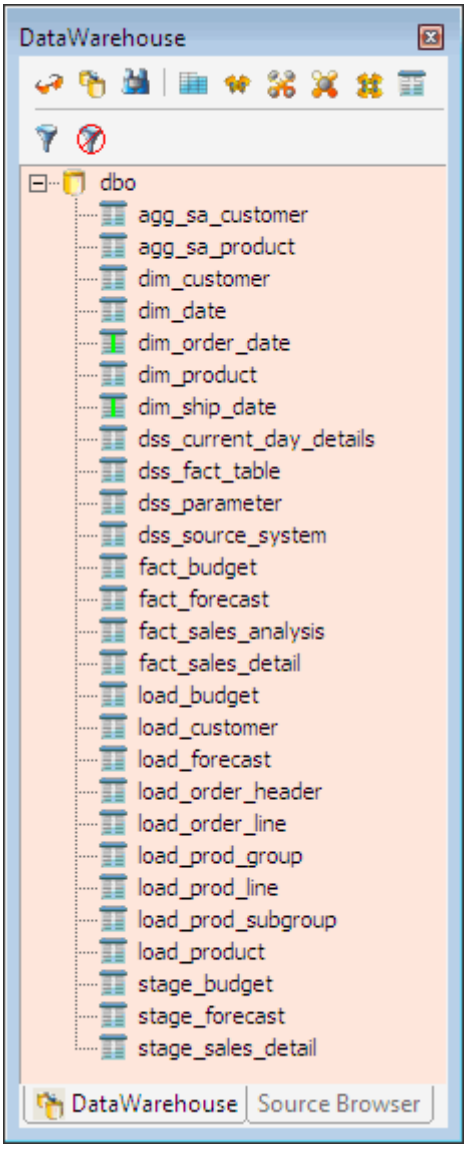
5 Now you need to browse the *DataWarehouse* connection to see available fact tables. From the Browse menu, select DataWarehouse then Change Connection. The following dialog displayed:



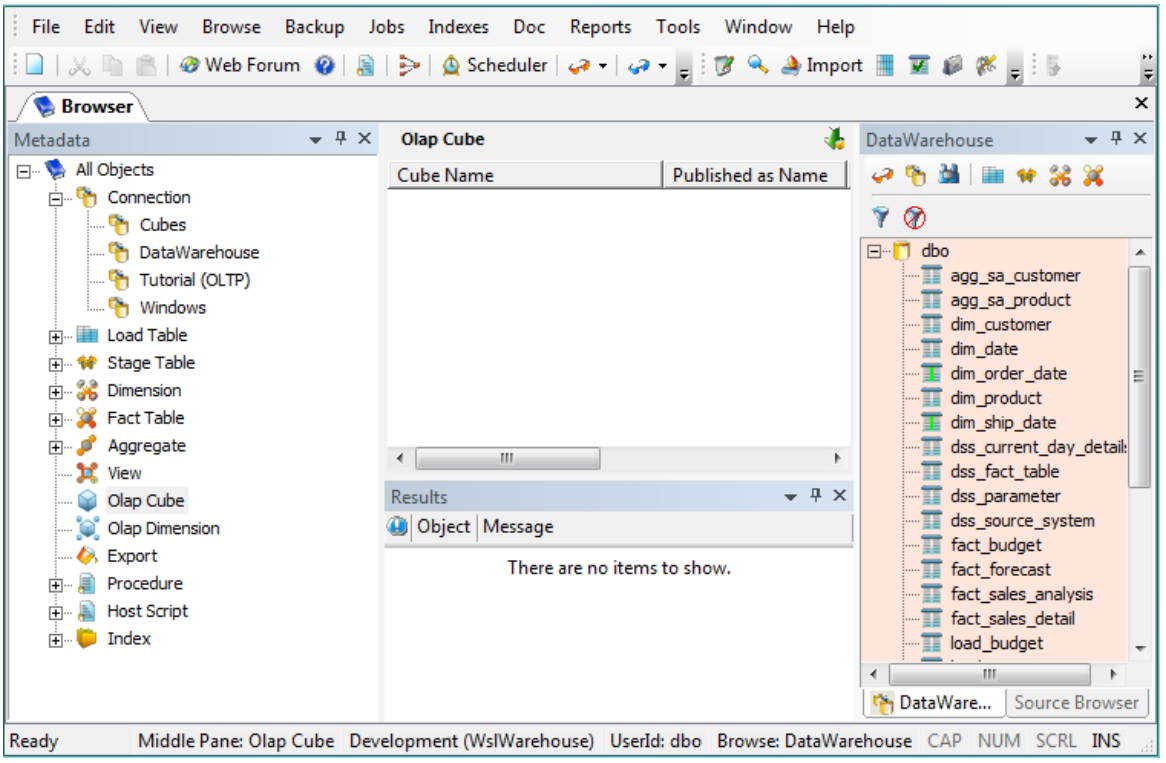
Choose *DataWarehouse* from the Connection drop down and click OK.

NOTE: For SQL Server the Data Warehouse schema must be dbo.

The following browse pane is displayed:

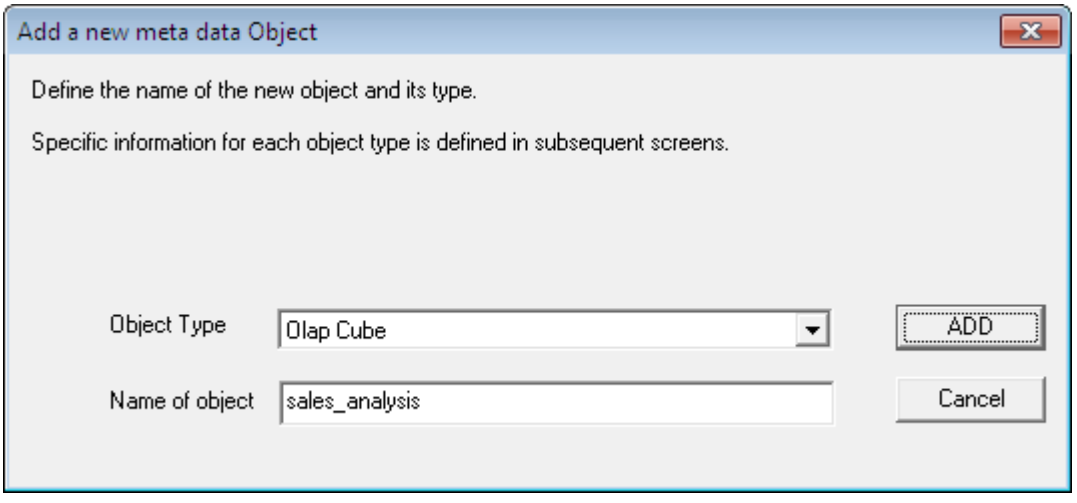


6 Double click on the OLAP Cube object group in the left hand pane to list all cubes in the middle pane. This makes the middle pane a drop target for cubes. Your screen should now look like this:



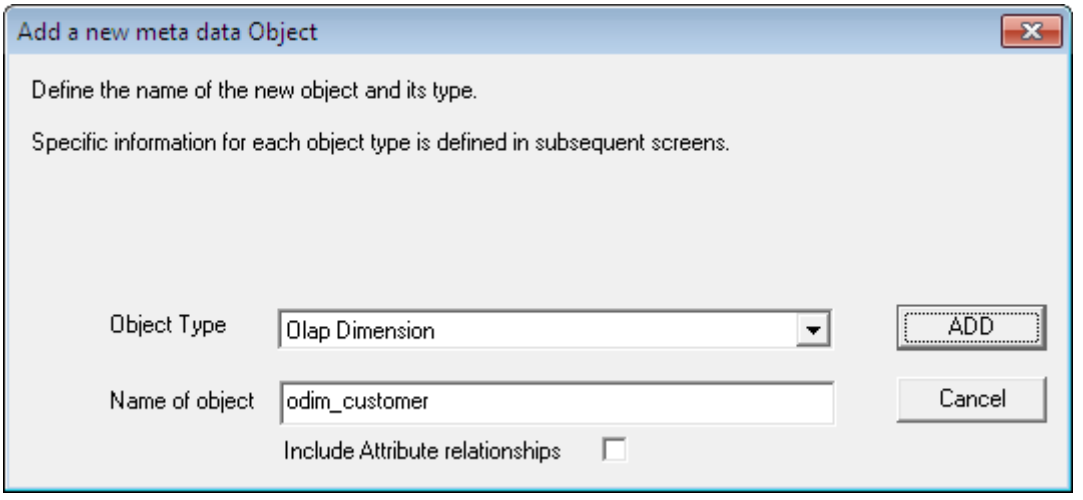
NOTE: As OLAP Cubes have not been created yet, the middle pane is empty.

7 Drag *fact_sales_detail* from the browser (right hand pane) and drop it into the middle to create a new OLAP Cube object. Give the OLAP Cube a name of *sales_analysis* as follows:



Click ADD.

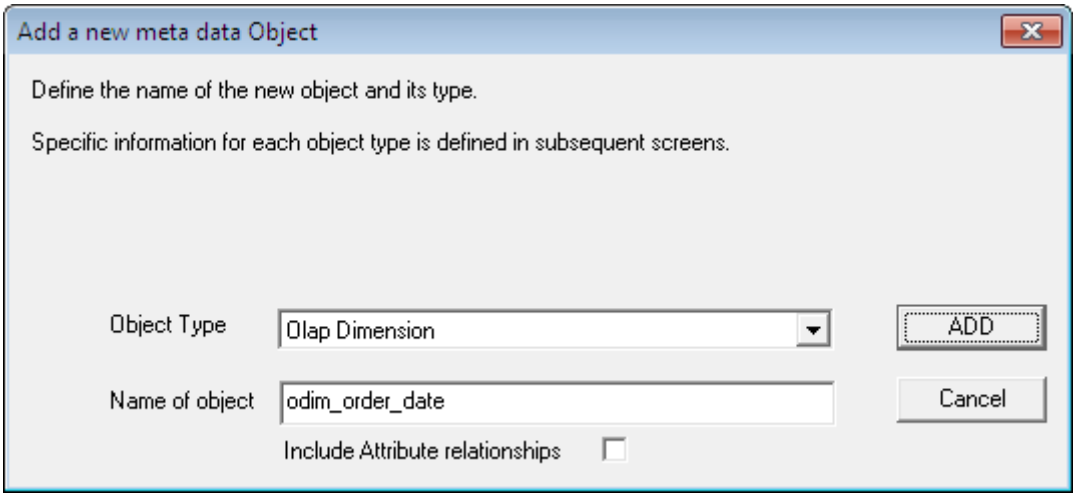
8 QAD Data Warehouse Designer will now cycle through each dimension associated with that fact table and will create an OLAP Dimension object for each, displaying the following dialog first:

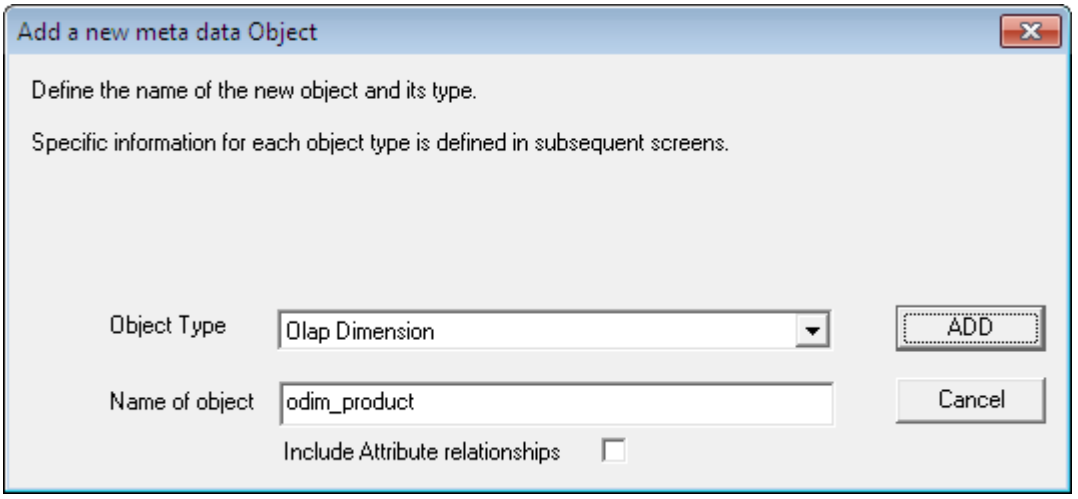


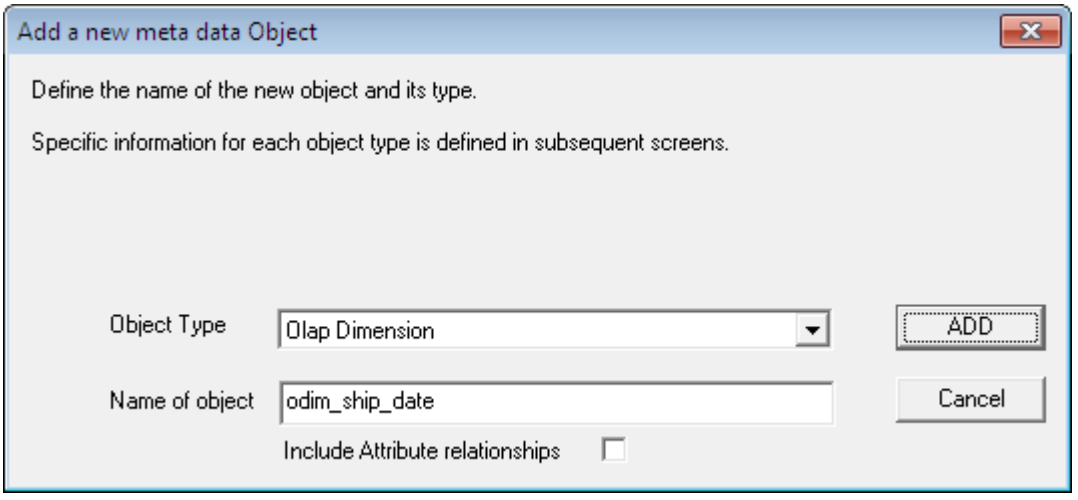
NOTE: If you wish to include Attribute Relationships in Analysis Services for this dimension, click on the Include Attribute relationships check box.

Click ADD for the *Customer* dimension.

9 Repeat step 8 for the remaining OLAP Dimensions:





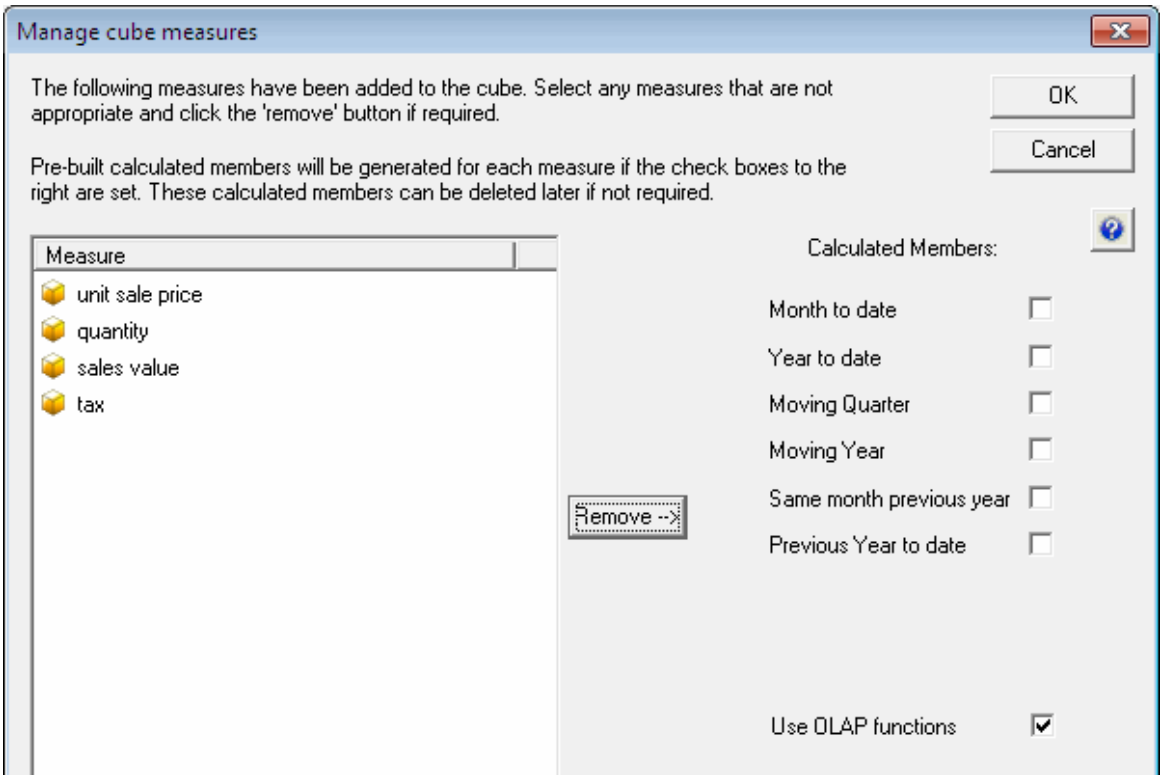


10 The Manage cube measures dialog is displayed next. Remove all non-measure columns (that is, columns that cannot be aggregated) from the Measure list by highlighting them and clicking the Remove button.

The columns to remove are:

- Order Number
- Order Line No
- Product Code
- Customer Code

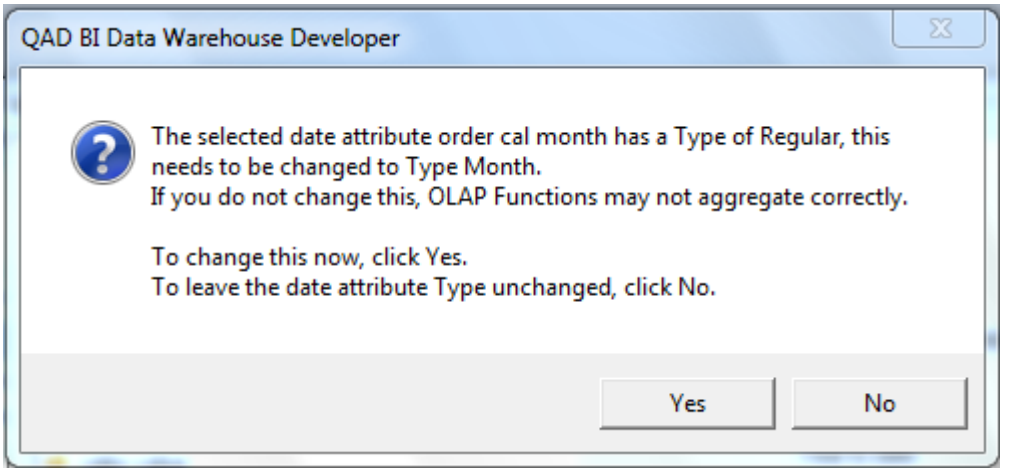
At this stage, your dialog should look like this:



11 Choose to create some date based calculated members using OLAP functions by selecting the Month to date, Year to date, and the Use OLAP functions check boxes. The calculated measures drop downs are now displayed. Select the required date hierarchy information. Specifically:

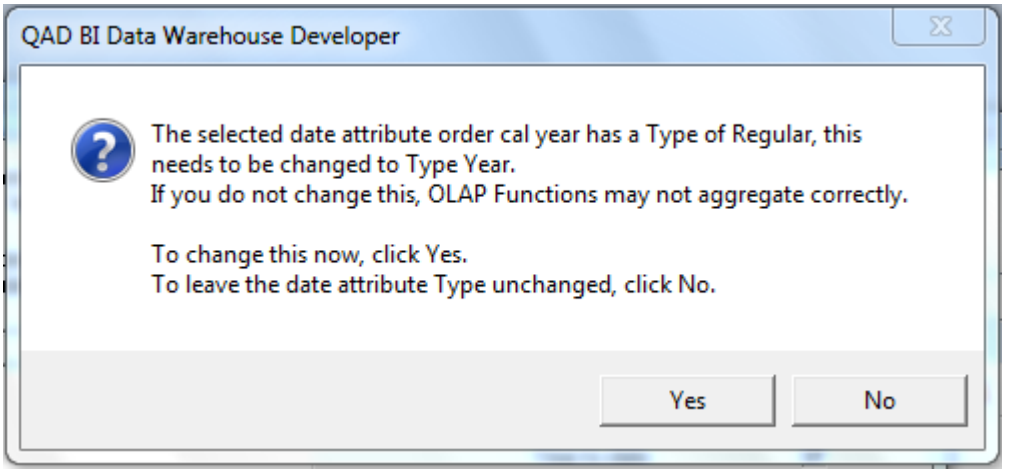
- for Date dim, select *dim_order_date*
- for Dim hie, select *calendar*
- for Month level, select *order cal month*
- for Year level, select *order cal year*

After selecting the Month level, you will be asked to confirm changing the attribute type to Months for the the *order cal month* attribute in Analysis Services as follows:



