QAD Enterprise Applications

Training Guide

QAD Data Warehouse Designer

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Contents

Data Warehouse Designer Training Guide

Change Summary

The following table summarizes significant differences between this document and the previous version.

Date/Version	Description	Reference
April 2015 / 6.7.4	New version of DWD; changes throughout.	--
September 2012/6.6.2	New version of DWD; changes throughout.	--
March 2012/6.5.6	Numerous updates throughout	--
September 2011/QAD BI 3.5	Rebranded for QAD BI 3.5	--

Tutorial 1
Basic Star Schema Fact Table

In This Tutorial

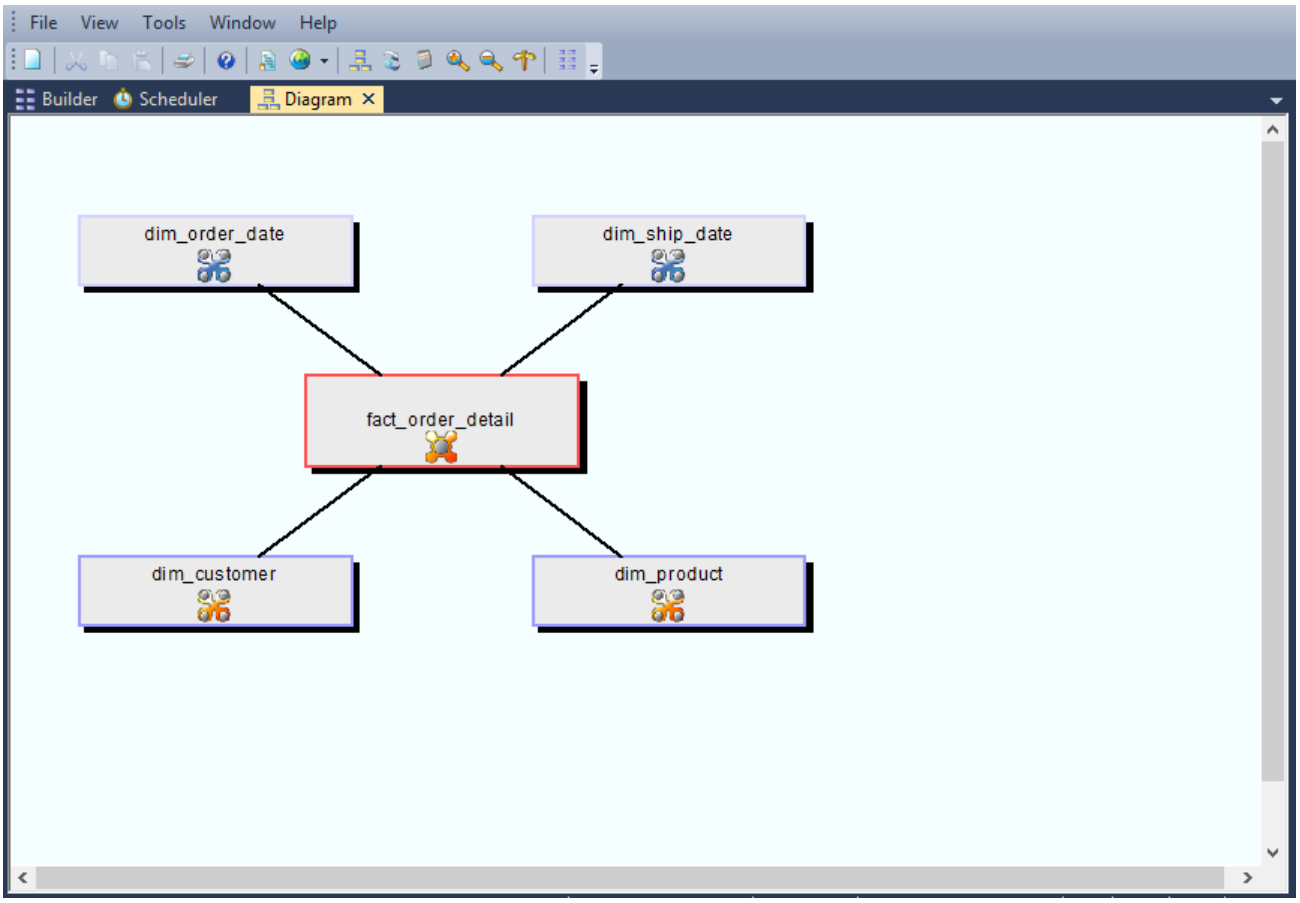
1.1 Purpose and Roadmap

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 Diagrammatic View Producing Documentation

1.2 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 "***1.2.1 Logging In***" on page 5) to the repository you have created.

1.2.1 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 **Data Source**, **Database Login ID** 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 Database Login ID and Password are those of the user under which the metadata repository has been loaded. See ***Switching Between Databases*** (see "***1.2.2 Switching Between Databases***" on page 7) 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 The **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.

4 Click **Connect**. The Builder screen displays.

Note: ODBC is the only supported connection method. This connection must have been established prior to logon. Refer to the Installation and Administrator Guide if no such connection exists.

You are now ready to proceed to the next step where you define the ***Repository Defaults*** (see "***1.3 Repository Defaults***" on page 8).

1.2.2 Switching Between Databases

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

For DB2, the **Data Source**, **Database Login ID** and **Password** as well as the **Metadata Schema** are those required to logon to the database server

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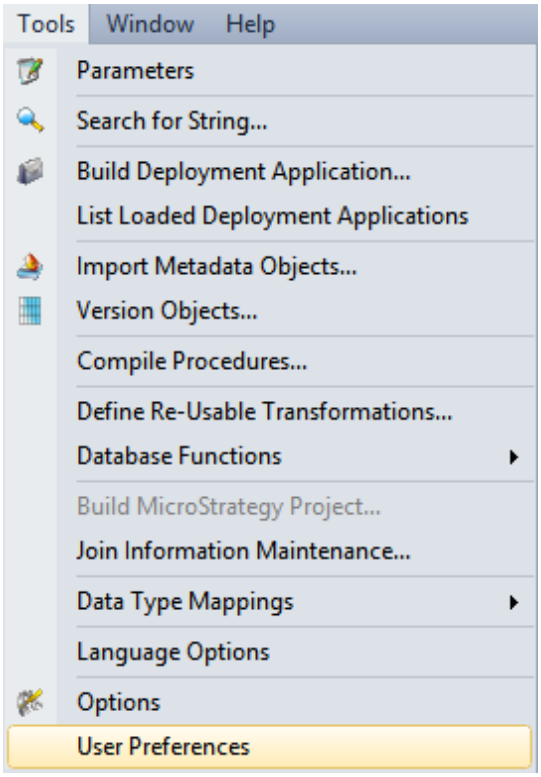
Note: A user name and password will be required if operating system authentication is not being used.

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

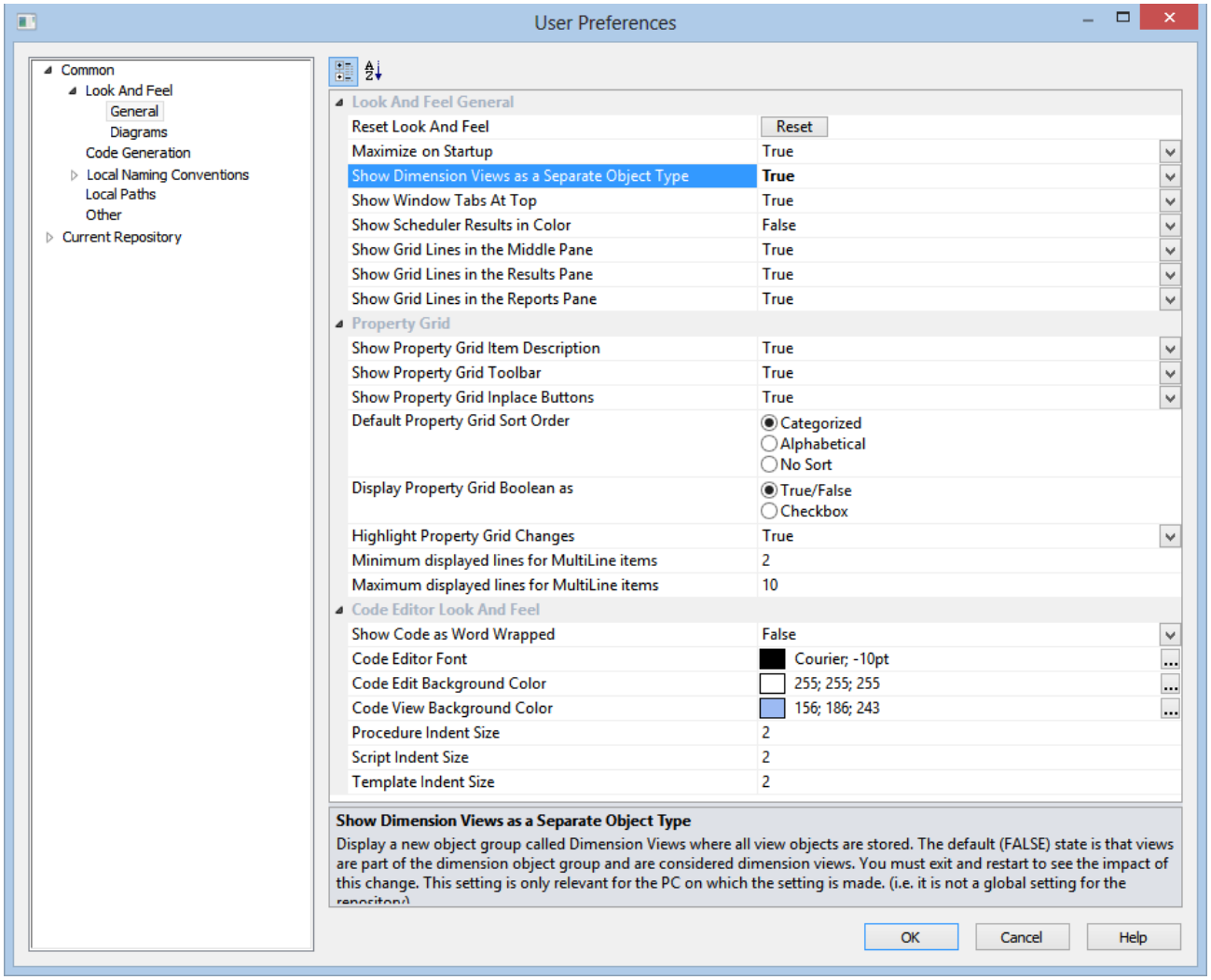
1.3 Repository Defaults

Before you begin to create the data warehouse, you can choose the defaults for the repository. You can do this from the **Tools** menu, by either selecting **Options** or **User Preferences**. There is no need to change the defaults for the tutorials.

1 From the **Tools** menu, select **User Preferences**.



2 In **Common / Look And Feel / General**, select **Show Dimension Views as a Separate Object Type** and set to **True**. Click **OK**.

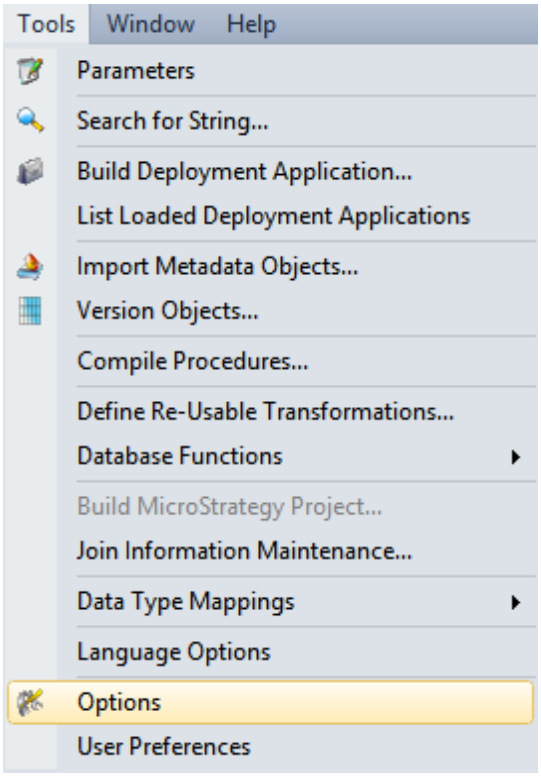


You are now ready to proceed to the next step where you define the ***Tablespace (FileGroup) Defaults*** (see "***1.4 Tablespace (FileGroup) Defaults***" on page 10)

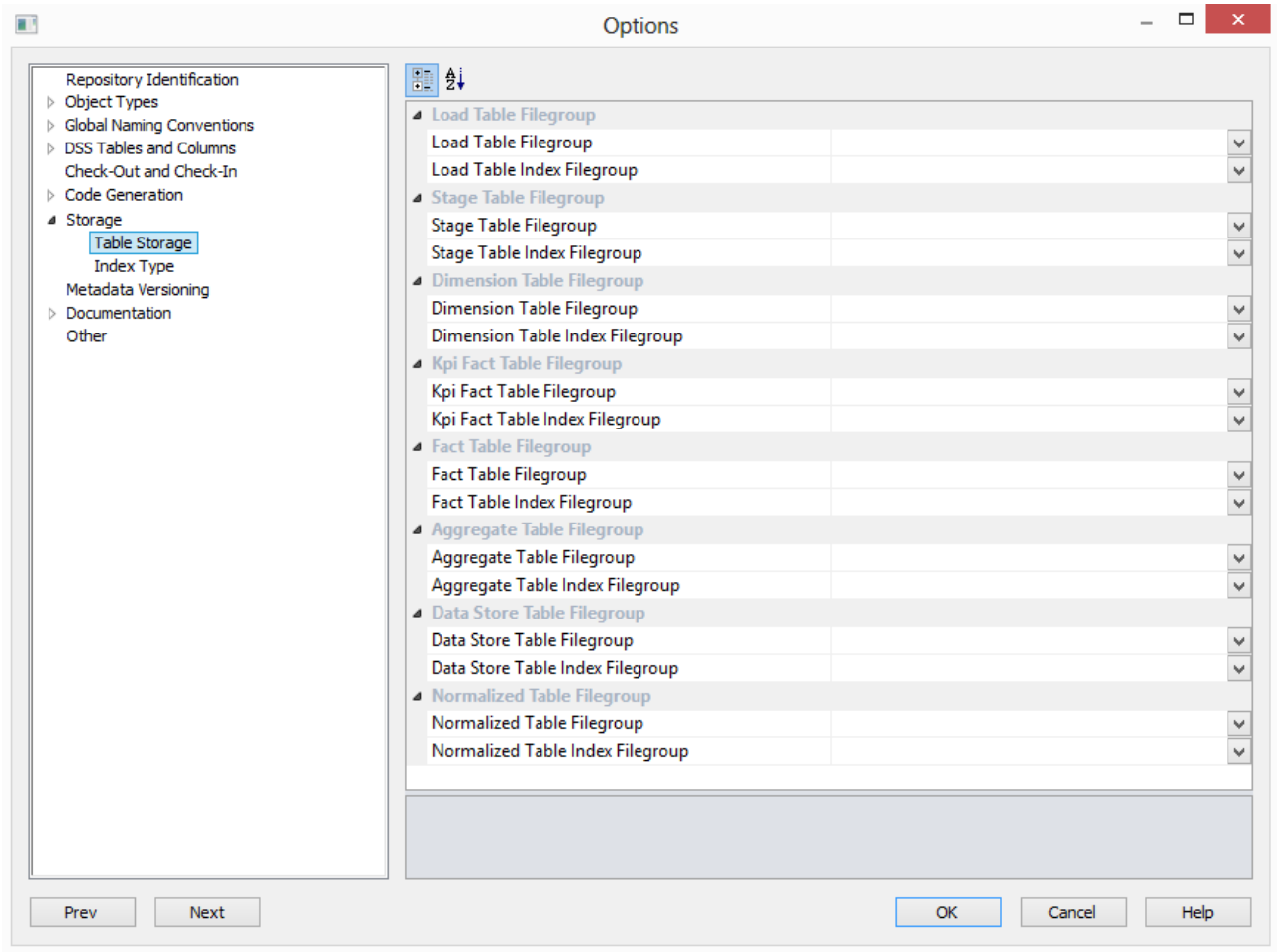
1.4 Tablespace (FileGroup) Defaults

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**.



2 Click on **Storage** and make the appropriate tablespace/filegroup choice for each option. Click **OK**.



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*** (see "***1.5 Table Name Defaults***" on page 12).

1.5 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 **User Preferences** and then **Local Naming Conventions**. Alter the defaults as required.
2. From the **Tools** menu, select **Options** and then **Global Naming Conventions**. Alter the defaults as required.
3. 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*** (see "***1.6 Creating a Connection***" on page 13).

1.6 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.

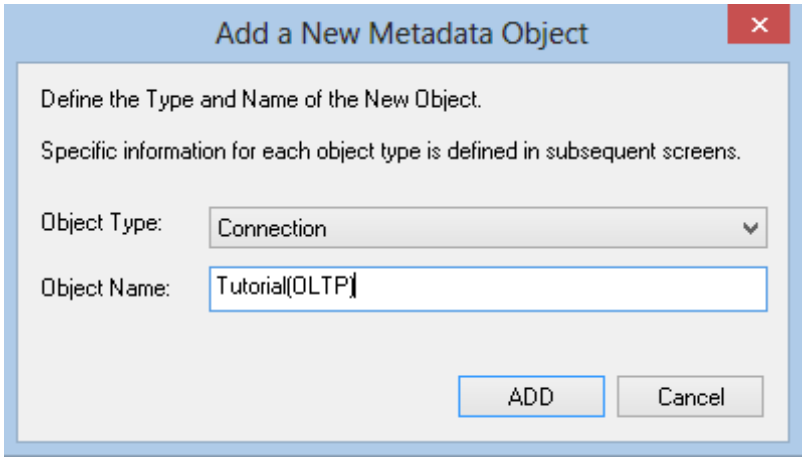
The second connection will be to the data warehouse tables.

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 right-click and select **New Object**. A dialog box displays with the Object Type defaulted to Connection. Name your connection. In this instance type **Tutorial(OLTP)** and click **ADD**.



3 A Properties dialog will display.

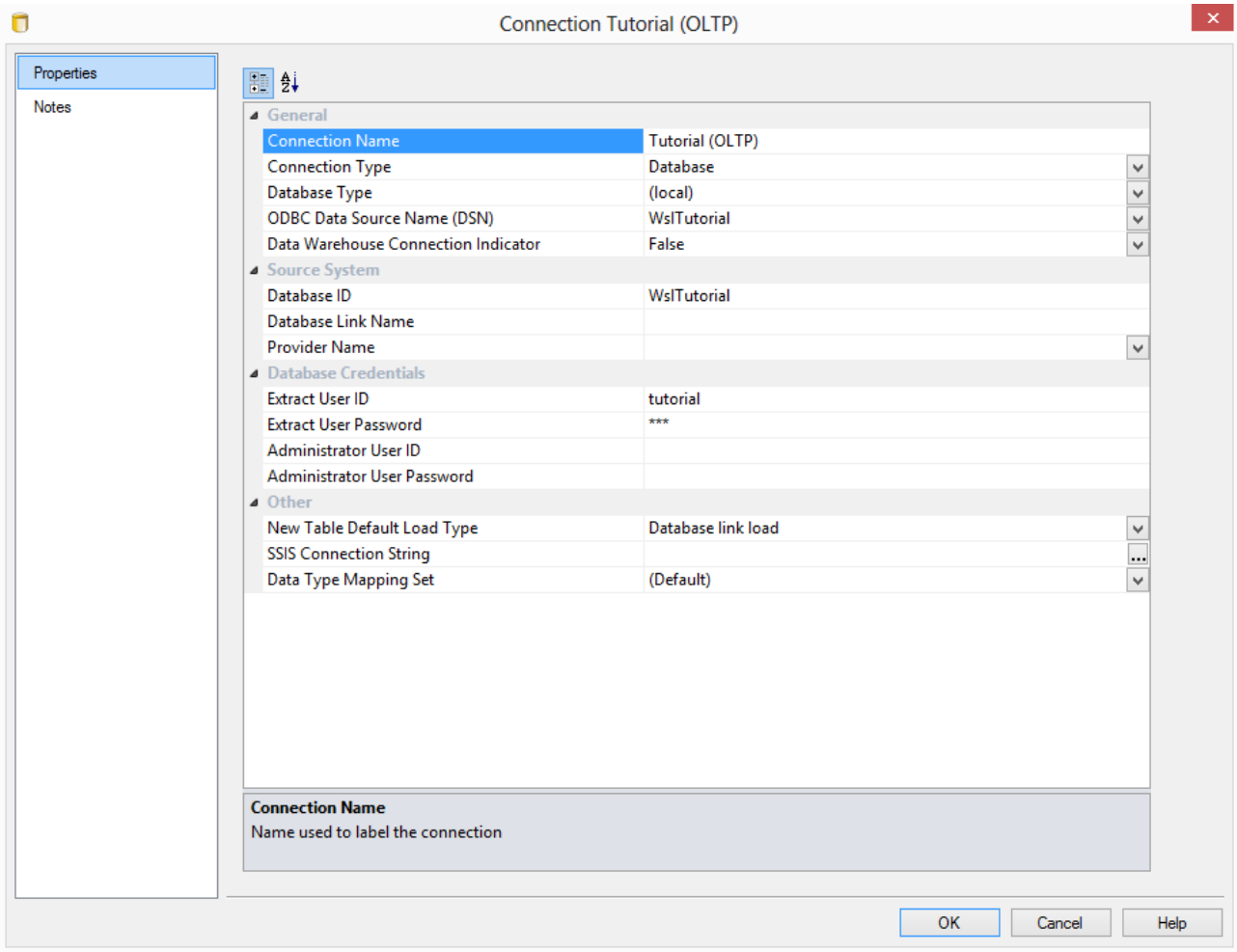
SQL Server:
If running a SQL Server data warehouse then proceed as follows.
In the Properties dialog, complete the details as below, and then select **Update**:

- The **ODBC Data Source Name (DSN)** 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 Name** 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 **Administrator User ID** and **Password** are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.
- The **New Table Default Load Type** enables you to set the default load type at connection level for ODBC and database connections. Set to Database link load.
- The **SSIS Connection String** is a valid SSIS connection string that can be used to connect to the data source or destination. The Reset button will attempt to construct a valid connection string from the connection information supplied in the connection details consisting of the Database ID, Database Link ID (Instance name), Provider Name, Extract User details. Leave this field blank.
- **Data Type Mapping Set** - XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the drop-down list or create a new one.



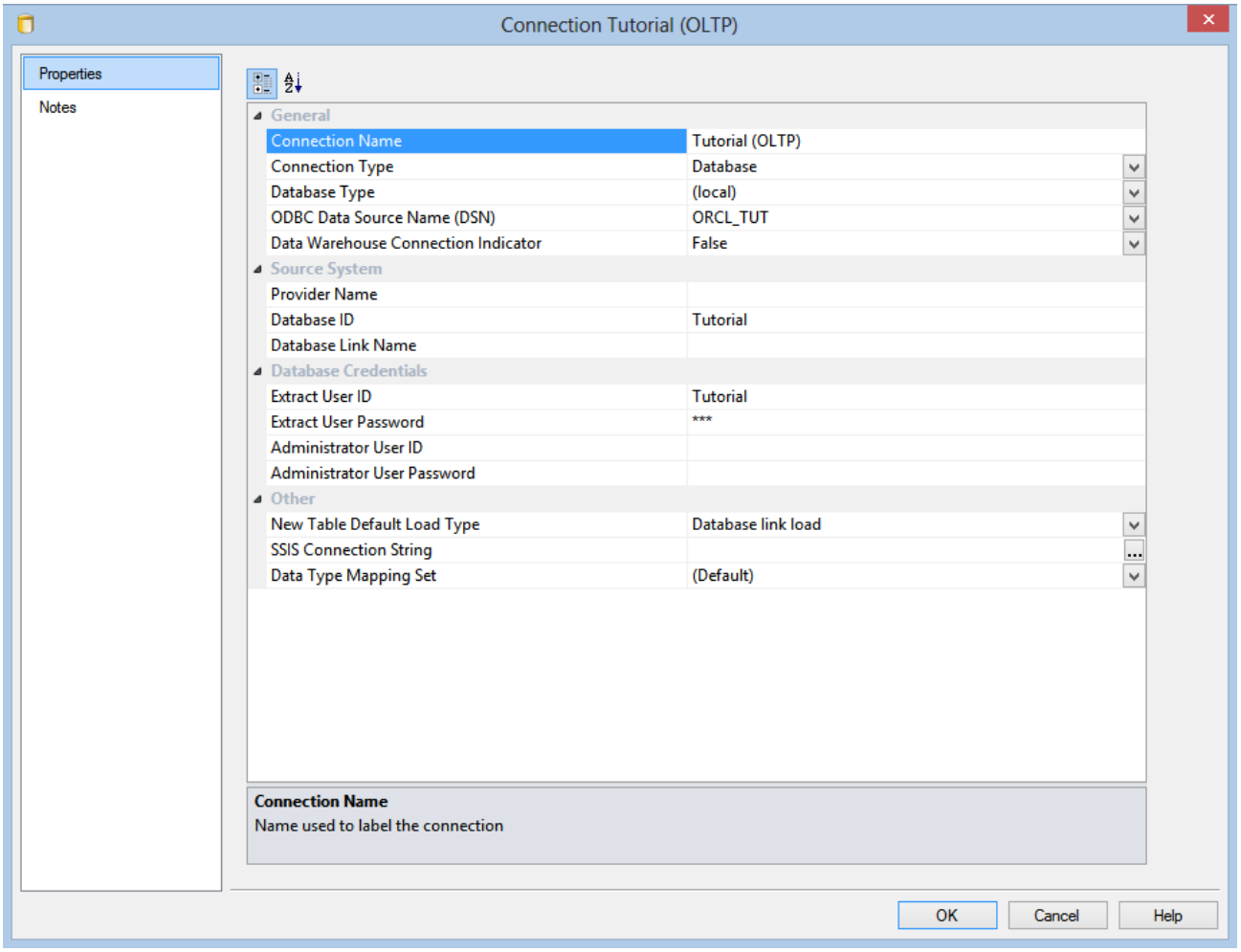
Oracle:
If running an Oracle data warehouse then proceed as follows.
In the Properties dialog, complete the details as below, and then select **Update**:

- The **ODBC Data Source Name** 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 Oracle will make in the case of a linked server. In this case it is not required as we are using tutorial tables in an Oracle database on the same server.
- 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 Name** 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 **Administrator User ID** and **Password** are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.
- The **New Table Default Load Type** enables you to set the default load type at connection level for ODBC and database connections. Set to Database link load.

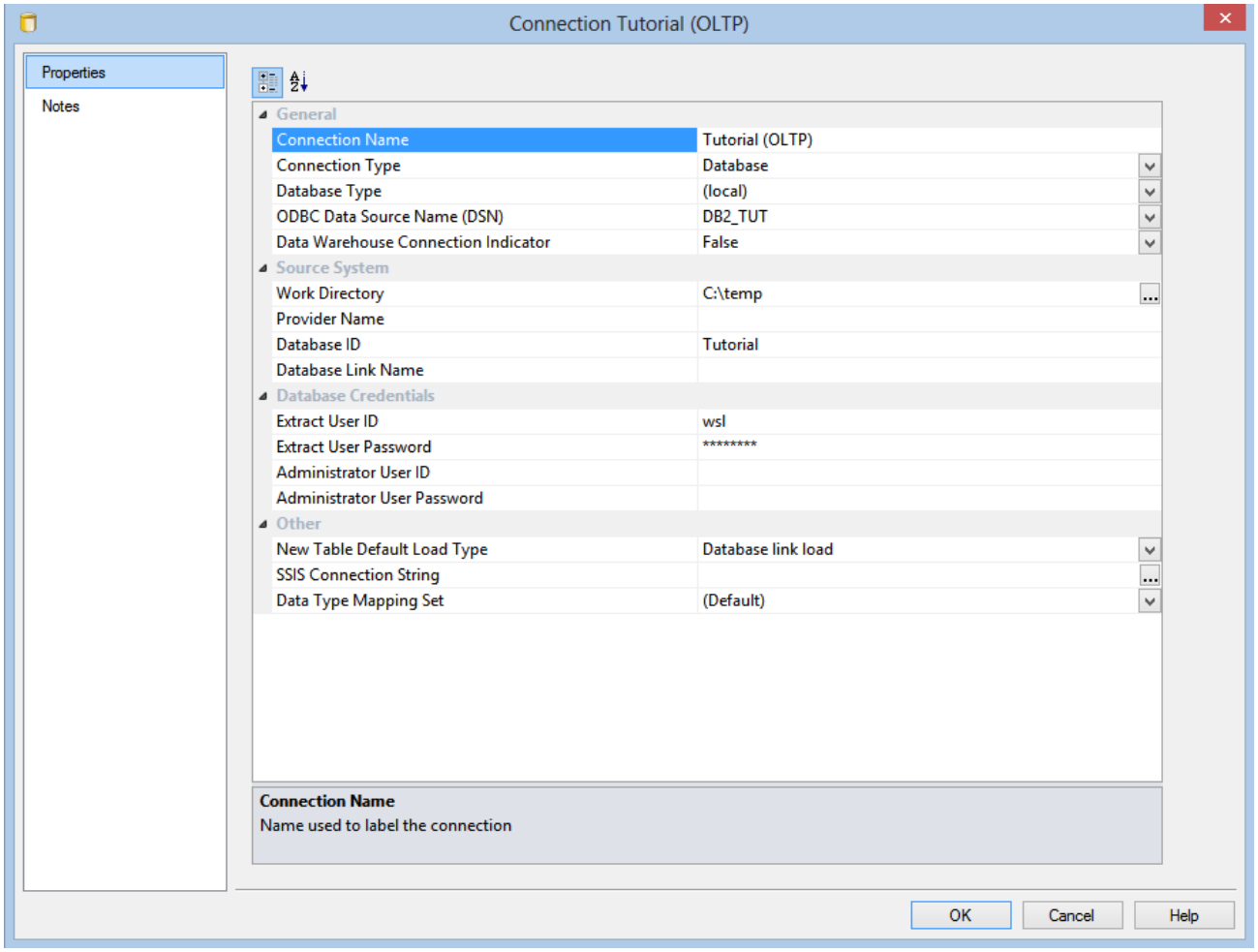
- **Data Type Mapping Set** - XML files have been created to store mappings from one set of data types to another. Setting this field to "(Default)" will cause Data Warehouse Designer to automatically select the relevant mapping set; otherwise you can choose one of the standard mapping sets from the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



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

- The **ODBC Data Source Name** 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 DB2 will make in the case of a linked server. In this case it is not required as we are using tutorial tables in a DB2 database on the same server.
- The **Work directory** is not used.
- The **Database ID (SID)** is not used.
- The **Database Link Name** 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 **Administrator User ID** and password are the administrator logon to the source location (tutorial). These can be left blank for the tutorial.
- The **New Table Default Load Type** enables you to set the default load type at connection level for ODBC and database connections. Set to Database link load.

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



4 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 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, displays showing the tables contained under the tutorial source system.

5 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*** (see "***1.7 Loading Source Tables***" on page 18).

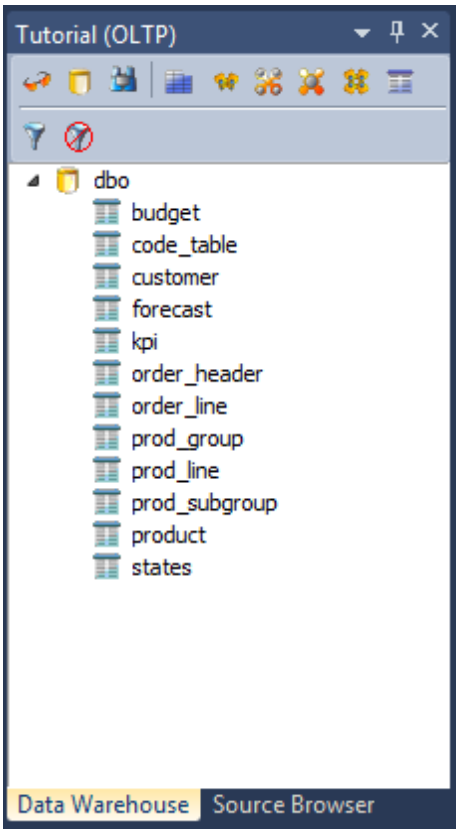
1.7 Loading Source Tables

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.

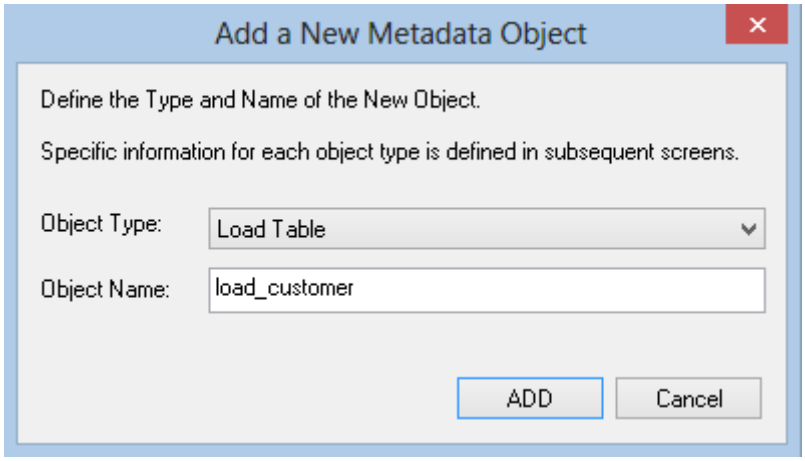
TIP: Ensure that your source system is displayed in the right pane, by selecting **Source Tables** from the **Browse** menu, then **Tutorial (OLTP)** from the **Connection List.** For **SQL Server** the schema must be **dbo.** For Oracle the schema should be the tutorial schema. Click **OK**.

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*.

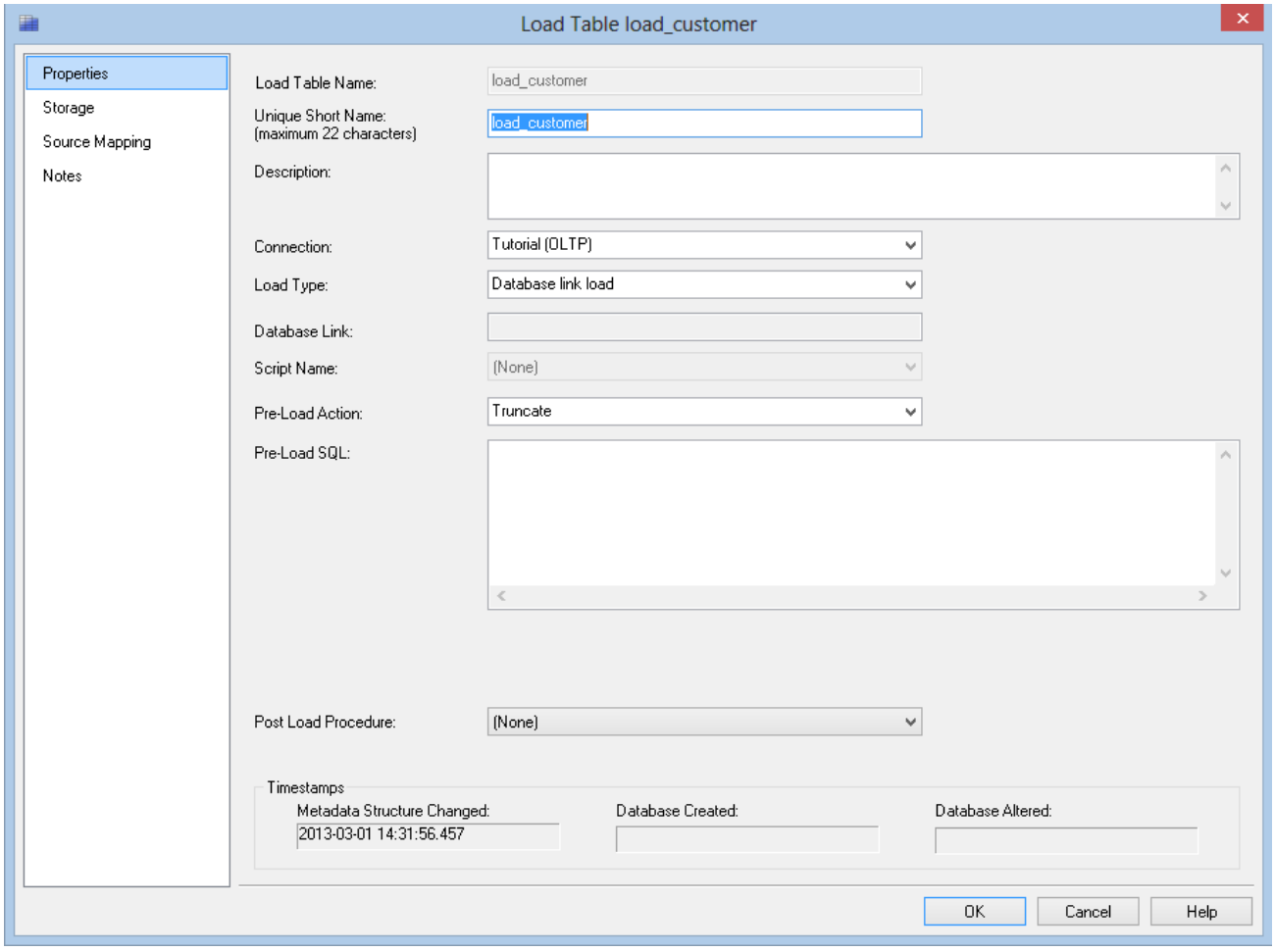
2 Expand the source table Object Tree in the right pane.



3 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**. Click **ADD**.



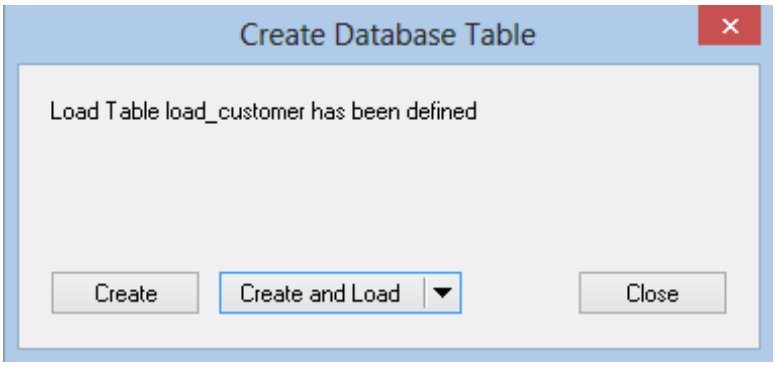
4 The following table definition will display. Click **OK**.



Note: For the purposes of this tutorial, all the necessary details have been automatically created. 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. Click **Create and Load**.



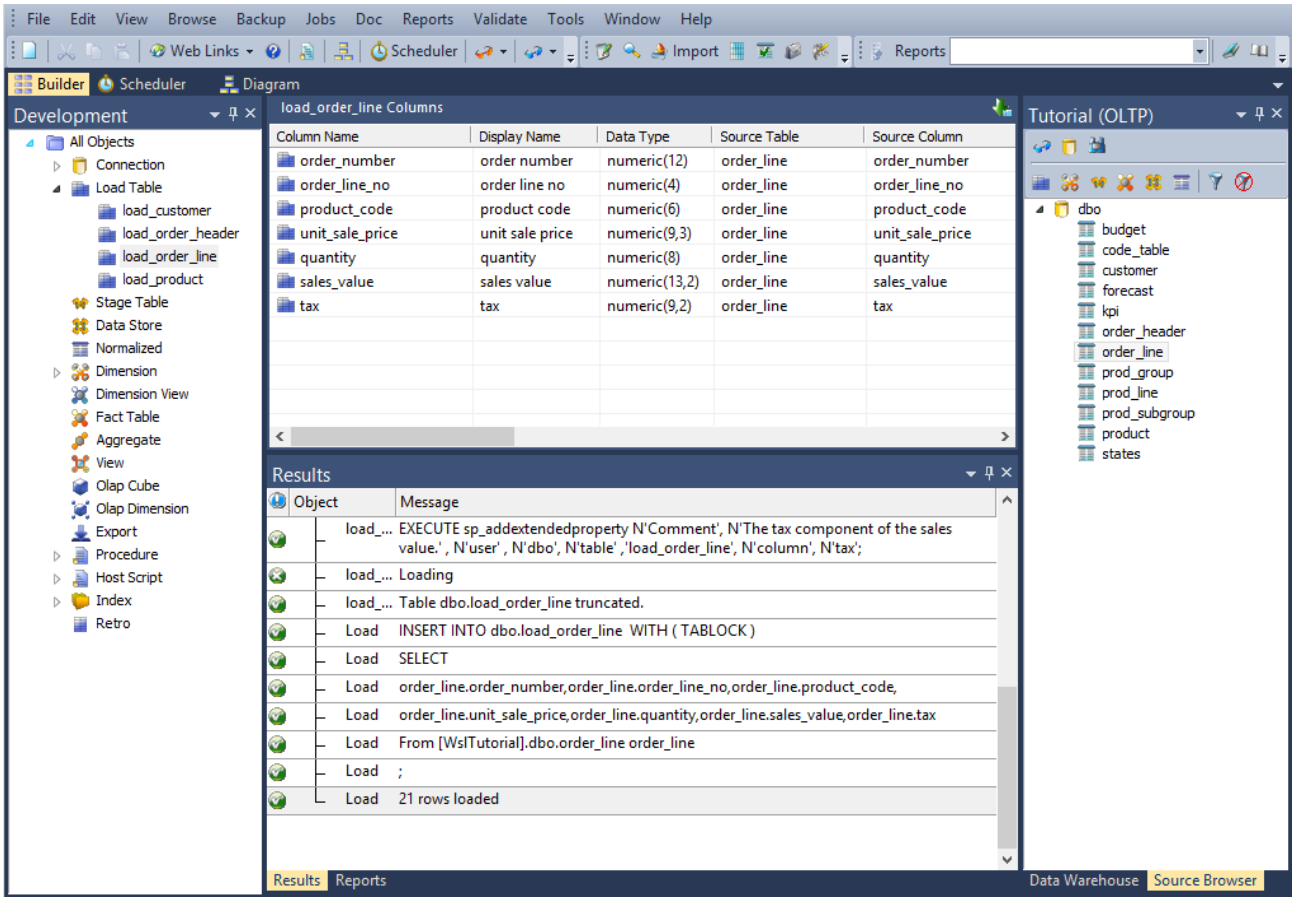
6 This will create the physical tables in the data warehouse and load the data.

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**.

Your screen should look something like this:



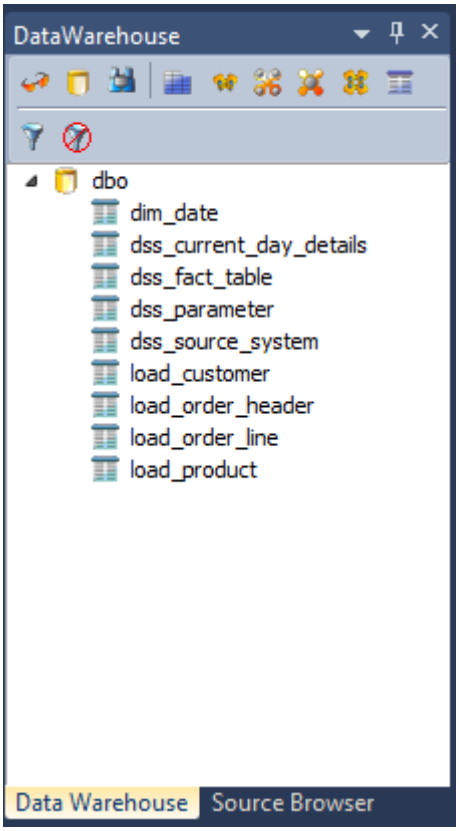
You are now ready to proceed to the next step - ***Building Dimensions*** (see "***1.8 Building Dimensions***" on page 22).

1.8 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 right pane view to show the Data Warehouse tables by selecting DataWarehouse from the Browse menu OR click the tab along the bottom of the source window.

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

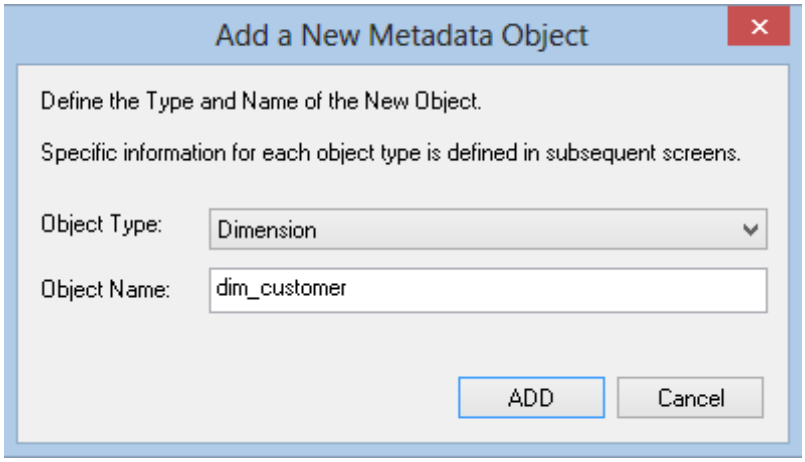


Note: From this point onwards, all work will be performed within the data warehouse.

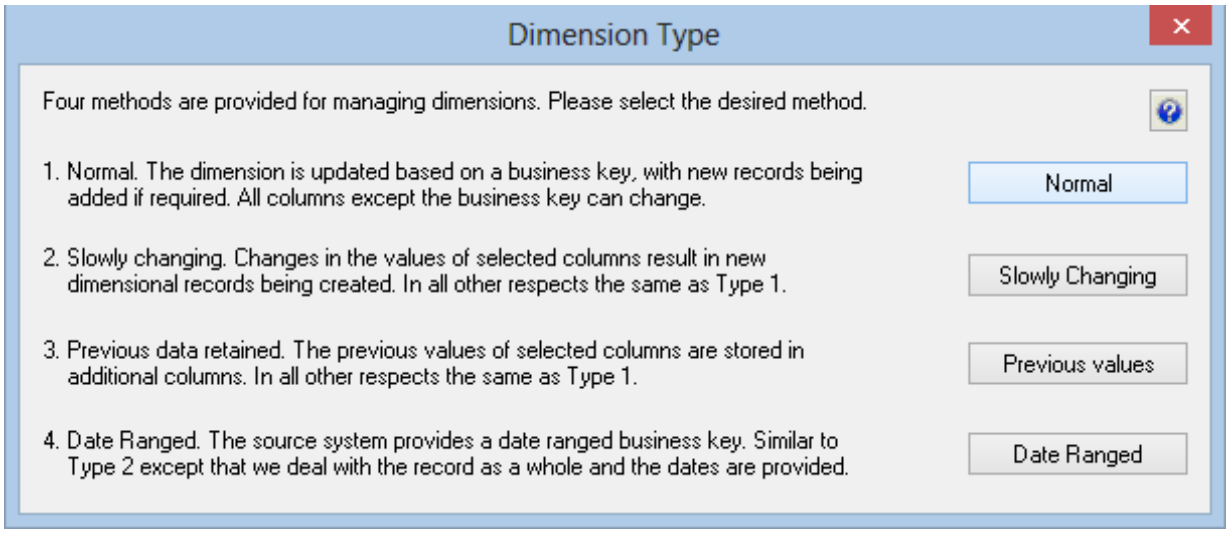
2 Double-click on the **Dimension object group** in the object tree in the left pane. The first column of the middle pane now reads *Dimension Name*.

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.** Click **ADD**.

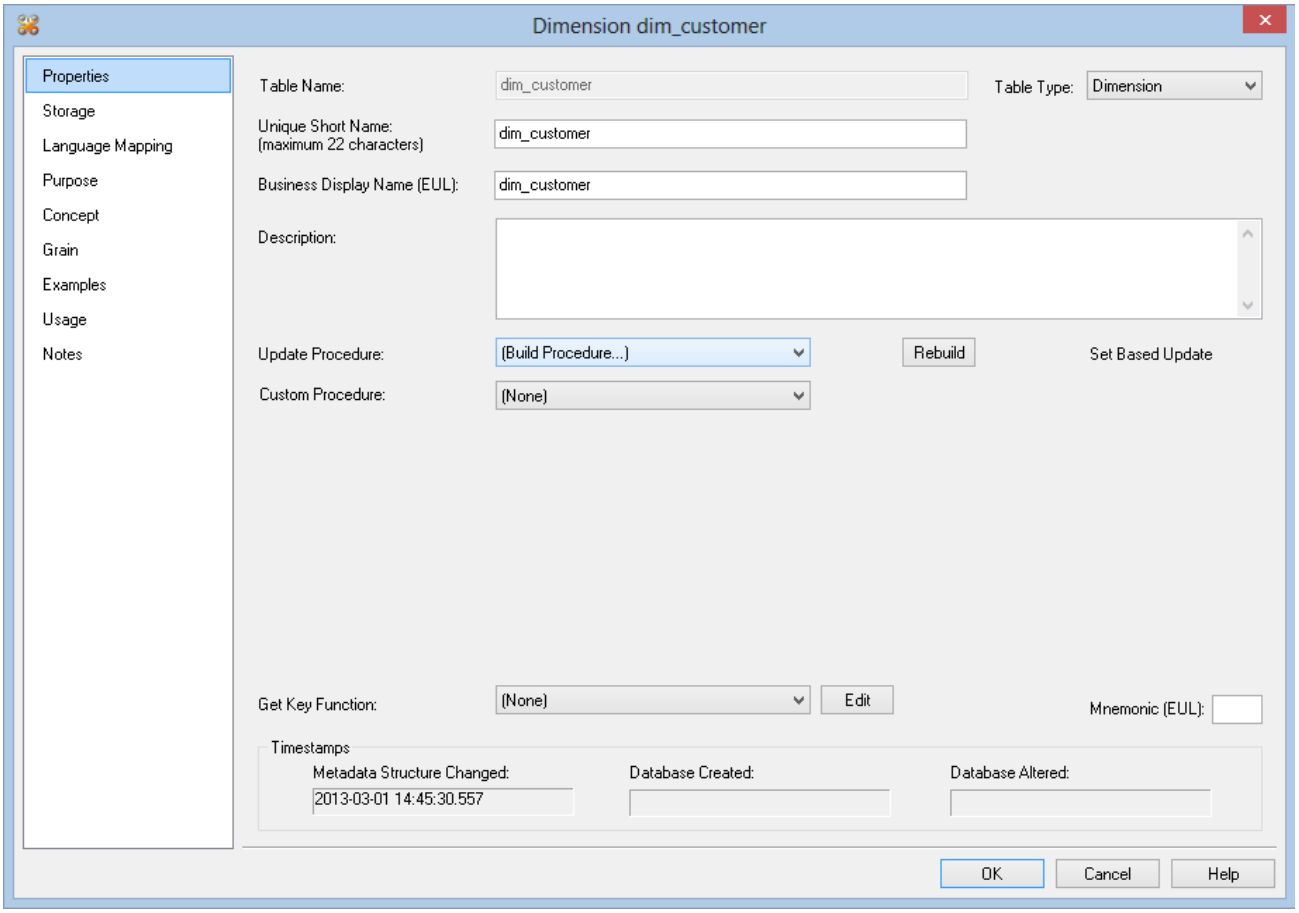


4 A dialog box displays asking how you want the dimension managed. Click **Normal.**

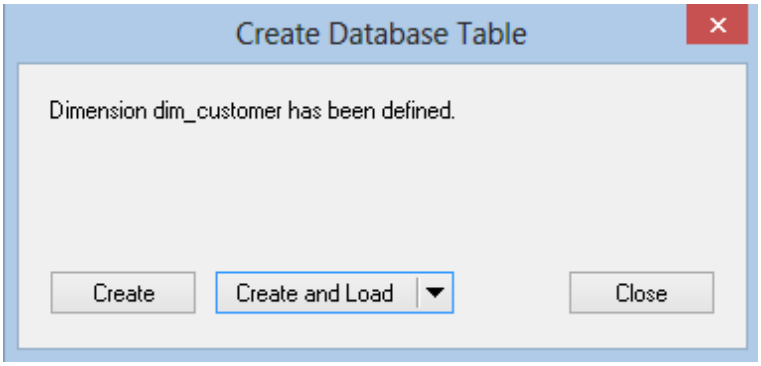


5 A table definition displays with all the necessary defaults completed.

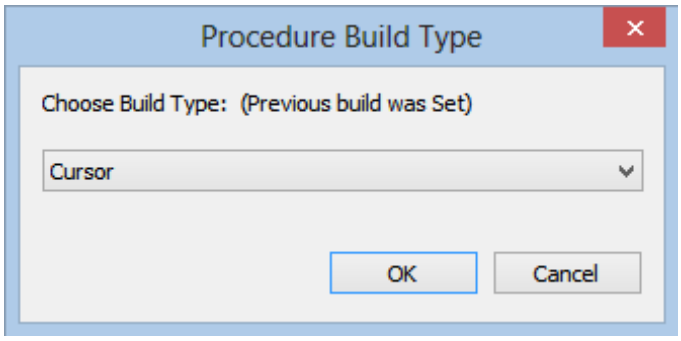
- Make one change - Select **(Build Procedure...)** from the Update Procedure drop-down list box. This will generate procedures to get surrogate (artificial) keys based on the business key and to update the dimension. Click **OK**.



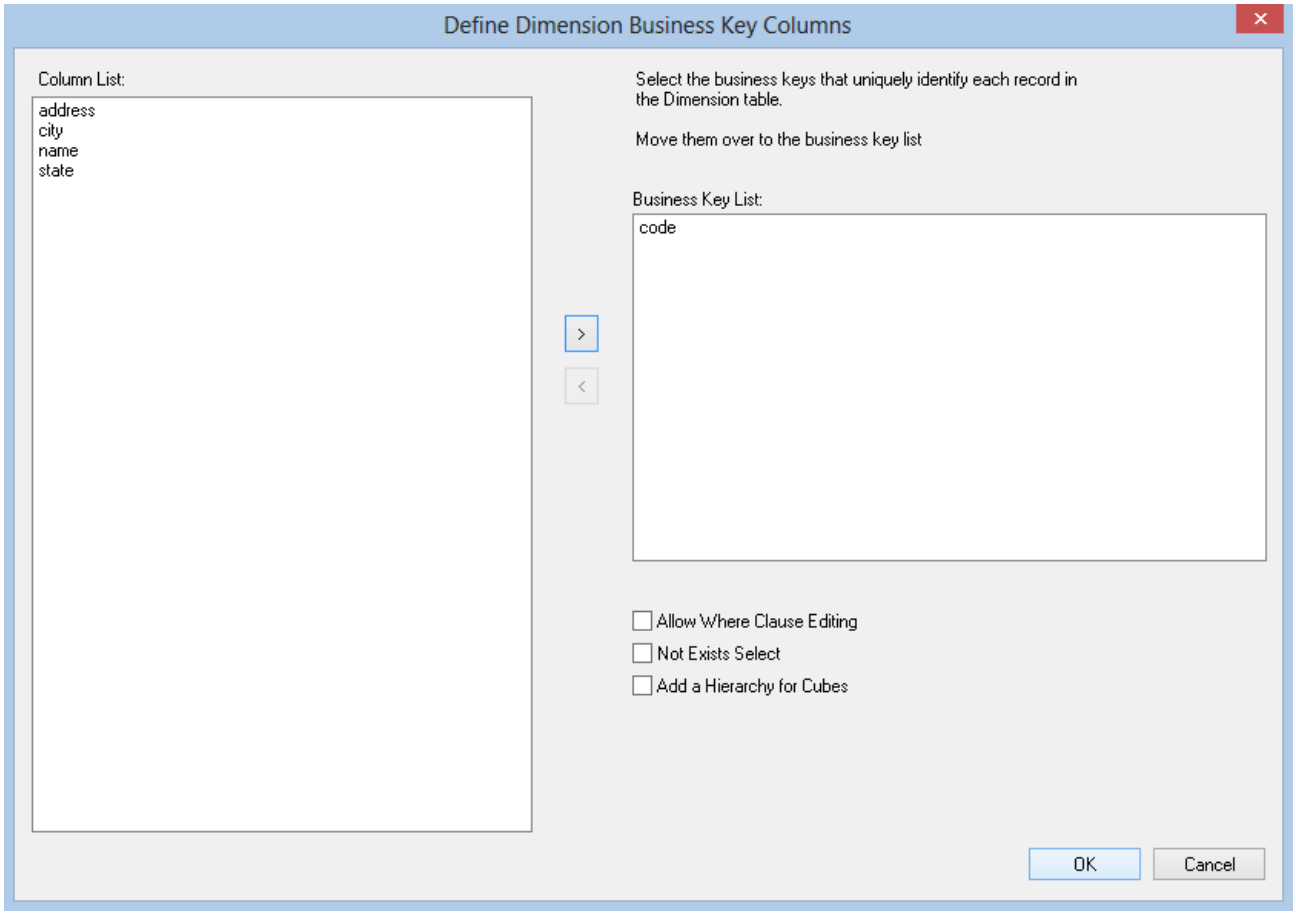
6 A dialog box displays confirming that the dimension table **dim_customer** has been defined and asking if you want to create and load the table. Click **Create and Load**.



7 A Procedure Build Type dialog will appear. Select **Cursor** and then click **OK**.



8 Define the Business Key (see below). The business (natural) key is the unique identifier for the dimensional record. Select **code** and **>** and click **OK**.



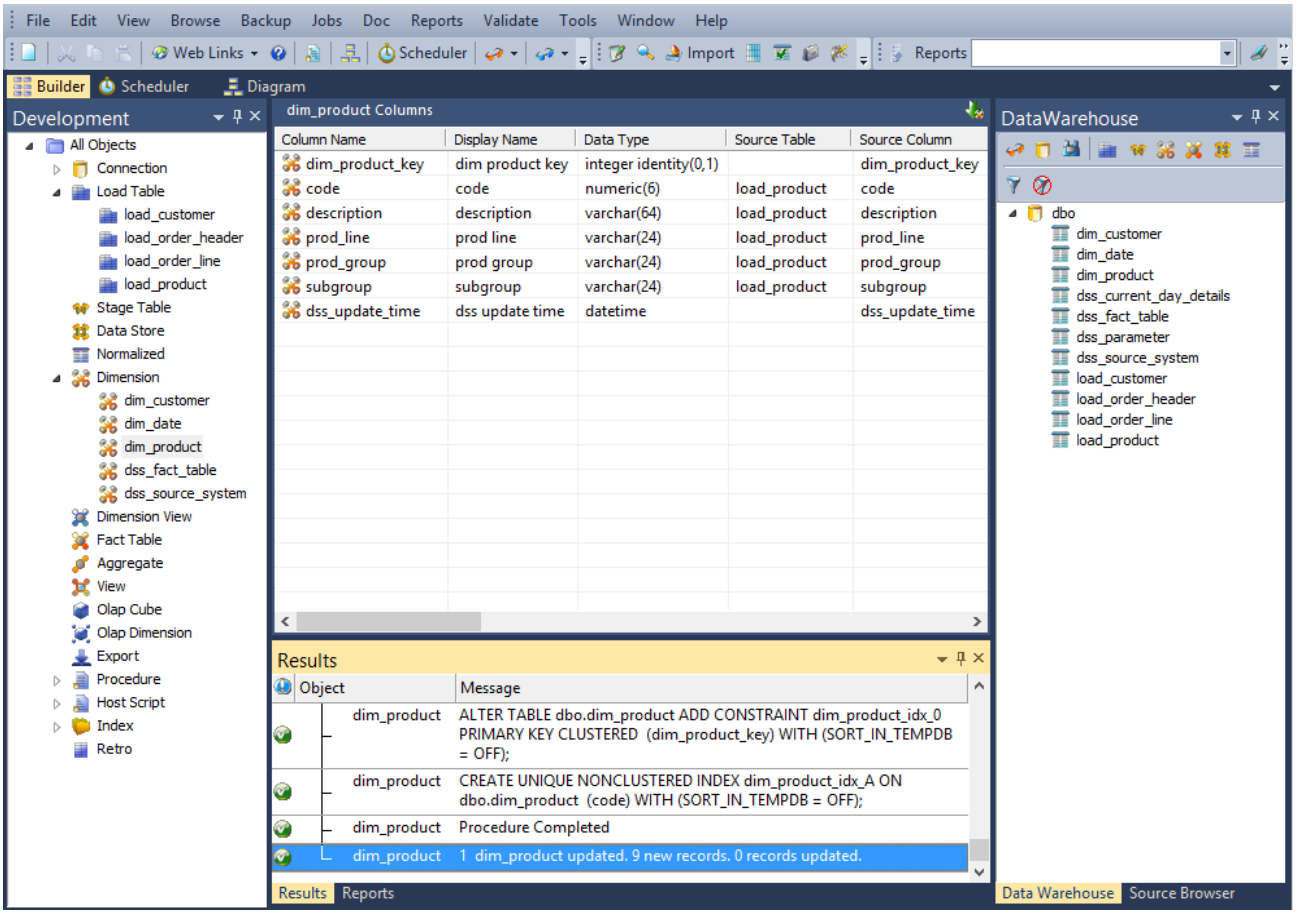
9 The procedure results display and can be reviewed.

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.

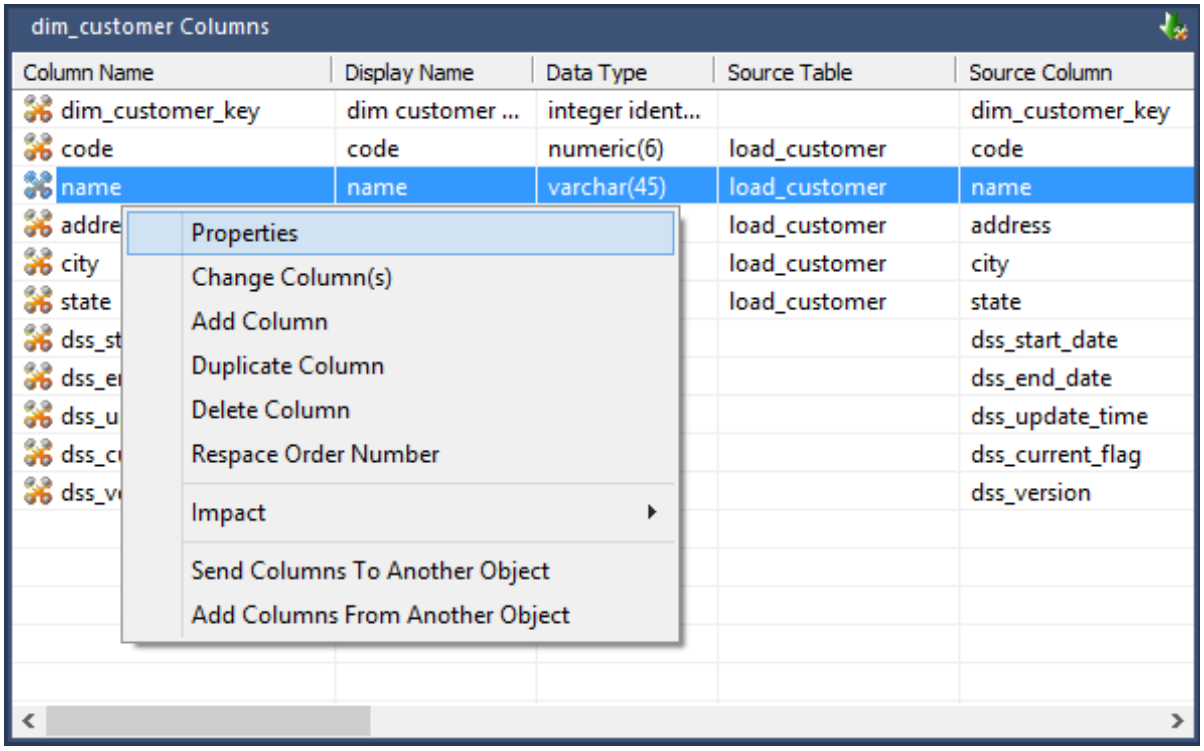
11 Refresh the Data Warehouse pane on the right (F5). Your screen should look something like this:



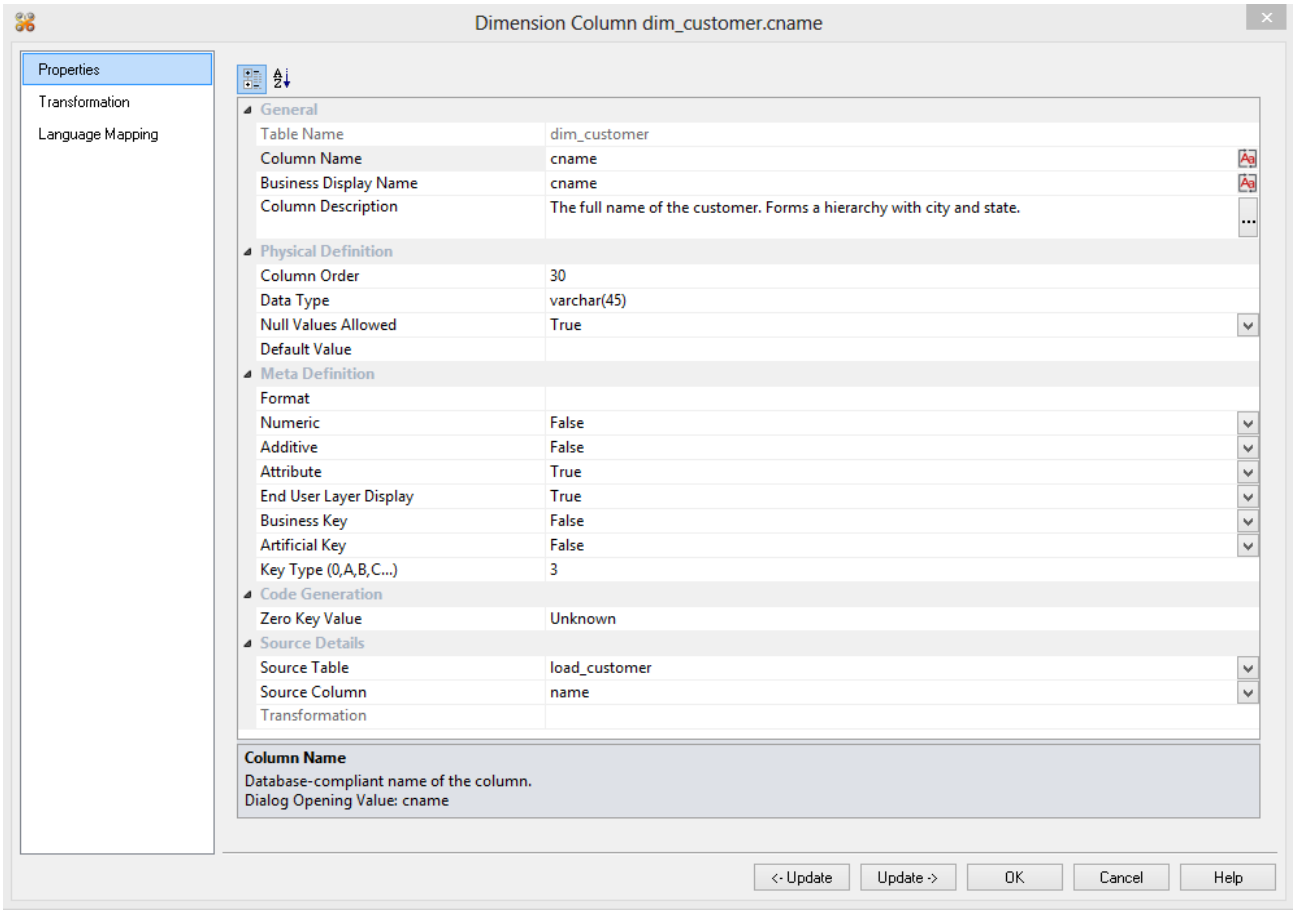
Note: Analysis Services does not like **name** as a column name. For dim_customer it will therefore be necessary to change the column name from **name** to **cname**.

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

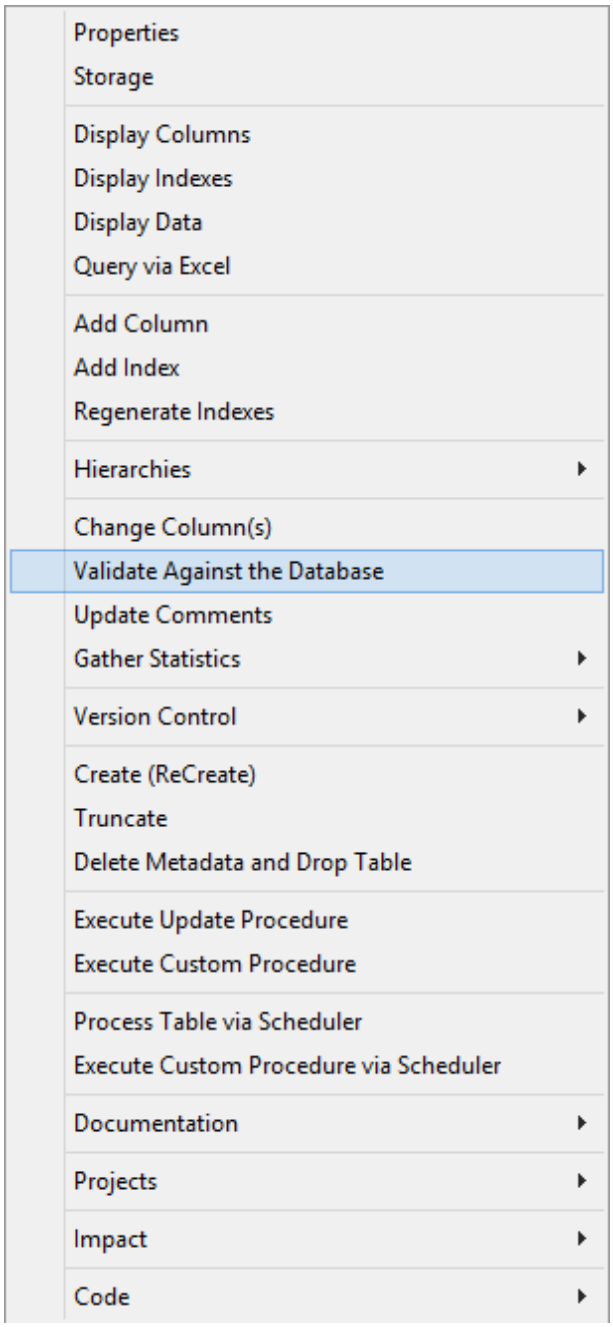
2 When positioned on the column **name** in the middle pane, right-click and select **Properties** from the drop-down menu.



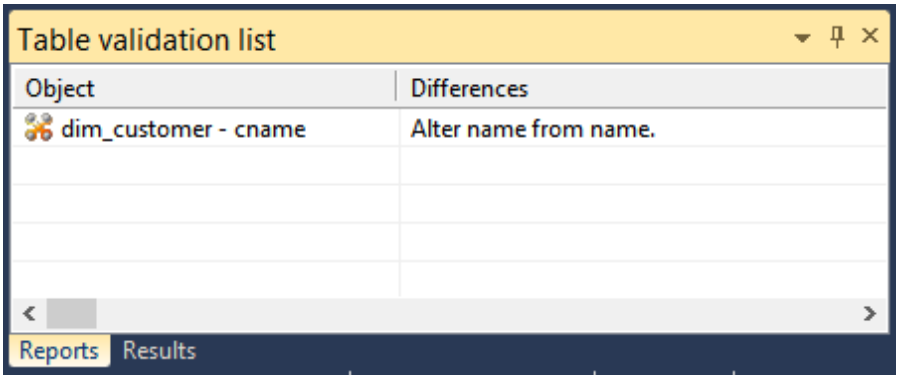
3 Change the column name and business display name from **name** to **cname** as shown below. Click **OK.**



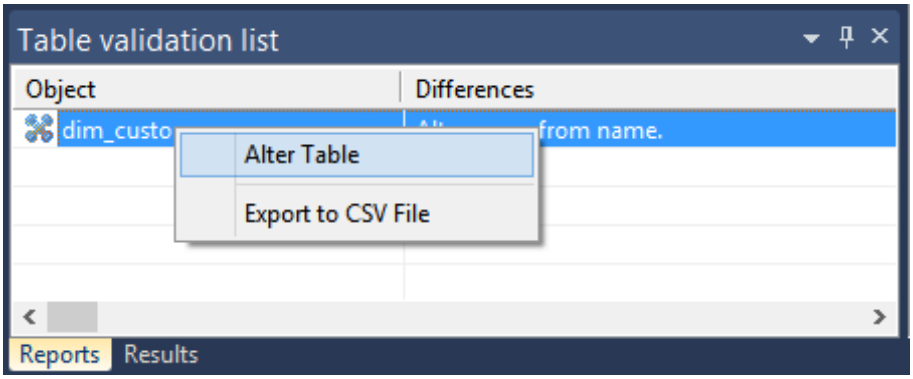
4 Right-click on **dim_customer** in the left pane and select **Validate against the Database**.



5 The results 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 bottom 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. Click **OK**.

9 Right-click on the **dim_customer** object in the left pane and select **Properties** from the drop-down menu. Choose the **Rebuild** button.

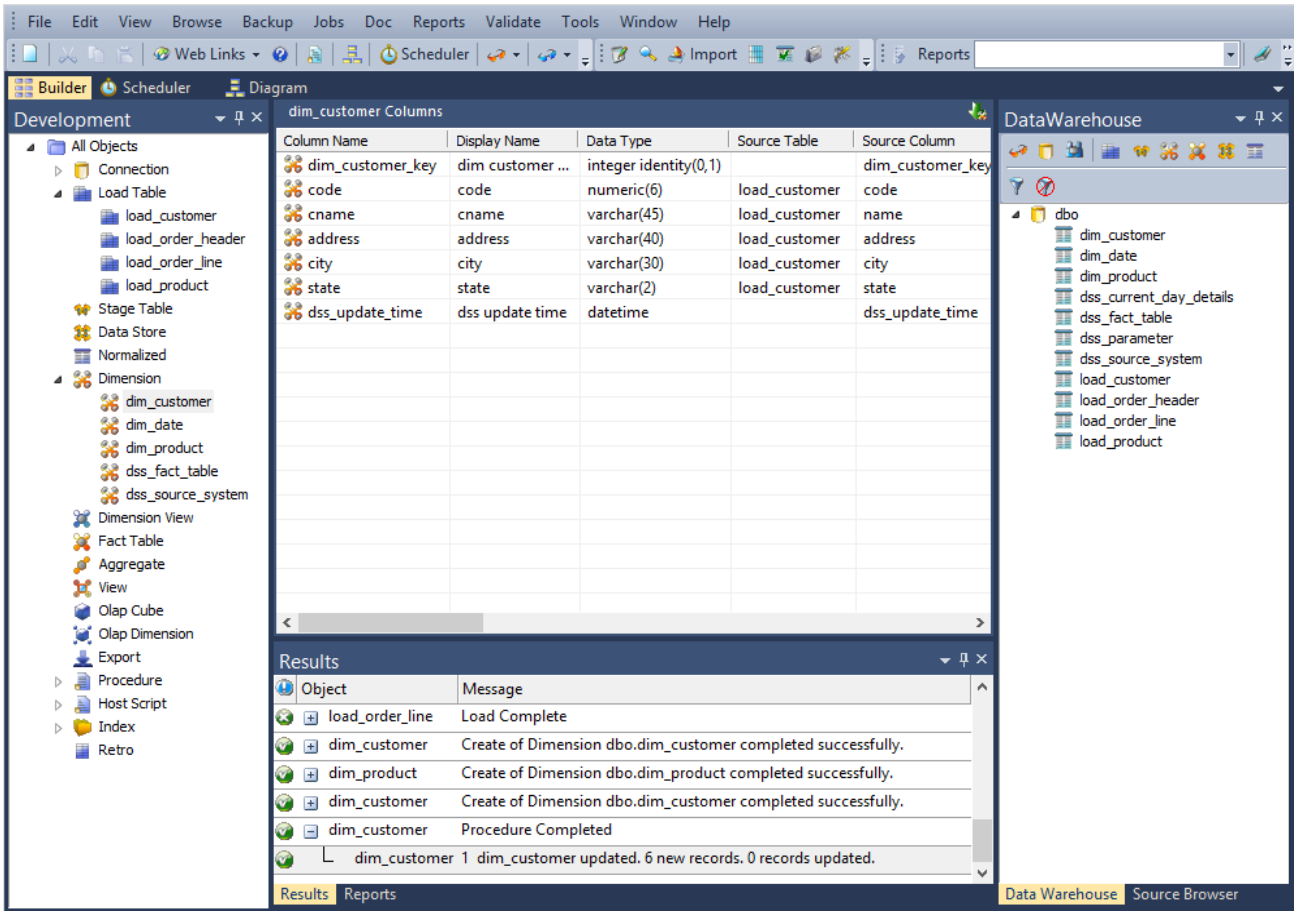
10 A Procedure Build Type dialog will appear. Select **Cursor** and then **OK**.

11 Leave the Business key as **Code** and click **OK**.

12 Right-click on **dim_customer** in the left pane and select **Execute Update Procedure.**

13 Click in the right pane and press **F5** to refresh the Data Warehouse table view.

Your screen should look something like this:



You are now ready to proceed to the next step - ***Creating Dimension Views*** (see "***1.9 Creating Dimension Views***" on page 32)

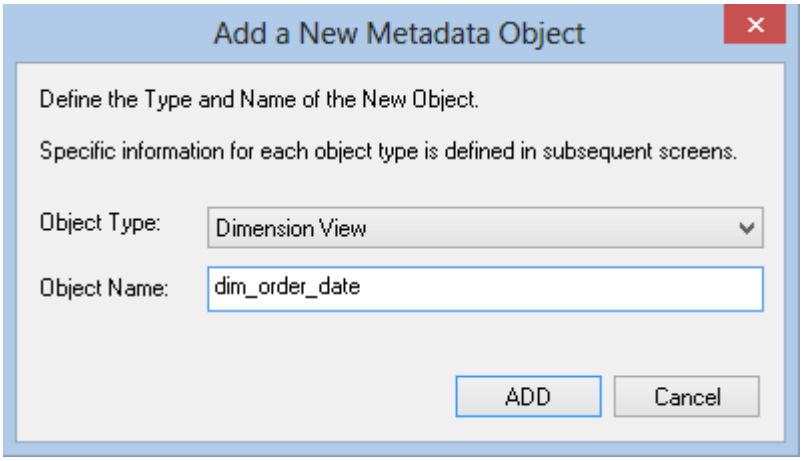
1.9 Creating Dimension Views

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.

