

Online Analytical Processing with SQL Server Analysis Services

Overview

This purpose of this lab is to introduce MOLAP development to you using an actual OLAP tool. The tool we will use is called SQL Server Analysis Services or SSAS. The goal is to help you get a feel for how the concepts you've learned in class apply in a real-world scenario.

Disclaimer!

As such it should be noted, this lab does not demonstrate everything you need to know about the MOLAP process, nor does it serve as training tool for SSAS. Both of these activities are beyond the scope of this course. Yes, when you're finished with the lab you'll know your way around SSAS, but more importantly you'll understand the purpose and various features of an OLAP tool.

To complete this lab you will need the following:

- Access to the **DemoDW** and **NorthwindDW** databases on Microsoft SQL Server 2012. This should be available through your iSchool vSphere login.
- Access to the SQL Server 2012 Data tools (used to author, SSAS packages).
- Microsoft Excel 2013.
- You should connect to your computer running your SQL server database before starting this lab.

Grading

This lab is worth 10 points total. 5 points for Part 2 and 5 points for part 3.

Part 1: Understanding Analysis Services

Microsoft SQL Server Analysis Services 2012 allows us to build Multi-dimensional OLAP solutions. We can deploy these solutions to a special database which users can connect to and perform ad-hoc, interactive reporting. Analysis services consists of two components:

- 1) **SQL Server Data tools** – we use this to build our analysis services databases.
- 2) **SQL Server Analysis Services**– we deploy our analysis services databases to this server to test and deploy our packages

Terminology

- **Data source** – Connections to relational databases and other sources of data.
- **Data Source View** – The logical model of the schema used by Analysis services. Typically comes from one source, but can be derived from several sources.
- **Cubes** – A set of measures and dimensions used to analyze data. This is the primary delivery mechanism for OLAP services.
- **Dimensions** – At the name implies, these are dimensions. Typically there are additional rows in the dimension tables such as AuditColumns, and SCD columns we do not wish to include in the OLAP presentation.

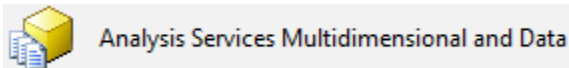
- **Mining Structures** – Defines a domain for a data mining models.
- **Roles** – Allows you to secure dimensions, measures and/or values in the cubes.
- **Assemblies** – Code libraries which are required by the project. These typically include custom data sources or data mining models.

Quick Walk-Thru

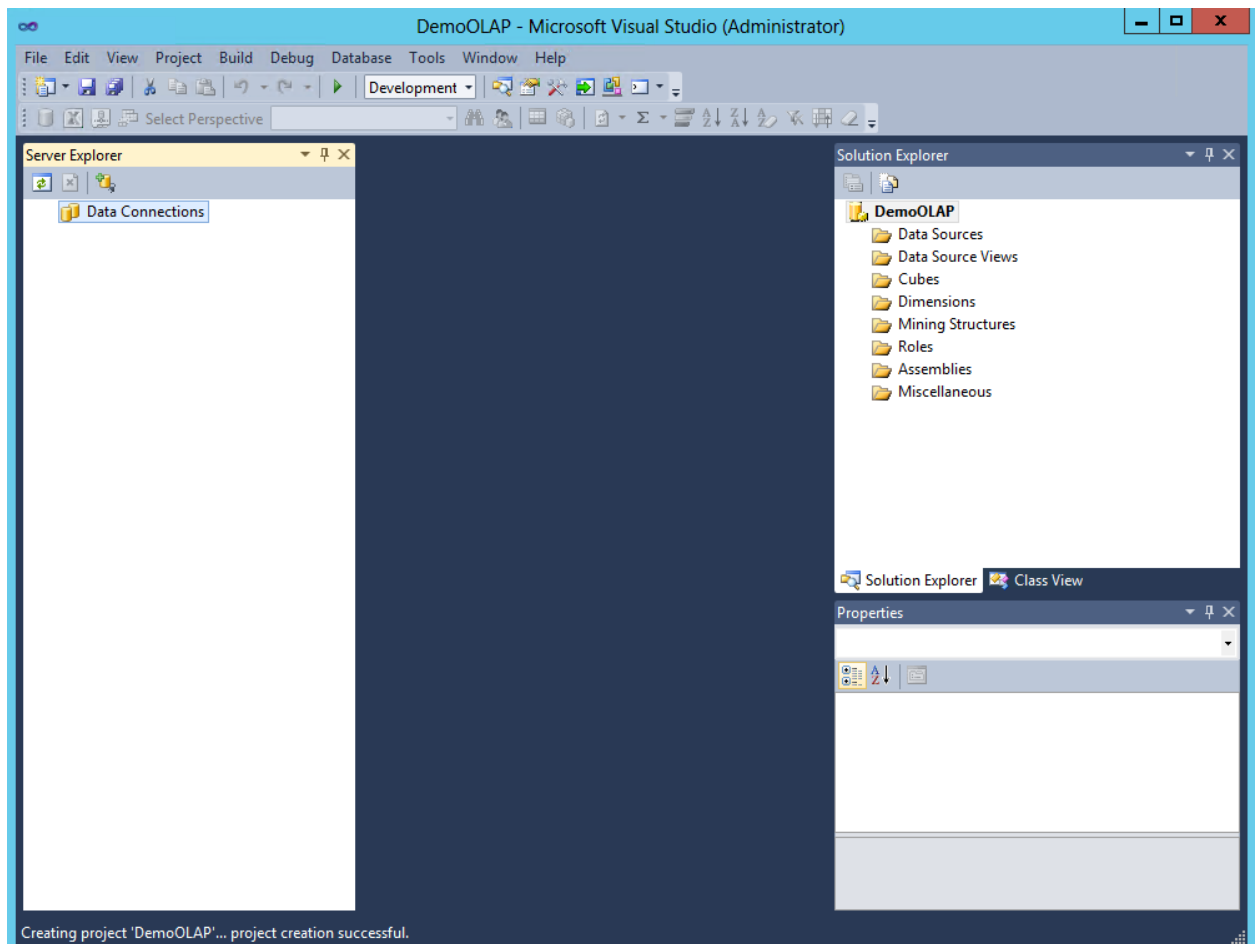
In this section we'll walk through creating and deploying an empty analysis services database. This will give you a general overview of how the process works and help setup your project for the rest of the lab.

DO THIS: Start a new Analysis Services Project

- 1) Click the **Start** button.
- 2) Click on the **SQL Server Data Tools** icon 
- 3) From the menu, click **File → New → Project**
- 4) Select **Analysis Services Multidimensional Project** from the list of options



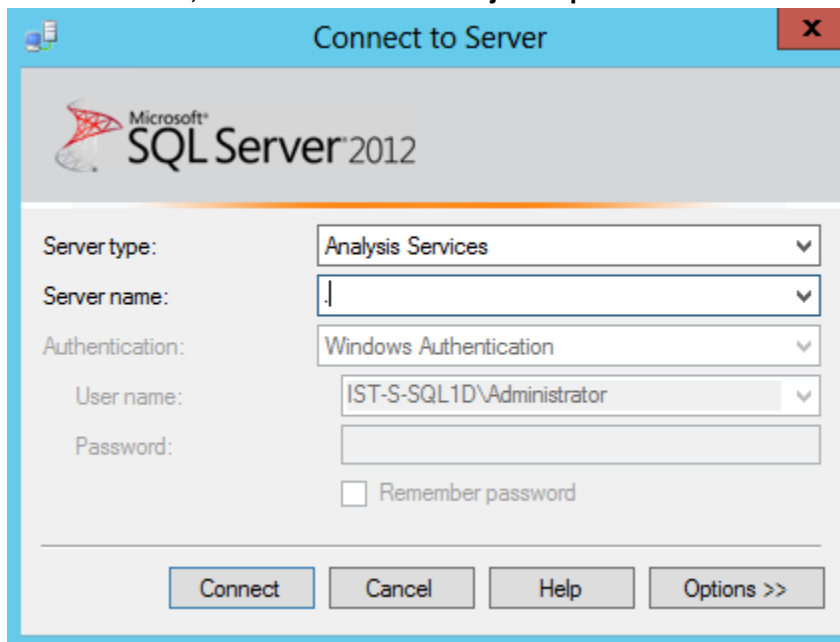
- 5) Name your project **DemoOLAP** and click **OK**
- 6) You should see this window:



- 7) Press the **F5** key to deploy the empty Analysis Services project to your local Analysis Server

DO THIS: Connect to your local Analysis Services Server

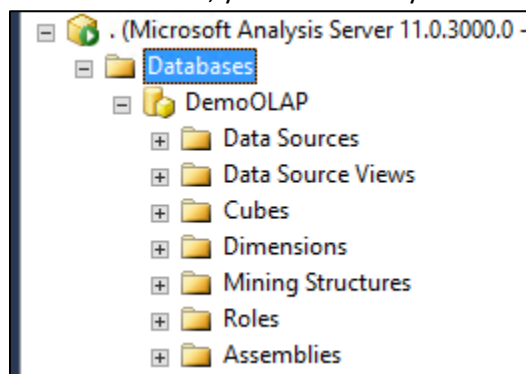
- 1) Click the **Start** button.
- 2) Click on the **SQL Server Data Tools** icon
From the menu, click **File** → **Connect Object Explorer**



Choose Server type: **Analysis Services**

For Server name: . (yes, that's a period)

- 3) Click **Connect**
- 4) Under databases, you should see your **DemoOLAP** database



If you did these steps successfully then you're ready to begin creating an analysis services database.