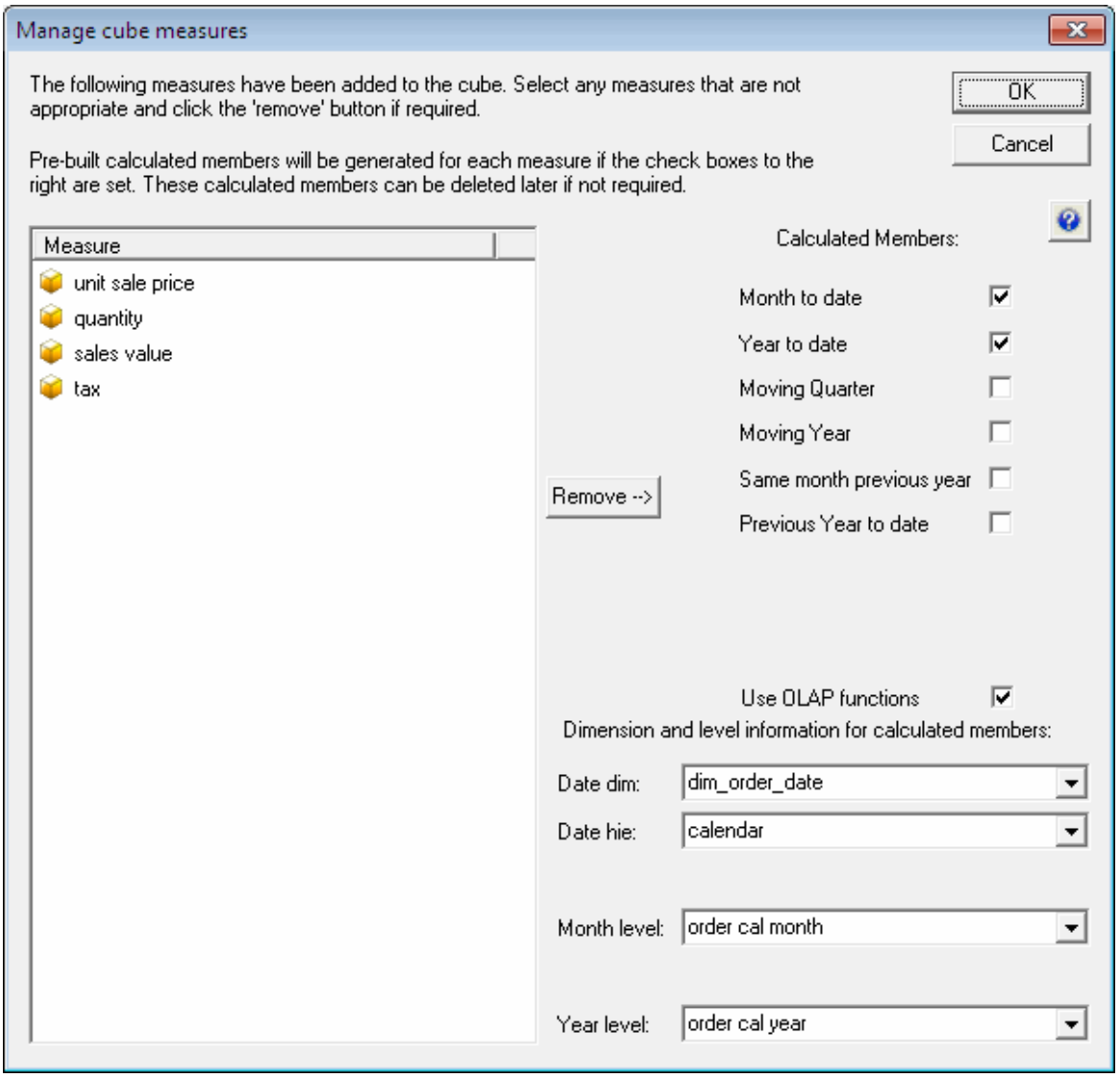
Click Yes.

Similarly, selecting the Year level, you will be asked to confirm changing the attribute type to *Years* for the the *order cal year* attribute in Analysis Services as follows:



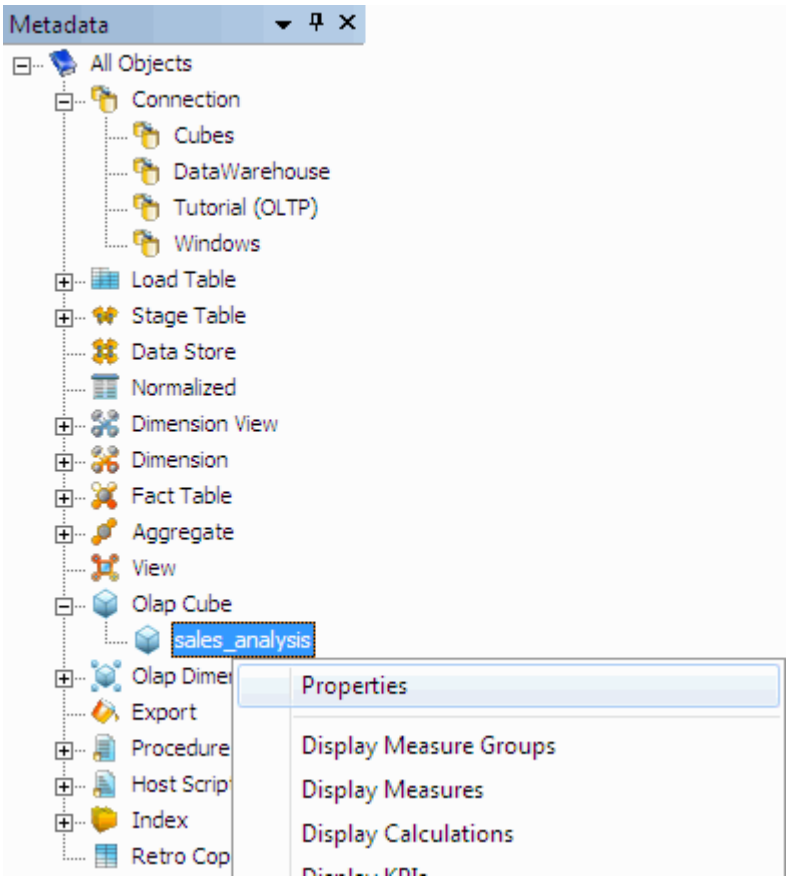
Again, click Yes.

Your Manage cube measures dialog should now look like this:

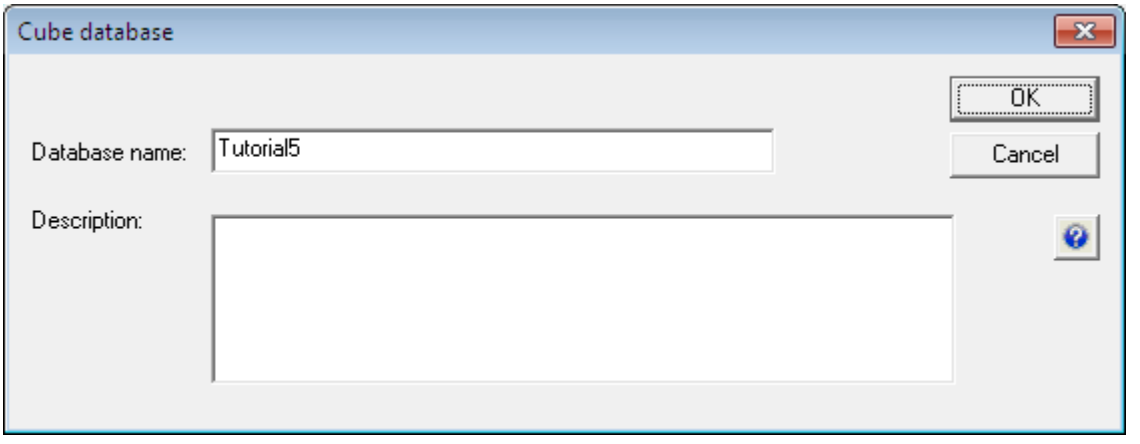


Click OK to complete definition of the cube.

12 Right click on the OLAP Cube *sales_analysis* in the left pane and choose Properties as follows:

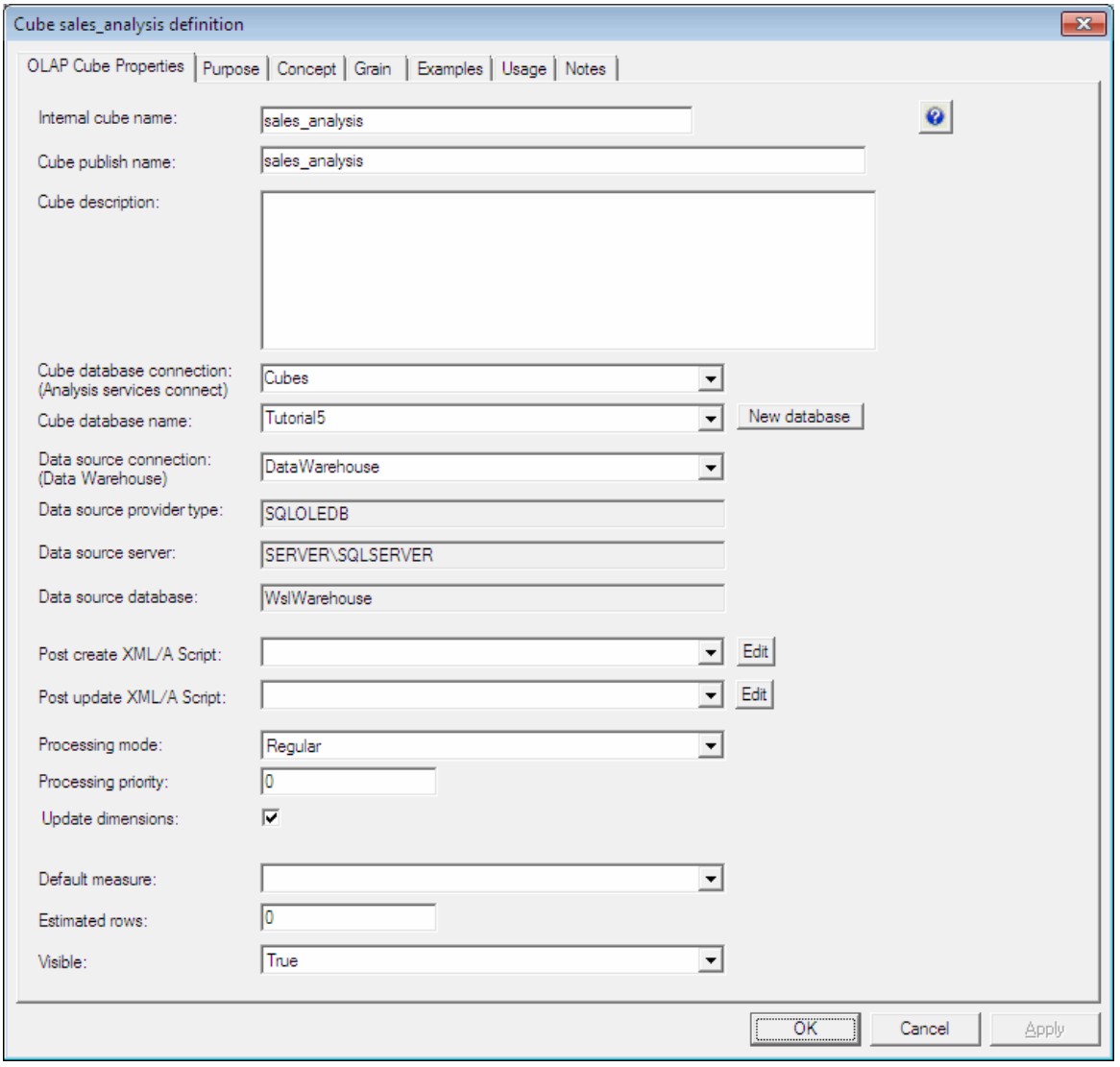


13 Click the New database button to display the Cube database dialog box. Enter a new cube Database name of *Tutorial5* as follows:



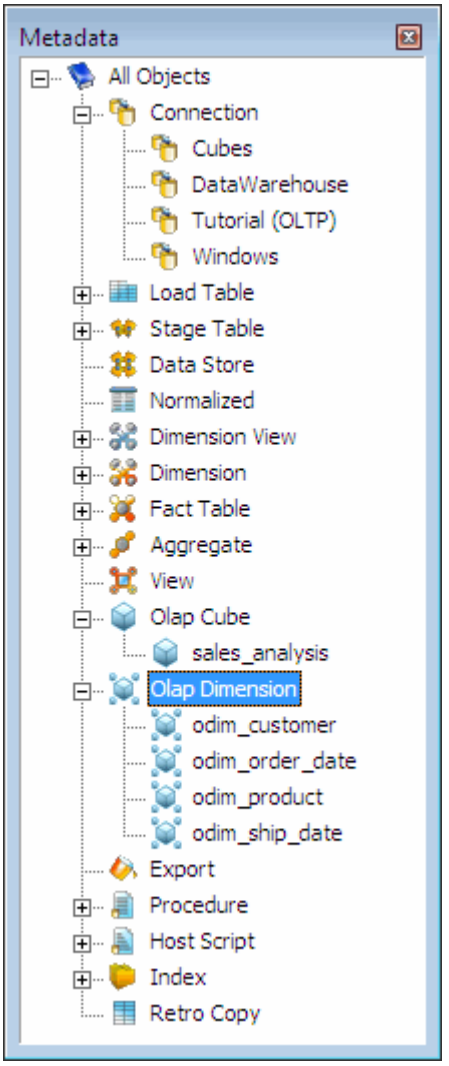
Now click OK.

Change the Cube publish name to be *sales_analysis* and the Cube database connection to be *Cubes* as follows:

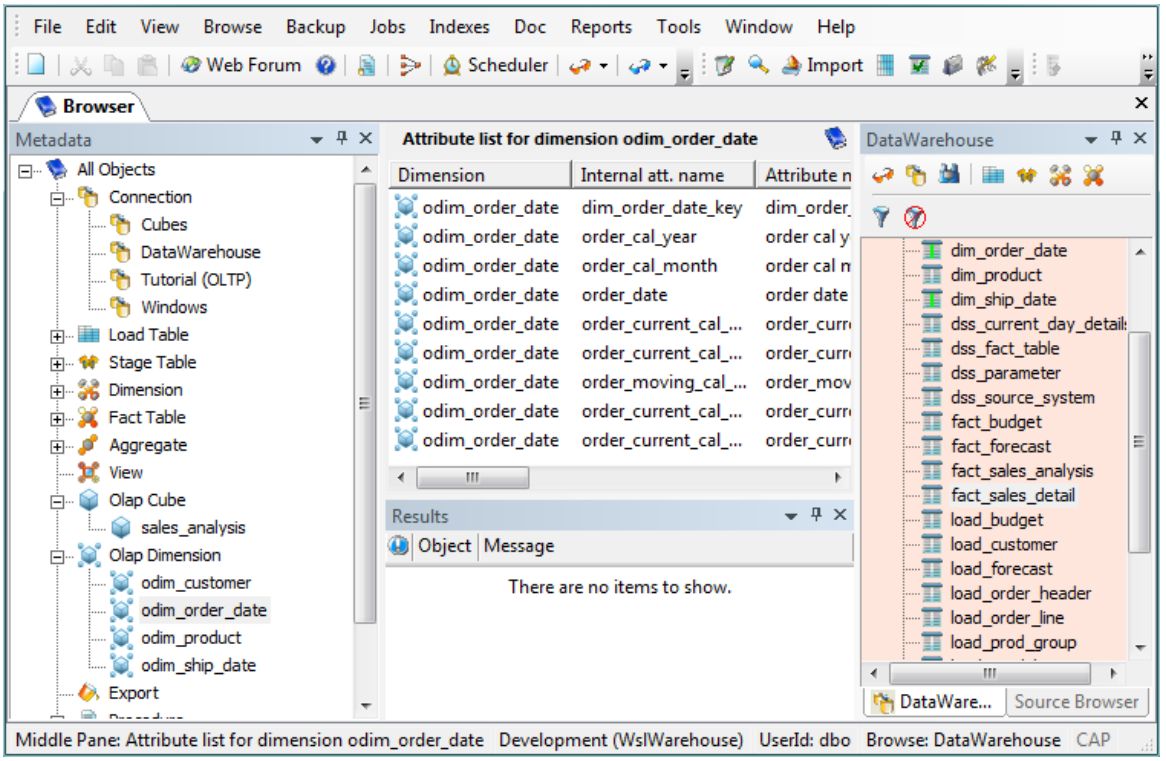


Click OK to close the *Cube sales_analysis definition* dialog and save the changes you've made.

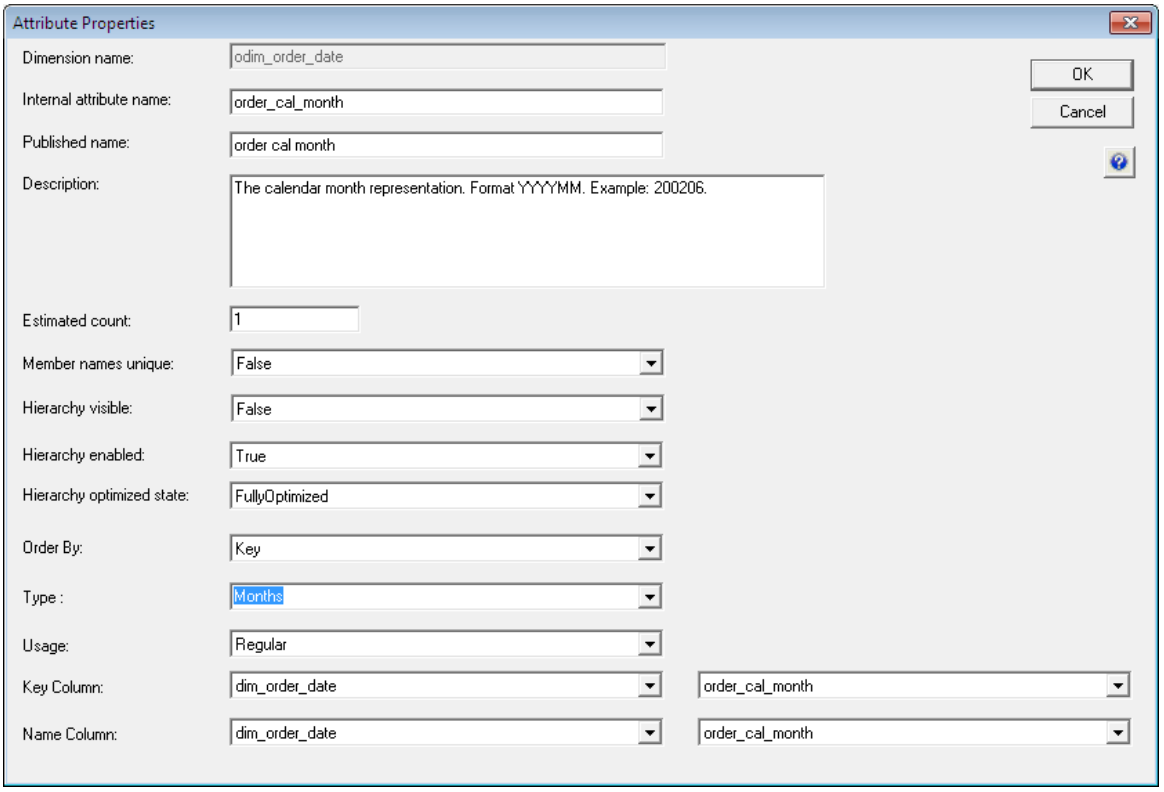
14 You now need to check that the date dimension supports using OLAP functions. Expand the OLAP Dimension object type in the left hand pane to display the four OLAP Dimensions. Your object tree should contain the following OLAP Dimensions:



15 Click on the *odim_order_date* OLAP Dimension in the left pane to show the dimension attributes in the middle pane as below:

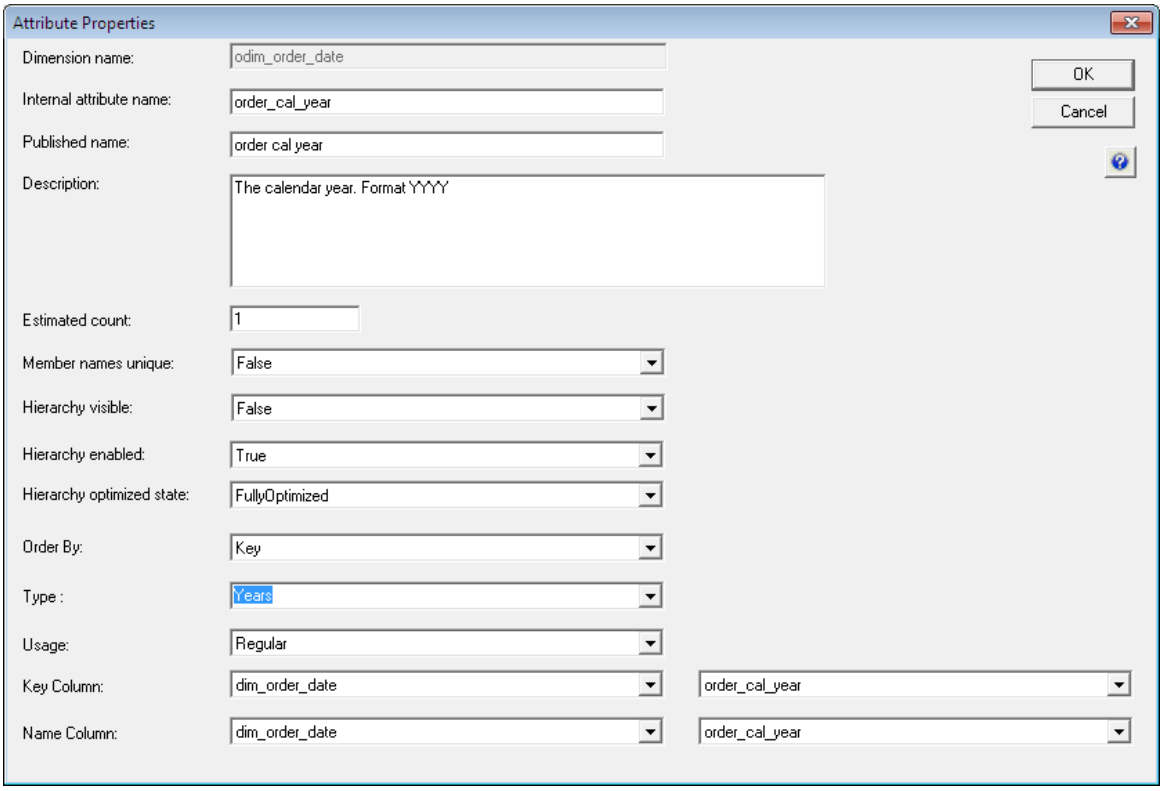


16 Right click on the *order_cal_month* attribute choose Properties. This displays the Attribute Properties dialog. Check the Type is set to *Months.* If it is not set to *Months*, change it. It needs to look like this:

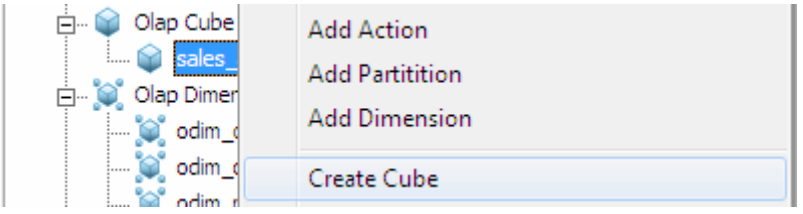


Click OK.