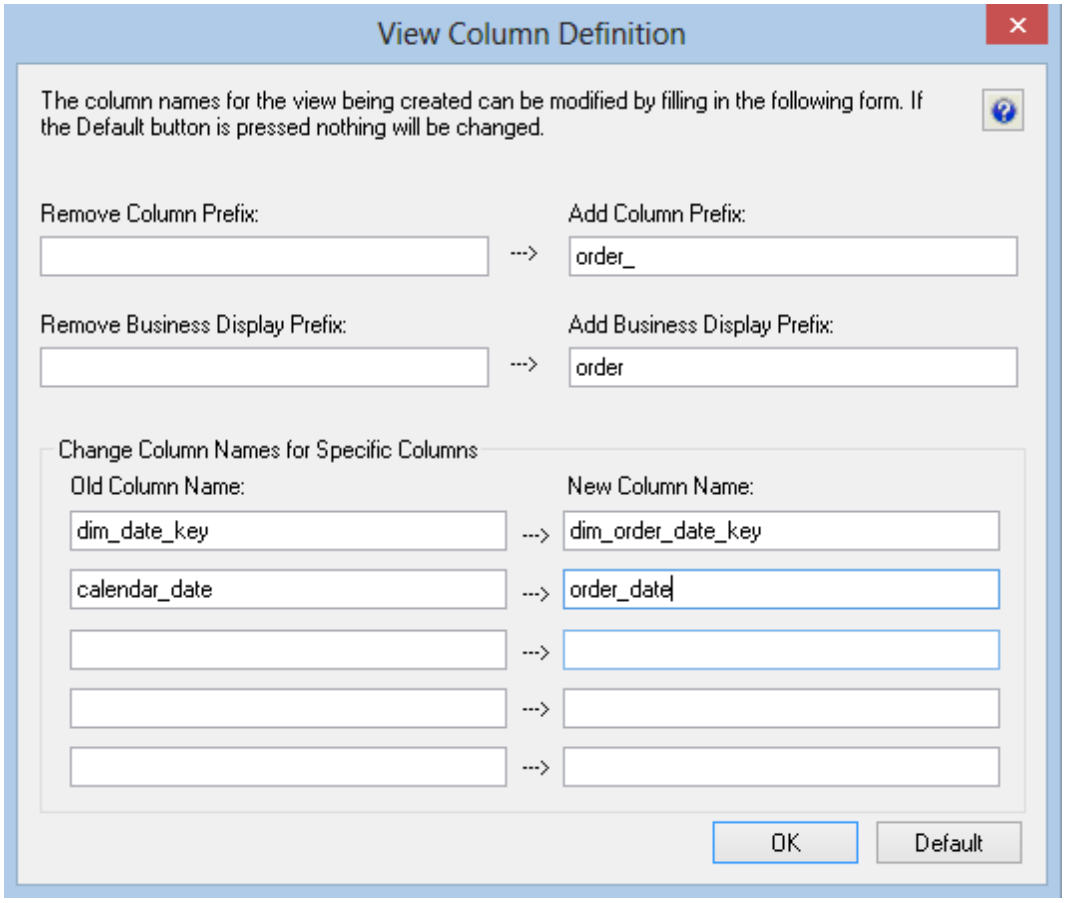
In this step you will create dimension views from an existing dimension. In many cases dimension views are built as part of the end user layer, but creating them in the data warehouse means they are available regardless of the end user tools used. This process is essentially the same as creating a dimension, but you are creating a view of an existing dimension, in this instance, dim_date.

1 After double-clicking on **Dimension View** in the left pane, click and drag **dim_date** from the right pane into the middle pane.

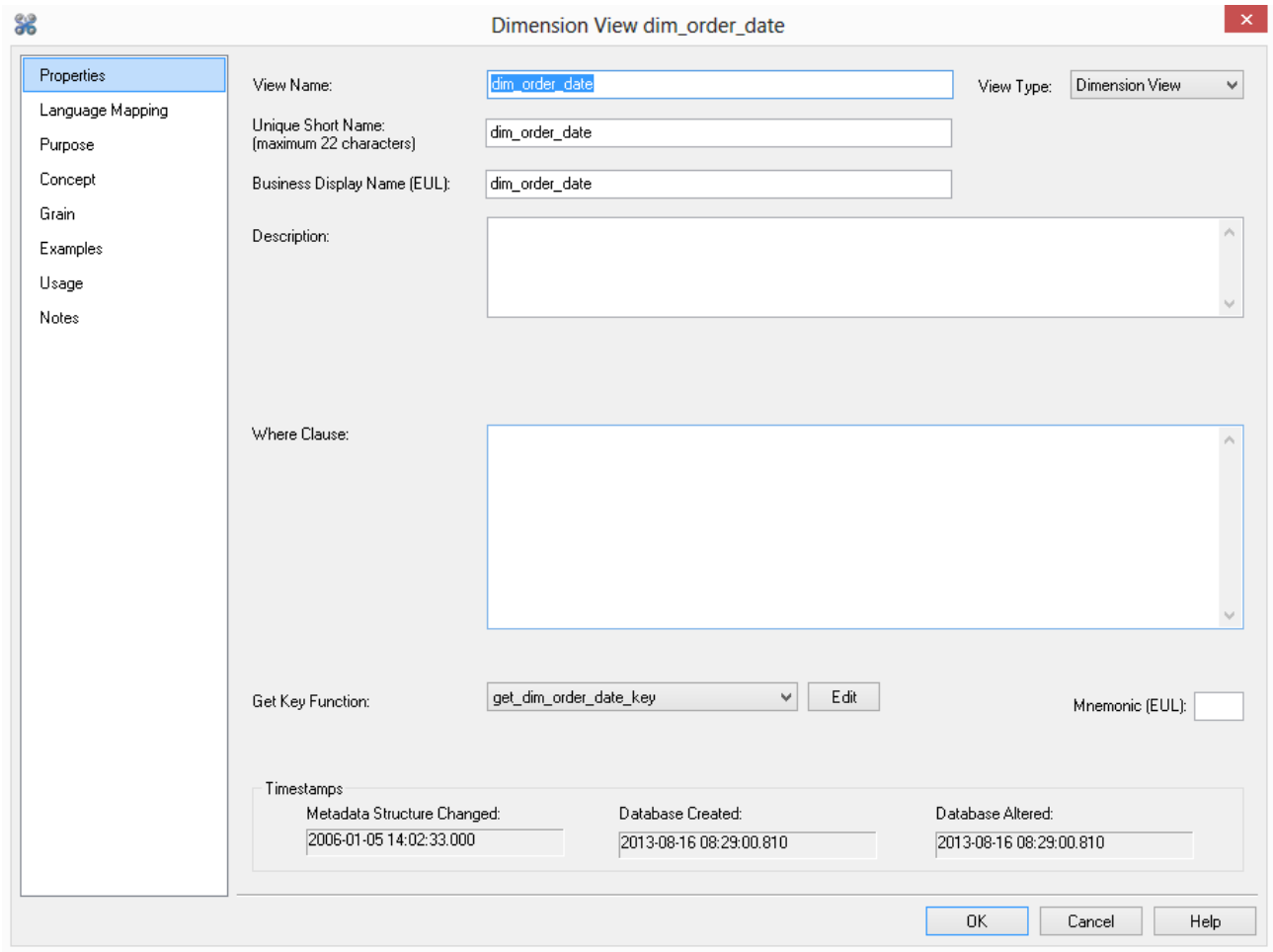
- The dialog box that displays defaults the object type to a dimension view, and names the dimension view **dim_date.**
- Because we want to create two dimension views from the same source, dim_date, we need to change this dimension view name to one that is more meaningful, specifically **dim_order_date.**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



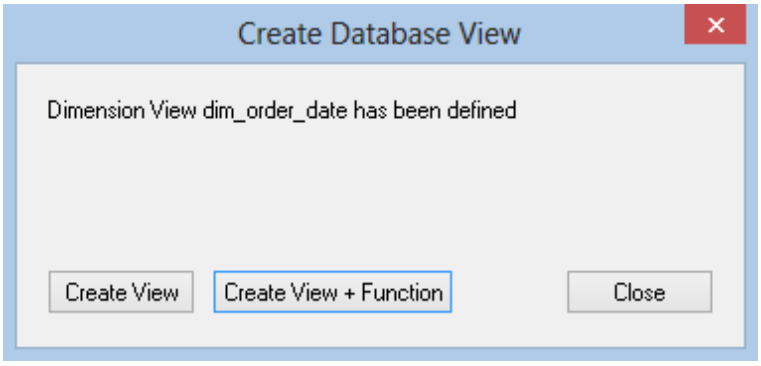
2 A dialog box displays to provide a means of re-mapping some of the column names in the view if required. Rename **calendar_date** to **order_date** and click **OK**.



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



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.**

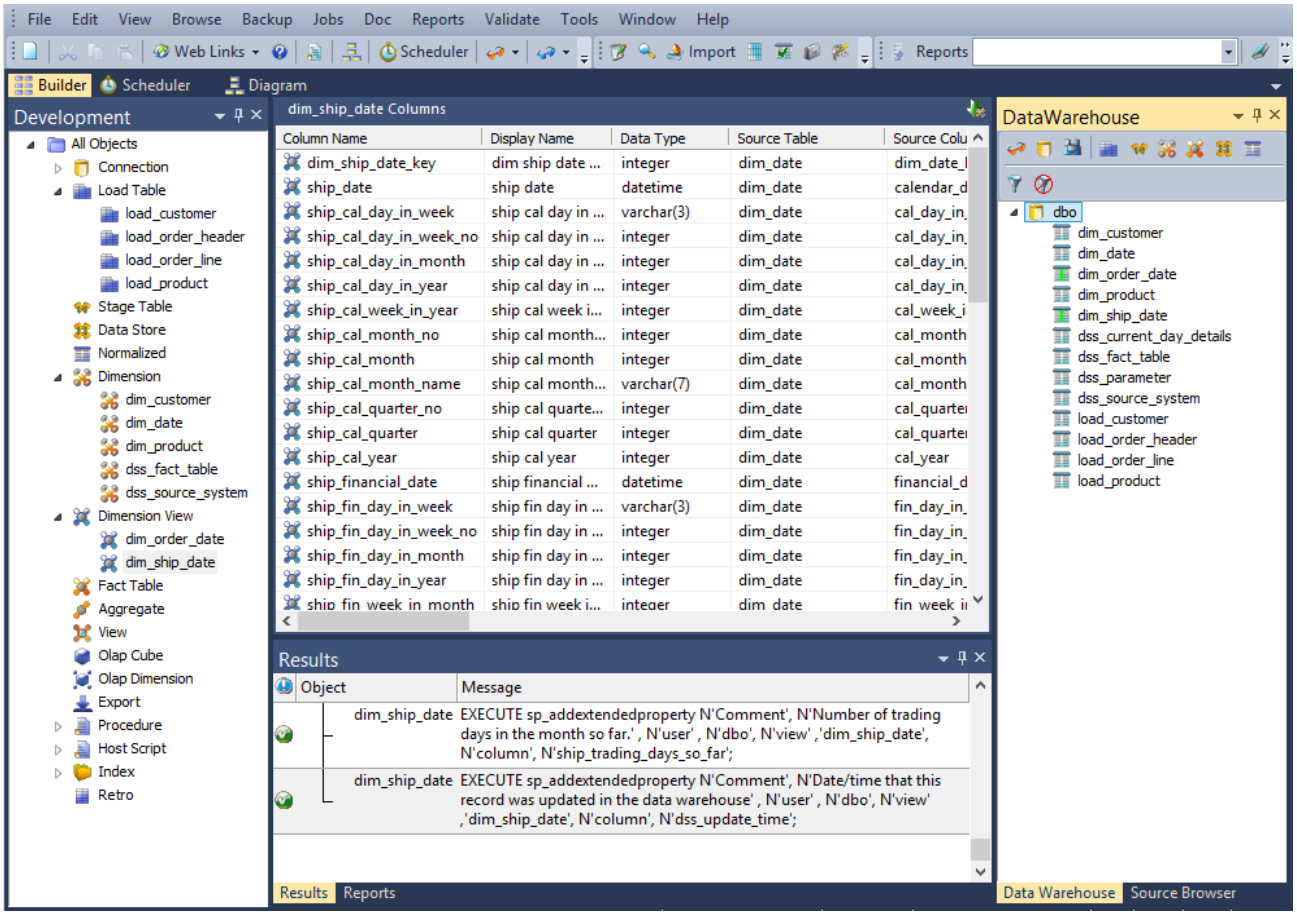


5 Click **OK** on the Business Key dialog.

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

7 Click in the right pane and press F5 to refresh the Data Warehouse table view in the right pane.

Your screen should look something like this:



You are now ready to proceed to the next step - ***Defining the Staging Table*** (see "***1.10 Defining the Staging Table***" on page 36).

1.10 Defining the Staging Table

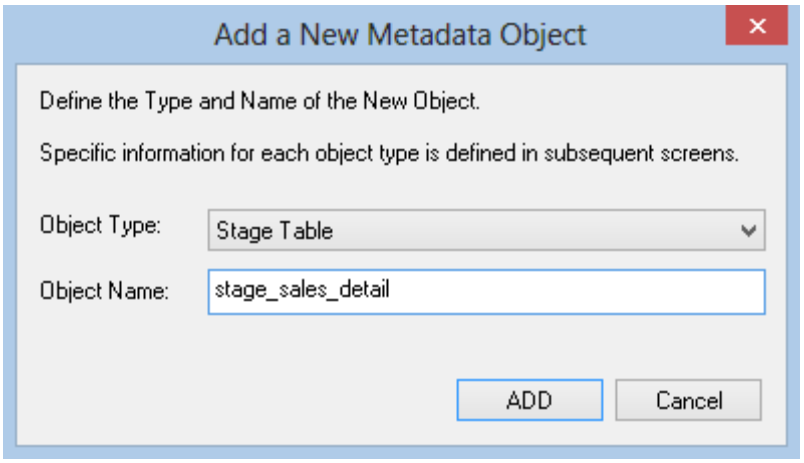
In this step you will create a stage table from two load tables. A stage table is used to build the format of the fact table, and generally contains changed or new data that will be added to the fact table. As stage tables contain dimensional keys, they should be defined after the dimensions.

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

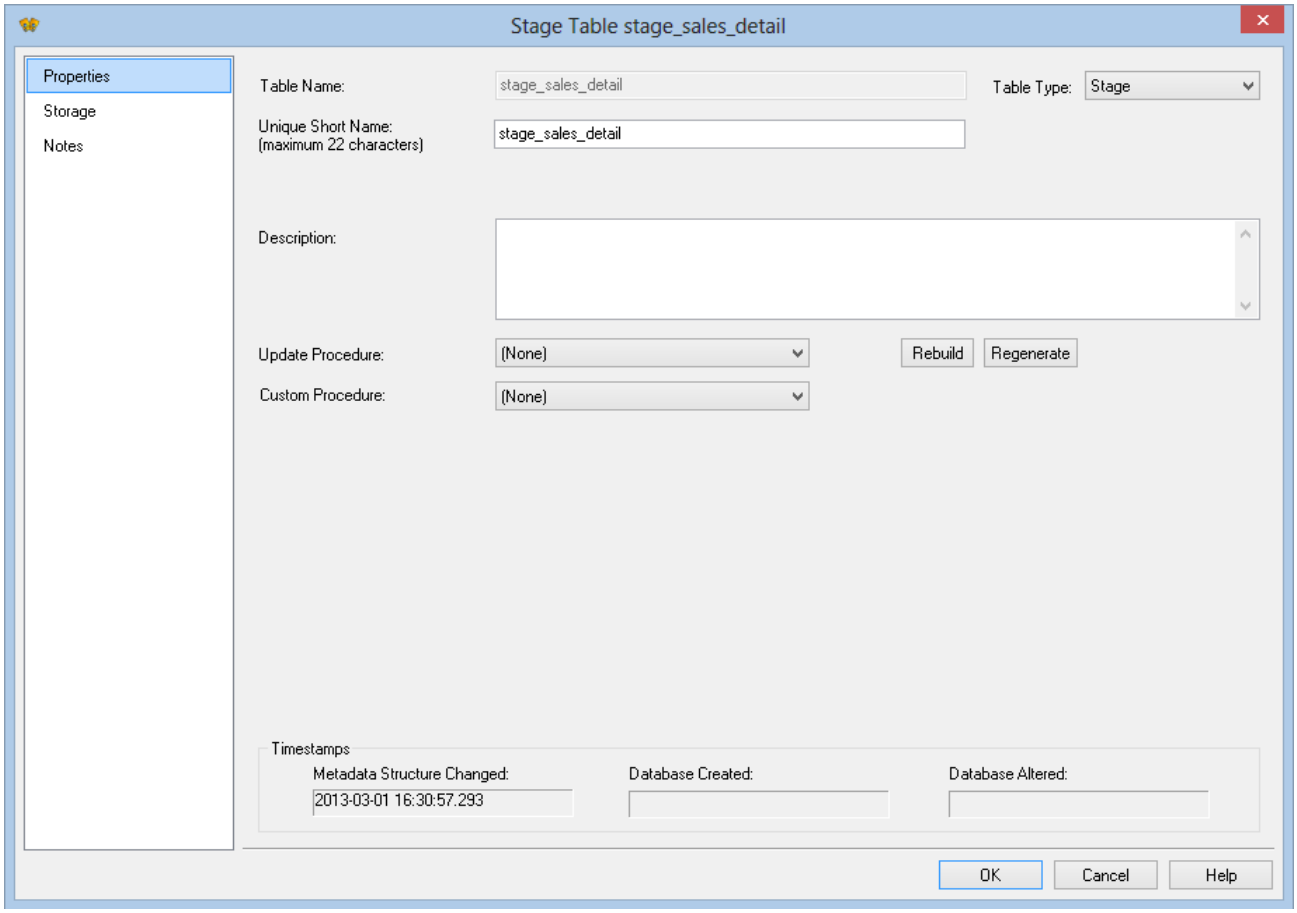
---

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 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**.



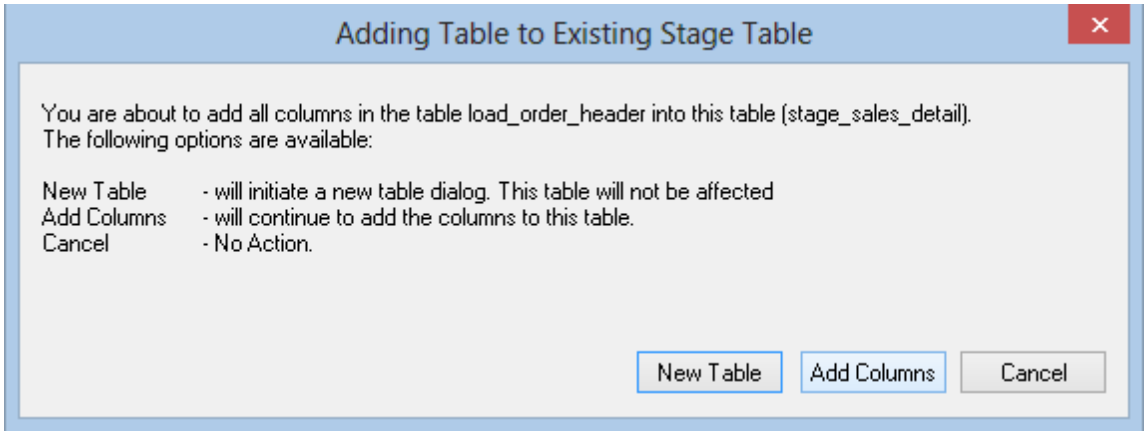
3 A table definition displays with all the necessary defaults completed. Click **OK**.



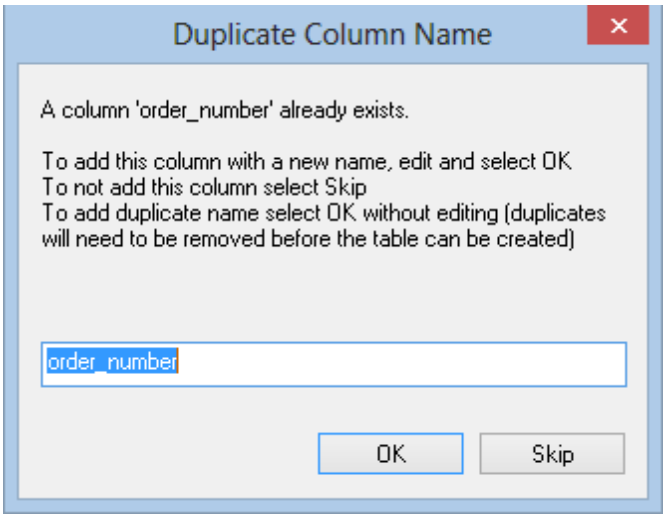
Note: The Stage Table object group in the left pane now has a dependent/child.

4 To add the remaining information from the second load table, click on **stage_sales_detail** in the left pane. Next drop **load_order_header** from the right pane into the middle pane.

5 A message is displayed with options to create a "New table" or to "Add columns". Click **Add Columns**.



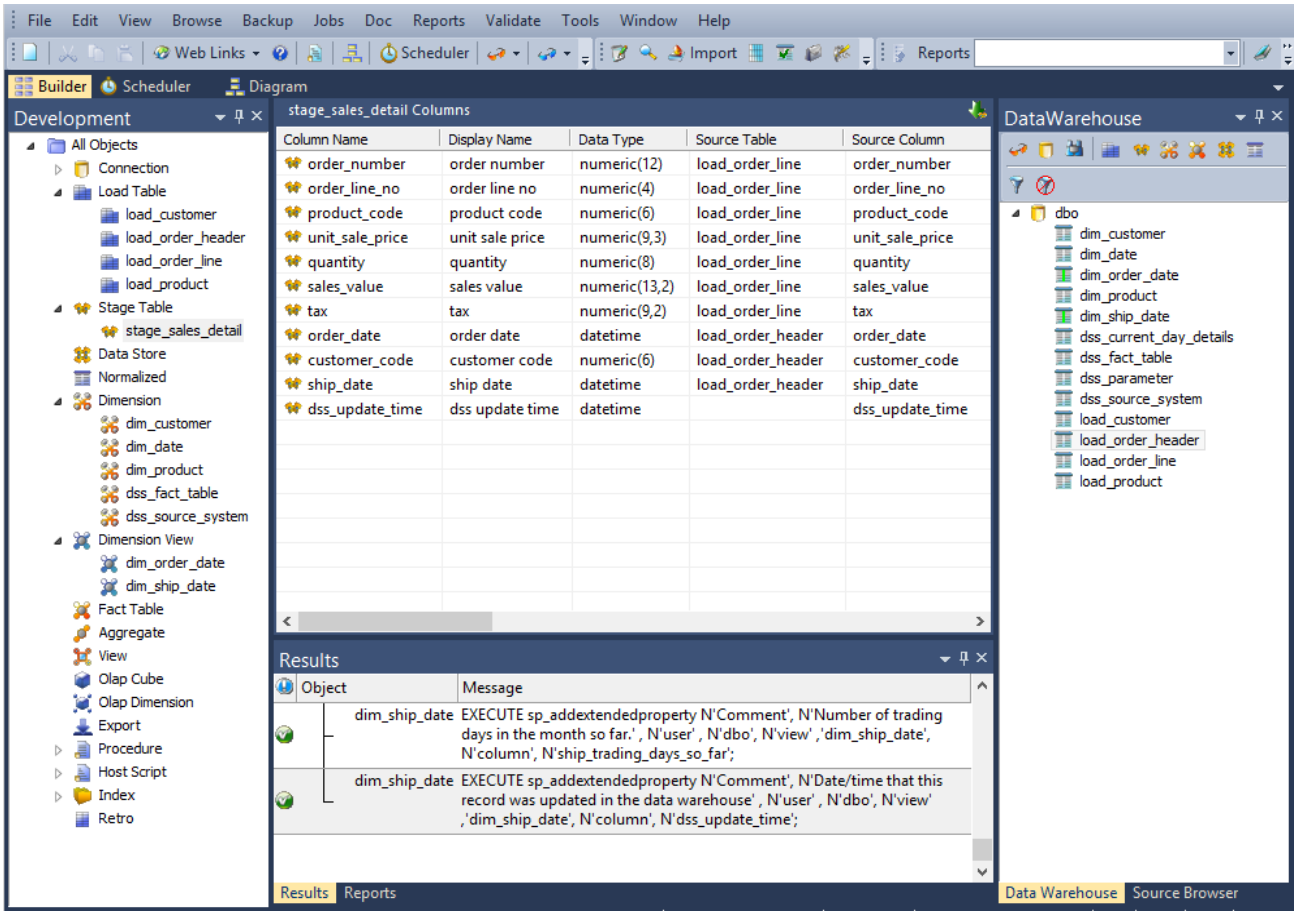
6 QAD Data Warehouse Designer detects duplicated columns. As both **load_order_header** and **load_order_line** have the *order number* field, the following is displayed. Click **Skip** to exclude the second instance of order_number.



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

7 This combines data from two load tables (**load_order_header** and **load_order_line**) into one stage table. In the middle pane under *Source Table, notice* the source of each of the columns.

Your screen should look something like this:



You are now ready to proceed to the next step - ***Including Dimension Links*** (see "***1.11 Including Dimension Links***" on page 40).

1.11 Including Dimension Links

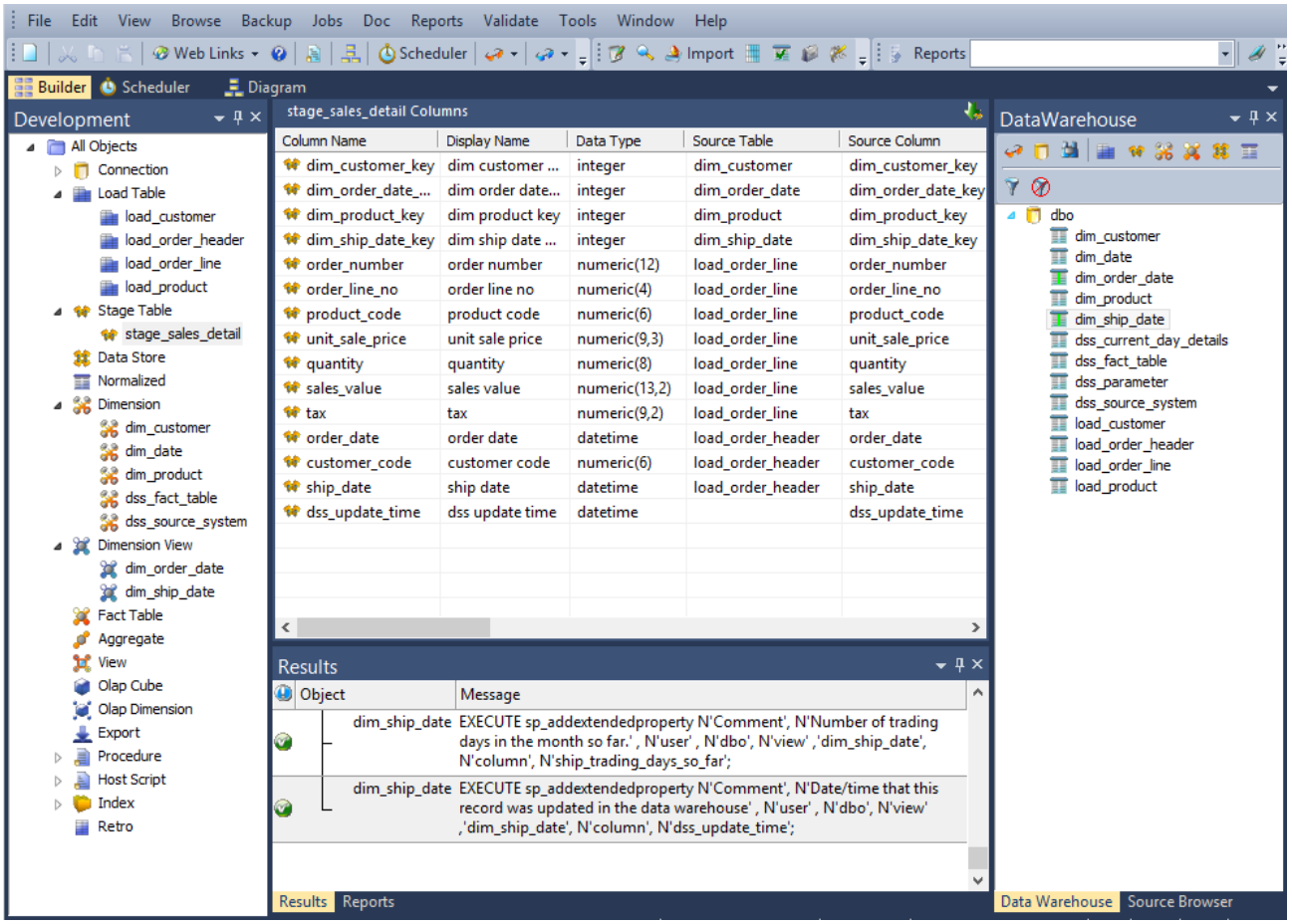
The dimension links that allow us to create the fact-like star schema now need to be included:

1 In the left pane, click on the **stage_sales_detail** table in the Stage Table object group. The middle pane should display the contents of this stage table.

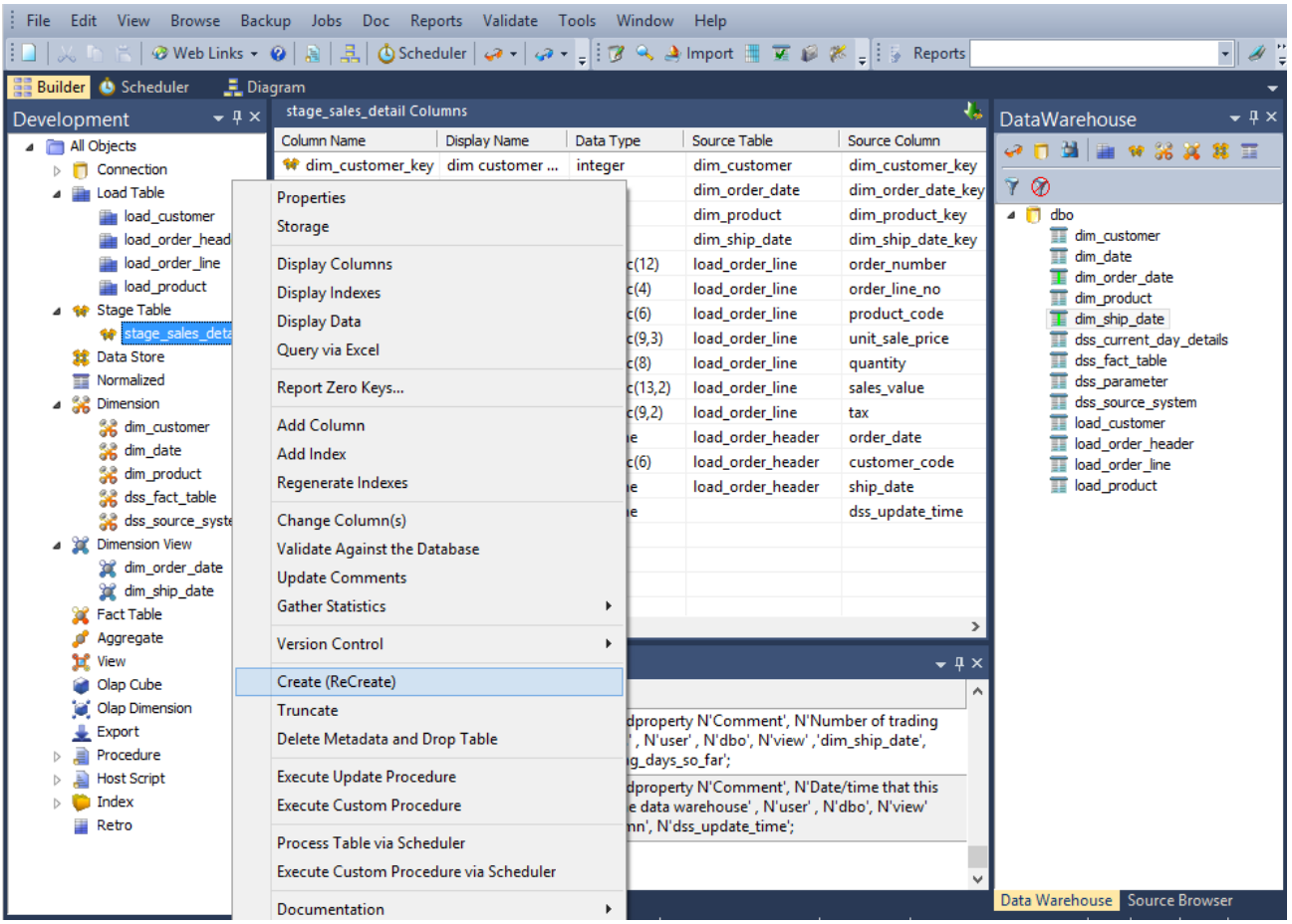
2 Drag each of the following dimensions from the right pane into the stage table in the middle pane:

- **dim_customer**
- **dim_order_date**
- **dim_product**
- **dim_ship_date**

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



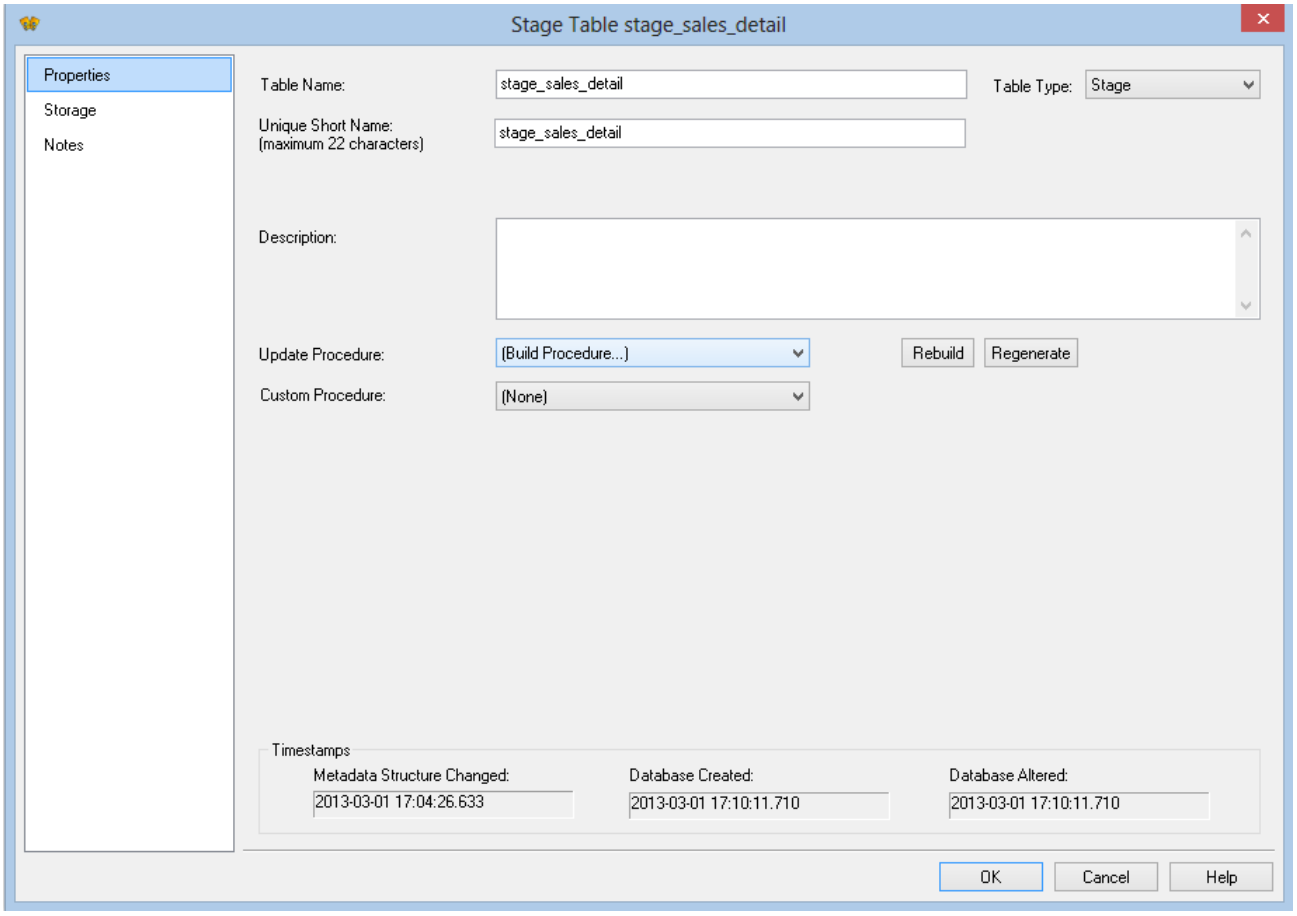
3 The stage table metadata has been defined, but the stage table has not been created. To create the stage table in the data warehouse, right-click on **stage_sales_detail** in the left pane and select **Create (ReCreate).**



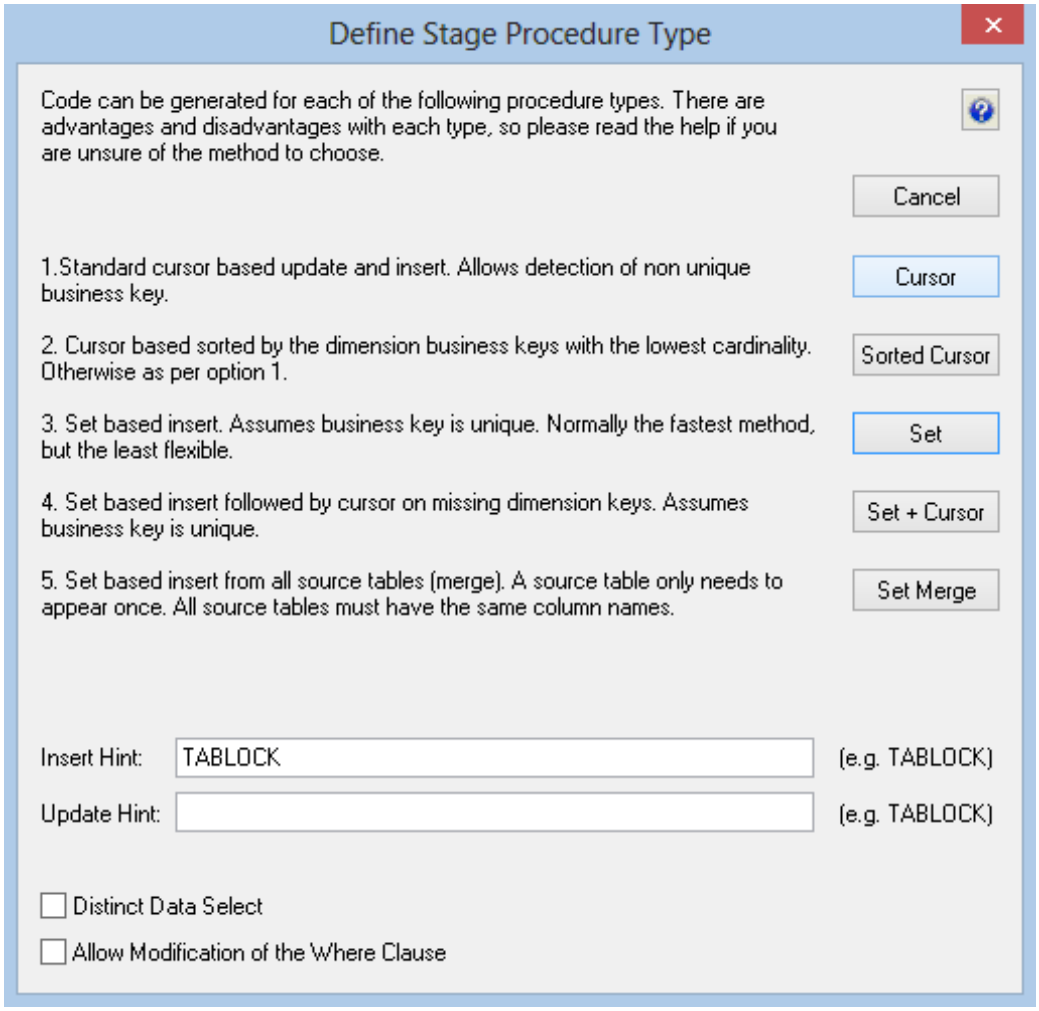
Note: The table must exist in the data warehouse before we can proceed to the next step. If the table has not been physically created then the procedure in step 5 will fail to compile.

4 Double-click on the stage table to select **Properties.**

5 Under Update Procedure, choose **(Build Procedure...)** to create an update stage procedure. Click **OK**.



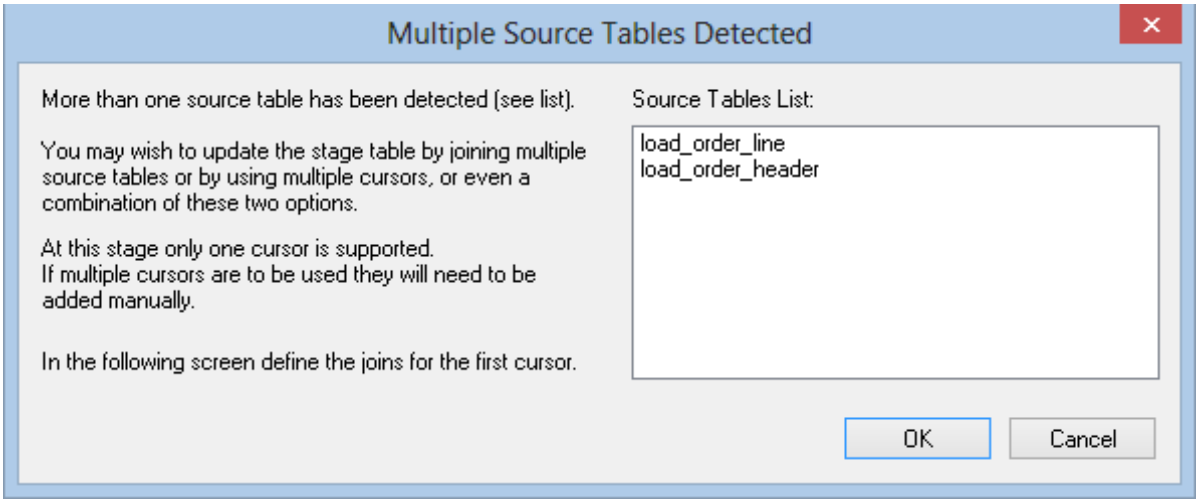
6 Select the **Cursor** based procedure generation from the stage procedure type dialog box.



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.

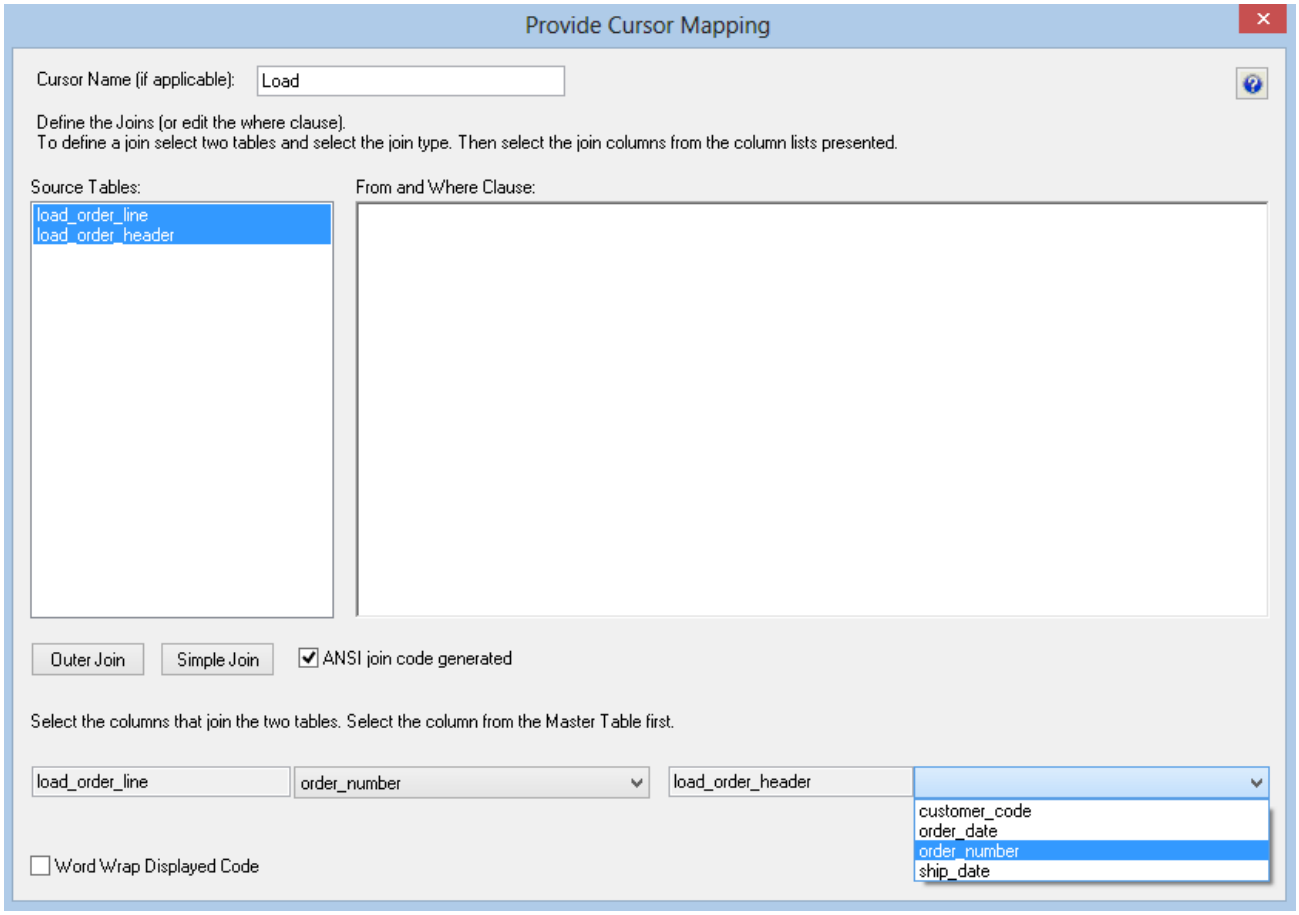
7 Click **OK** on the Parameters dialog.

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

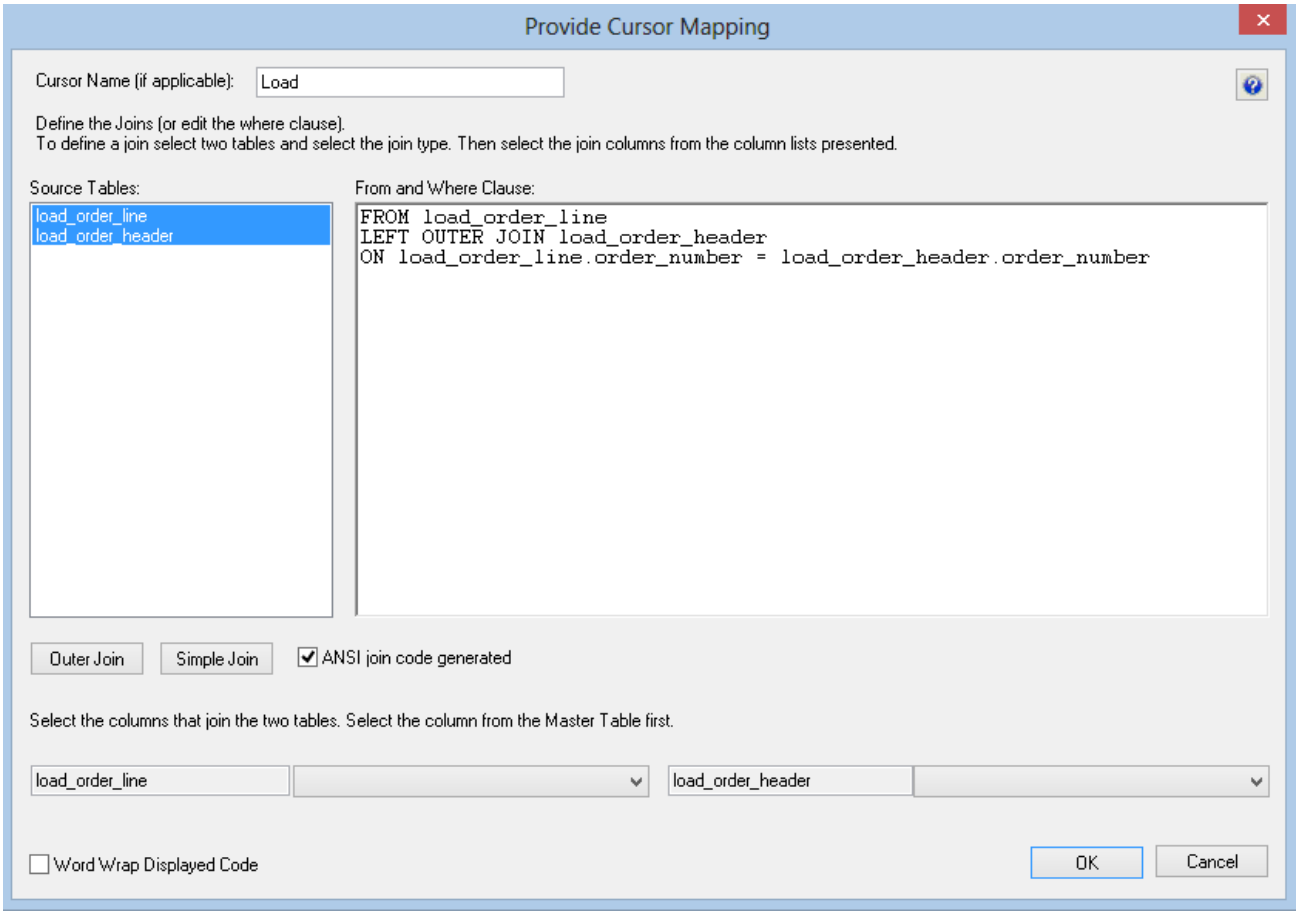


9 Highlight the source tables **load_order_line** and **load_order_header** which are to be joined by **order_number**.

- 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.

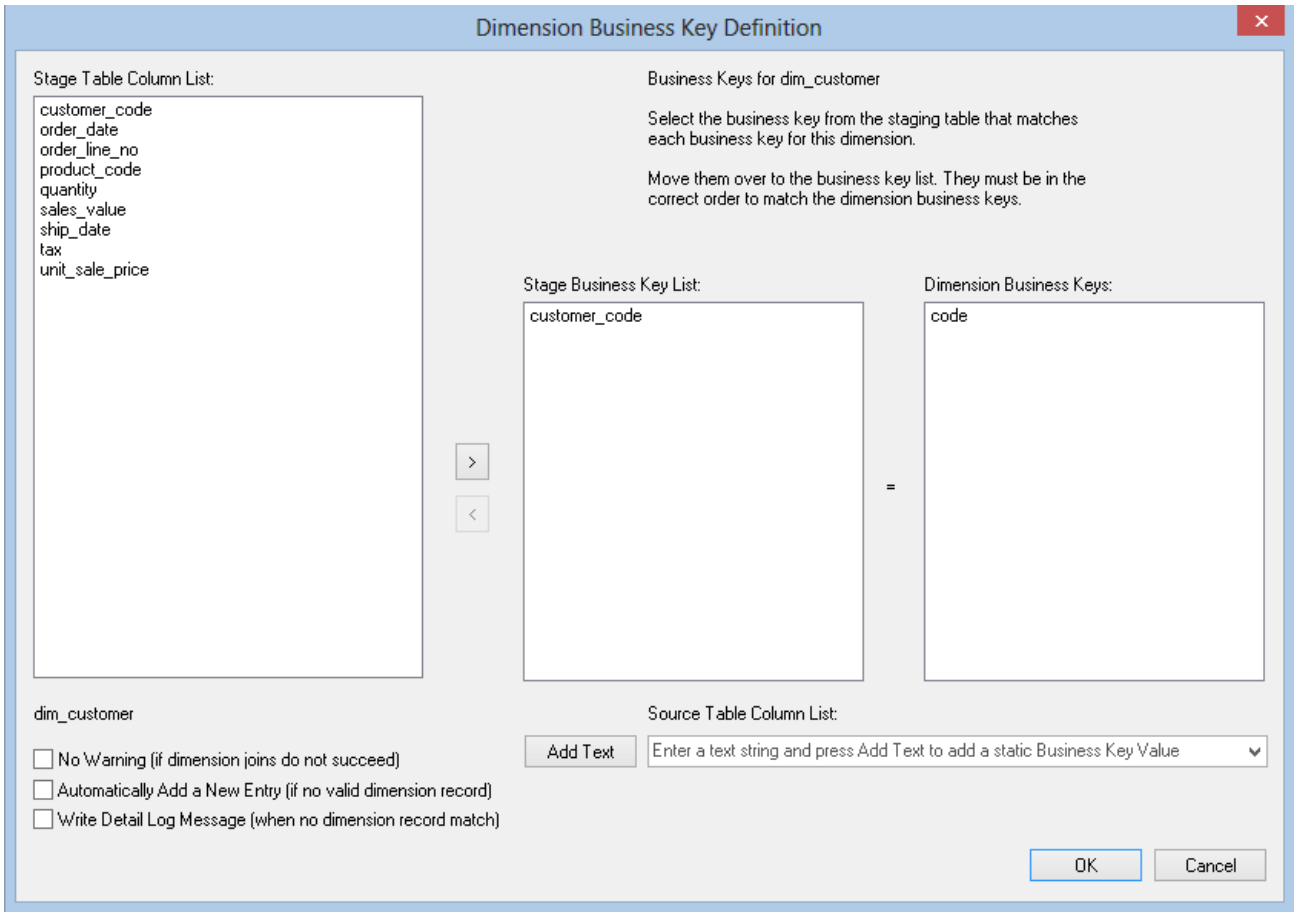


- This will create a join statement in the right window. Click **OK**.



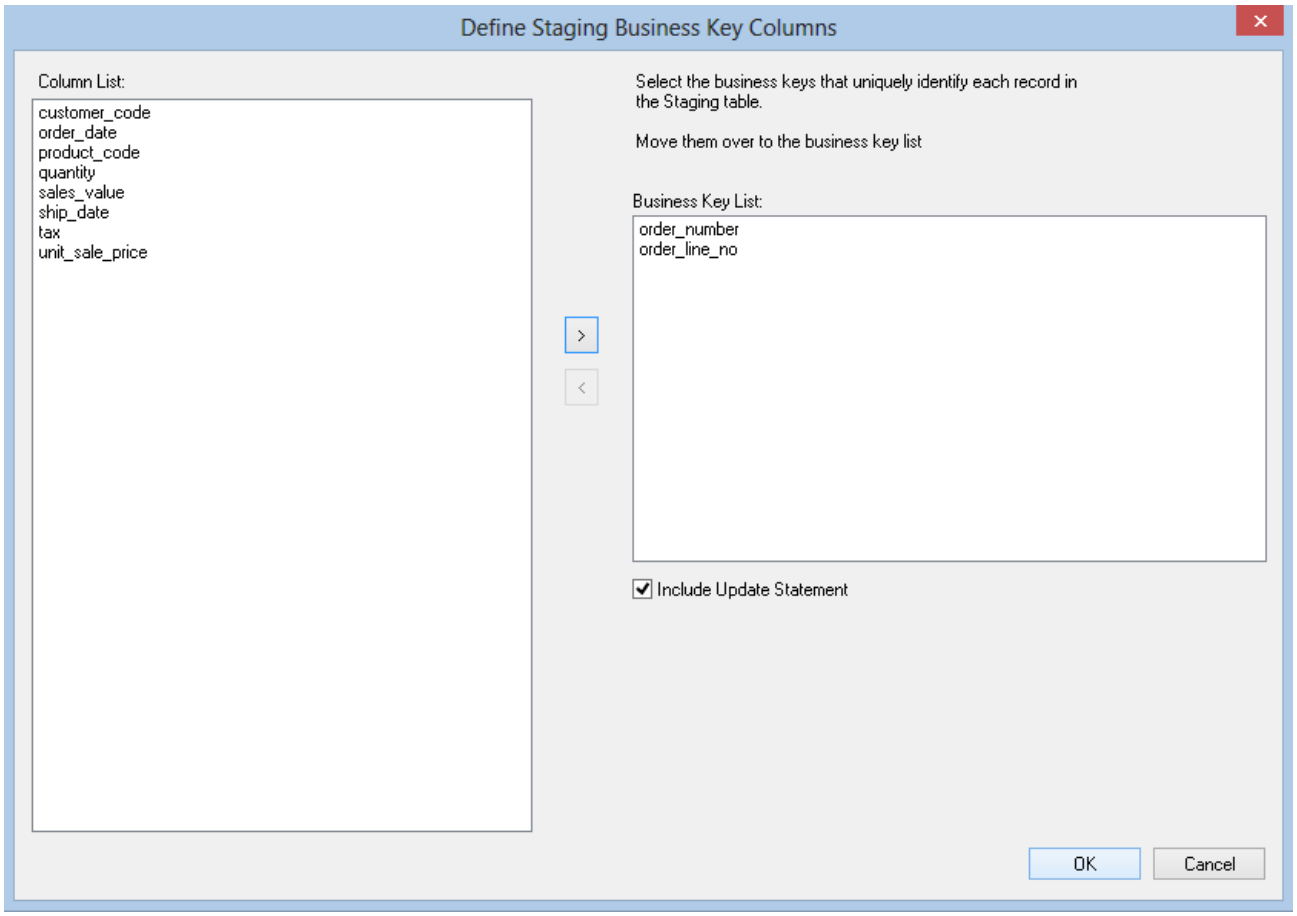
10 You need to match the dimension business keys with the business keys in the stage table. This associates the correct dimensional record to each stage table record. A dialog box displays for each dimensional join.

- For **dim_customer**, select **customer_code.** Click **>** and **OK.**



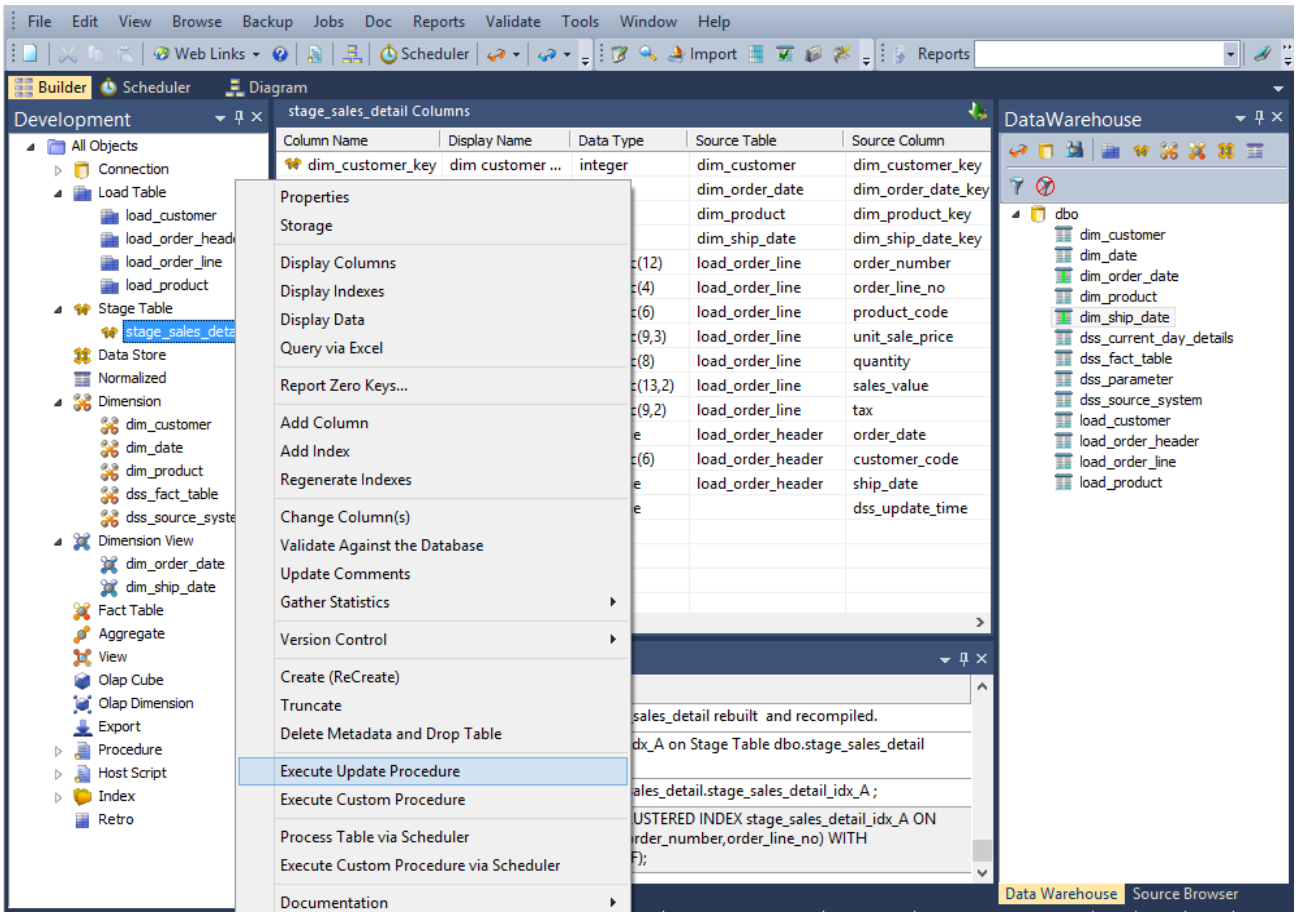
- For **dim_product**, select **product_code.** Click **>** and **OK.**
- The business key for dim_ship_date has the same column name in the stage table and the dimension view, allowing QAD Data Warehouse Designer to automatically move **ship_date** to the left side. Click **OK** to progress to dim_order_date, 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 **>** and **OK.**

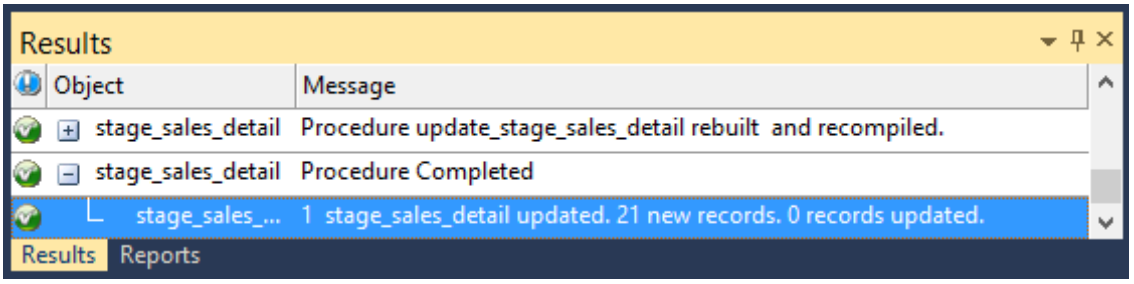


12 QAD Data Warehouse Designer now builds and compiles the update procedure. The results pane shows any indexes that were created.

13 The final step is the population of the stage table. Right-click on **stage_sales_detail** in the left pane and select **Execute Update Procedure.**



14 Output from the stage table being updated can now be seen in the **Results** window.



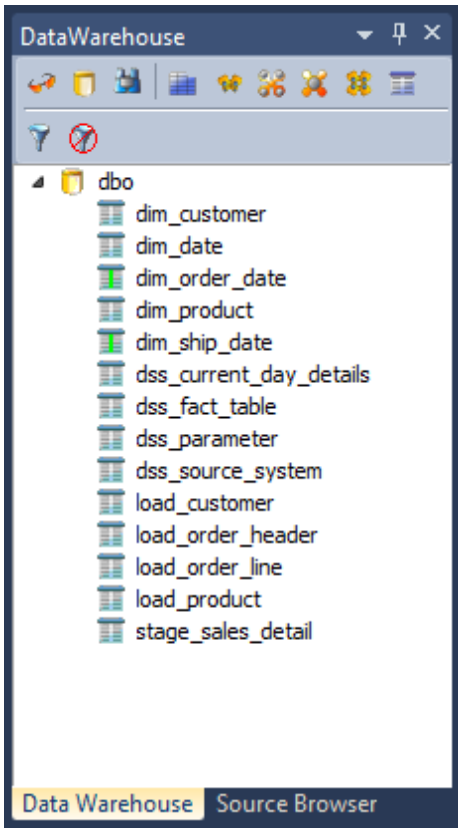
You are now ready to proceed to the next step - ***Creating a Fact Table*** (see "***1.12 Creating a Fact Table***" on page 49).

1.12 Creating a Fact Table

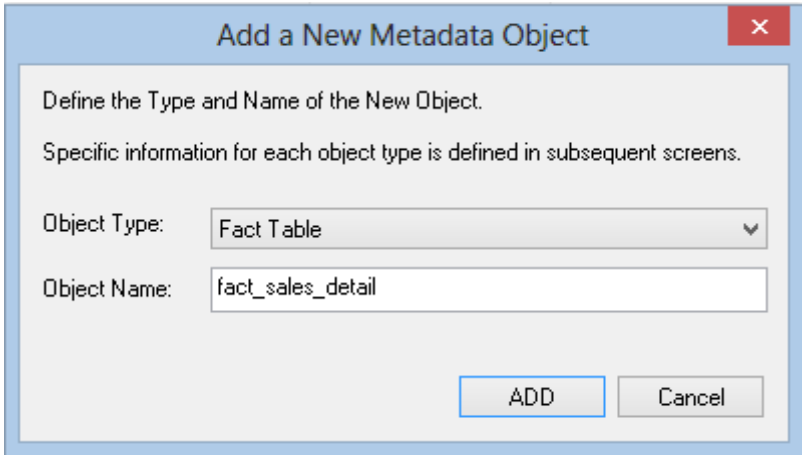
In this step you will create a fact table.

1 Create a drop target by double-clicking on the **Fact Table object group** in the left pane.

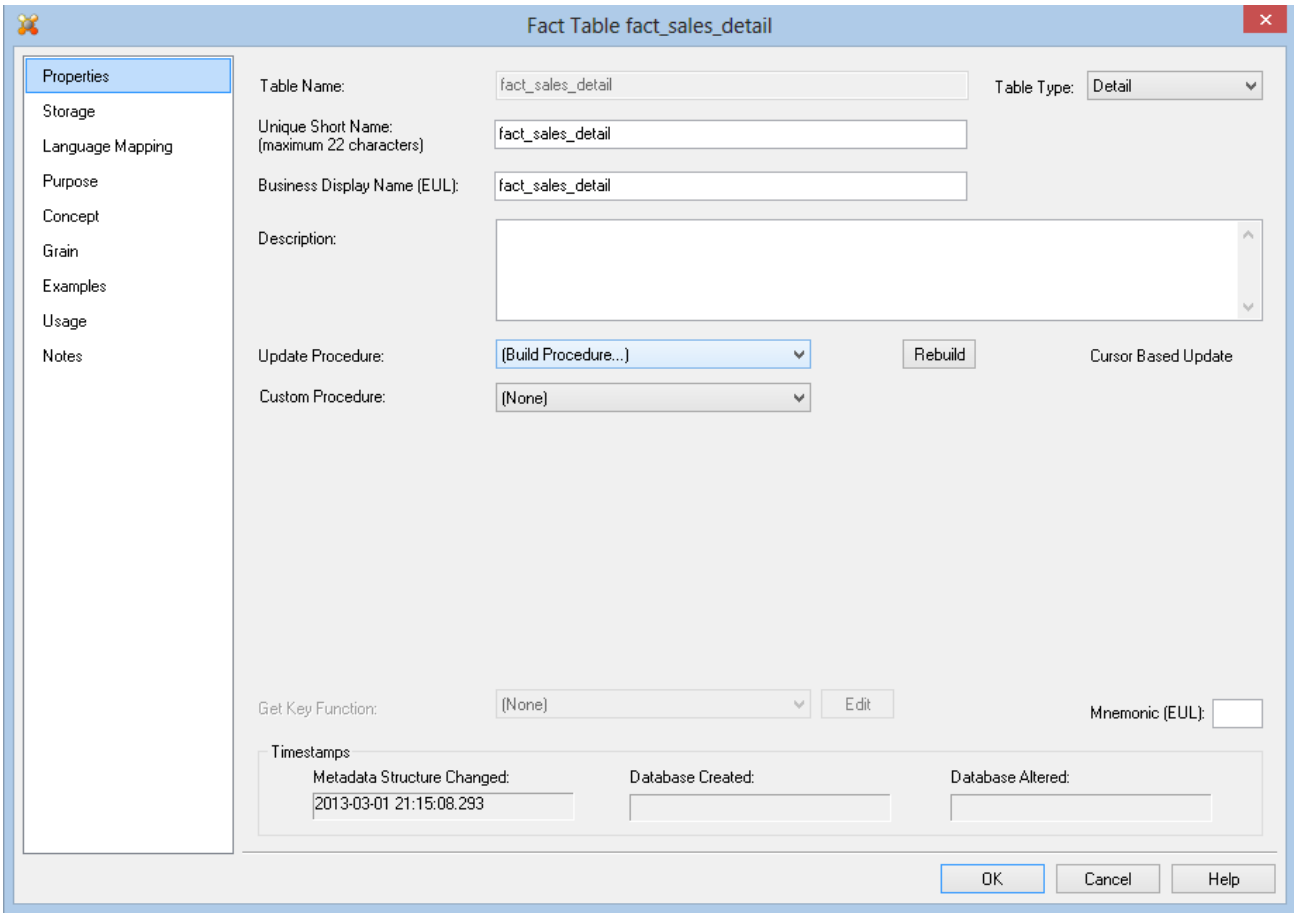
2 Browse the data warehouse connection again (or refresh the data warehouse connection):



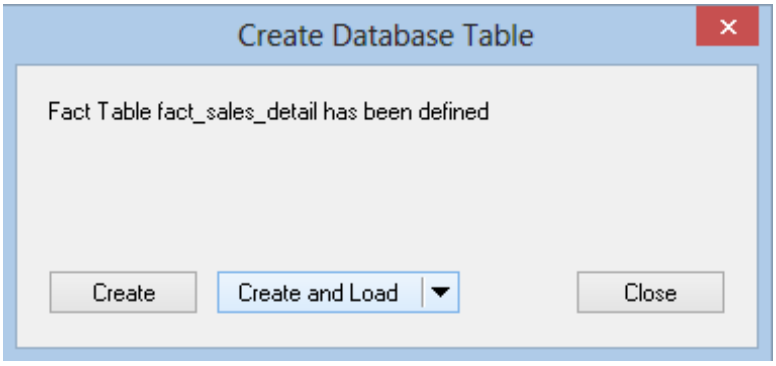
3 Drag the stage table **stage_sales_detail** over from the right pane into the middle pane. The following dialog is displayed. Click **ADD**.



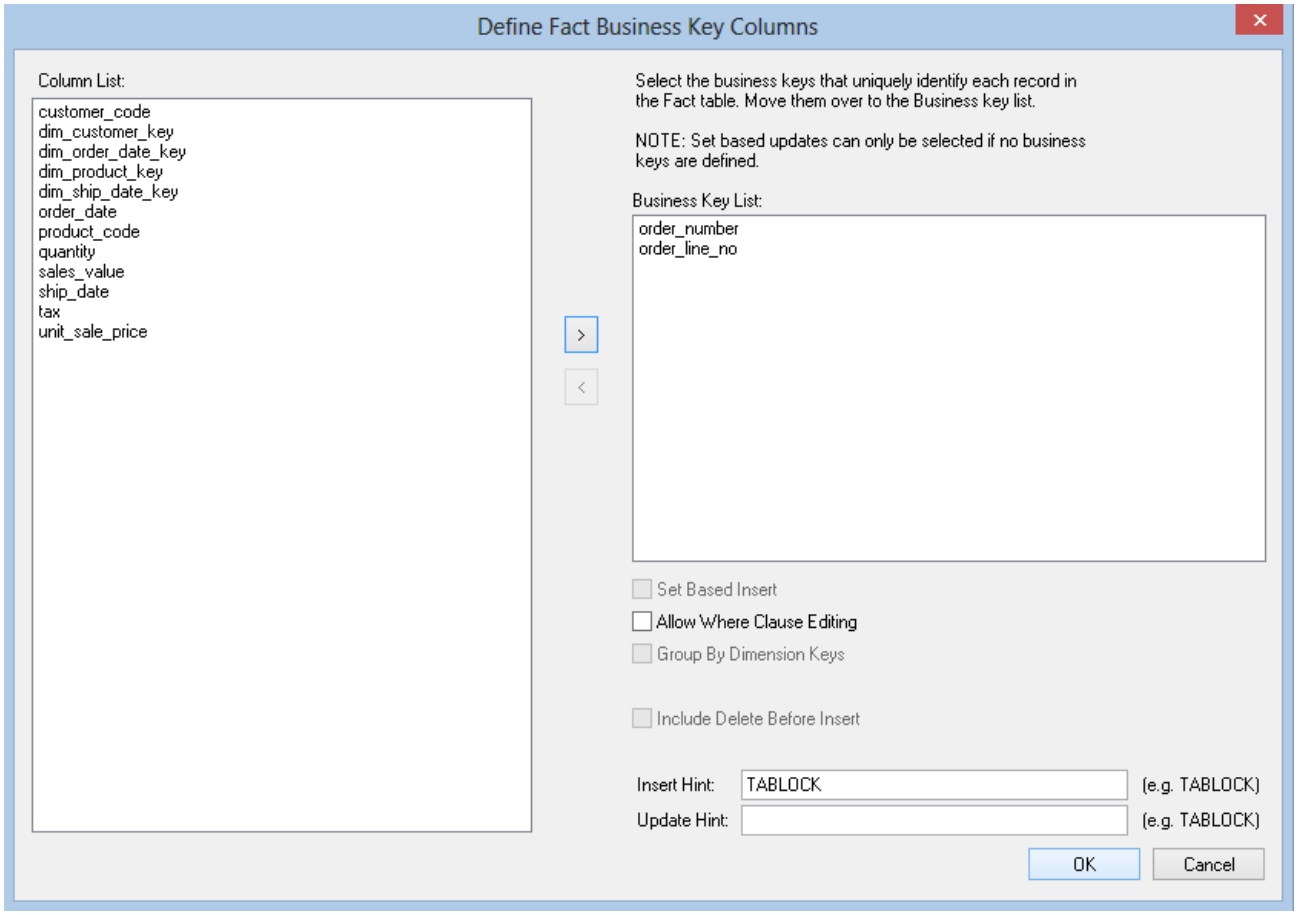
4 The **fact_sales_detail** table Properties dialog will appear. Select **(Build Procedure...)** in the update procedure drop-down and click **OK.**



5 Select **Create and Load** to create and load the table now.

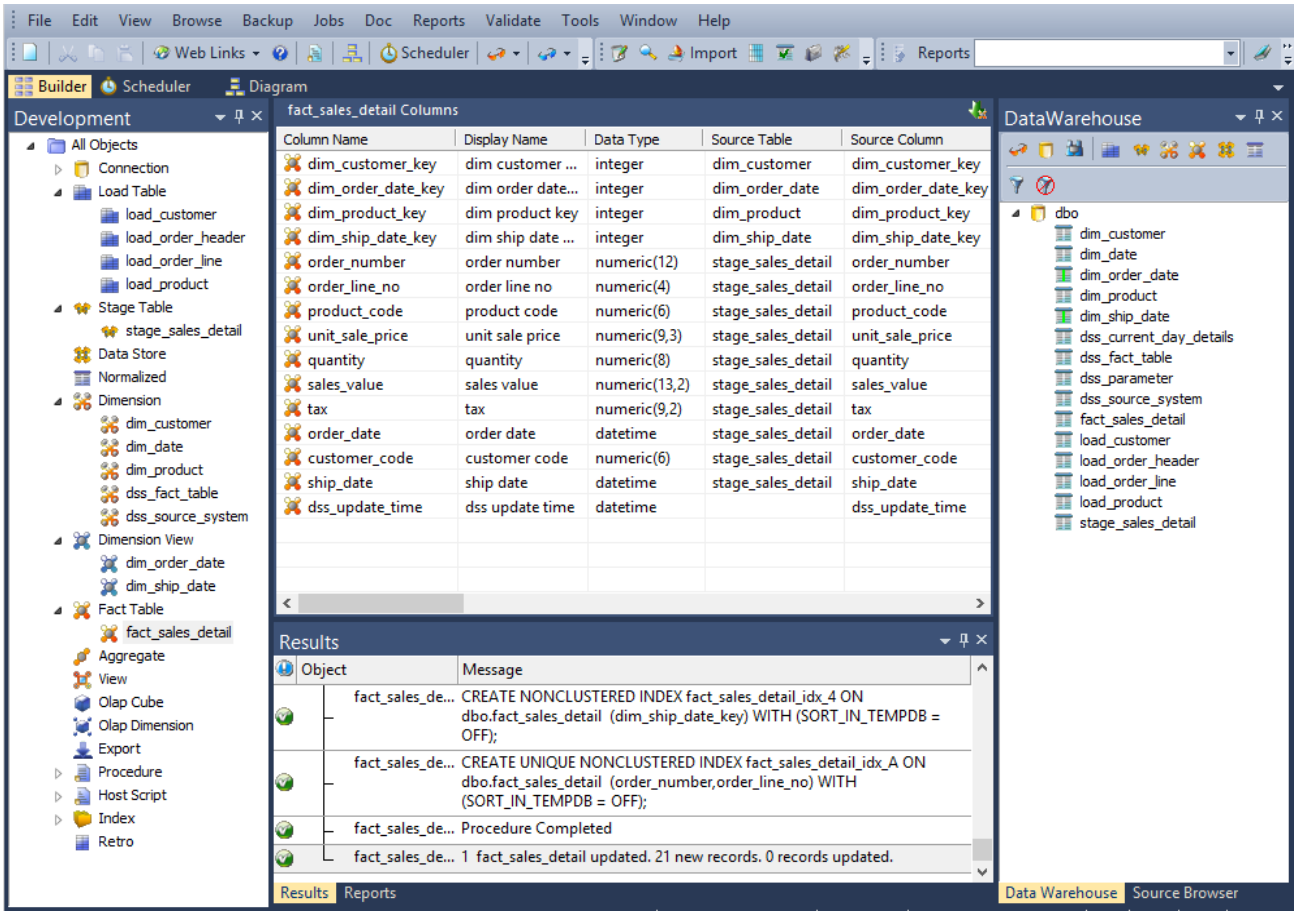


6 Select the Business Key for the fact table. Choose **order_number** and **order_line_number**. Click **>** and then **OK.**



7 Output from the fact table being created and updated can now be seen in the **Results** window. Refresh the Data Warehouse in the right pane.