Part 2: Cube-Building Walk-Thru

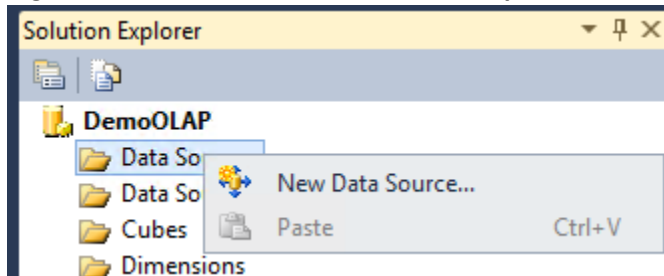
In this part we will walk through the process of building an Analysis Services we will then build and deploy the cube and access it with Excel.

We'll build the cube based on the DemoDW database.

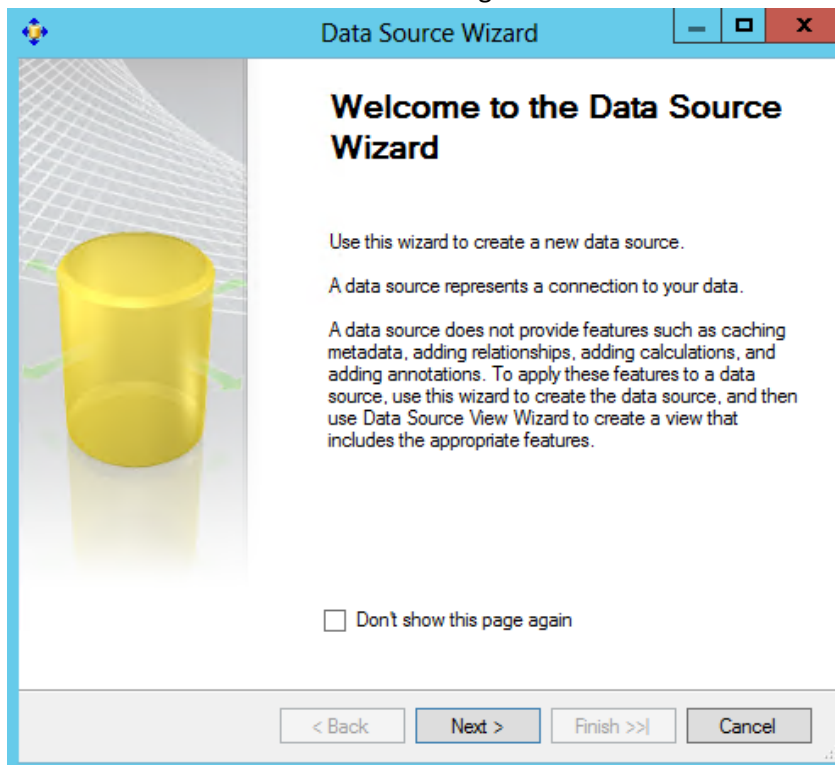
Step 1: Add a data source to the project

The first thing you must do in your analysis services project is connect to one or more data sources. Since we're following the Kimball model of storing our MOLAP solution in a ROLAP structure, we will need only one connection to the **DemoDW** database containing our relational dimensional model.

- 1) Right-click on **Data Sources** in **Solution Explorer** then click **New Data Source...**

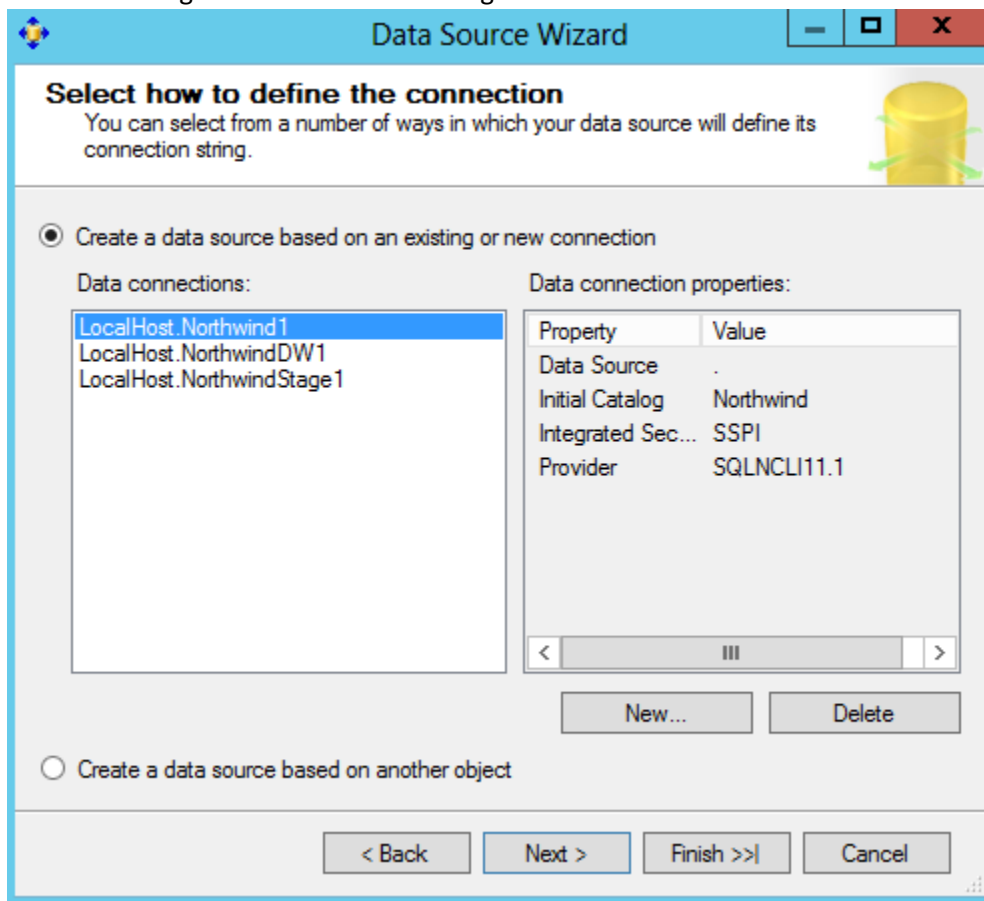


- 2) You'll see the **Data Source Wizard** dialog.