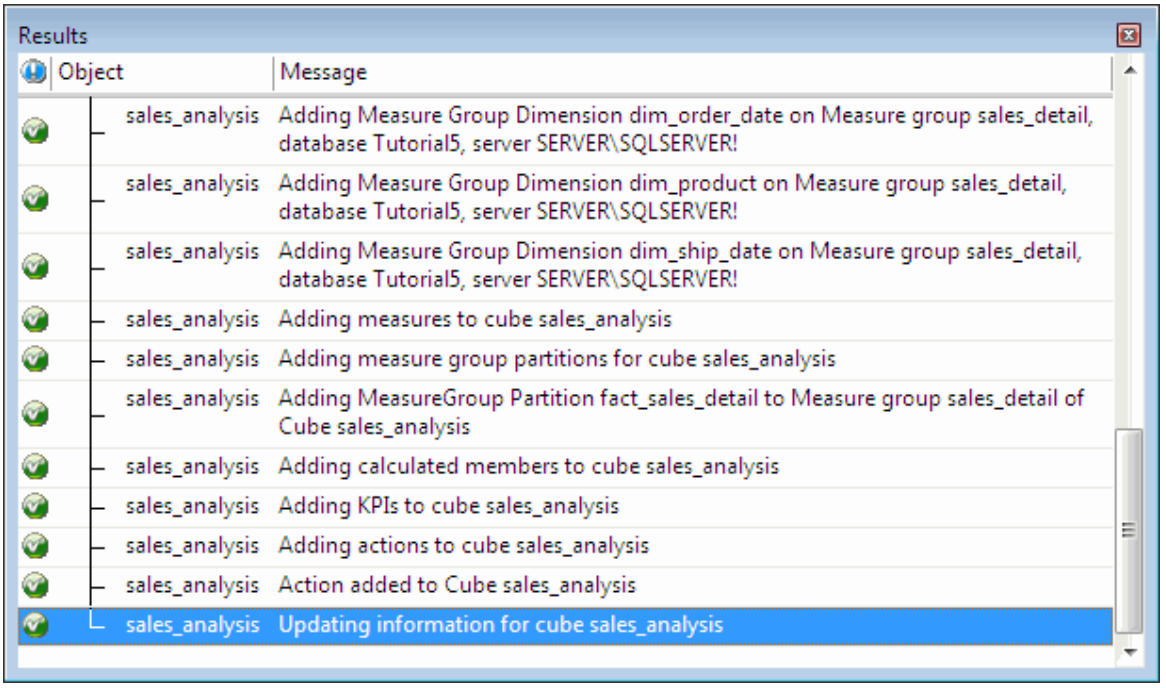
Repeat the process for the *order_cal_year* attribute, checking the Type is set to the *Years* and changing it if it is not. It needs to look like this:



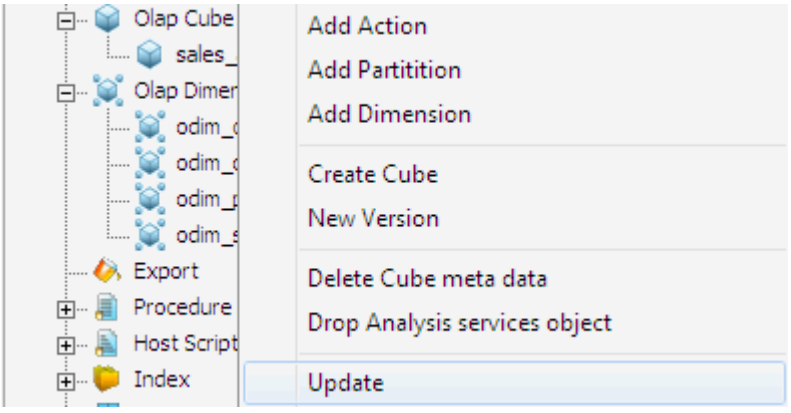
17 To create the cube in Analysis Services, right Click the *sales_analysis* cube in the left hand pane and choose Create Cube as follows:



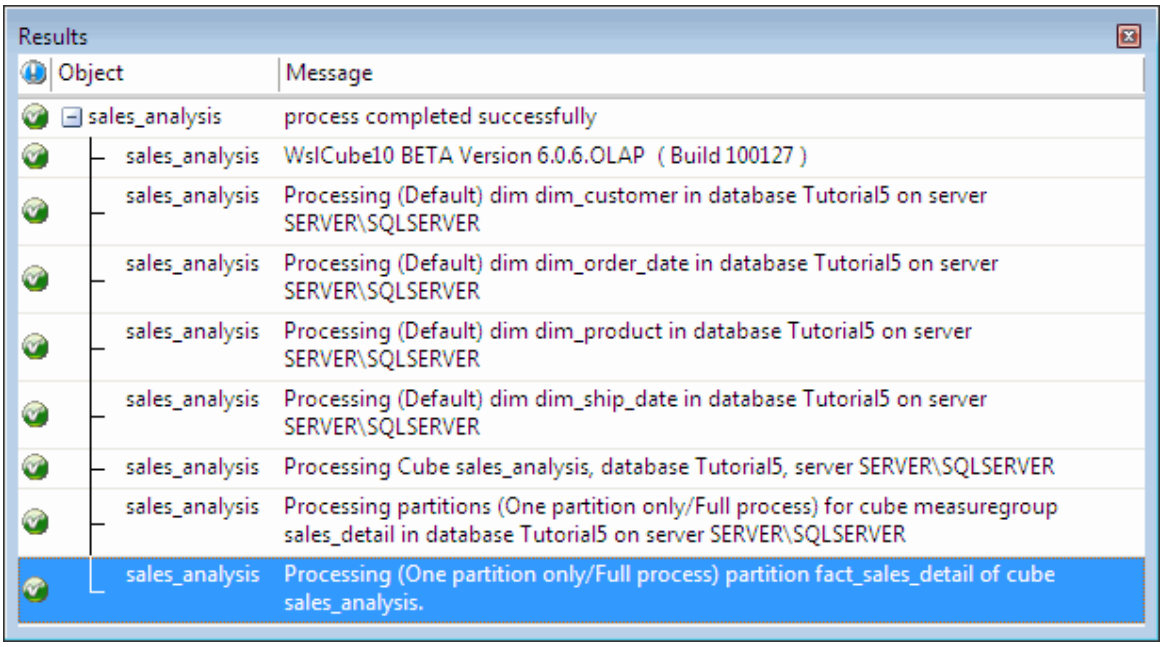
This will open the WSL Cube executable that connects to Analysis Services to create the *sales_analysis* cube structure. You will see the successful completion in the results pane:



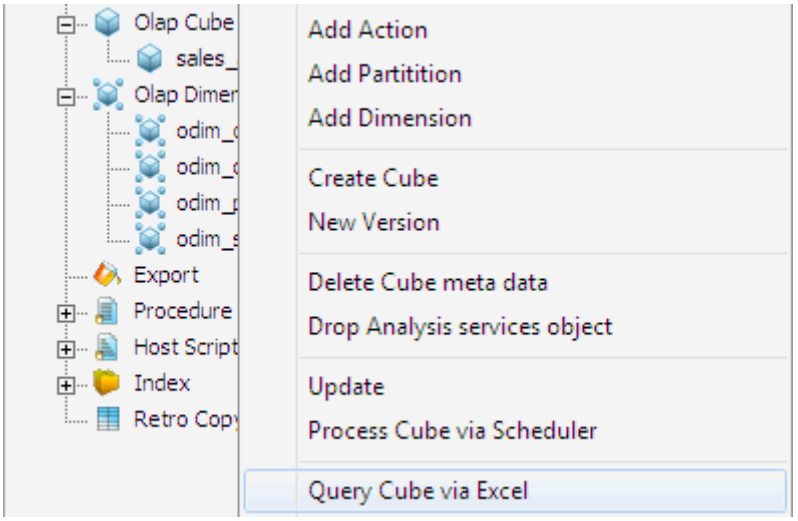
18 To process the cube *sales_analysis* in Analysis Services right click the sales_analysis cube in the left hand pane and choose Update as follows:



This will open the WSL Cube executable to process data into the cube structure. Once the cube is processed it can be viewed. Again, you will see the successful completion in the results pane:

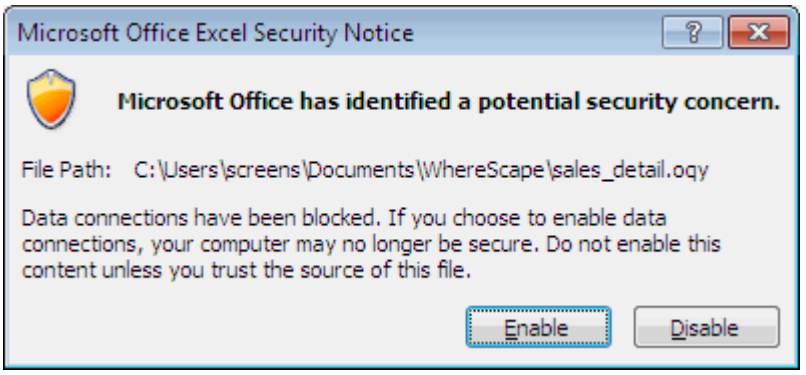


19 To view the cube in Excel right click the *sales_analysis* cube in the left hand pane and choose Query cube Via Excel as follows:



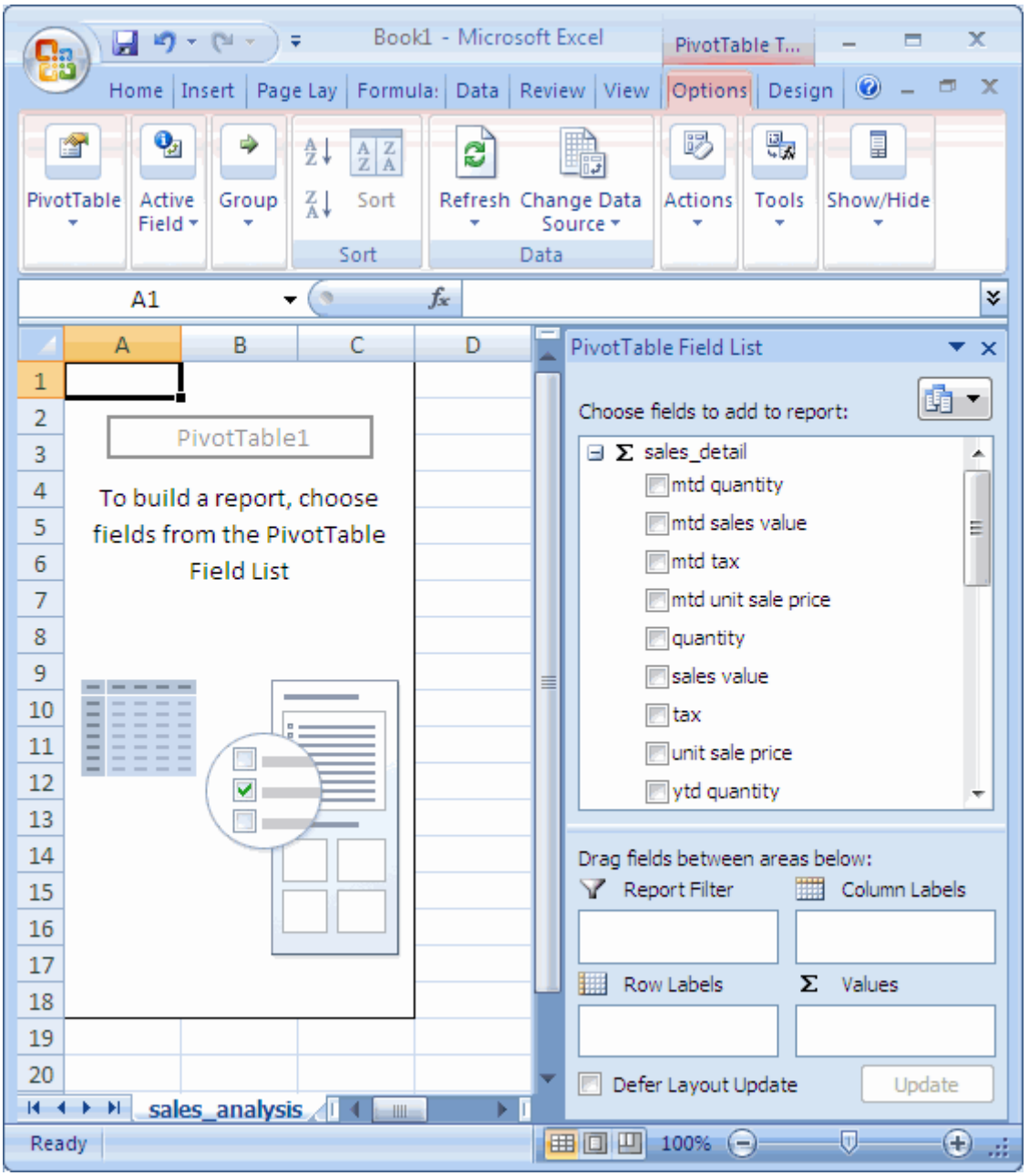
This will open Excel if it is installed.

NOTE: If Excel displays the following dialog box, click Enable:



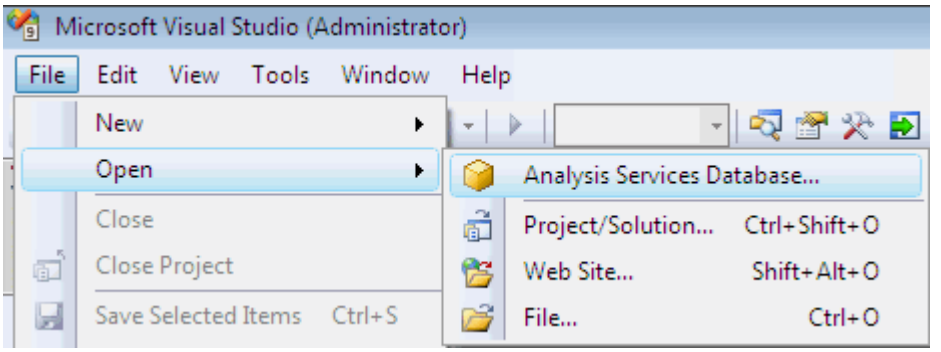
This message may not be displayed.

Excel then opens a connection to the cube for querying in a pivot table:

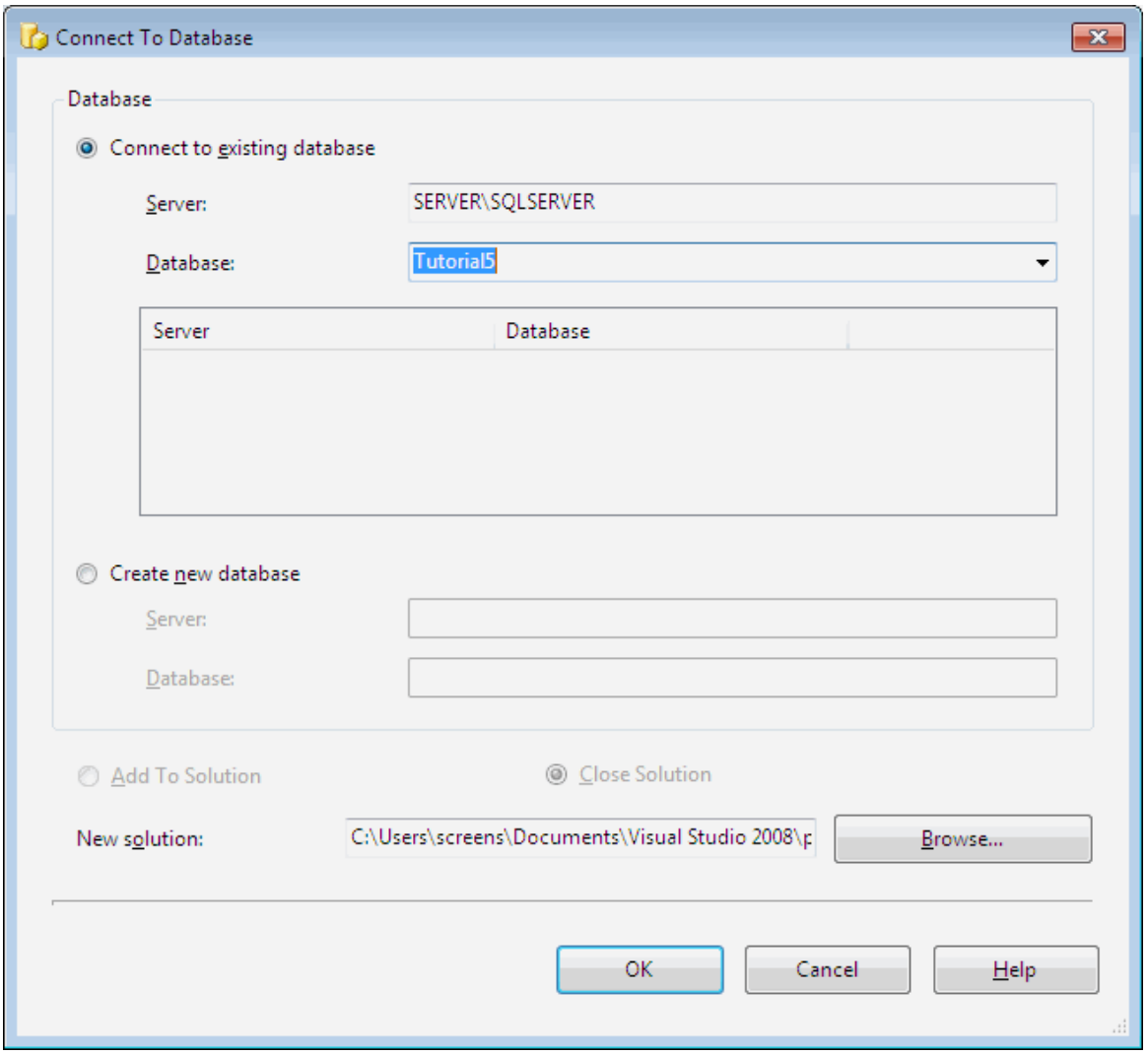


NOTE: In order for Excel to open the cube the OQY file extension in Windows explorer needs to be associated with Excel.

20 In addition, the cube structure can be opened in the Microsoft Business Intelligence Development Studio (BIDS). Open BIDS from the start menu in Windows. Then choose Open, Analysis Services Database as follows:

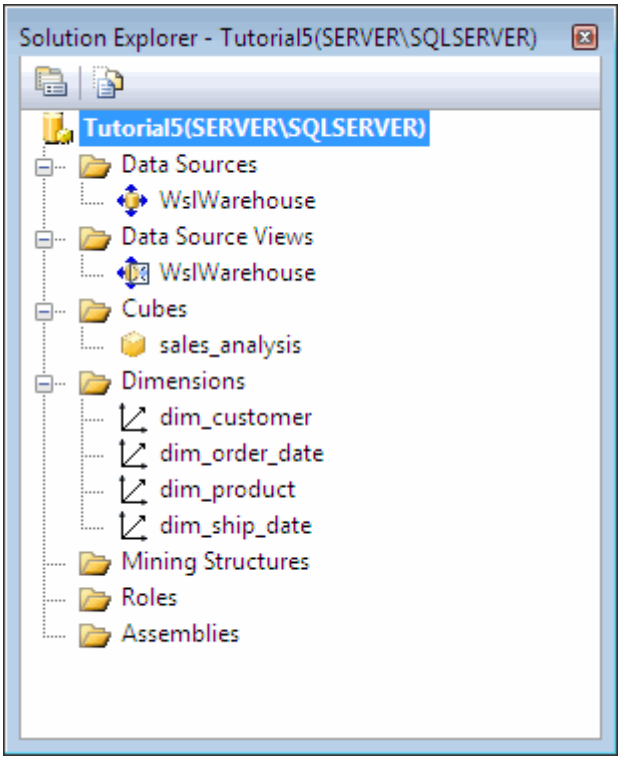


21 Choose the server and Tutorial5 cube database. A sample is shown:



Click OK.