Your screen should look something like this:



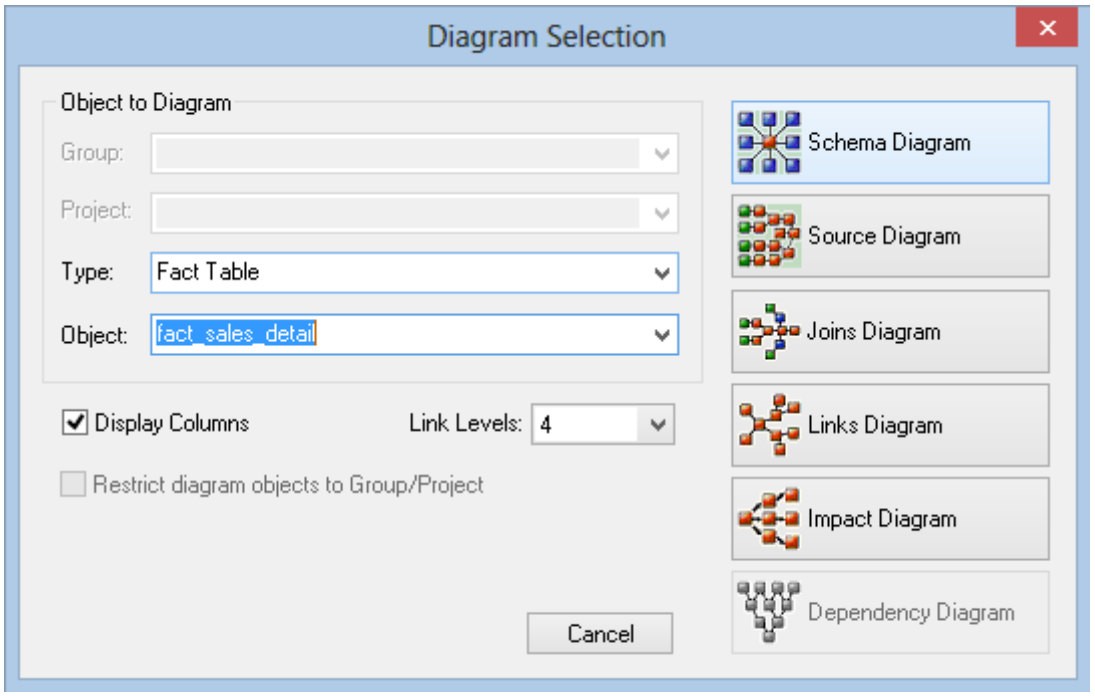
You are now ready to proceed to the next step - ***Switching to Diagrammatic View*** (see "***1.13 Switching to Diagrammatic View***" on page 53)

1.13 Switching to Diagrammatic View

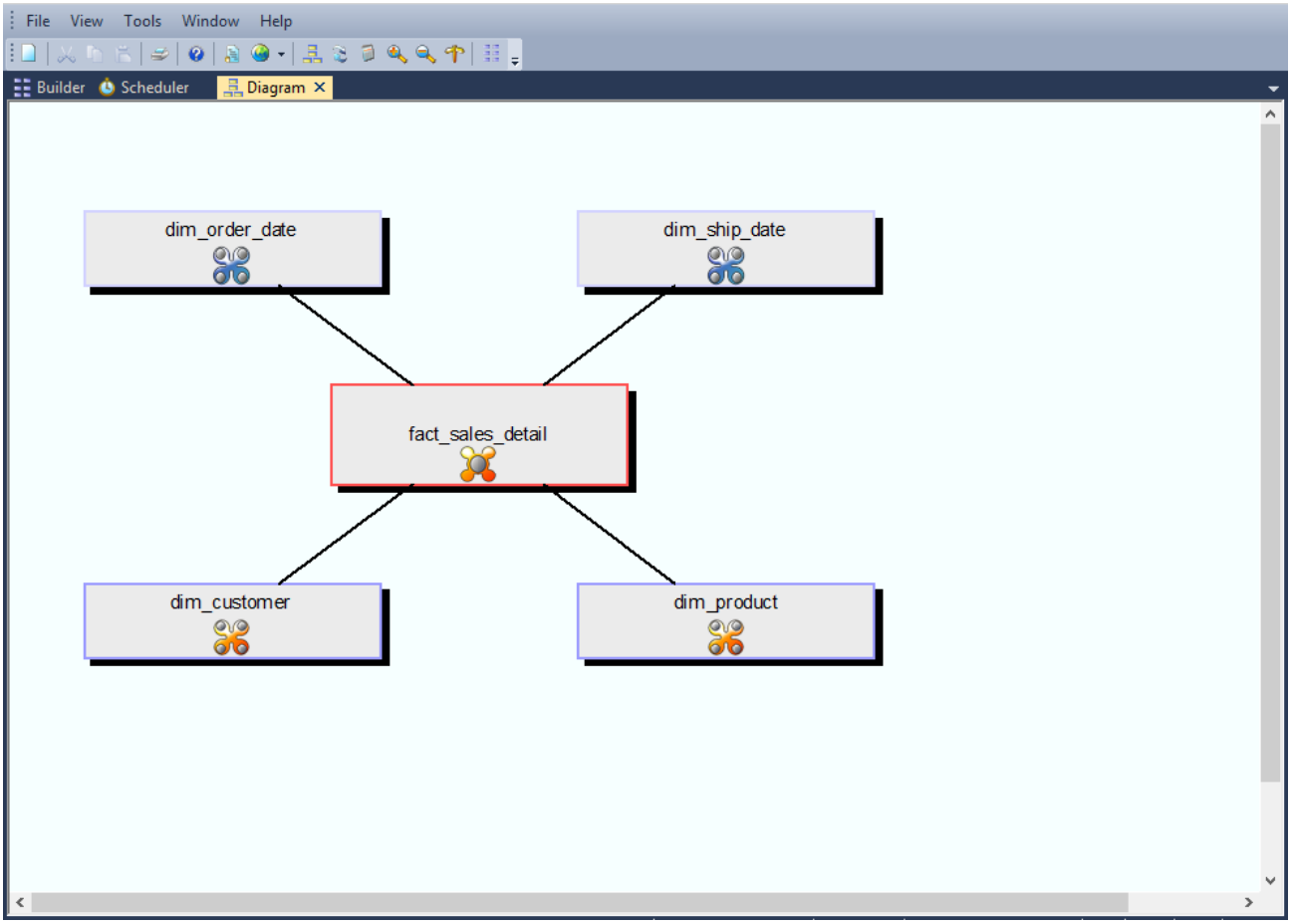
QAD Data Warehouse Designer provides the ability to diagrammatically view the data warehouse you have created.

1 Click on the  button to display the **Diagram Selection** dialog.

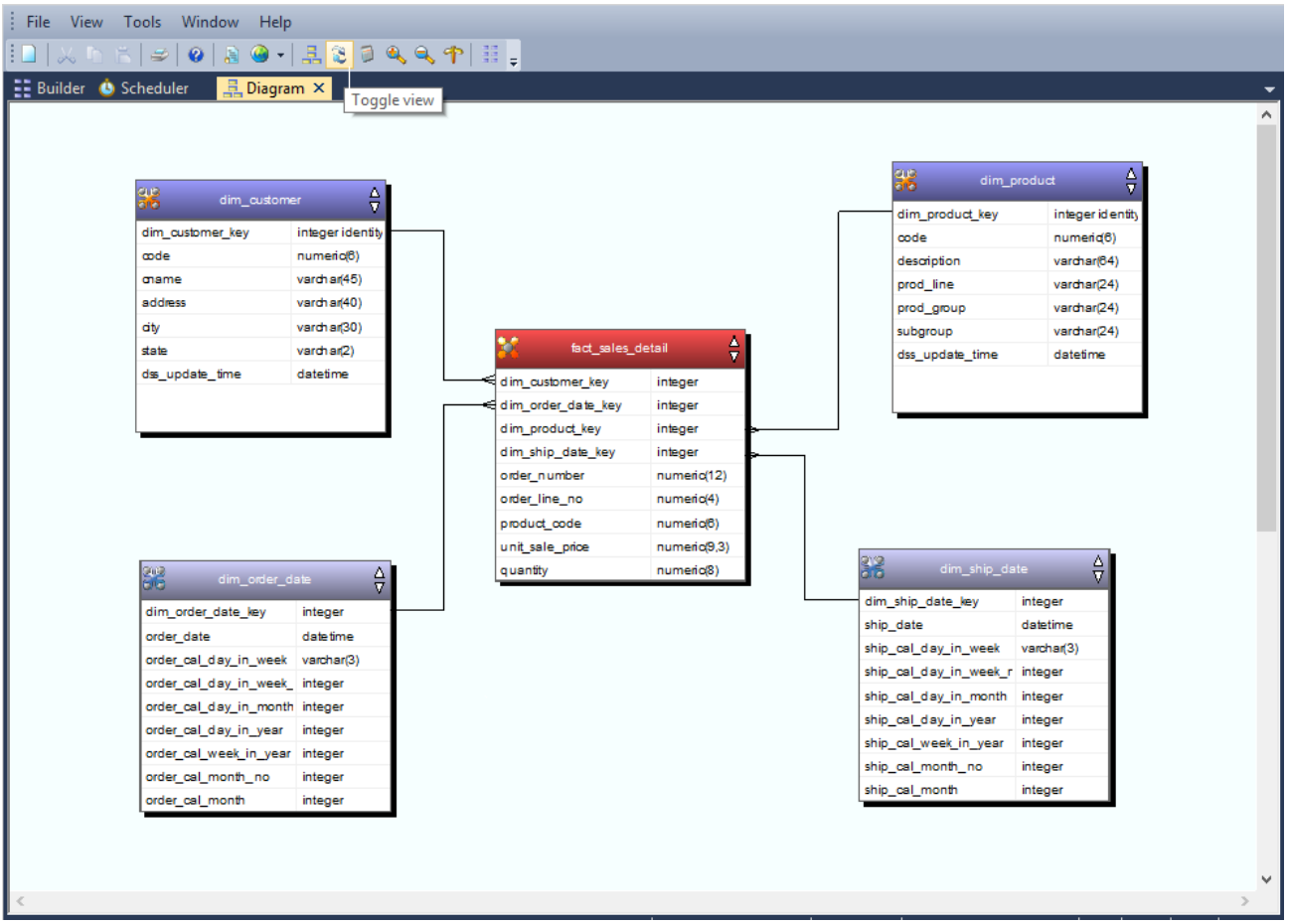
2 Select an object **Type** of **Fact Table** to narrow the selection list and then select **fact_sales_detail.** Click on the **Schema Diagram** button to display a star schema diagram.



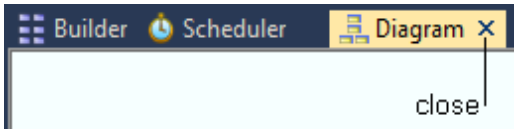
The diagram looks like this:



The **toggle** button will enable you to switch between the detailed and standard diagrams.

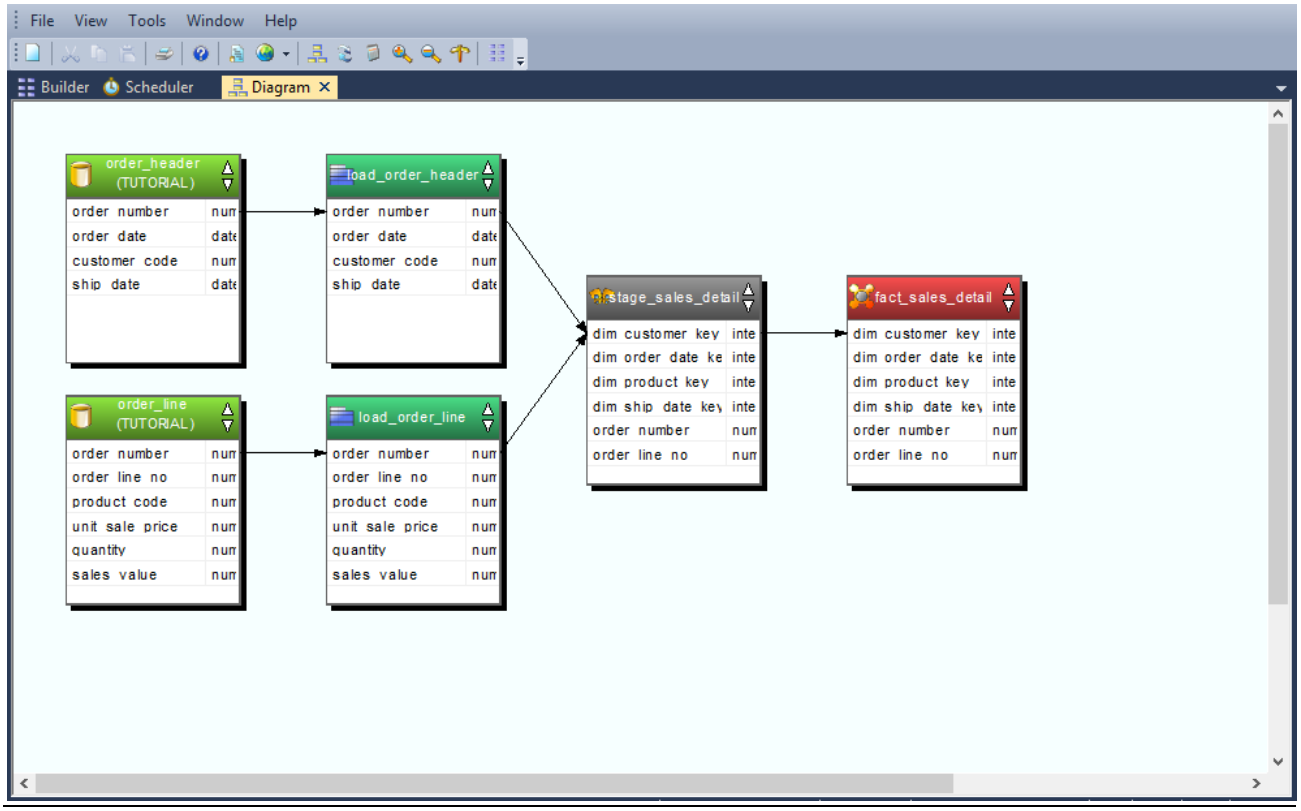


3 To close the diagrammatic view, click on the **X** on the diagram tab, or alternatively, return to the Builder section by clicking the Builder tab.



TIP: To view the source tracking of the **fact_sales_detail** table, click once more on the  button, choose the **fact_sales_detail** table and then click on the **Source Diagram** button.

The diagram looks like this:

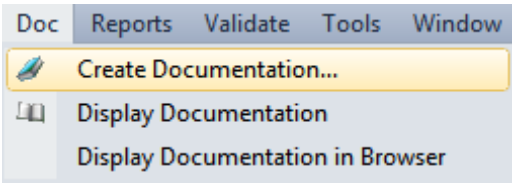


You are now ready to proceed to the next step - ***Producing Documentation*** (see "***1.14 Producing Documentation***" on page 57).

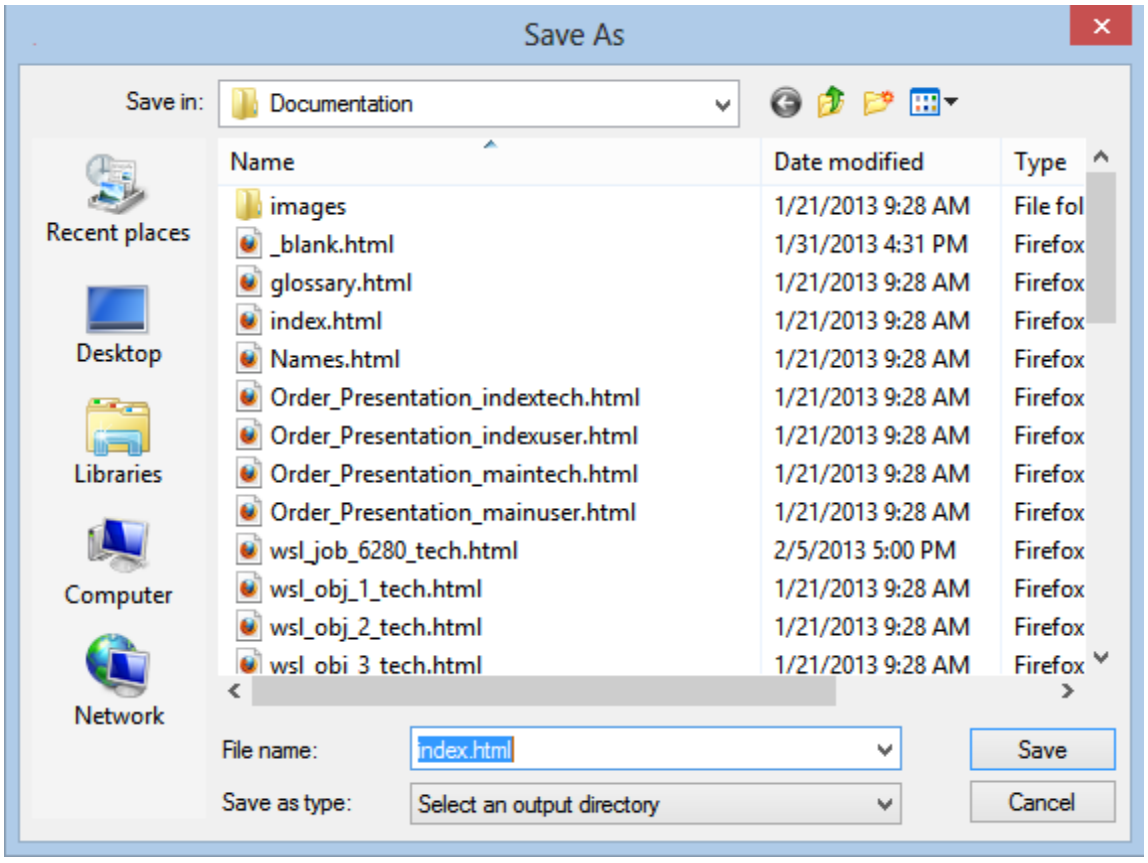
1.14 Producing Documentation

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.

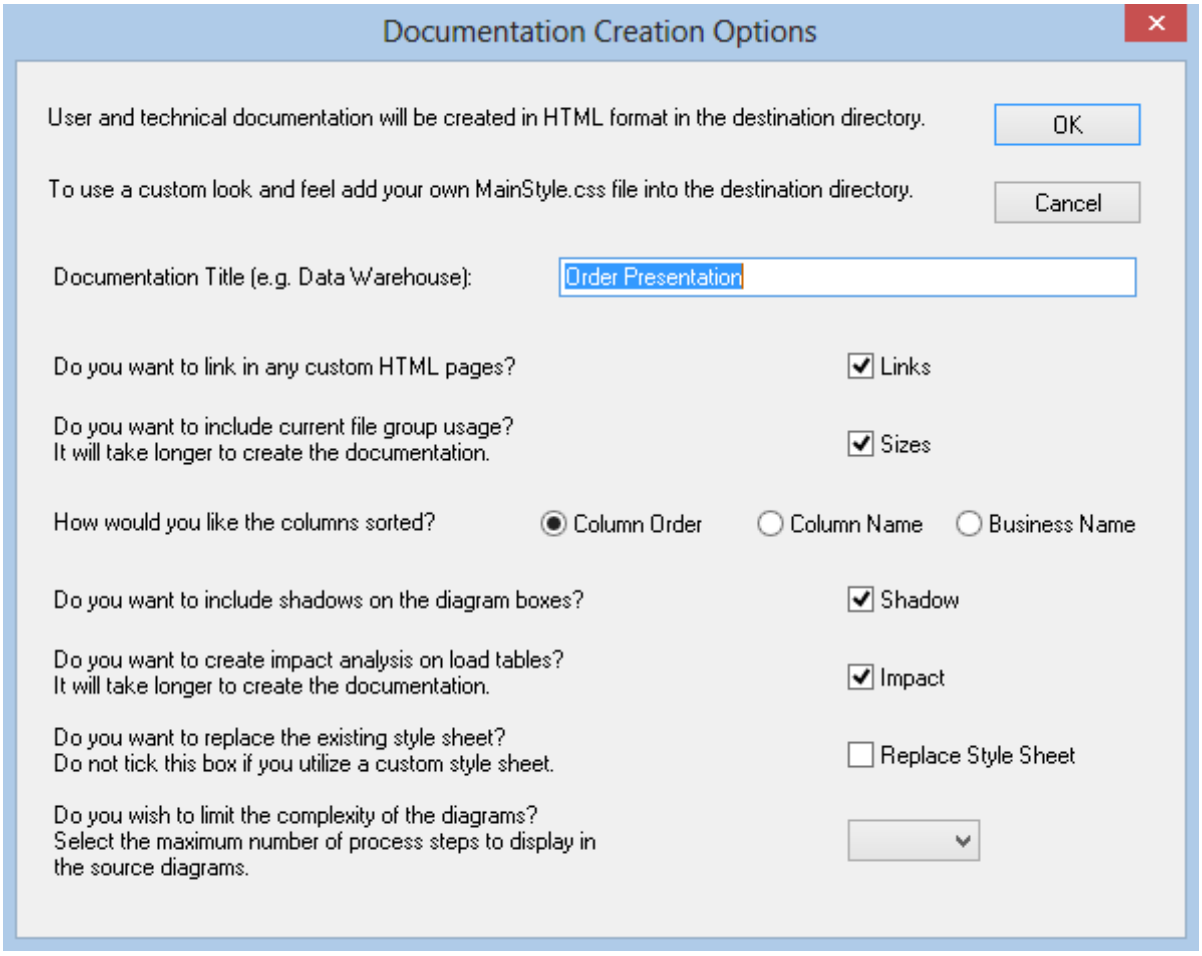
1 To view the documentation for the components of the data warehouse, select **Doc** from the menu, then **Create Documentation**.



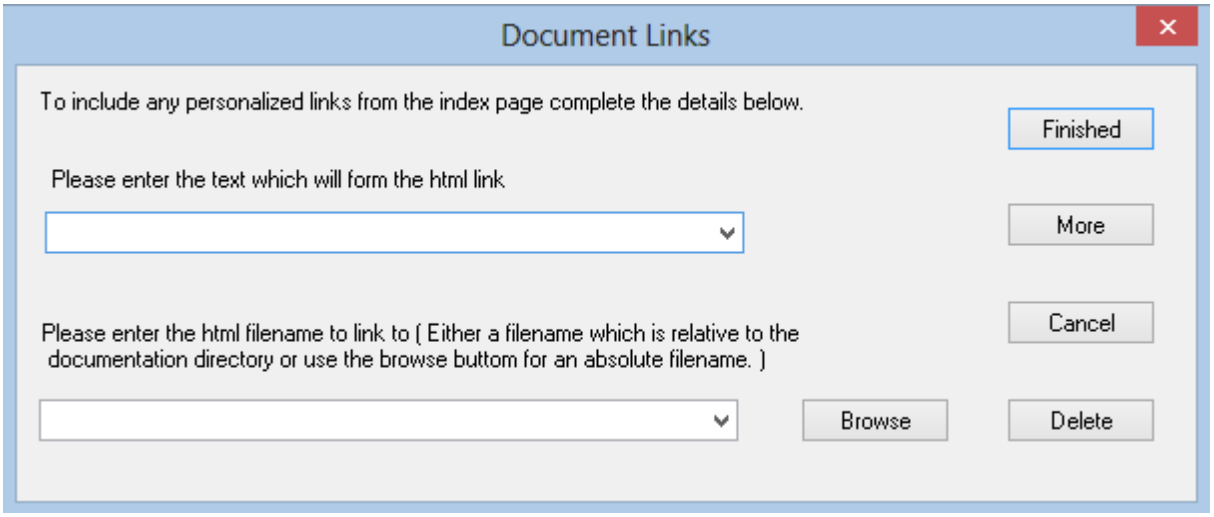
2 Select a file path (directory) under which to save the HTML files that will be produced.



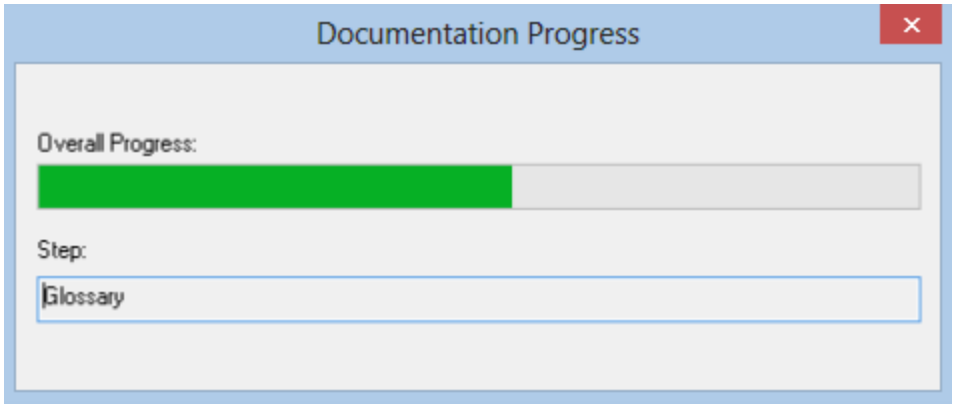
3 The next screen allows for the inclusion of a banner and user defined links. Leave these options unchecked and click **OK** to proceed.



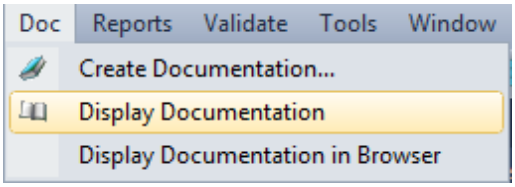
4 Include any personalized links if required and click **Finish**.



The documentation runs:



TIP: To view the documentation select Doc, Display Documentation:



You are now ready to proceed to the next step - ***Data Store Objects*** (see "***1.15 Data Store Objects (Optional)***" on page 60)

1.15 Data Store Objects (Optional)

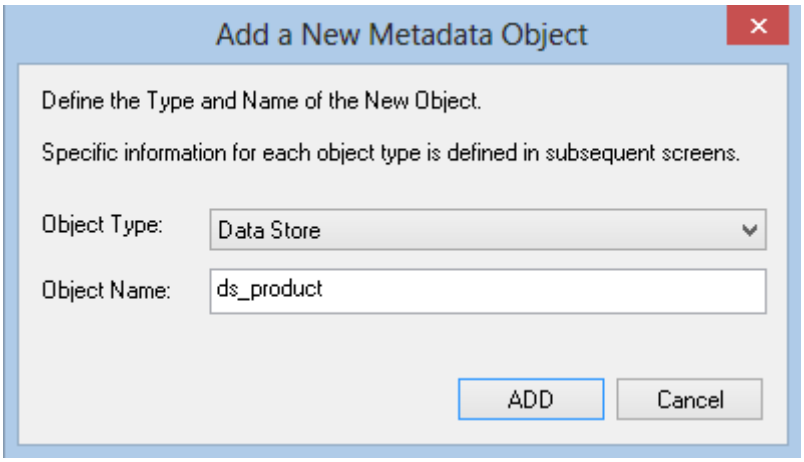
Data Store objects are used to provide a persistent storage of load tables. These objects are not licensed for every installation and hence this section is optional.

1 Browse the **Data Warehouse** in the right pane.

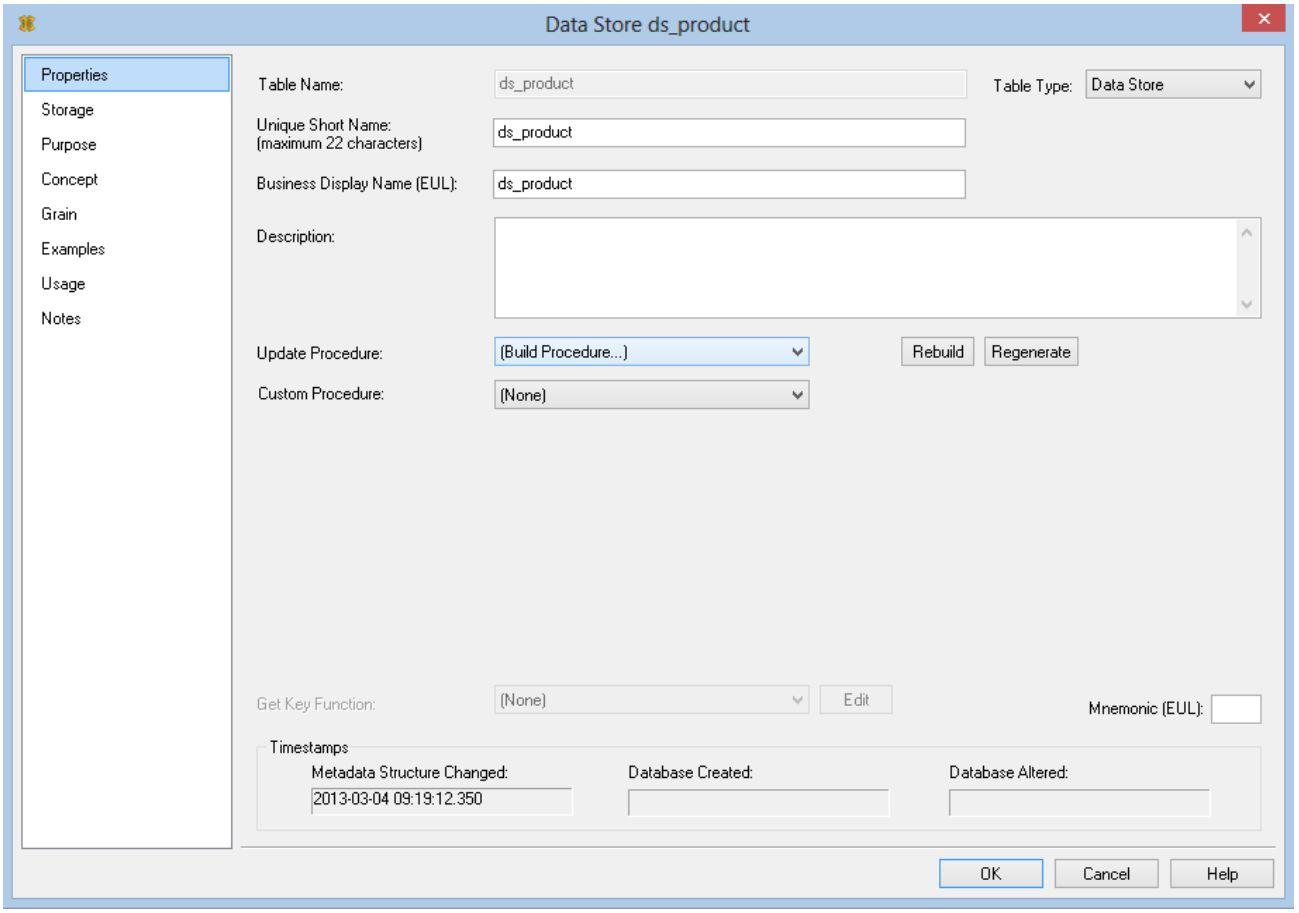
2 Double-click the **data store** object in the left pane.

3 Drag **load_product** from the right pane into the middle pane.

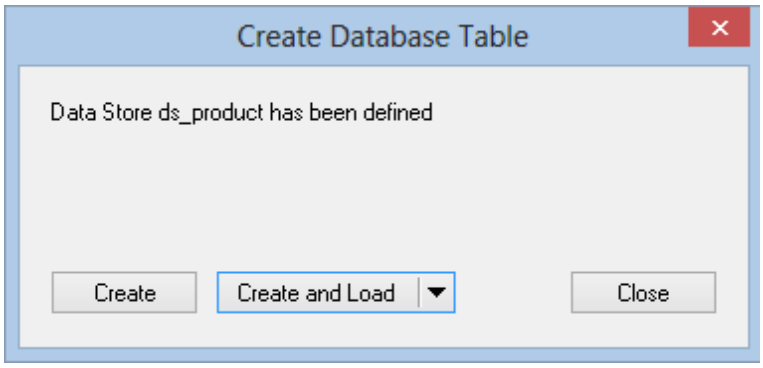
4 Accept the default name of **ds_product** and click **ADD**.



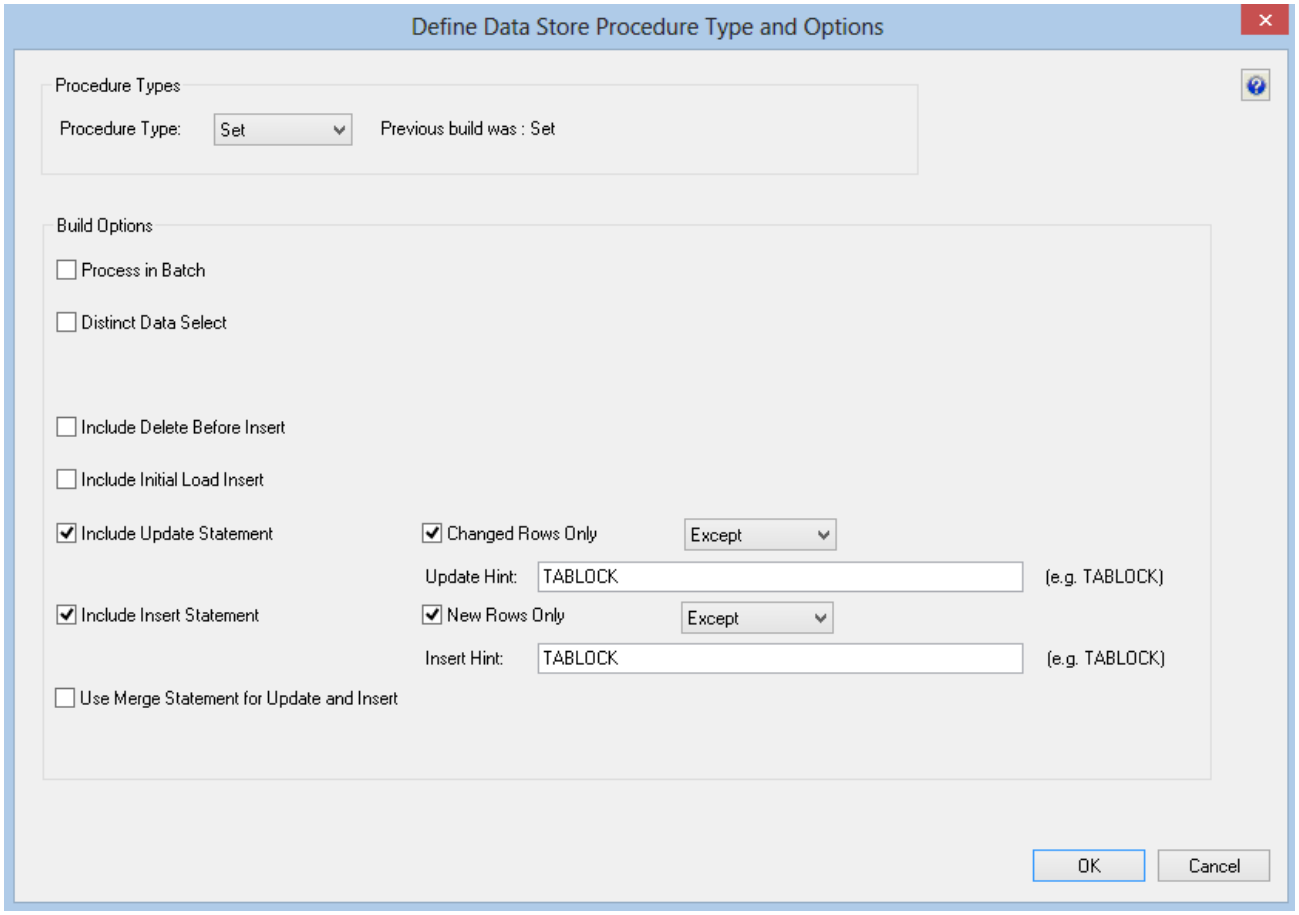
5 Select **(Build Procedure...)** from the Update Procedure drop-down list. Click **OK**.



6 Click **Create and Load**.

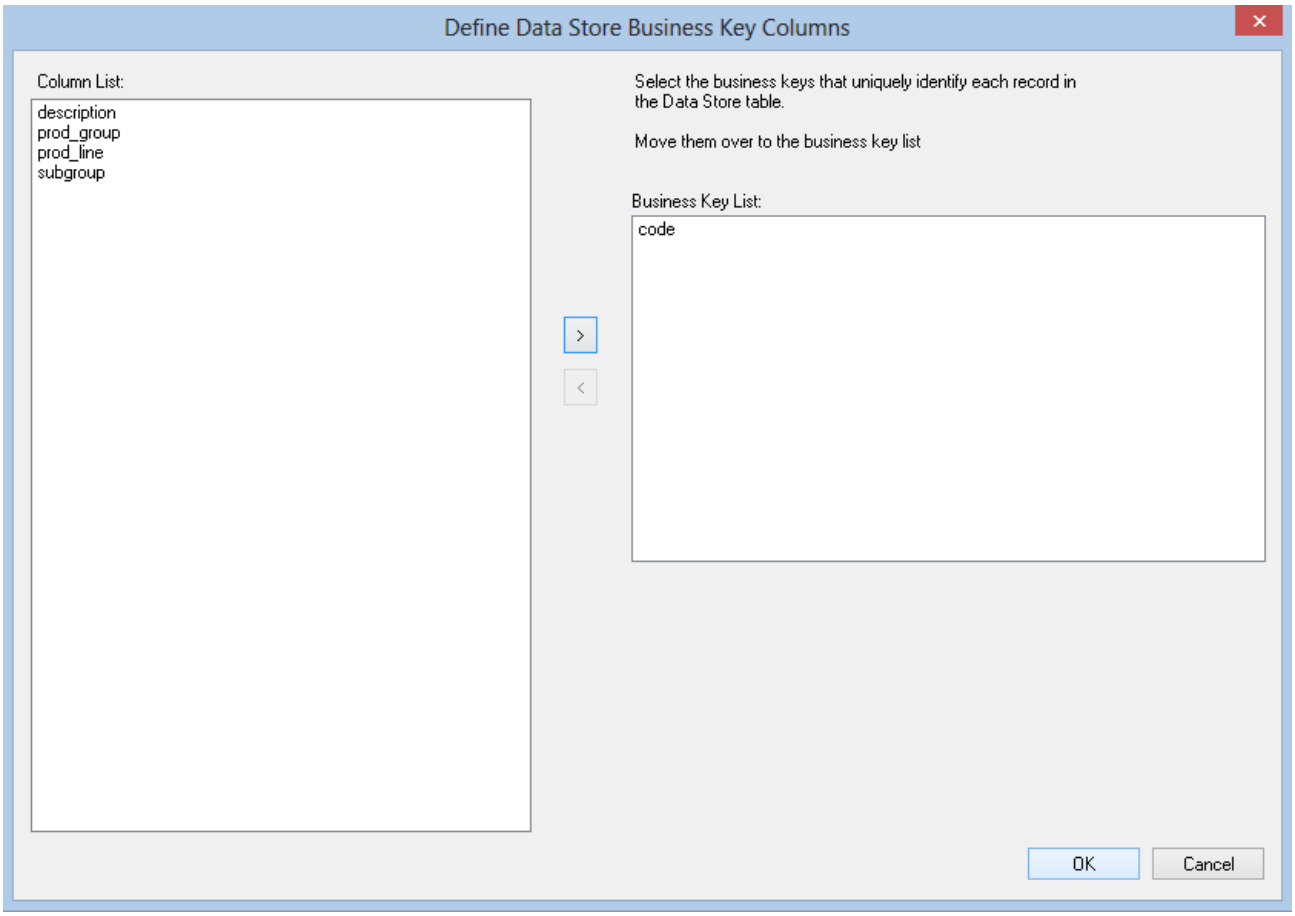


7 Select the options as shown below and click **OK**.

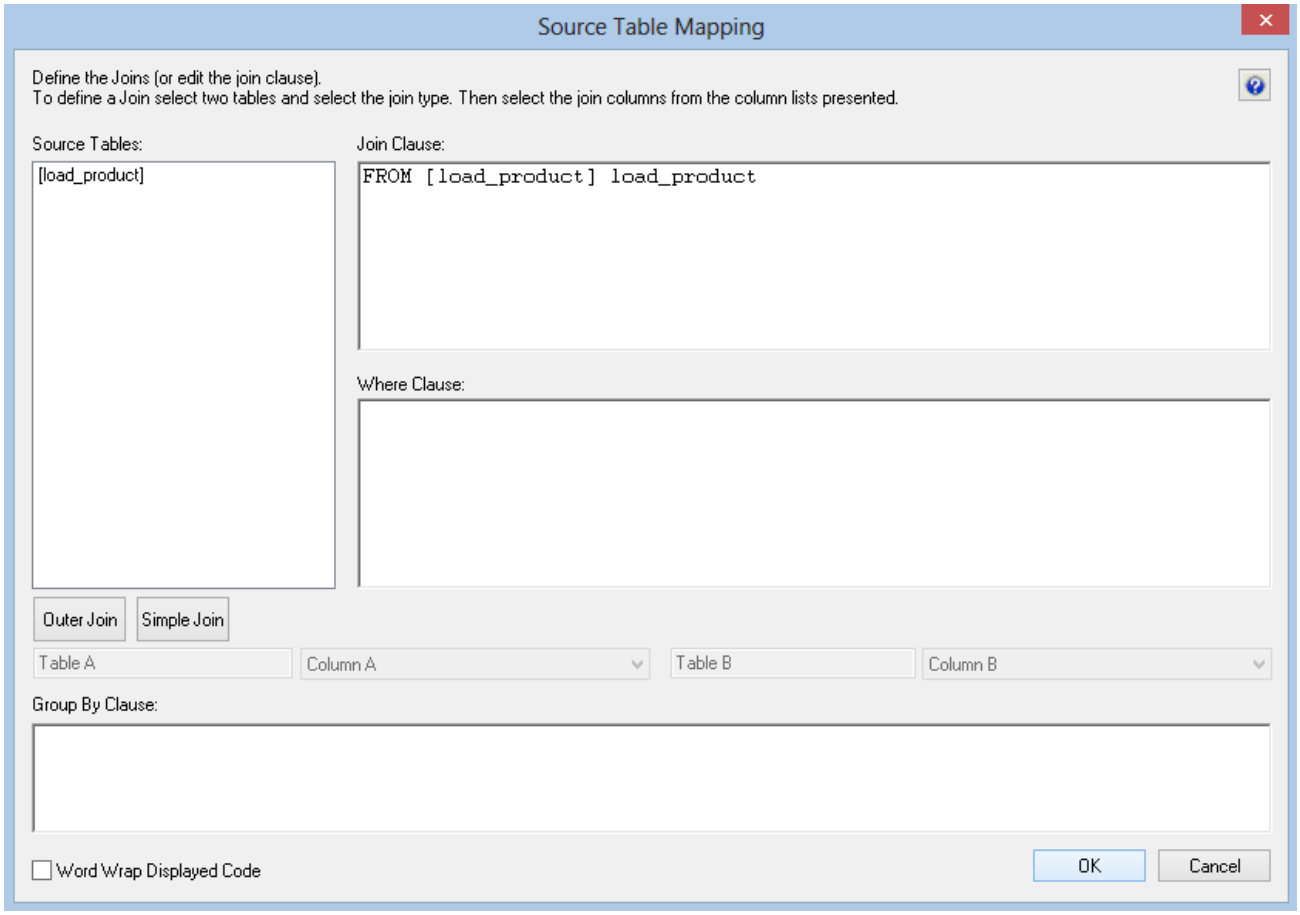


8 Click **OK** on the Parameters dialog.

9 Select **code** as the business key, select **>** and click **OK**.

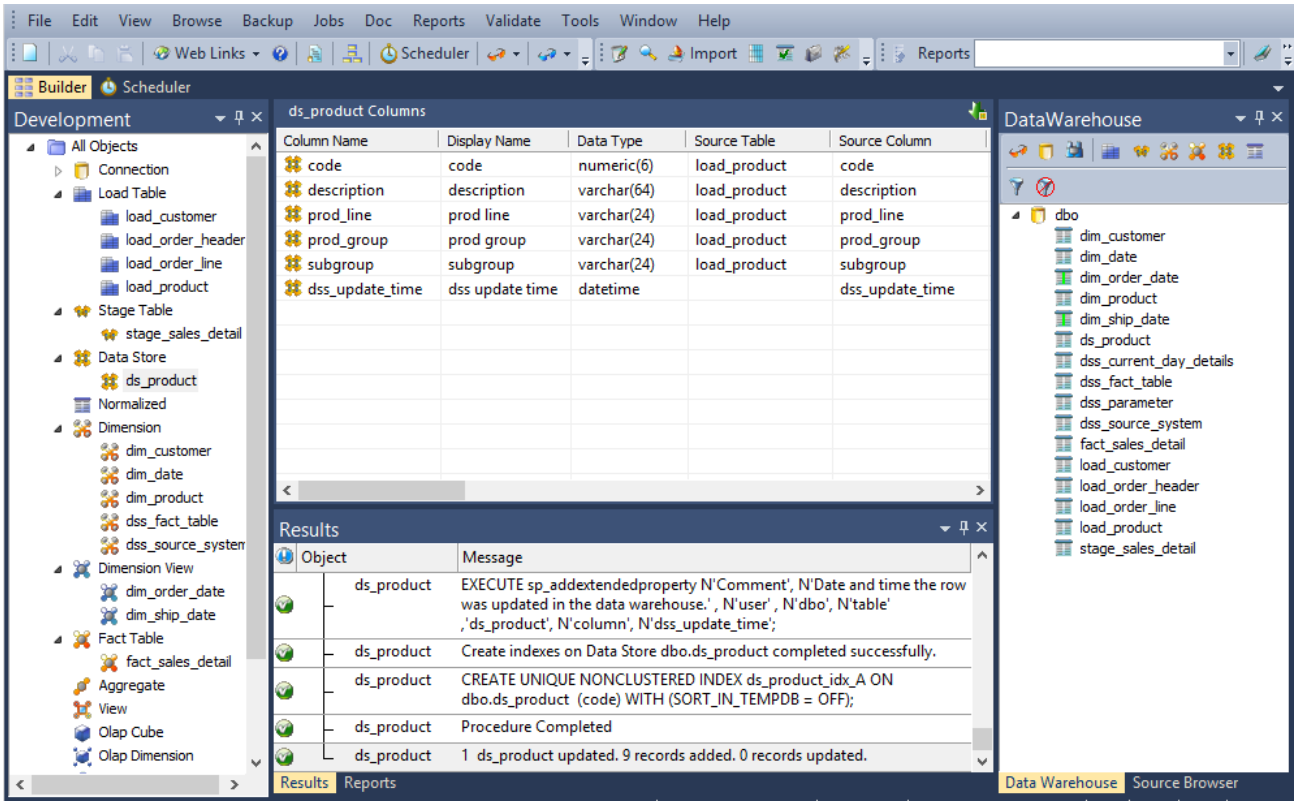


10 Click **OK** on the Source Table mapping screen.



11 Data should now be loaded into the ds_product table. Refresh the Data Warehouse in the right pane (F5).

Your screen should look something like this:



Repeat the exercise for **order_line**, **order_header** and **customer**.

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*** (see "***Basic Star Schema Fact Table***" on page 1)
- ☐ Successfully completed ***Creating a Fact Table*** (see "***1.12 Creating a Fact Table***" on page 49)

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 Tutorial

2.1 Purpose and Roadmap

Purpose

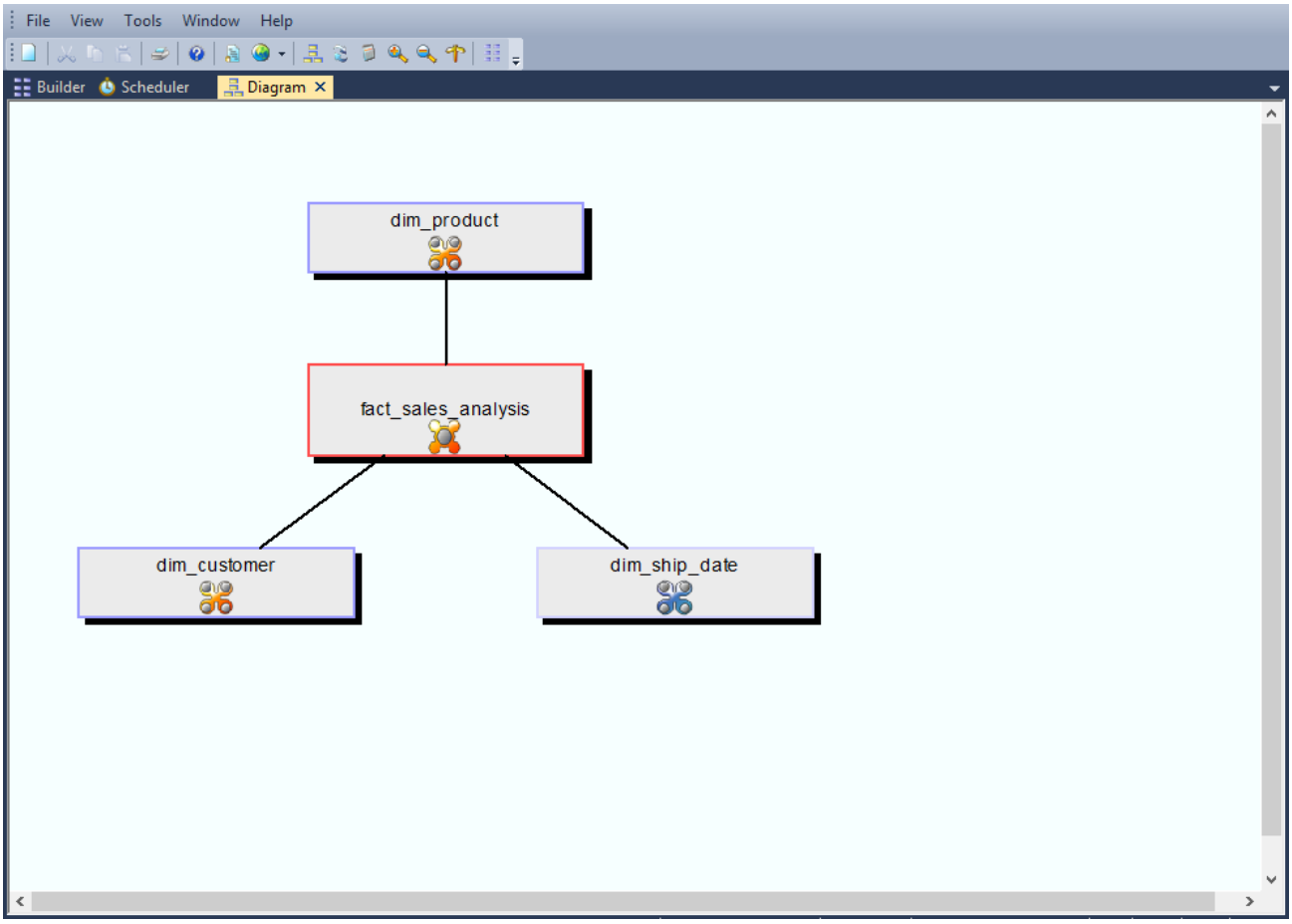
This tutorial will walk you through the process to:

- ☐ 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

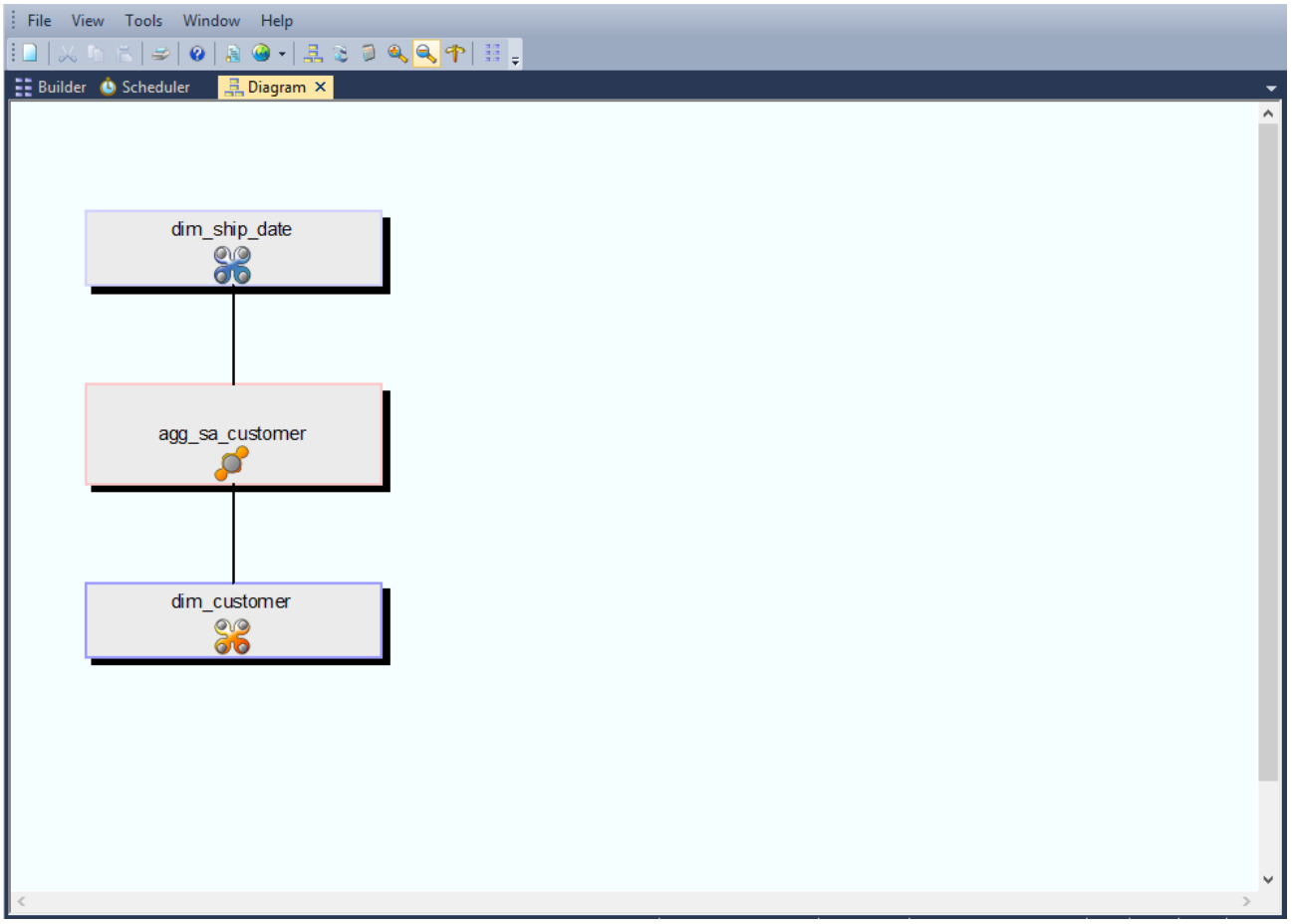
In short, this tutorial loads budget and forecast data from flat files into their own load, stage and fact tables. This data is then combined with data from the fact_sales_detail table (created in Tutorial 1) and summarized to create a new rollup fact table, fact_sales_analysis. Further summarization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



Aggregate **agg_sa_customer**:



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

Step in Tutorial	Section
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*** (see "***2.2 Making a Connection to Windows***" on page 69).

2.2 Making a Connection to Windows

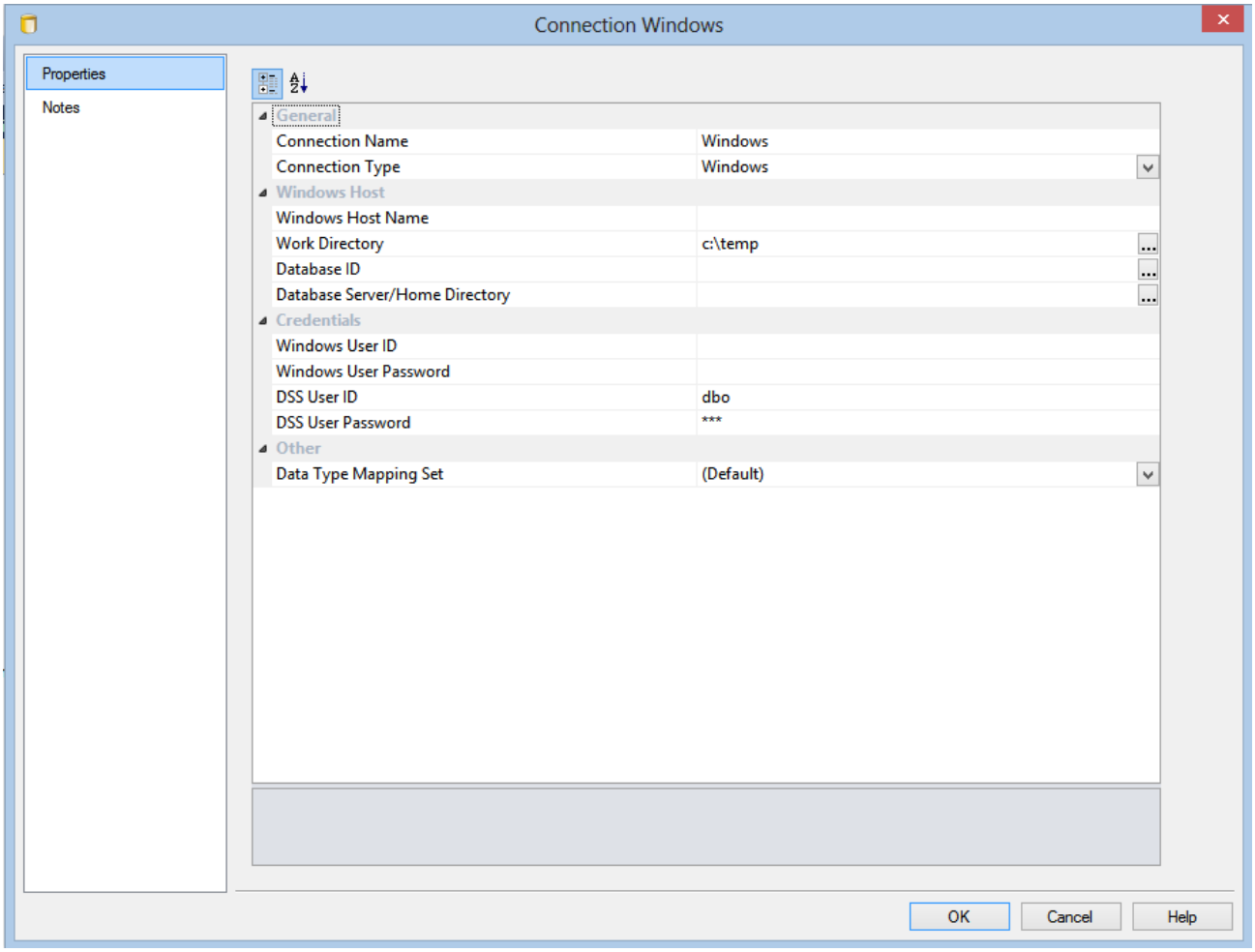
This follows a similar process to the earlier ***connections*** (see "***1.6 Creating a Connection***" on page 13) made, but differs in that the connection is within the PC.

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

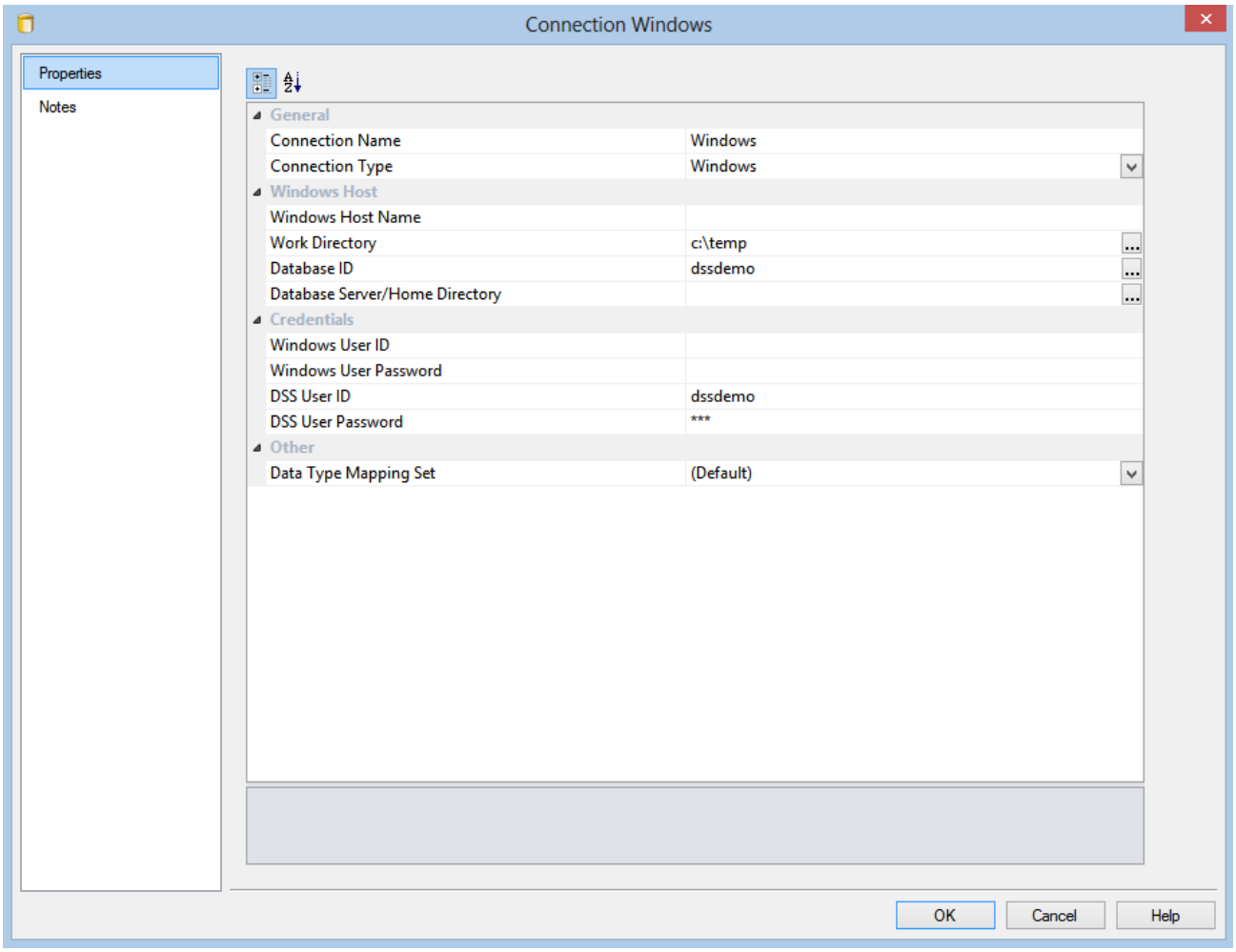
1. Log on to QAD Data Warehouse Designer.
2. In the left pane, double-click on the **Connection** object group.
3. Select **File | New**, or right-click the **Connection** object and select **New Object**.
4. Enter **Windows** in the 'Name of Object' text box and select **Add**.
5. Enter the Connection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

Field	Description
Connection Name	Windows
Connection Type	Windows
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 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 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.

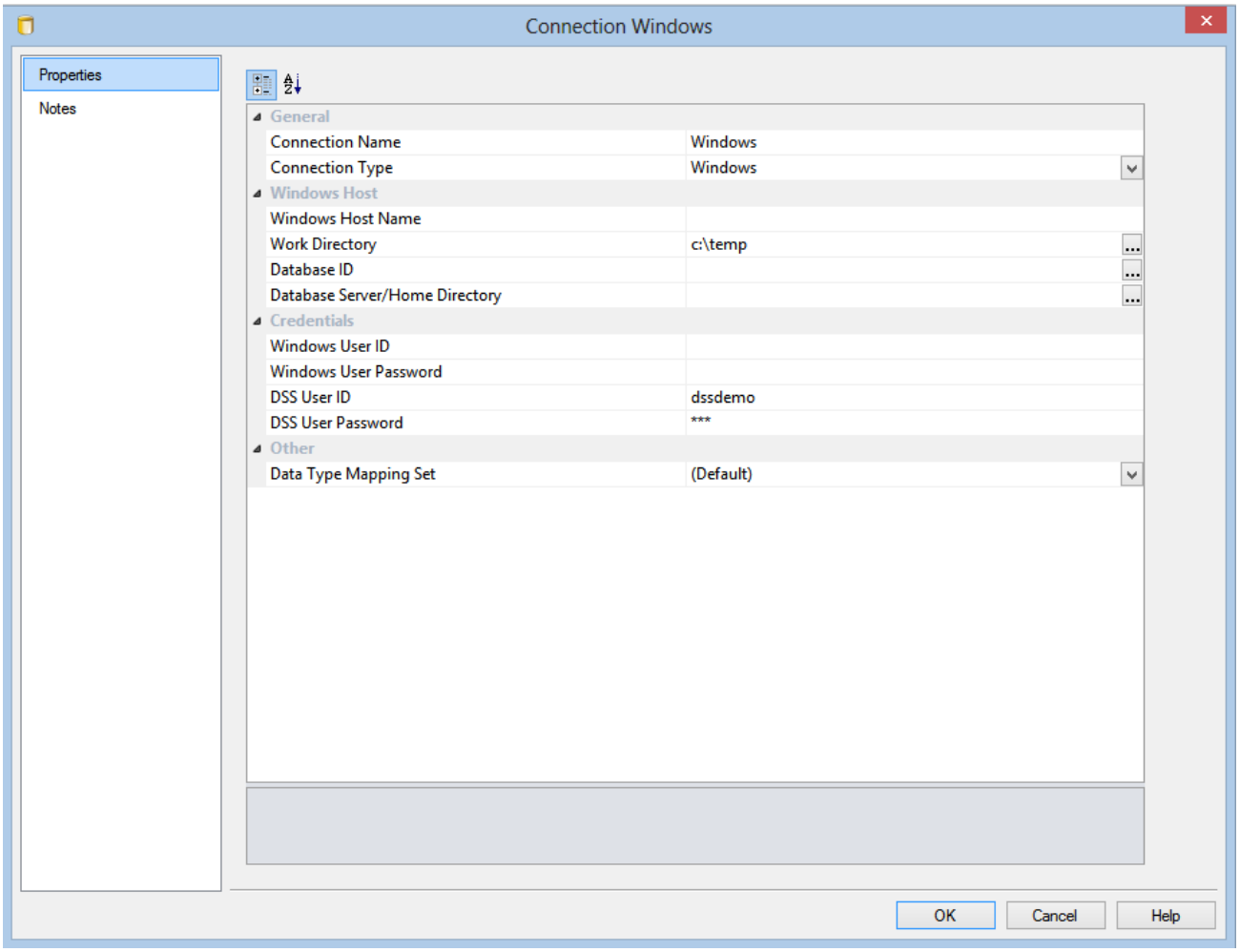
Sample SQL Server **Properties**



Sample Oracle **Properties:**



Sample DB2 **Properties:**



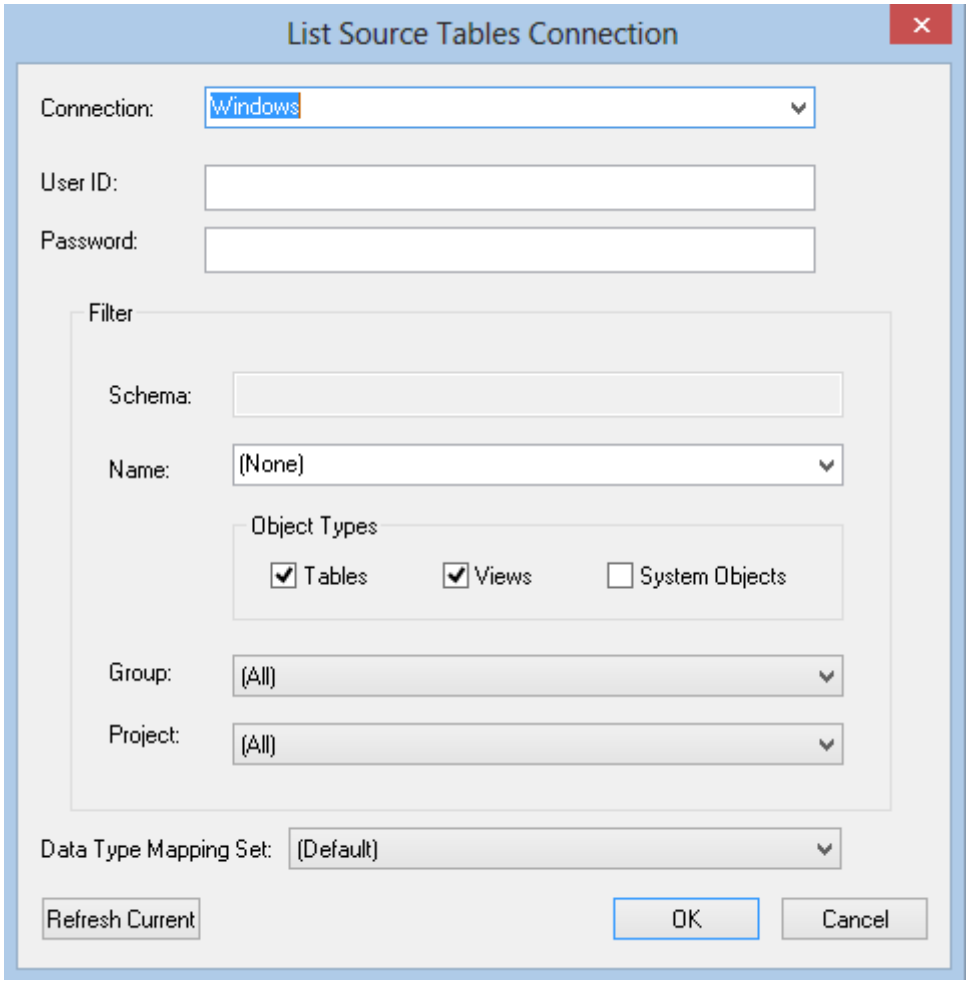
You are now ready to proceed to the next step - ***Loading Tables from Flat files*** (see "***2.3 Loading Tables from Flat Files***" on page 73)

2.3 Loading Tables from Flat Files

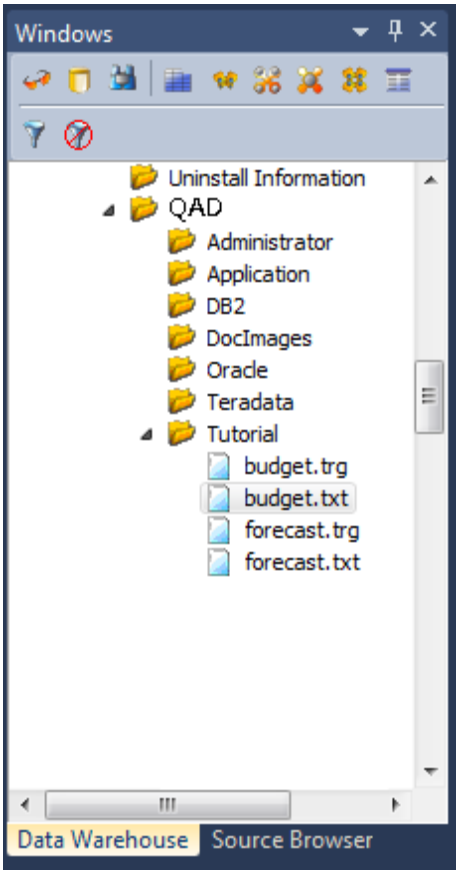
In this step you will parse and load a file from Windows into a load table in the data warehouse.

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.

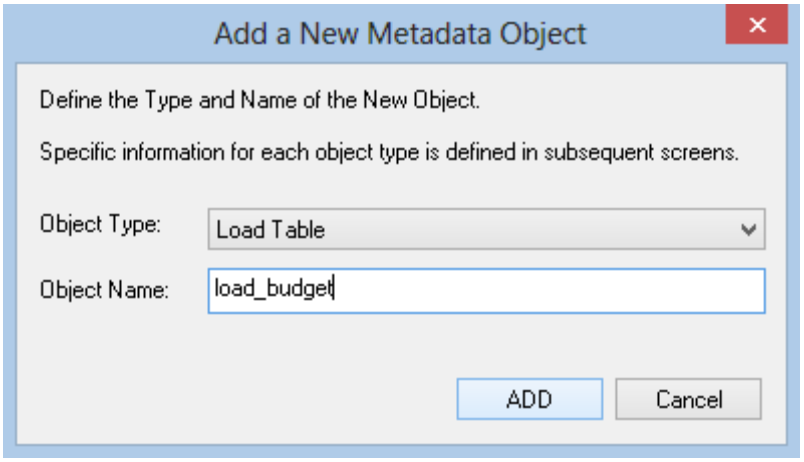
2 Browse to the Windows connection in the right pane by selecting **Browse | Source Tables** from the menu strip at the top of the screen. Select **Windows** as the Connection. Leave the Schema field blank. Click **OK**.



3 Navigate to **c:\Program Files\QAD\Tutorial** folder, click on **budget.txt** and drag it into the middle pane.



4 Rename the object **load_budget** (i.e. remove the _txt suffix) and click **ADD**.



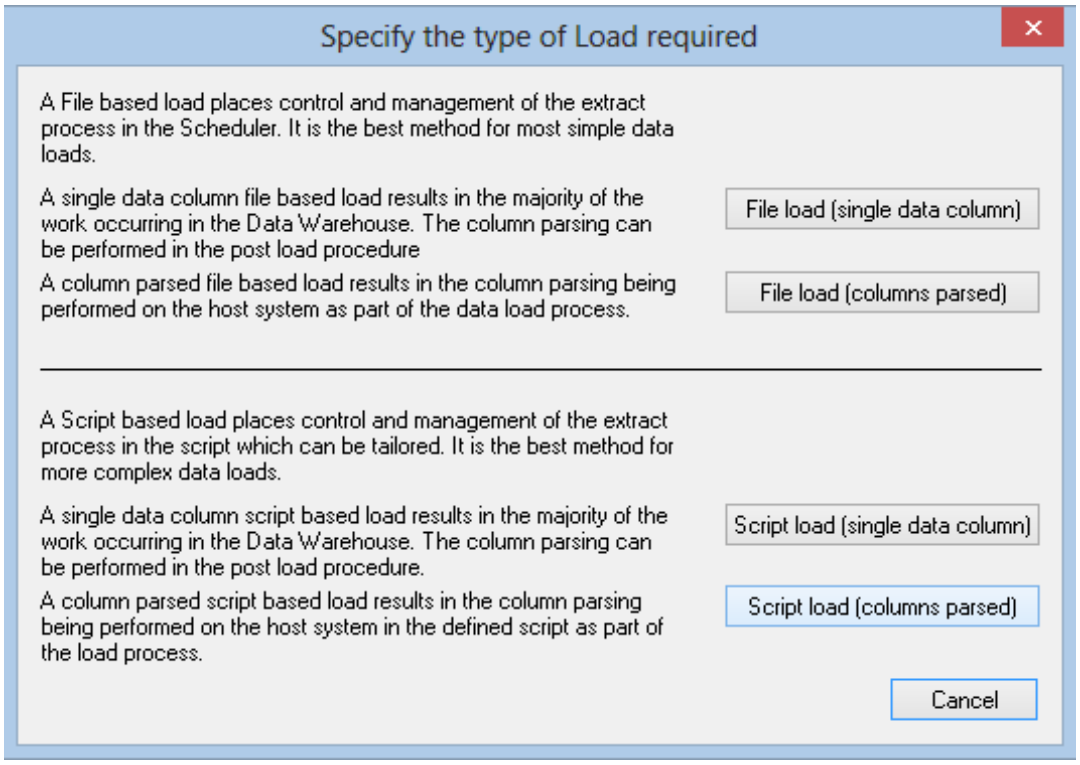
Specifying the load type

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)

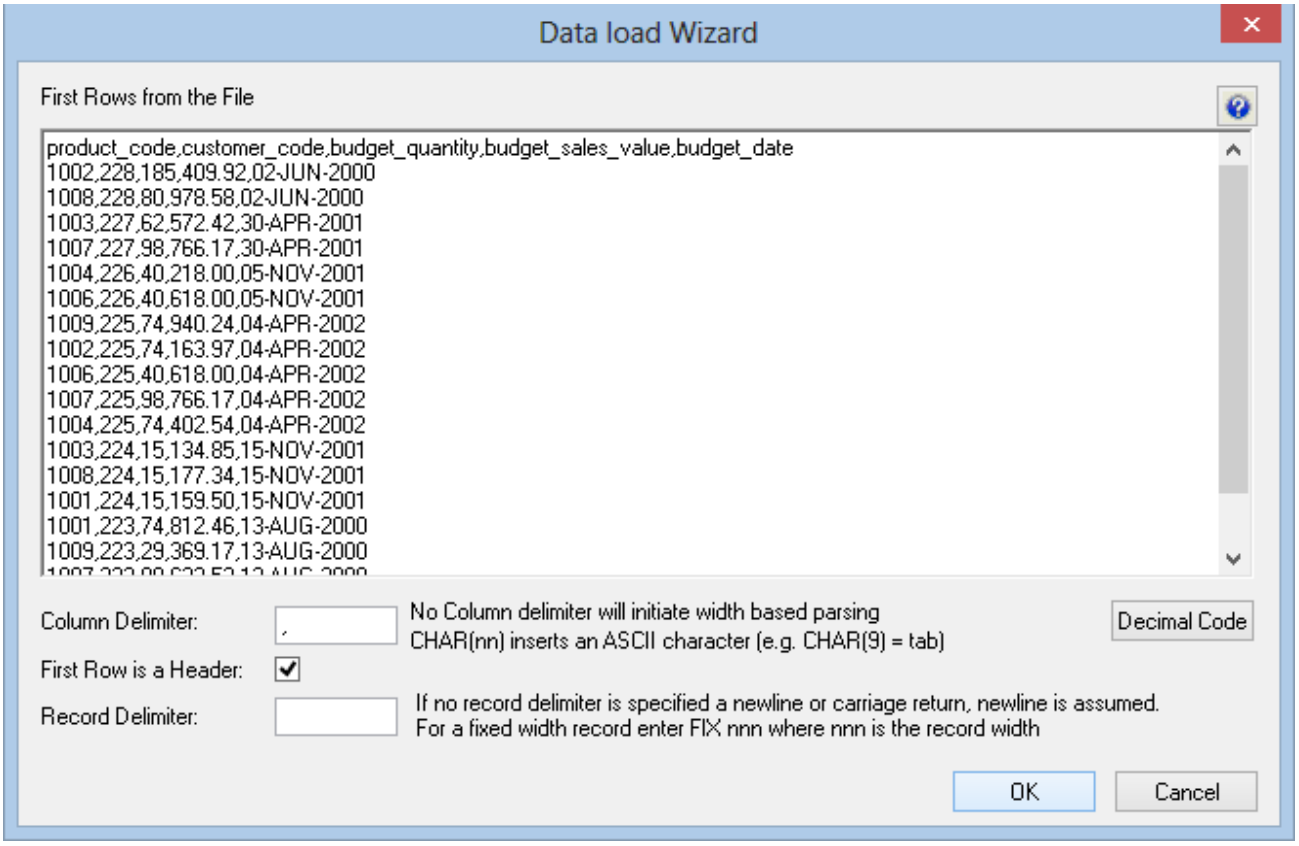
For more information on load types see the section on flat file loads in the loading data chapter.