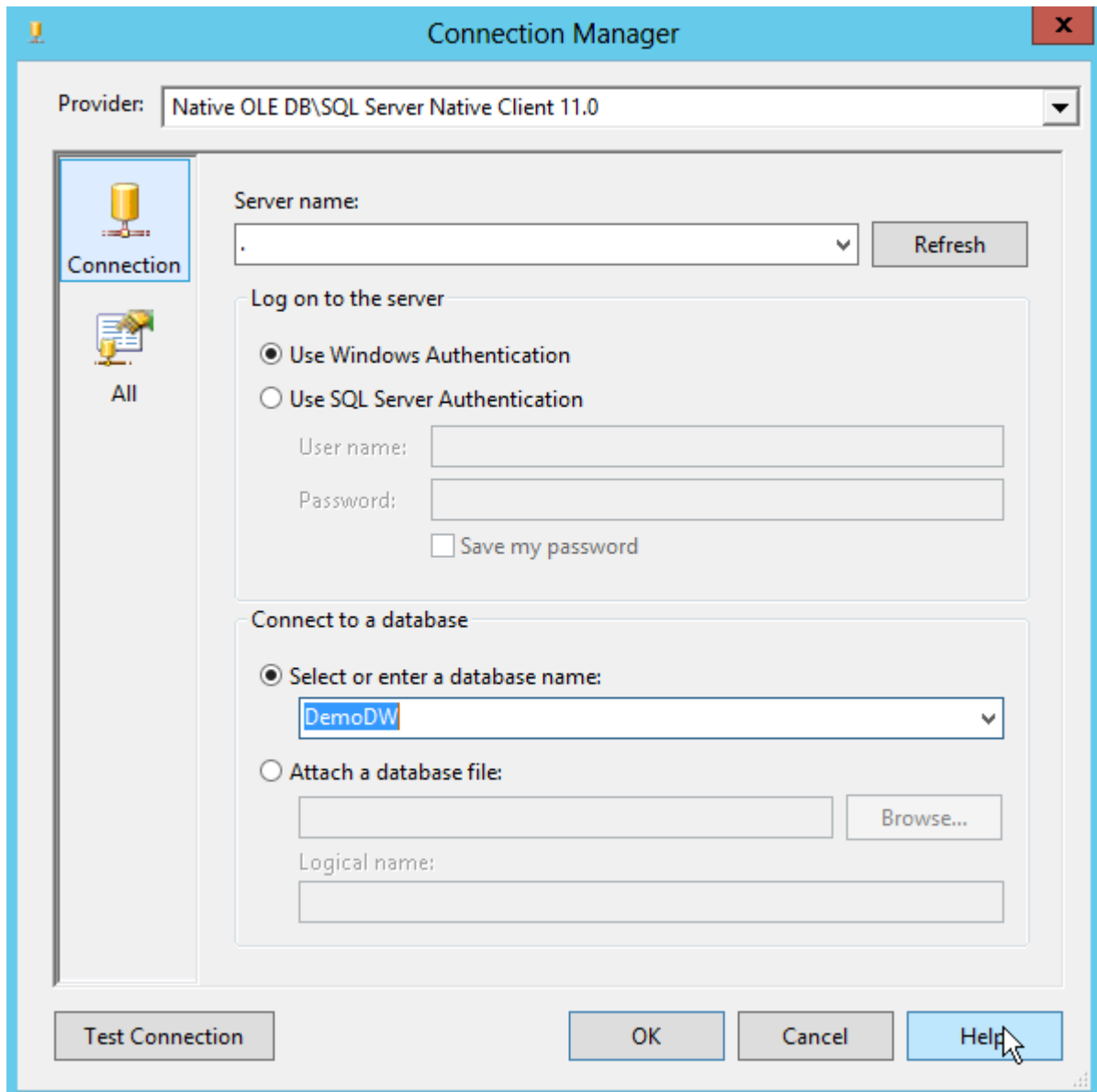
Click **Next>**

- 3) This next dialog is familiar from the Integration Services lab.



Click **New...** to create a new connection

- 4) From the **Connection Manager** dialog, we need to fill out information to connect to our **DemoDW** database:

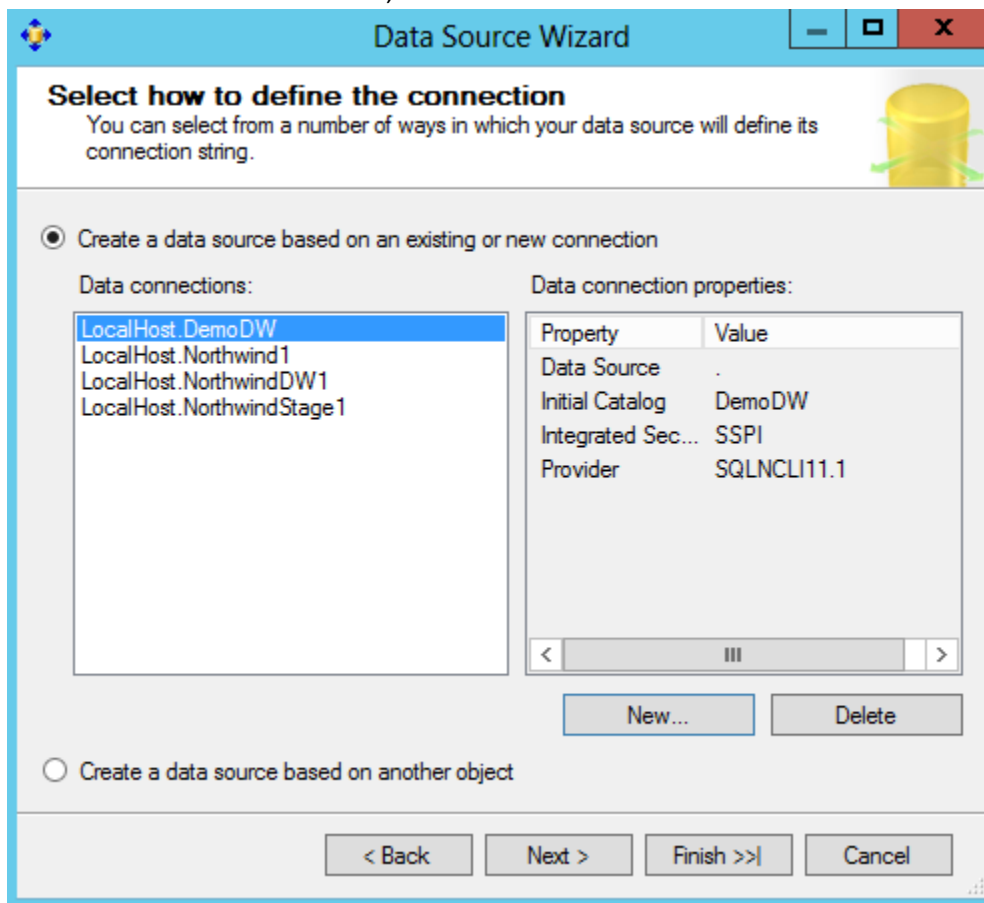


Use Server name: . (yes, that's a period)

Connect to database: **DemoDW**

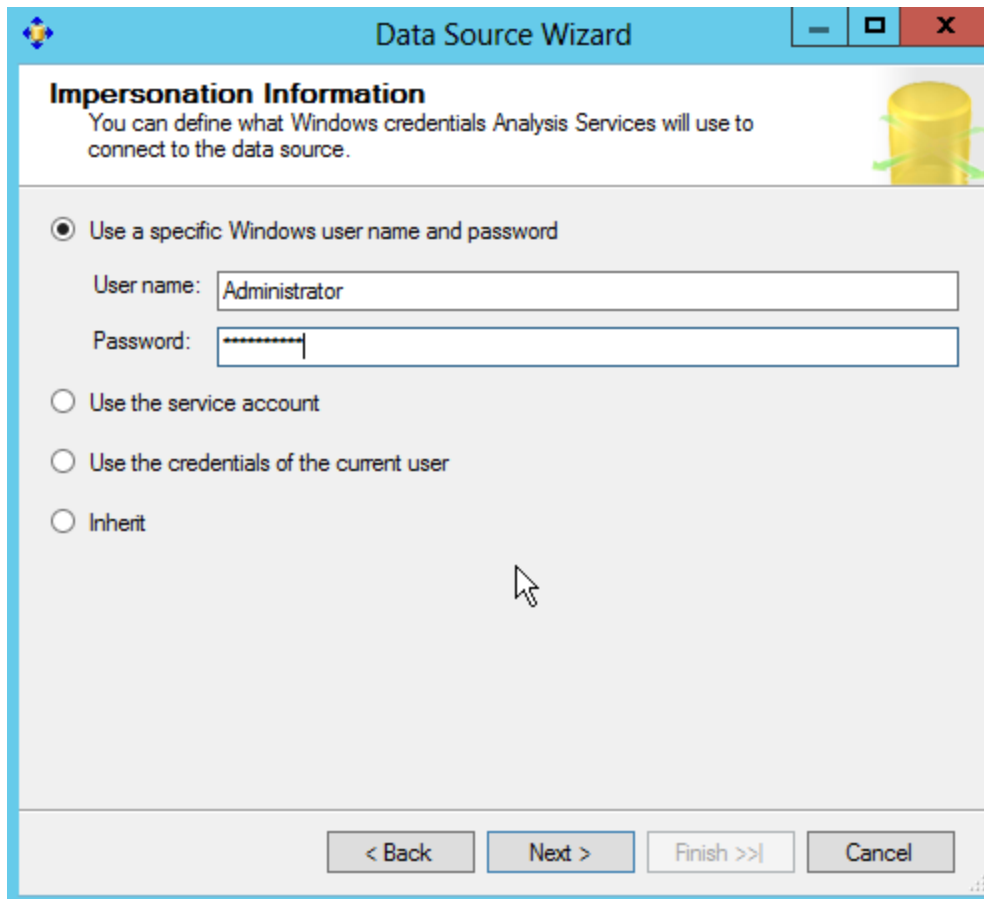
Click **Test Connection** to verify your connection works, and after it does click **OK**

- 5) Back at the **Data Source Wizard**,



click on the **Localhost.DemoDW** connection, then click **Next>**

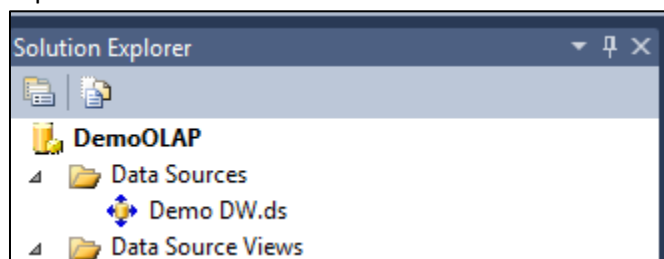
- 6) You must choose the security credentials for this connection. Under normal circumstances we would inherit this value, but here we need to re-enter the administrator's credentials:



IMPORTANT: Your credentials may be different from this screenshot. They should match the administrator's user name and password for your virtual machine.