This now displays the cube database definition from the Analysis Services server:

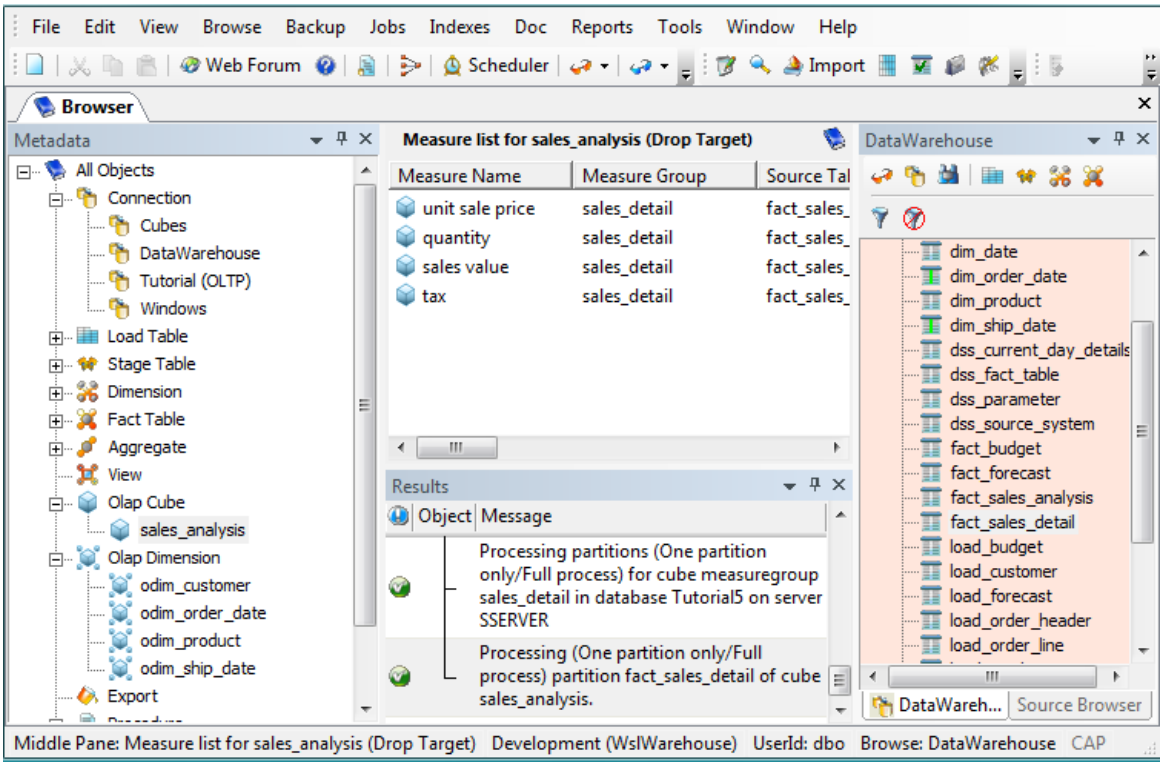


Close BIDS when finished.

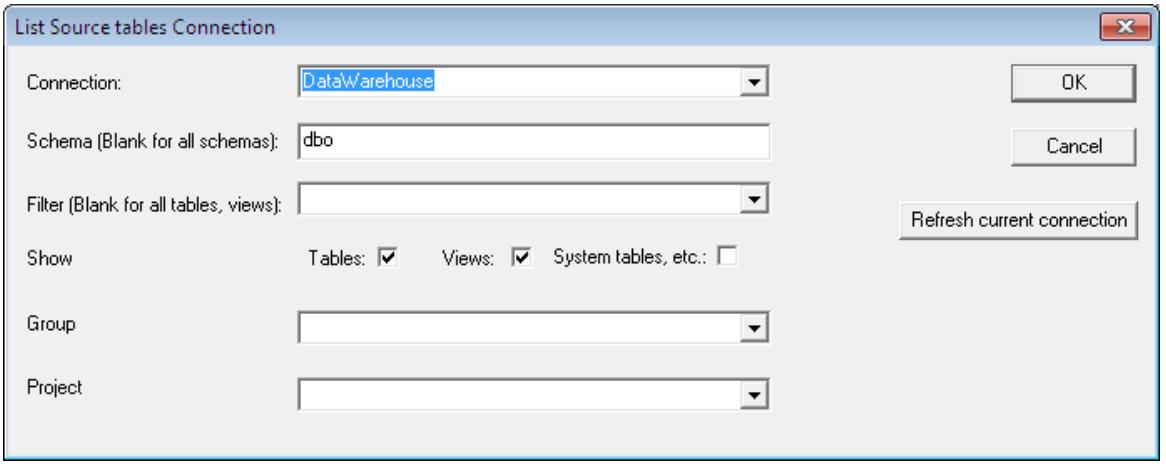
Adding a Measure Group

A cube can contain multiple Measure Groups. In QAD Data Warehouse Designer, a Measure Group relates to a relational star schema. The cube ties Measure Groups together through shared dimensions that are conformed in the relational data warehouse. Measure Groups can be added to an existing cube by dragging additional fact tables into the cube.

1 Click on the OLAP Cube *sales_analysis* in the left hand pane to show the Measures associated with the cube. Your screen should look like this:



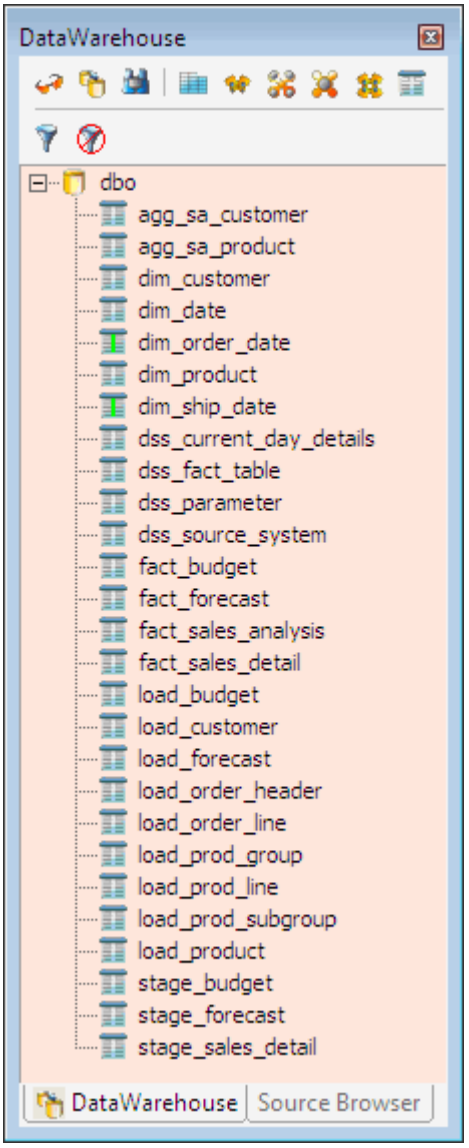
2 Now you need to browse the *DataWarehouse* connection to see available fact tables. From the Browse menu, select DataWarehouse then Change Connection. The following dialog displayed:



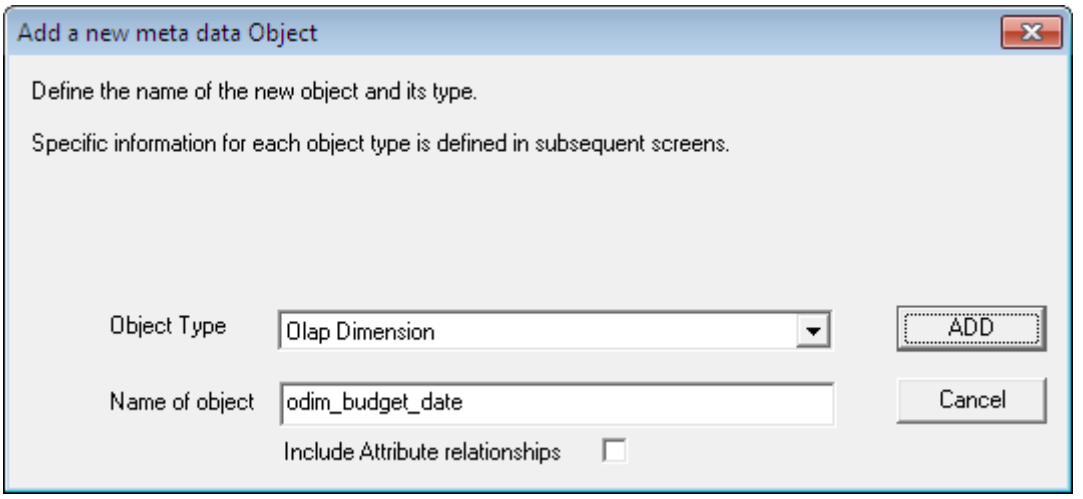
Choose *DataWarehouse* from the Connection drop down and click OK.

NOTE: For SQL Server the Data Warehouse schema must be dbo.

The following browse pane is displayed:



3 Drag the *fact_budget* table into the middle pane. QAD Data Warehouse Designer will confirm that it is OK to add a new OLAP Dimension for the date dimension. Change the Name of object to *odim_budget_date.*



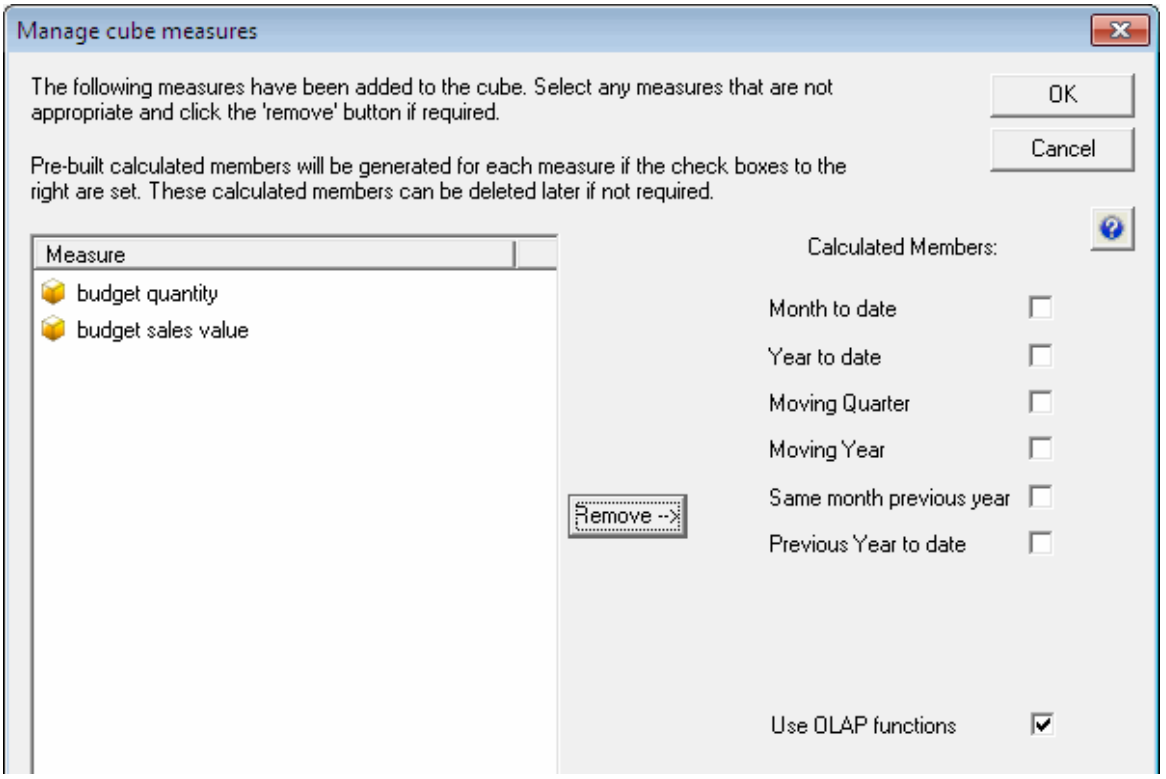
Then click ADD.

NOTE: If you wish to include Attribute Relationships in Analysis Services for this dimension, click on the Include Attribute relationships check box.

4 The Adding cube measures dialog is displayed next. Remove all non-measure columns (that is, columns that cannot be aggregated) from the Measure list by highlighting them and clicking the Remove button. The columns to remove are:

- Product Code
- Customer Code

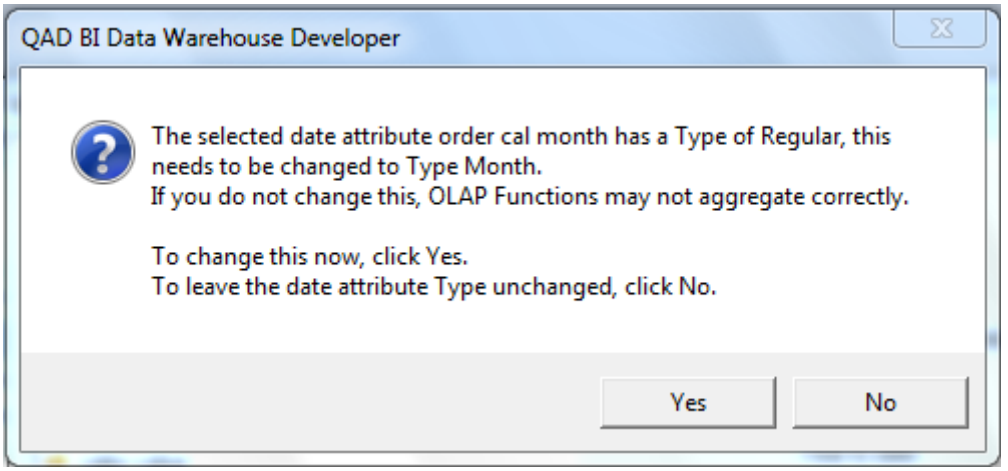
At this stage, your dialog should look like this:



5 Choose to create some date based calculated members using OLAP functions by selecting the Month to date, Year to date, and the Use OLAP functions check boxes. The calculated measures drop downs are now displayed. Select the required date hierarchy information. Specifically:

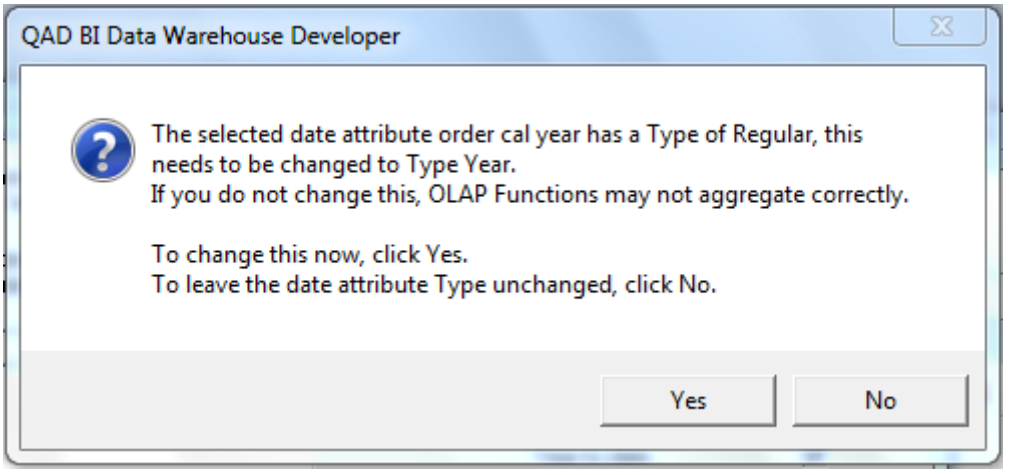
- for Date dim, select *Date Dimension*
- for Dim hie, select *calendar*
- for Month level, select *cal month*
- for Year level, select *cal year*

After selecting the Month level, you will be asked to confirm changing the attribute type to Months for the the *cal month* attribute in Analysis Services as follows:



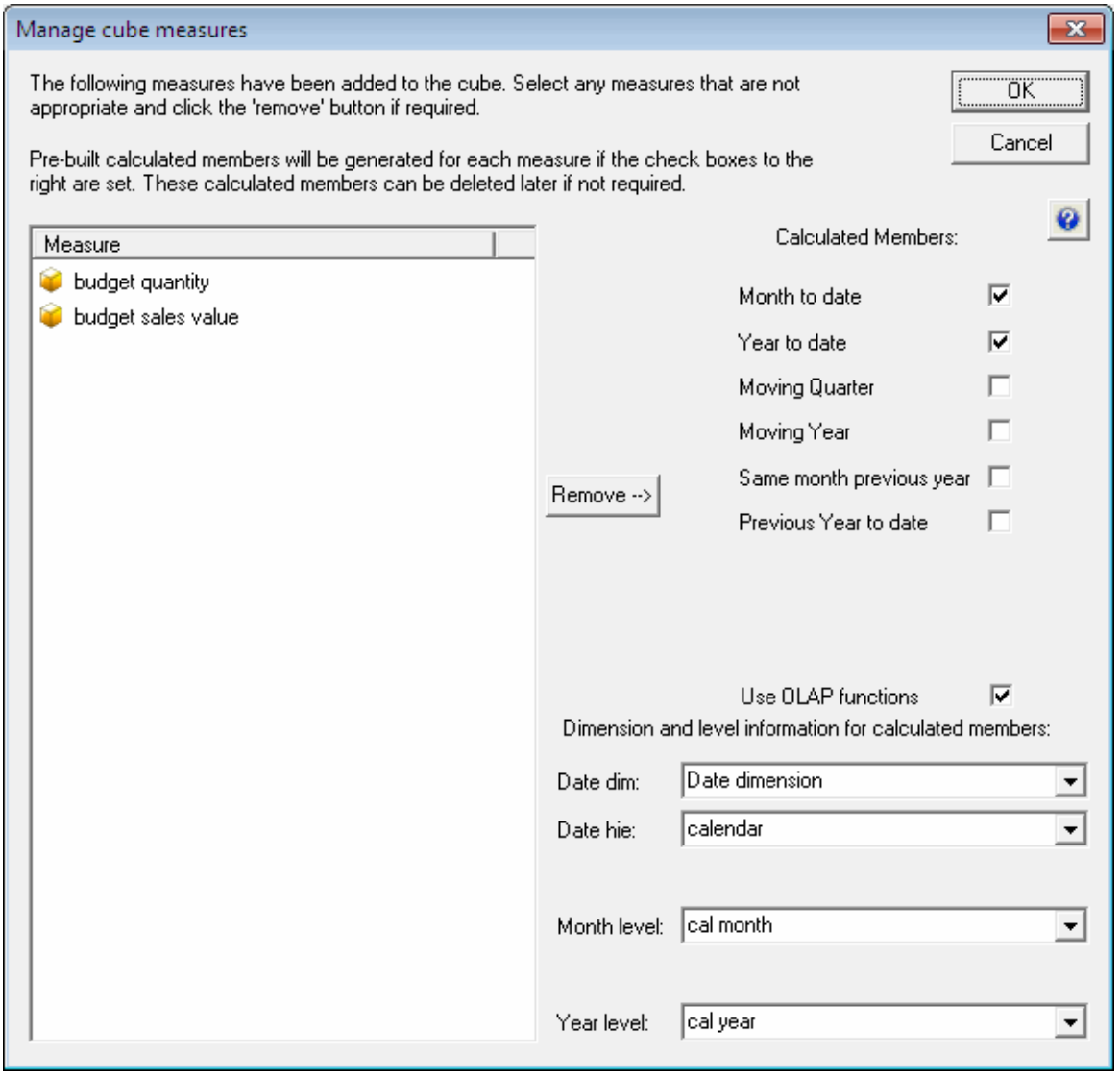
Click Yes.