1 For this tutorial select **Script load (columns parsed).**

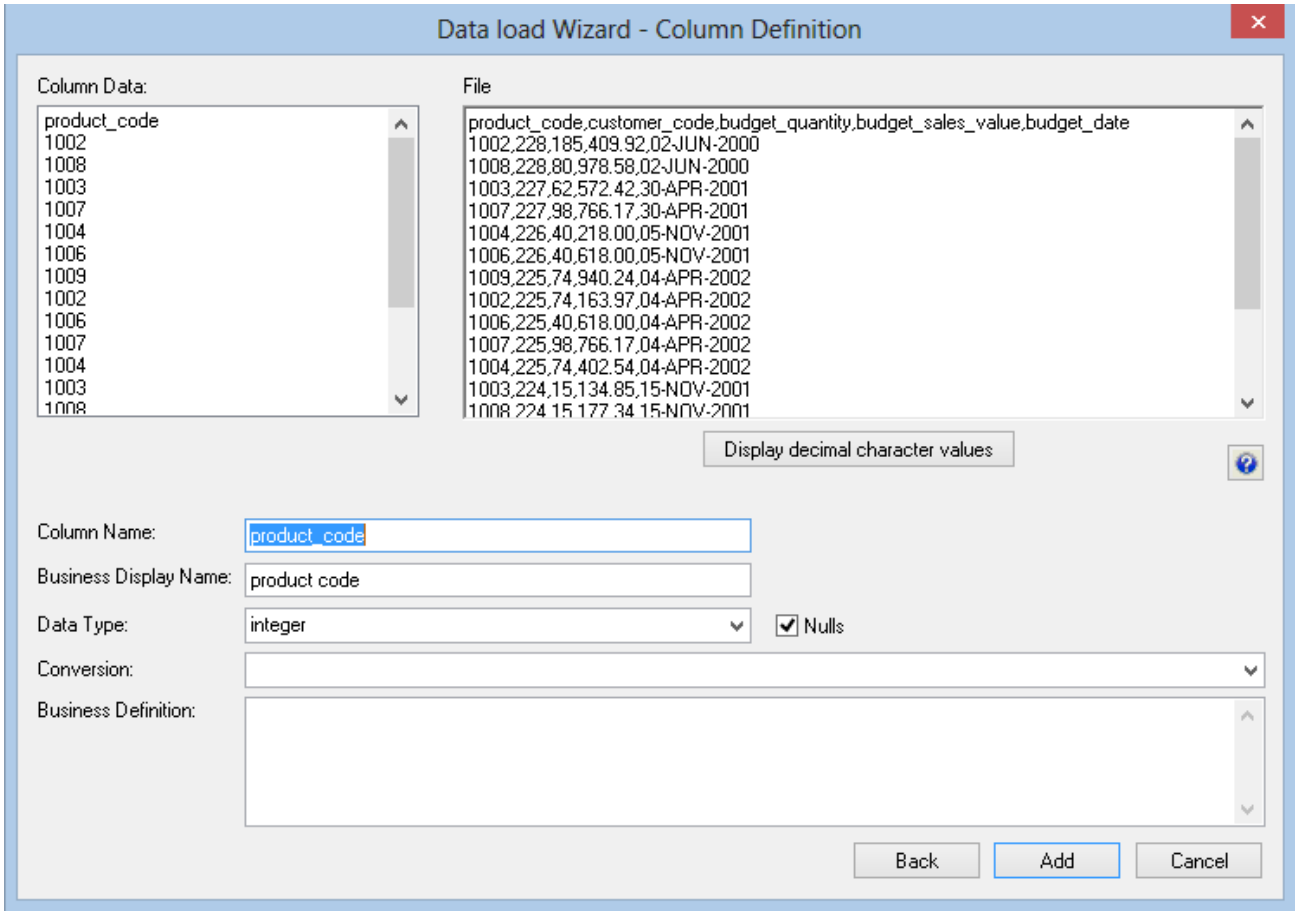


Note: For DB2, file loads are not available in this dialog.

2 From the data load wizard enter a comma (**,**) in the Column Delimiter field. As the first row is a header, place a **check** in the box and click **OK.**



3 QAD Data Warehouse Designer uses the header row as suggested column names. For each column confirm the **name** and **data type**. You may have to change it to a more appropriate value. Click **Add**.



4 Click **OK** on the load_budget **Properties** dialog.

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

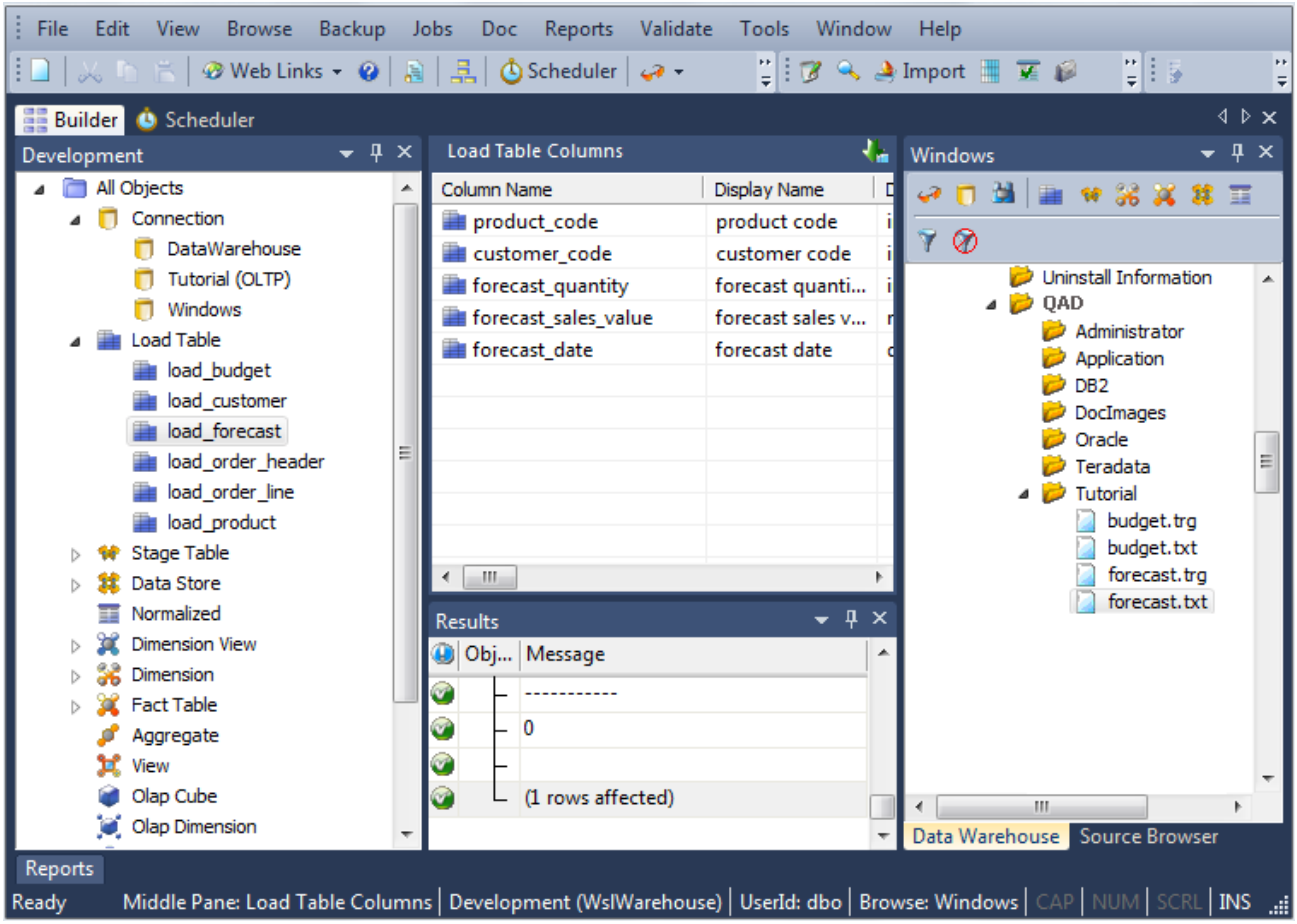
6 Click **OK** for the **New script created** dialog.

7 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.

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

Your screen should look something like this:



You are now ready to proceed to the next step - ***Creating Stage Tables*** (see "***2.4 Creating Stage Tables***" on page 79).

2.4 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*** (see "***1.10 Defining the Staging Table***" on page 36).

1. Double-click the **stage table** object group in the left 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 pane to the middle pane and drop.
4. Click **ADD** to add the stage table called stage_budget.
5. Click **OK** on the Properties dialog.
6. Now bring in the following keys from the right pane into the new table. Click the stage table name in the left pane to list the stage table columns in the middle pane; this also makes the middle pane a drop target for new columns:

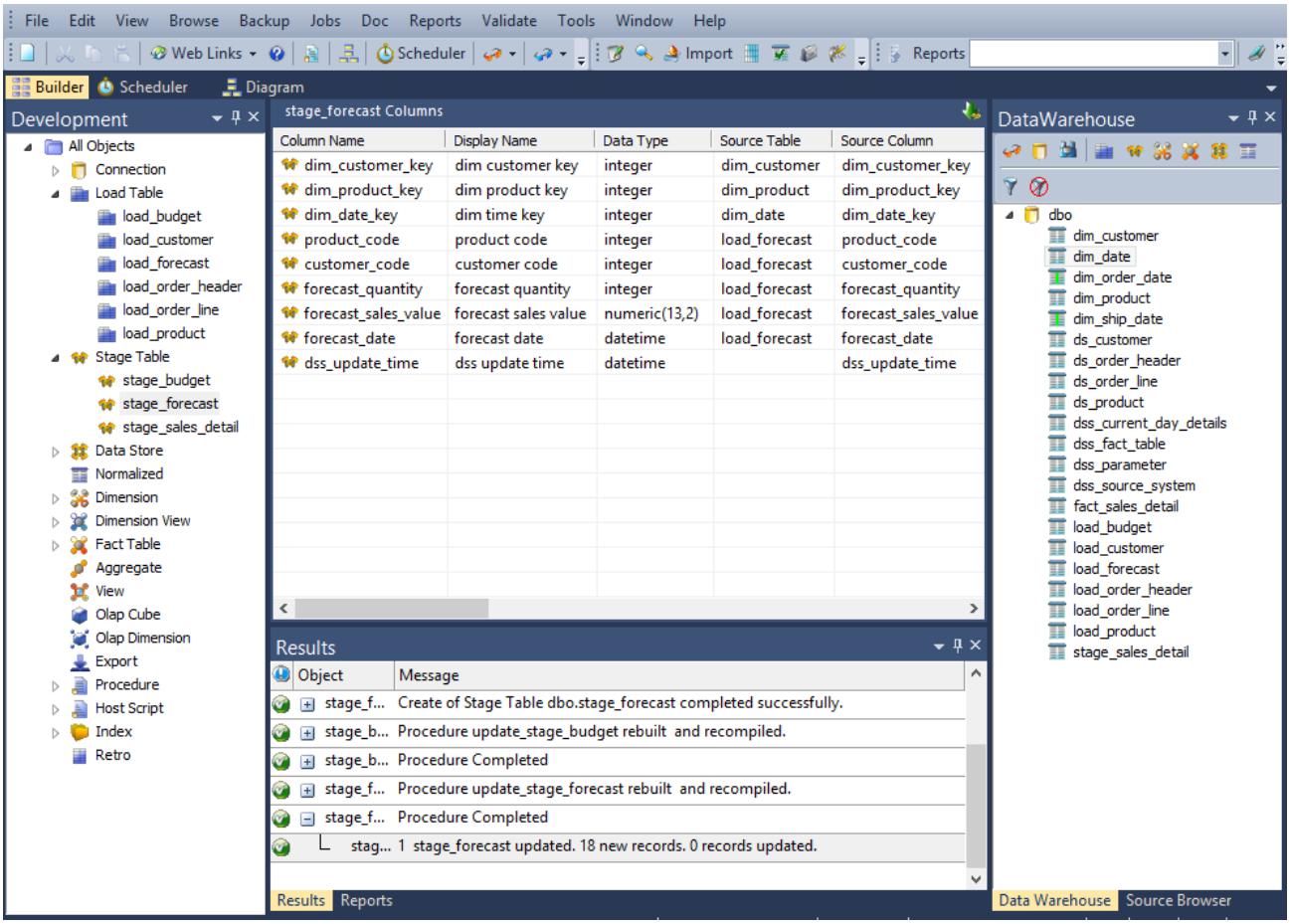
   - dim_customer_key

   - dim_product_key

   - dim_date_key
7. Now in the left pane, right-click on **stage_budget** and select **Create (ReCreate)**.
8. In the left pane, right-click on **stage_budget** and select **Properties**. In the Update Procedure field select **(Build Procedure...)**. Click **OK.**
9. Select **Cursor** as the update procedure type.
10. Click **OK** on the Parameters dialog.
11. 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.
12. 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 **>** then **OK** for each one.
13. Now define the business keys. Add **customer_code**, **product_code**, and **budget/forecast_date** to the business key list, and click **OK**.
14. Right-click on the stage table in the left pane, and select **Execute Update Procedure**.
15. Repeat steps (1) to (14) to create stage table **stage_forecast** from **load_forecast**.
16. Refresh the Data Warehouse in the right pane (F5).

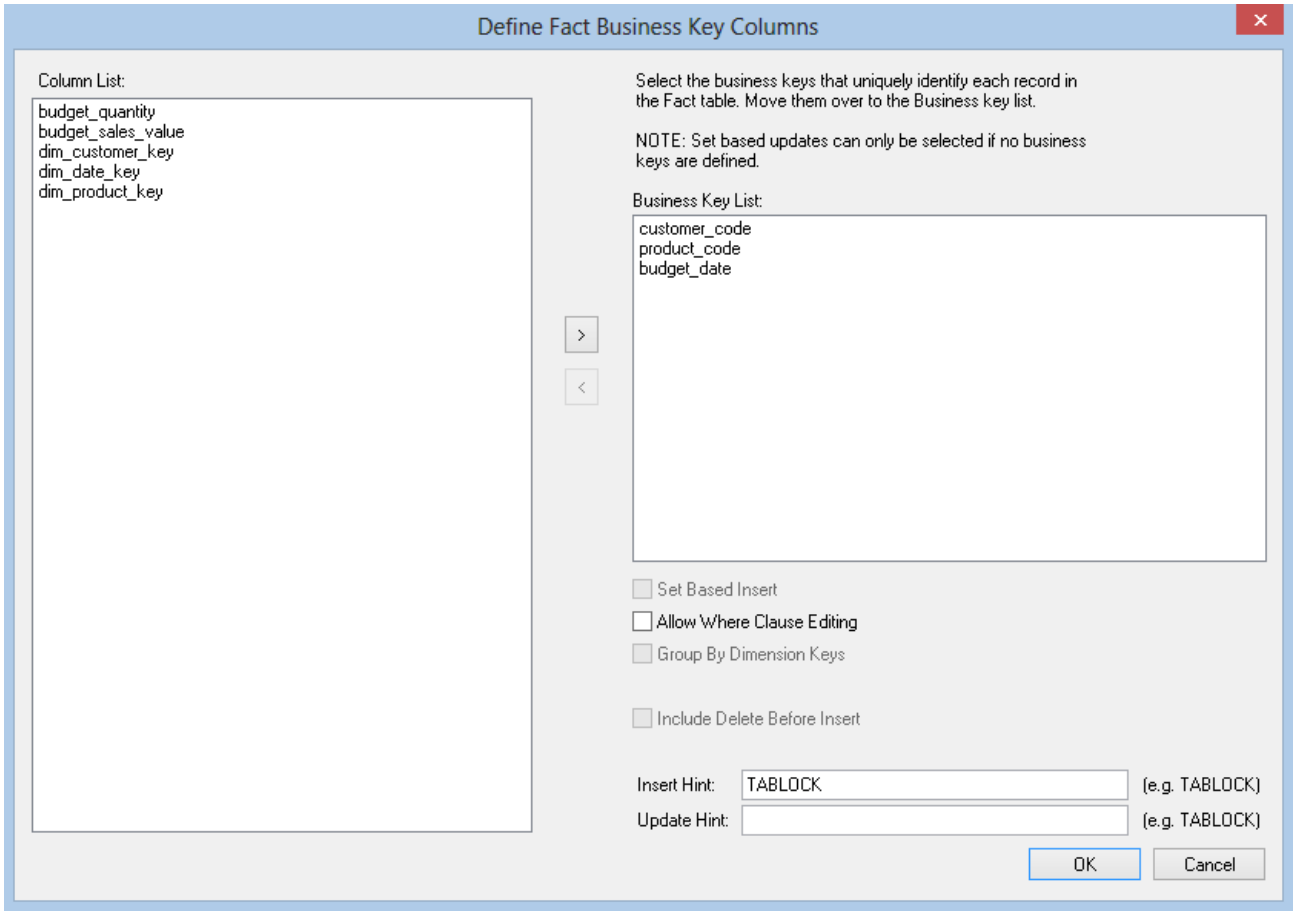
Your screen should look something like this:



You are now ready to proceed to the next step - ***Creating Fact Tables*** (see "***2.5 Creating Fact Tables***" on page 81) for these two new stage tables.

2.5 Creating Fact Tables

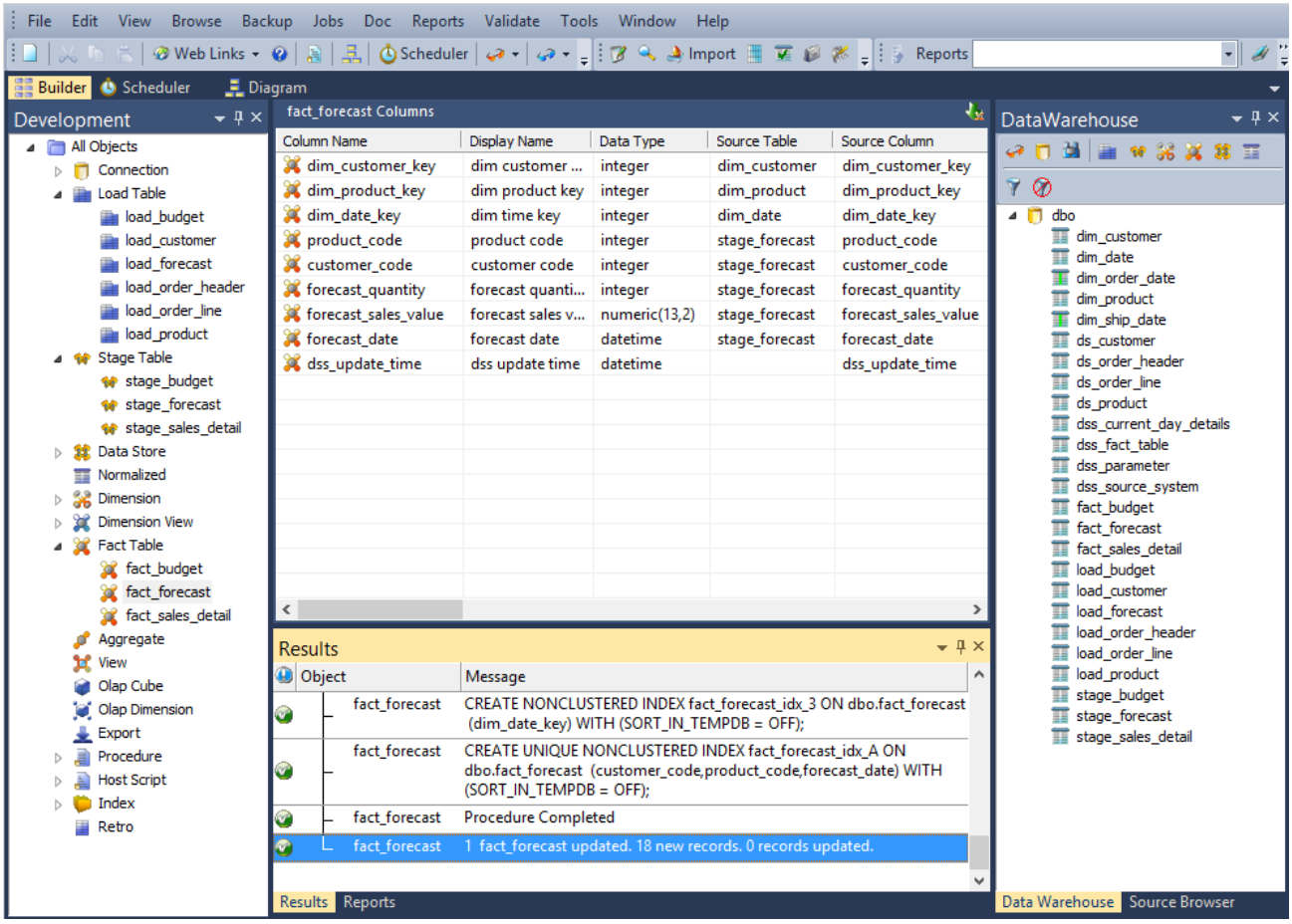
1. Double-click on the **Fact Table object group** in the left pane.
2. Click and drag **stage_budget** into the middle pane. Accept the name **fact_budget** and click **ADD**.
3. Select **(Build Procedure...)** from the update procedure drop-down list and click **OK**.
4. Click **Create and Load** when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



6. Repeat steps (1) to (5) on **stage_forecast** to create **fact_forecast** (with a business key of **customer_code**, **product_code**, and **forecast_date**).

7. Refresh the Data Warehouse in the right pane (F5).

Your screen should look something like this:



You are now ready to proceed to the next step - ***Rollup/Snapshot Fact Table*** (see "***2.6 Rollup/Combined Fact Table***" on page 83)

2.6 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 Double-click on the **Fact Table object group** in the left 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 **Close** 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 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).

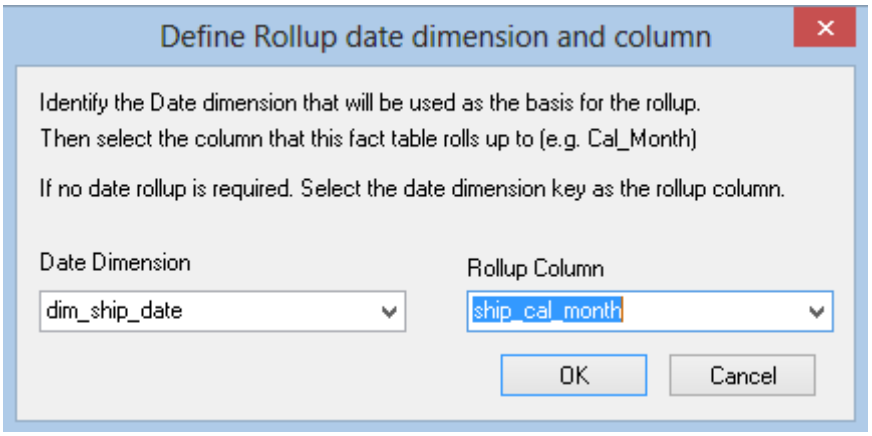
5 In the right pane open fact_forecast and drag **forecast_quantity** and **forecast_sales_value** into the middle pane (within fact_sales_analysis).

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

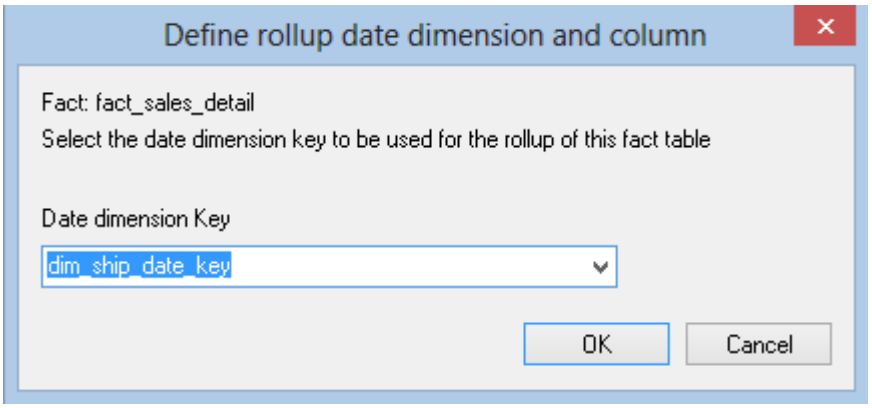
7 In the left pane, again right-click on **fact_sales_analysis** and select **Properties**. In the Update Procedure field select **(Build Procedure...)** and then click **OK**.

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.**

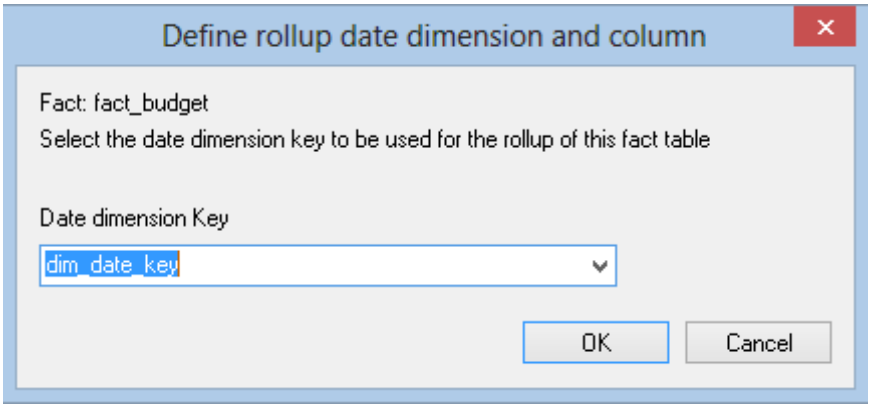
- Date dimension - **dim_ship_date**
- Rollup column - **ship_cal_month:**



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



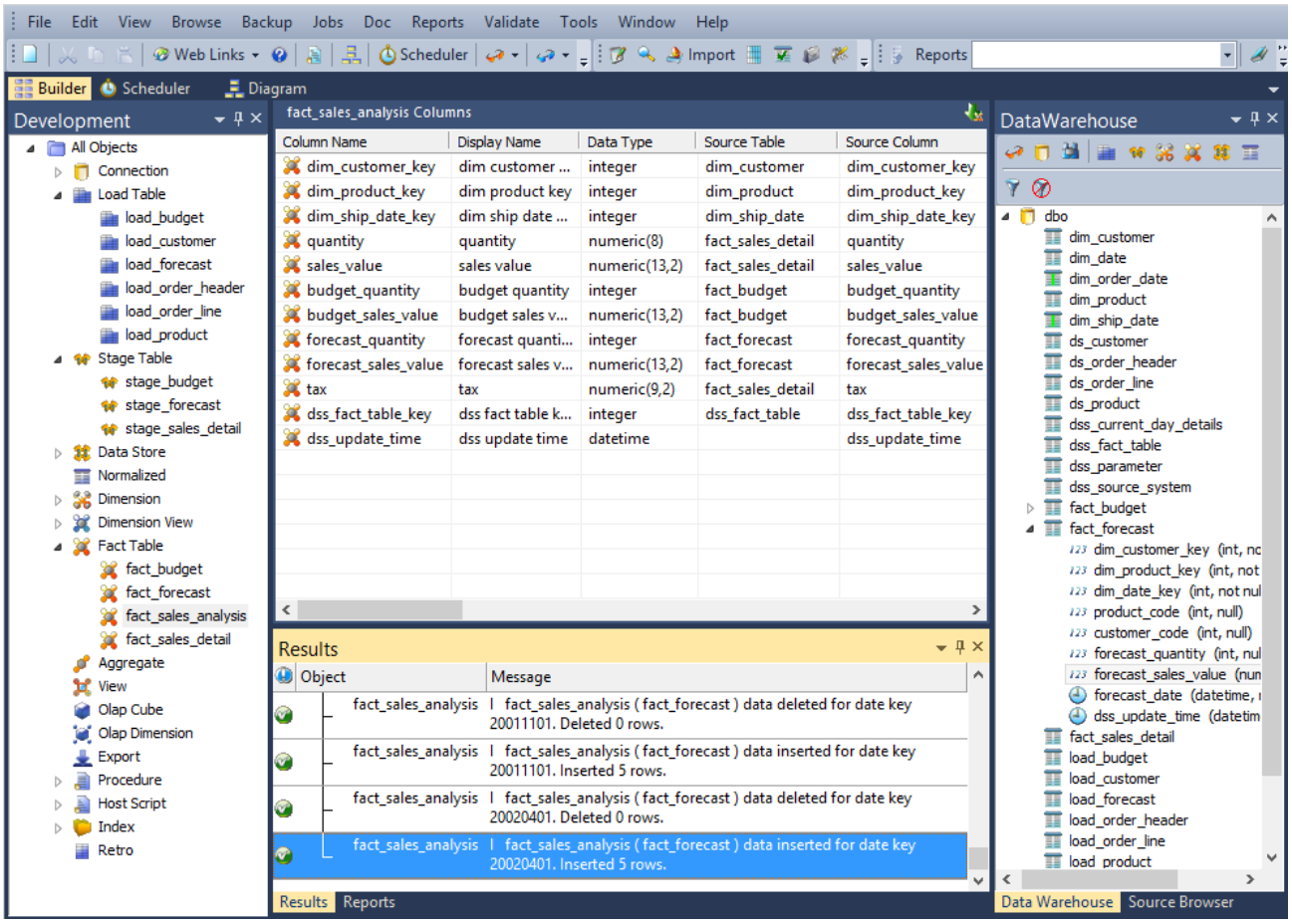
For fact_budget choose **dim_date_key** and click **OK**:



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 right-clicking on **fact_sales_analysis** and choosing **Execute Update Procedure**.

Your screen should look something like this:



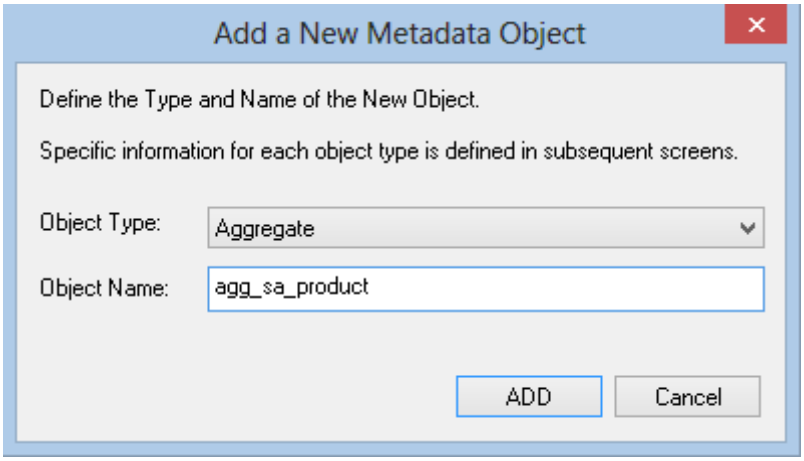
You are now ready to proceed to the next step - ***Aggregate Tables*** (see "***2.7 Aggregate Tables***" on page 86)

2.7 Aggregate Tables

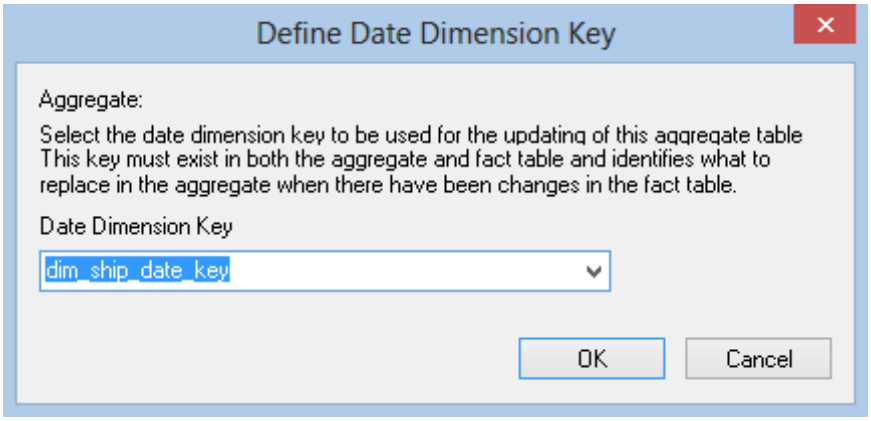
Aggregate tables are used to improve performance. They provide a subset of the main fact table which the end user tools can navigate for a faster query time. An aggregate is typically created by the deletion of items that don't make sense when summarized and by deleting one or more of the dimension keys.

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**. Click **ADD**.



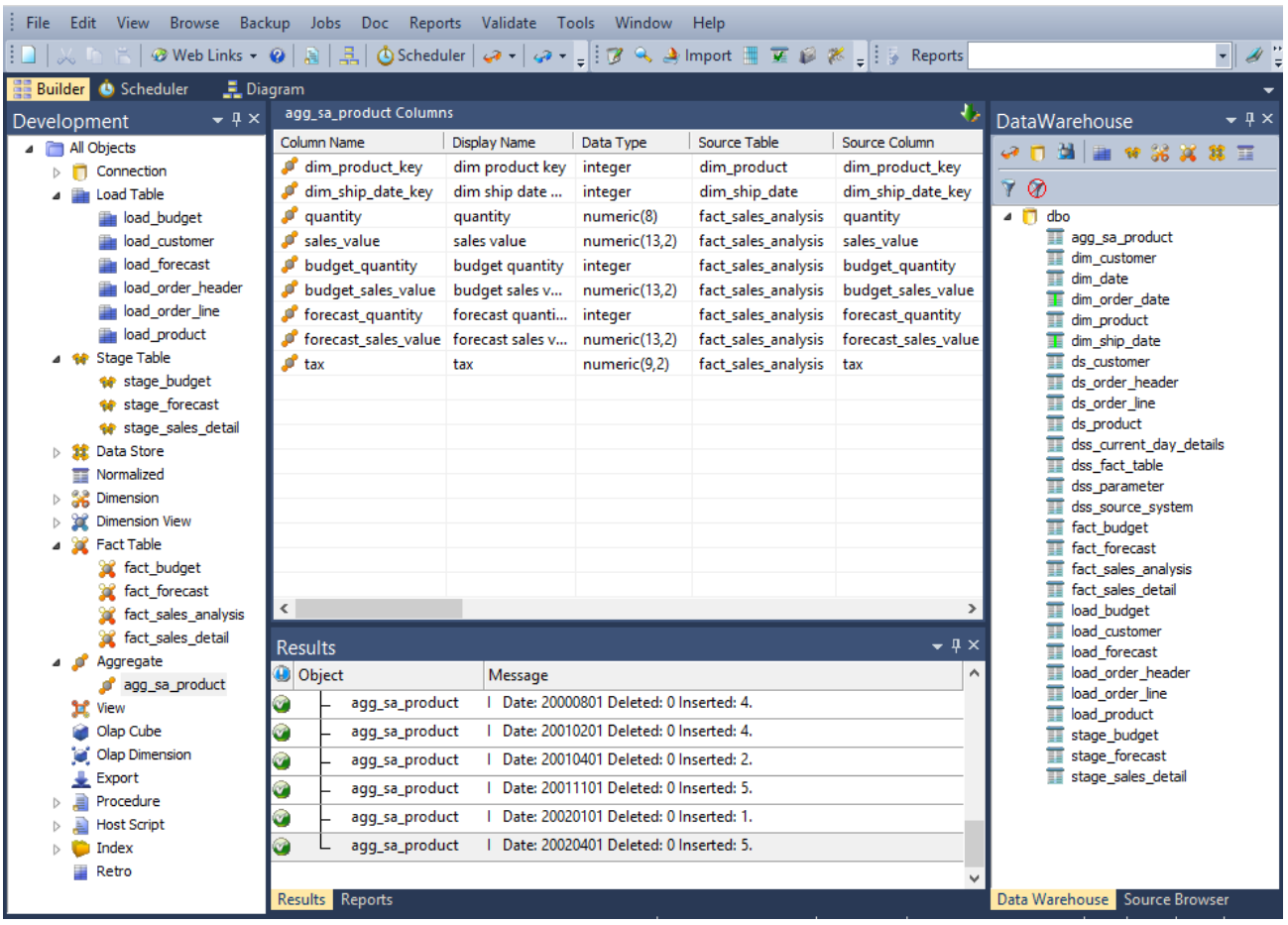
3. Click **OK** on the **Properties** dialog.
4. Click **Close** on the **Create Database Table** dialog.
5. Delete **dss_fact_table_key** so that data can be summarized from various source fact tables. Also delete **dim_customer_key** and **dss_update_time**.
6. Create the aggregate table.
7. In the left pane right-click **agg_sa_product** and select **Properties**. Select **(Build Procedure...)** in the Update Procedure field and click **OK** on the Properties screen.
8. Select **dim_ship_date_key** as the date dimension key and click **OK**.



9. Update the table.

10 Refresh the Data Warehouse in the right pane (F5).

Your screen should look something like this:



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.

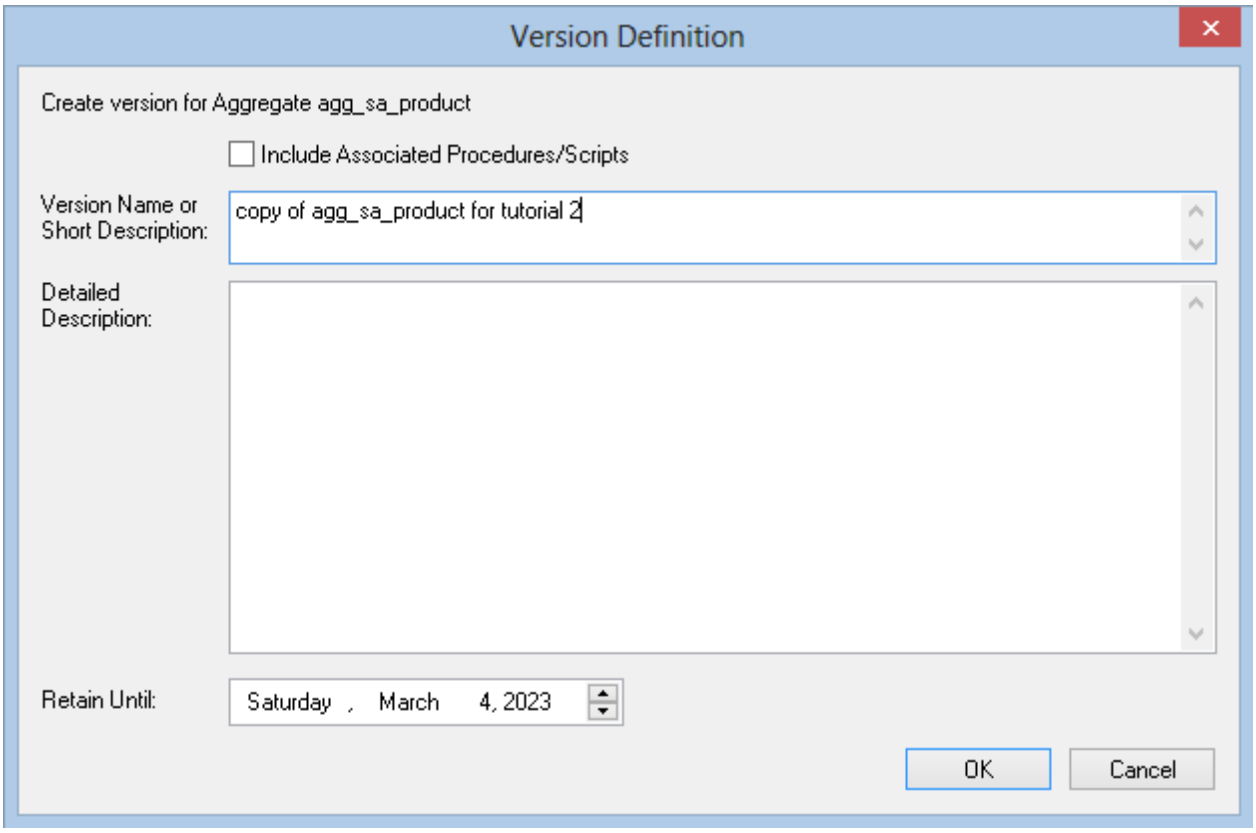
You are now ready to proceed to the next step - ***Creating a Customer Aggregate*** (see "***2.8 Creating a Customer Aggregate***" on page 88)

2.8 Creating a Customer Aggregate

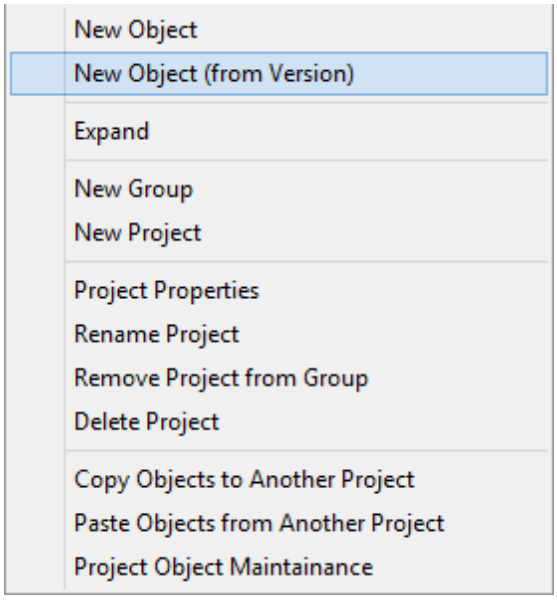
This aggregate uses an alternative process to that described in **Aggregate Tables**. For this process we will create a version of the product aggregate table's metadata and create a new aggregate from this version.

1 In the left pane, right-click on **agg_sa_product** and select **Version Control / New Version.**

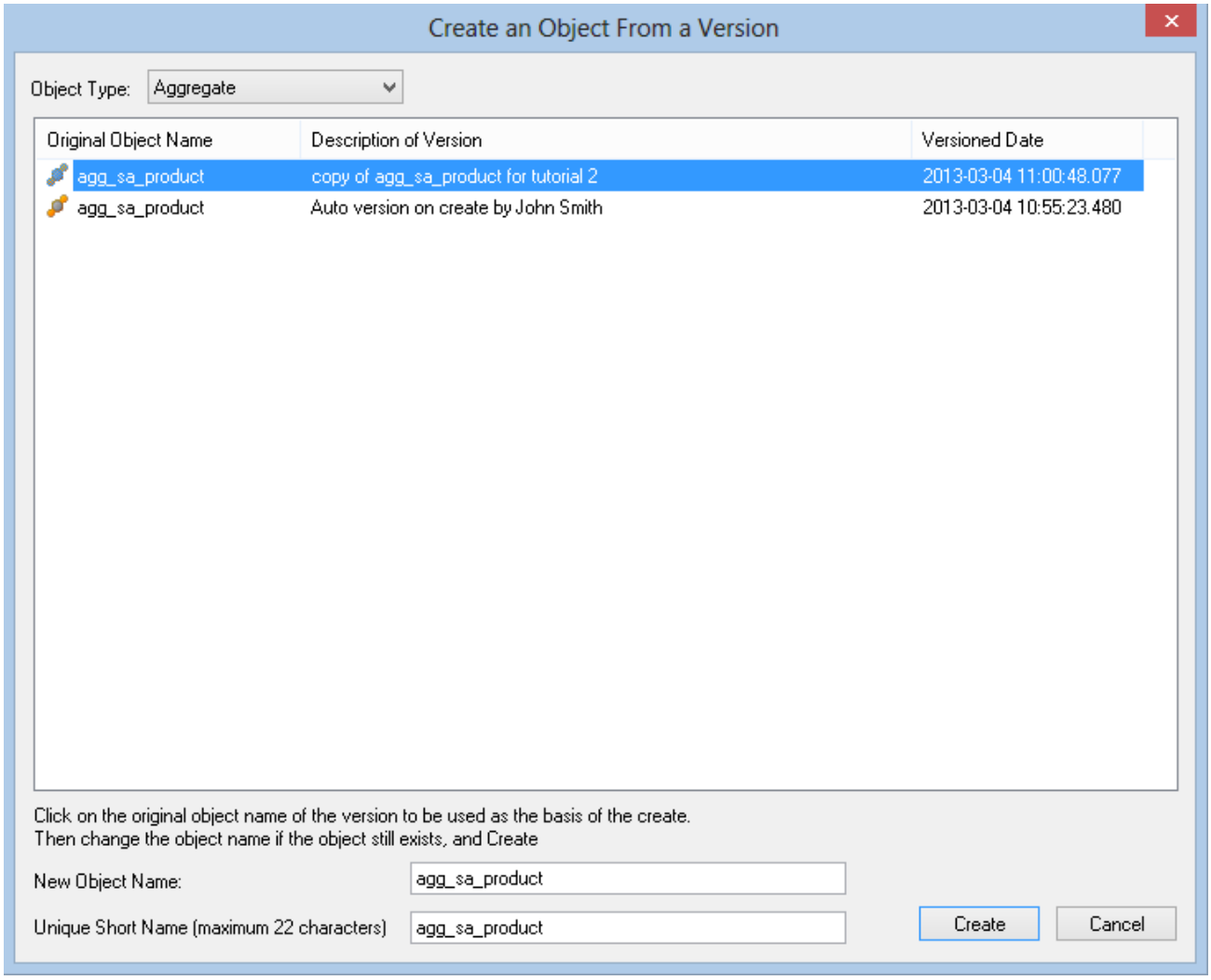
2 The following screen displays. Enter a name for the new version and click **OK**.



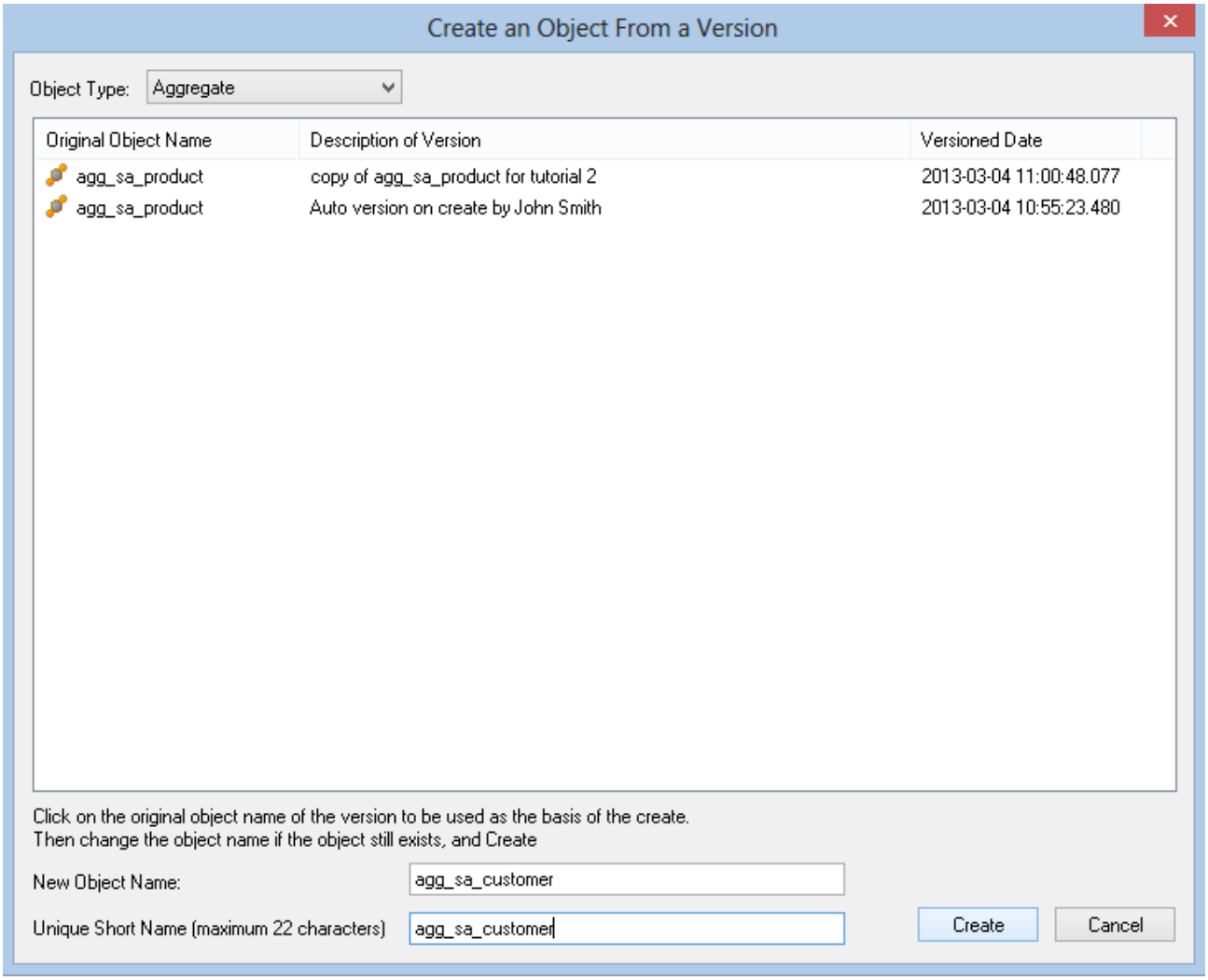
3 In the left pane, right-click on **Aggregate** and select **New Object (from Version).**



4 Double-click on the copy of **agg_sa_product** to select it.



5 Change the name and short name to **agg_sa_customer**. Click **Create.**



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.

6 Select the new **agg_sa_customer** table in the left pane.

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

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

9 In the left pane right-click **agg_sa_customer** and select **Create (ReCreate)**.

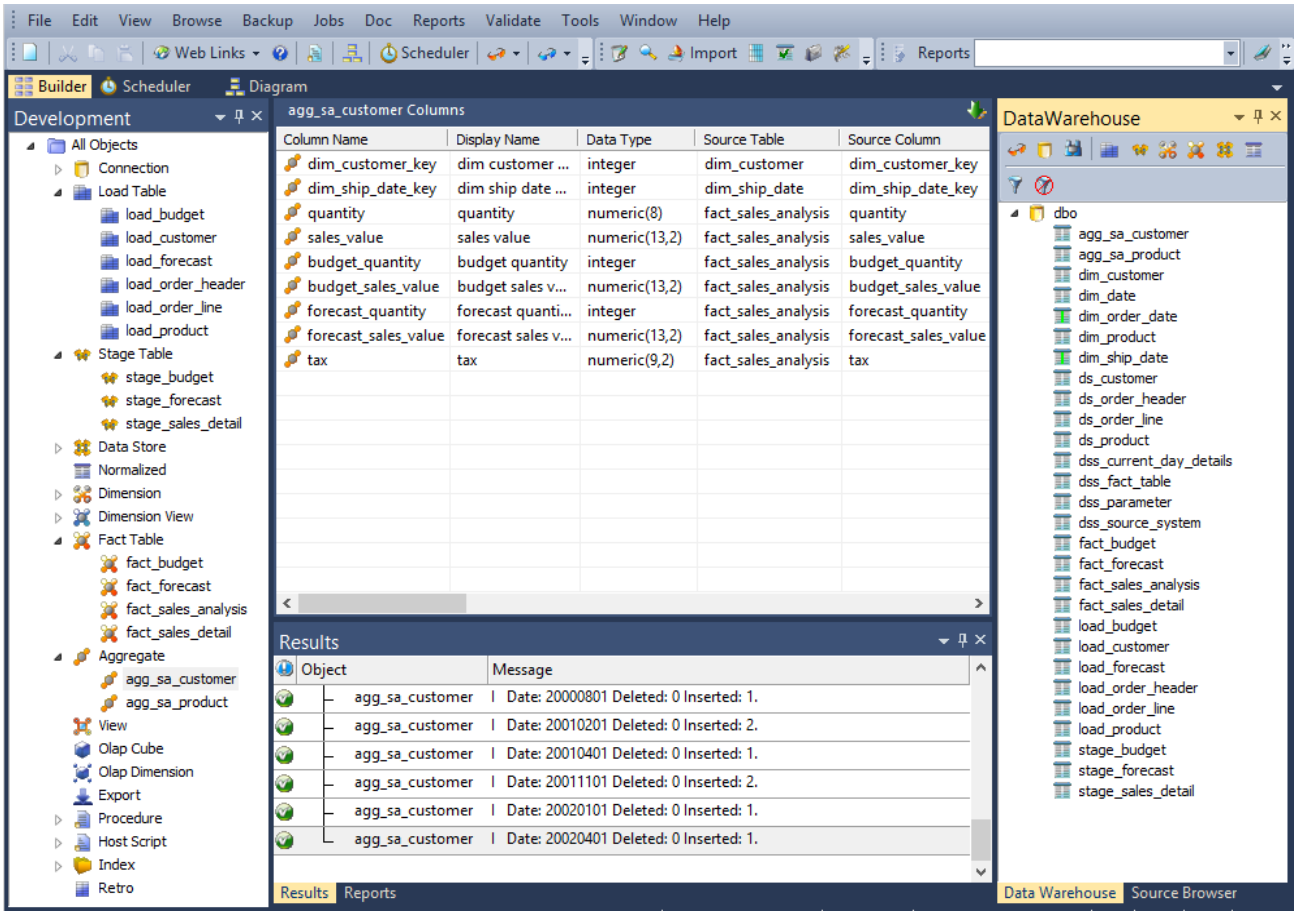
10 In the left pane right-click **agg_sa_customer** and select **Properties**. For the Update Procedure field select **(Build Procedure…)** and click **OK**.

11 Select **dim_ship_date_key** as the date dimension and click **OK**.

12 Right-click on the table in the left pane and select **Execute Update Procedure**.

13 Refresh the Data Warehouse in the right pane (F5).

Your screen should look something like this:



Tutorial 3
Scheduling and Dependencies

Before you start on this chapter you should have:

- ☐ Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (see "***Basic Star Schema Fact Table***" on page 1)
- ☐ Successfully completed ***Creating a Fact Table*** (see "***1.12 Creating a Fact Table***" on page 49)

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 Tutorial

3.1 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

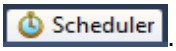
This tutorial has been completed using Oracle. All of the features illustrated in this tutorial are available in SQL Server, Oracle and DB2 (unless otherwise stated). Any differences in usage of QAD Data Warehouse Designer between these databases are highlighted.

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*** (see "***3.2 Creating and Scheduling a Job***" on page 95) section.

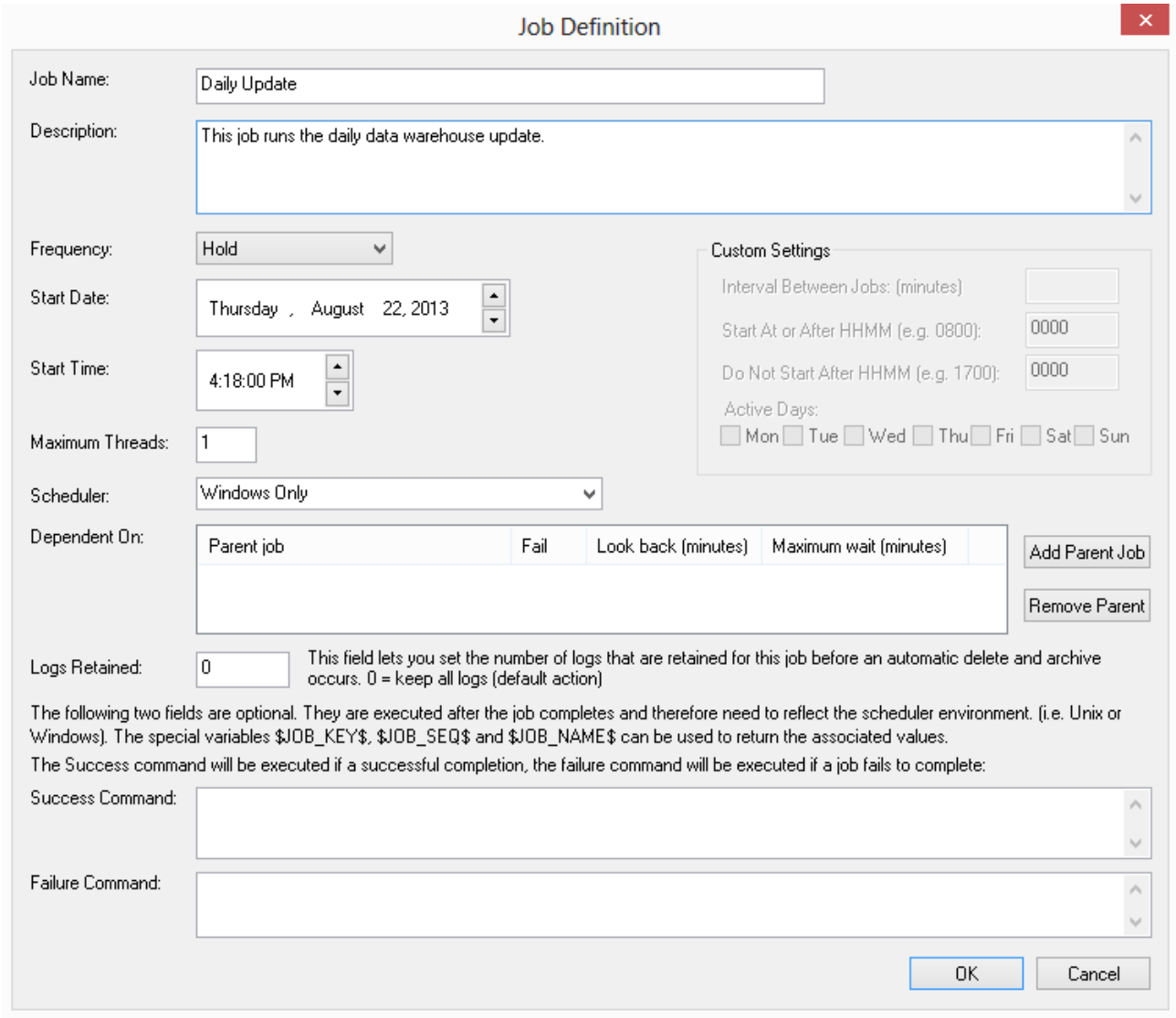
3.2 Creating and Scheduling a Job

To schedule a job click on the **Scheduler** button 

. This will open the scheduler window. A new job can be initiated by selecting the **File/New Job** menu option.

The new job dialog will appear.

1 Change the job name to **Daily Update** and enter in the **Description**.



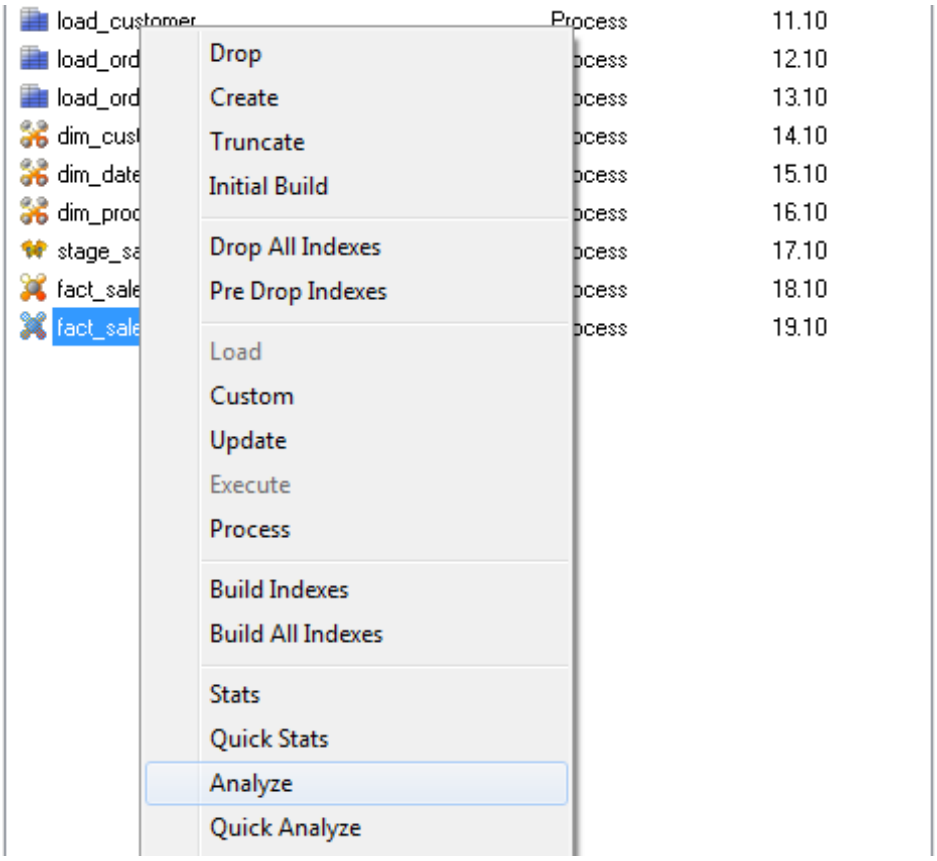
2 Click **OK.**

You are now ready to proceed to the next step - ***Adding Tasks*** (see "***3.3 Adding Tasks***" on page 96)

3.3 Adding Tasks

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

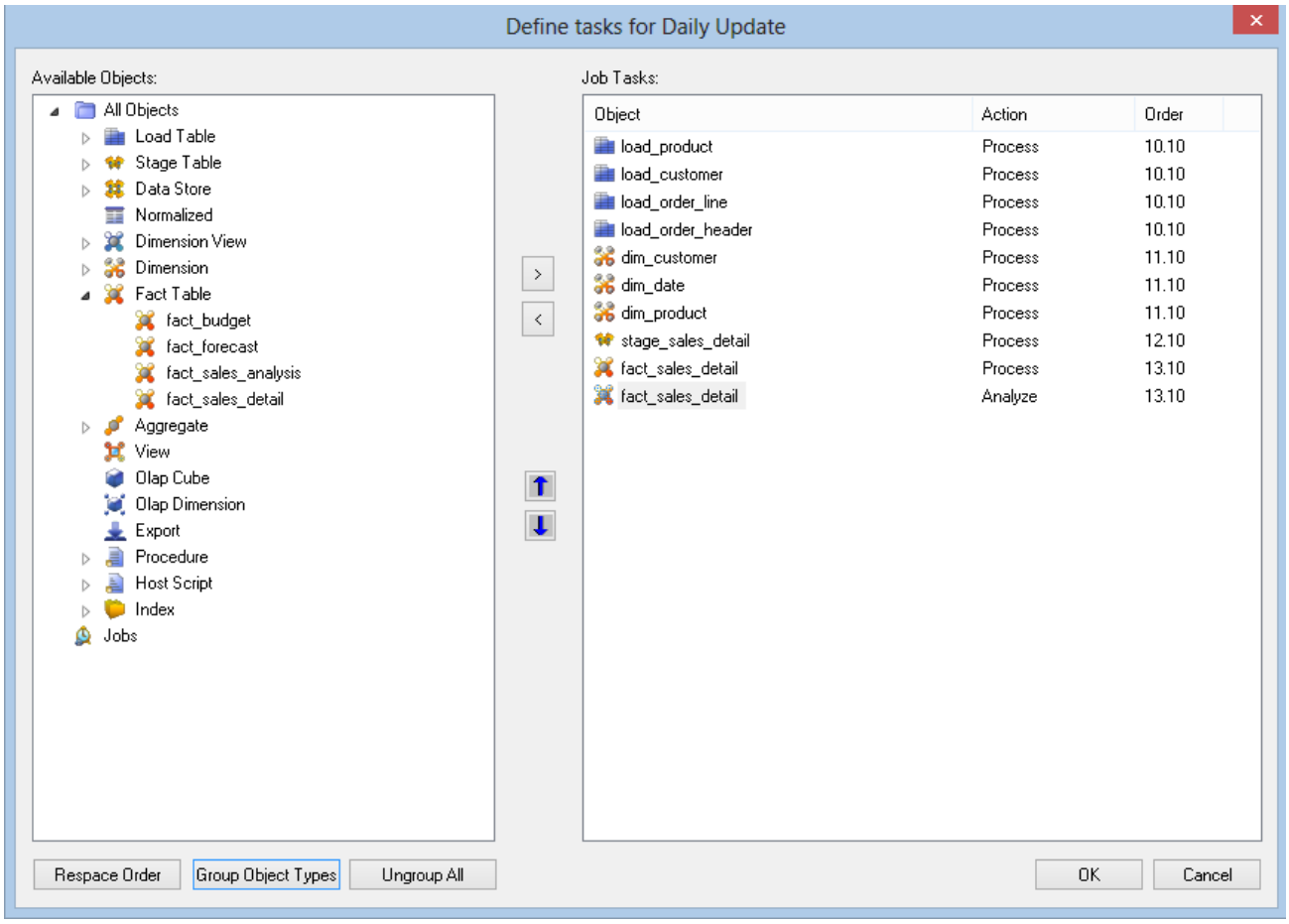
1. Open the object tree by double-clicking on the **All Objects** project in the left pane.
2. Double-click on the **Load Table** object group.
3. Double-click on **load_product**, **load_customer**, **load_order_line** and **load_order_header**. Note that as each object is double-clicked it is added to the right pane.
4. Double-click on the **Dimension** object group.
5. Double-click on **dim_customer**, **dim_date** and **dim_product**. As each object is double-clicked it is added to the right 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 right 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 right pane.
8. Double-click again on **fact_sales_detail** to add a second copy of this object to the right pane.
9. Right-click on the second **fact_sales_detail** and select **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.

10 Click the **Group Object Types** button. You will notice that the order number for tasks of the same type now have the same number. 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-click 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.

11 Click **OK** to close.

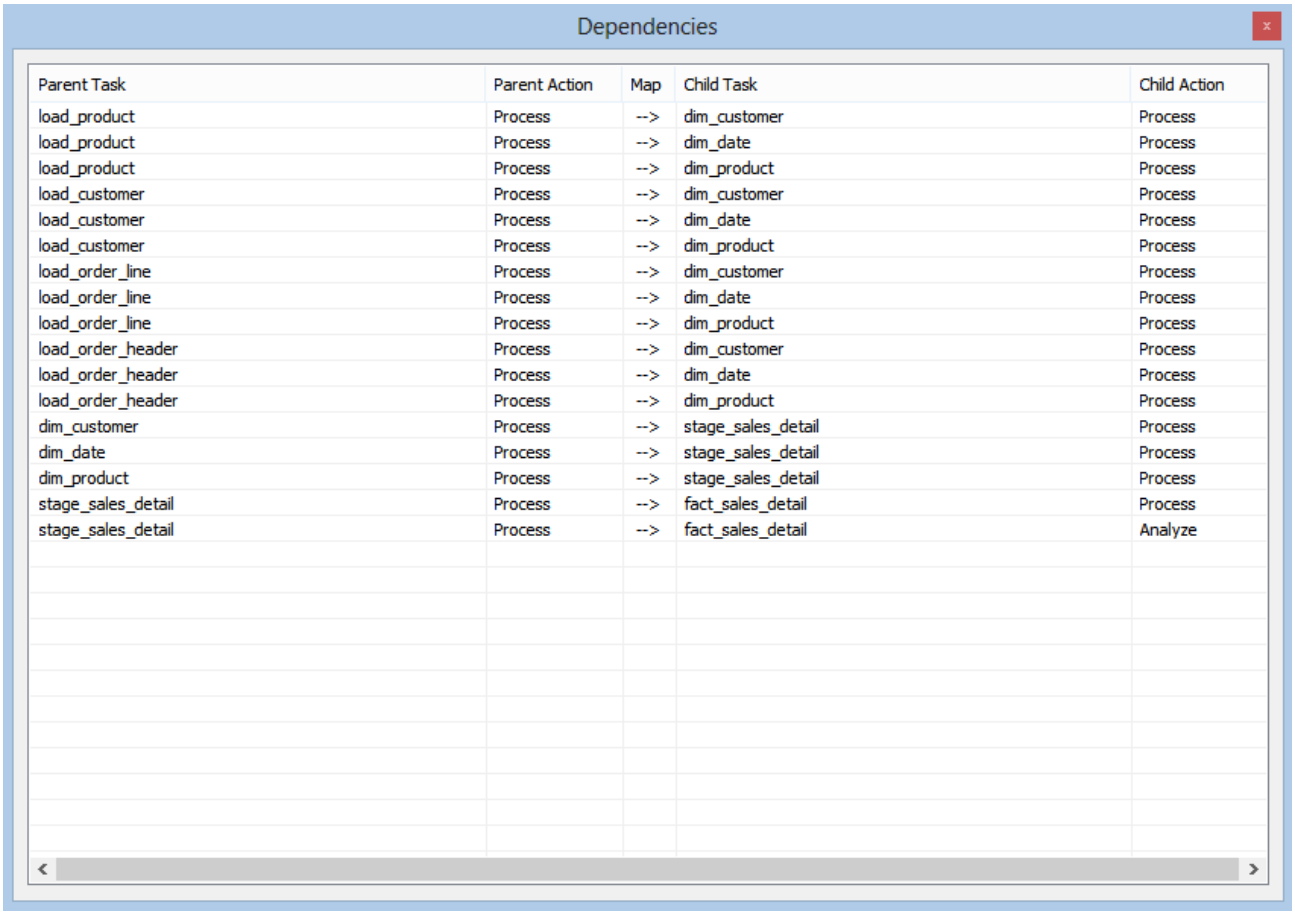
You are now ready to proceed to the next step - ***Task Dependencies*** (see "***3.4 Task Dependencies***" on page 98).

3.4 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:

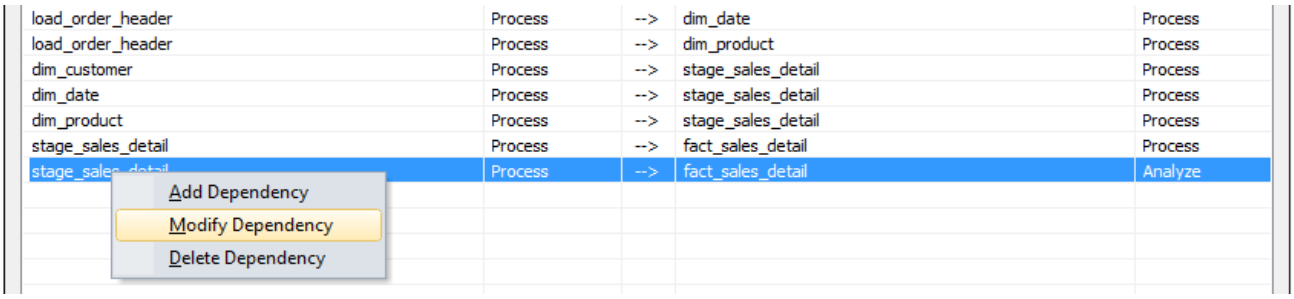
1 Click on the **All Jobs** button in the toolbar to display our Daily Update job in the top pane.

2 Position over the job name **Daily Update** and using the right-click 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.

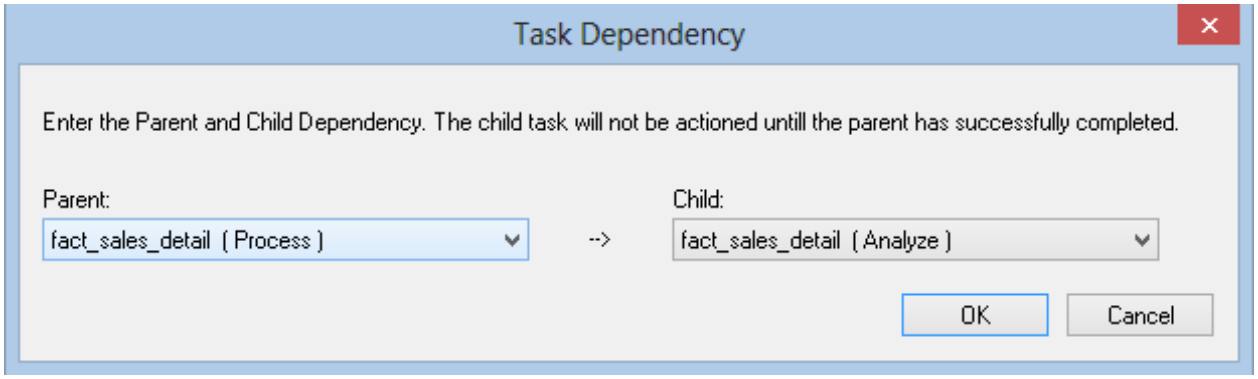


Parent Task	Parent Action	Map	Child Task	Child Action
load_product	Process	-->	dim_customer	Process
load_product	Process	-->	dim_date	Process
load_product	Process	-->	dim_product	Process
load_customer	Process	-->	dim_customer	Process
load_customer	Process	-->	dim_date	Process
load_customer	Process	-->	dim_product	Process
load_order_line	Process	-->	dim_customer	Process
load_order_line	Process	-->	dim_date	Process
load_order_line	Process	-->	dim_product	Process
load_order_header	Process	-->	dim_customer	Process
load_order_header	Process	-->	dim_date	Process
load_order_header	Process	-->	dim_product	Process
dim_customer	Process	-->	stage_sales_detail	Process
dim_date	Process	-->	stage_sales_detail	Process
dim_product	Process	-->	stage_sales_detail	Process
stage_sales_detail	Process	-->	fact_sales_detail	Process
stage_sales_detail	Process	-->	fact_sales_detail	Analyze

3 Right-click on the **Parent task** for the last dependency and 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.

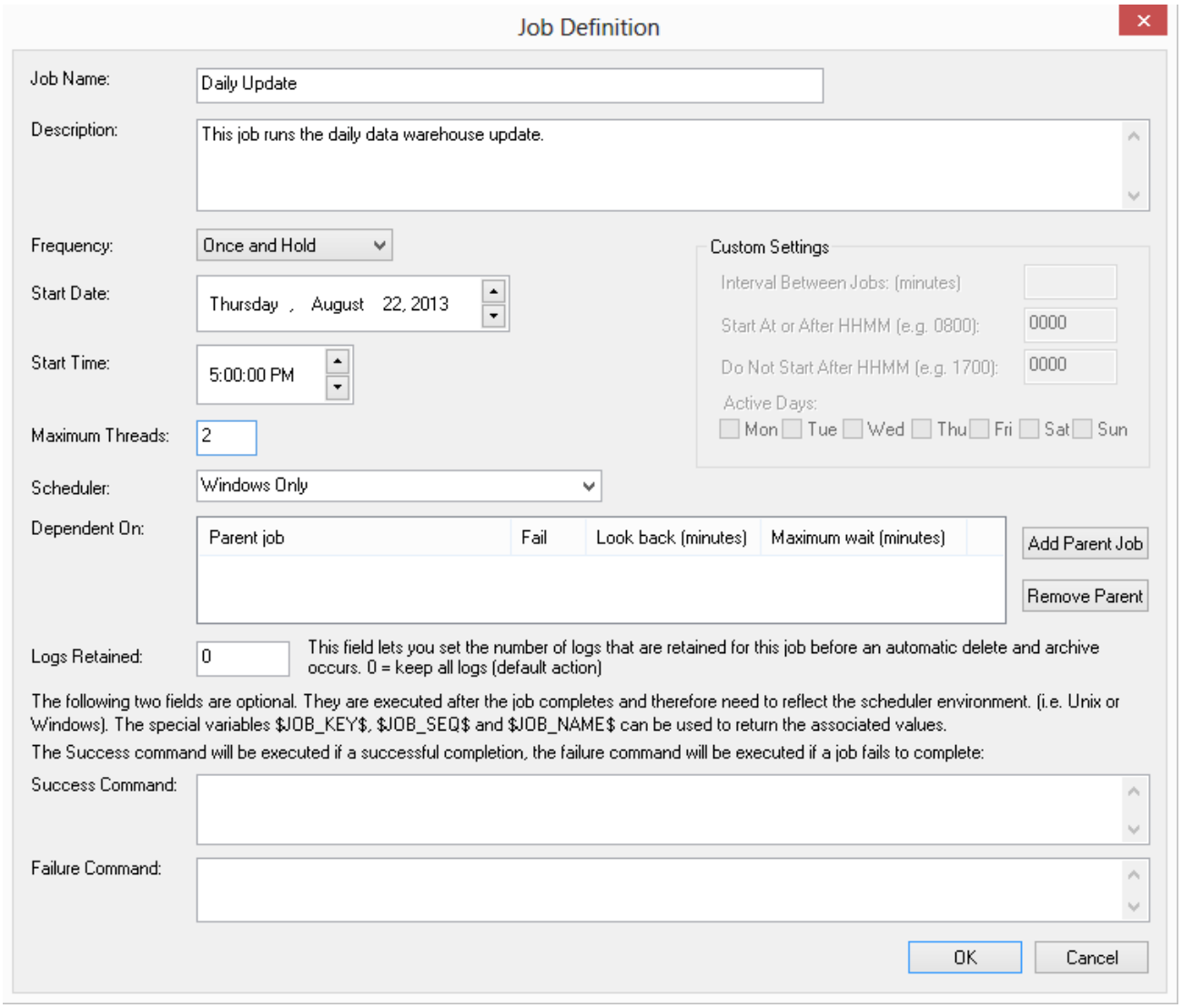
6 Close the **Dependencies** dialog.

We are now ready to release the job, which is done in the next section - ***Editing a Scheduled Job*** (see "***3.5 Editing a Scheduled Job***" on page 100).

3.5 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. Right-click on the job **Daily Update** and 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 **Start Time** to be 2 minutes from now.
5. 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.

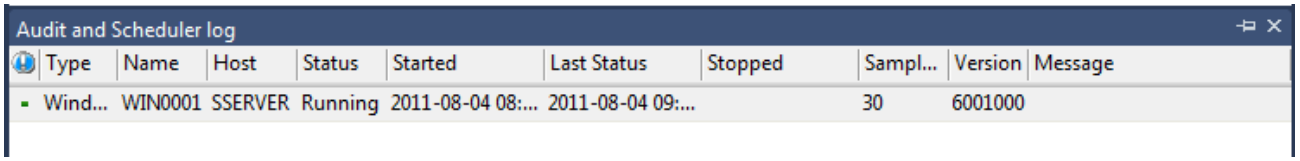


6. Click **OK** to save the changes.

7 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, select **Start the Job** from the job's popup menu.

8 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.