Enter your Administrator username and password and then click **Next>**

- 7) At the **Completing the Wizard** step, click **Finish**. You should now see the data source in solution explorer:

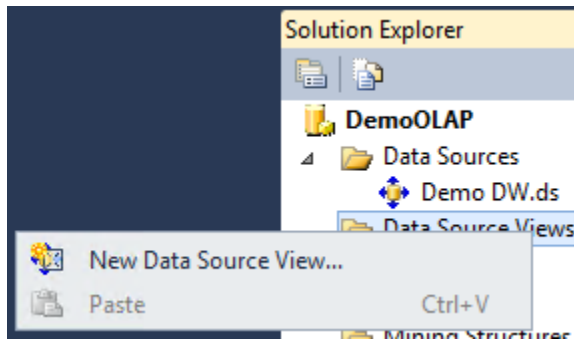


TIP: It's a good idea to save your work periodically! Do so now.

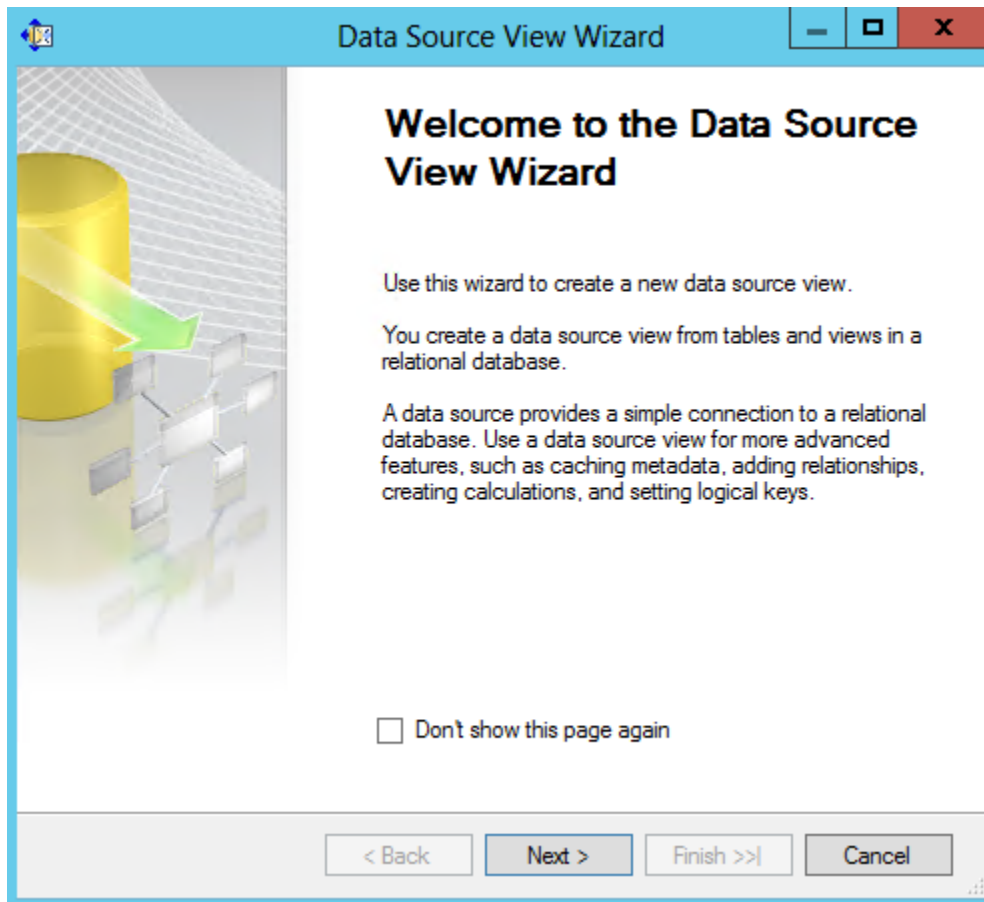
Step 2: Create the data source view

The data source view contains the logical model of the relational objects (tables, keys, columns, and constraints) which will be used by your OLAP database to build out cubes.

- 1) Right-click on **Data Source Views** from within the **Solution Explorer** and click **New Data Source View...** from the menu.