Similarly, selecting the Year level, you will be asked to confirm changing the attribute type to *Years* for the the *cal year* attribute in Analysis Services as below:



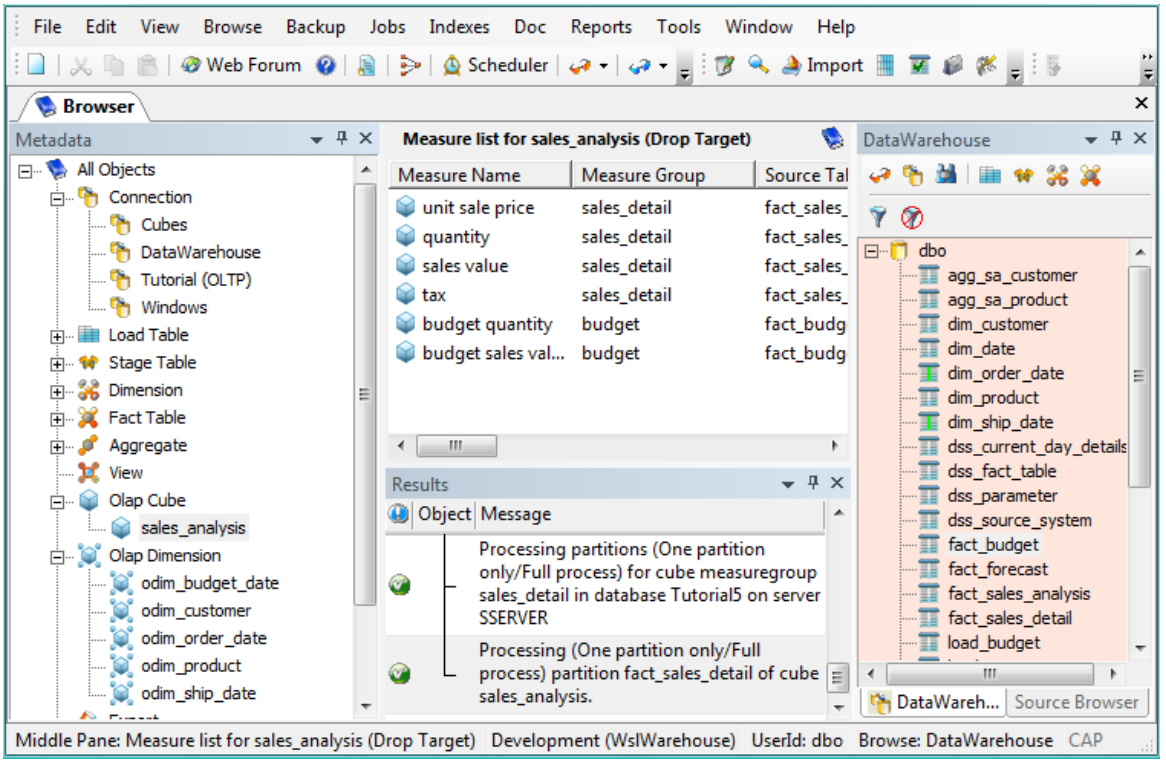
Again, click Yes.

Your Manage cube measures dialog should now look like this:

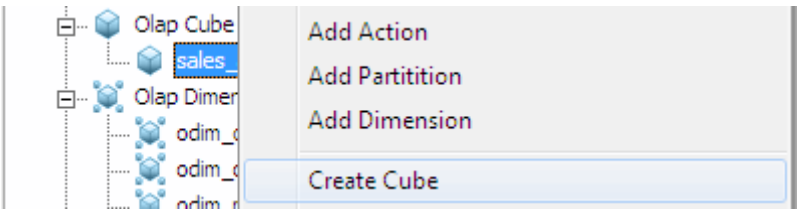


Click OK to complete definition of the cube.

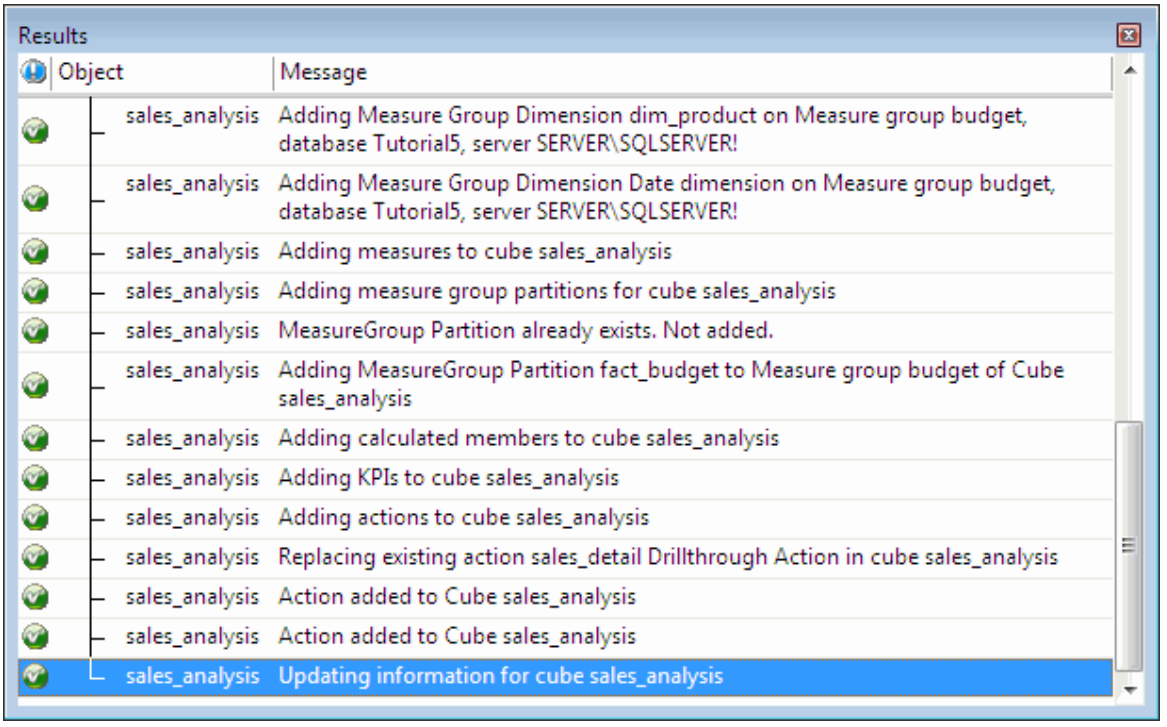
6 Click on the OLAP Cube *sales_analysis* in the left hand pane to show the updated Measures associated with the cube. You should now see measures from both fact tables in the middle pane:



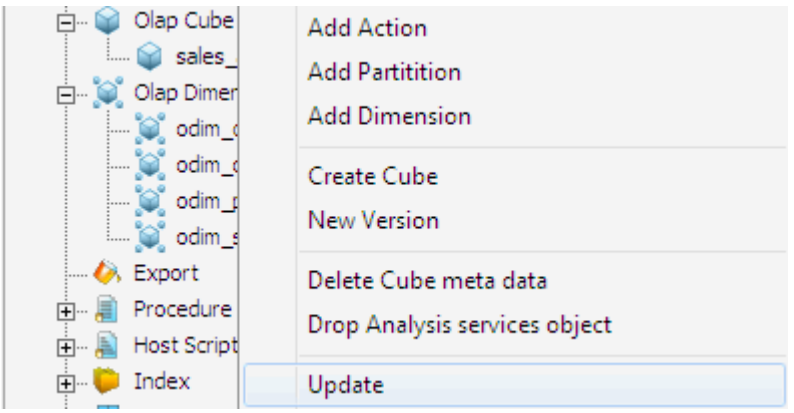
7 To apply the changes made in the QAD Data Warehouse Designer metadata to Analysis Services, right click the *sales_analysis* OLAP Cube in the left hand pane and choose Create Cube as below:



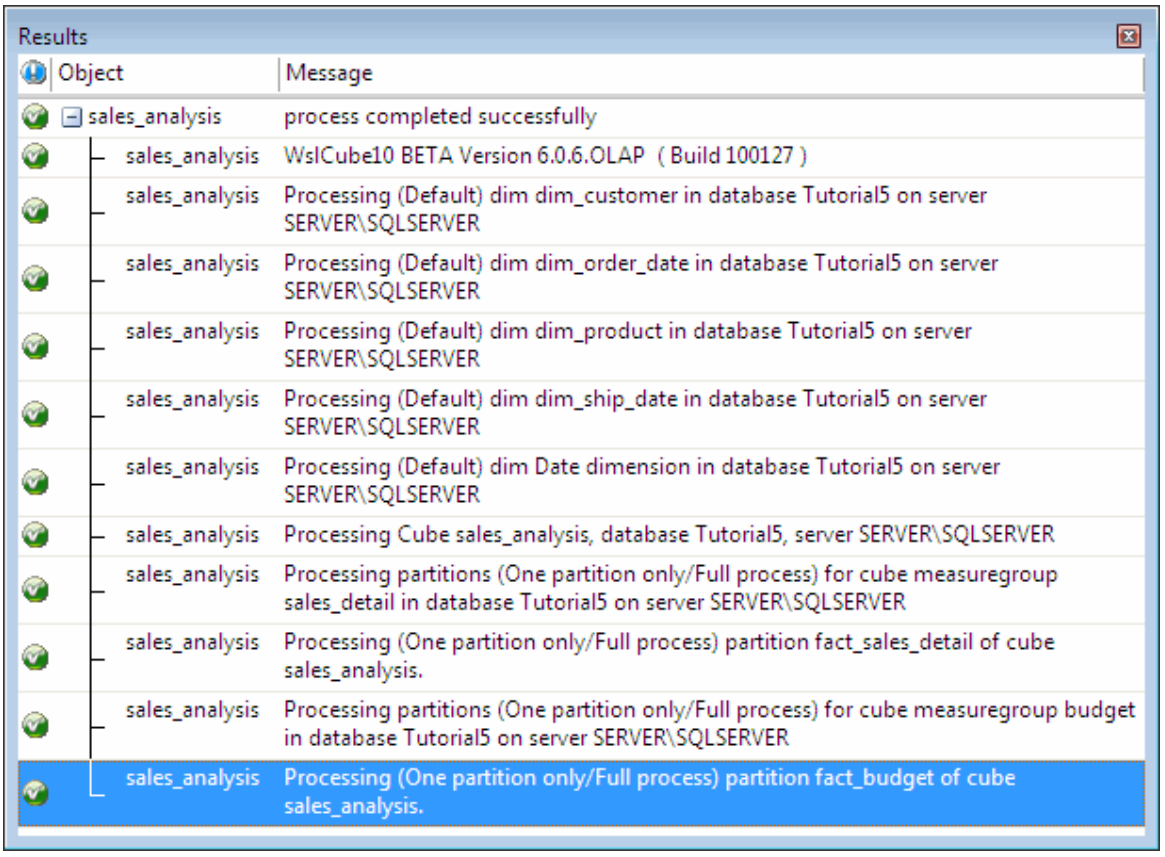
This will open the WSL Cube executable that connects to Analysis Services to create the sales_analysis cube structure. You will see the successful completion in the results pane:



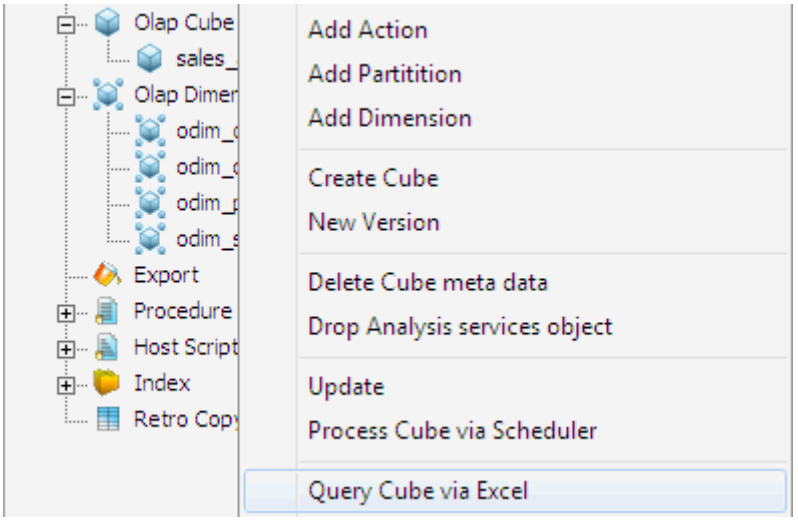
8 Next, reload the cube in OLAP Cube in Analysis Services. Do this by right clicking on the *sales_analysis* cube in the left hand pane and choosing Update as follows:



This will open the WSL Cube executable to process data into the cube structure. Once the cube is processed it can be viewed. Again, you will see the successful completion in the results pane:

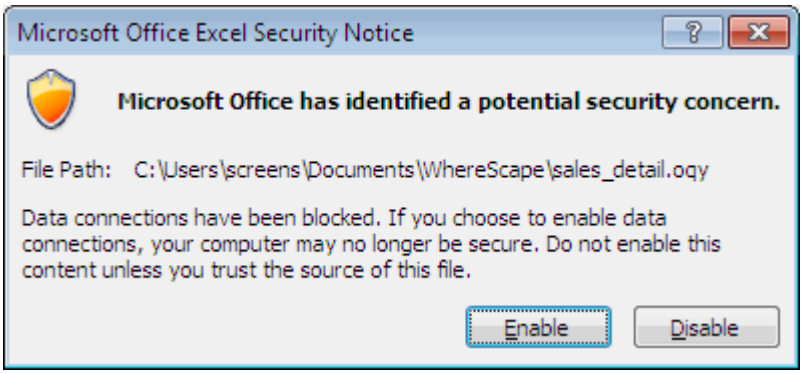


9 To view the cube in Excel, right click the *sales_analysis* cube in the left hand pane and choose Query cube Via Excel like this:



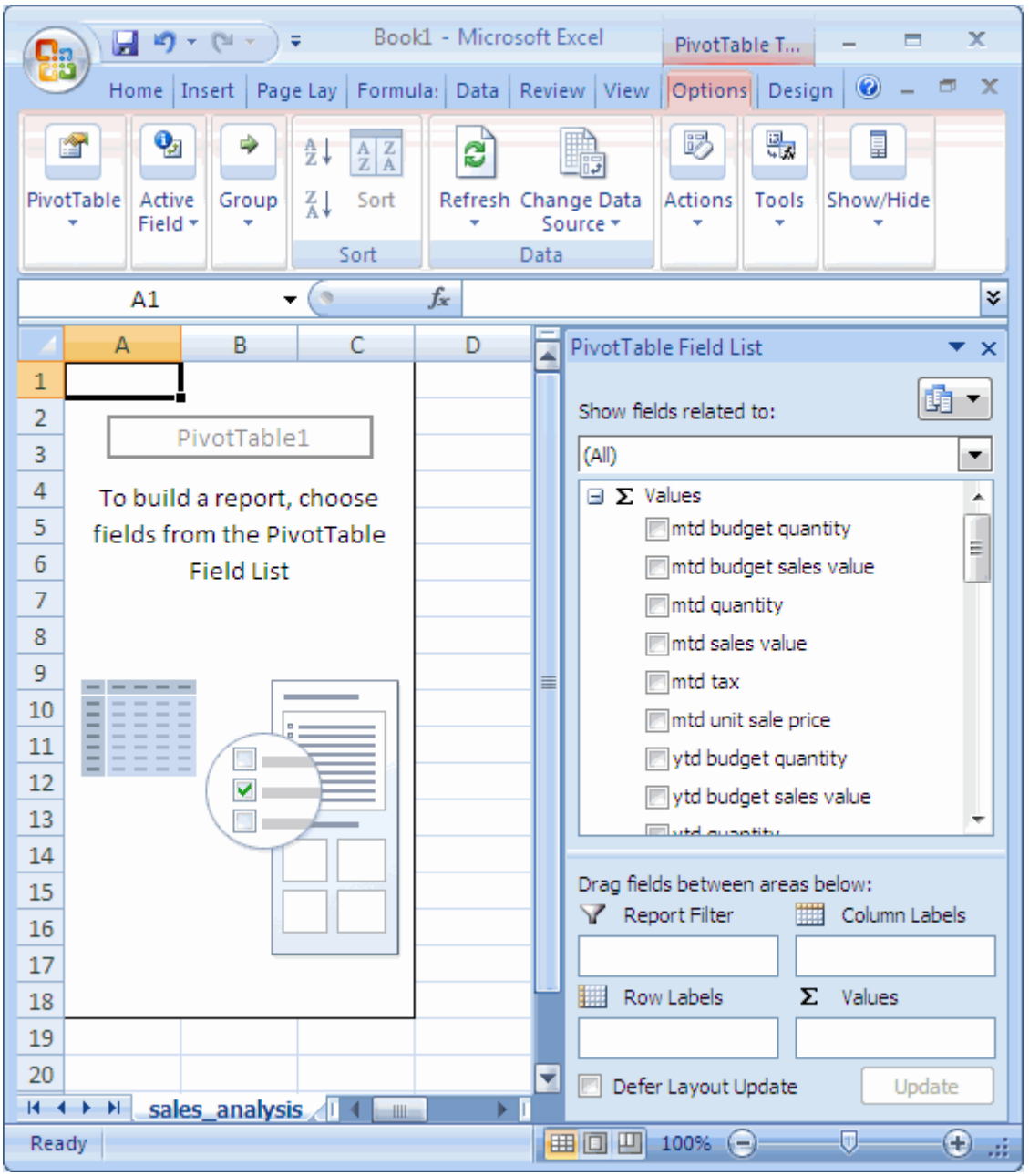
This will open Excel if it is installed.

NOTE: If Excel displays the following dialog box, click Enable:



This message may not be displayed.

Excel then opens a connection to the cube for querying in a pivot table:



NOTE: the two measure groups are now displayed in the Field list.

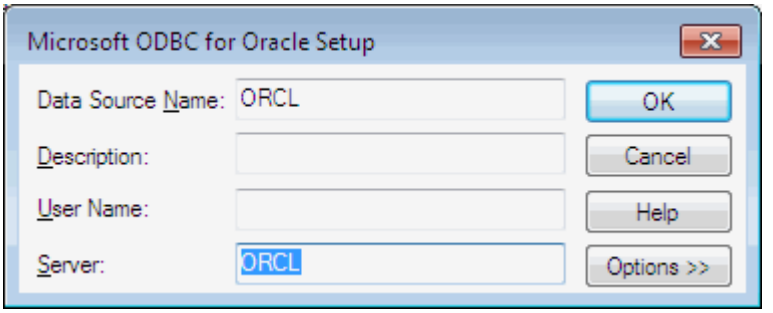
Cube Connections for Other Databases

This tutorial has been completed using Microsoft SQL Server as the data warehouse database. If you wish to use Oracle or DB2, the data warehouse connections need to be set differently as follows.

This section shows how to configure the DataWarehouse connection for either an Oracle or a DB2 data warehouse database.

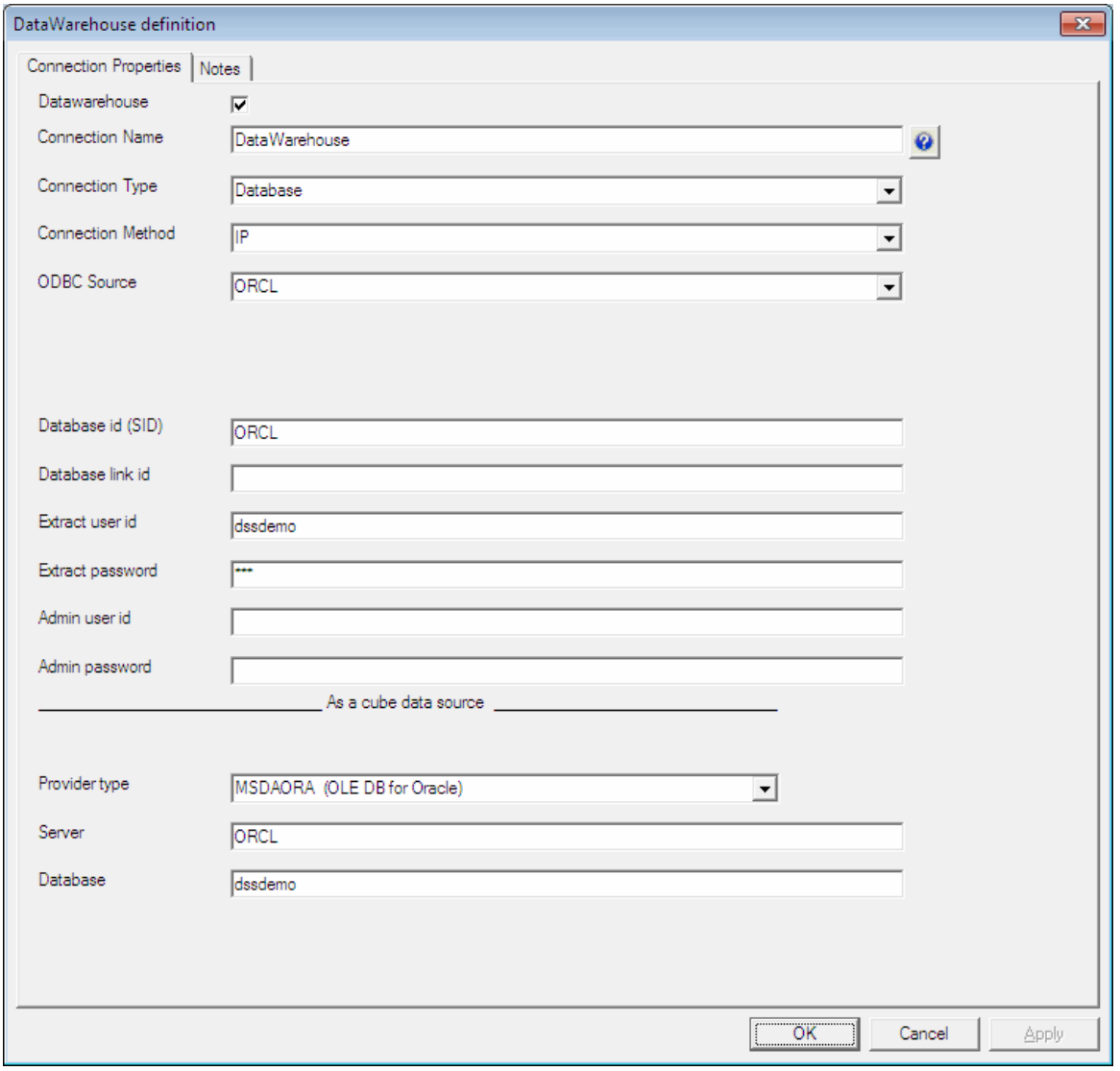
Oracle Configuration

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



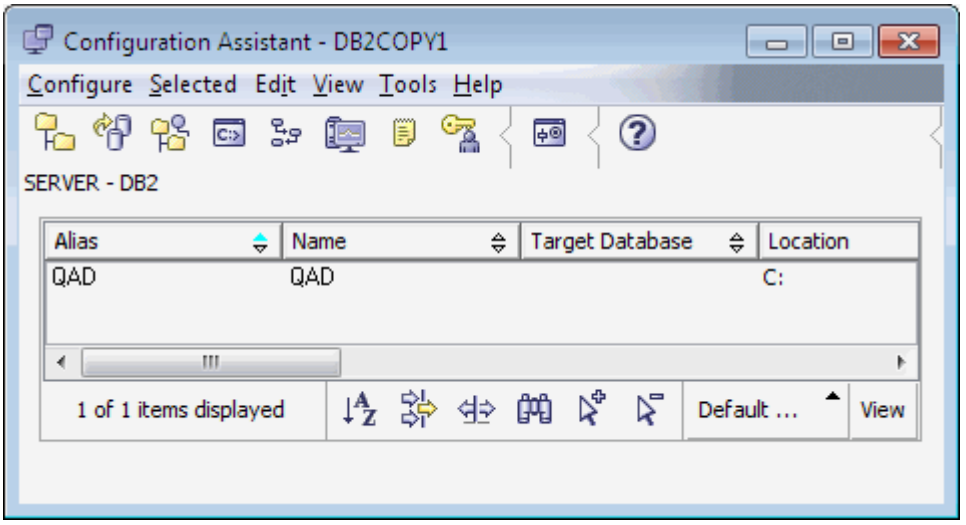
- Enter the data warehouse "schema" for the **Database** field