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

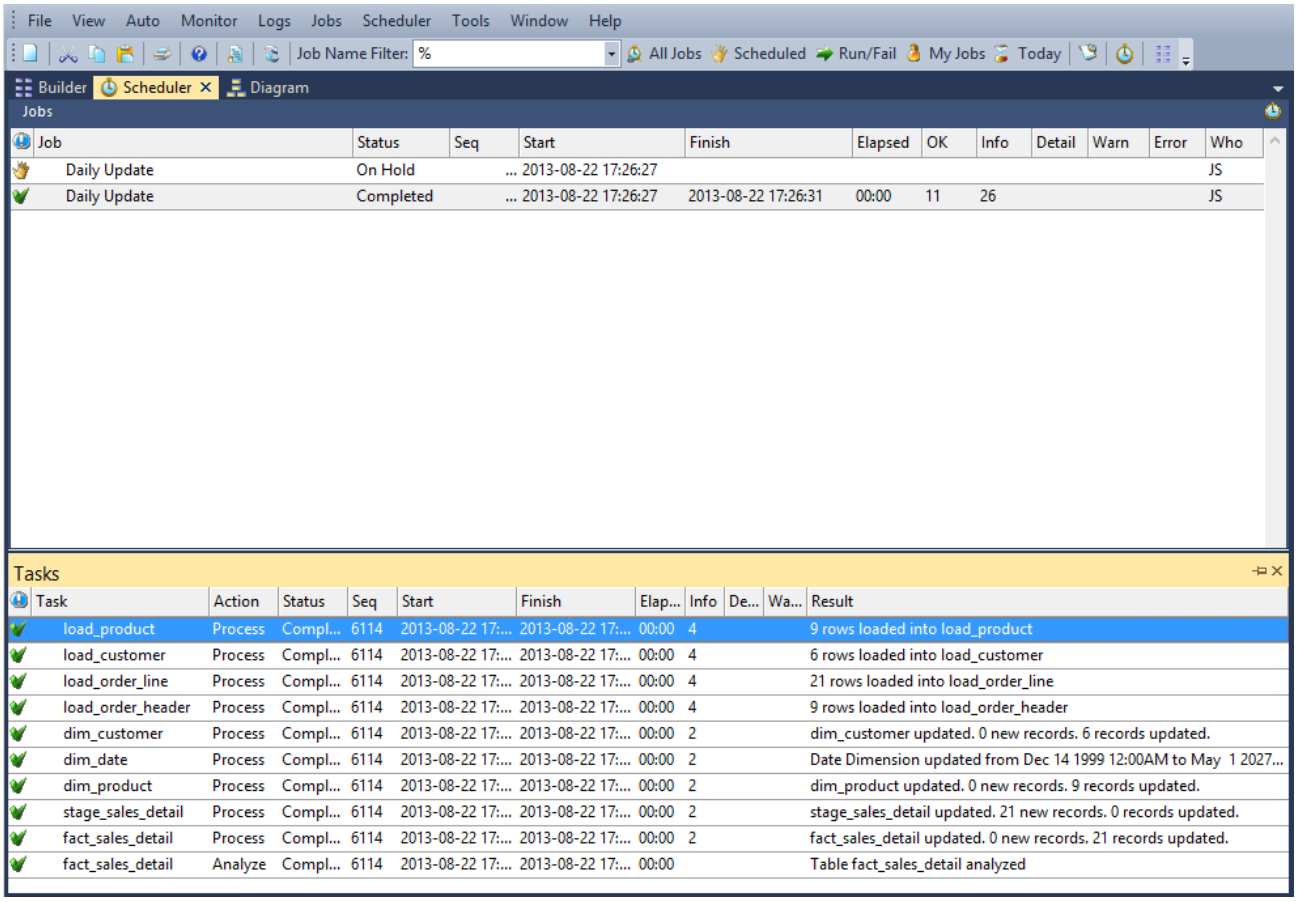
We are now ready to proceed to the next section - ***Job Results*** (see "***3.6 Job Results***" on page 102)

3.6 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. Double-click on the job **Daily Update** in a 'Completed', 'Running' or 'Failed' state to display the individual tasks within the job.
3. Double-click on the **fact_sales_detail** task with action **Process** to display the messages returned from this task. These messages should include information on any indexes dropped and created.

Your screen should look something like this:



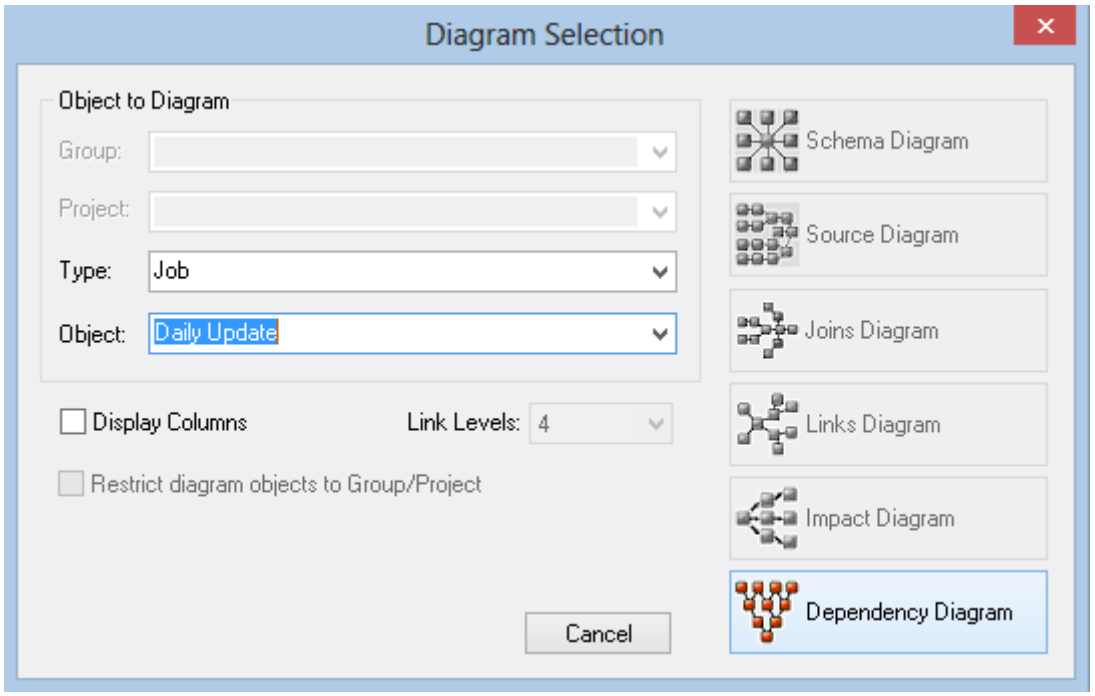
We are now ready to proceed to the next section - ***Diagrammatic View for Jobs*** (see "***3.7 Diagrammatic View for Jobs***" on page 103)

3.7 Diagrammatic View for Jobs

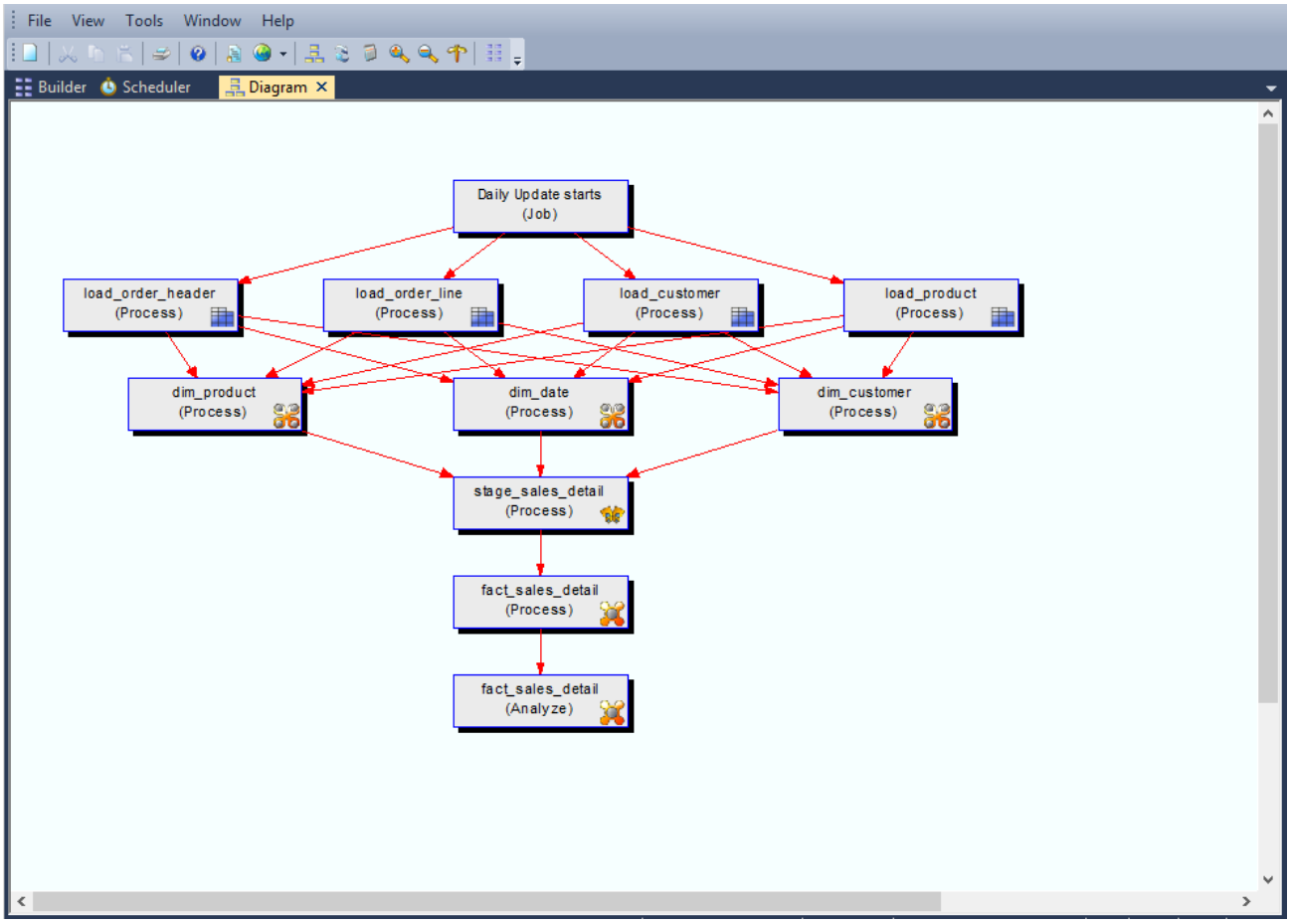
QAD Data Warehouse Designer provides the ability to diagrammatically view the job dependencies for the job you have created.

1 To bring up the **Diagram Selection** dialog, click on the  button.

2 Select an object **Type** of **Job** to narrow the selection list and then select **Daily Update**. Click on the **Dependency Diagram** button.



The diagram looks like this:



Tutorial 4
Complex Dimensions and Hierarchies

Before you start on this chapter you should have:

- ☐ Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (see "***Basic Star Schema Fact Table***" on page 1)
- ☐ Successfully completed ***Creating a Fact Table*** (see "***1.12 Creating a Fact Table***" on page 49)

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

In This Tutorial

4.1 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*** (see "***4.2 Creating a Slowly Changing Dimension***" on page 107)

4.2 Creating a Slowly Changing Dimension

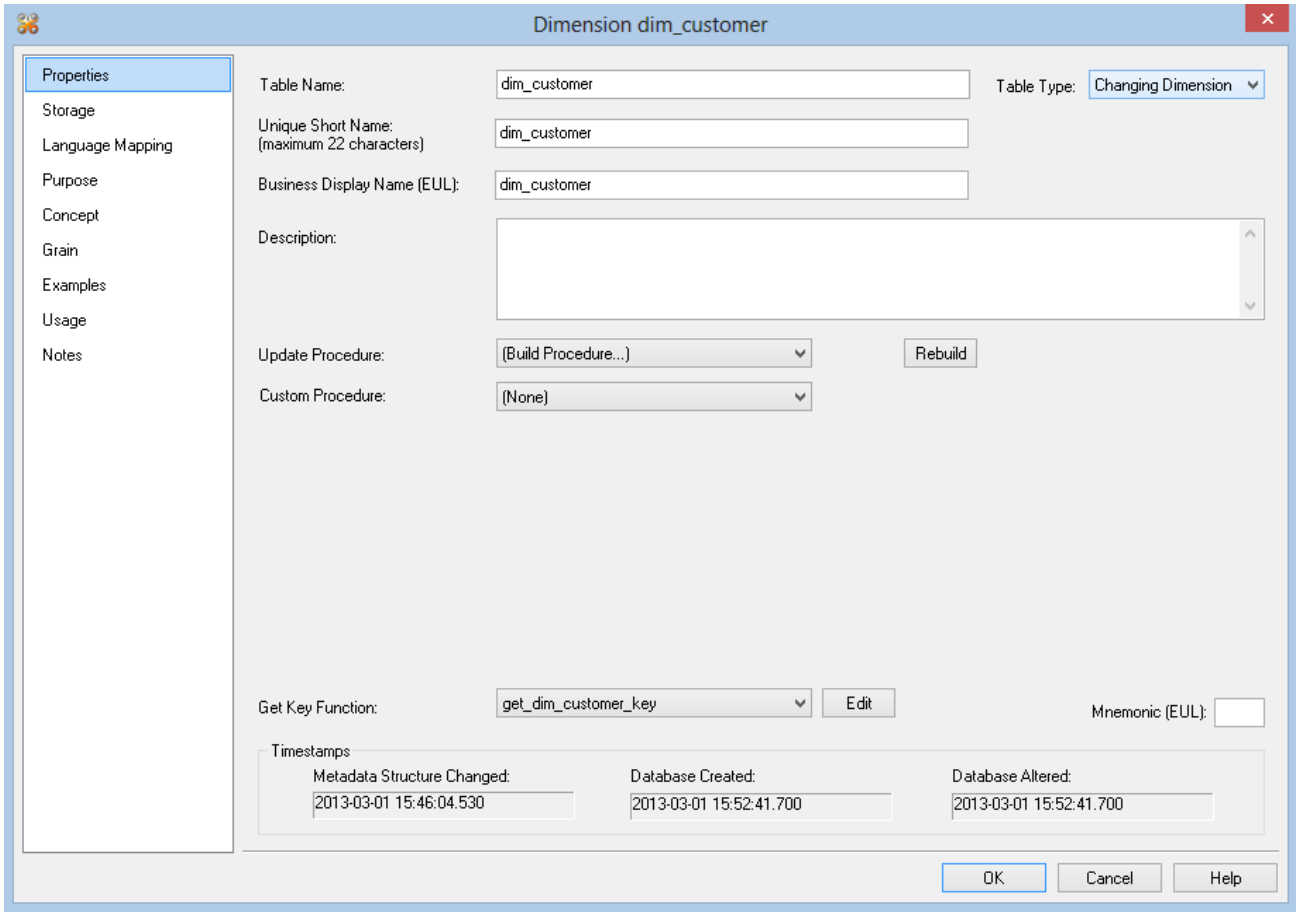
The process of creating a slowly changing dimension is largely the same as creating a normal dimension. Two additional questions are asked during the dimension creation process when the 'Slowly changing dimension' button is chosen during the dimension create. In this section we will cover the more common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

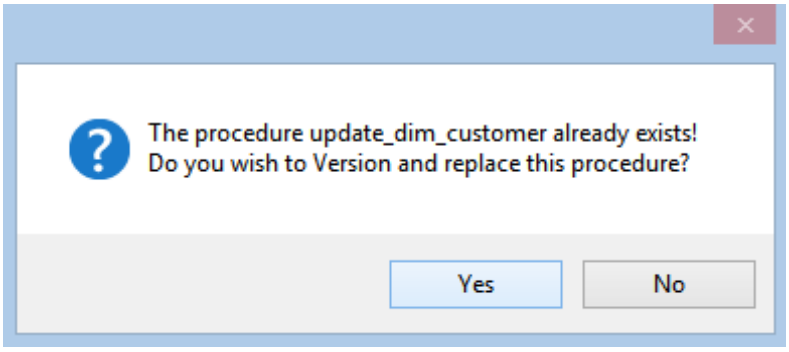
1 Right-click on **dim_customer** and select **Properties.**

2 On the dimension Properties change the **Update Procedure** drop-down to select **(Build Procedure...)**.

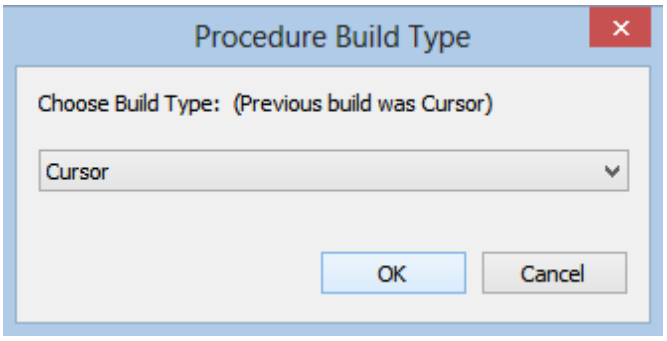
3 Use the **Table Type** drop-down to select **Changing Dimension.** Click **OK.**



4 You will be asked if you wish to version and replace the update and get key procedures. Answer **Yes** to both prompts.

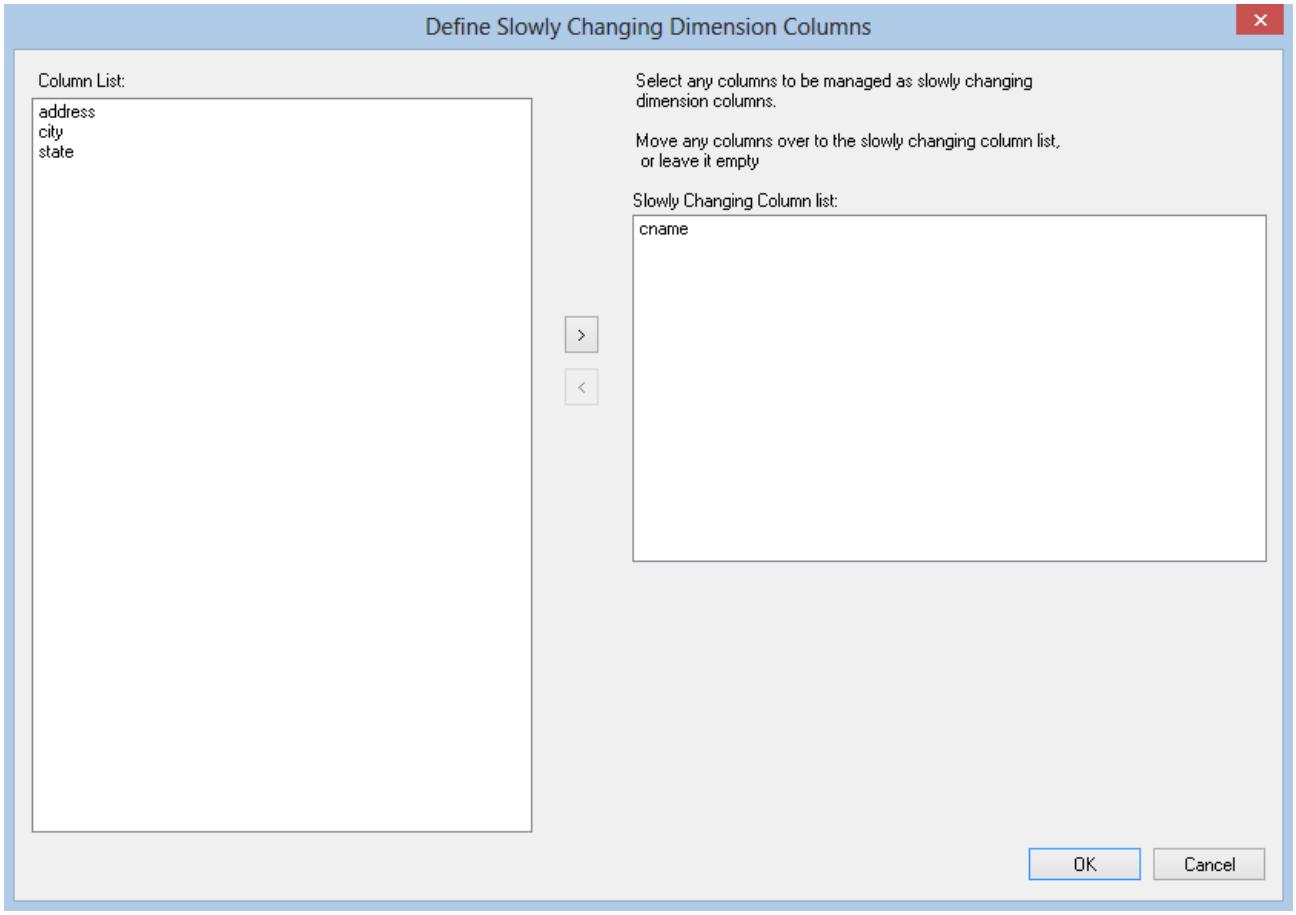


5 A Procedure Build Type dialog will appear. Select **Cursor**.



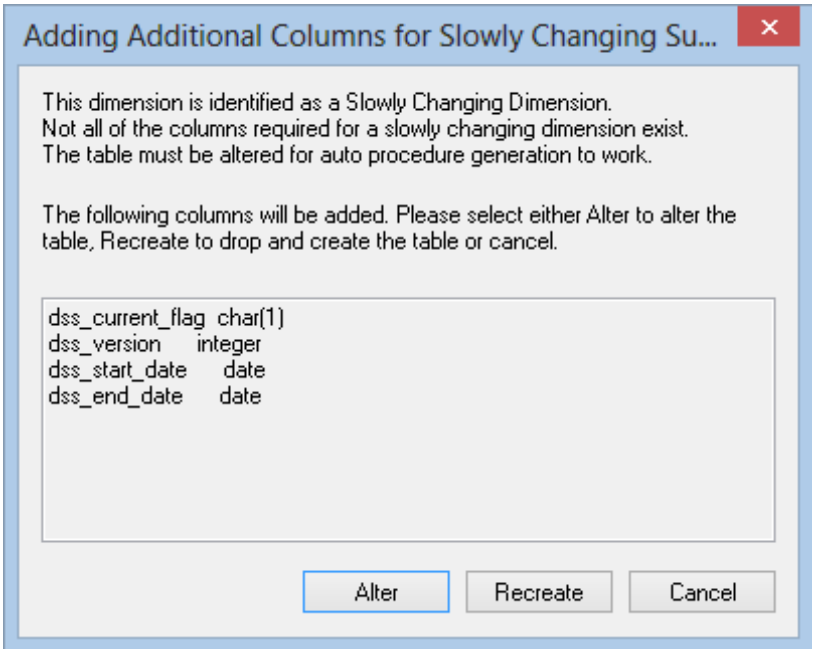
6 The **Define Dimension Business Key(s)** dialog will be presented. The existing business key **code** should already be the default value so click **OK** to proceed to the next screen.

7 The **Define Slowly Changing Dimension Columns** dialog will now be presented. Multiple columns can be selected to be handled as slowly changing. Double-click on **cname** to add it to the list of slowly changing columns. Click **OK**.

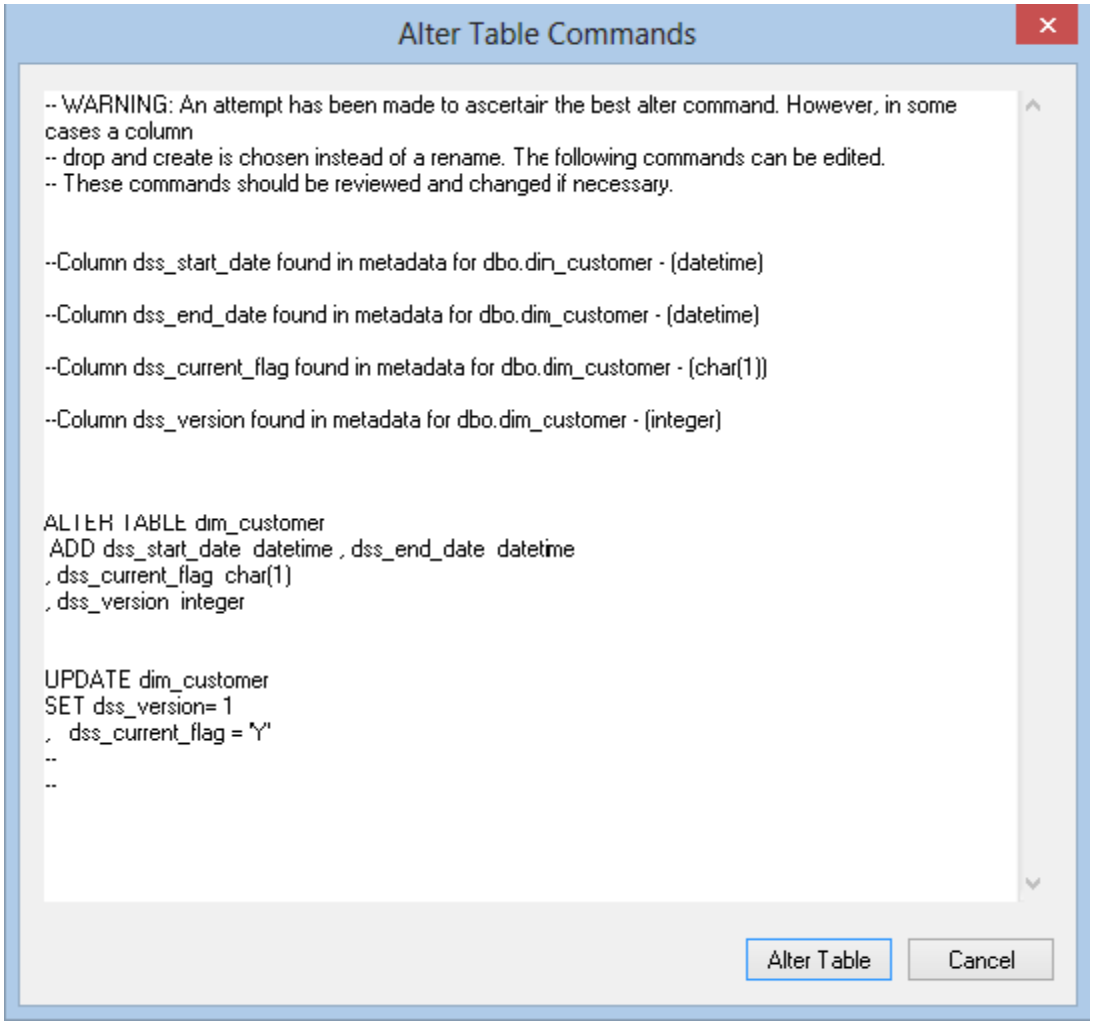


Note: Refer to the Dimensions chapter for an explanation of slowly changing dimensions.

8 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.

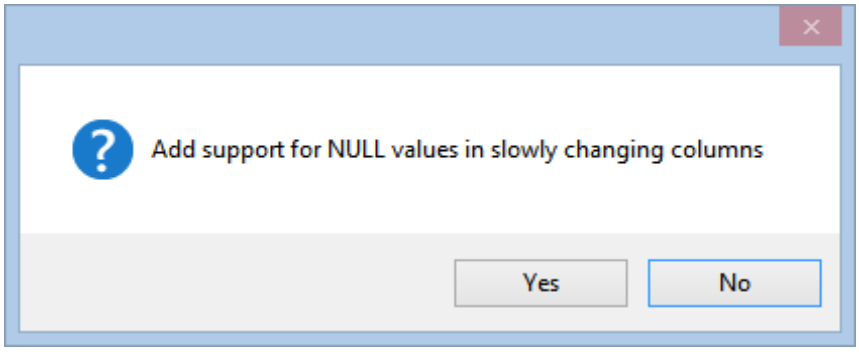


9 A dialog will now be presented with the SQL commands that will be executed to add the new columns and set default values for the dss_version and dss_current_flag columns. Click the **Alter Table** button to alter the table in the database. It is worth noting that whenever a database table is altered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



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

11 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.

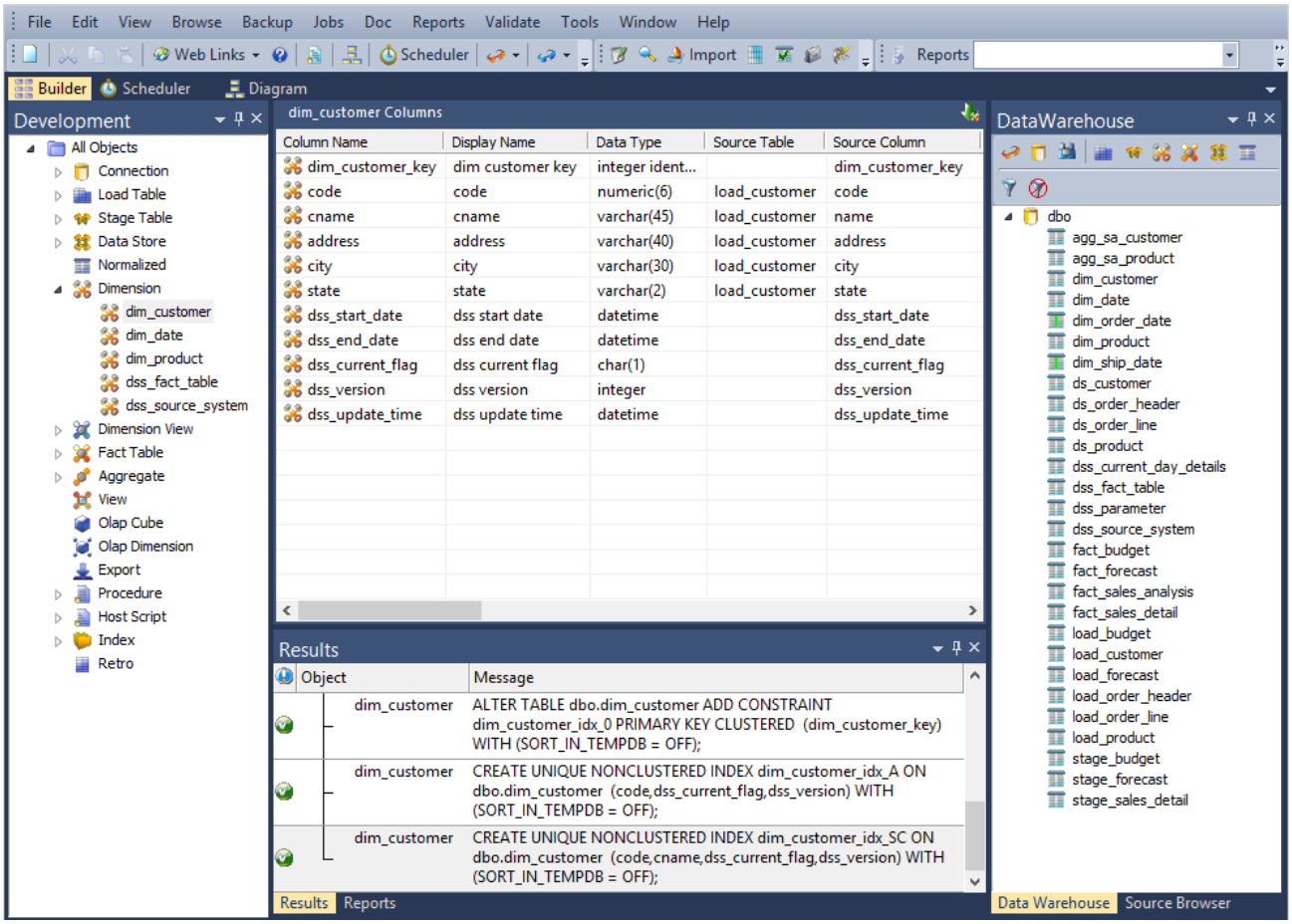


12 The results dialog will show the indexes that were created/re-created for the dimension.

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 screen should look something like this:



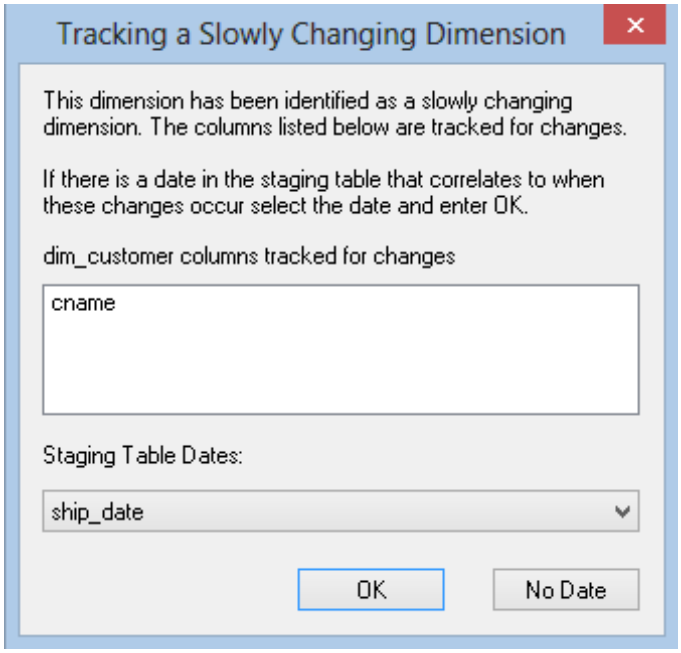
Note: This conversion to a slowly changing dimension has changed the get key function for the dimension. This function is called from the stage tables that use this dimension. We must now rebuild the update procedures for the stage tables that use this dimension.

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. Right-click on **stage_sales_detail** and select **Properties**.
2. Use the Update procedure drop-down to select **(Build 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 Parameters dialog.
7. Click **OK** on the screen informing of multiple source tables.
8. Accept the previous entries by clicking **OK** on the cursor mapping screen.
9. Click **OK** on the business key join for each of the dimensions. The previously chosen business key should be the default value provided.

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



11 Click **OK** on any other dimension joins.

12 Click **OK** on the business key for the stage table.

13 The update procedure will now be rebuilt to handle the fact that the customer dimension is now slowly changing. Repeat steps **(1) through (11)** 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 successfully converted the dimension dim_customer to a slowly changing dimension, and made all dependent changes.

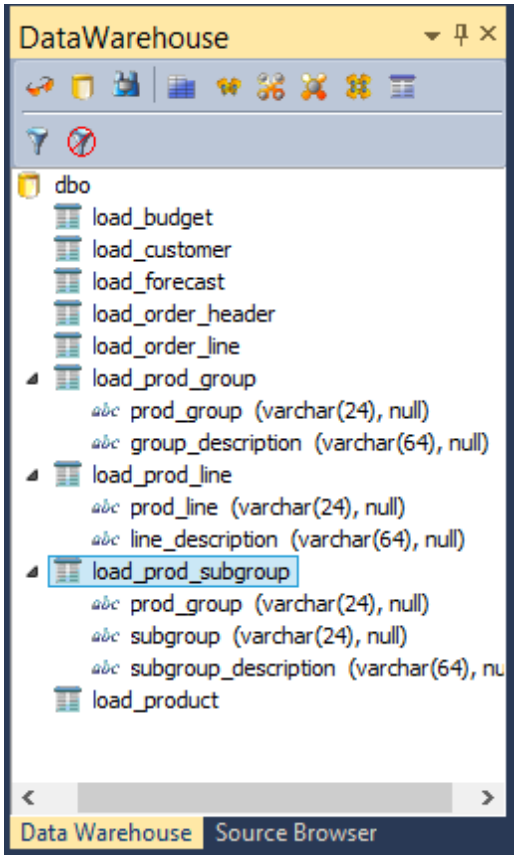
You are now ready to proceed to the next section - ***Multiple Soure Table Dimension*** (see "***4.3 Multiple Source Table Dimension***" on page 114)

4.3 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 descriptions 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. In the right pane, browse to the **Tutorial** connection that was created in tutorial one. Click on the glasses or select the Browse/Source tables menu option. The tutorial tables should now be shown in the right 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 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 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 pane 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 pane should now show the data warehouse tables. You can position the mouse in this right pane and select the 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.

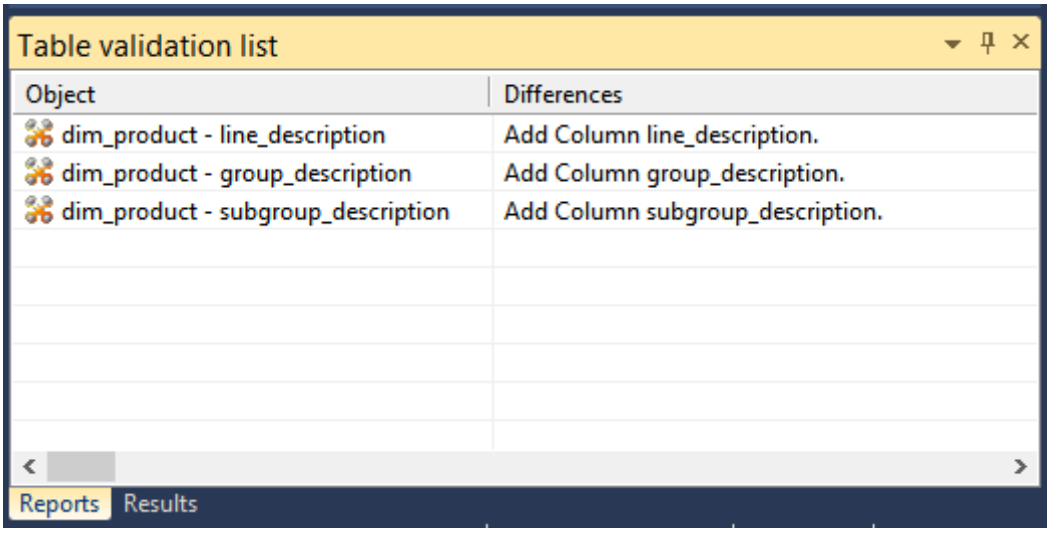
10 Drag **line_description** from load_prod_line into the middle pane. This will add it to the product dimension columns.

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.

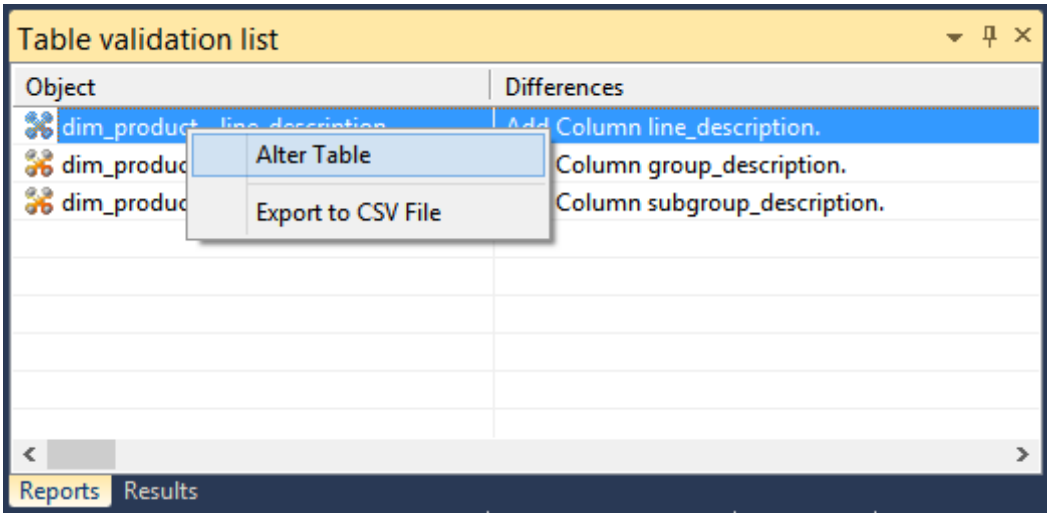
dim_product Columns

Column Name	Display Name	Data Type	Source Table	Source Column
dim_product_key	dim product key	integer id...		dim_product_key
code	code	numeric(6)	load_product	code
description	description	varchar(64)	load_product	description
prod_line	prod line	varchar(24)	load_product	prod_line
line_description	line description	varchar(64)	load_prod_line	line_description
prod_group	prod group	varchar(24)	load_product	prod_group
group_description	group description	varchar(64)	load_prod_group	group_description
subgroup	subgroup	varchar(24)	load_product	subgroup
subgroup_description	subgroup description	varchar(64)	load_prod_subgroup	subgroup_description
dss_update_time	dss update time	datetime		dss_update_time

Right-click on **dim_product** in the left pane and 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.



12 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. Right-click on **dim_product** in the **middle pane** and select **Alter Table**.



13 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.

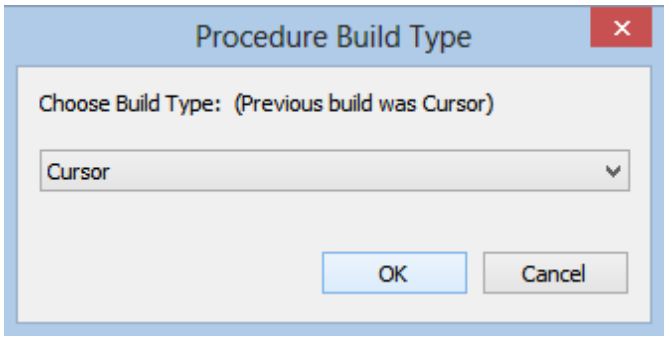
14 A message will display advising that the table was altered. Click **OK** to clear the message.

15 Repeat steps (12) to (14) for the other two changes.

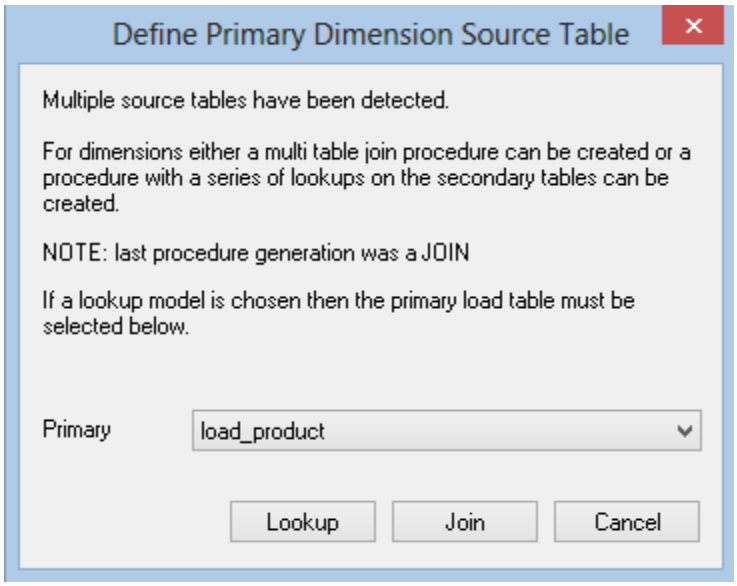
16 Right-click on **dim_product** in the left pane and select **Properties.**

17 Click **Rebuild**.

18 A Procedure Build Type dialog will appear. Select **Cursor**.

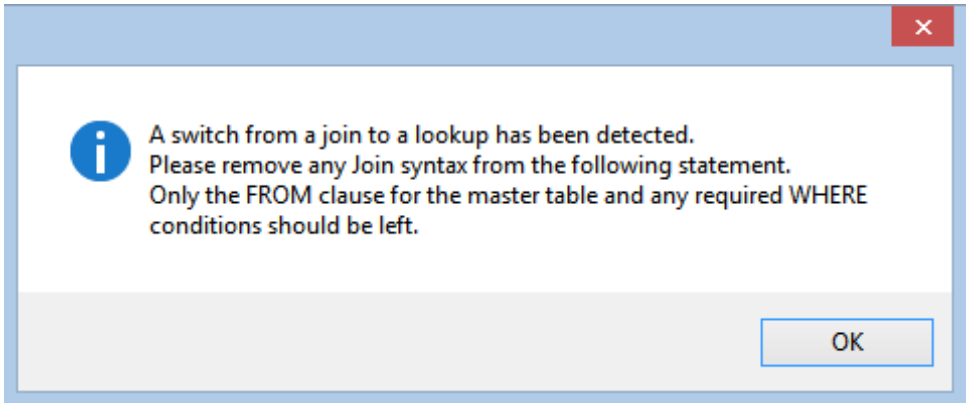


19 A dialog will now appear asking you to define the primary source table and to choose between a join of the source tables or a series of lookups. Refer to the Dimensions chapter for an explanation on these two choices. The **load_product** should have been selected as the primary source table. If it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

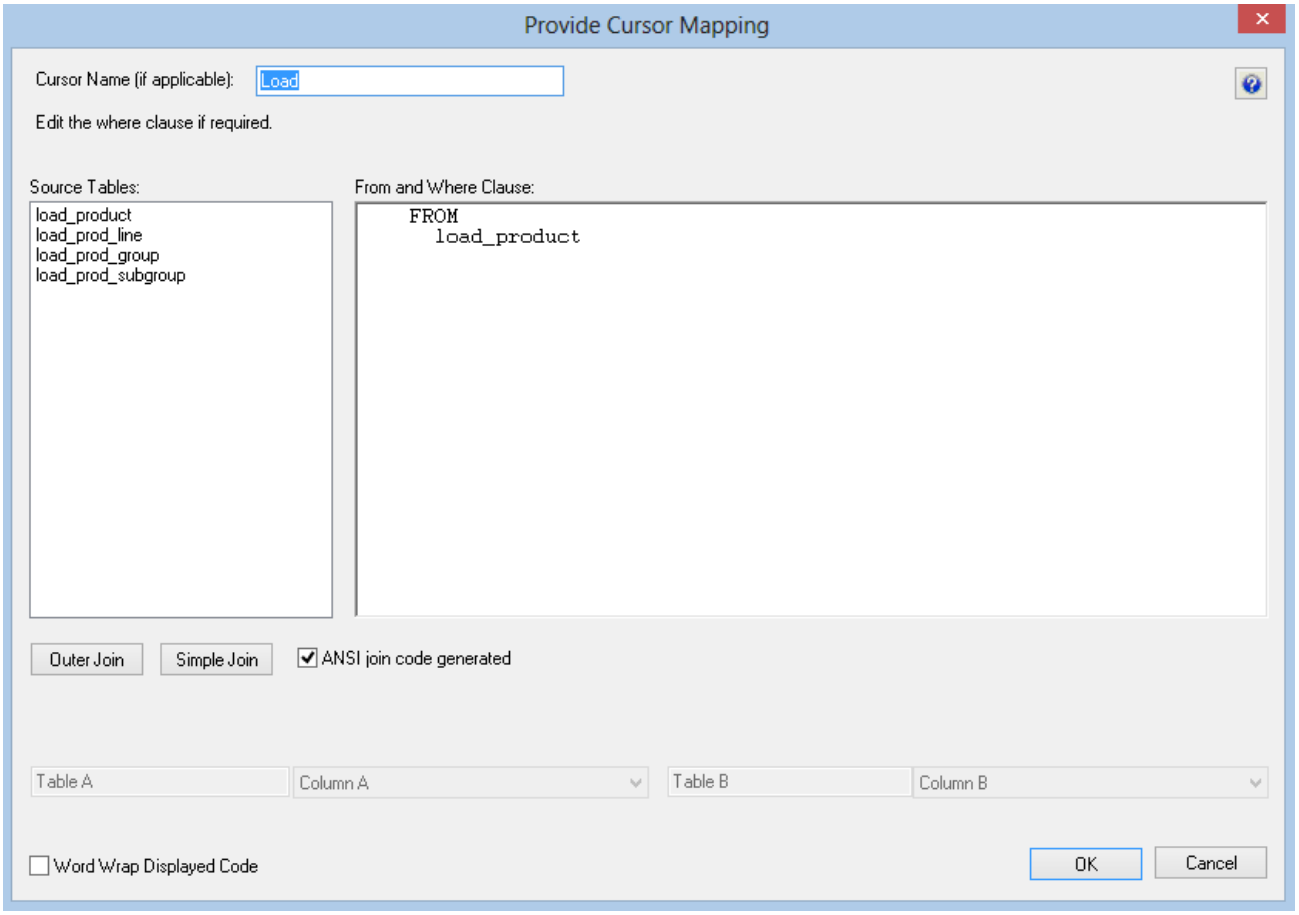


20 The **Define Dimension Business Key(s)** dialog will be presented. The existing business key **code** should already be the default value so click **OK** to proceed to the next screen.

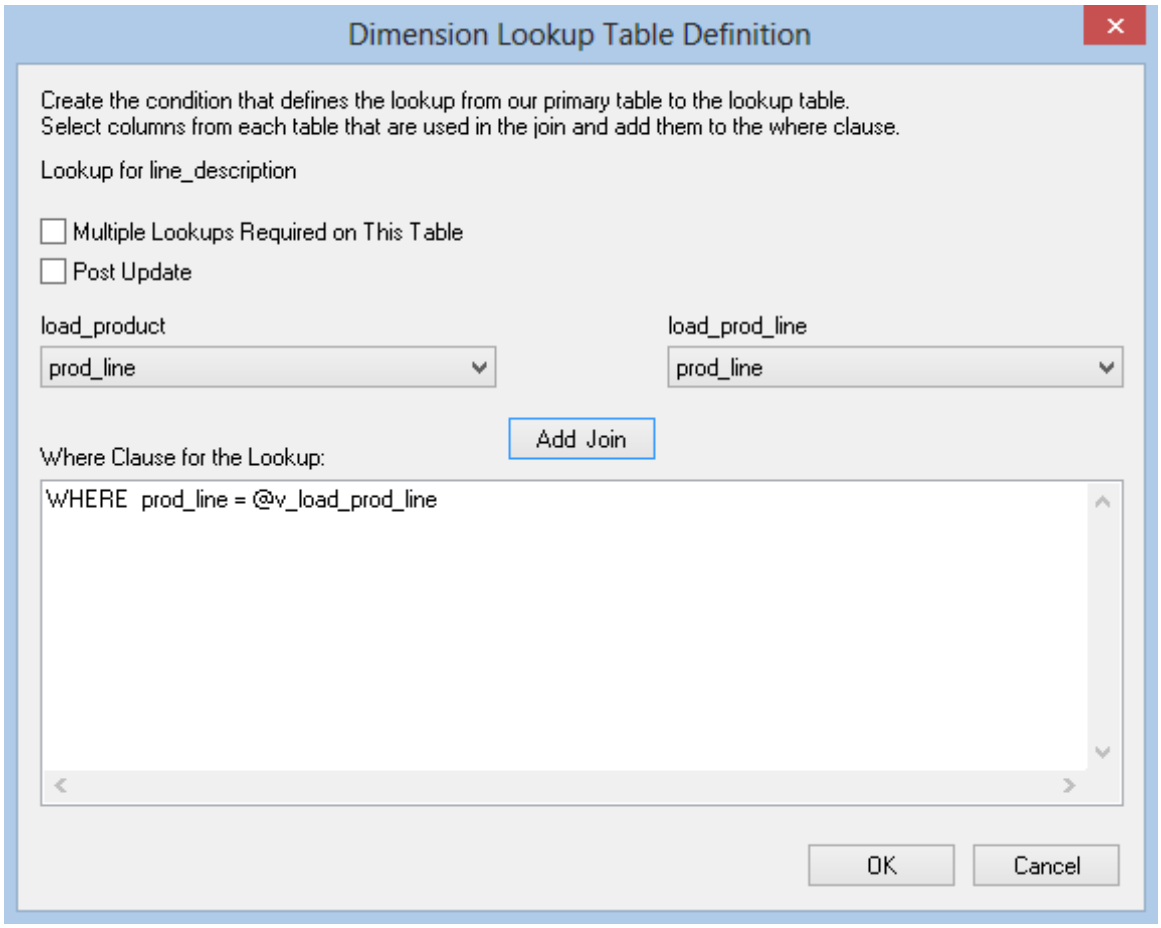
21 A message is displayed, asking you to ensure that any join syntax be removed from the statement in the dialog to follow. Click **OK**.

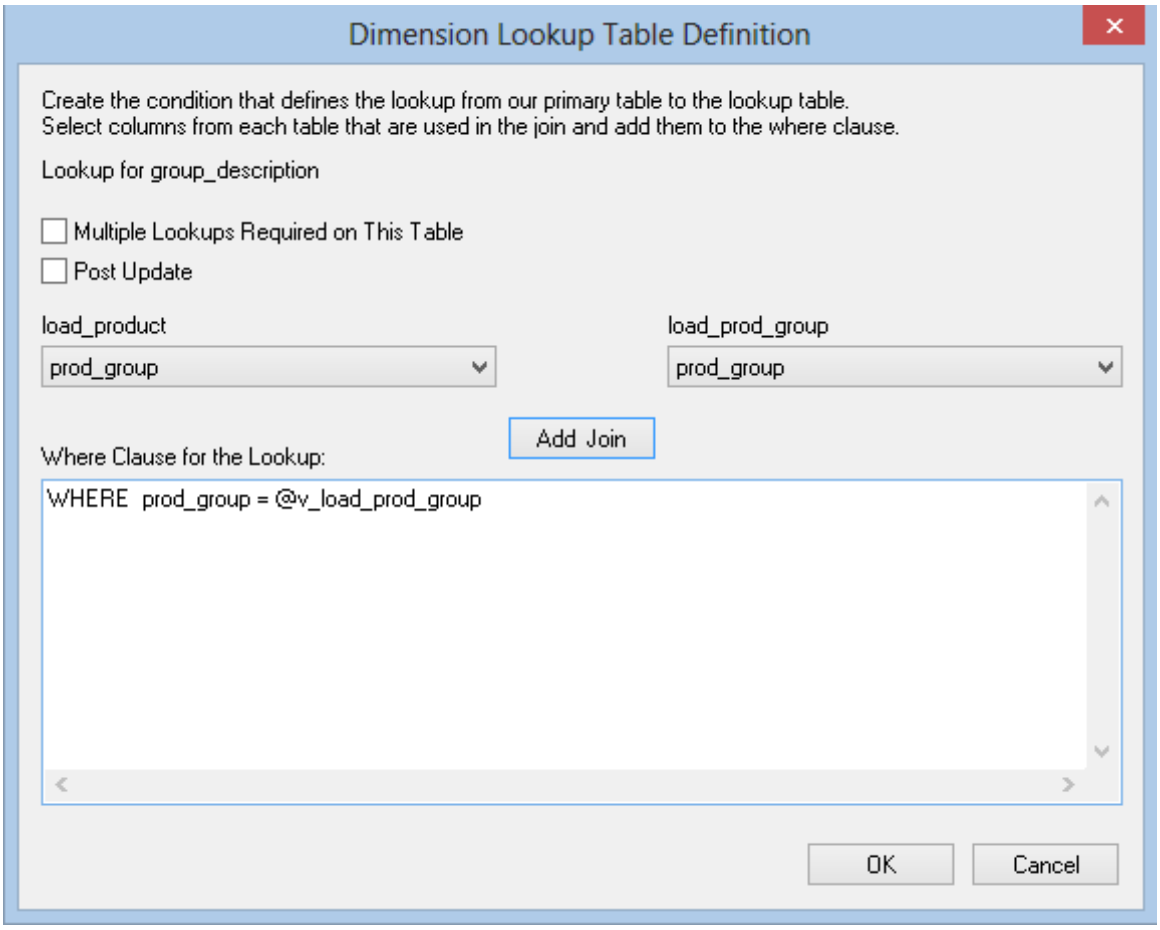


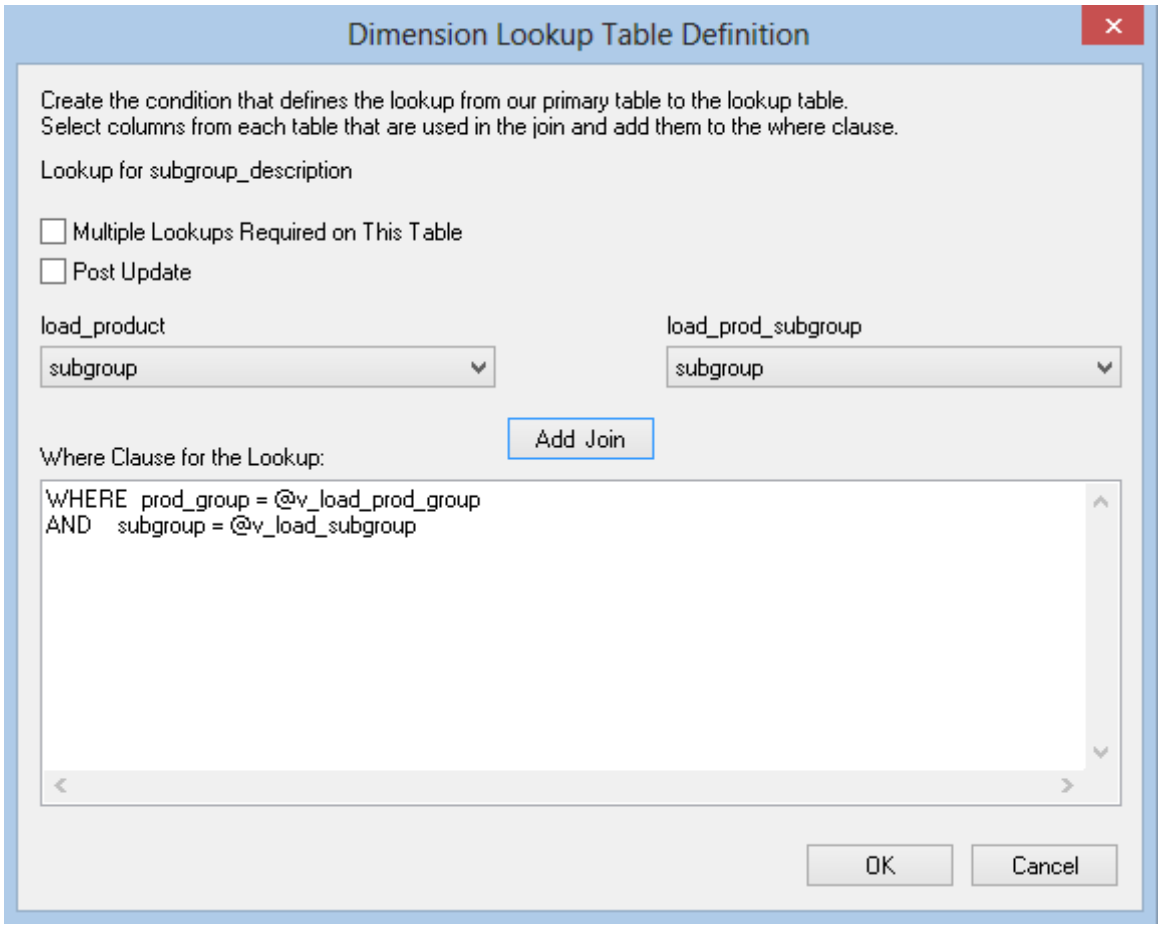
22 Click **OK** on the **Cursor Mapping** screen.



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




Dimension Lookup Table Definition
Create the condition that defines the lookup from our primary table to the lookup table.
Select columns from each table that are used in the join and add them to the where clause.
Lookup for group_description
Multiple Lookups Required on This Table
Post Update
load_product
prod_group
load_prod_group
prod_group
Add Join
Where Clause for the Lookup:
WHERE prod_group = @v_load_prod_group
OK
Cancel



Although not being used at this point there are a number of features in these dialogs which are worth noting. The first is that there is a checkbox 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.

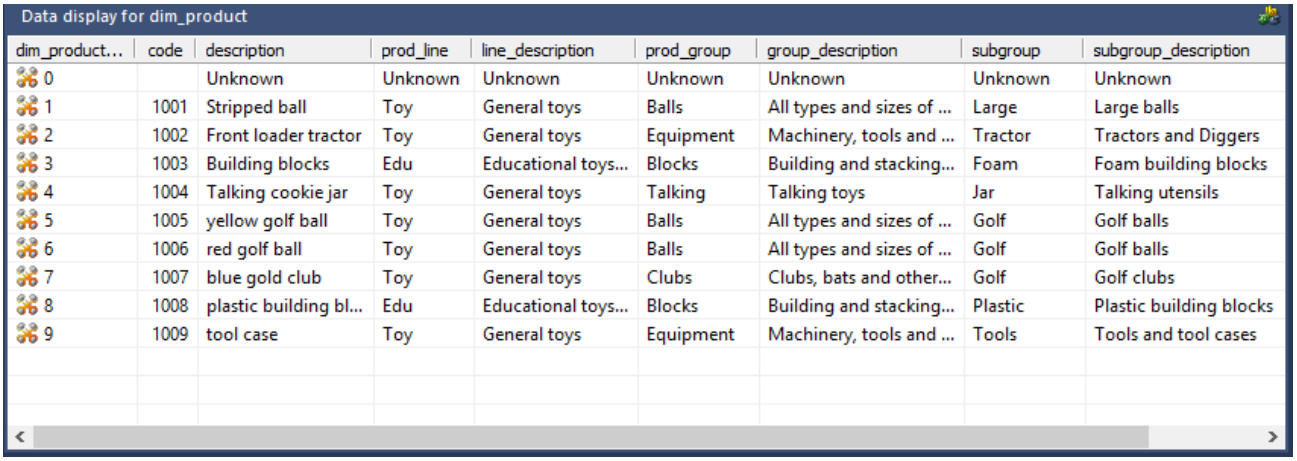
Lookup table	Primary src (load_product)	Lookup column
load_prod_group	prod_group	prod_group
load_prod_subgroup	prod_group prod_subgroup	prod_group prod_subgroup
load_prod_line	prod_line	prod_line

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.

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

25 Right-click on **dim_product** in the left pane and select **Execute Update Procedure**. The dimension will now be refreshed.

26 Right-click on **dim_product** in the left pane and select **Display Data**. Provided the lookups were done correctly, the descriptions should now be populated.



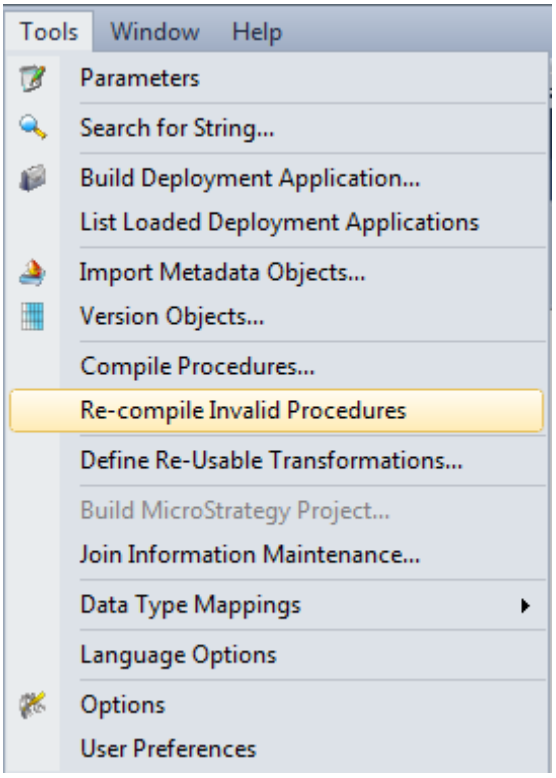
Data display for dim_product

dim_product...	code	description	prod_line	line_description	prod_group	group_description	subgroup	subgroup_description
0		Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
1	1001	Stripped ball	Toy	General toys	Balls	All types and sizes of ...	Large	Large balls
2	1002	Front loader tractor	Toy	General toys	Equipment	Machinery, tools and ...	Tractor	Tractors and Diggers
3	1003	Building blocks	Edu	Educational toys...	Blocks	Building and stacking...	Foam	Foam building blocks
4	1004	Talking cookie jar	Toy	General toys	Talking	Talking toys	Jar	Talking utensils
5	1005	yellow golf ball	Toy	General toys	Balls	All types and sizes of ...	Golf	Golf balls
6	1006	red golf ball	Toy	General toys	Balls	All types and sizes of ...	Golf	Golf balls
7	1007	blue gold club	Toy	General toys	Clubs	Clubs, bats and other...	Golf	Golf clubs
8	1008	plastic building bl...	Edu	Educational toys...	Blocks	Building and stacking...	Plastic	Plastic building blocks
9	1009	tool case	Toy	General toys	Equipment	Machinery, tools and ...	Tools	Tools and tool cases

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.

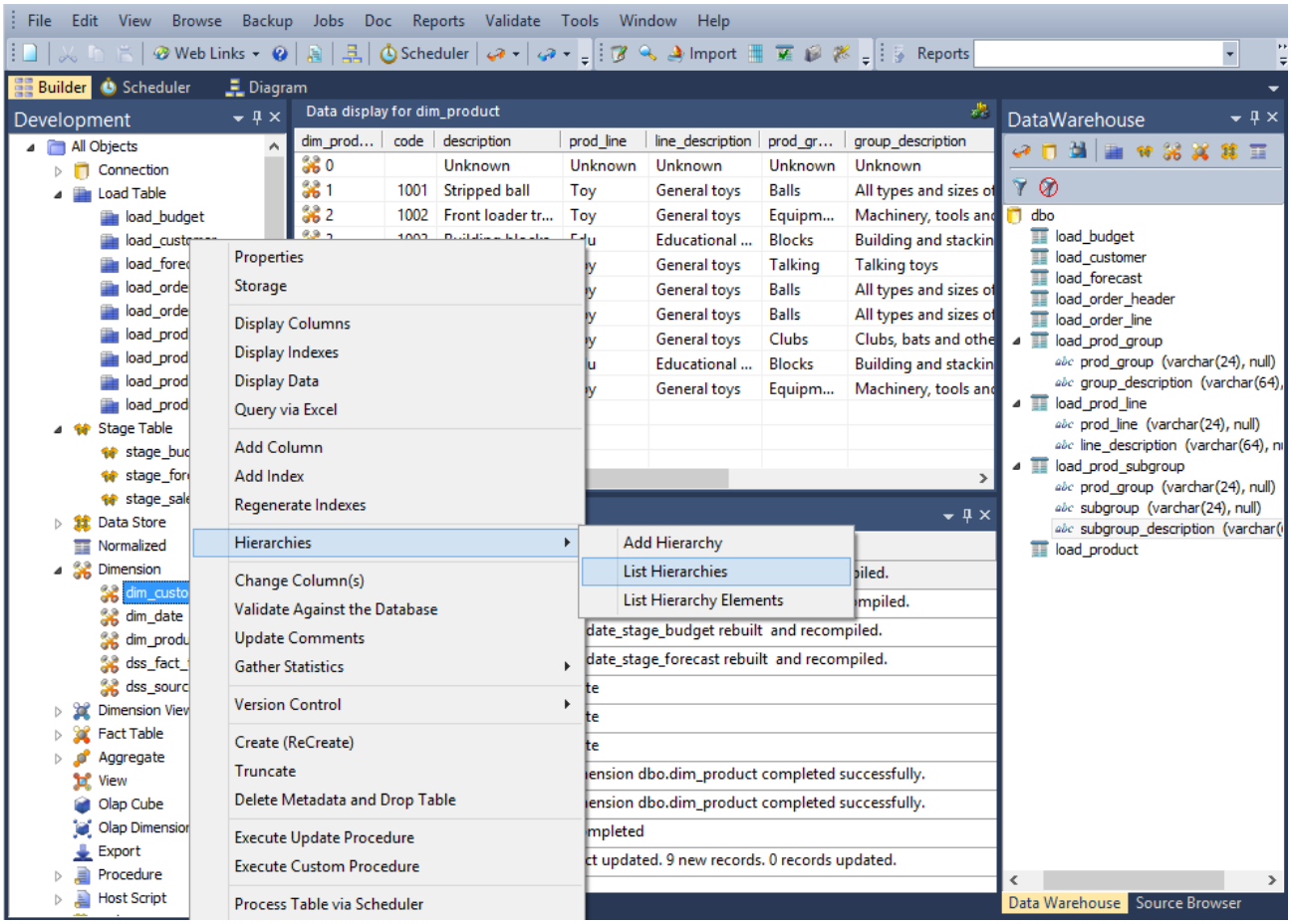
You are now ready to proceed to the next section - ***Creating a Dimension Hierarchy*** (see "***4.4 Creating a Dimension Hierarchy***" on page 124)

4.4 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.

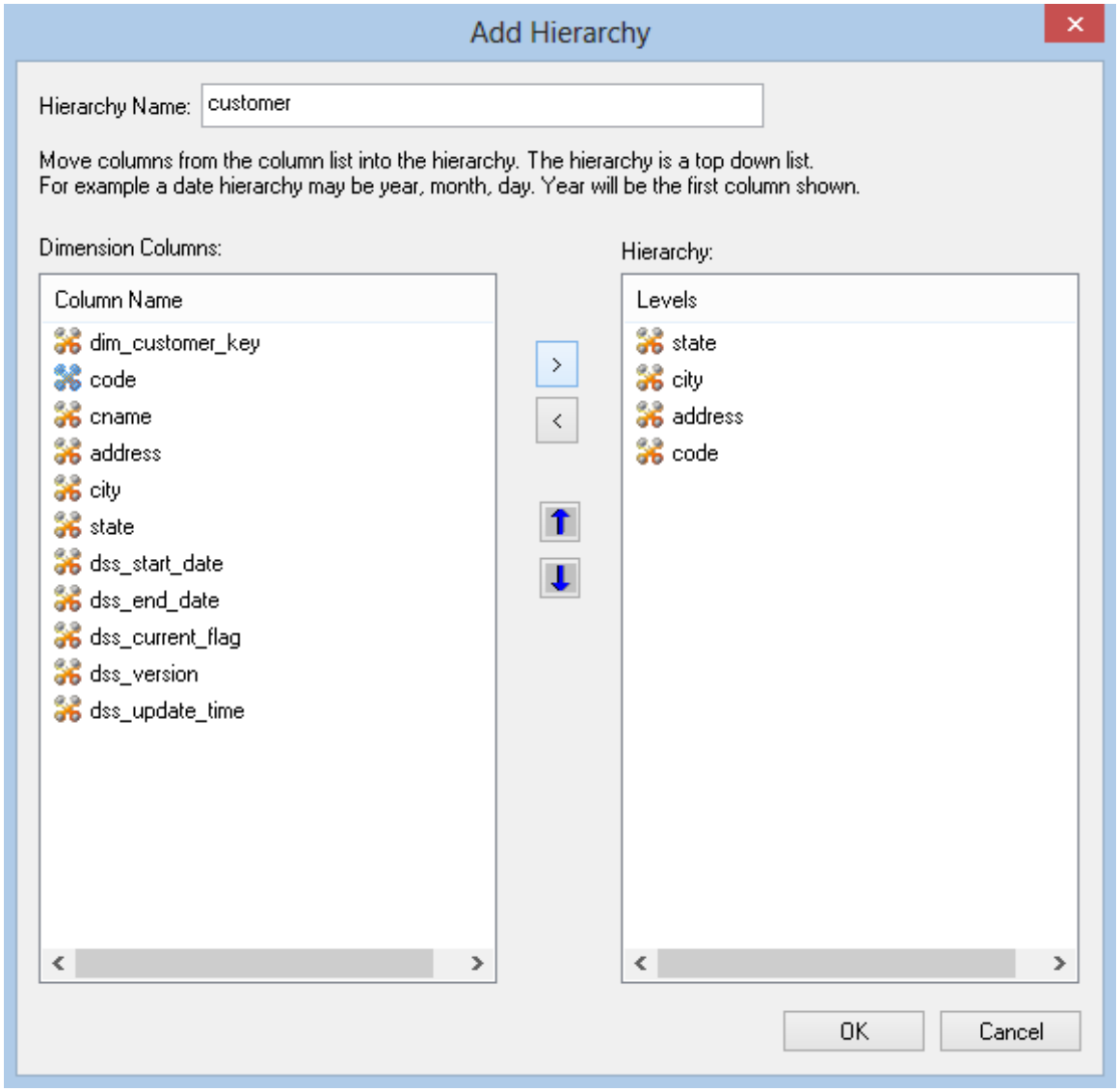
1 Right-click on **dim_customer** in the left pane and select **Hierarchies / List Hierarchies**.



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

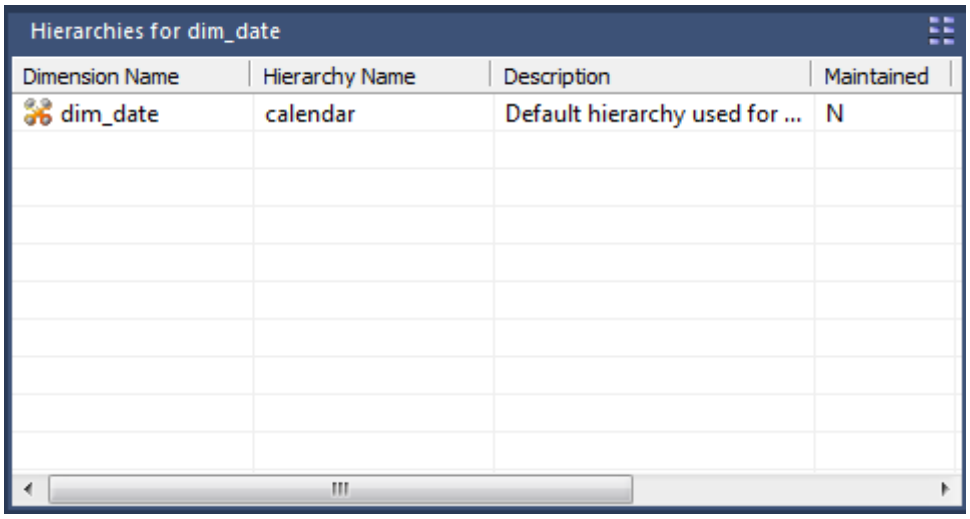
3 Right-click on **dim_customer** in the left pane and select **Hierarchies / Add Hierarchy**.

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.

Tutorial 5
Analysis Services Cubes

Before you start on this chapter you should have:

- ☐ Completed ***Tutorial 1 - Basic Star Schema Fact Table*** (see "***Basic Star Schema Fact Table***" on page 1)
- ☐ Completed ***Tutorial 2 - Rollup Fact Tables, ASCII File Loads, Aggregates*** (see "***Rollup Fact Tables, ASCII File Loads, Aggregates***" on page 65)
- ☐ Completed ***Tutorial 4 - Complex Dimensions and Hierarchies*** (see "***Complex Dimensions and Hierarchies***" on page 105)

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

In This Tutorial

5.1 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*** (see "***5.4 Cube Connections for Other Databases***" on page 172) 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*** (see "***5.2 Creating an OLAP Cube Object***" on page 129)

5.2 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.

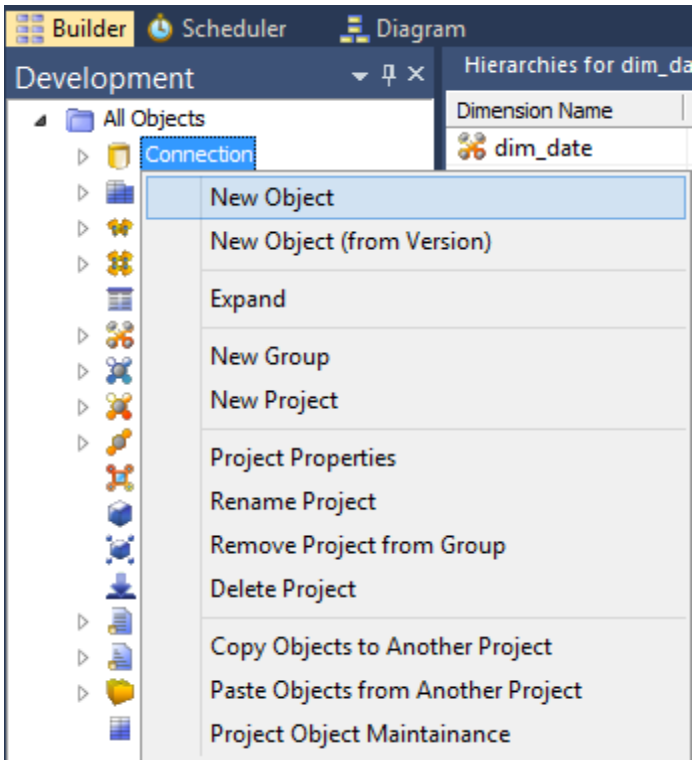
In this step we will create an **OLAP Cube** from the *fact_sales_detail* table. Before we start we need to have access to a Microsoft Analysis Services server with appropriate security rights to create an OLAP database.

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

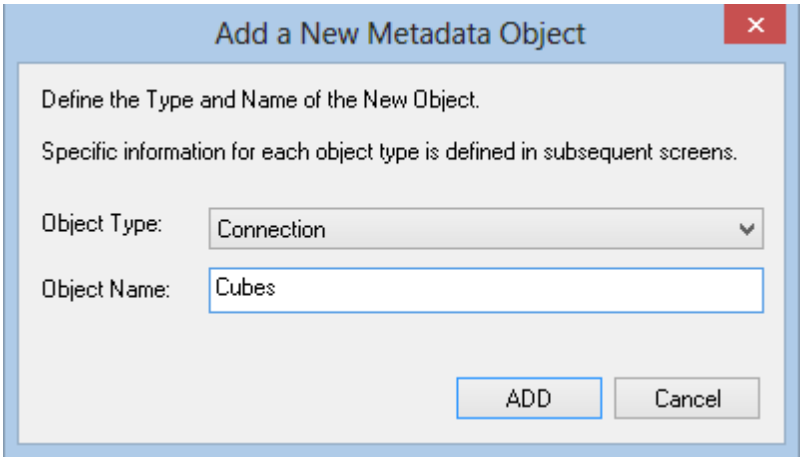
Note: This tutorial is only possible if an Analysis Services server is available

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.

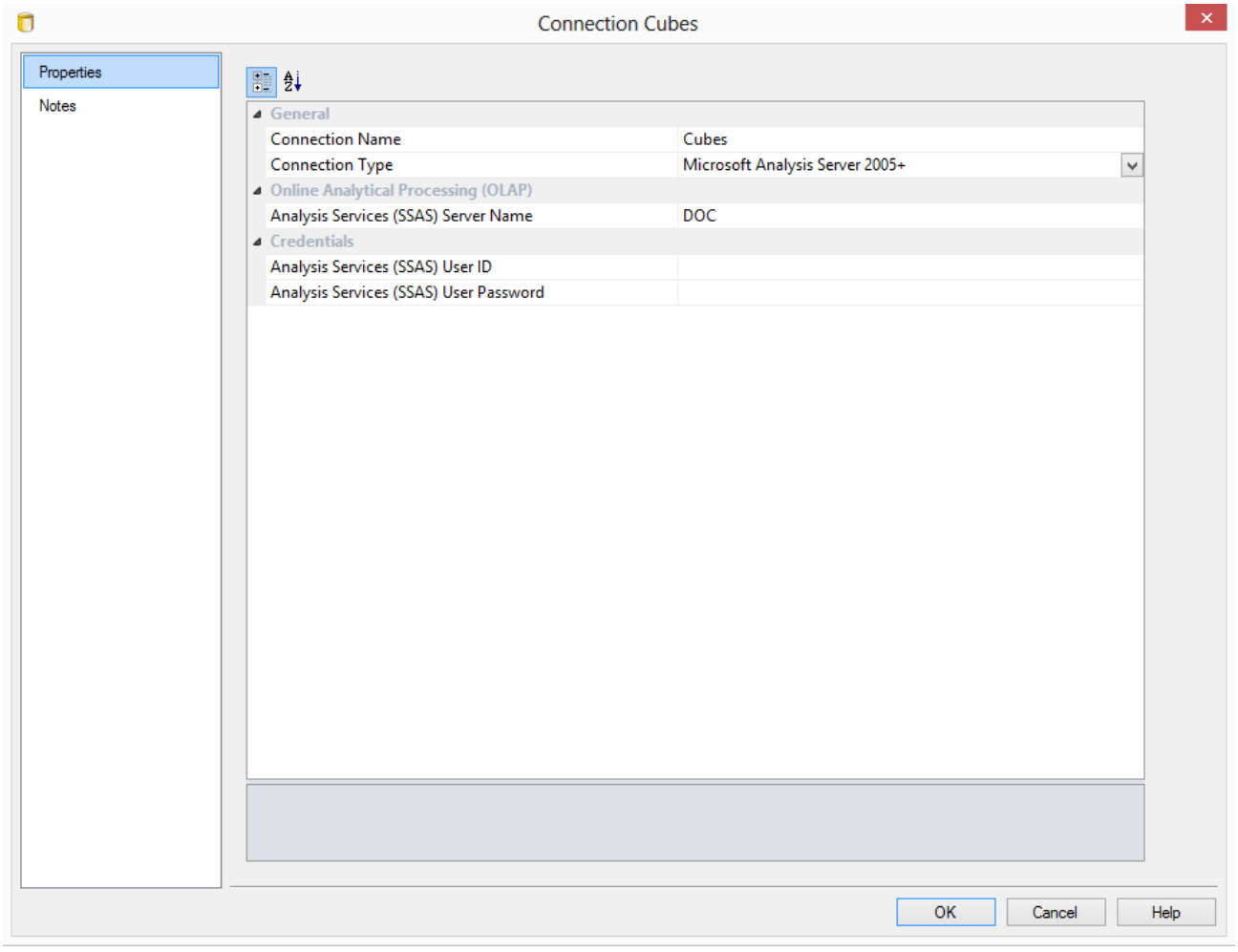
1 Create a new **connection** for the Analysis Services server. Right-click on the **Connection** object group in the left pane and select **New Object**.



2 Enter a name of **Cubes** for the connection and click **ADD.**

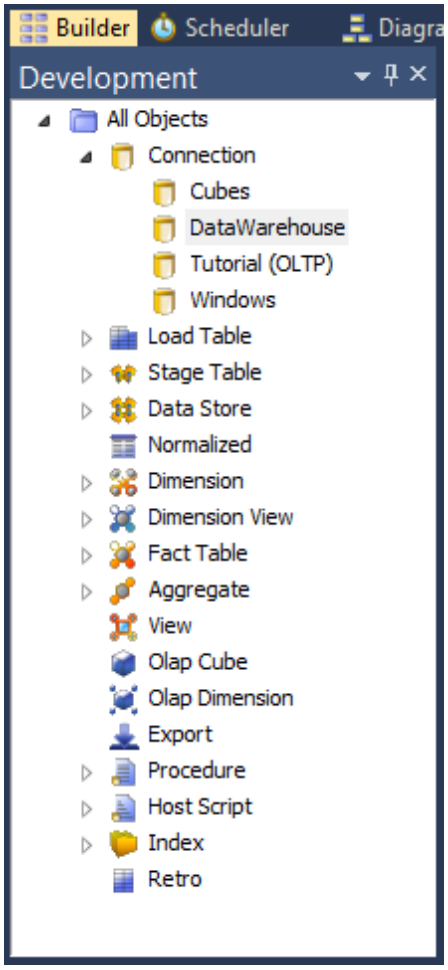


3 The connection Properties screen will now appear. Select the connection type: **Microsoft Analysis Server 2005+**. Enter the **name** of the server for the Analysis Server. Leave the username and password blank. Enter the server and database details for your Analysis Services server. A sample is shown next. Click **OK**.



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

4 Expand the Connection object group in the left pane and double-click on the DataWarehouse connection to bring up the **Properties** dialog.

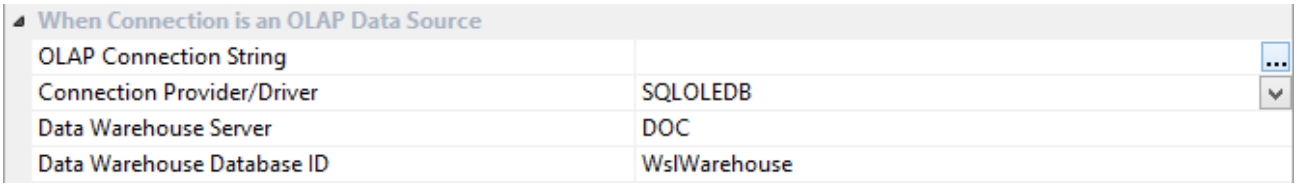


5 The Properties dialog will now show some additional columns at the bottom of the screen. These are required so that the data warehouse can be used as a source for the Analysis Services cubes. These fields are:

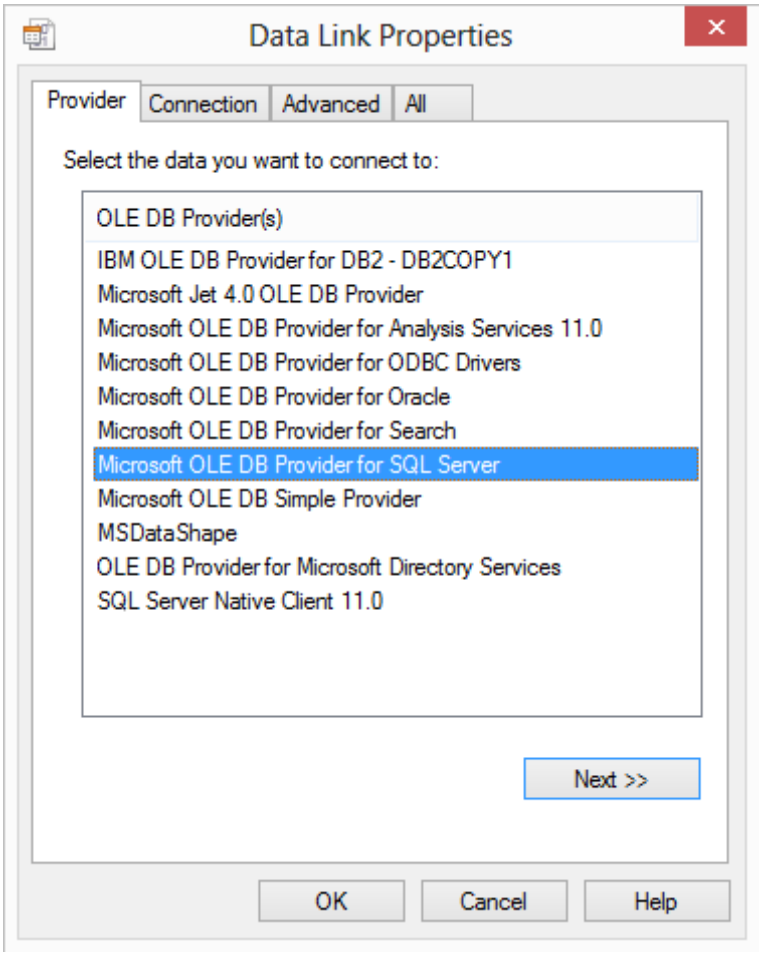
- OLAP Connection String
- Connection Provider/Driver
- Data Warehouse Server
- Data Warehouse Database ID

For a SQL Server data warehouse:

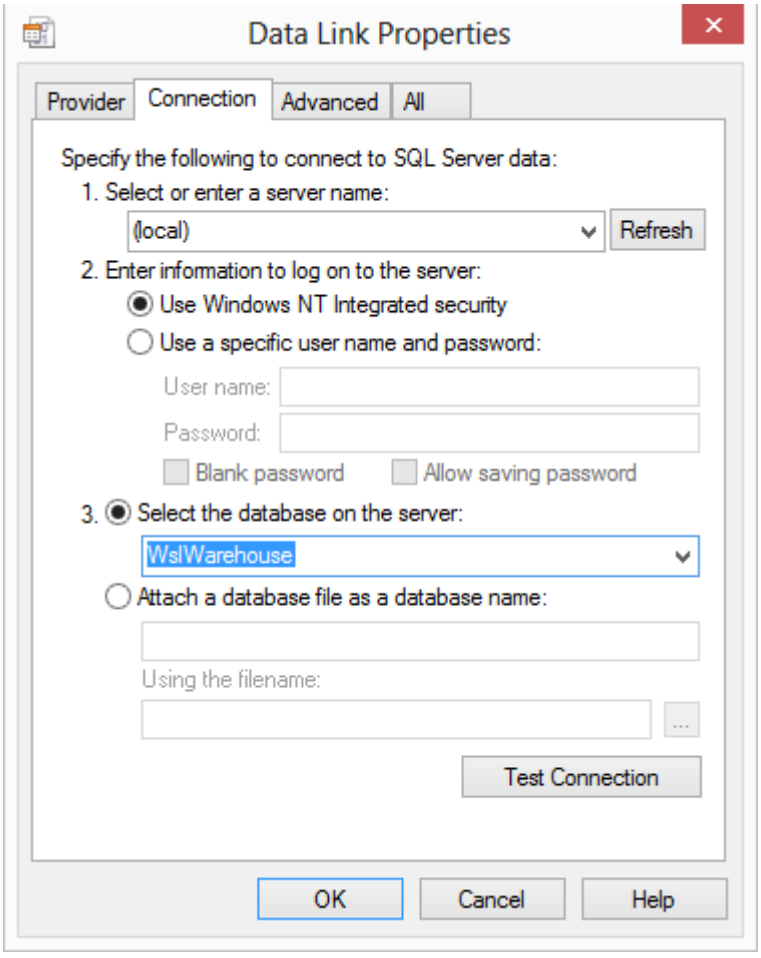
- The **OLAP Connection String** is built using a wizard. To activate the wizard, click on the expander button.



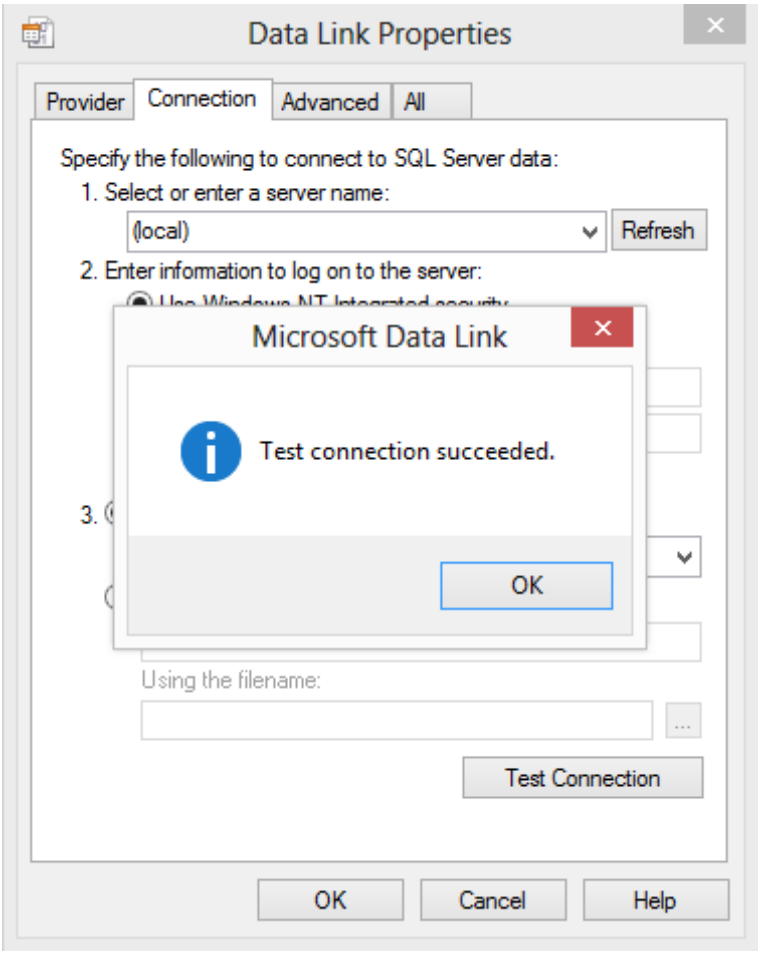
On the Provider tab, select the **OLE DB Provider** and click **Next**.



Enter the connection details and click Test Connection.



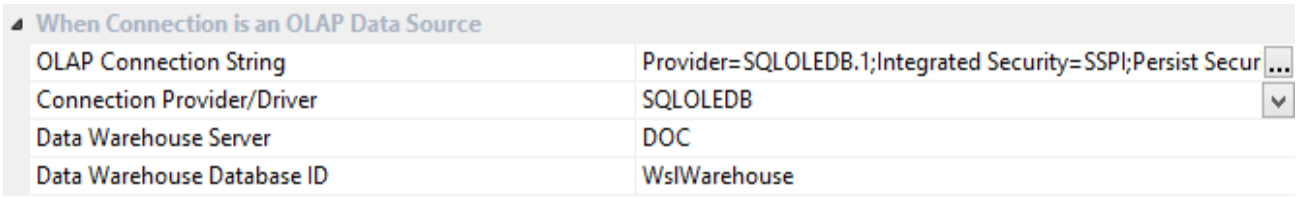
Click **OK** on the success message and then **OK** again on the Data Link Properties screen.



The OLAP connection string will be displayed.

- Set **Connection Provider/Driver** to *SQLOLEDB*
- Set **Data Warehouse Server** to the SQL Server *server name*
- Set **Data Warehouse Database ID** to the SQL Server *database name*

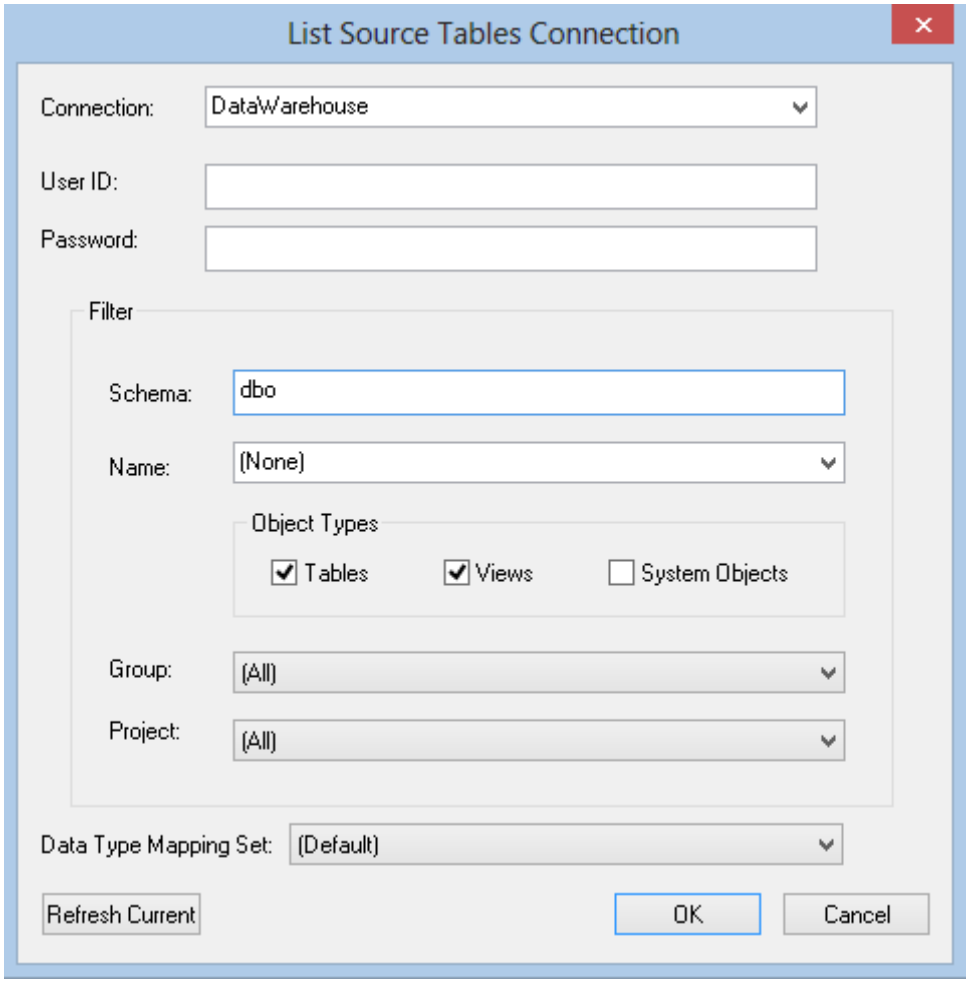
A SQL Server sample:



Click **OK**.

See ***Cube Connections for Other Databases*** (see "***5.4 Cube Connections for Other Databases***" on page 172) for more details on Oracle and DB2.

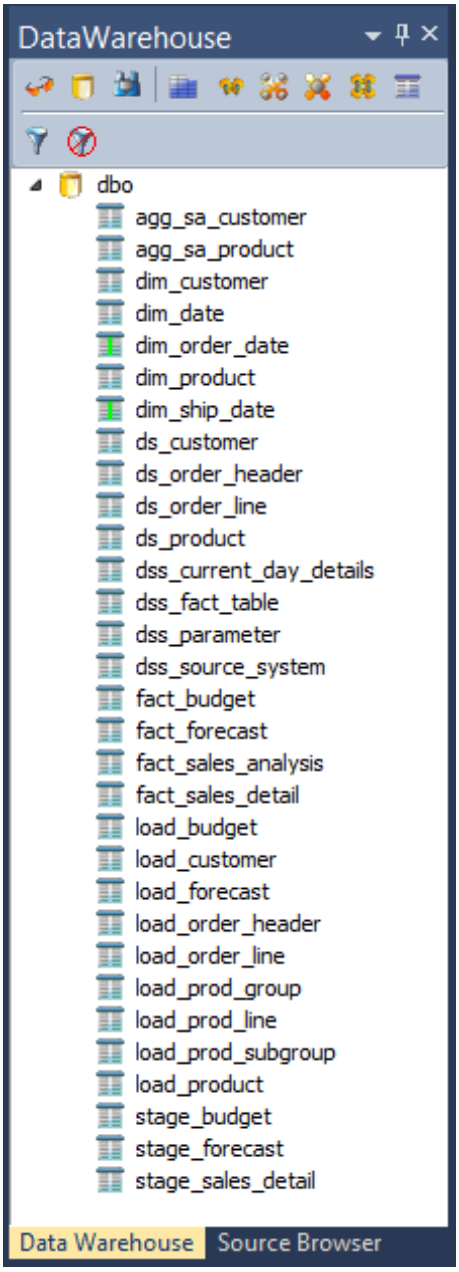
6 Now you need to browse the *DataWarehouse* connection to see available fact tables. From the **Browse** menu, select **DataWarehouse** then **Change Connection**. The following dialog displayed.



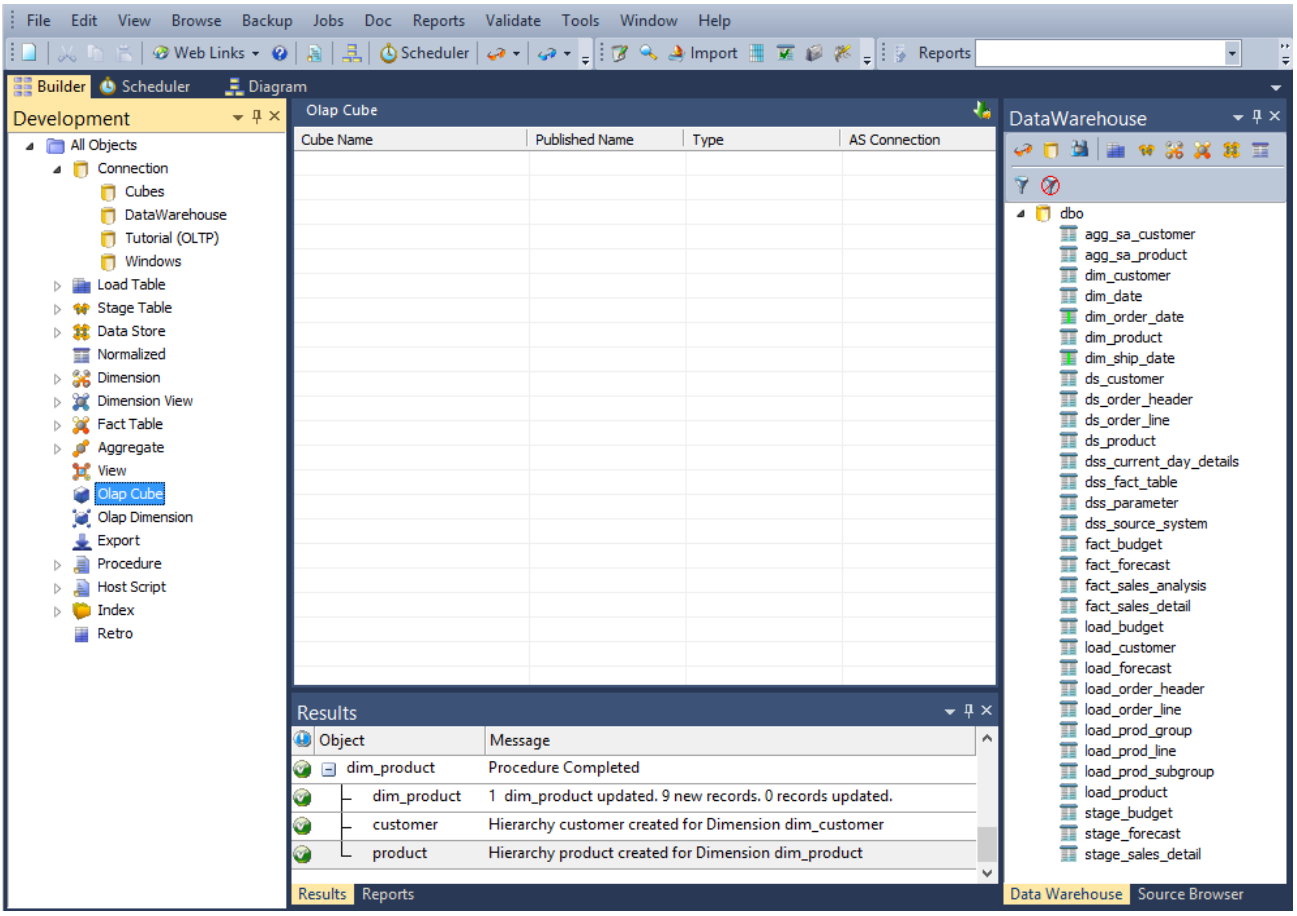
Choose *DataWarehouse* from the **Connection** drop-down and click **OK**.

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

The following browse pane is displayed.

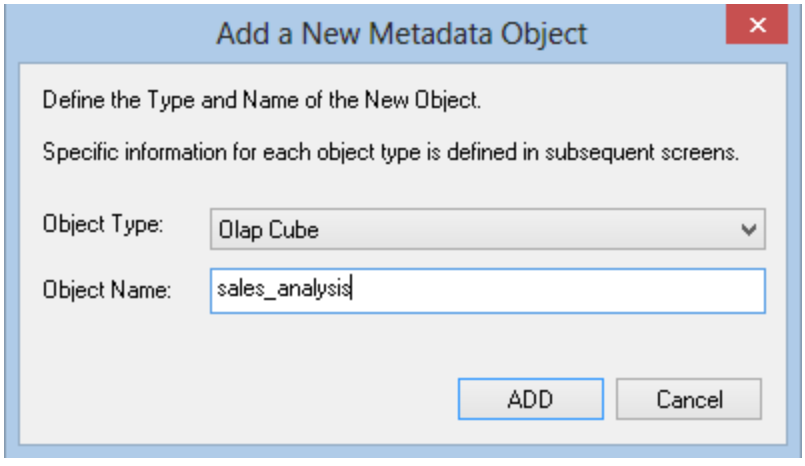


7 Double-click on the **OLAP Cube** object group in the left pane to list all cubes in the middle pane. This makes the middle pane a drop target for cubes. Your screen should look something like this:

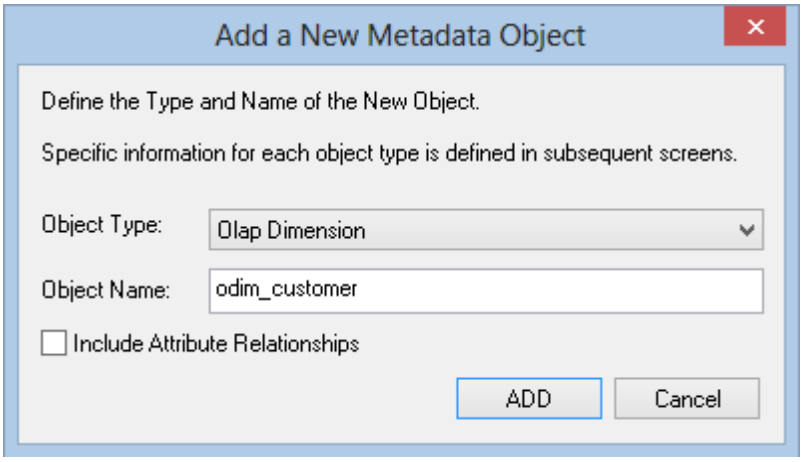


Note: As **OLAP Cubes** have not been created yet, the middle pane is empty.

8 Drag **fact_sales_detail** from the browser (right 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 and click **ADD**.



9 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.

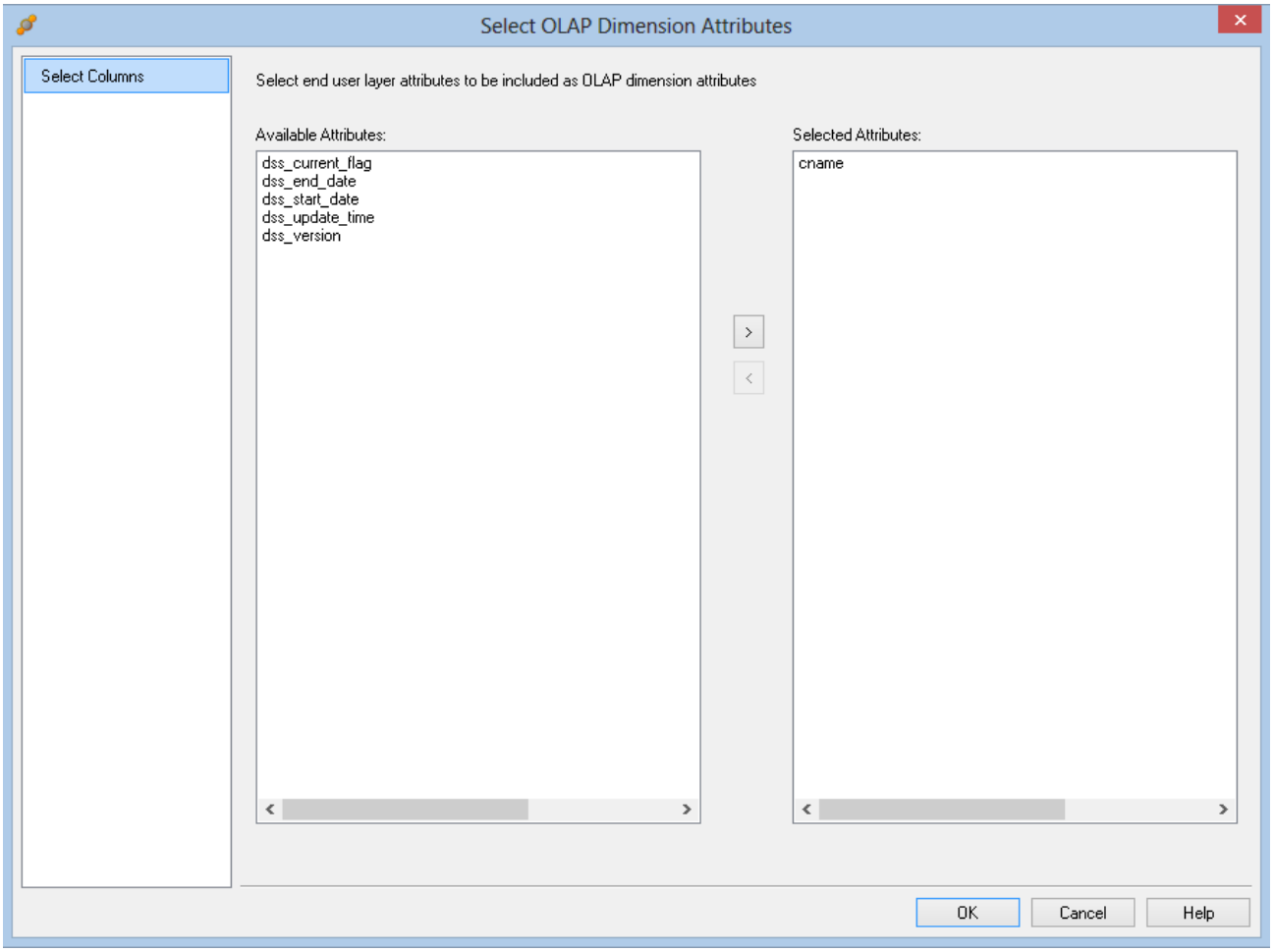


Note: If you wish to include Attribute Relationships in Analysis Services for this dimension, click on the **Include Attribute relationships** checkbox.

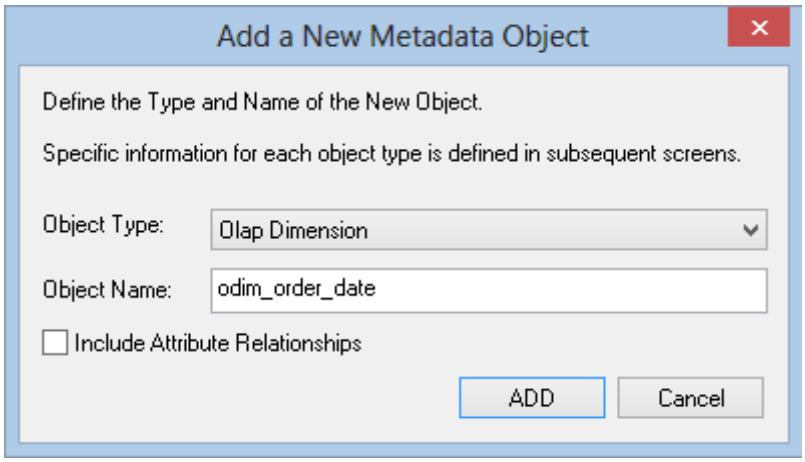
Click **ADD** for the *Customer* dimension.

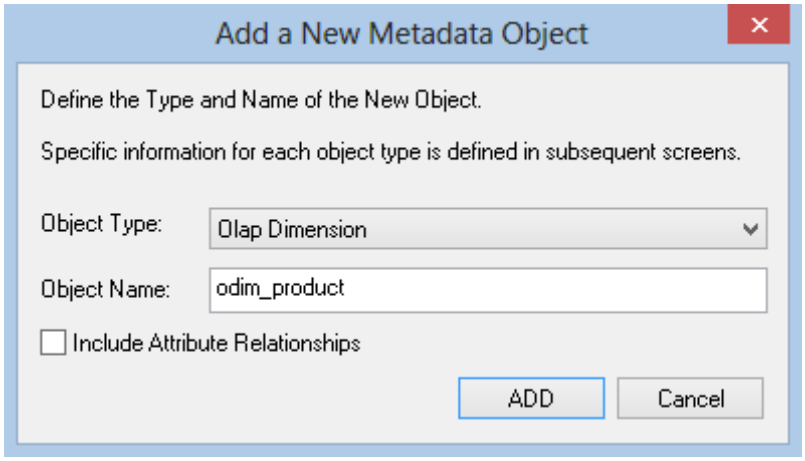
10 The following dialog appears, prompting you to select the attributes to be included in the *Customer* OLAP dimension. The attributes available for selection are in the left column. To select an attribute, click on the attribute in the left column and click **>**. This will move the attribute to the right column.

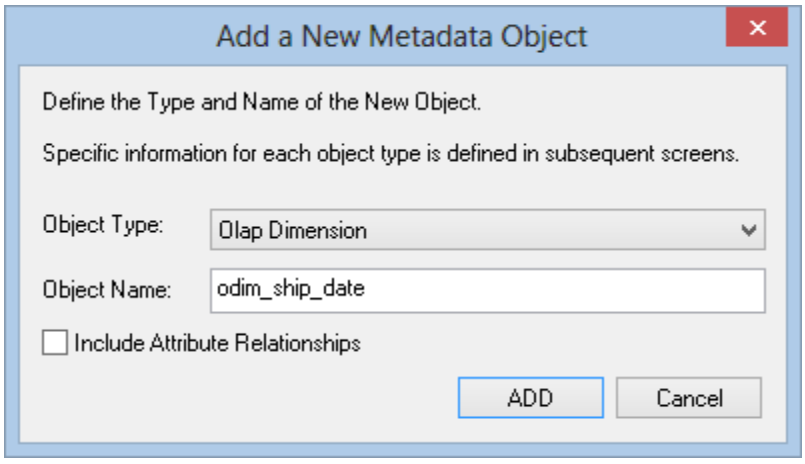
To de-select an attribute, click on the attribute in the right column and click **<**. This will move the attribute to the left column.



11 Repeat **steps (9) and (10)** for the remaining **OLAP Dimensions.**





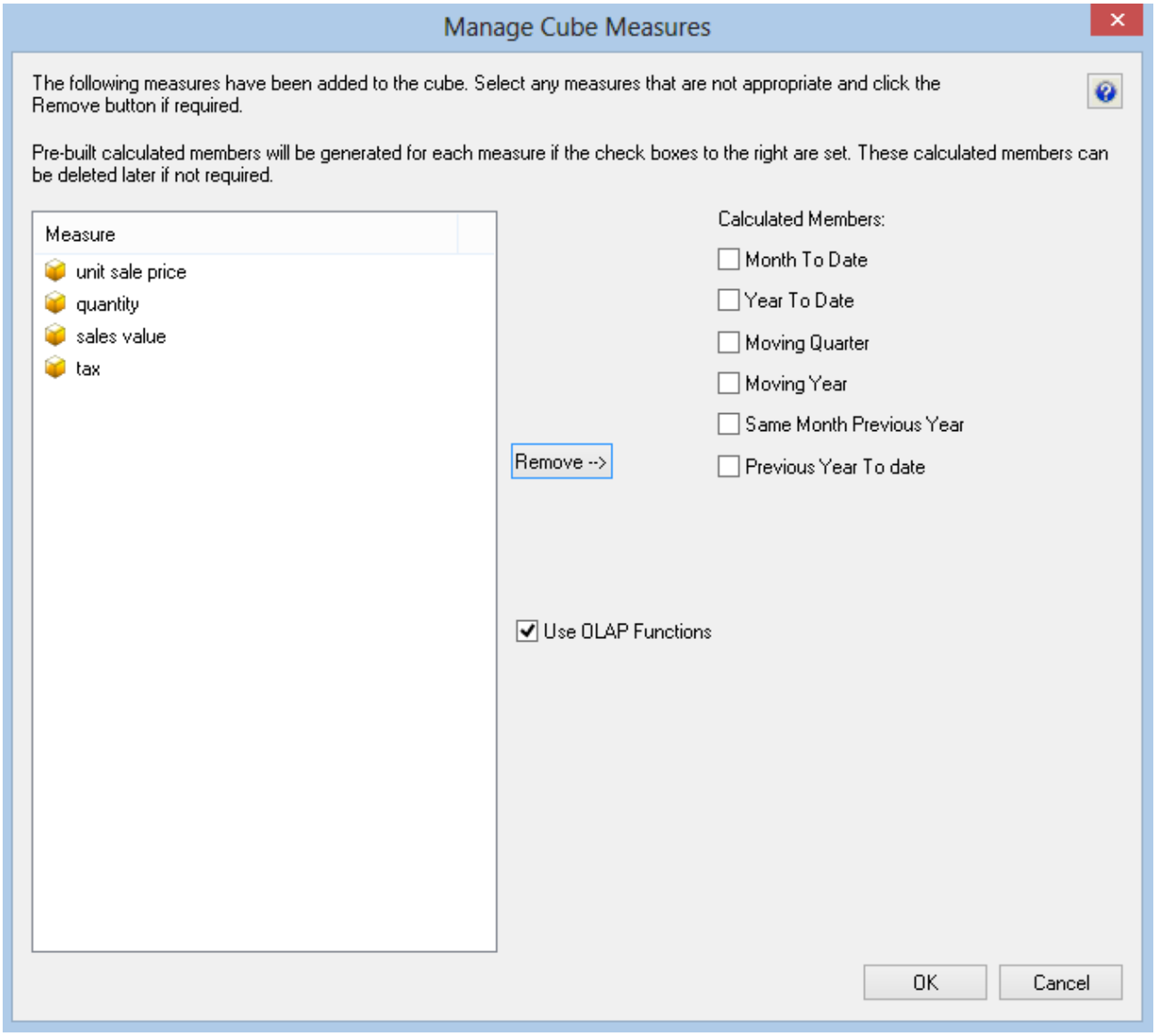


12 The **Manage cube measures** dialog is displayed next. Remove all non-measure columns (that is, columns that cannot be aggregated) from the **Measure** list by highlighting them and clicking the **Remove** button.

The columns to remove are:

- **order number**
- **order line no**
- **product code**
- **customer code**

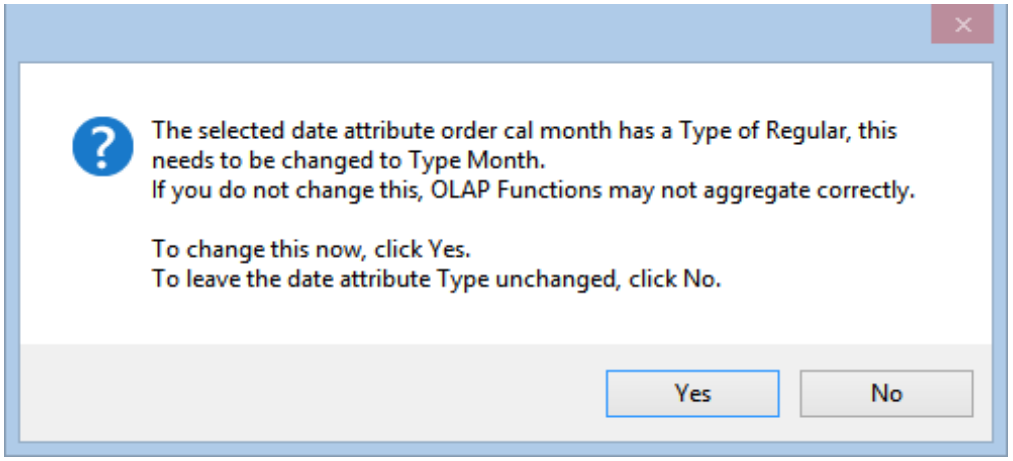
At this stage, your dialog should look like this.



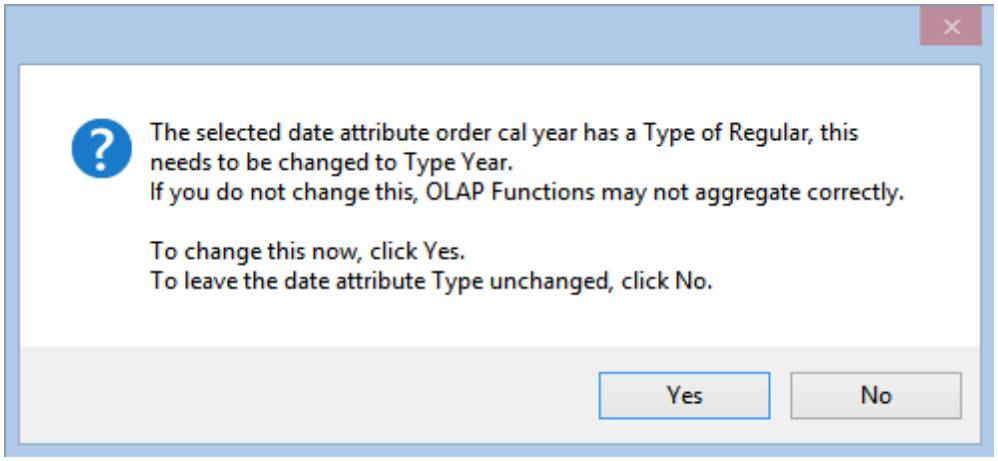
13 Choose to create some date based calculated members using OLAP functions by selecting the **Month to date**, **Year to date**, and the **Use OLAP functions** checkboxes. The calculated measures drop-downs are now displayed. Select the required **date hierarchy** information. Specifically:

- for **Date Dimension**, select *dim_order_date*
- for **Date Hierarchy**, select *calendar*
- for **Month Level**, select *order cal month*
- for **Year Level**, select *order cal year*

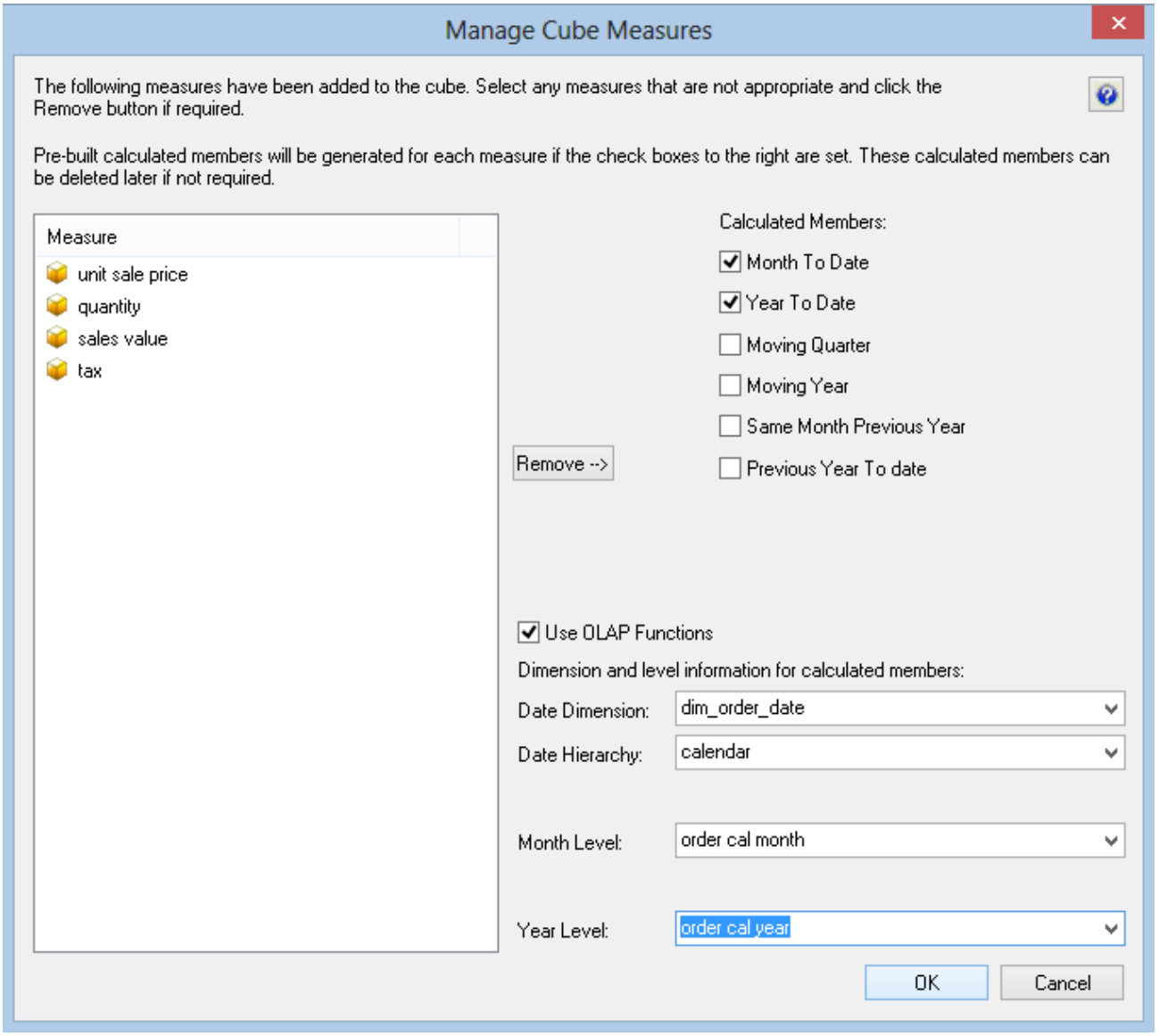
After selecting the **Month level**, you will be asked to confirm changing the **attribute type** to **Months** for the the *order cal month* attribute in Analysis Services as follows. Click **Yes**.



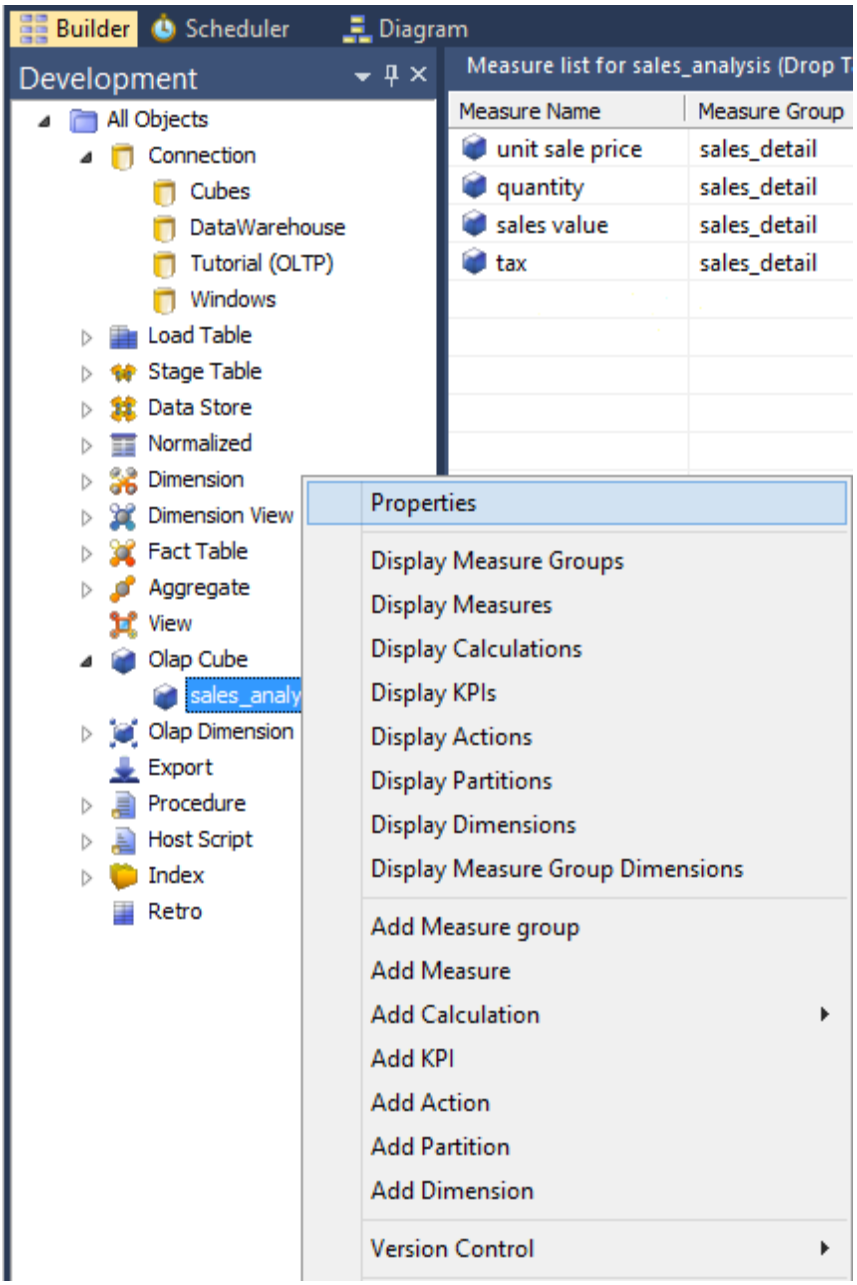
Similarly, selecting the **Year level**, you will be asked to confirm changing the **attribute type** to *Years* for the the *order cal year* attribute in Analysis Services as follows. Again click **Yes**.



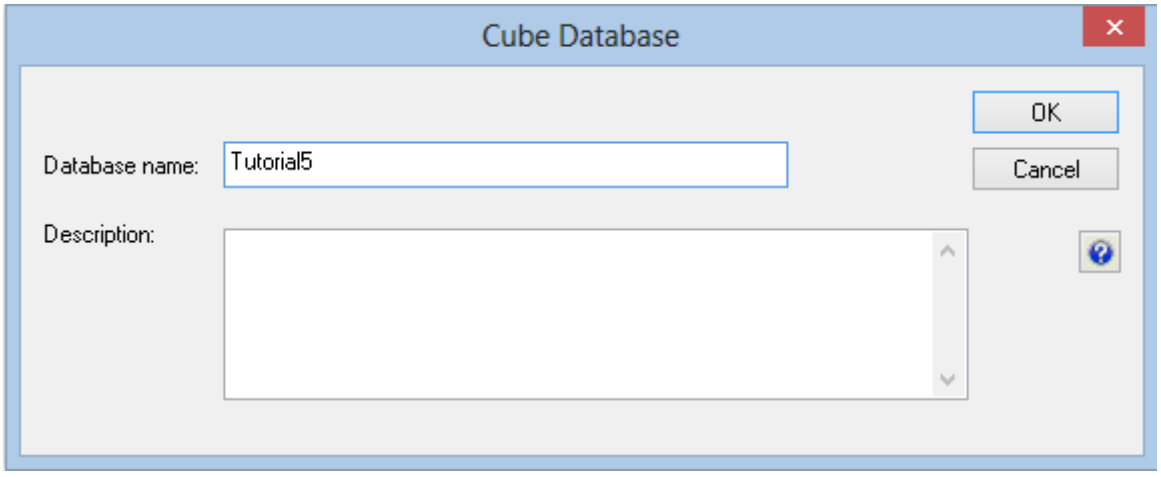
Your **Manage cube measures** dialog should now look like this. Click **OK** to complete the definition of the cube.


Manage Cube Measures
The following measures have been added to the cube. Select any measures that are not appropriate and click the Remove button if required.
Pre-built calculated members will be generated for each measure if the check boxes to the right are set. These calculated members can be deleted later if not required.
Measure
unit sale price
quantity
sales value
tax
Remove -->
Calculated Members:
Month To Date
Year To Date
Moving Quarter
Moving Year
Same Month Previous Year
Previous Year To date
Use OLAP Functions
Dimension and level information for calculated members:
Date Dimension:
dim_order_date
Date Hierarchy:
calendar
Month Level:
order cal month
Year Level:
order cal year
OK
Cancel

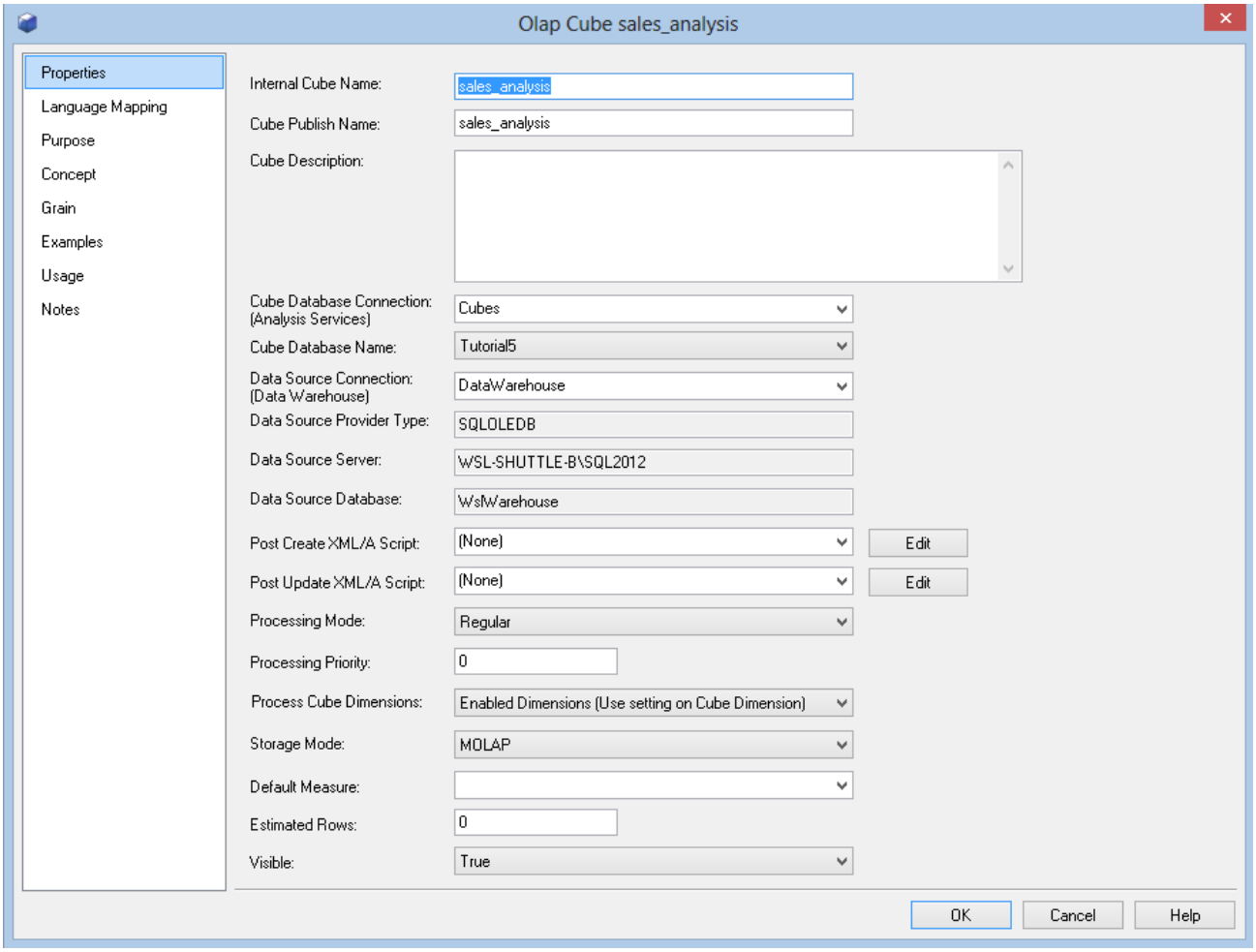
14 Right-click on the OLAP Cube **sales_analysis** in the left pane and select **Properties.**



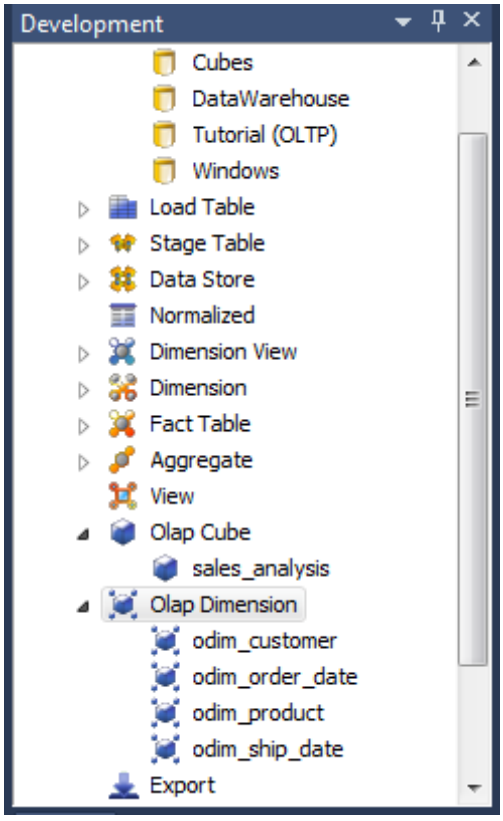
15 Click on the down arrow for the **Cube Database name** field and choose the option **(Define New Cube Database)**, which will bring up the **Cube database** dialog box. Enter a new cube Database name of **Tutorial5**. Click **OK.**



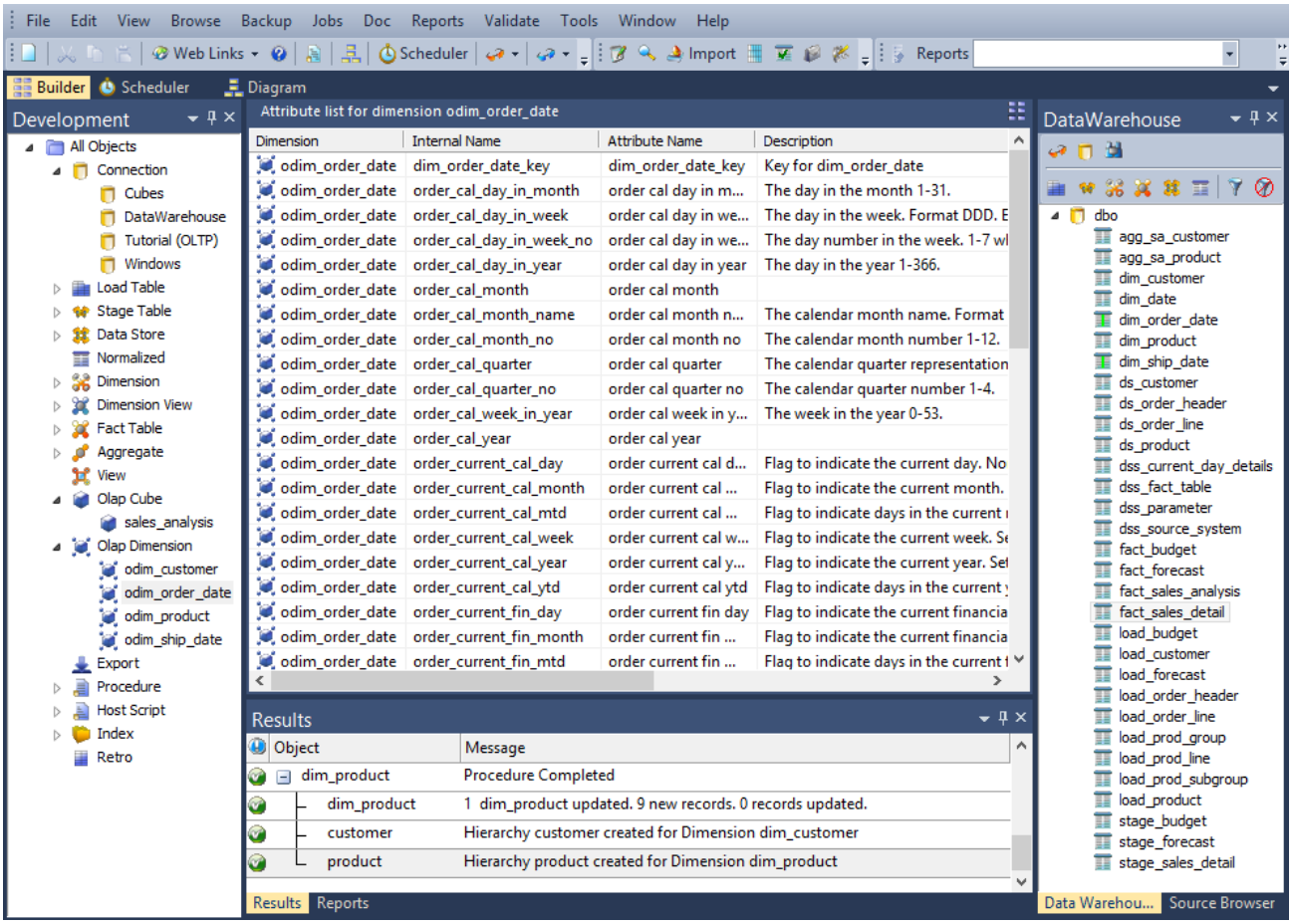
Change the Cube publish name to be **sales_analysis** and the Cube database connection to be **Cubes**. Click **OK** to close the dialog and save the changes you've made.



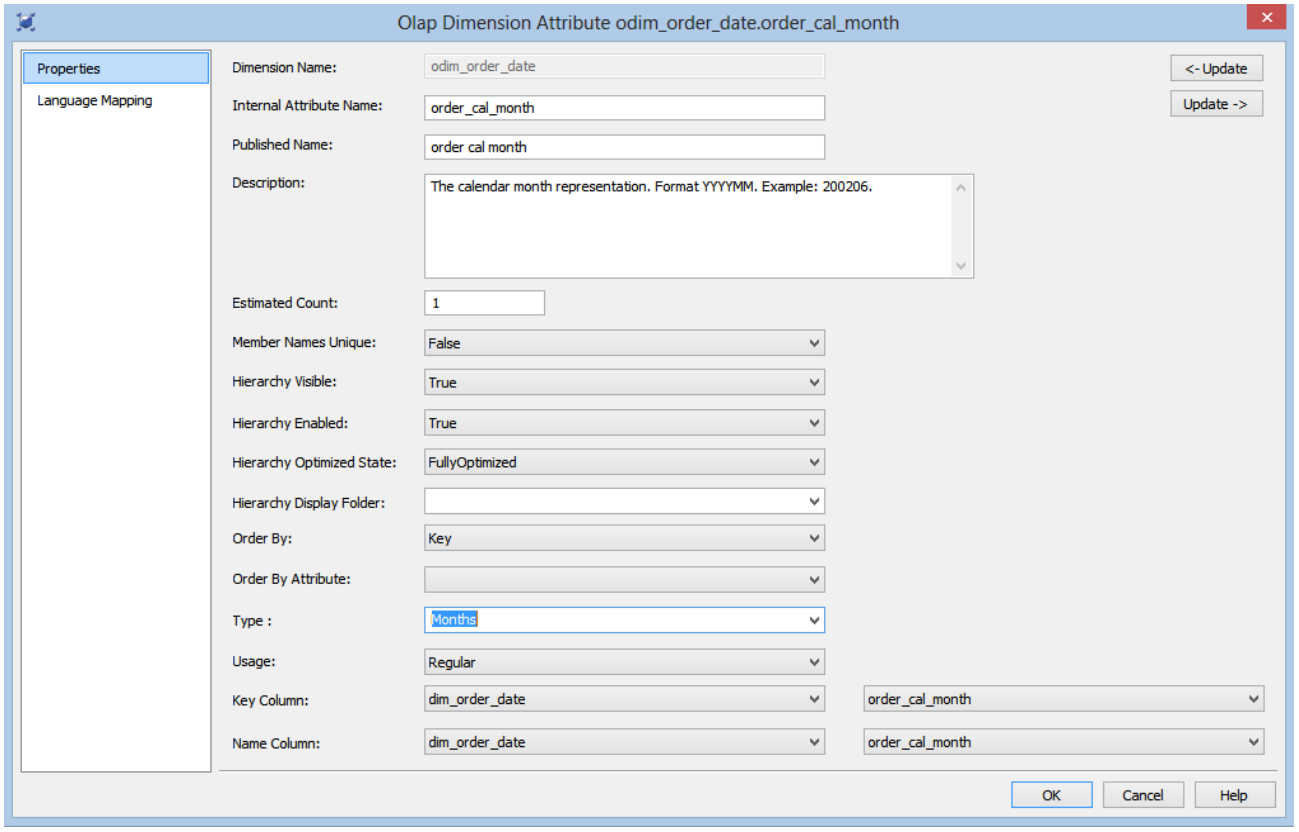
16 You now need to check that the date dimension supports using OLAP functions. Expand the **OLAP Dimension** object type in the left pane to display the four **OLAP Dimensions**. Your object tree should contain the following **OLAP Dimensions.**



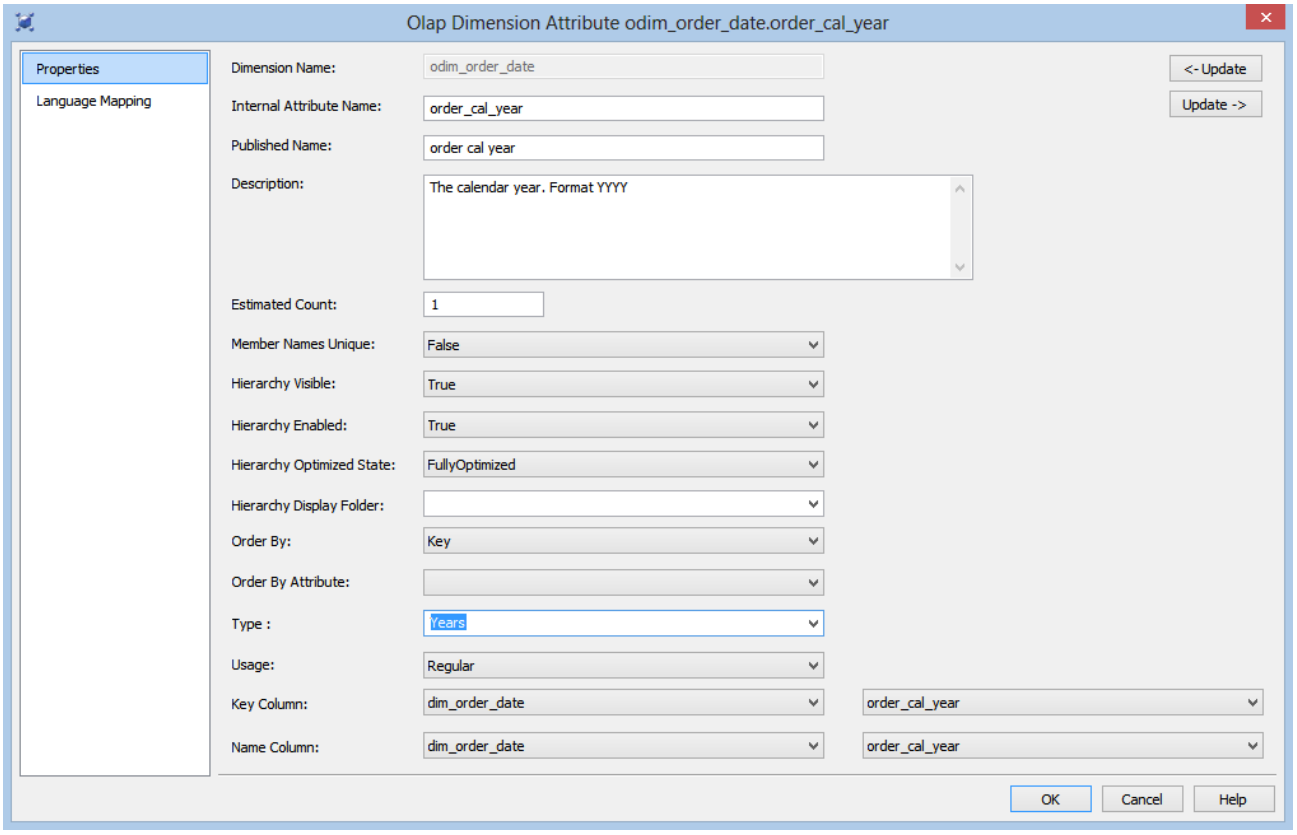
17 Click on the **odim_order_date** OLAP Dimension in the left pane to show the dimension attributes in the middle pane as below.



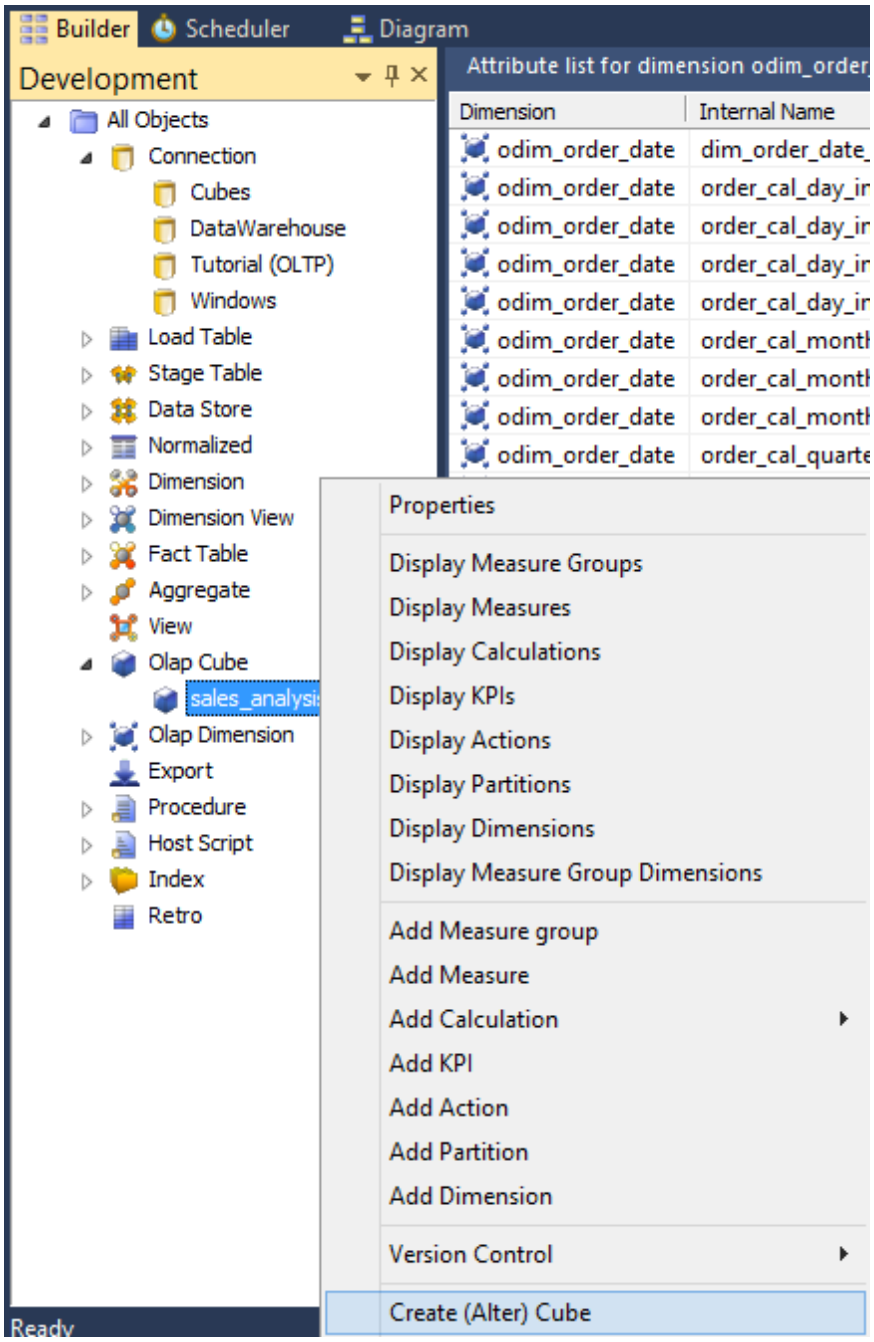
18 Right-click on the **order_cal_month** attribute and select **Properties**. This displays the Attribute Properties dialog. Check the **Type** is set to **Months**. If not, change it. Click **OK**.



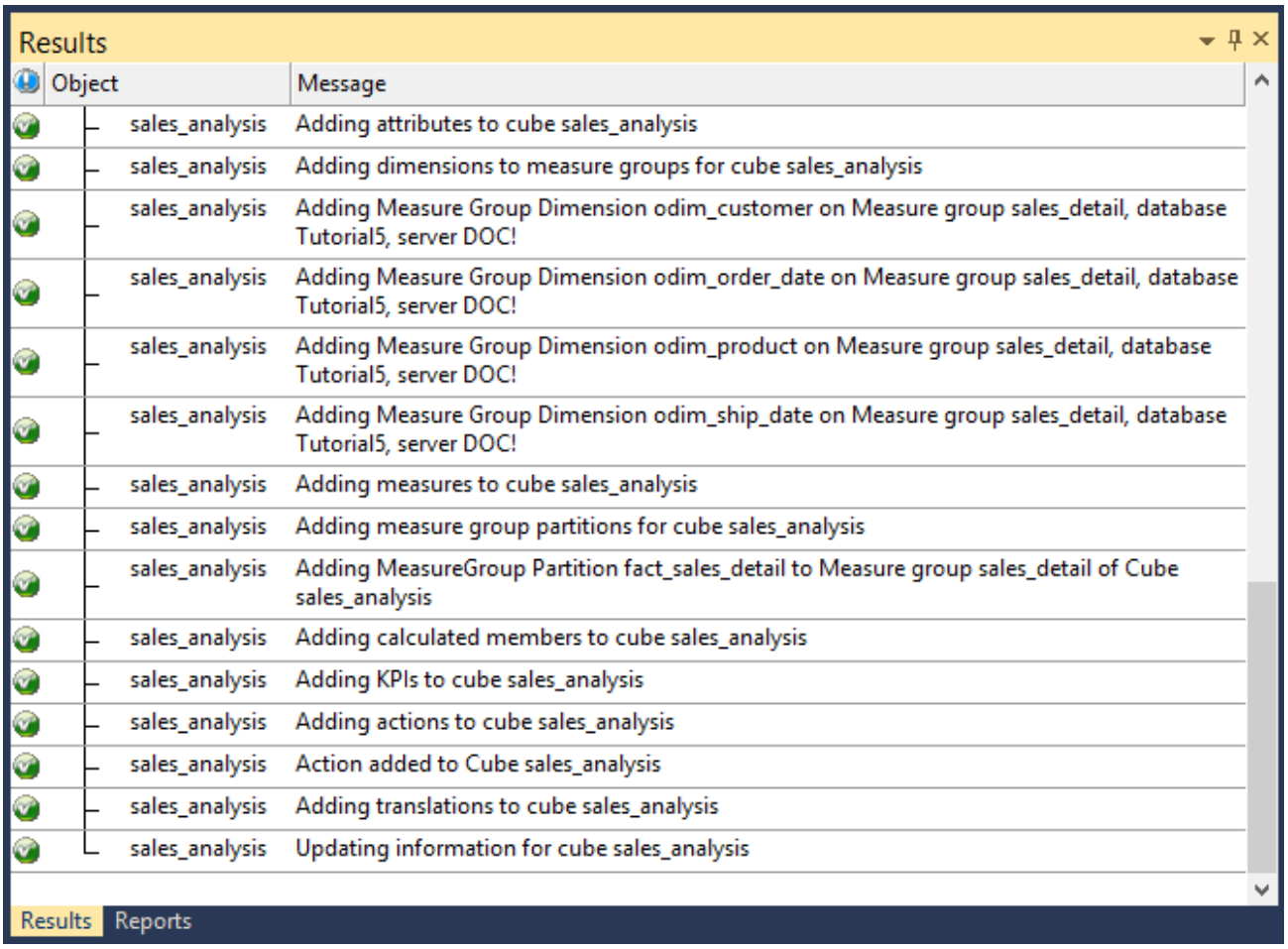
19 Repeat the process for the **order_cal_year** attribute, checking the **Type** is set to the **Years** and changing it if it is not. Click **OK**.


Olap Dimension Attribute odim_order_date.order_cal_year
Properties
Language Mapping
Dimension Name:
odim_order_date
Internal Attribute Name:
order_cal_year
Published Name:
order cal year
Description:
The calendar year. Format YYYY
Estimated Count:
1
Member Names Unique:
False
Hierarchy Visible:
True
Hierarchy Enabled:
True
Hierarchy Optimized State:
FullyOptimized
Hierarchy Display Folder:
Order By:
Key
Order By Attribute:
Type :
Years
Usage:
Regular
Key Column:
dim_order_date
order_cal_year
Name Column:
dim_order_date
order_cal_year
<- Update
Update ->
OK
Cancel
Help

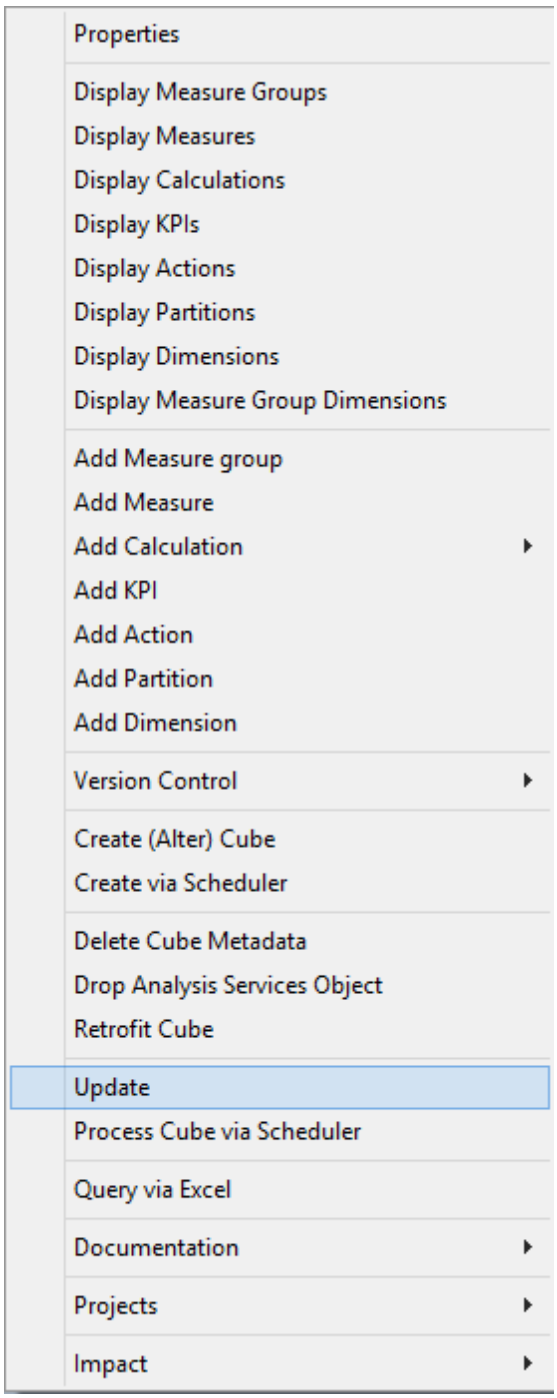
20 To create the cube in Analysis Services, right-click on the **sales_analysis** olap cube in the left pane and select **Create (Alter) Cube**.