Here is an Oracle example:

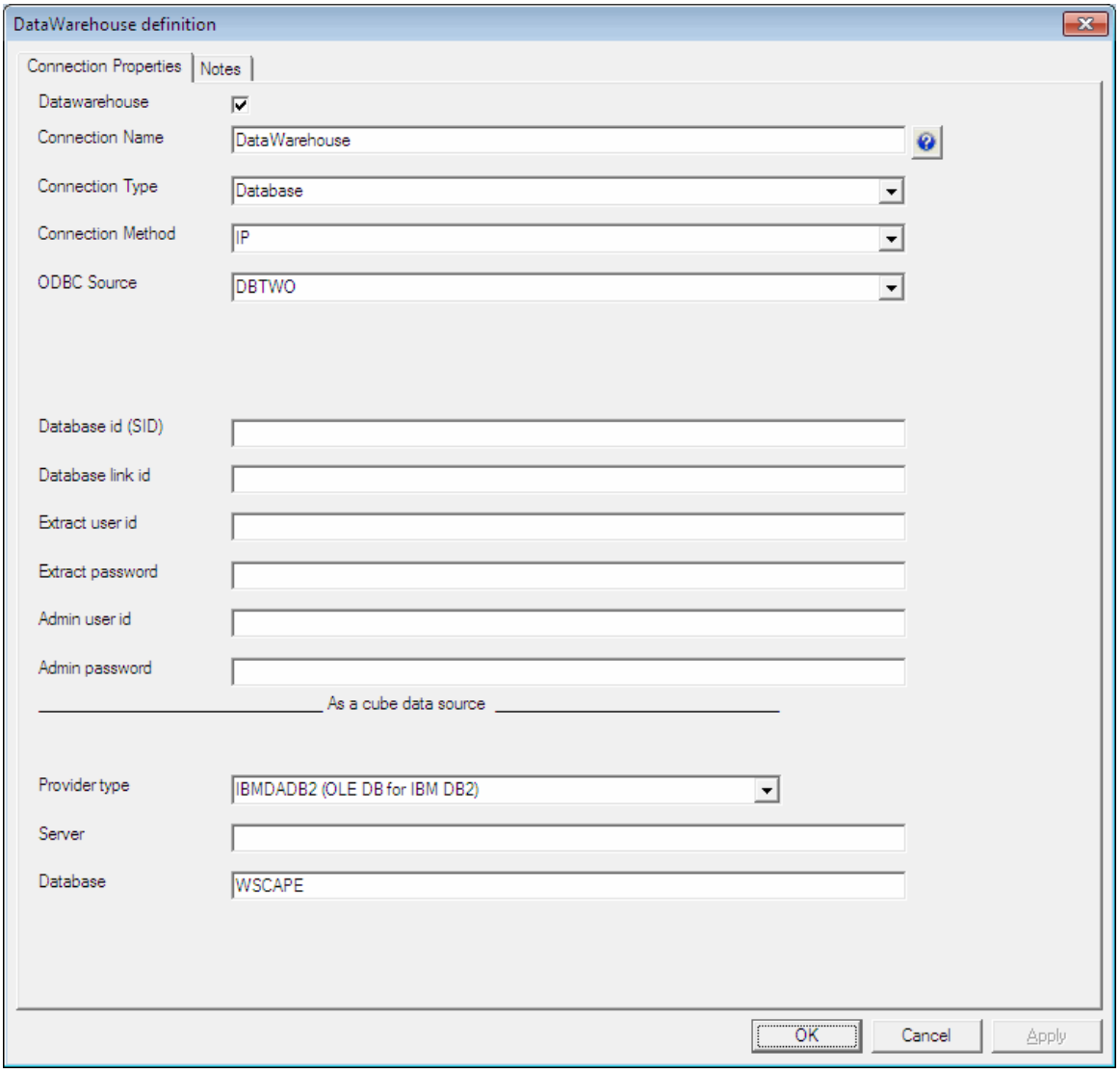


DB2 Configuration

- Select *IBMDADB2* for the Provider Type
- The Server field is left empty for DB2
- Enter the database server alias for the Database field, specifically the alias field for the IBM DB2 connection in the following DB2 Configuration Assistant screen:



Here is an IBM DB2 example:



CHAPTER 6

Tutorial 6 - KPI fact table

Before you start on this chapter you should have:

- Completed ***Tutorial 2 - Rollup fact tables, ASCII file loads, aggregates*** (on page 57)

This chapter will cover the definition of a Key Performance Indicator (KPI) fact table. The fact tables built as part of the first two tutorials are used in this process.

In This Chapter

Tutorial 6 - Purpose and Roadmap....160
The KPI Dimension....161
Defining the KPI Fact Table....162
Creating the KPI Fact Table and Procedure....168
The KPI Parameters....170
Defining a KPI....171
Defining the Activity KPI....175

Tutorial 6 - Purpose and Roadmap

Purpose

KPI fact tables are designed to assist in the answering of difficult business questions. The star schema design does not support an easy means of answering questions that wish to compare current month values with the same period last year, or current month with year to date values. In many cases it is possible to build such measures into monthly rollup fact tables, but in some instances even that design does not provide an adequate solution. KPI fact tables are a very specific type of fact table and are narrowly focused to handle these complex comparative queries.

In this tutorial you will learn how to:

(i) set-up a KPI dimension

(ii) create a KPI fact table

(iii) define individual KPIs

This tutorial relies upon the tables created in the previous tutorials.

Tutorial Environment

This tutorial has been completed using IBM DB2. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

Tutorial Roadmap

Step in Tutorial	Section
Create a dimension to support the KPI fact table	The KPI dimension
Define the columns of the KPI fact table including the measures and the specific dimensions required.	Defining the KPI fact table
Create the KPI fact table and build a procedure used to update the fact table.	Creating the KPI fact table
Create and initialize the parameters used to establish the update window for the fact table.	The KPI parameters
Define a simple KPI	Defining a KPI
Define a KPI that does year to date calculations for each month.	Defining the Activity KPI

The tutorial starts with '***The KPI Dimension*** (on page 161)'.

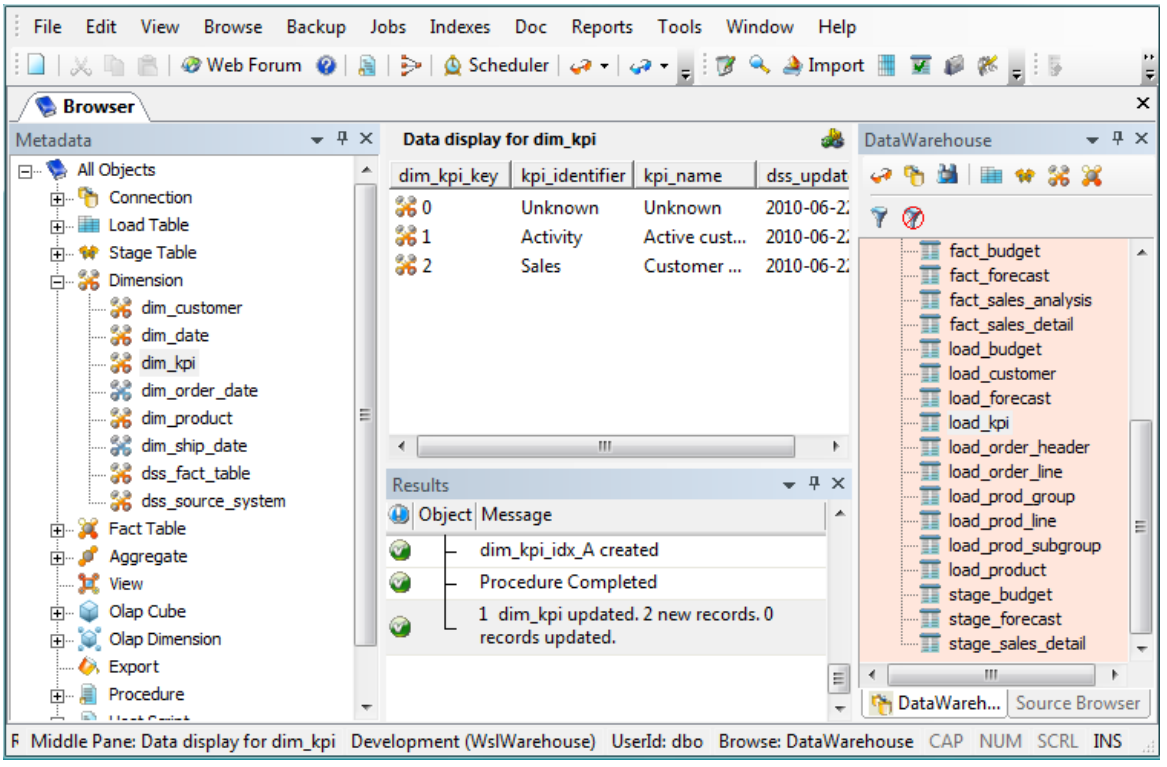
The KPI Dimension

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 KPI dimension can be created from the KPI table distributed with the other tutorial tables:

1. Double click on the 'Load Table' object group in the left hand pane to create a drop target in the middle pane.
2. Browse to the tutorial tables and drag the table 'KPI' into the middle pane. Accept the default name of load_kpi. Create and load the table.
3. Double click on the 'Dimension' object group in the left hand pane to create a dimension drop target in the middle pane.
4. Browse to the data warehouse and drag the newly created 'load_kpi' table into the middle pane. Accept the default name of dim_kpi and proceed to create and populate a Normal dimension as per the examples in the first tutorial. The business key is kpi_identifier.

Your QAD Data Warehouse Designer screen should look like this when you have finished:

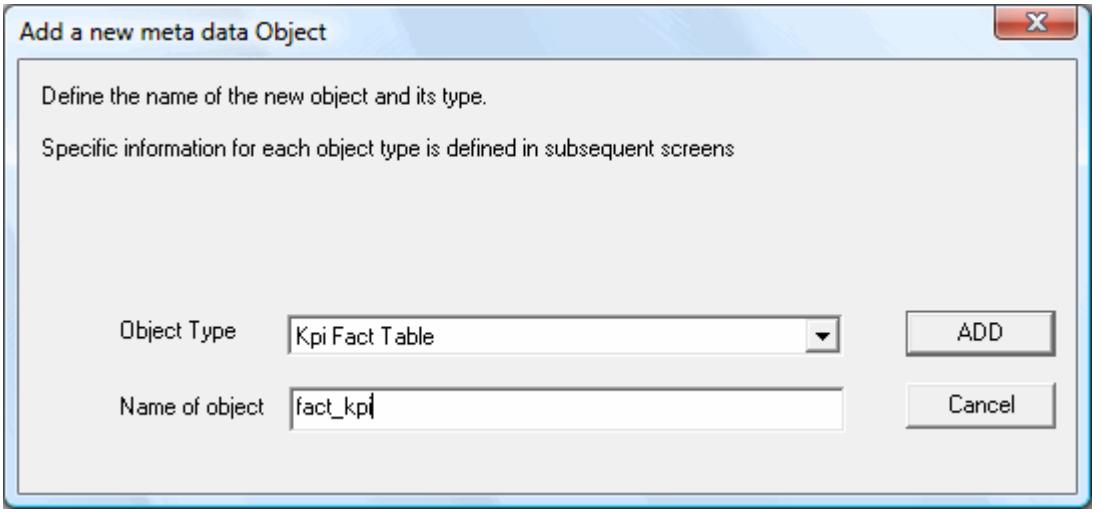


The tutorial continues in the next section ***Defining the KPI Fact Table*** (on page 162).

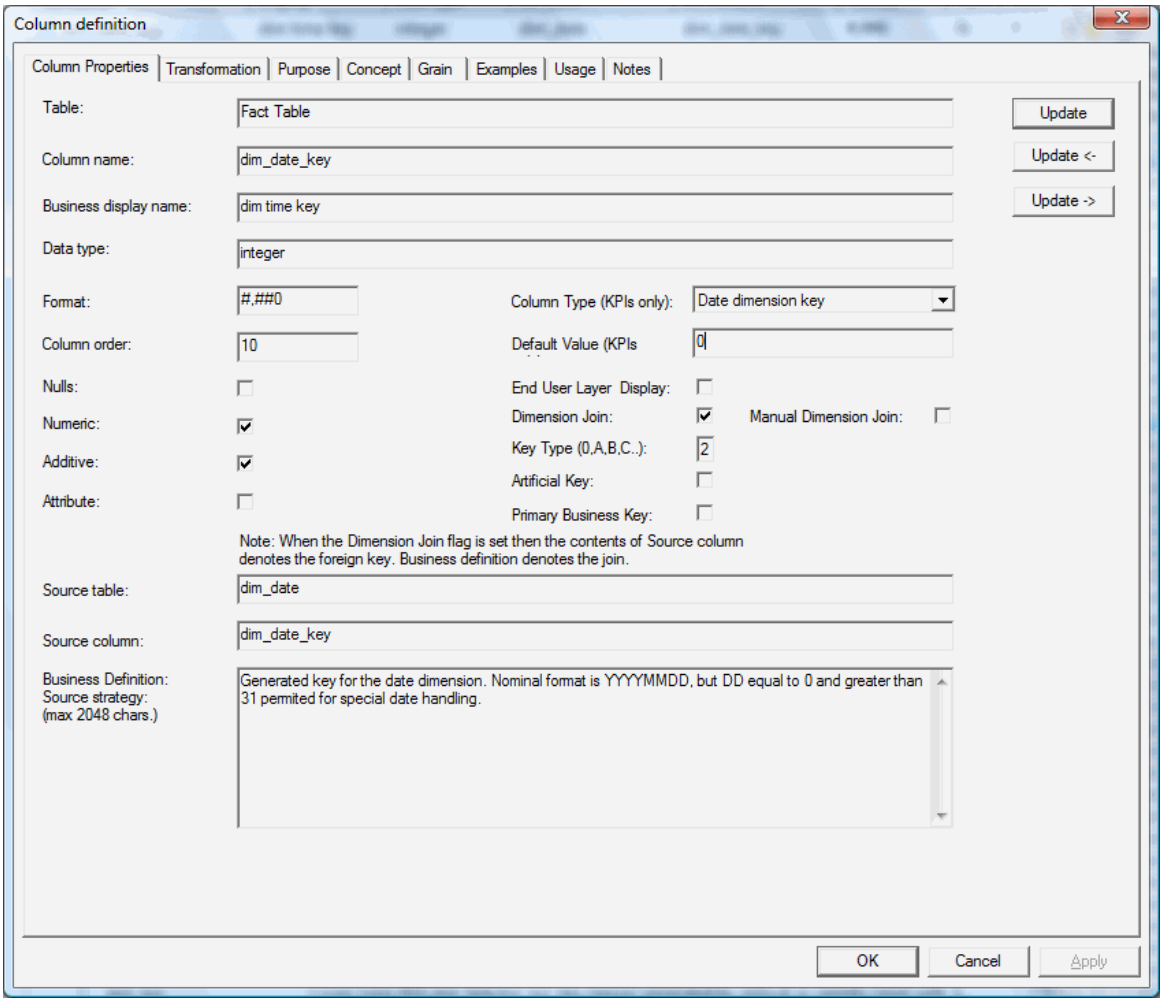
Defining the KPI Fact Table

A KPI fact table is normally created manually. We will, however, use the drag and drop functionality to acquire the dimension key settings. Proceed as follows:

1. Double click on the 'Fact Table' object group in the left hand pane. This will display a list of fact tables in the middle pane and create a fact table drop target.
2. Browse to the data warehouse and double click on dim_date to expand the tree and display the columns.
3. Drag the column dim_date_key from the right hand (browse) pane into the middle pane. The add a new object dialog will appear defaulting to a fact table called fact_date. Change the object type to Kpi fact table and the table name to fact_kpi.

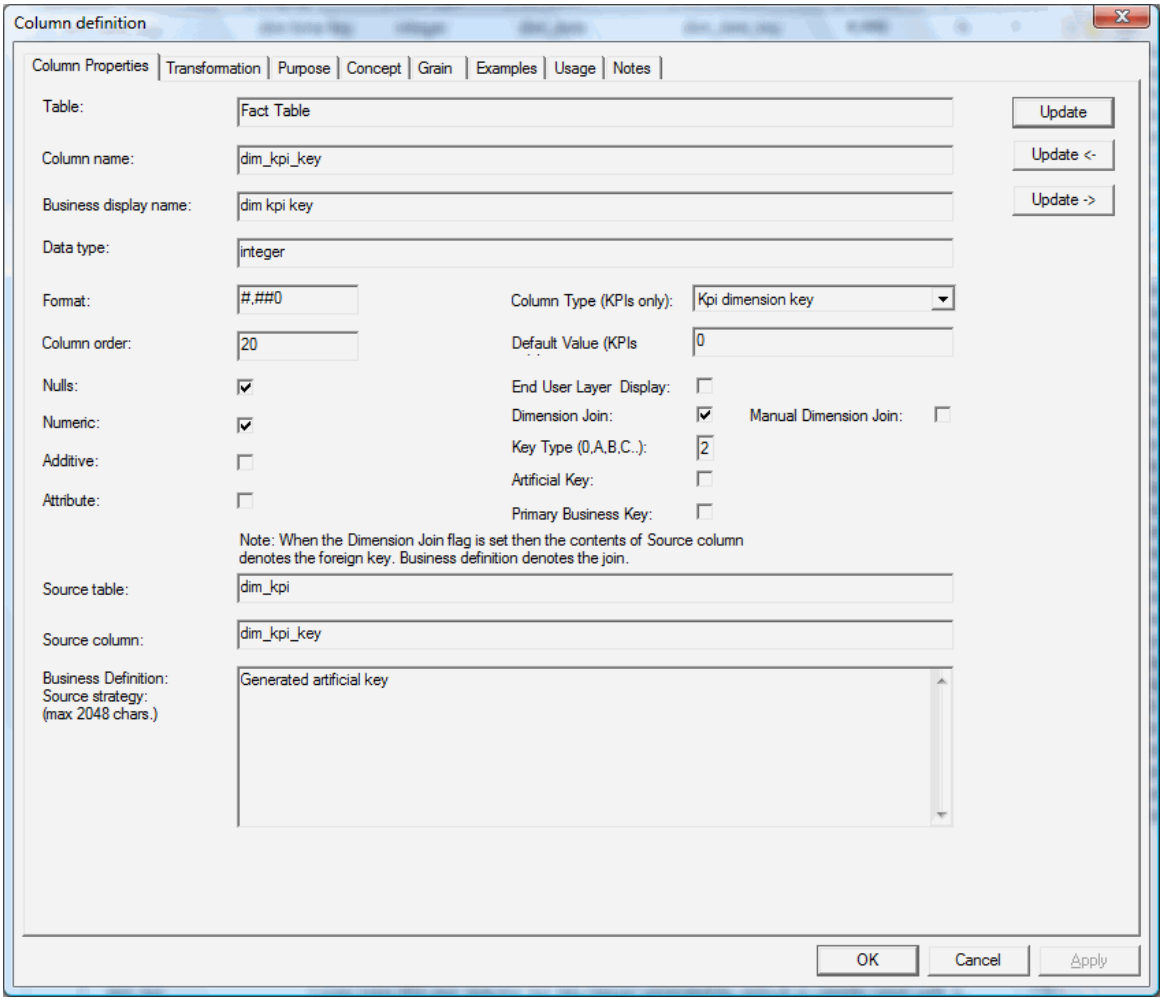


4. Click ADD to add the new object and OK on the properties screen.
5. Use the right mouse menu on the column named 'dim_date_key' in the middle pane and select the properties of this column. Under the column type select 'date dimension key' and enter 0 for the default value. Click OK. This identifies this column as the date dimension column to be used during the definition of the individual KPIs.