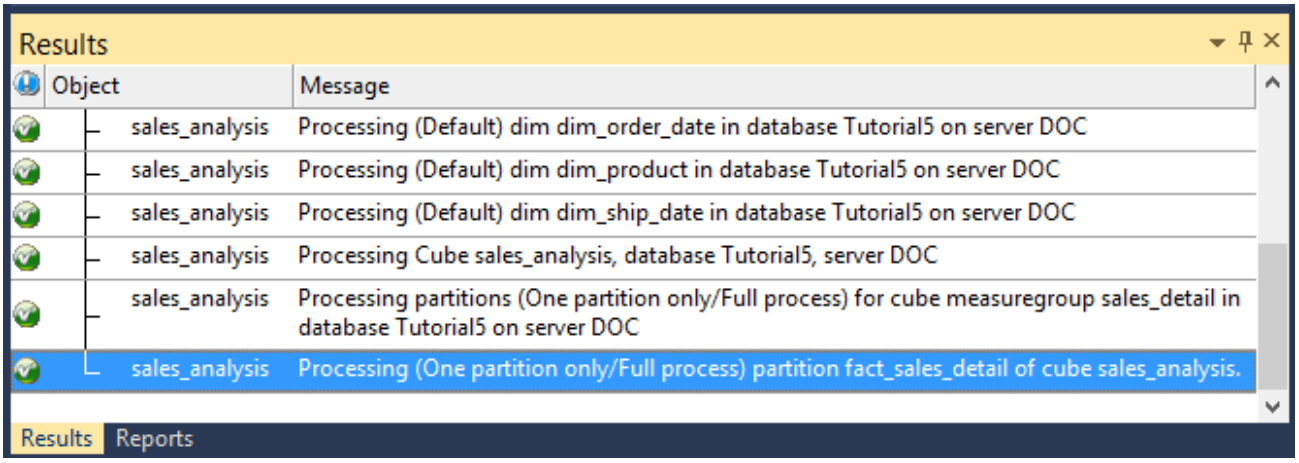
This will open the WSL Cube executable that connects to Analysis Services to create the *sales_analysis* cube structure. You will see the successful completion in the results pane.


Results
Object
Message
sales_analysis
Adding attributes to cube sales_analysis
sales_analysis
Adding dimensions to measure groups for cube sales_analysis
sales_analysis
Adding Measure Group Dimension odim_customer on Measure group sales_detail, database Tutorial5, server DOC!
sales_analysis
Adding Measure Group Dimension odim_order_date on Measure group sales_detail, database Tutorial5, server DOC!
sales_analysis
Adding Measure Group Dimension odim_product on Measure group sales_detail, database Tutorial5, server DOC!
sales_analysis
Adding Measure Group Dimension odim_ship_date on Measure group sales_detail, database Tutorial5, server DOC!
sales_analysis
Adding measures to cube sales_analysis
sales_analysis
Adding measure group partitions for cube sales_analysis
sales_analysis
Adding MeasureGroup Partition fact_sales_detail to Measure group sales_detail of Cube sales_analysis
sales_analysis
Adding calculated members to cube sales_analysis
sales_analysis
Adding KPIs to cube sales_analysis
sales_analysis
Adding actions to cube sales_analysis
sales_analysis
Action added to Cube sales_analysis
sales_analysis
Adding translations to cube sales_analysis
sales_analysis
Updating information for cube sales_analysis
Results
Reports

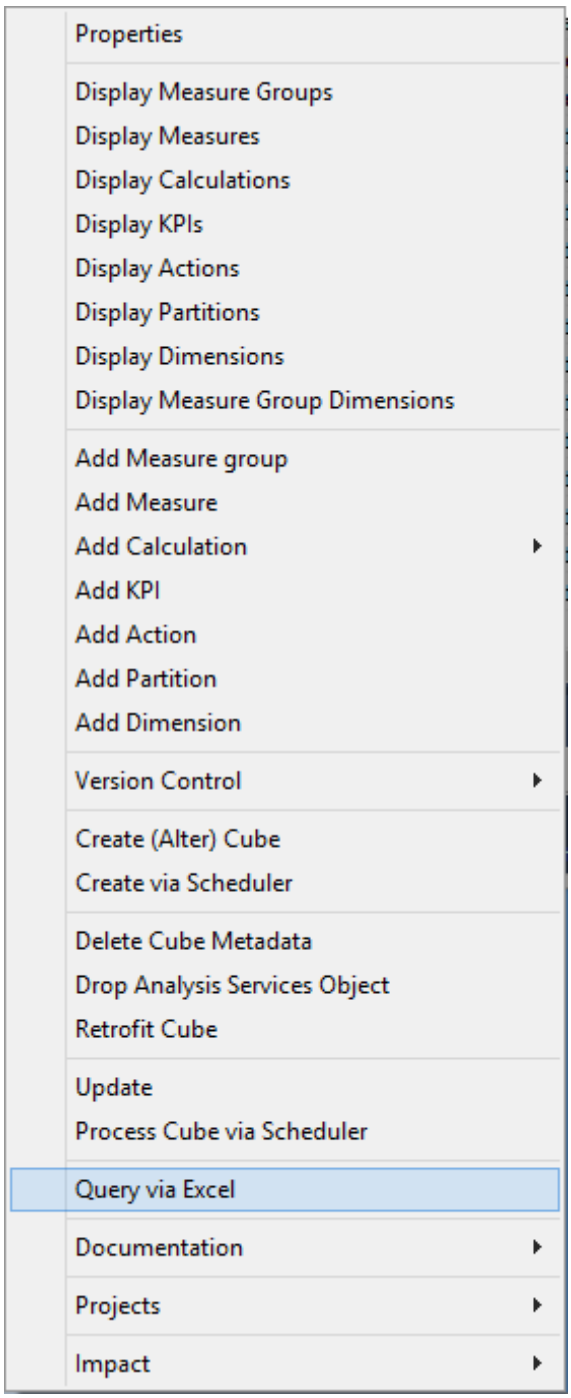
21 To process the cube *sales_analysis* in Analysis Services right-click the **sales_analysis** cube in the left pane and select **Update.**



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.

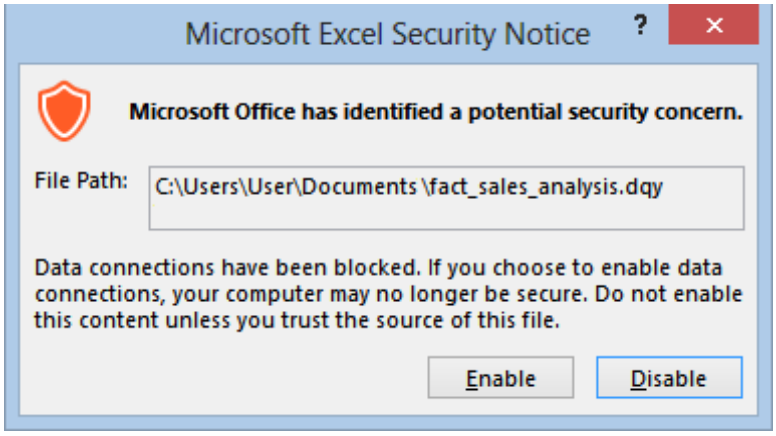

Results
Object
Message
sales_analysis
Processing (Default) dim dim_order_date in database Tutorial5 on server DOC
sales_analysis
Processing (Default) dim dim_product in database Tutorial5 on server DOC
sales_analysis
Processing (Default) dim dim_ship_date in database Tutorial5 on server DOC
sales_analysis
Processing Cube sales_analysis, database Tutorial5, server DOC
sales_analysis
Processing partitions (One partition only/Full process) for cube measuregroup sales_detail in database Tutorial5 on server DOC
sales_analysis
Processing (One partition only/Full process) partition fact_sales_detail of cube sales_analysis.
Results
Reports

22 To view the cube in Excel right-click the **sales_analysis** cube in the left pane and select **Query cube Via Excel** as follows.



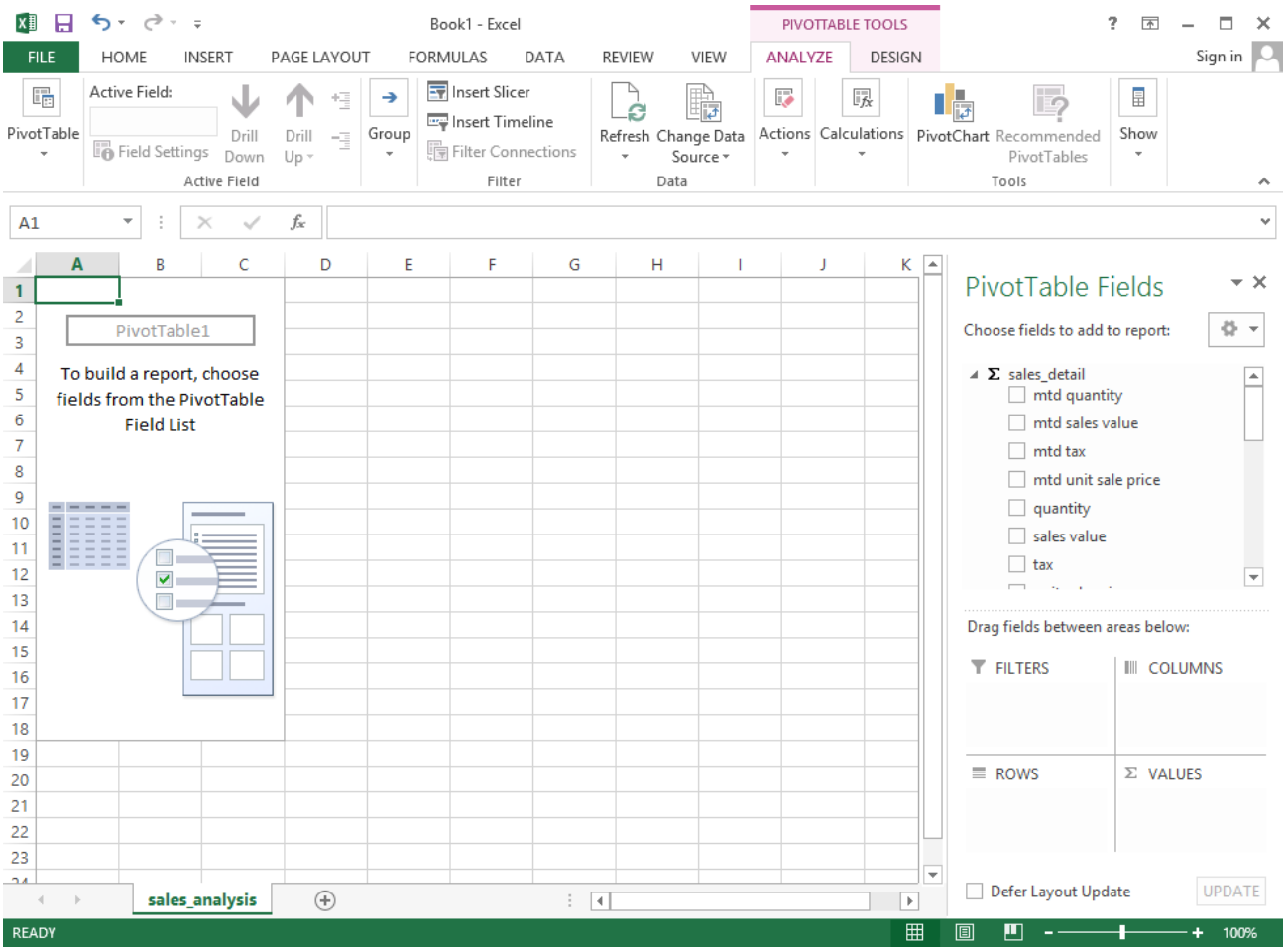
This will open Excel if it is installed.

Note: If Excel displays the following dialog box, click **Enable**:



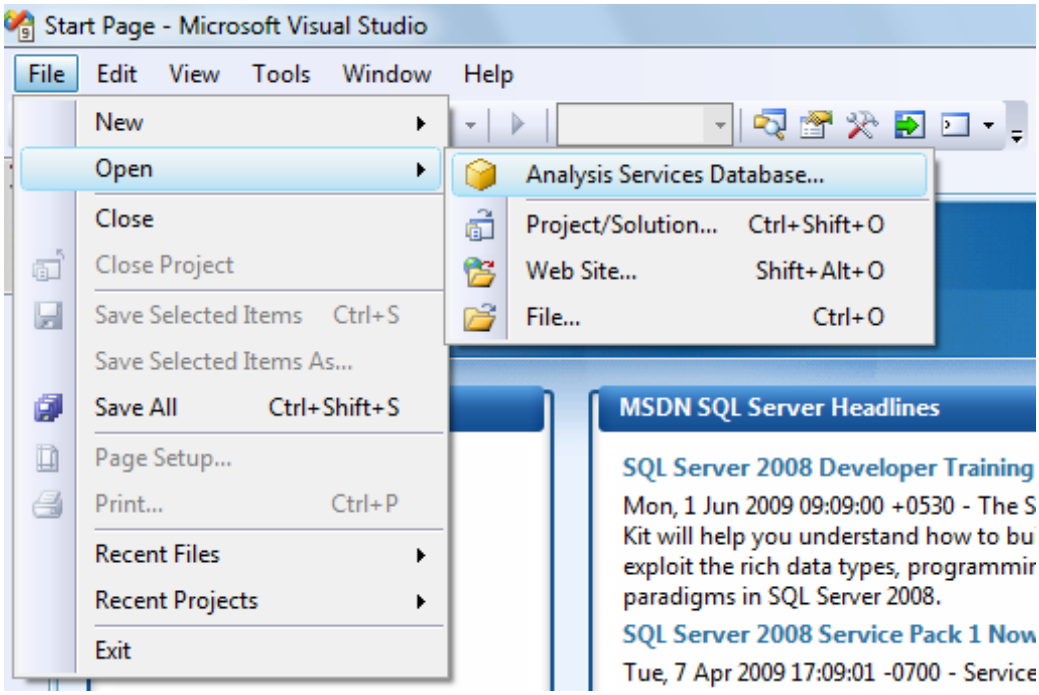
This message may not be displayed.

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

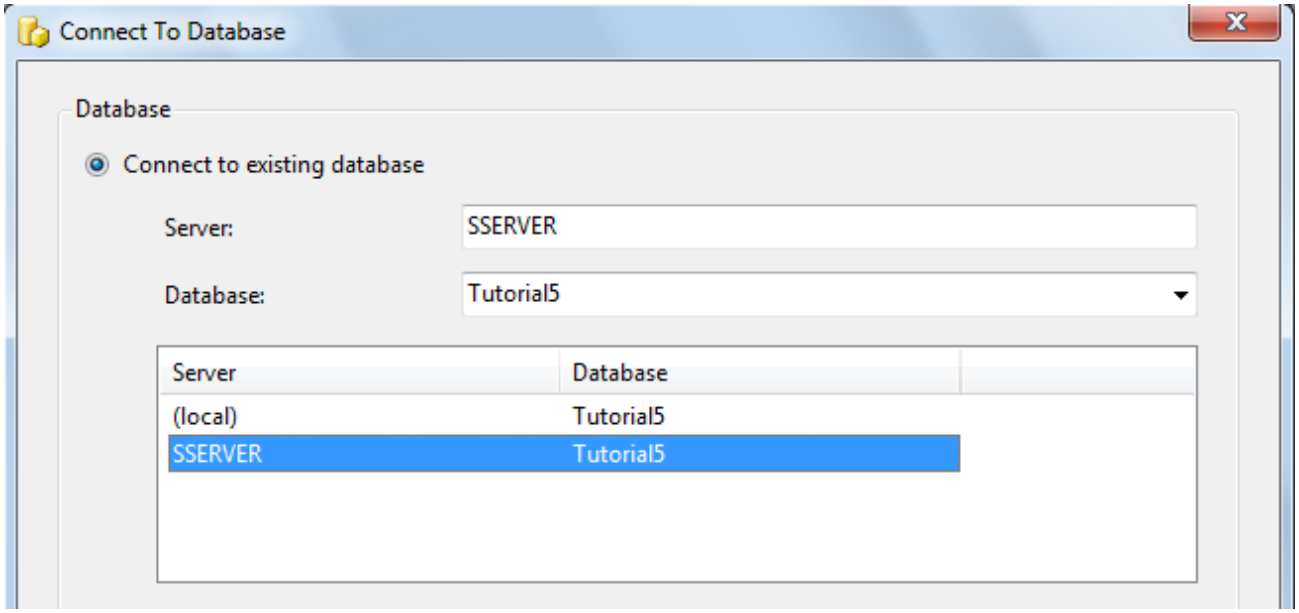


Note: In order for Excel to open the cube the **OQY** file extension in Windows explorer needs to be associated with Excel.

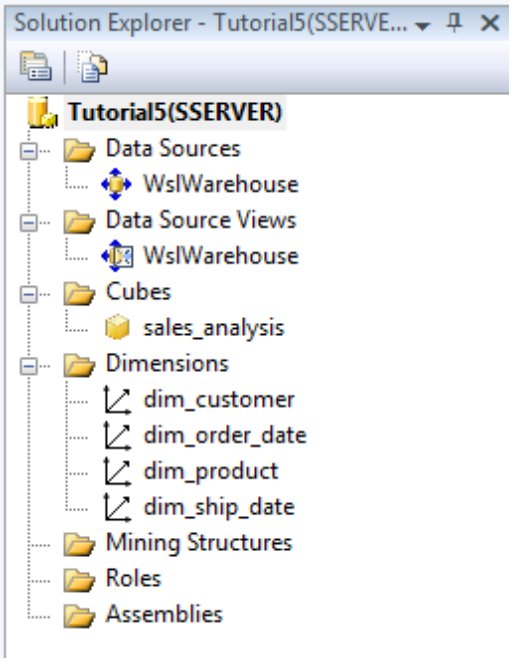
23 In addition, the cube structure can be opened in the Microsoft Business Intelligence Development Studio (BIDS). Open **BIDS** in Windows, then select **Open / Analysis Services Database**.



24 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.

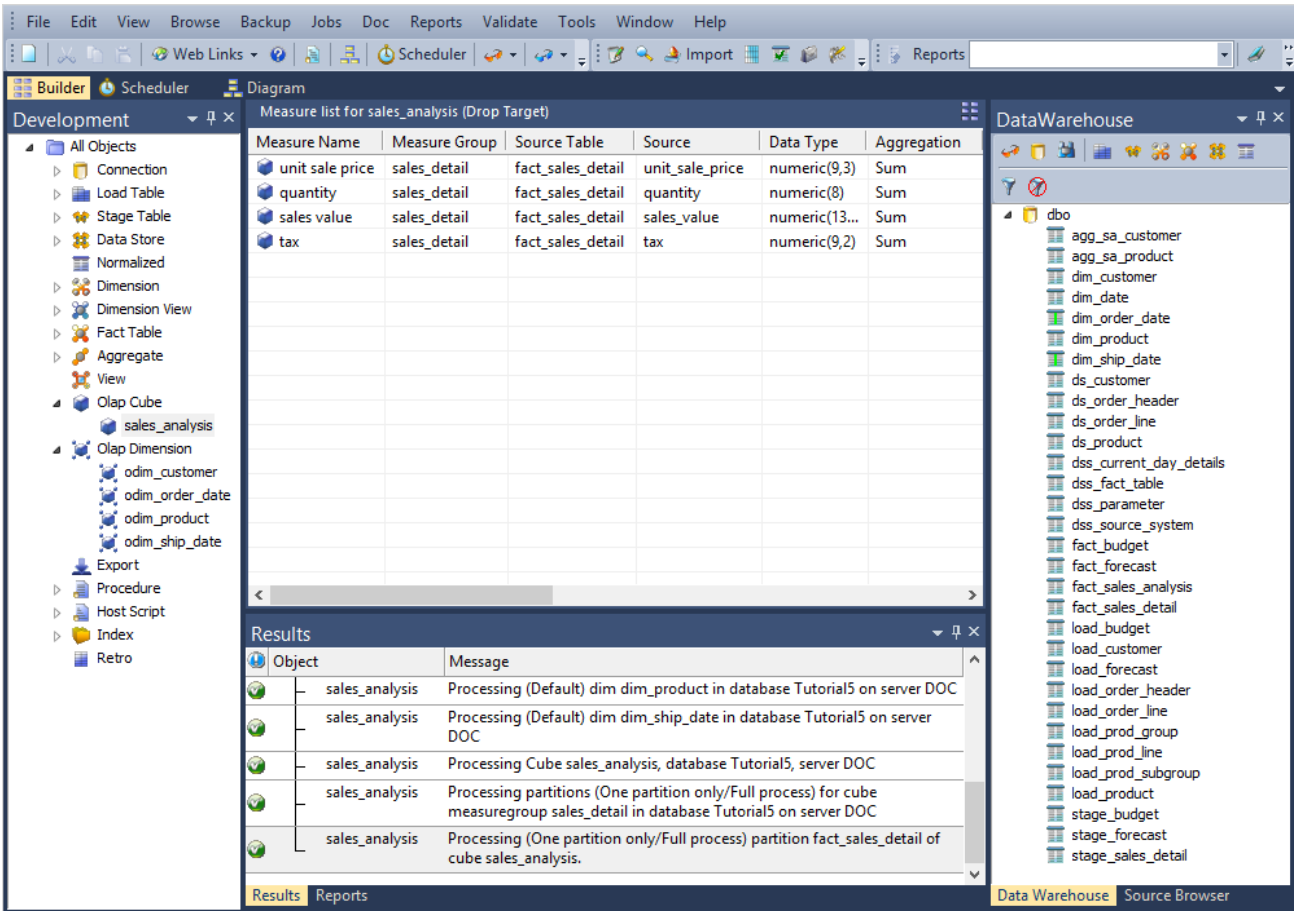
Note for Oracle: In the latest version of Data Warehouse Designer, the default 0 key date for all databases has been set to 1st Jan 1753. Prior to 6.5.4.2 however, procedure update_dim_date uses sysdate-700000 which gives a date in year 0095. SSAS does not support dates before year 0100 using the oracle OLEDB driver. If using a previous version of Data Warehouse Designer, or upgrading from a previous version, it will therefore be necessary for you to replace 'sysdate - 700000' with 'TO_DATE('17530101','YYYYMMDD')' in procedure update_dim_date and to recreate the dim_date table.

You are now ready to proceed to the next section - ***Adding a Measure Group*** (see "***5.3 Adding a Measure Group***" on page 157)

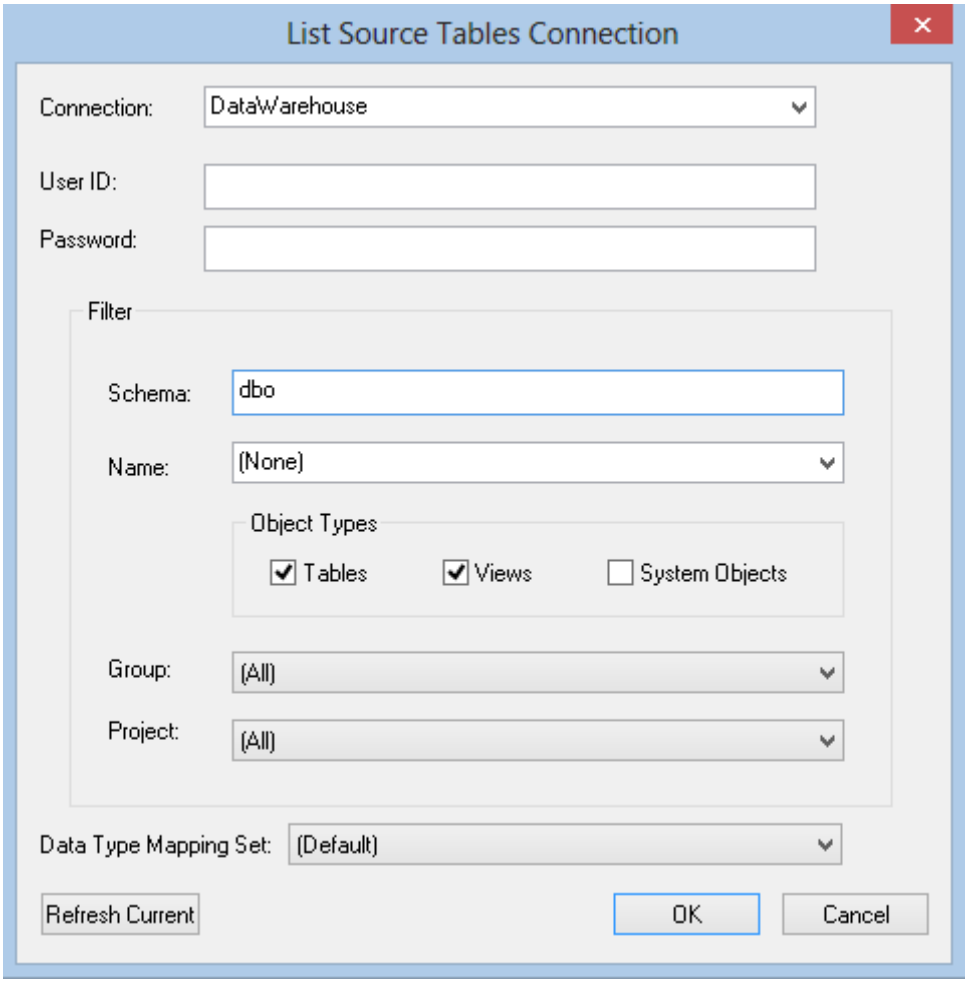
5.3 Adding a Measure Group

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 pane to show the Measures associated with the cube. Your screen should look something like this:



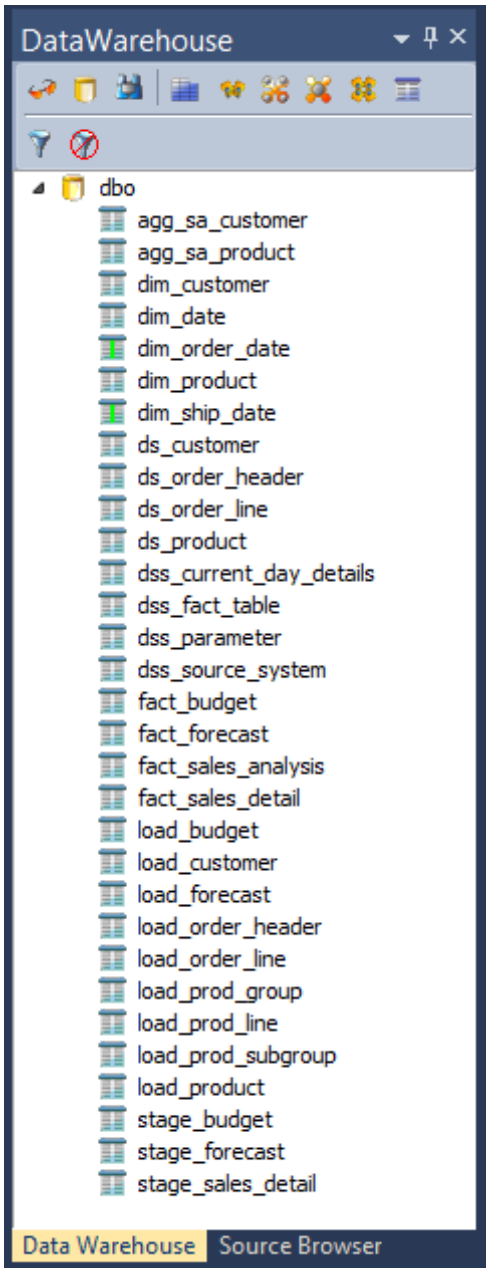
2 Now you need to browse the *DataWarehouse* connection to see available fact tables. From the **Browse** menu, select **DataWarehouse** then **Change Connection**. The following dialog displays.



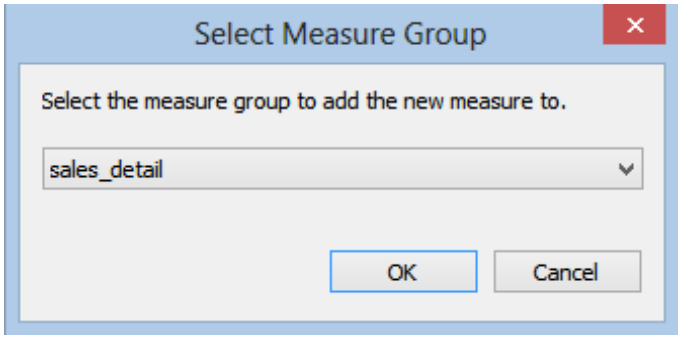
Choose **DataWarehouse** from the Connection drop-down and click **OK**.

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

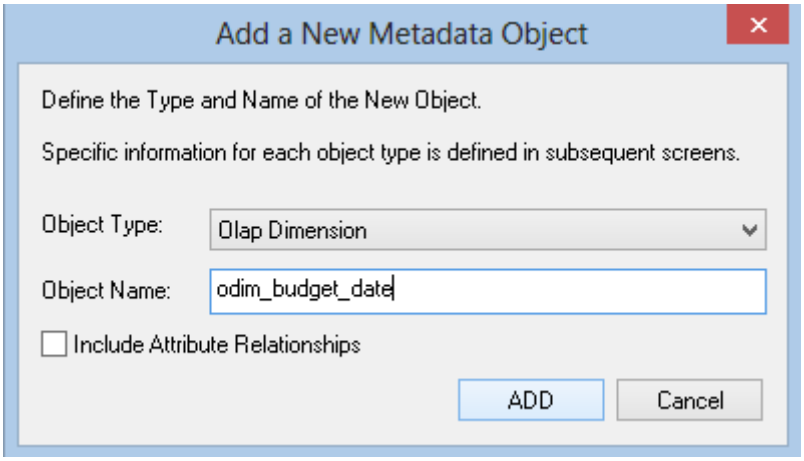
3 The following browse pane is displayed.



4 Drag the **fact_budget** table into the middle pane. The following dialog will appear. Select **Cancel**.



5 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** and click **ADD.**



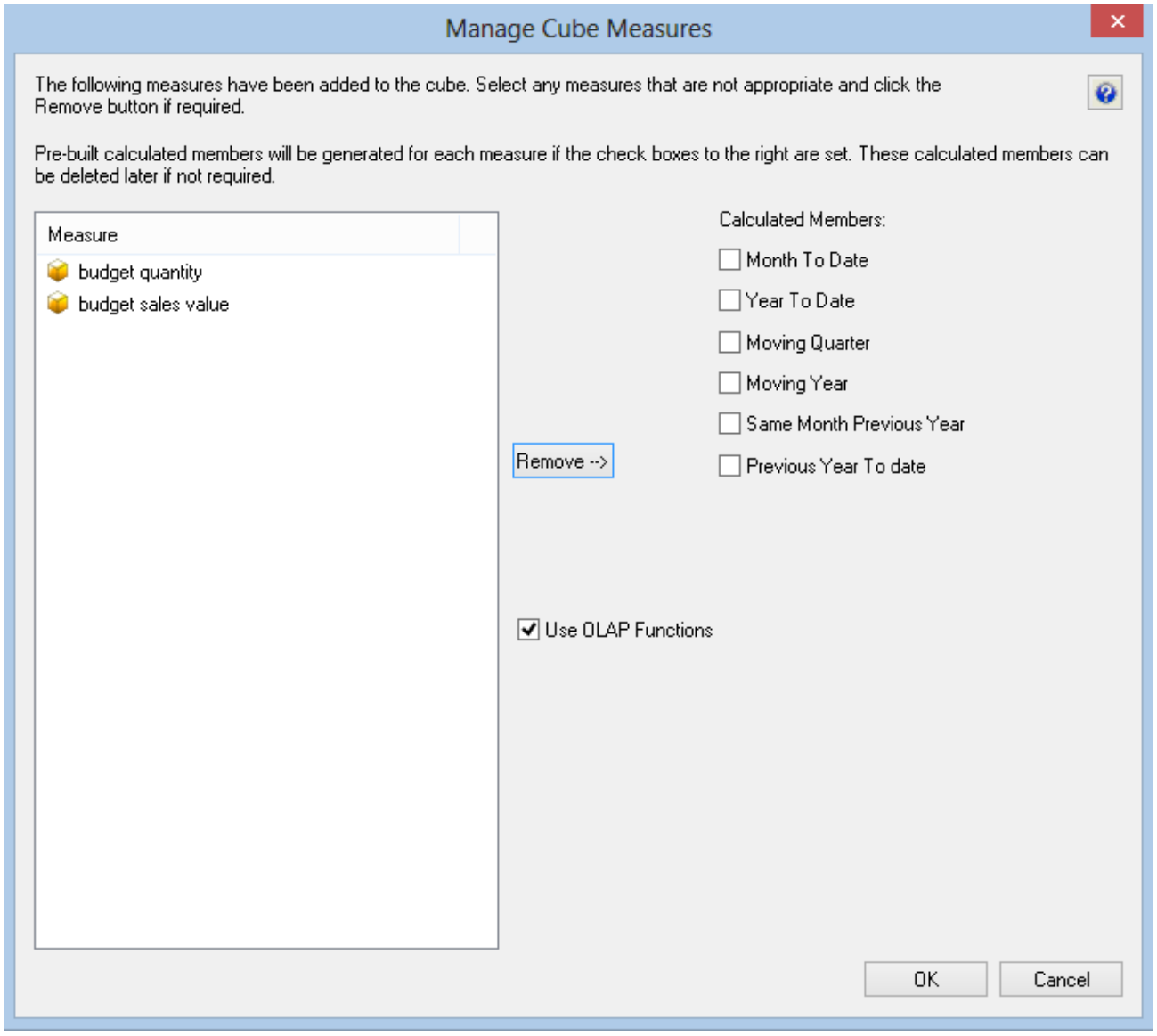
Note: If you wish to include Attribute Relationships in Analysis Services for this dimension, click on the **Include Attribute Relationships** checkbox.

6 Click **OK** on the Attributes screen.

7 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:

- Product Code
- Customer Code

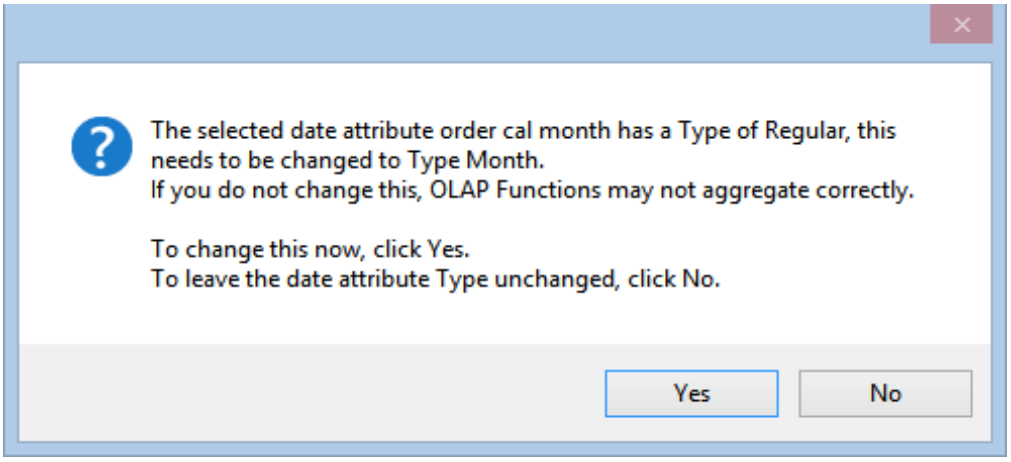
At this stage, your dialog should look like this.



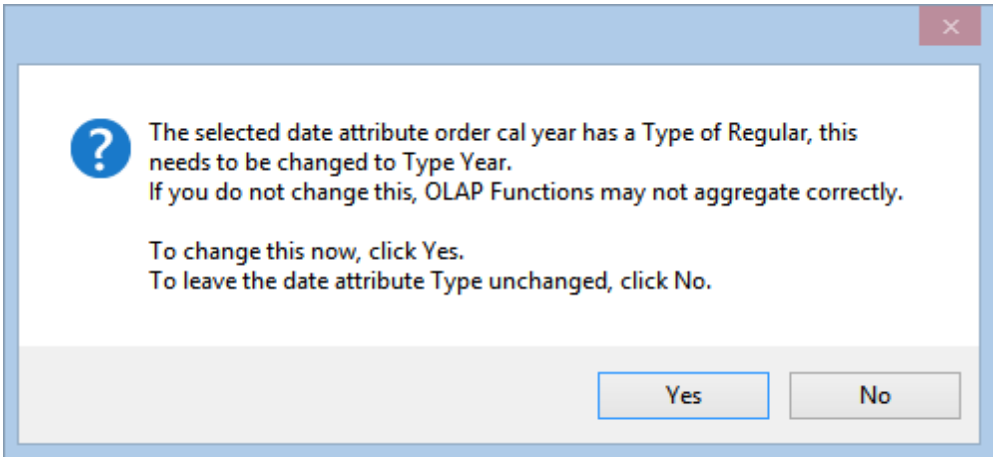
8 Choose to create some date based calculated members using OLAP functions by selecting the **Month to date**, **Year to date**, and the **Use OLAP Functions** checkboxes. The calculated measures drop-downs are now displayed. Select the required **date hierarchy** information. Specifically:

- for **Date Dimension**, select *Date Dimension*
- for **Dim Hierarchy**, select *calendar*
- for **Month Level**, select *cal month*
- for **Year Level**, select *cal year*

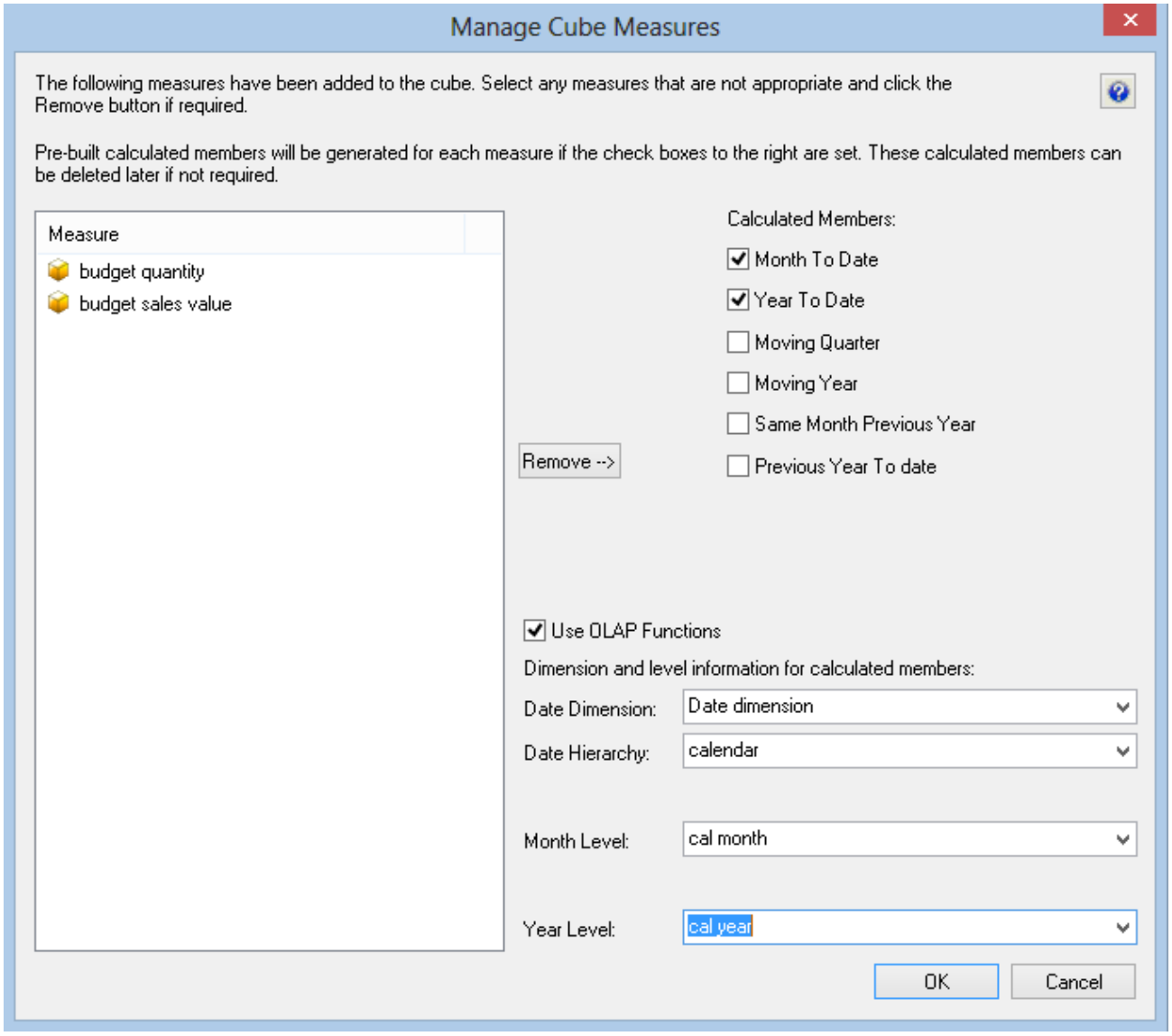
After selecting the **Month level**, you will be asked to confirm changing the **attribute type** to **Months** for the the *cal month* attribute in Analysis Services. Click Yes.



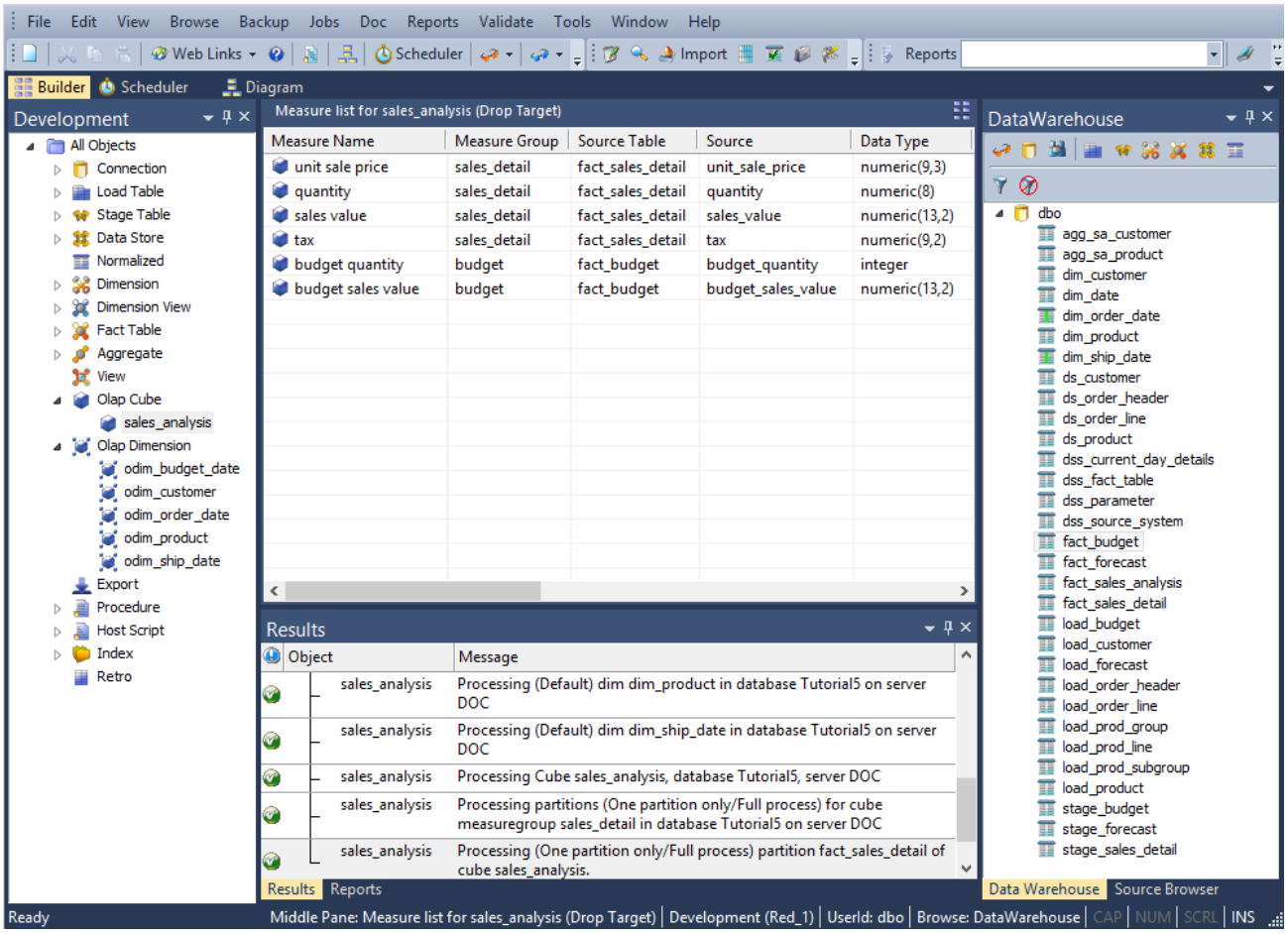
Similarly, selecting the **Year level**, you will be asked to confirm changing the **attribute type** to *Years* for the the *cal year* attribute in Analysis Services. Again click **Yes**.



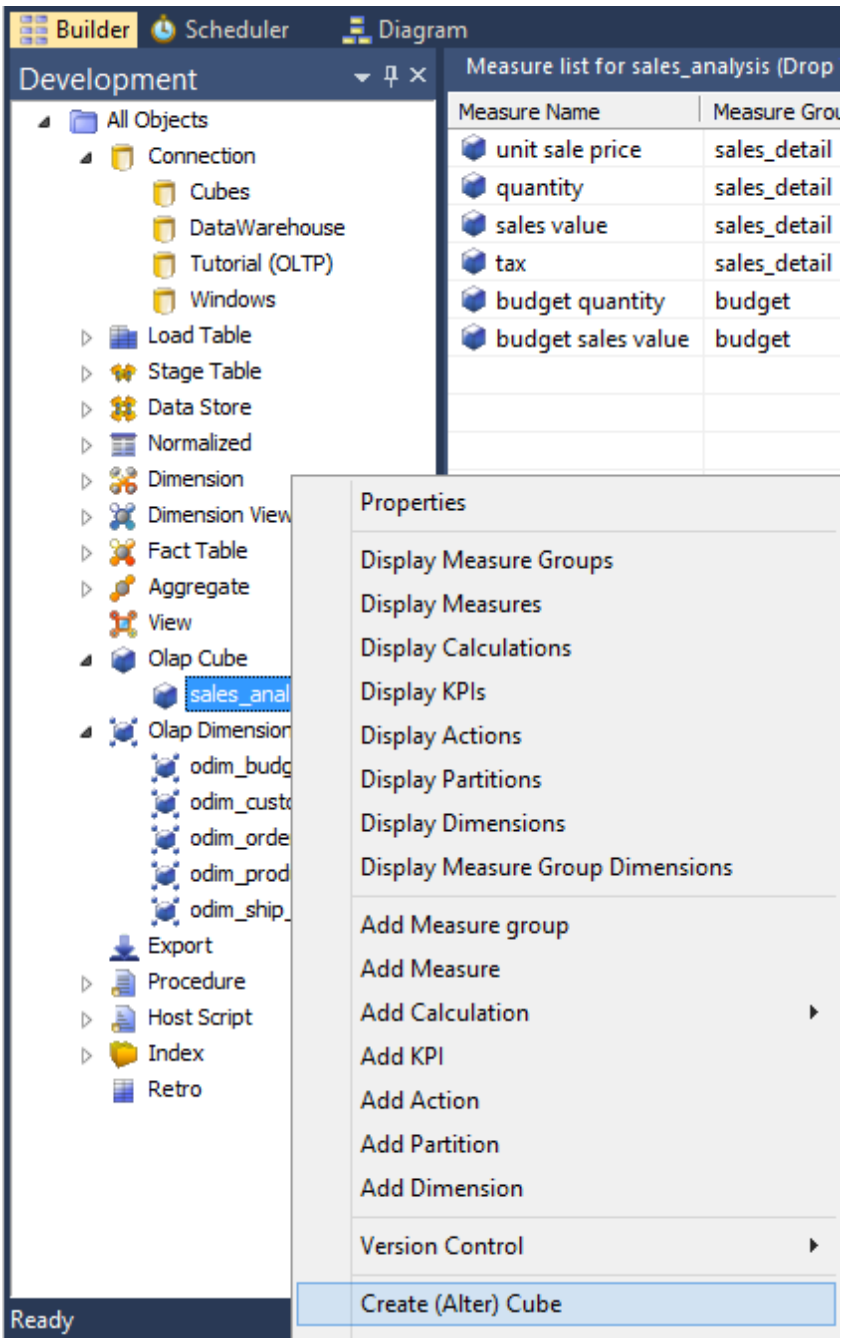
Your **Manage cube measures** dialog should now look like this. Click **OK**.



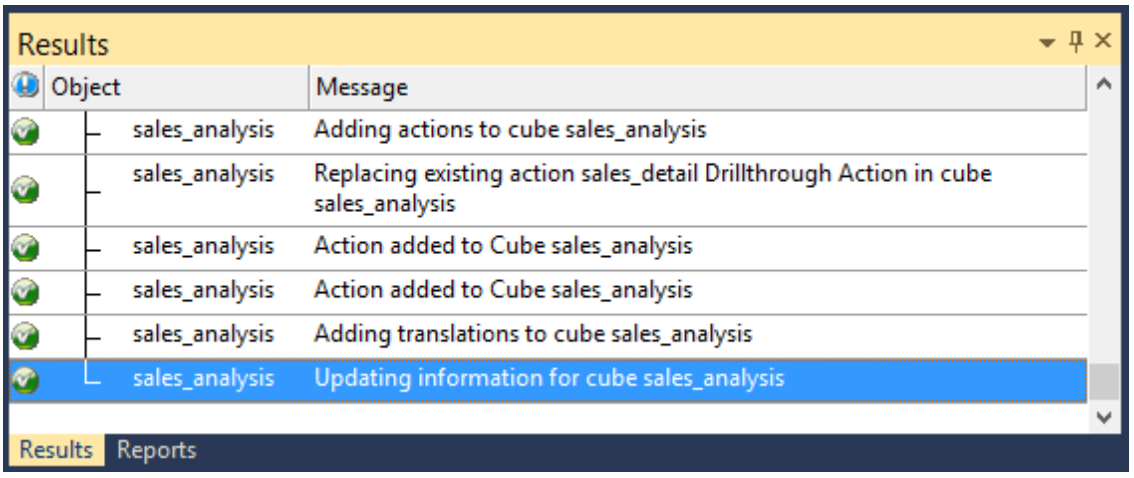
9 Click on the OLAP Cube **sales_analysis** in the left pane to show the updated Measures associated with the cube. You should now see measures from both fact tables in the middle pane:


File Edit View Browse Backup Jobs Doc Reports Validate Tools Window Help
Web Links
Scheduler
Import
Reports
Builder
Scheduler
Diagram
Development
All Objects
Connection
Load Table
Stage Table
Data Store
Normalized
Dimension
Dimension View
Fact Table
Aggregate
View
Olap Cube
sales_analysis
Olap Dimension
odim_budget_date
odim_customer
odim_order_date
odim_product
odim_ship_date
Export
Procedure
Host Script
Index
Retro
Measure list for sales_analysis (Drop Target)
Measure Name | Measure Group | Source Table | Source | Data Type
unit sale price | sales_detail | fact_sales_detail | unit_sale_price | numeric(9,3)
quantity | sales_detail | fact_sales_detail | quantity | numeric(8)
sales value | sales_detail | fact_sales_detail | sales_value | numeric(13,2)
tax | sales_detail | fact_sales_detail | tax | numeric(9,2)
budget quantity | budget | fact_budget | budget_quantity | integer
budget sales value | budget | fact_budget | budget_sales_value | numeric(13,2)
Results
Object | Message
sales_analysis | Processing (Default) dim dim_product in database Tutorial5 on server DOC
sales_analysis | Processing (Default) dim dim_ship_date in database Tutorial5 on server DOC
sales_analysis | Processing Cube sales_analysis, database Tutorial5, server DOC
sales_analysis | Processing partitions (One partition only/Full process) for cube measuregroup sales_detail in database Tutorial5 on server DOC
sales_analysis | Processing (One partition only/Full process) partition fact_sales_detail of cube sales_analysis.
Results
Reports
DataWarehouse
dbo
agg_sa_customer
agg_sa_product
dim_customer
dim_date
dim_order_date
dim_product
dim_ship_date
ds_customer
ds_order_header
ds_order_line
ds_product
dss_current_day_details
dss_fact_table
dss_parameter
dss_source_system
fact_budget
fact_forecast
fact_sales_analysis
fact_sales_detail
load_budget
load_customer
load_forecast
load_order_header
load_order_line
load_prod_group
load_prod_line
load_prod_subgroup
load_product
stage_budget
stage_forecast
stage_sales_detail
Data Warehouse
Source Browser
Ready
Middle Pane: Measure list for sales_analysis (Drop Target)
Development (Red_1)
UserId: dbo
Browse: DataWarehouse
CAP
NUM
SCRL
INS

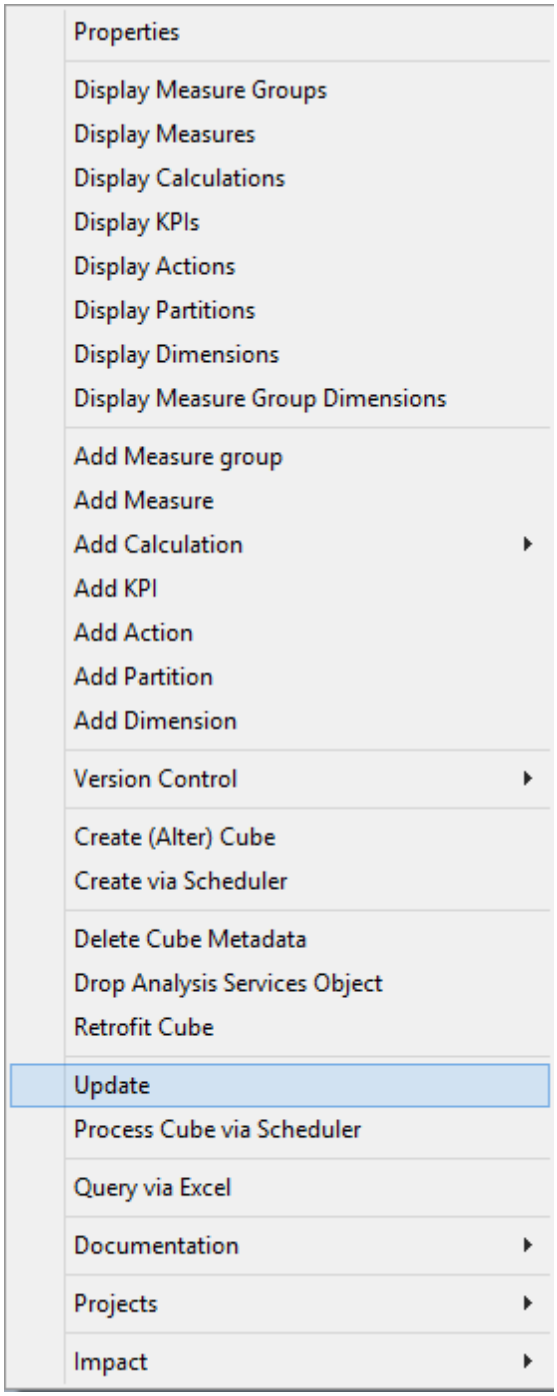
10 To apply the changes made in the QAD Data Warehouse Designer metadata to Analysis Services, right-click on the **sales_analysis** OLAP Cube in the left pane and select **Create (Alter) Cube**.



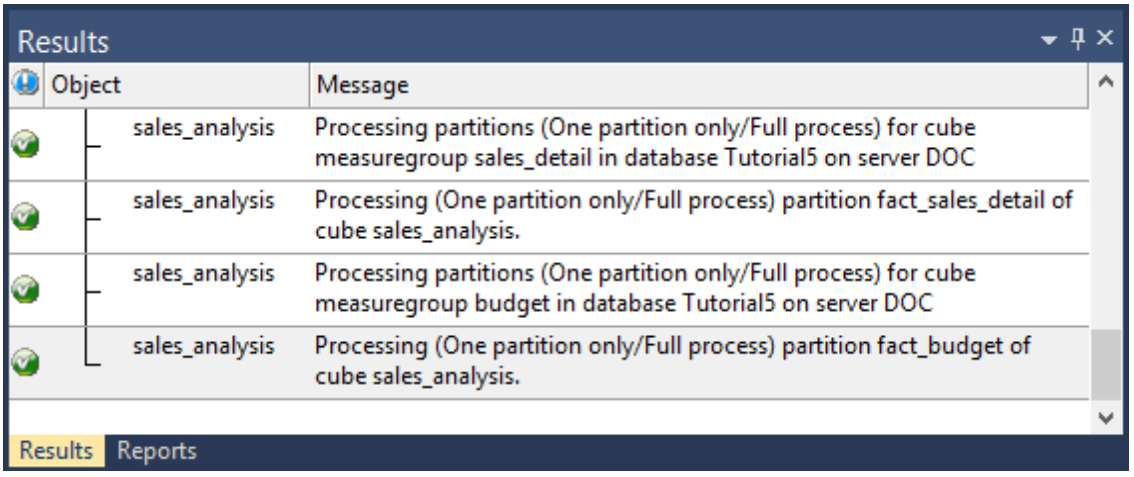
This will open the WSL Cube executable that connects to Analysis Services to create the sales_analysis cube structure. You will see the successful completion in the results pane.


Results
Object
Message
sales_analysis
Adding actions to cube sales_analysis
sales_analysis
Replacing existing action sales_detail Drillthrough Action in cube sales_analysis
sales_analysis
Action added to Cube sales_analysis
sales_analysis
Action added to Cube sales_analysis
sales_analysis
Adding translations to cube sales_analysis
sales_analysis
Updating information for cube sales_analysis
Results
Reports

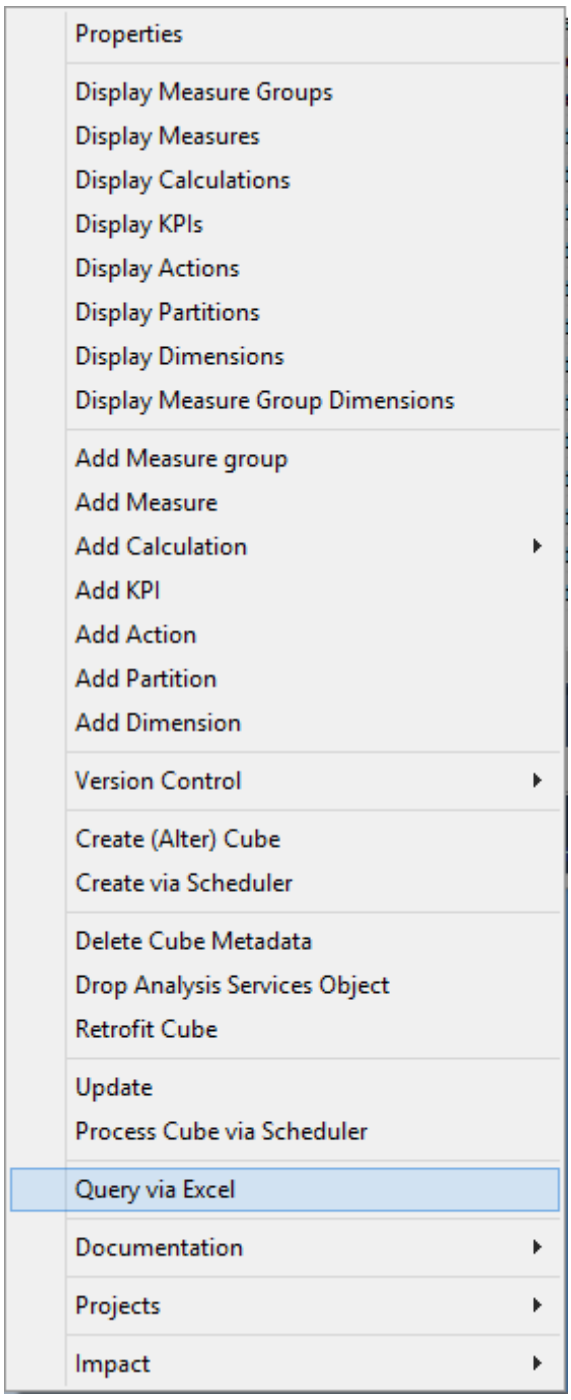
11 Next, reload the **OLAP Cube** in Analysis Services. Do this by right-clicking on the **sales_analysis** cube in the left pane and choosing **Update**.



This will open the OLAP 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.

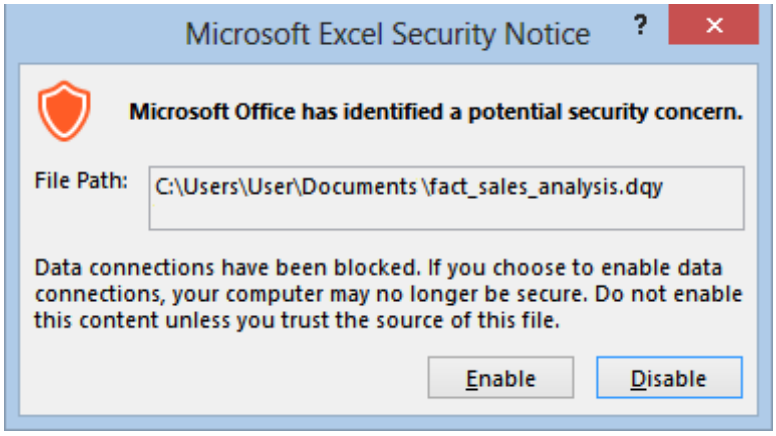

Results
Object
Message
sales_analysis
Processing partitions (One partition only/Full process) for cube measuregroup sales_detail in database Tutorial5 on server DOC
sales_analysis
Processing (One partition only/Full process) partition fact_sales_detail of cube sales_analysis.
sales_analysis
Processing partitions (One partition only/Full process) for cube measuregroup budget in database Tutorial5 on server DOC
sales_analysis
Processing (One partition only/Full process) partition fact_budget of cube sales_analysis.
Results
Reports

12 To view the cube in Excel, right-click the *sales_analysis* cube in the left pane and select **Query cube Via Excel**.



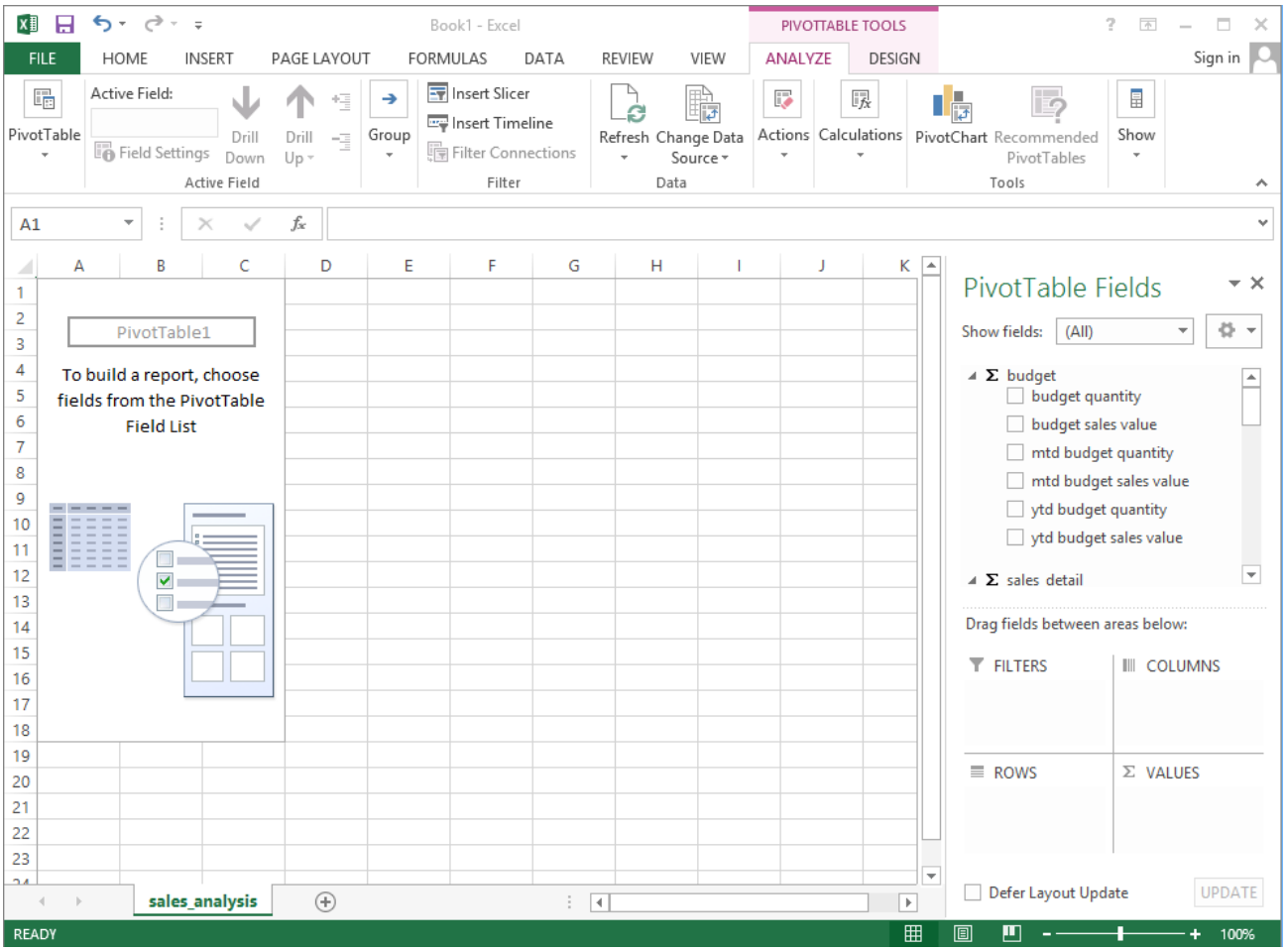
This will open Excel if it is installed.

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.

You are now ready to proceed to the next section - ***Cube Connections for Other Databases*** (see "***5.4 Cube Connections for Other Databases***" on page 172)

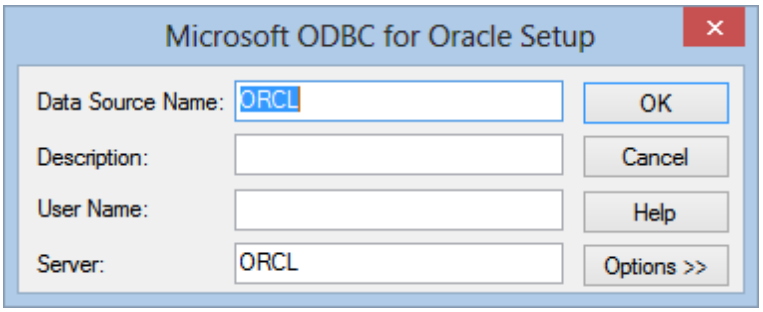
5.4 Cube Connections for Other Databases

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.

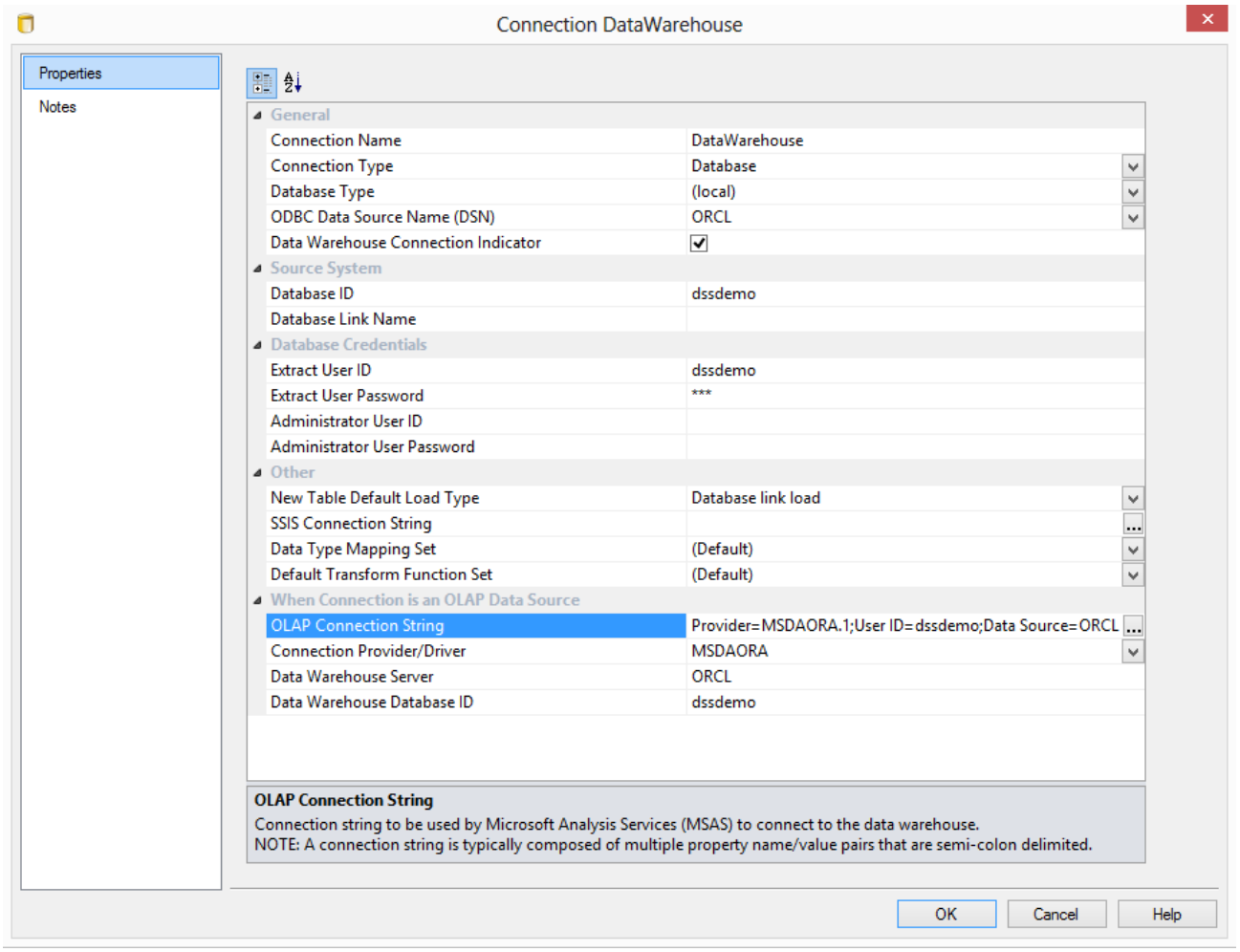
Oracle Configuration

- ☐ Select *MSDAORA* for the **Connection Provider/Driver**
- ☐ Enter the oracle "TNS Server Name" for the **Data Warehouse Server**, specifically the **Server** field in the ODBC set up screen shown



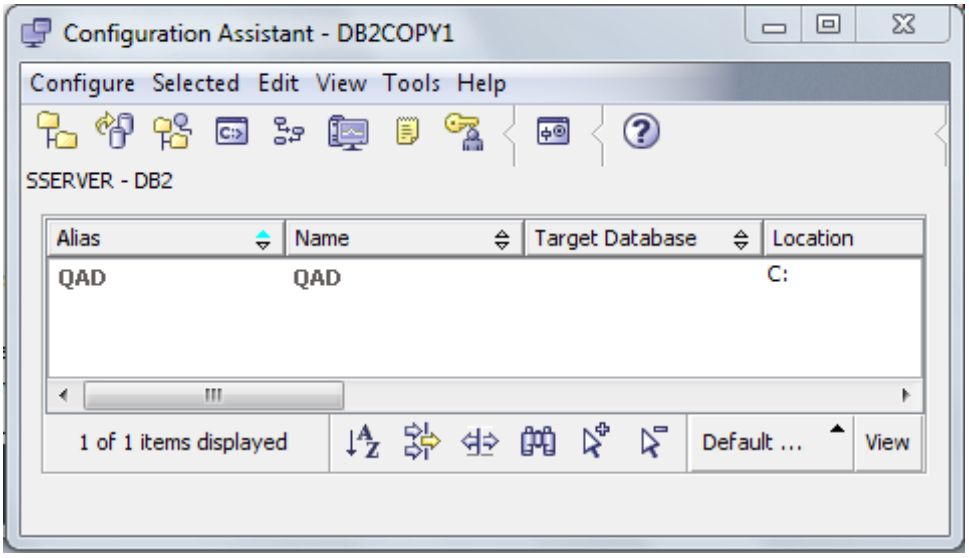
☐ Enter the data warehouse "schema" for the **Data Warehouse Database ID** field

Here is an **Oracle** example:

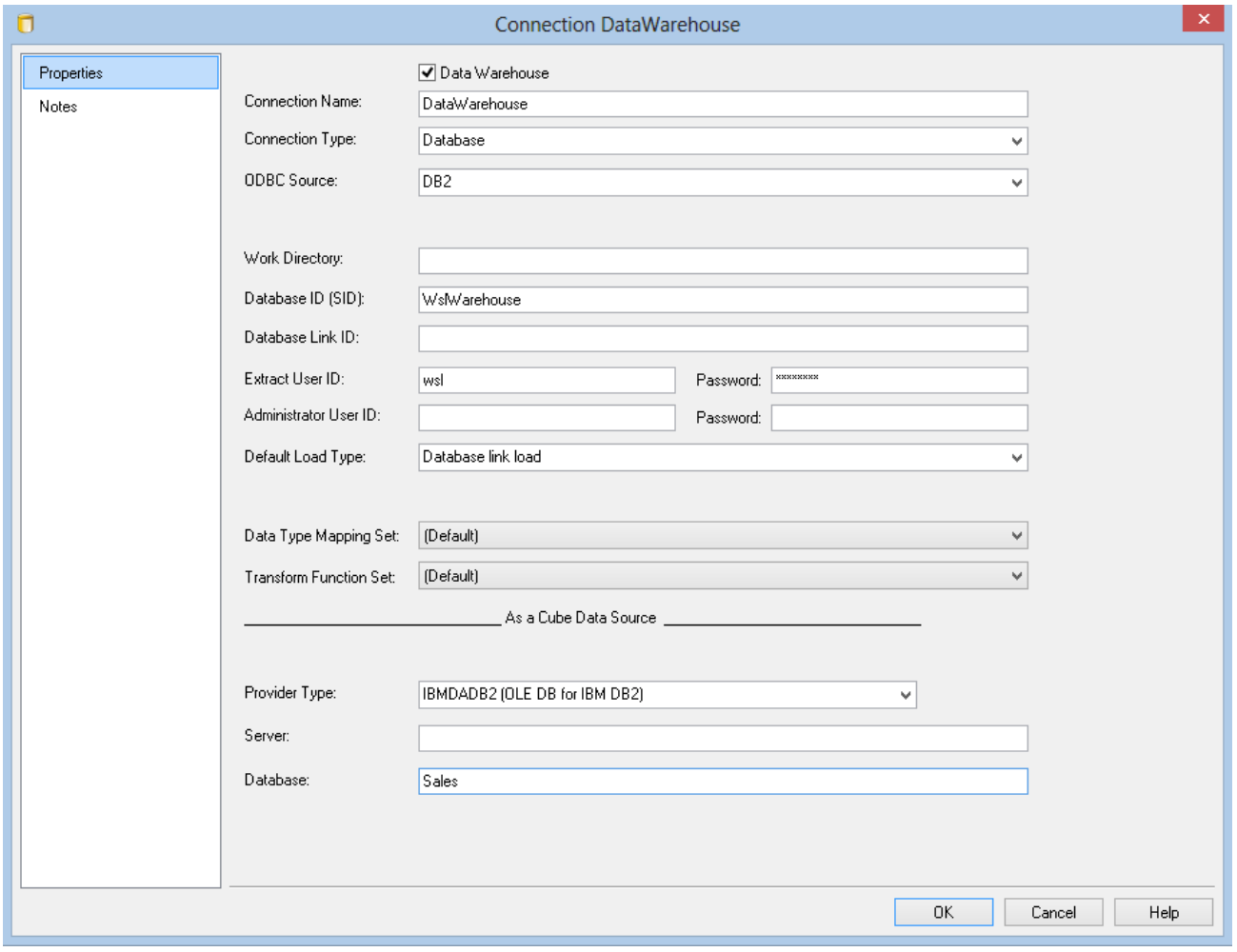


DB2 Configuration

- ☐ Select *IBMDADB2* for the **Connection Provider/Driver**
- ☐ The **Data Warehouse Server** field is left empty for DB2
- ☐ Enter the database server alias for the **Data Warehouse Database ID** field, specifically the **alias** field for the IBM DB2 connection in the following DB2 Configuration Assistant screen:



Here is an **IBM DB2** example:



Tutorial 6
KPI fact table

Before you start on this chapter you should have:

☐ Completed ***Tutorial 2 - Rollup fact tables, ASCII file loads, aggregates*** (see "***Rollup Fact Tables, ASCII File Loads, Aggregates***" on page 65)

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 Tutorial

6.1 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*** (see "***6.2 The KPI Dimension***" on page 179)'.

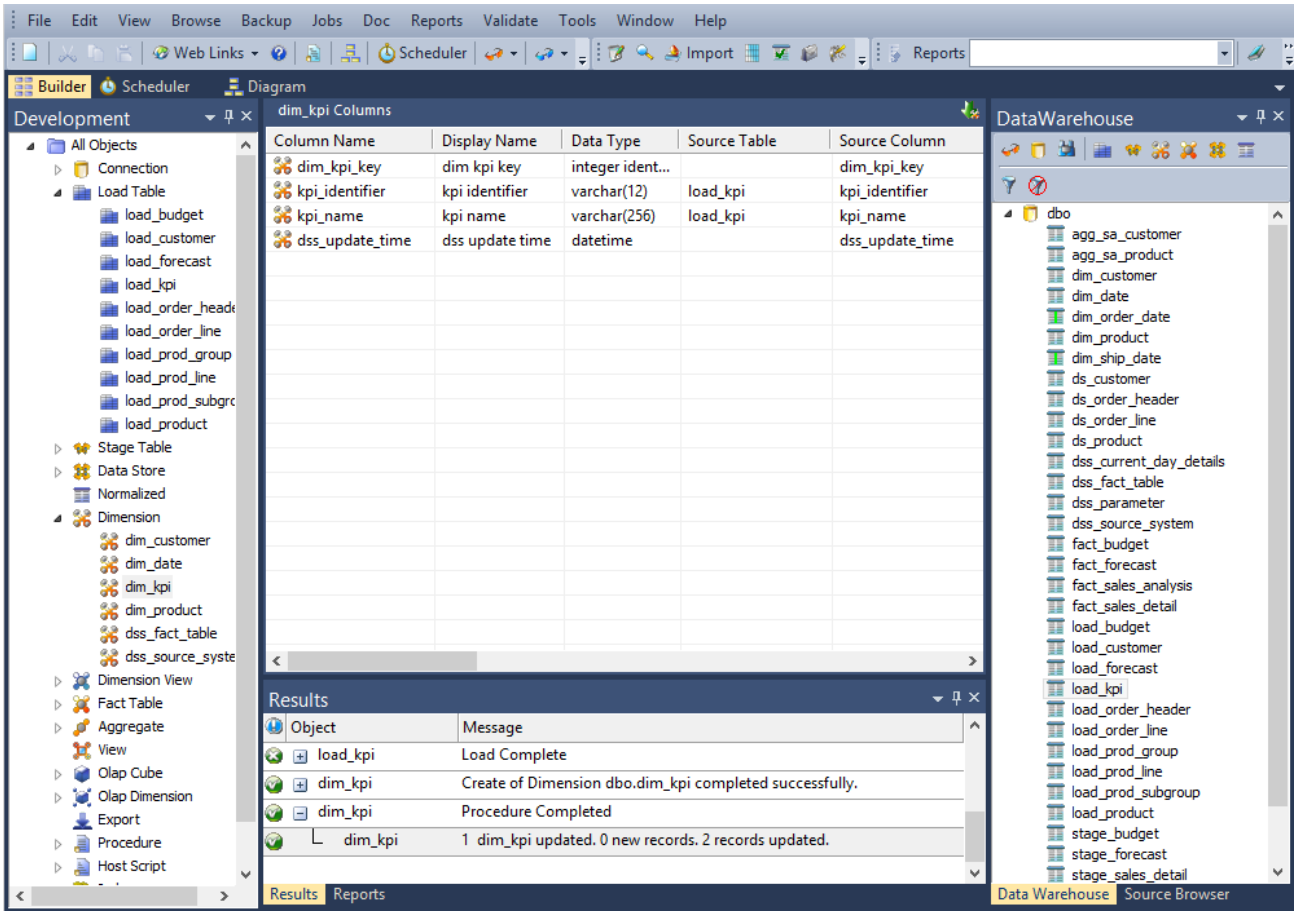
6.2 The KPI Dimension

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 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** and click **ADD**.
3. Click **OK** on the Properties screen.
4. **Create and Load** the table.
5. Double-click on the **Dimension object group** in the left pane to create a dimension drop target in the middle pane.
6. 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**.
7. Right-click on **dim_kpi** and select **Execute Update Procedure**.

Your screen should look something like this:

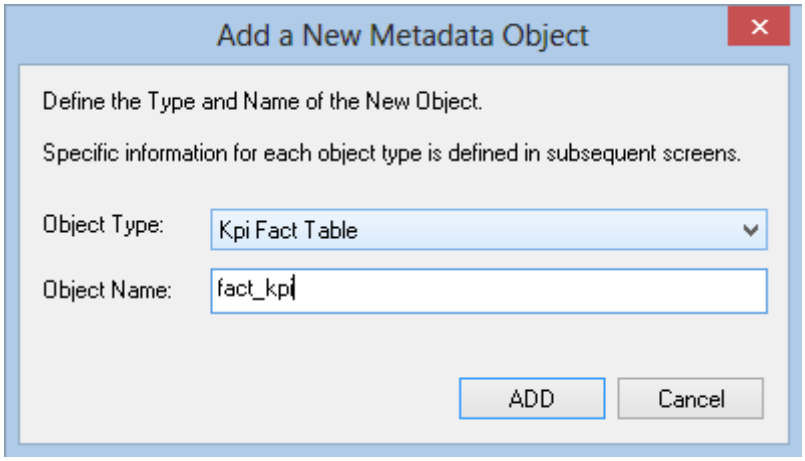


You are now ready to proceed to the next section - ***Defining the KPI Fact Table*** (see "***6.3 Defining the KPI Fact Table***" on page 181).

6.3 Defining the KPI Fact Table

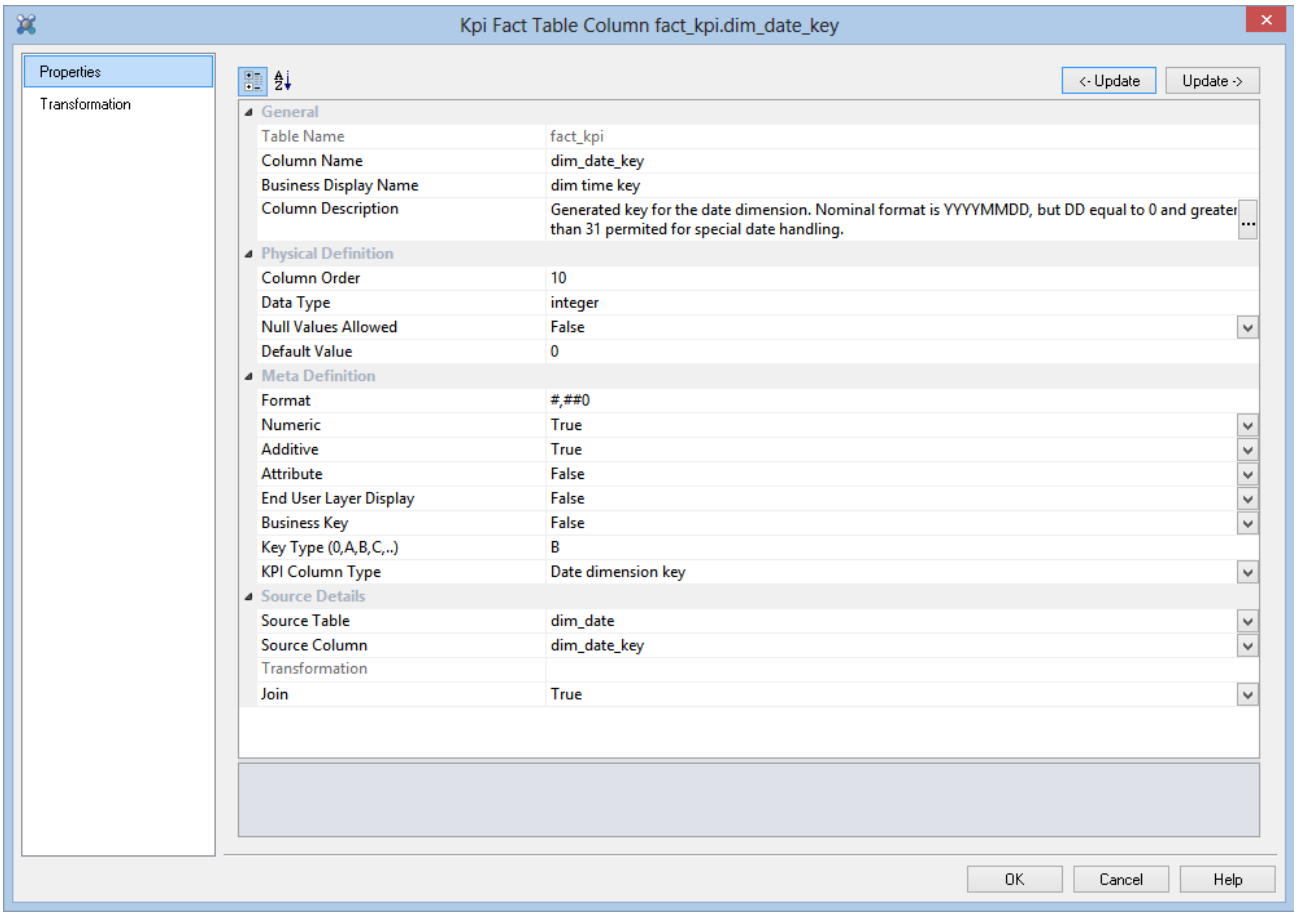
A KPI fact table is normally created manually. We will, however, use the drag and drop functionality to acquire the dimension key settings. Proceed as follows:

1. Double-click on the **Fact Table object group** in the left 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 (browse) pane into the middle pane. The **Add a New Metadata 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** and click **ADD.**



4. Click **OK** on the Properties screen.

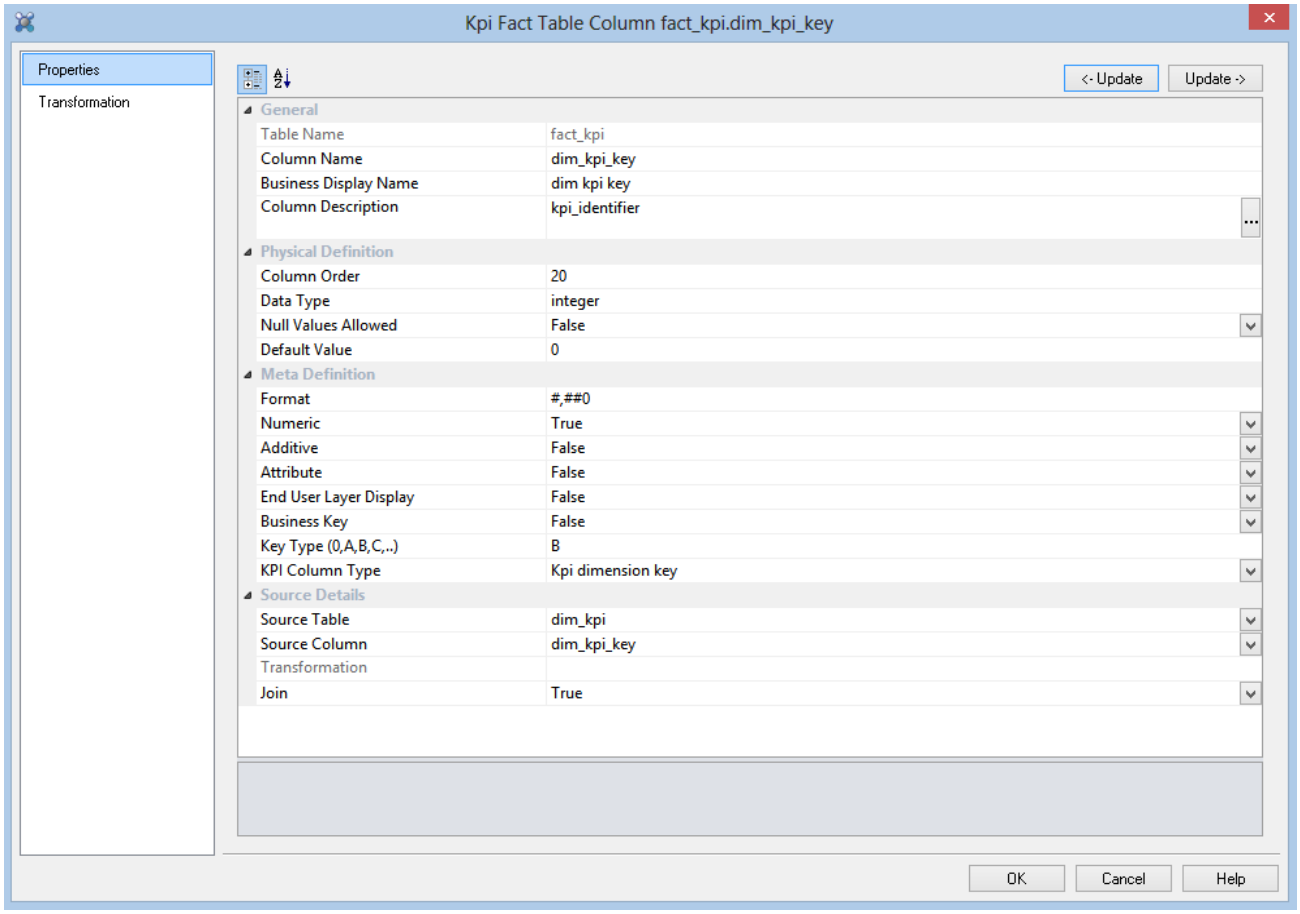
5 Right-click on **dim_date_key** in the middle pane and select the **Properties** of this column. For the KPI Column Type select **Date dimension key** and enter **0** for the Default Value. Click **OK**.



This identifies this column as the date dimension column to be used during the definition of the individual KPIs.

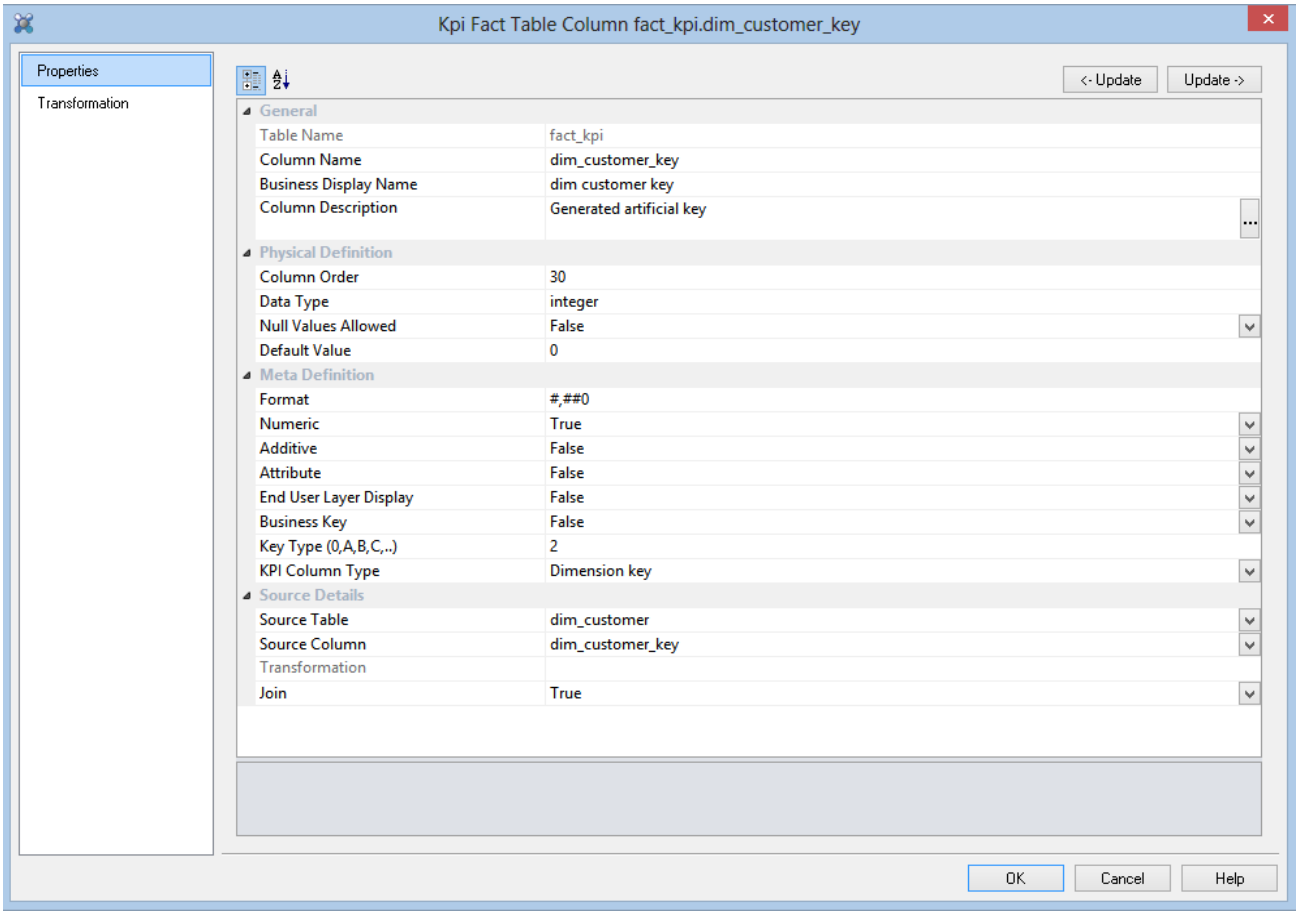
6 Drag the column **dim_kpi_key** from the dim_kpi table in the right pane into the column list in the middle pane.

7 Right-click on the column **dim_kpi_key** in the middle pane and select the **Properties** of this column. For the KPI Column Type select **Kpi dimension key** and enter **0** for the Default Value. Click **OK**.



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

9 Right-click on the column **dim_customer_key** in the middle pane and select the **Properties** of this column. For the KPI Column Type select **Dimension key** and enter **0** for the Default Value. Click **OK**.


Kpi Fact Table Column fact_kpi.dim_customer_key
Properties
Transformation
<- Update
Update ->
General
Table Name
fact_kpi
Column Name
dim_customer_key
Business Display Name
dim customer key
Column Description
Generated artificial key
Physical Definition
Column Order
30
Data Type
integer
Null Values Allowed
False
Default Value
0
Meta Definition
Format
#,##0
Numeric
True
Additive
False
Attribute
False
End User Layer Display
False
Business Key
False
Key Type (0,A,B,C,..)
2
KPI Column Type
Dimension key
Source Details
Source Table
dim_customer
Source Column
dim_customer_key
Transformation
Join
True
OK
Cancel
Help

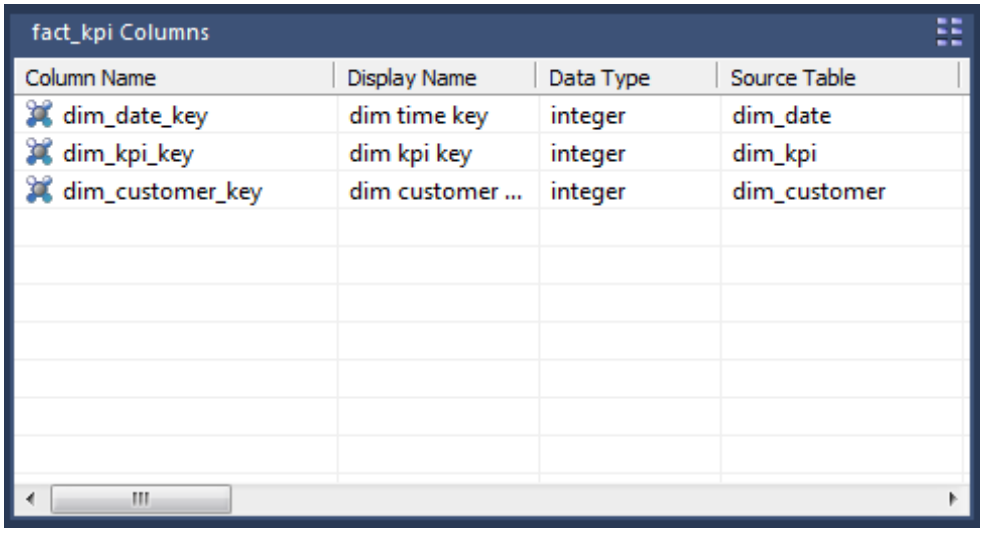
At this point we have defined the new KPI fact table and have added three columns to it, namely **dim_date_key**, **dim_kpi_key** and **dim_customer_key**. For the purposes of this tutorial these will be the only dimensions we will utilize.

We will now define the measures of the KPI fact table. KPI fact tables contain four types of measure. These measure types are:

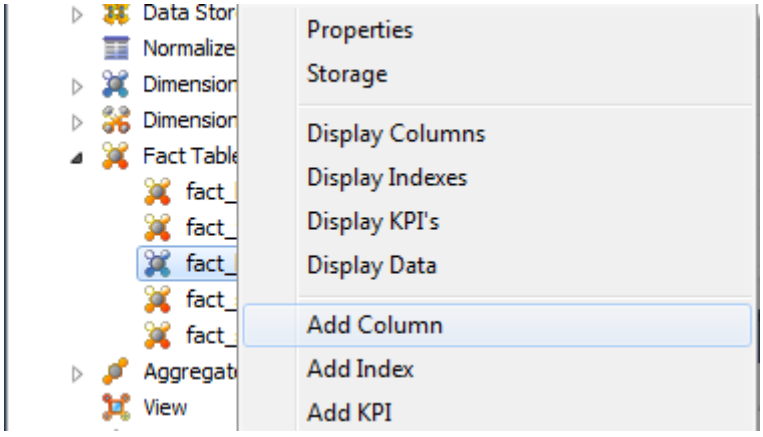
- ☐ month to date
- ☐ year to date
- ☐ same month last year
- ☐ previous year to date.

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.

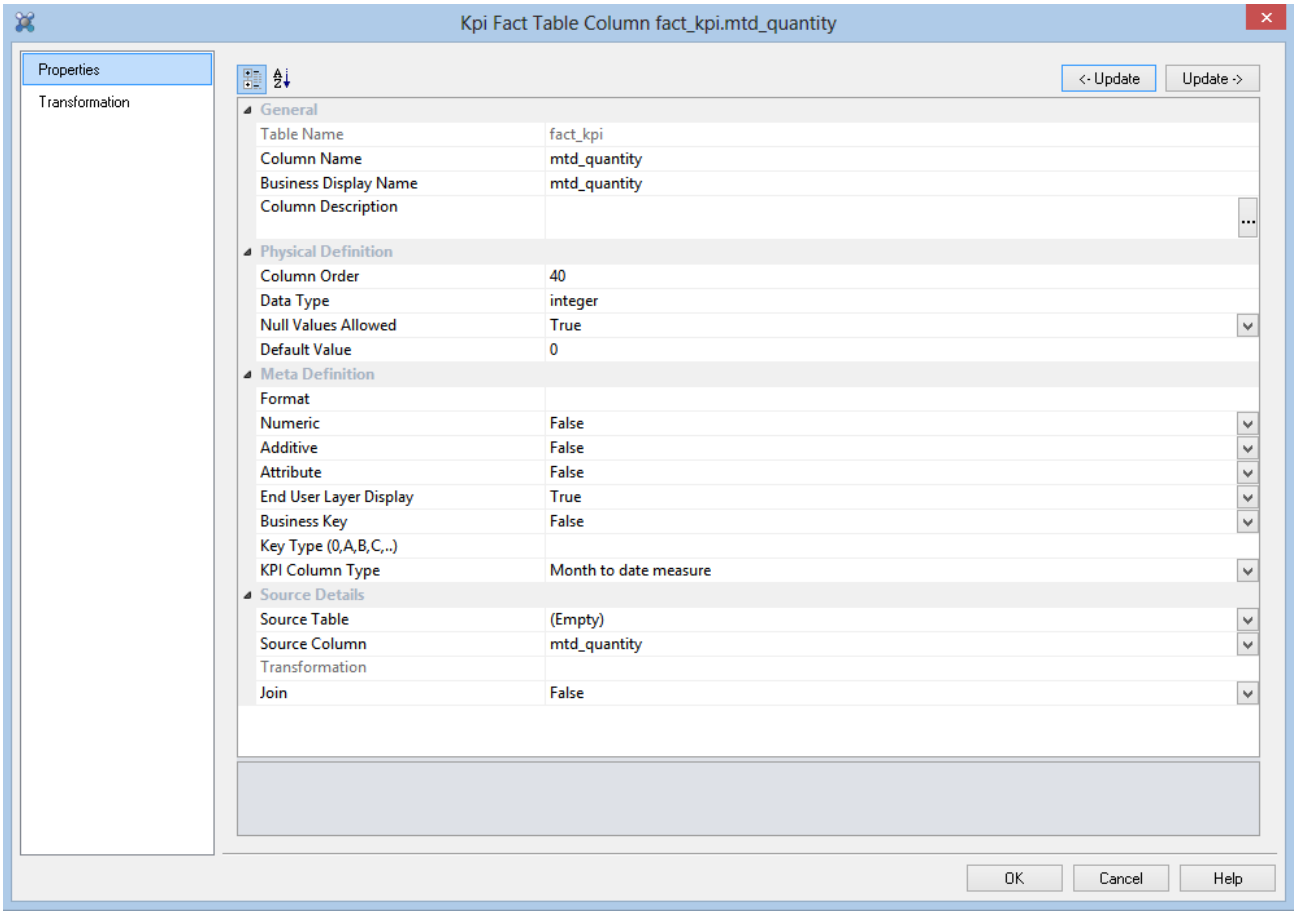
1 Click on the **fact_kpi** table name to refresh the column display in the middle pane. These columns are listed.



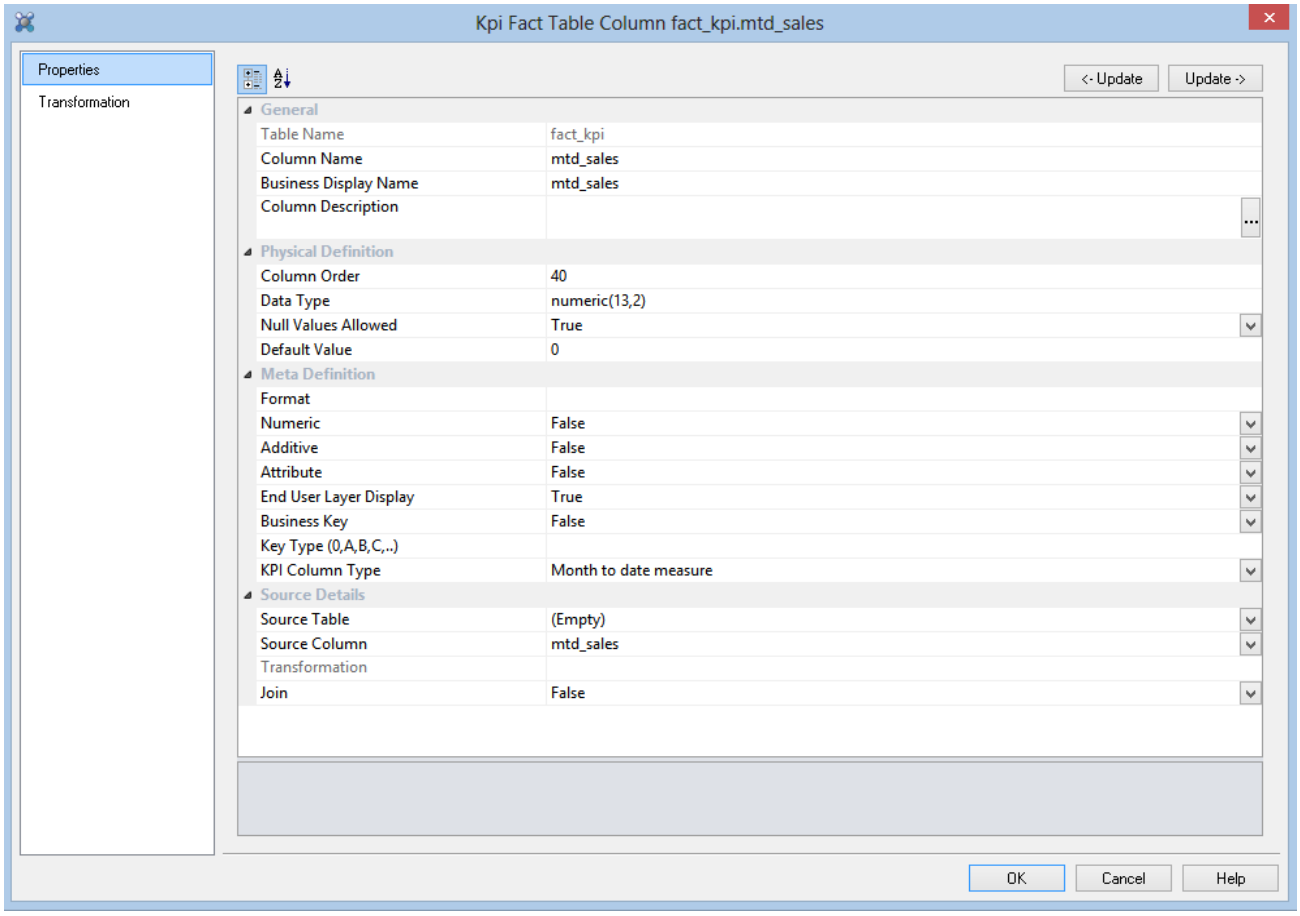
2 Right-click on **fact_kpi** in the left pane and select **Add Column**.



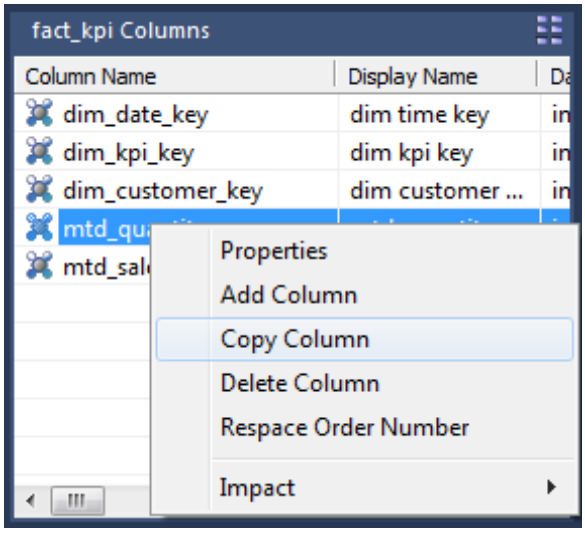
3 Enter **mtd_quantity** for the column and business names. Enter **integer** for the Data Type. Select **Month to date measure** for the KPI Column Type and set a Default Value of **0**. Set the Null Values Allowed to **True.** Enter **mtd_quantity** for the Source Column and click **OK**.


Kpi Fact Table Column fact_kpi.mtd_quantity
Properties
Transformation
<- Update
Update ->
General
Table Name
fact_kpi
Column Name
mtd_quantity
Business Display Name
mtd_quantity
Column Description
Physical Definition
Column Order
40
Data Type
integer
Null Values Allowed
True
Default Value
0
Meta Definition
Format
Numeric
False
Additive
False
Attribute
False
End User Layer Display
True
Business Key
False
Key Type (0,A,B,C,..)
KPI Column Type
Month to date measure
Source Details
Source Table
(Empty)
Source Column
mtd_quantity
Transformation
Join
False
OK
Cancel
Help

4 Repeat steps (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 Right-click on the **mtd_quantity** column in the middle pane and select **Copy 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

Column Name	Display Name	Data Type	Source Table	Source 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 key	integer	dim_customer	dim_customer_key
mtd_quantity	mtd_quantity	integer		mtd_quantity
mtd_sales	mtd_sales	numeric(13,2)		mtd_sales
ytd_quantity	ytd_quantity	integer		ytd_quantity
ytd_sales	ytd_sales	numeric(13,2)		ytd_sales
prev_month_quantity	prev_month_quantity	integer		prev_month_quantity
prev_month_sales	prev_month_sales	numeric(13,2)		prev_month_sales
prev_ytd_quantity	prev_ytd_quantity	integer		prev_ytd_quantity
prev_ytd_sales	prev_ytd_sales	numeric(13,2)		prev_ytd_sales

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.

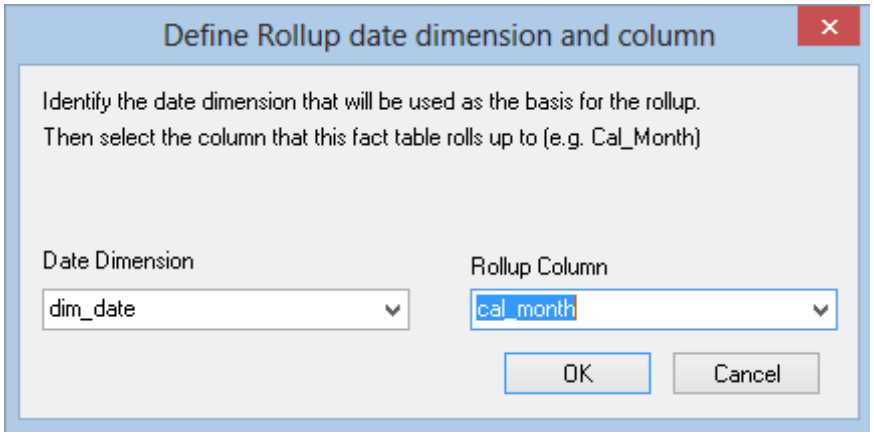
The KPI fact table has now been defined and can be created.

You are now ready to proceed to the next section - '***Creating the KPI Fact Table and Procedure*** (see "***6.4 Creating the KPI Fact Table and Procedure***" on page 189)'.

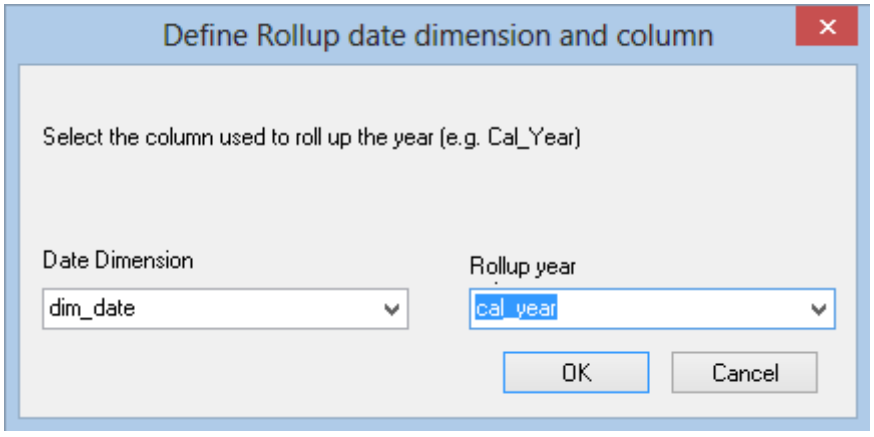
6.4 Creating the KPI Fact Table and Procedure

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

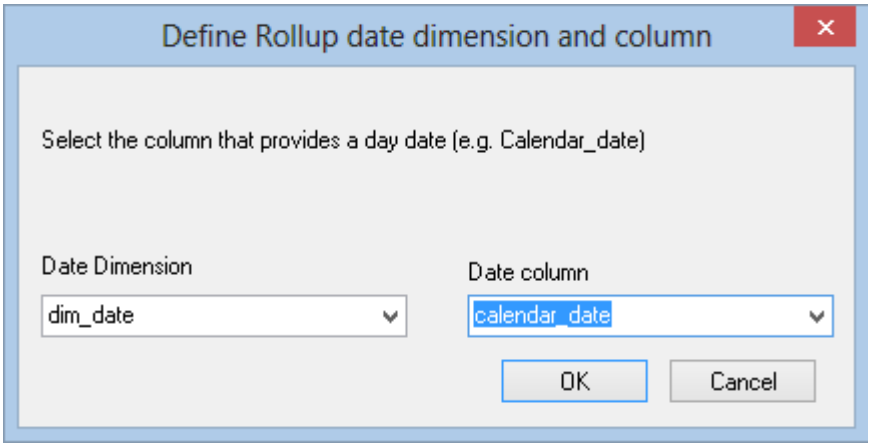
1. To create the KPI fact table, right-click on **fact_kpi** and select **Create / ReCreate**.
2. Alter the Properties of the table and select **(Build Procedure...)** from the Update procedure drop list. Click **OK**.
3. A dialog box will prompt for a period start parameter. This parameter along with 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*** (see "***6.5 The KPI Parameters***" on page 191) for a description of these parameters.
4. A date dimension and month rollup column are prompted for. Select **dim_date** and **cal_month** and click **OK.**



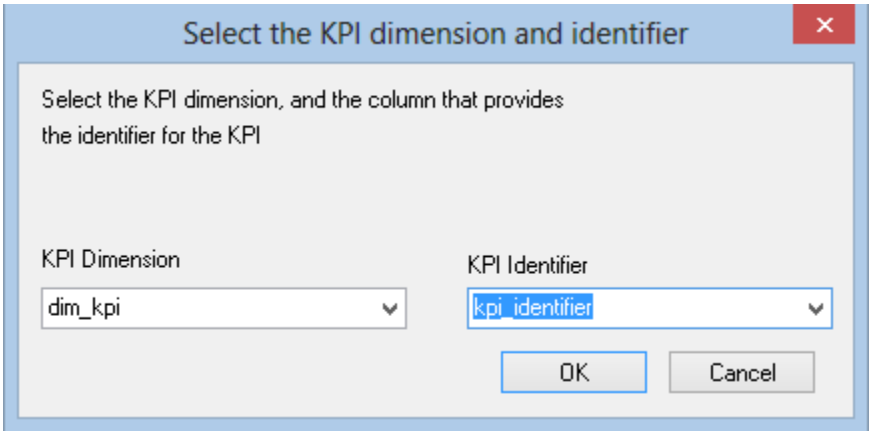
5. Select **cal_year** for the rollup year column and click **OK**.



and then **calendar_date** for a date column and click **OK**.



6 Enter the KPI dimension and identifier as **dim_kpi** and **kpi_identifier** and click **OK.**



7 The procedure will now be built and compiled.

You are now ready to proceed to the next section - ***The KPI Parameters*** (see "***6.5 The KPI Parameters***" on page 191).

6.5 The KPI Parameters

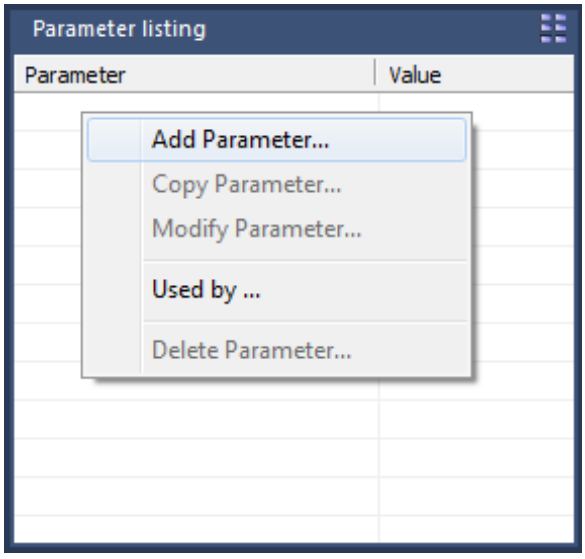
During the procedure creation phase of the KPI fact table we are prompted for parameters used to define the period start and period end. These parameters are read by the update procedure whenever a KPI is updated, and are used to ascertain what time periods are being processed.

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 this 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.

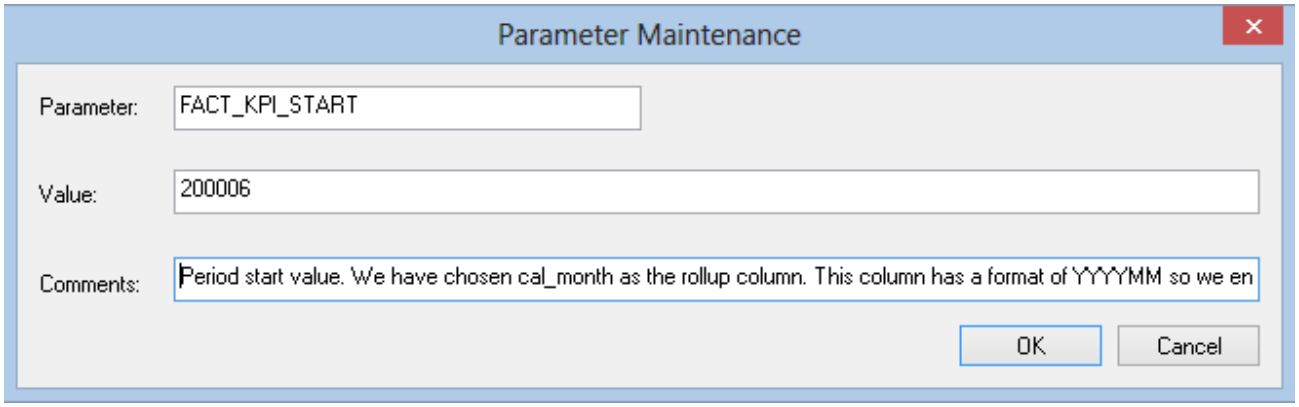
2 Right-click in the middle pane and select **Add Parameter**.



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 define the KPI.

You are now ready to proceed to the next section - ***Defining a KPI*** (see "***6.6 Defining a KPI***" on page 193).

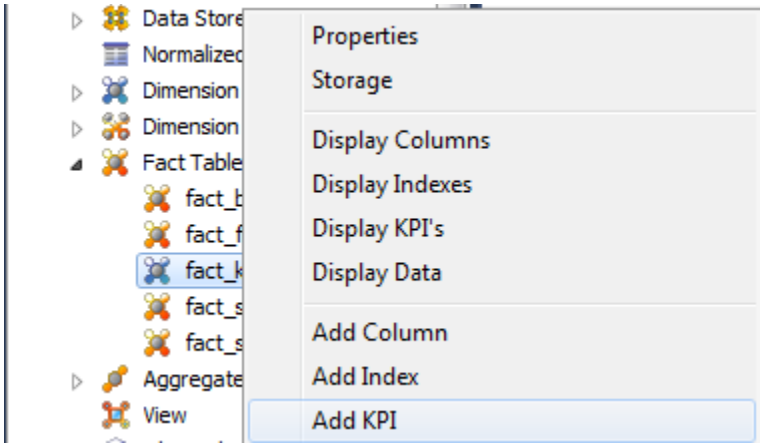
6.6 Defining a KPI

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.

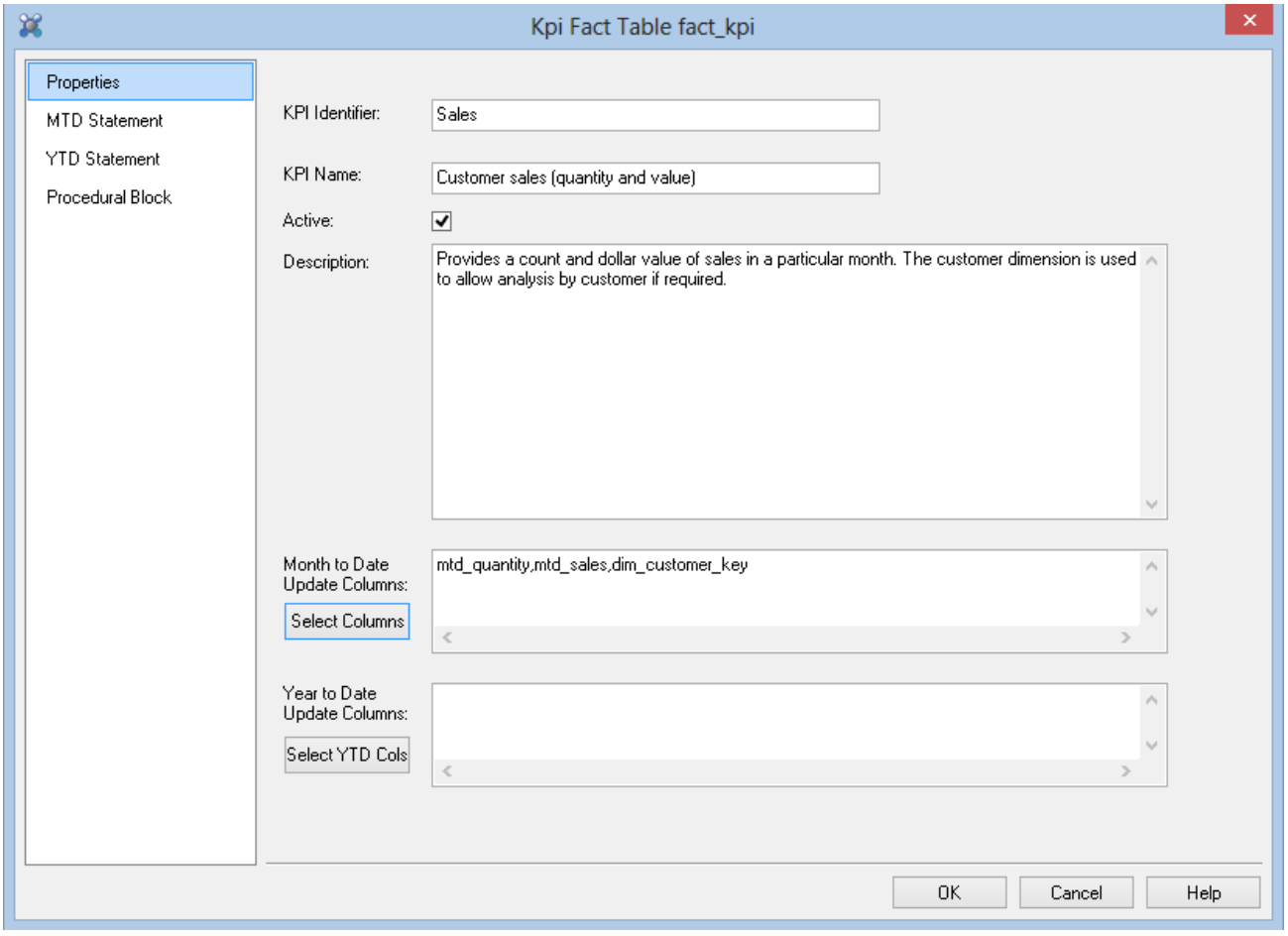
We will do the simpler Sales KPI first followed by the Activity KPI.

Sales KPI

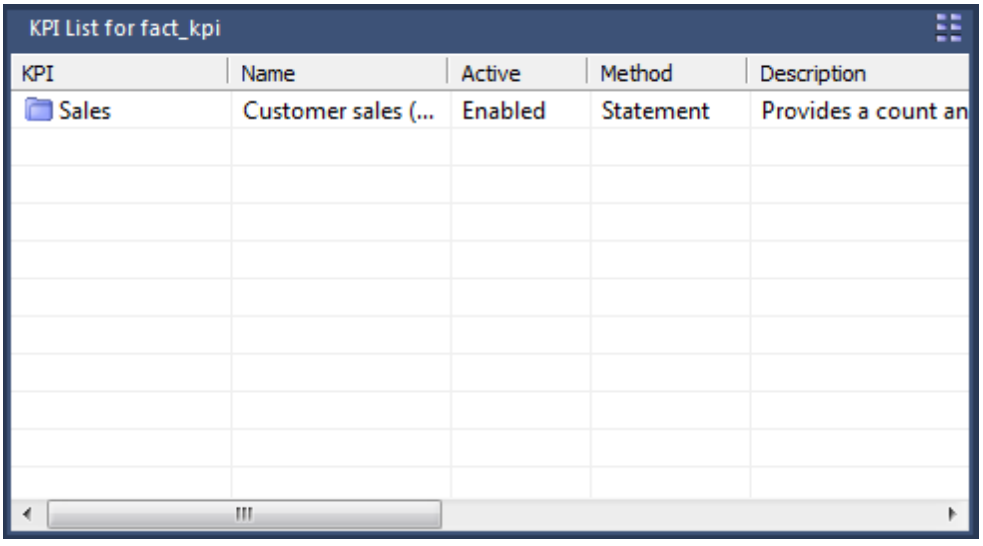
1 Right-click on **fact_kpi** in the left pane and select **Add KPI.**



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** checkbox 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. Click **OK** to add the KPI.



3 Right-click on **fact_kpi** in the left pane and select **Display Kpi's** to display our newly defined KPI.



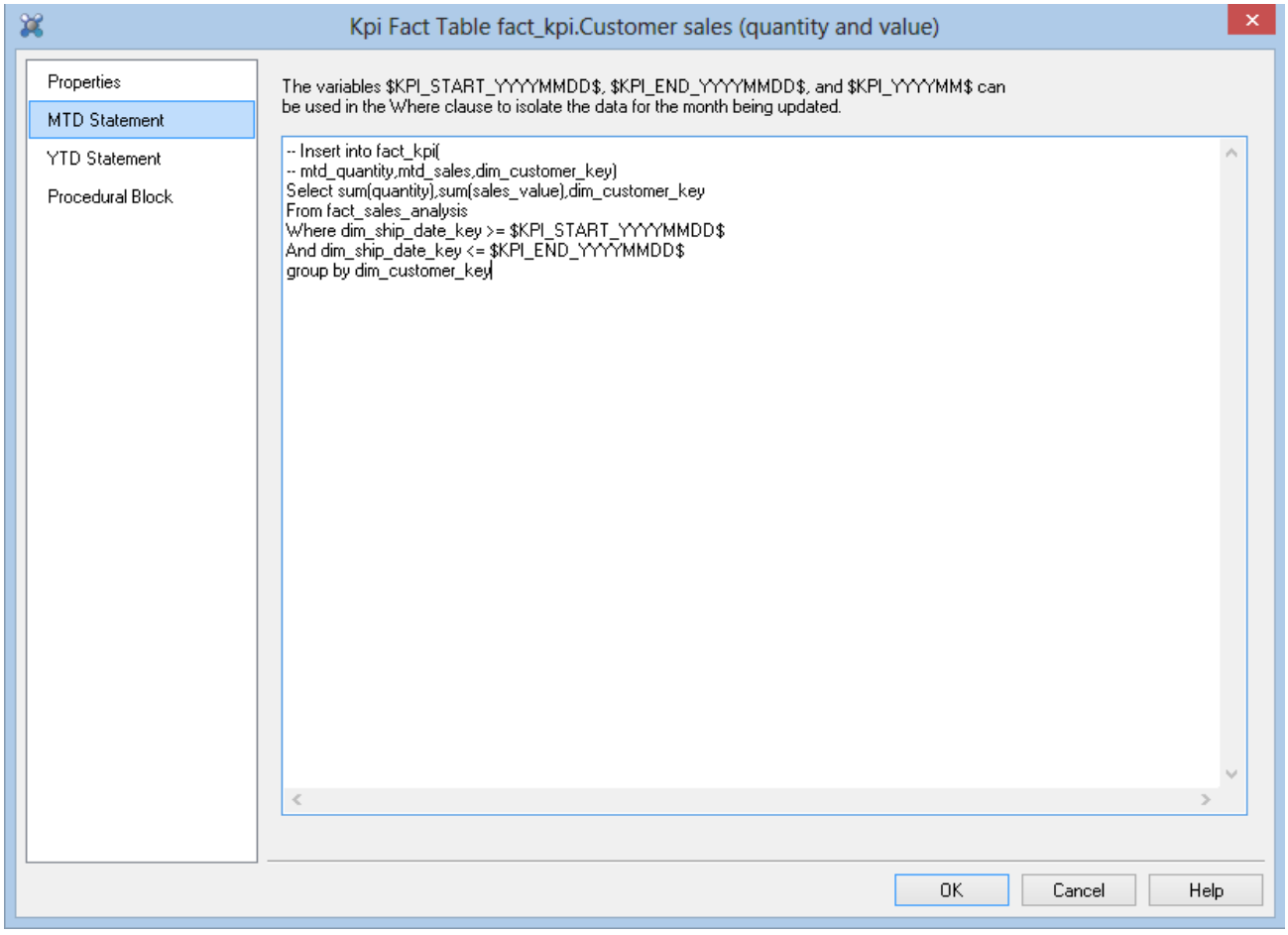
There are three additional tabs on the dialog box as shown in the screen shot in point 2. These tabs allow the definition of a **month to date statement**, a **year to date statement** and a **procedural block**. In this example we will be defining a month to date statement. A procedural block can be 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 Right-click on the **Sales** KPI in the middle pane and select **Modify Kpi,** then click on 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.

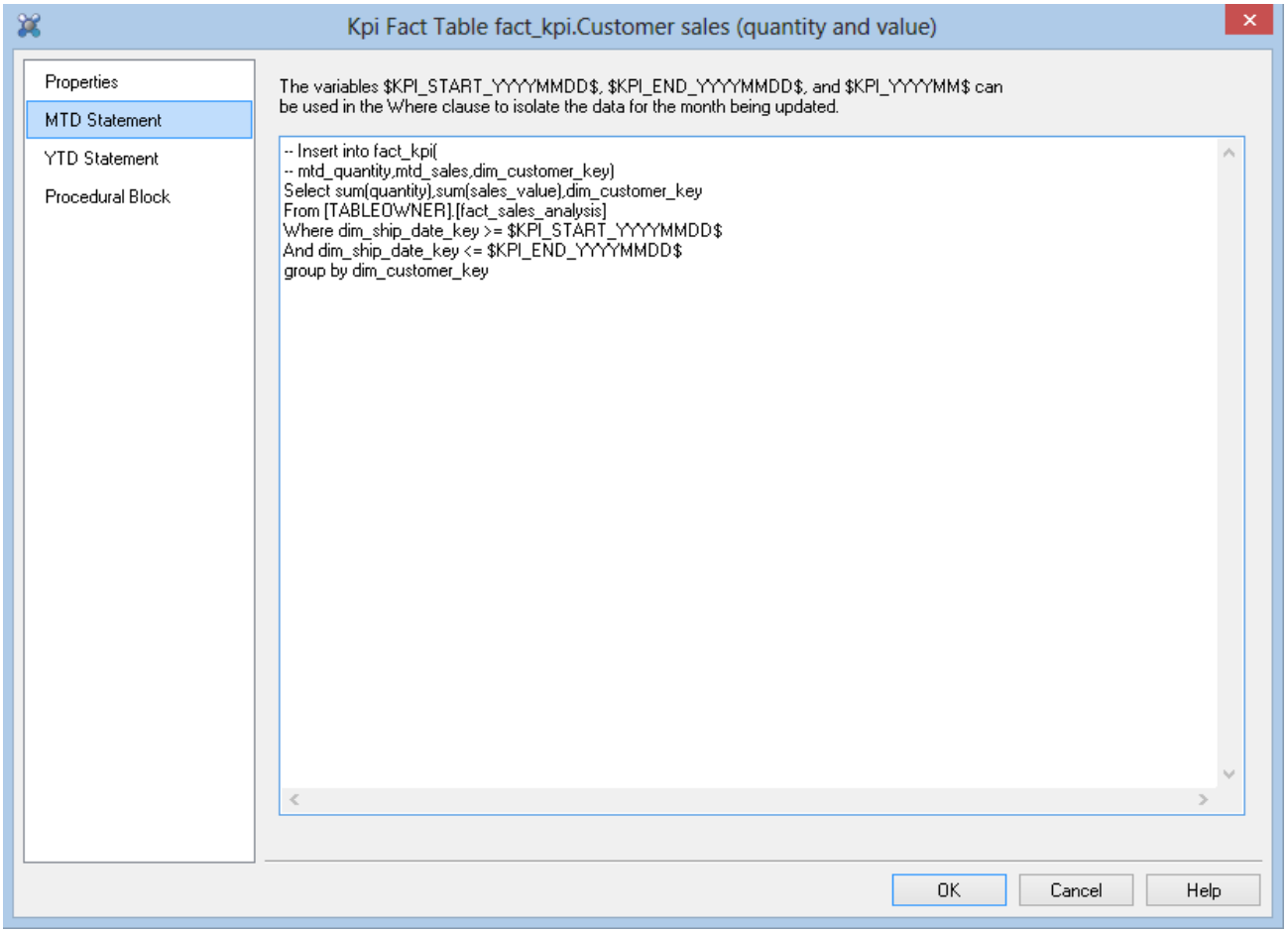
```
-- Insert into fact_kpi(
-- mtd_quantity,mtd_sales,dim_customer_key)
Select sum(quantity),sum(sales_value),dim_customer_key
From fact_sales_analysis
Where dim_ship_date_key >= $KPI_START_YYYYMMDD$
And dim_ship_date_key <= $KPI_END_YYYYMMDD$
group by dim_customer_key
```



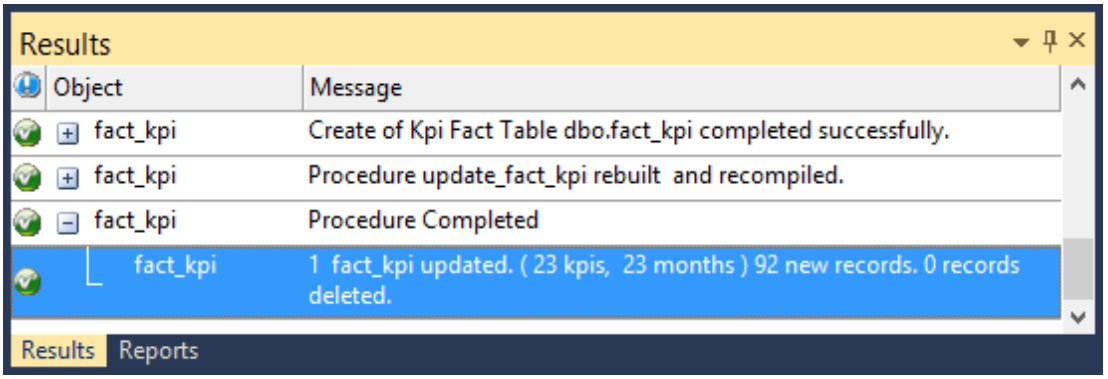
For **DB2**, enter the statement as shown below.

```
-- Insert into fact_kpi(
```

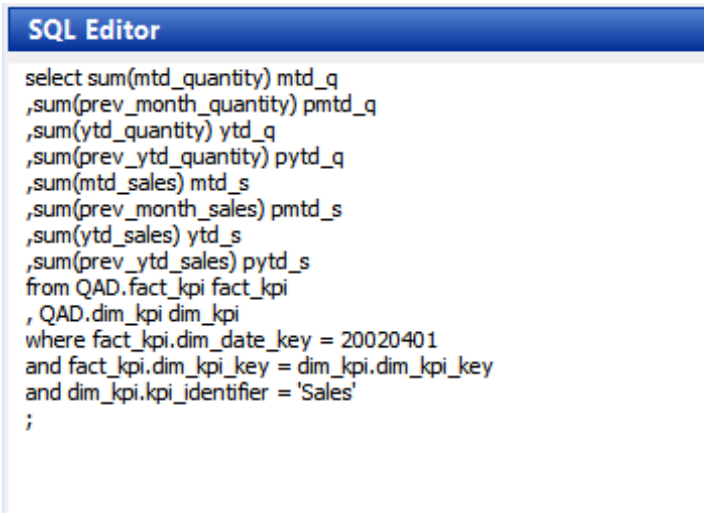
```
-- mtd_quantity,mtd_sales,dim_customer_key)
Select sum(quantity),sum(sales_value),dim_customer_key
From [TABLEOWNER].[fact_sales_analysis]
Where dim_ship_date_key >= $KPI_START_YYYYMMDD$
And dim_ship_date_key <= $KPI_END_YYYYMMDD$
group by dim_customer_key
```



3 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.



4 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.



You are now ready to proceed to the next section - '***Defining the Activity KPI*** (see "***6.7 Defining the Activity KPI***" on page 198)'

6.7 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 Right-click on the **Sales** KPI and select **Insert Copy**.

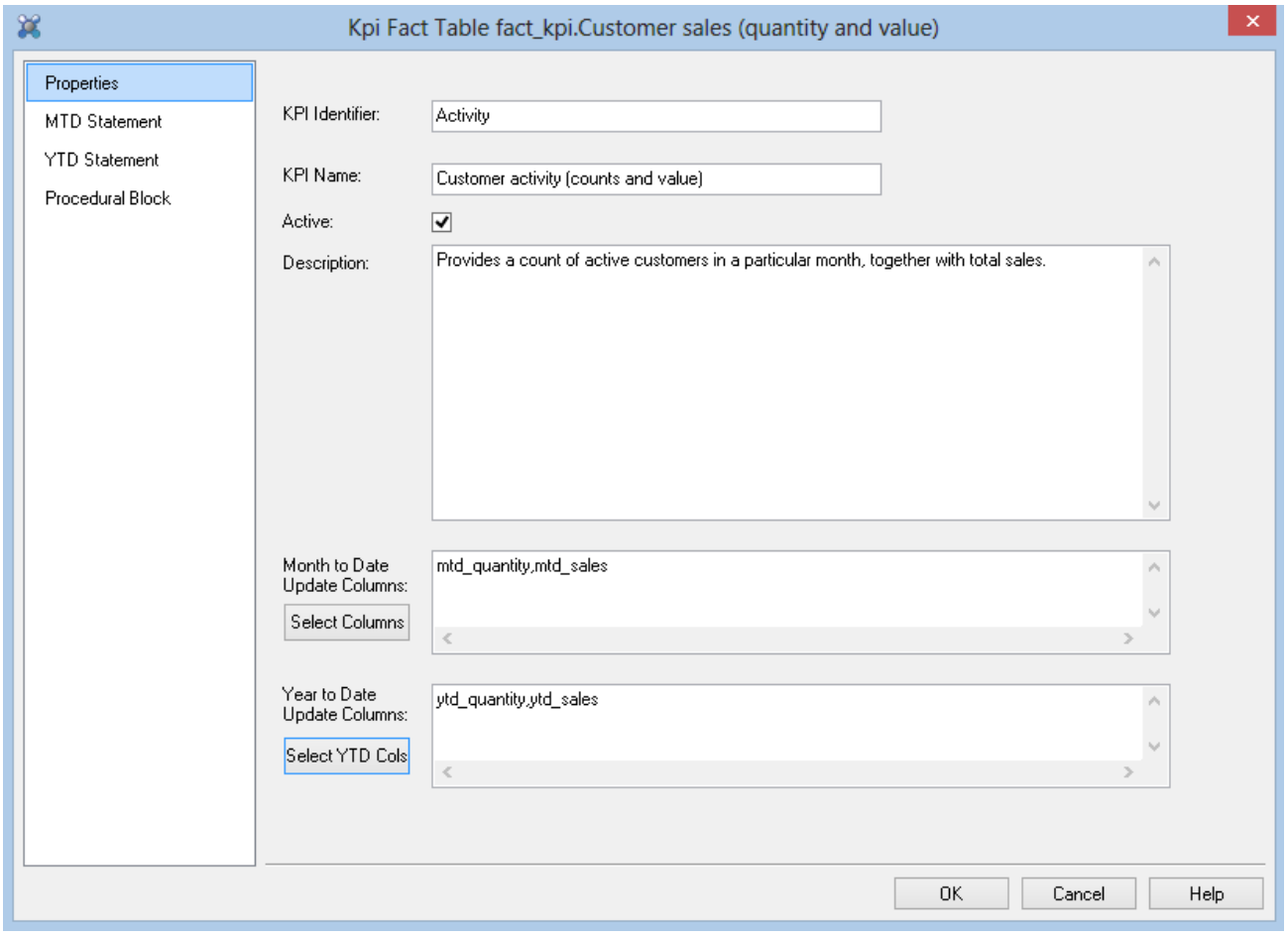
2 Right-click on the second (copy of) **Sales** KPI and select **Properties**.

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.

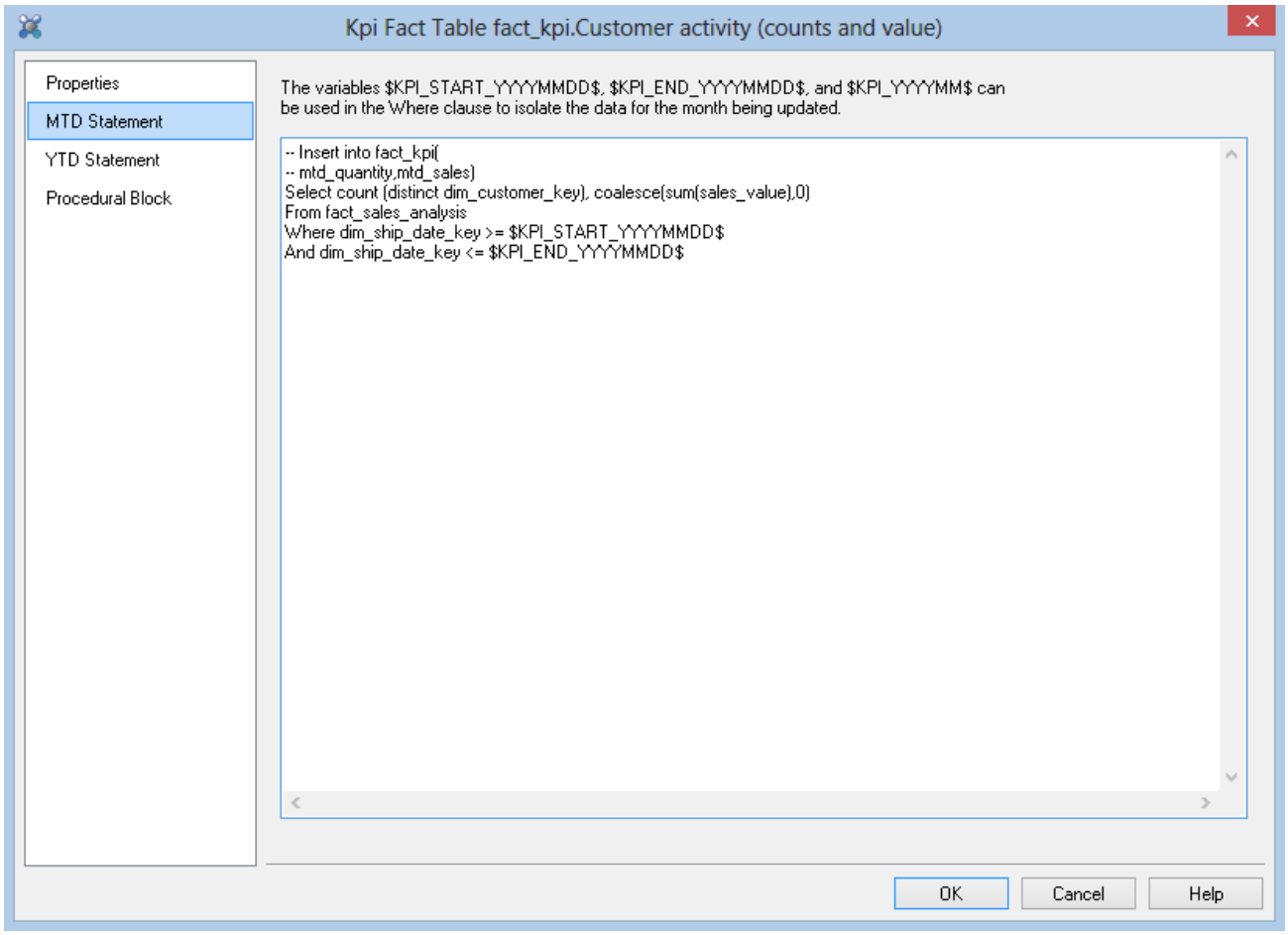
We will now proceed to modify the SQL statement required to perform the month to date update.

1 Right-click on the **Activity** KPI and select **Modify Kpi**, then click on the **Mtd Statement** tab.

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

For **SQL Server** enter the statement as:

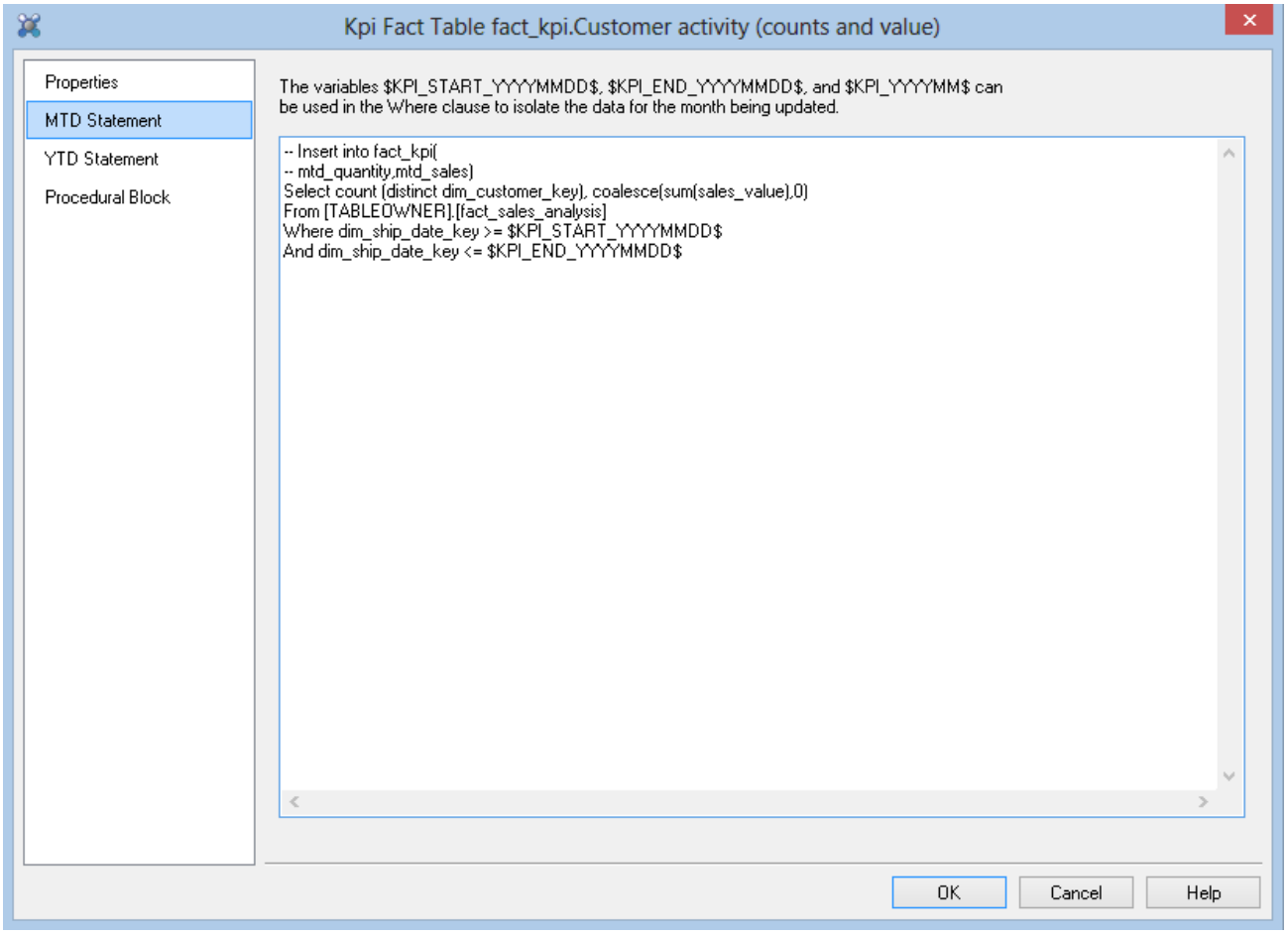
```
-- Insert into fact_kpi(
-- mtd_quantity,mtd_sales)
Select count (distinct dim_customer_key), coalesce(sum(sales_value),0)
From fact_sales_analysis
Where dim_ship_date_key >= $KPI_START_YYYYMMDD$
And dim_ship_date_key <= $KPI_END_YYYYMMDD$
```



For **DB2** enter the statement as:

```
-- Insert into fact_kpi(
-- mtd_quantity,mtd_sales)
Select count (distinct dim_customer_key), coalesce(sum(sales_value),0)
From [TABLEOWNER].[fact_sales_analysis]
```

Where dim_ship_date_key >= $KPI_START_YYYYMMDD$
And dim_ship_date_key <= $KPI_END_YYYYMMDD$



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

1 Click on 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.

For **SQL Server** enter the statement as:

-- Insert into fact_kpi(

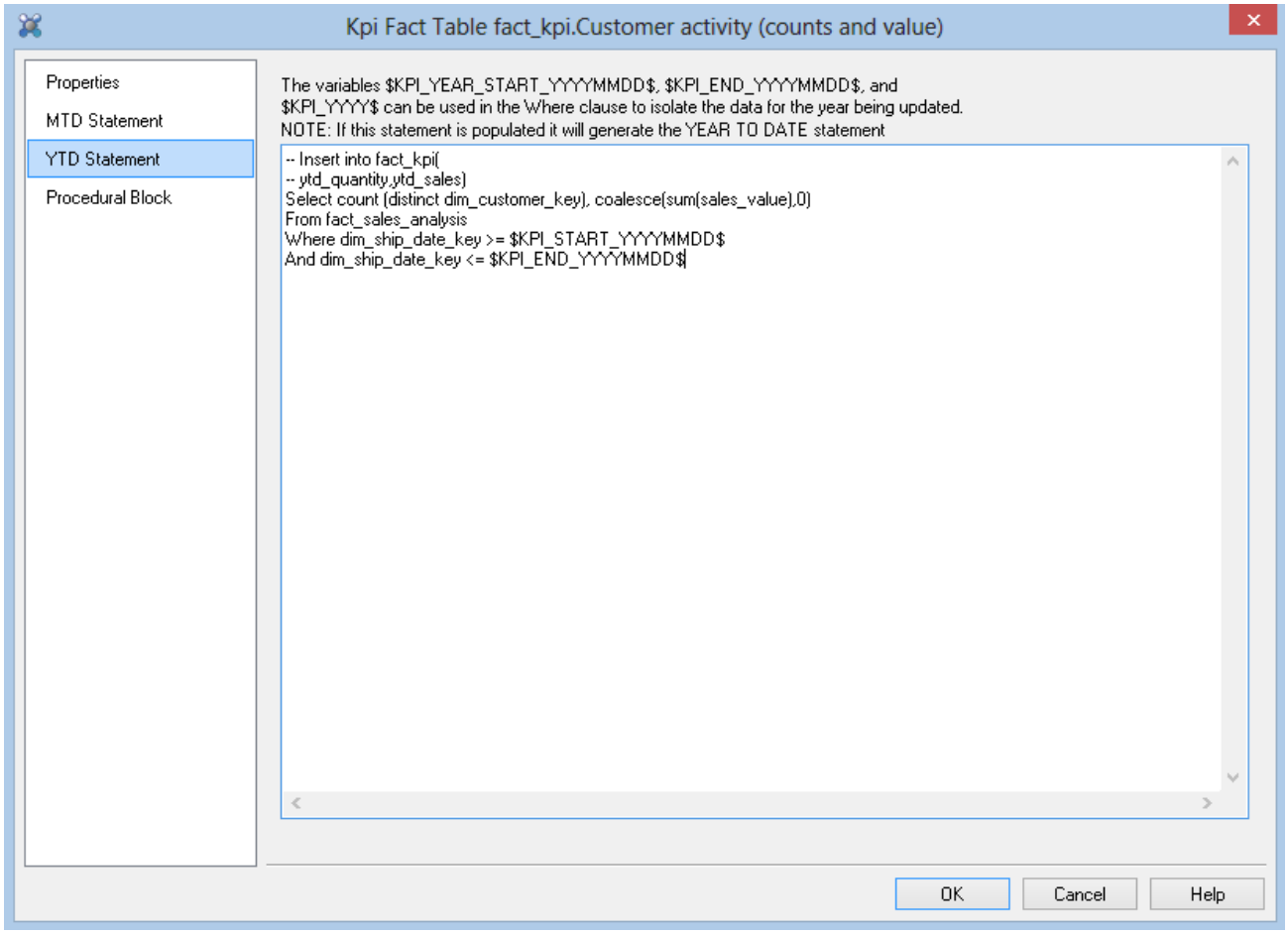
-- ytd_quantity,ytd_sales)

Select count (distinct dim_customer_key), coalesce(sum(sales_value),0)

From fact_sales_analysis

Where dim_ship_date_key >= $KPI_START_YYYYMMDD$

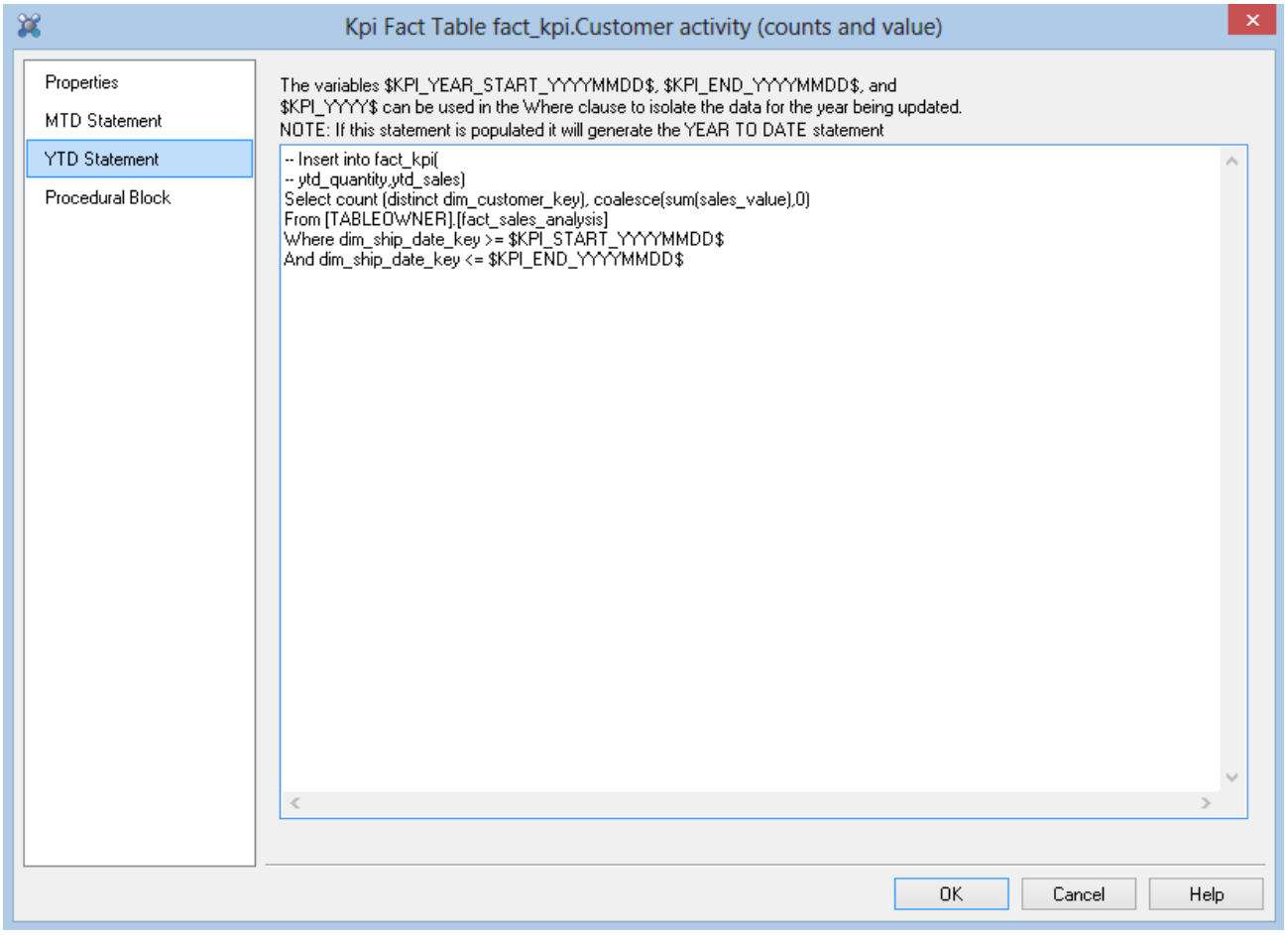
And dim_ship_date_key <= $KPI_END_YYYYMMDD$



For **DB2** enter the statement as:

-- Insert into fact_kpi(
-- ytd_quantity,ytd_sales)
Select count (distinct dim_customer_key), coalesce(sum(sales_value),0)
From [TABLEOWNER].[fact_sales_analysis]

Where dim_ship_date_key >= $KPI_START_YYYYMMDD$
And dim_ship_date_key <= $KPI_END_YYYYMMDD$



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