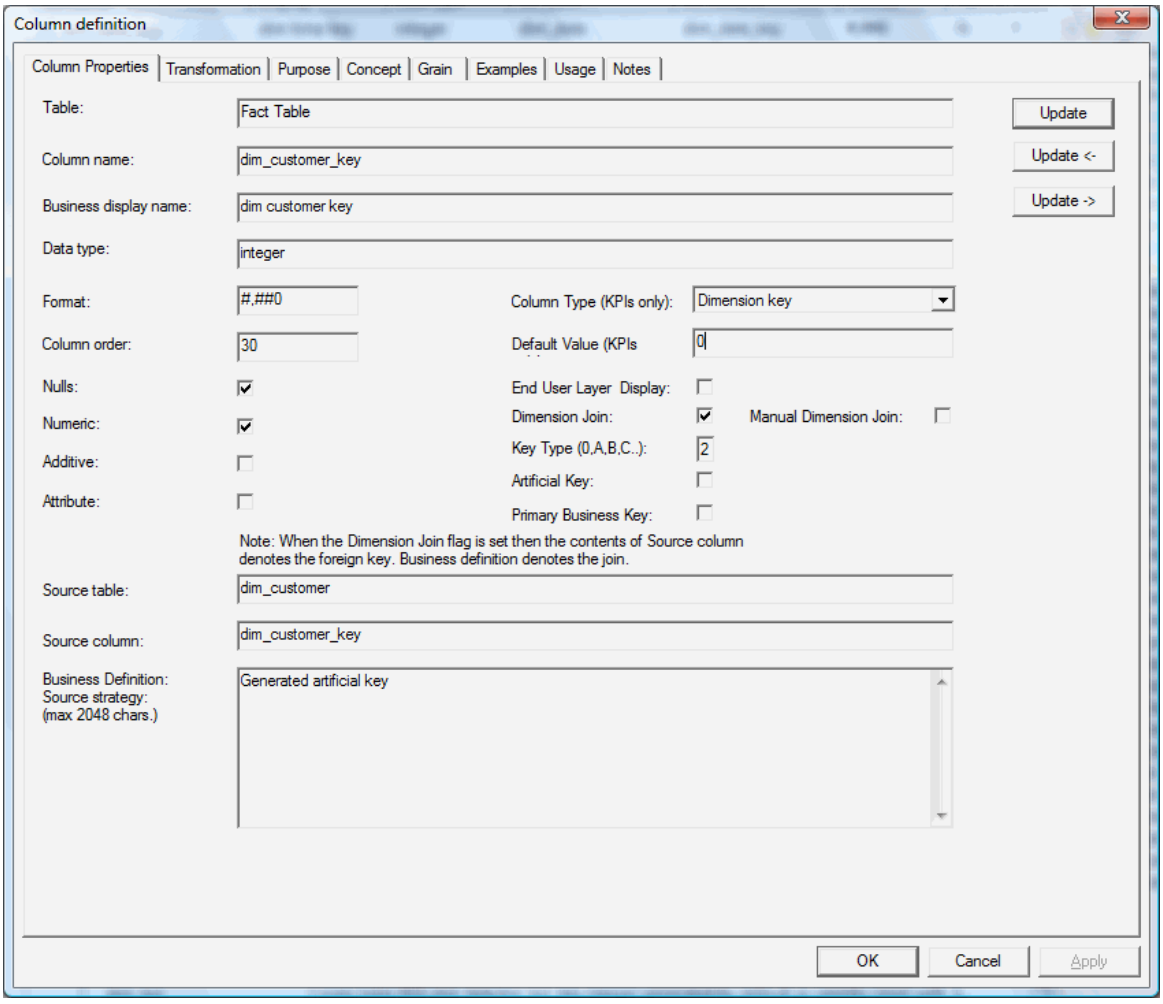
6 Drag the column dim_kpi_key from the dim_kpi table in the right hand pane into the column list in the middle pane.

7 Use the right mouse menu on the column named 'dim_kpi_key' in the middle pane and select the properties of this column. Under the column type select 'Kpi dimension key' and enter 0 for the default value.



8 Drag the column dim_customer_key from the dim_customer table in the right hand pane into the column list in the middle pane.

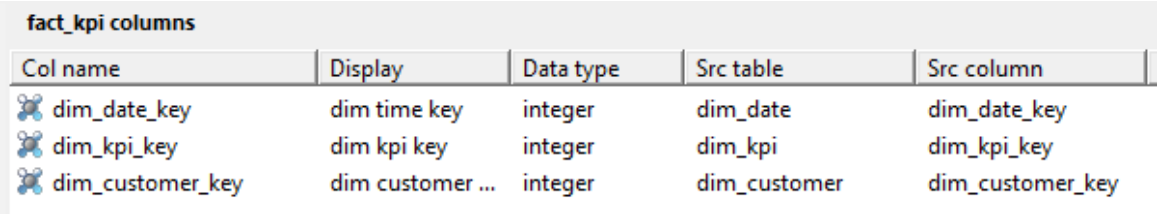
9 Use the right mouse menu on the column named 'dim_customer_key' in the middle pane and select the properties of this column. Under the column type select 'Dimension key' and enter 0 for the default value.


Column definition
Column Properties
Transformation
Purpose
Concept
Grain
Examples
Usage
Notes
Table:
Fact Table
Column name:
dim_customer_key
Business display name:
dim customer key
Data type:
integer
Format:
#,##0
Column order:
30
Nulls:
Numeric:
Additive:
Attribute:
Column Type (KPIs only):
Dimension key
Default Value (KPIs
0
End User Layer Display:
Dimension Join:
Manual Dimension Join:
Key Type (0,A,B,C..):
2
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:
dim_customer
Source column:
dim_customer_key
Business Definition:
Source strategy:
(max 2048 chars.)
Generated artificial key
Update
Update <-
Update ->
OK
Cancel
Apply

At this point we have defined the new KPI fact table and have added three columns to it, namely dim_date_key, dim_kpi_key and dim_customer_key. For the purposes of this tutorial these will be the only dimensions we will utilize.

We will now define the measures of the KPI fact table. KPI fact tables contain four types of measure. These measure types are month to date, year to date, same month last year, and previous year to date. These measures will have different meanings depending on the KPI being evaluated. They are by necessity, therefore very generic. Typically just a count and a dollar value. Note, that all measures must allow nulls. Although the resultant record will not contain nulls, the KPI update procedure makes multiple passes in order to update the fact table and needs the ability to insert nulls during the process. Proceed as follows to create quantity and sales measures for each of the types defined above.

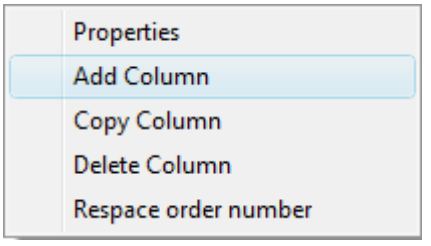
1 Click on the '**fact_kpi**' table name to refresh the column display in the middle pane. These columns are listed:



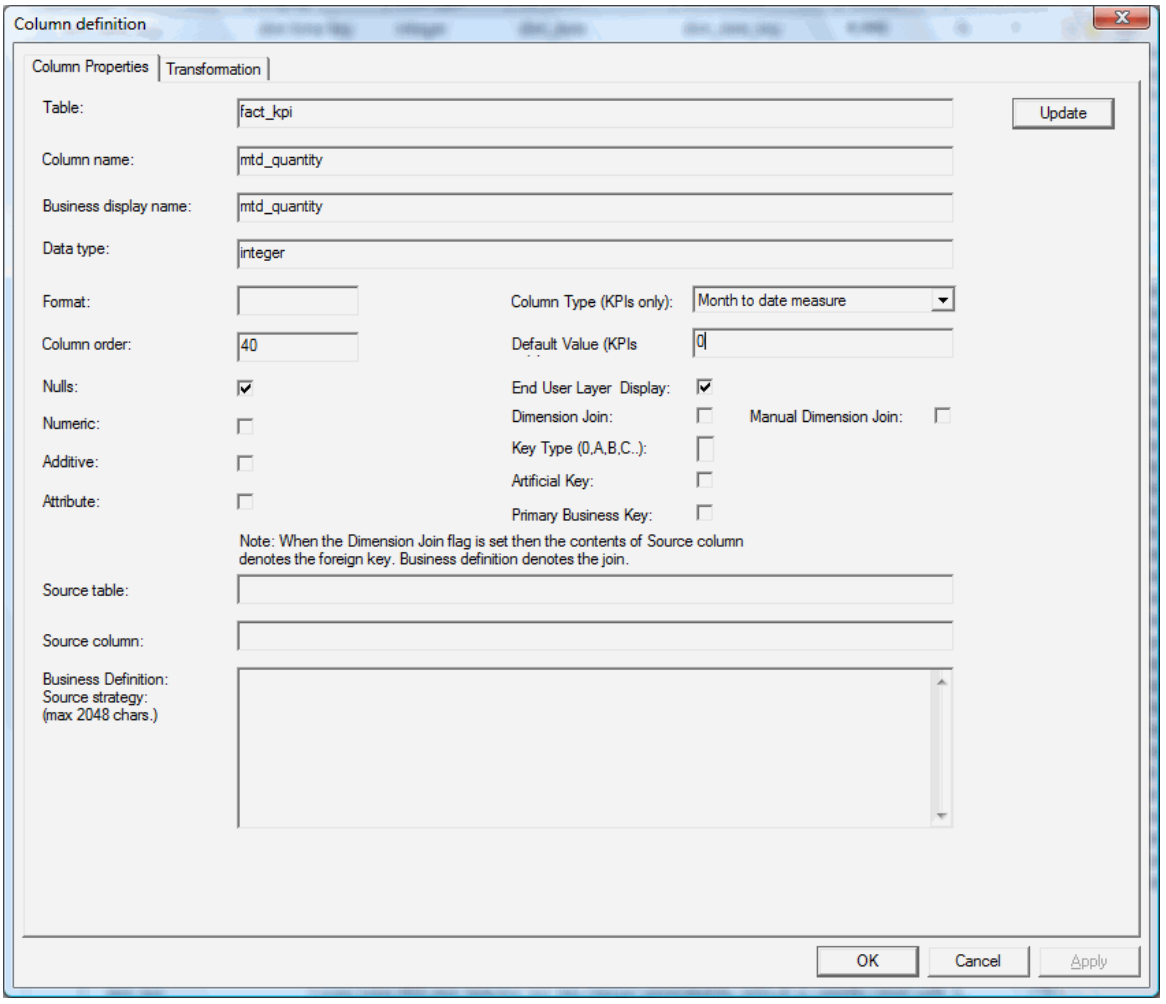
fact_kpi columns

Col name	Display	Data type	Src table	Src column
dim_date_key	dim time key	integer	dim_date	dim_date_key
dim_kpi_key	dim kpi key	integer	dim_kpi	dim_kpi_key
dim_customer_key	dim customer ...	integer	dim_customer	dim_customer_key

2 Use the right mouse menu on 'fact_kpi' and select '**Add Column**'.

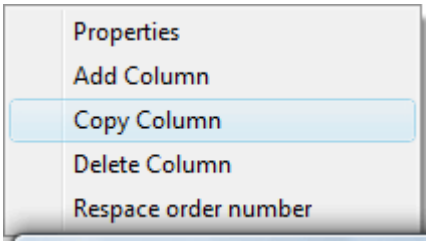


3 Enter **mtd_quantity** for the column and business names. Enter **integer** for the data type. Select '**Month to date measure**' for the column type and set a default value of **0**. The **Nulls** check box must be set. Update the column properties:



4 Repeat step 2 and 3 using the column name mtd_sales with a data type of number(13,2) for Oracle, or numeric(13,2) for SQL Server and DB2.

5 Position on the mtd_quantity column and use the right mouse menu option 'Copy Column' to copy the column.



Change the properties of the copied column to be ytd_quantity and the column type to 'Year to date measure'.

6 Repeat step 5 for mtd_sales to create ytd_sales.

7 Repeat steps 5 and 6 to create prev_month_quantity and prev_month_sales using a column type of 'Last year same month measure'

8 Repeat steps 5 and 6 to create prev_ytd_quantity and prev_ytd_sales using a column type of 'Prev year to date measure'.

The resultant set of columns should be named as follows with the column type as shown (SQL Server).

Note: Oracle should have number(13,2) instead of numeric(13,2).

fact_kpi columns

Col name	Display	Data type	Src table	Src column	Nulls	Key...	Col Type	Default Value
dim_date_key	dim time key	integer	dim_date	dim_date_key	N	2	Date dimension key	0
dim_kpi_key	dim kpi key	integer	dim_kpi	dim_kpi_key	Y	2	Kpi dimension key	0
dim_customer_key	dim customer key	integer	dim_customer	dim_customer_key	Y	2	Dimension key	0
mtd_quantity	mtd_quantity	integer			Y		Month to date measure	0
ytd_quantity	ytd_quantity	integer			Y		Year to date measure	0
prev_month_quantity	prev_month_quantity	integer			Y		Last year same month measure	0
prev_ytd_quantity	prev_ytd_quantity	integer			Y		Previous year to date measure	0
mtd_sales	mtd_sales	numeric(13,2)			Y		Month to date measure	0
ytd_sales	ytd_sales	numeric(13,2)			Y		Year to date measure	0
prev_month_sales	prev_month_sales	numeric(13,2)			Y		Last year same month measure	0
prev_ytd_sales	prev_ytd_sales	numeric(13,2)			Y		Previous year to date measure	0

Note: The column order is important. For example if we have mtd quantity and sales in that order then the prev month, prev ytd and ytd figures also need quantity first followed by sales. If this order is not adhered to then the generated procedure will load the wrong values into the wrong columns.

The KPI fact table has now been defined and can be created. Proceed to '***Creating the KPI Fact Table and Procedure*** (on page 168)'.

Creating the KPI Fact Table and Procedure

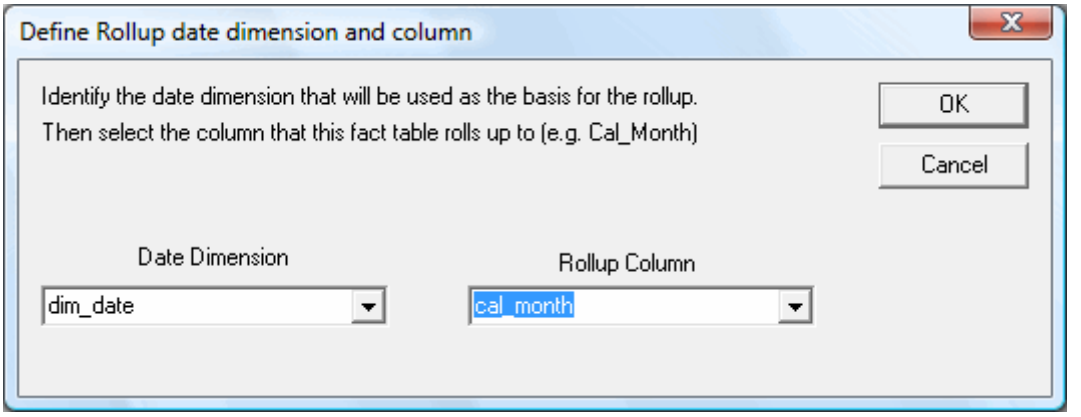
Once defined the KPI fact table can be created and the update procedure built.

1 Create the KPI fact table by selecting the 'Create/ReCreate' menu option when positioned over the fact_kpi table name.

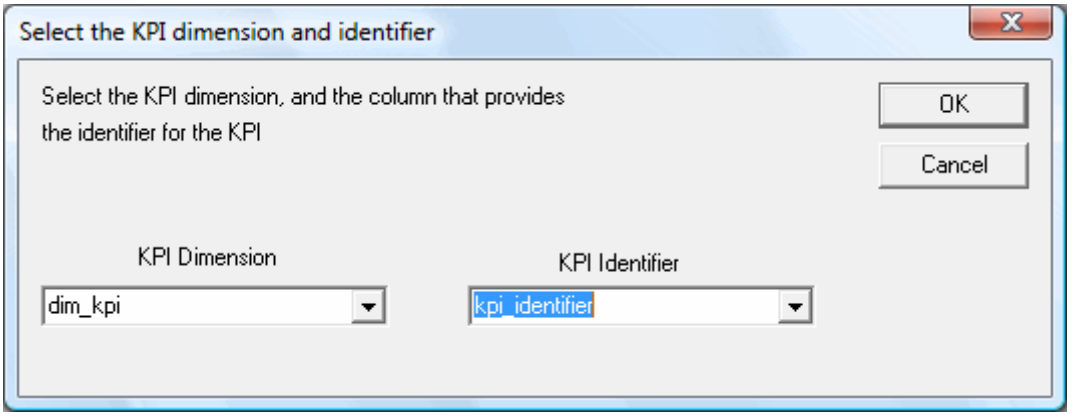
2 Alter the properties of the table and select '*** Create new procedure ***' from the 'Update procedure' drop list. Enter OK to update the properties.

3 A dialog box will prompt for a period start parameter. This parameter along with the subsequent period end parameter define what period(s) will be processed when the KPI fact table is updated. These parameters must be defined, so accept the default FACT_KPI_START and FACT_KPI_END parameter names. See ***The KPI Parameters*** (on page 170) for a description of these parameters.

4 A date dimension and month rollup column are prompted for. Select dim_date and cal_month:



5 Two subsequent prompts require a year rollup column and a date column. Select cal_year and calendar_date to match these prompts. Enter the KPI dimension and identifier as dim_kpi and kpi_identifier:



6 The procedure will now be built and compiled.

We are now ready to define the KPIs, but first we will create and populate ***The KPI Parameters*** (on page 170).

The KPI Parameters

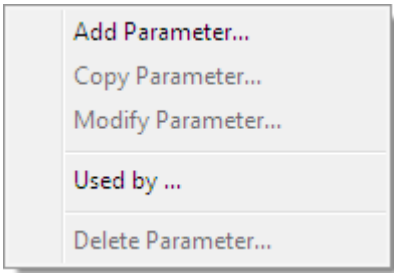
During the procedure creation phase of the KPI fact table we are prompted for parameters used to define the period start and period end. These parameters are read by the update procedure whenever a KPI is updated, and are used to ascertain what time periods are being processed.

If the parameters do not exist then the default of the current and previous months is used. It would however be normal practice to create and maintain these parameters. A procedure called 'daily_date_roll' is shipped with the metadata. This procedure updates a number of parameters to reflect the current date. It is designed to be run every night. Normally we would alter this procedure and include the setting of our KPI period parameters to perhaps the current and previous months.

For the tutorial we will create these parameters and set dates to cover the full range of tutorial data.

1 Select the Tools/Parameters menu option. This displays the current parameters in the middle pane.

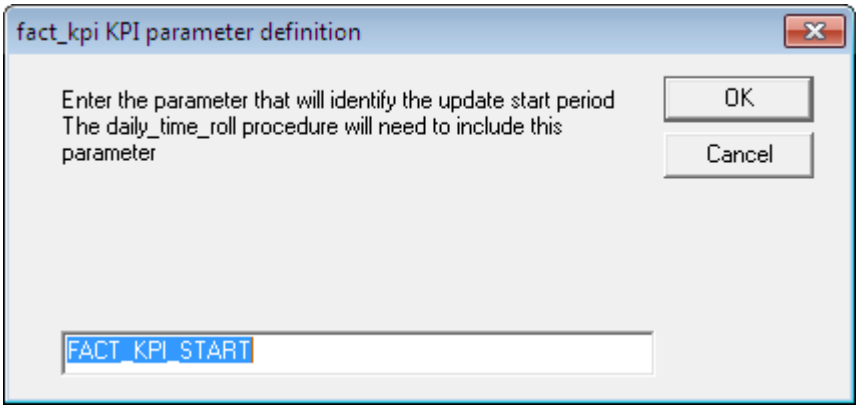
2 Right mouse in the middle pane and choose the 'Add parameter' menu option:



3 Enter the values from the following table for the period start parameter and then repeat step 2 and enter the values for the period end parameter.

Parameter	Value	Comments
FACT_KPI_START	200006	Period start value. We have chosen cal_month as the rollup column. This column has a format of YYYYMM so we enter 200006 for June/ 2000
FACT_KPI_END	200204	Period end value. April/2002 for tutorial

Sample parameter:



Once the parameters have been created we can proceed to the ***Defining a KPI*** (on page 171) section.

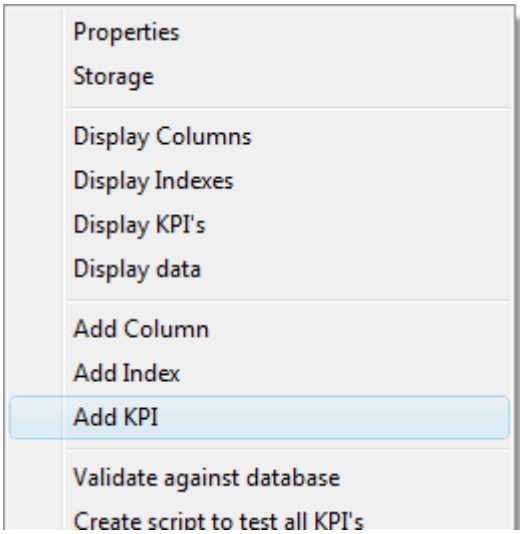
Defining a KPI

We will now define two KPIs. The dimension we have created dim_kpi has two KPIs. These are firstly an Activity KPI, which shows the number of active customers and the value of sales during a month. Secondly a Sales KPI, which shows the number of sales and the value of the sales by customer by month. The process for creating the two KPIs is similar, but there is a difference in complexity. In the Sales KPI we can simply add up all the monthly sales counts and values to achieve year to date values. However, we cannot add the number of active customers in each month to acquire the year to date activity count, as a customer may have been active in more than one month, but we only want to recognize that customer once.

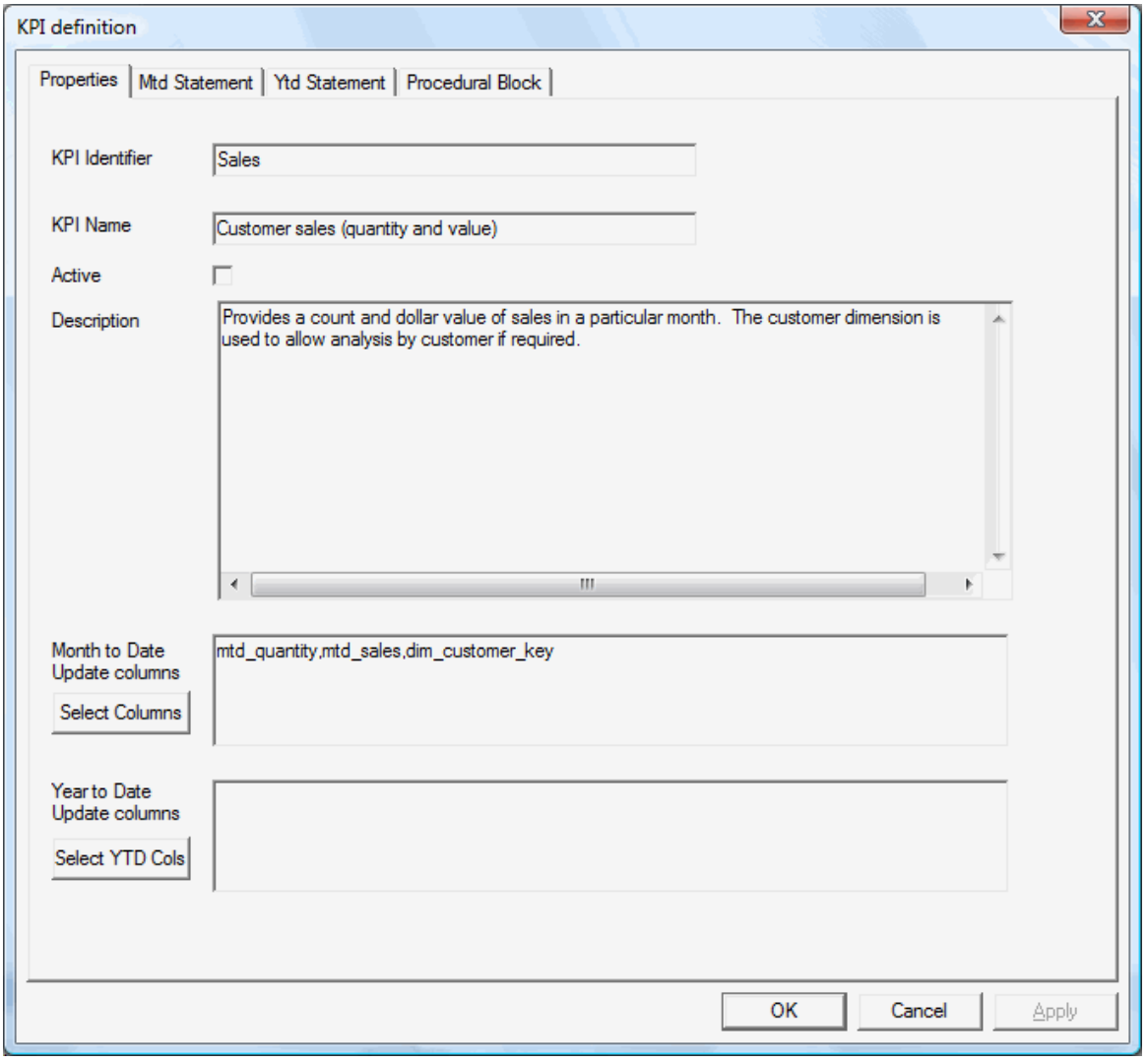
We will do the simpler Sales KPI first followed by the Activity KPI.

Sales KPI

1 Use the right mouse menu when positioned over the fact_kpi table and select 'Add Kpi':


Properties
Storage
Display Columns
Display Indexes
Display KPI's
Display data
Add Column
Add Index
Add KPI
Validate against database
Create script to test all KPI's

2 Populate the dialog box as per the following example. The Kpi Identifier must match the value in the KPI dimension. In this case it must be 'Sales'. The Kpi Name and Description are not matched to the dimension, and can be used here for internal definition of the KPI. The active check box should be set, so that this particular KPI will be processed when we update the KPI fact table. For the 'Month to date update columns' we select the mtd_quantity, mtd_sales, and dim_customer_key. The 'Year to date update columns' are left blank to allow the update procedure to automatically handle these values.



Once the dialog above is completed click OK to add the KPI. Selecting the 'Display Kpi's' right mouse menu option when positioned on the fact_kpi table will now display our newly defined KPI:

KPI list for fact_kpi

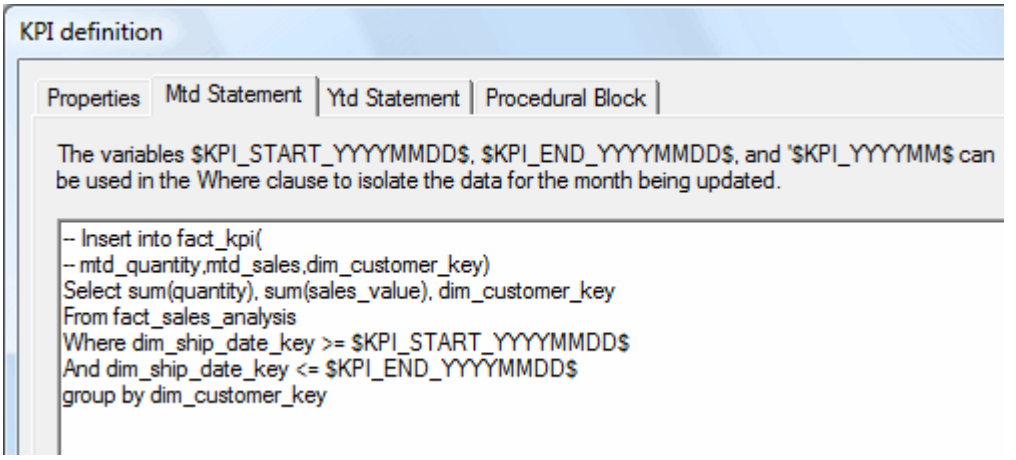
Id	Name	Active	Method	Description
Sales	Customer sales (qunatity and value)	Enabled	Statement	Provides a count and dollar val

There are three additional tabs on the dialog box as shown in the screen shot above. These tabs allow the definition of a month to date statement, a year to date statement and a procedural block. In this example we will be defining a month to date statement. A procedural block can be used when the KPI is too complex to be performed as a single SQL statement and procedural language is required.

We will now proceed to create the SQL statement required to perform the month to date update.

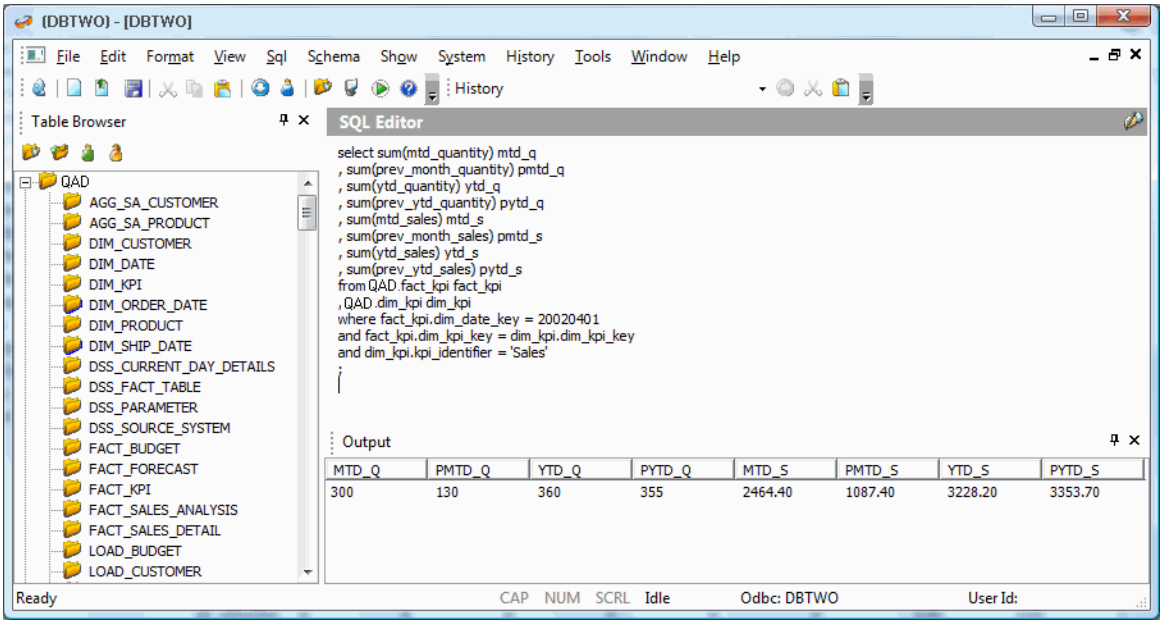
1 Use the right mouse menu when positioned on the Sales KPI and select 'Modify Kpi'. Then choose the 'Mtd Statement' tab. You will note that there are two comment lines at the top of the edit window. These comments show the order in which information is to be added, and hence the order in which the Mtd select statement must return its information.

2 Enter the statement as shown below. Note, that no trailing semi-colon is required. When done click OK to complete the definition of the KPI.



The KPI has now been defined and we can update the KPI fact table in the normal manner, or by selecting 'Update (run)' when positioned over the KPI in the middle pane. This will execute the KPI table update procedure in foreground. If all goes well the procedure will report the processing of 23 months, and will add a number of records.

We would normally examine the fact table through an end user tool, but the following SQL statement can be used to see the results. The screen shot below shows the normal output from this select statement.



In the next section we will cover '***Defining the Activity KPI*** (on page 175)'

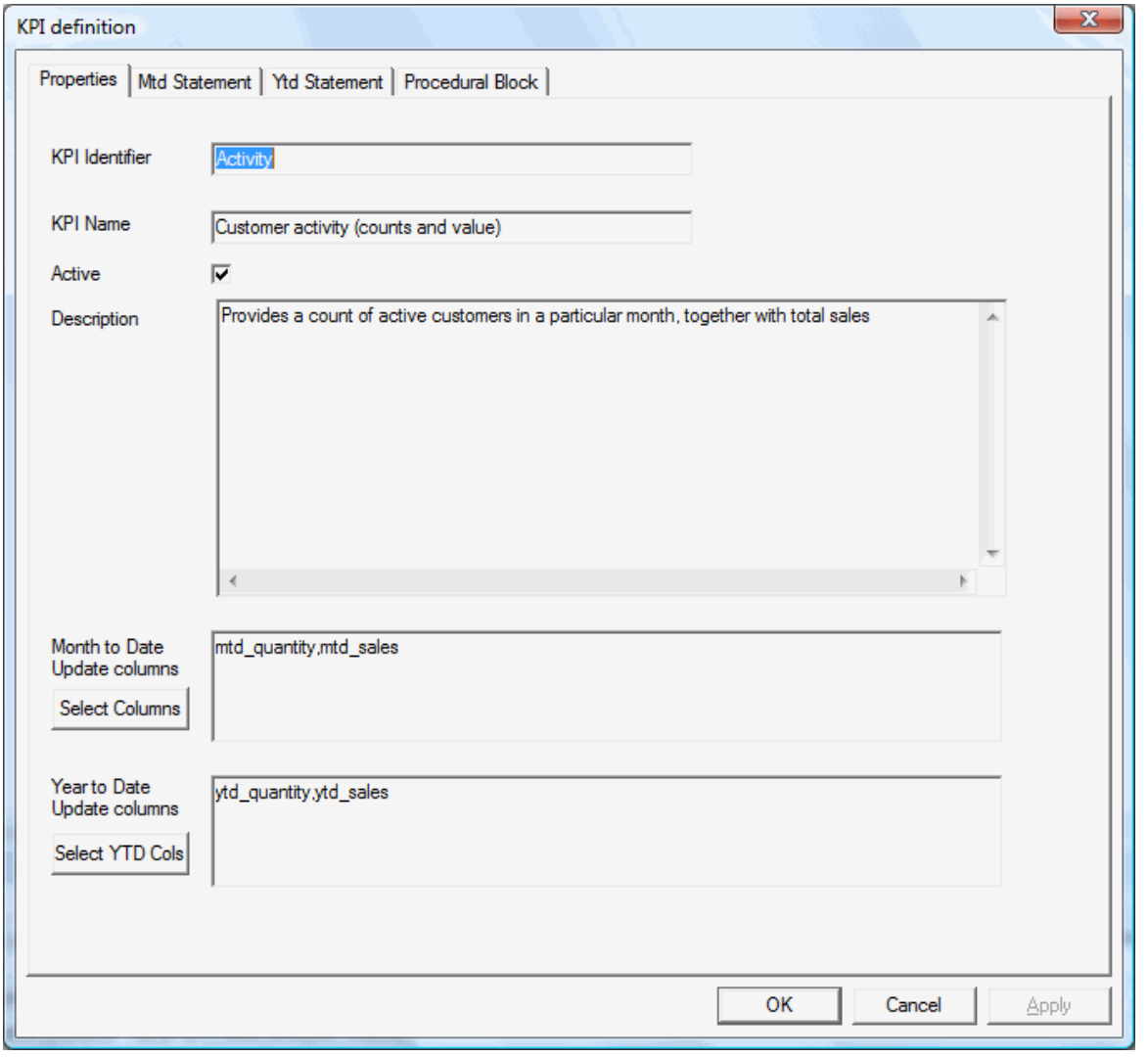
Defining the Activity KPI

The Activity KPI is similar to the Sales KPI, except that it will require the definition of a year to date statement. We will create the KPI by copying the first KPI to show the use of this copy capability.

Activity KPI

1. Use the right mouse menu when positioned over the Sales KPI and select 'Insert copy'.
2. Position over the second (copy of) Sales KPI and select 'Properties' from the right mouse menu.
3. Change the Kpi Identifier to 'Activity', and the name and definition as per the example screen below.
4. Click the 'Select Columns' button and remove the dim_customer_key entry.
5. Click the 'Select YTD Cols' button and add ytd_quantity and ytd_sales.

The completed properties screen should look as follows:

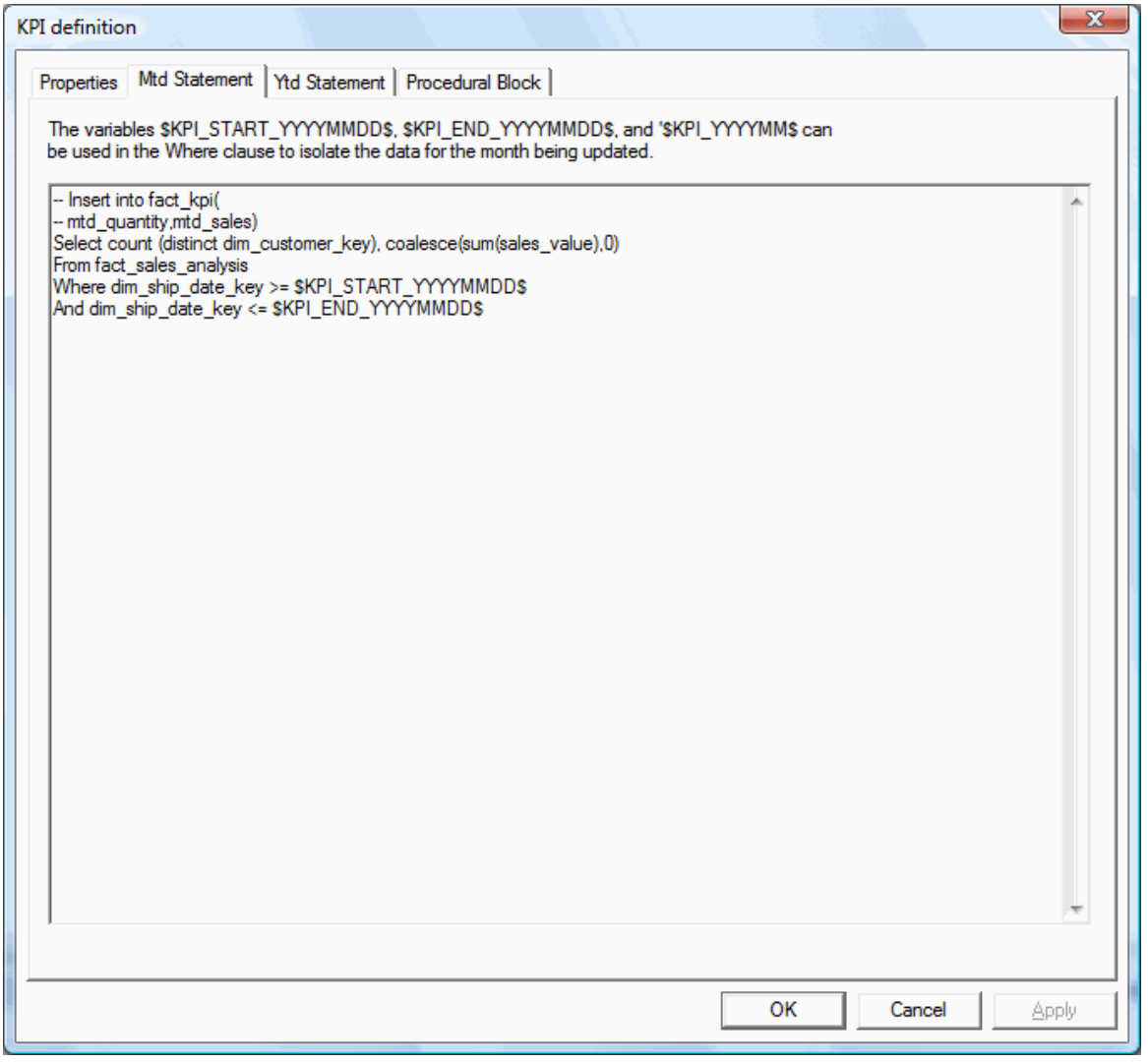


Once the dialog above is completed click OK to modify the KPI.

We will now proceed to modify the SQL statement required to perform the month to date update.

1 Use the right mouse menu when positioned on the Activity KPI and select 'Modify Kpi'. Then choose the 'Mtd Statement' tab.

2 Replace the statement with the statement as shown below. Note, that no trailing semi-colon is required.

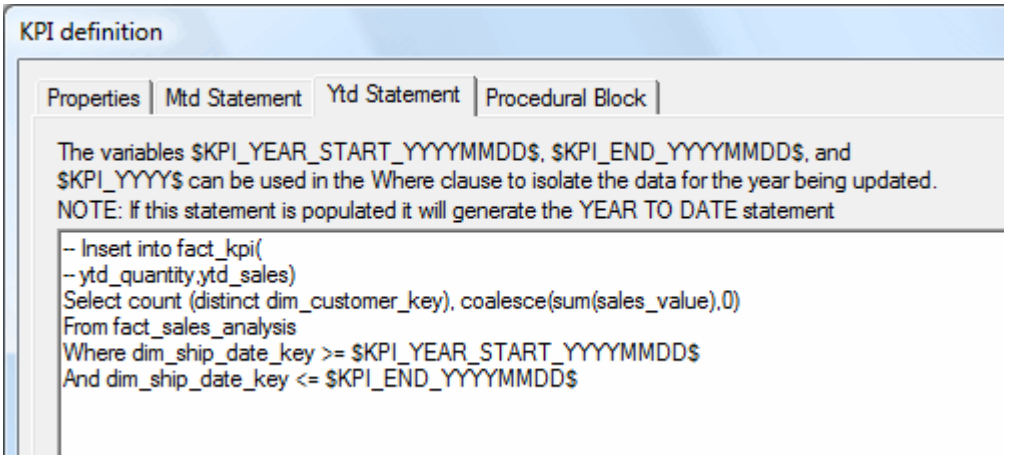


Note: For an Oracle data warehouse replace the coalesce(with a nvl(in the statement above. For a SQL Server data warehouse replace the coalesce(with an isnull(in the statement above.

We now need to define the year to date statement, to ensure we do not count the same customer twice. Proceed as follows:

1 Choose the Ytd Statement tab.

2 Insert the statement as shown below. Note, that no trailing semi-colon is required. When done click OK to complete the definition of the KPI.



Note: For an Oracle data warehouse replace the coalesce(with a nvl(in the statement above. For a SQL Server data warehouse replace the coalesce(with an isnull(in the statement above.

The KPI has now been defined and can be updated as per the Sales KPI. Again an end user tool is required to adequately examine the results.