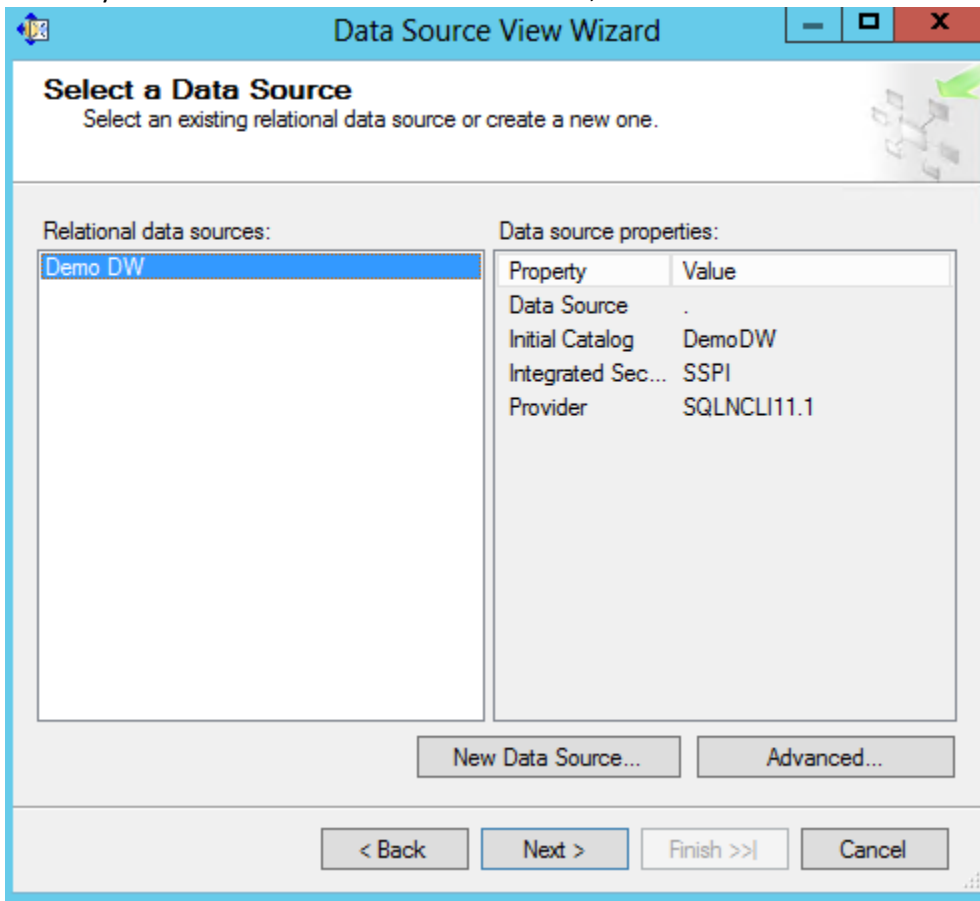


- 2) This will launch the **Data Source View Wizard**



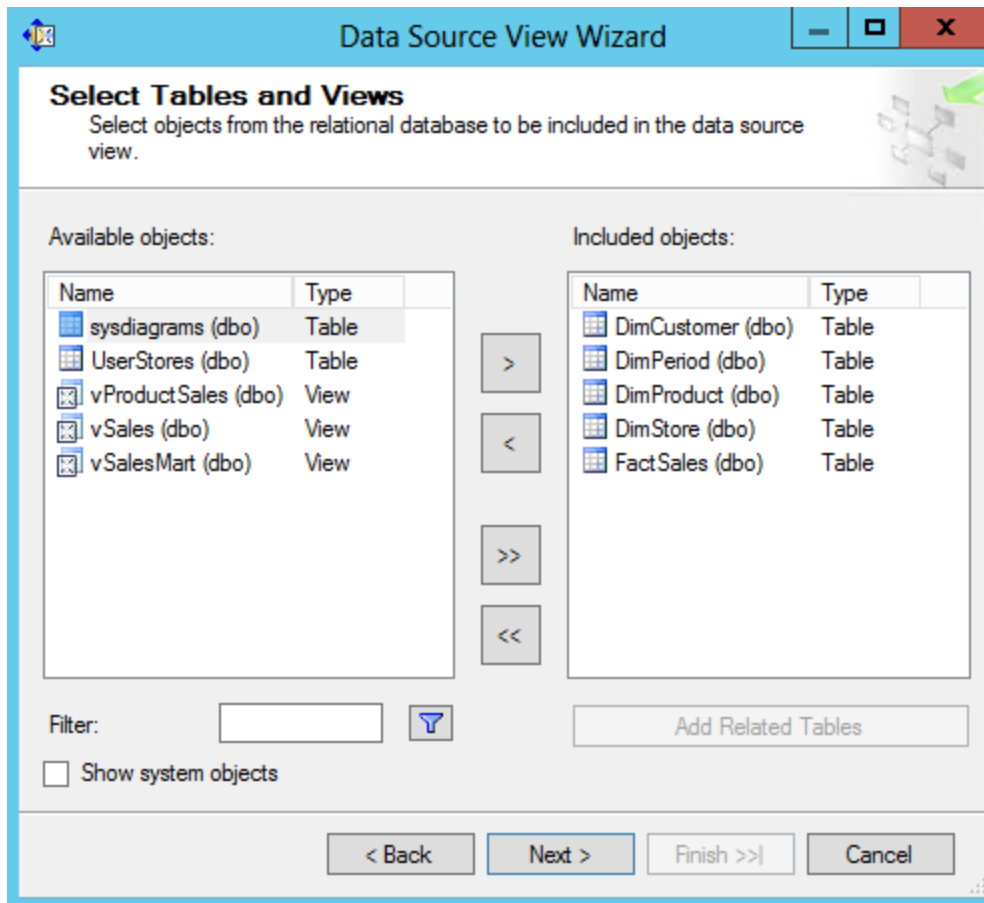
Click **Next>** to begin.

- 3) Choose your data source. Rather than create one, we'll use the one we built in step 1.



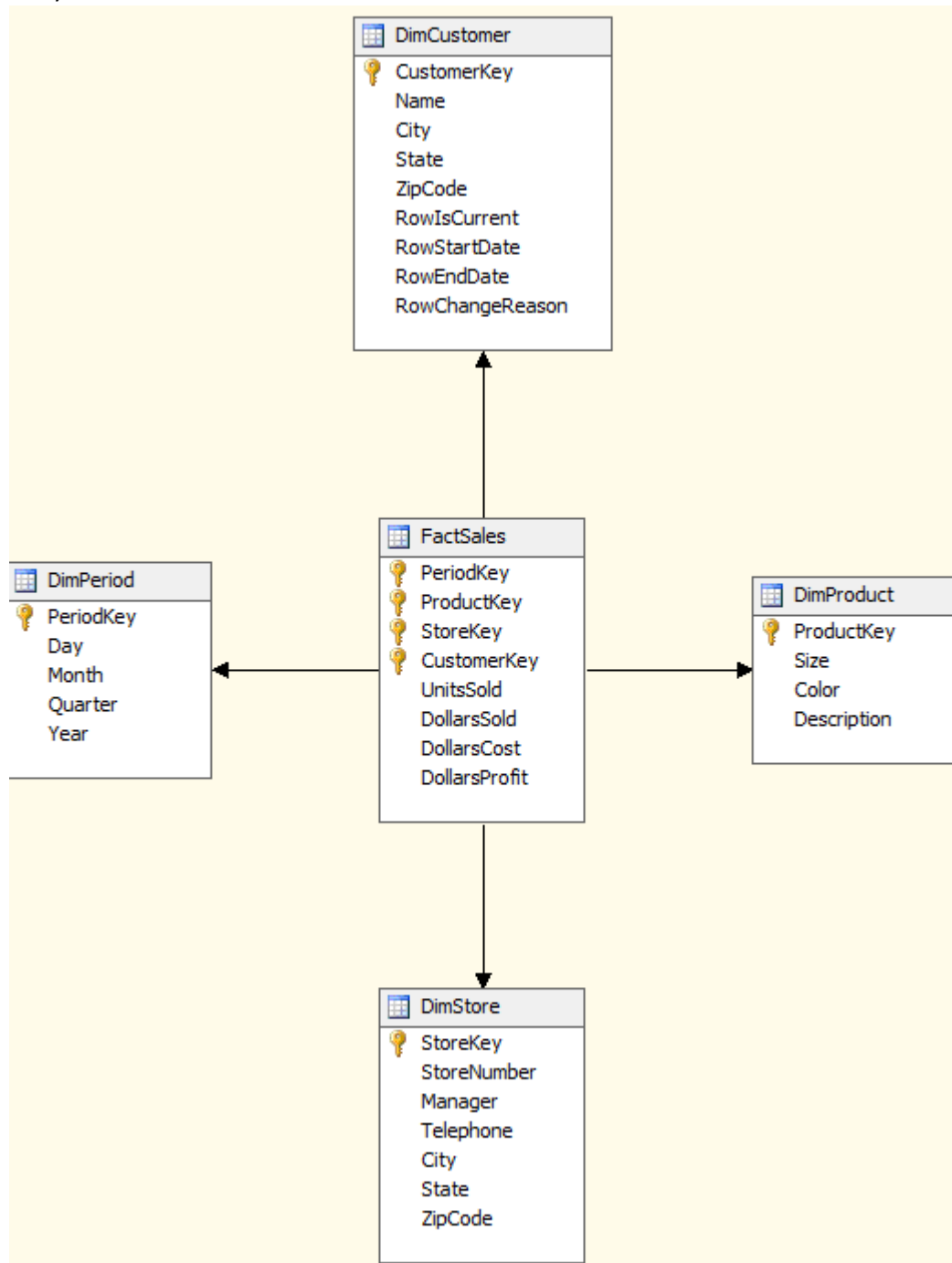
Click **Next>**

- 4) Next we must select the tables and views used by our dimensional model. We should select all of the tables and views used by our star-schema:



Add the tables shown in the screenshot, and click **Next>**

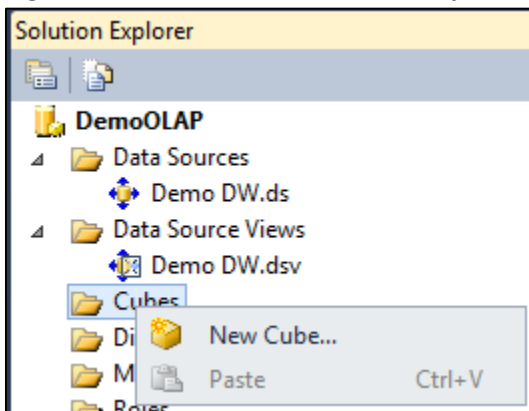
- 5) At the last screen click **Finish** to save your data source view. In your design surface you should see your star schema:



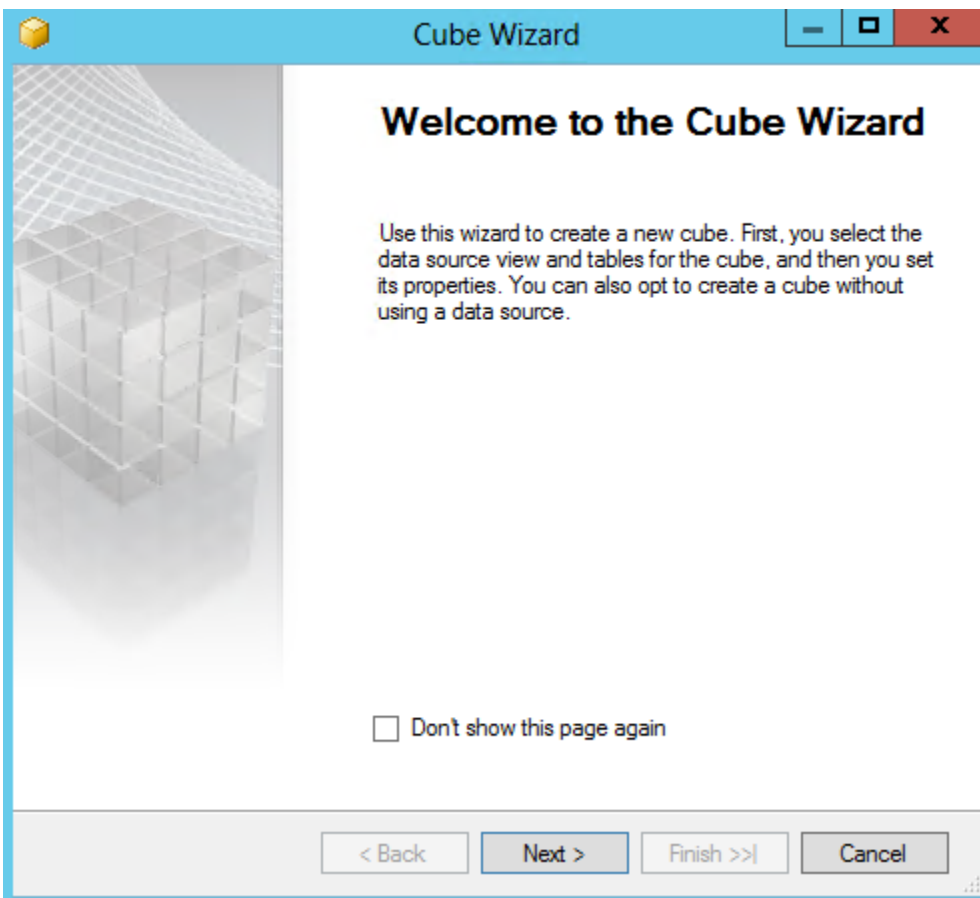
Step 3: Create a Data Cube

In this step we will create a cube from our data source view. Eventually, this cube will be used by end users for ad-hoc queries.

- 1) Right-click on **Cubes** from **Solution Explorer** and select **New Cube...**

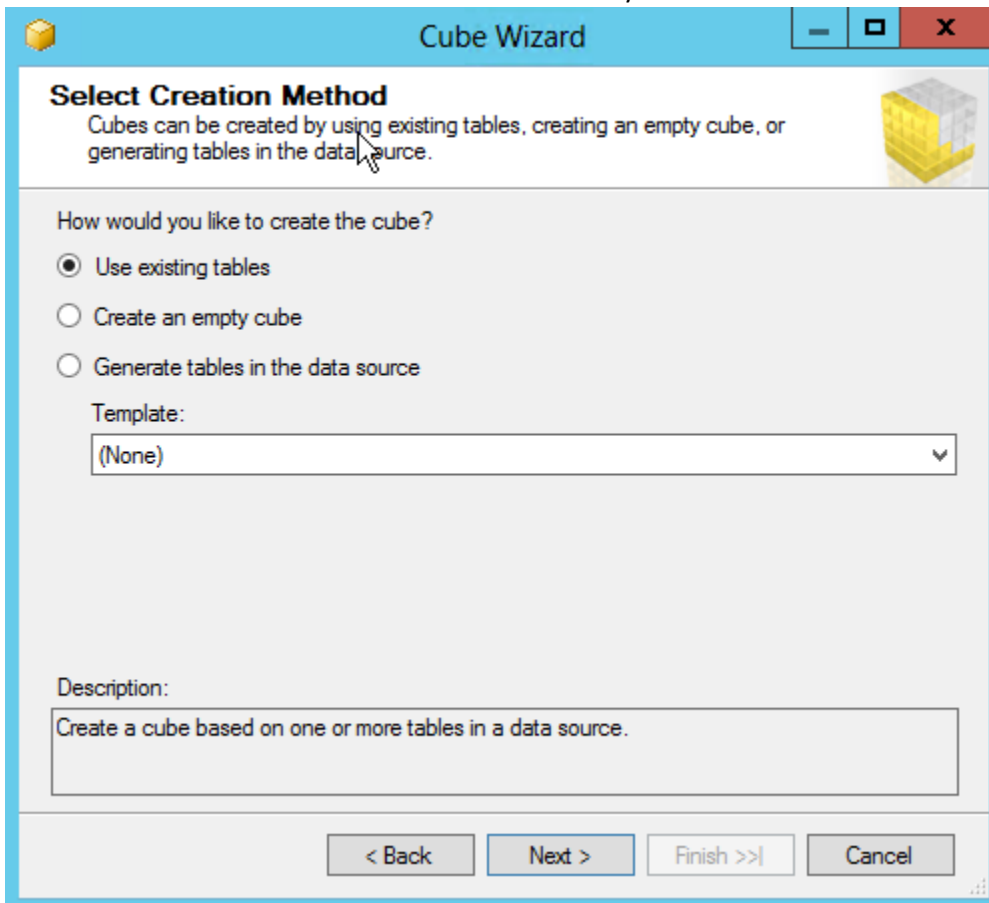


- 2) This will start the cube wizard:



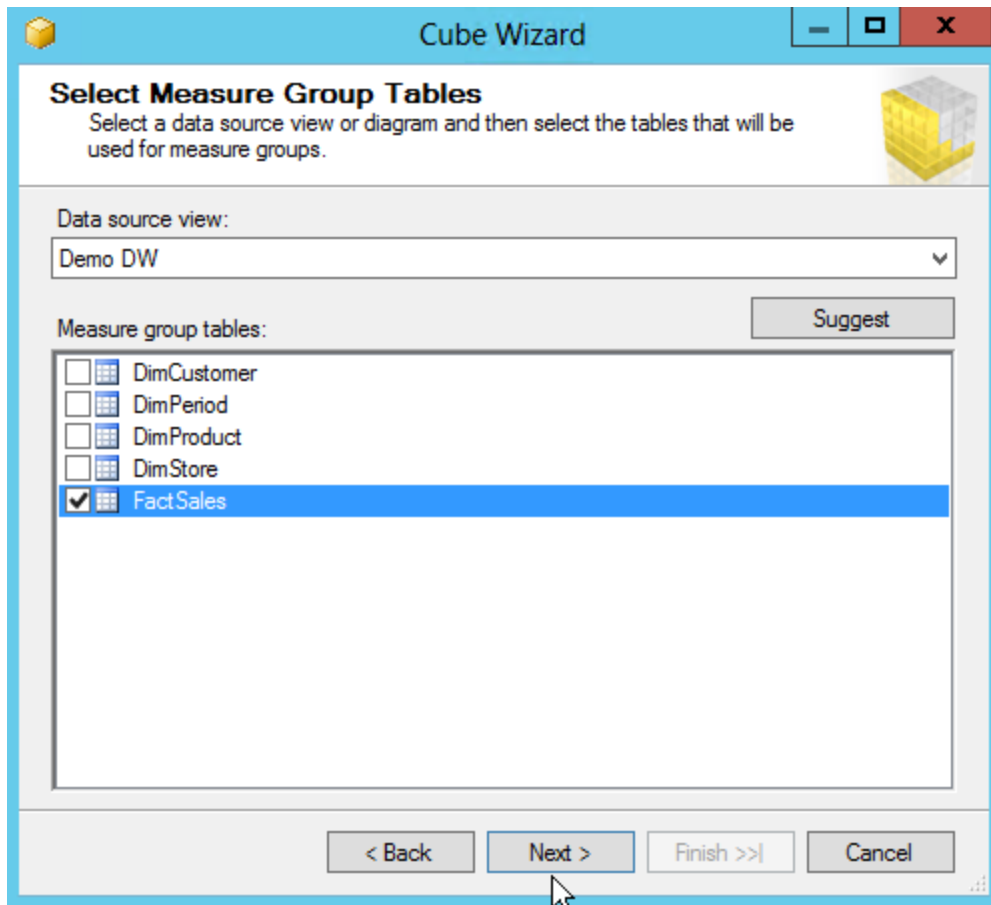
Click **Next>**

- 3) We'll build our cube from the tables we have already added to our data source view:



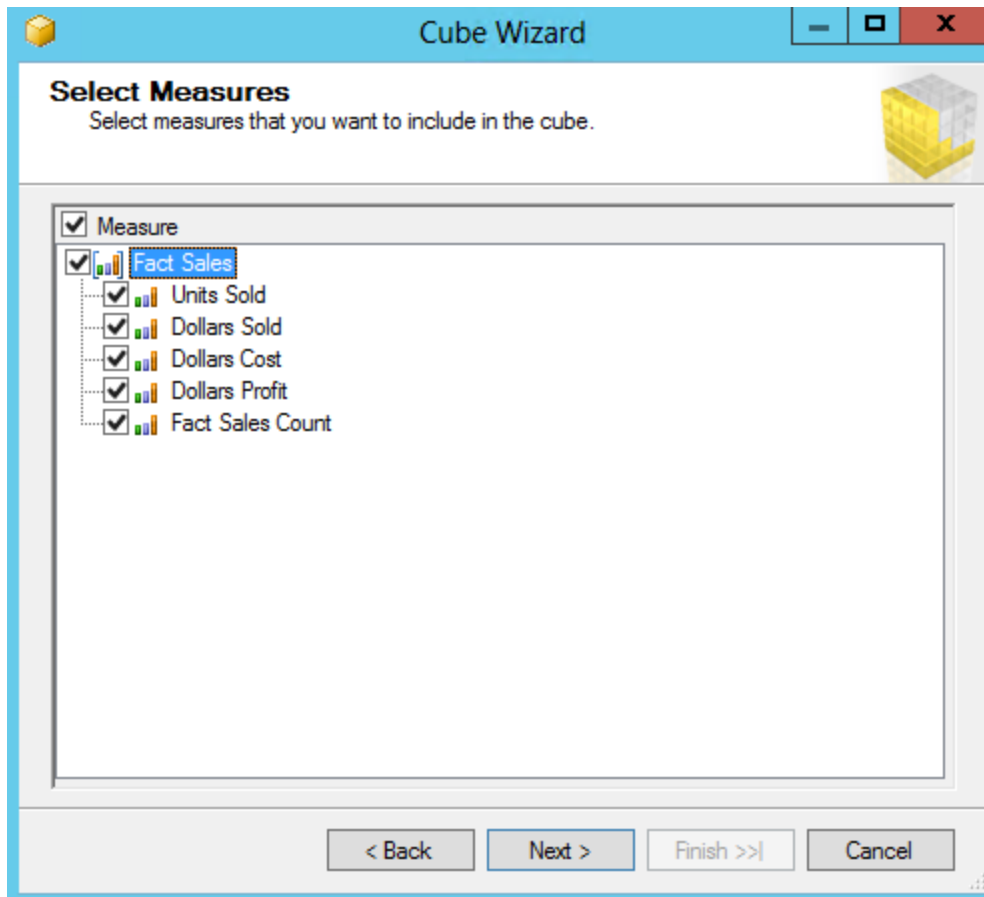
Select **Use existing tables** and click **Next>**

- 4) In this step, you should select the Fact table as it contains the measurements required by our cube:



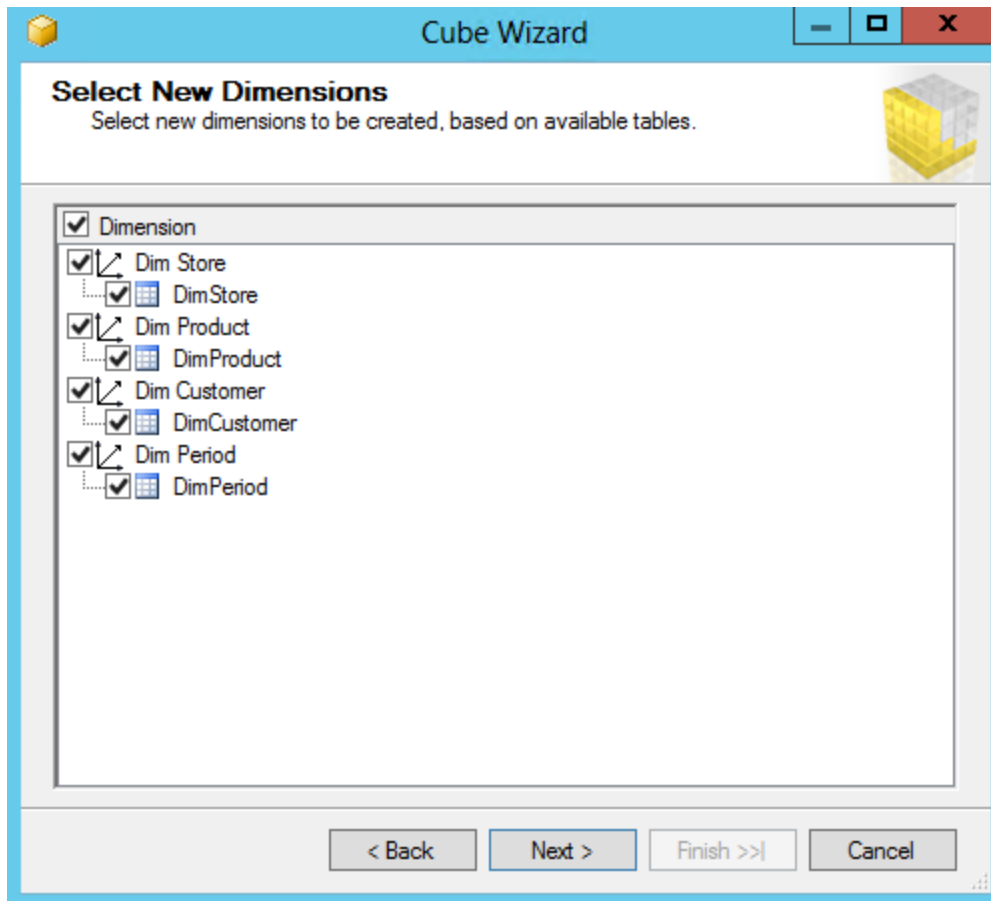
Select on **FactSales** and click **Next>**

- 5) Next we select measures from our fact table we would like to include in our cube. While most of the time you'll select all the columns in your fact table, This screen give you the opportunity to omit degenerate dimensions and audit columns from your cube.



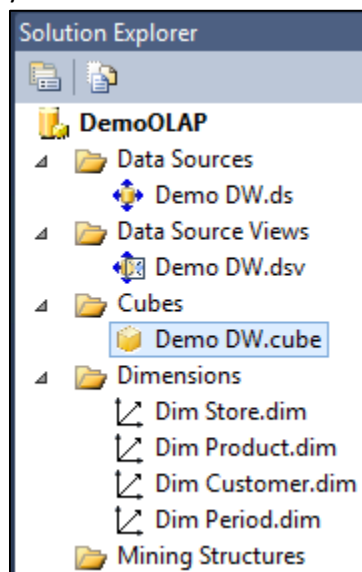
Select all columns and click **Next>**

- 6) At this step you will get to select dimensions. The dimensions are discovered automatically from the foreign keys in your fact table.



Select all the dimension tables and click **Next>**

- 7) In the last step, you can name your cube. Leave it as **Demo DW** and click **Finish** You should see your cube and dimensions loaded into the project:



Step 4: Configure our dimensions

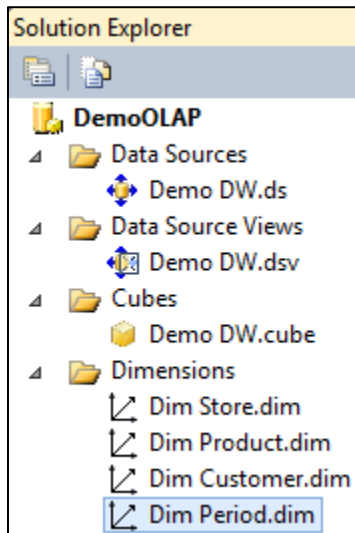
The wizard created our dimensions, but we need to populate them with attributes, hierarchies and relationships. This important step is what makes our cube fully functional!

Here's an overview of the process:

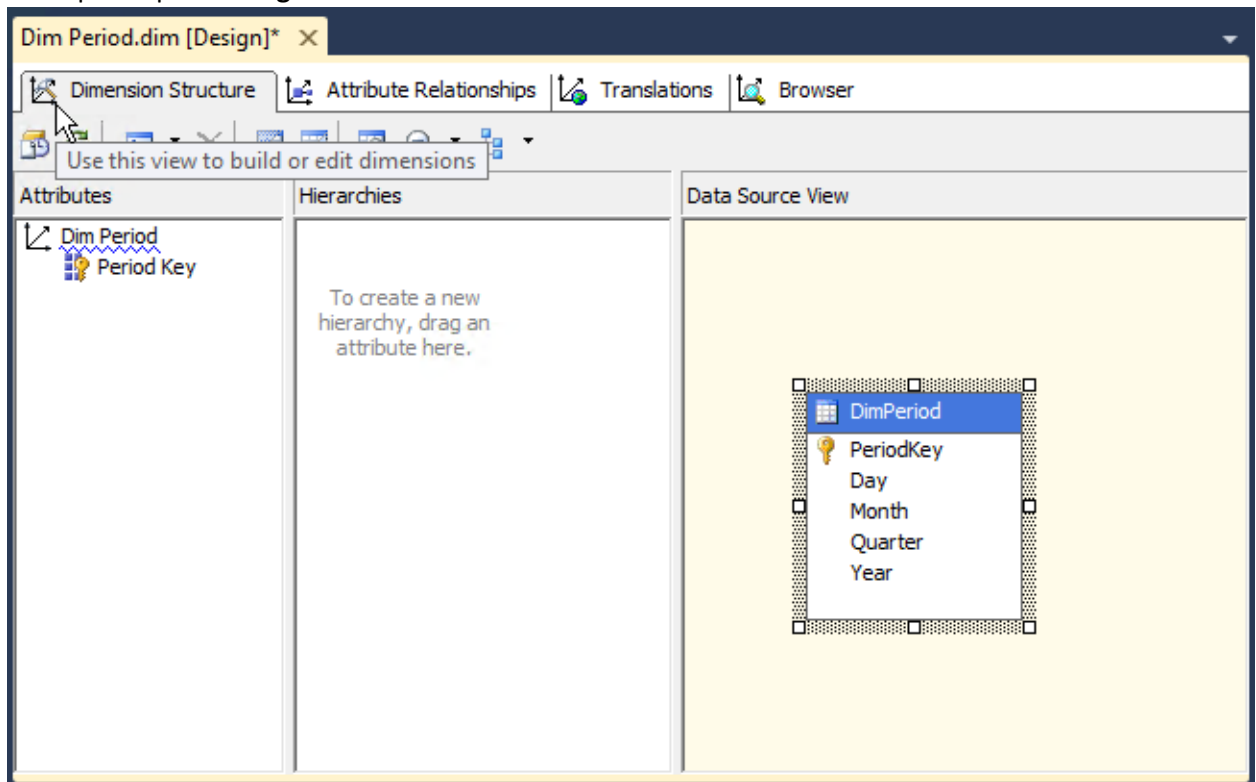
- Edit the name of the dimension
- Add attributes from the data source to the dimension
- Create hierarchies – drill paths through your dimension
- Define relationships – help you associate connections among dimension attributes
ex: 5=May, Syracuse is in NY
- Build & deploy the dimension so you can view the data.
- Rinse, Lather, Repeat!

Let's configure the **Period** dimension together. I'll leave the remaining dimensional configurations as an exercise for you.

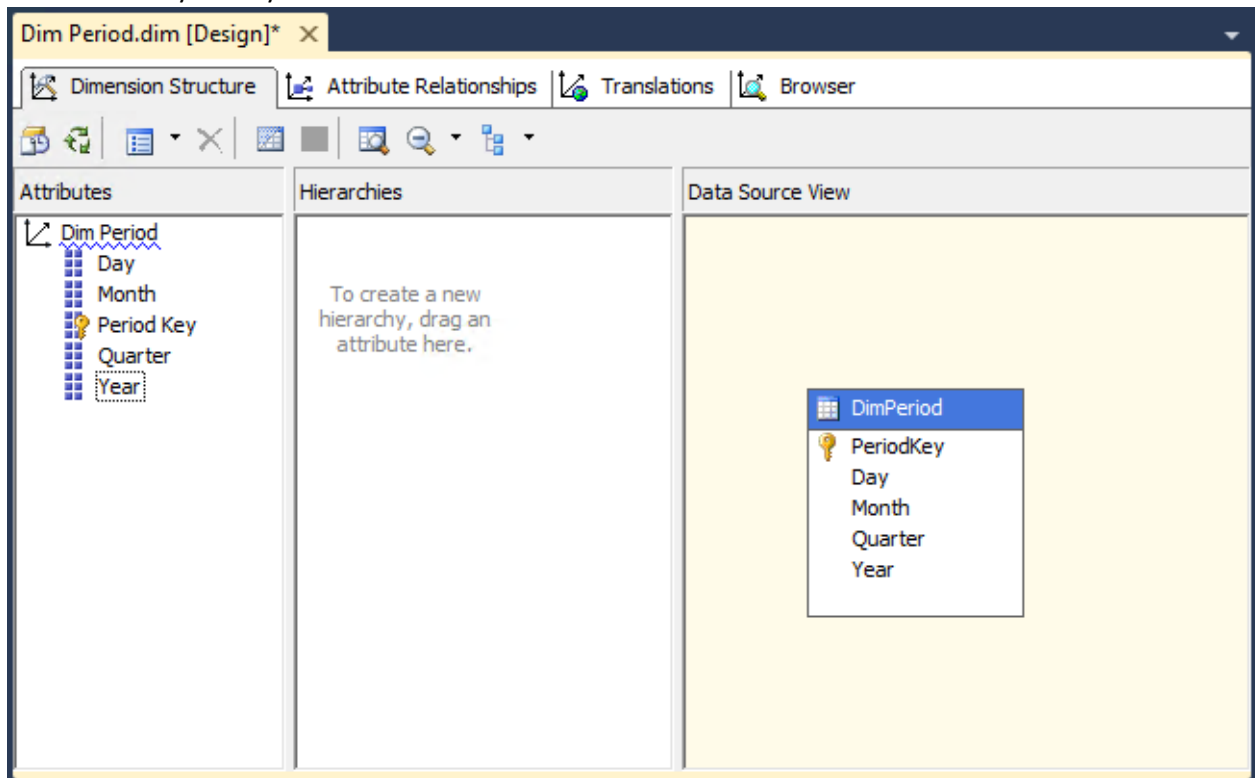
- 1) From the **Solution Explorer**, double-click on **Dim Period**.



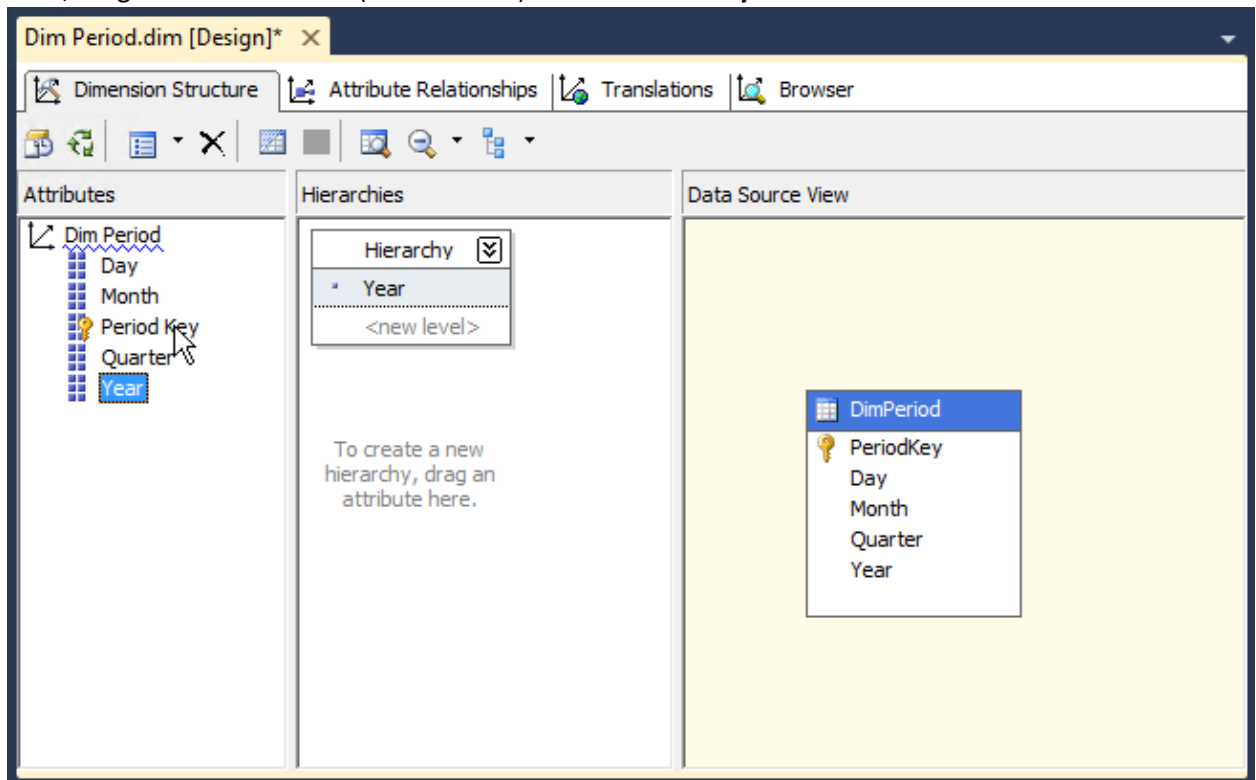
- 2) This opens up the **Designer for Dim Period**



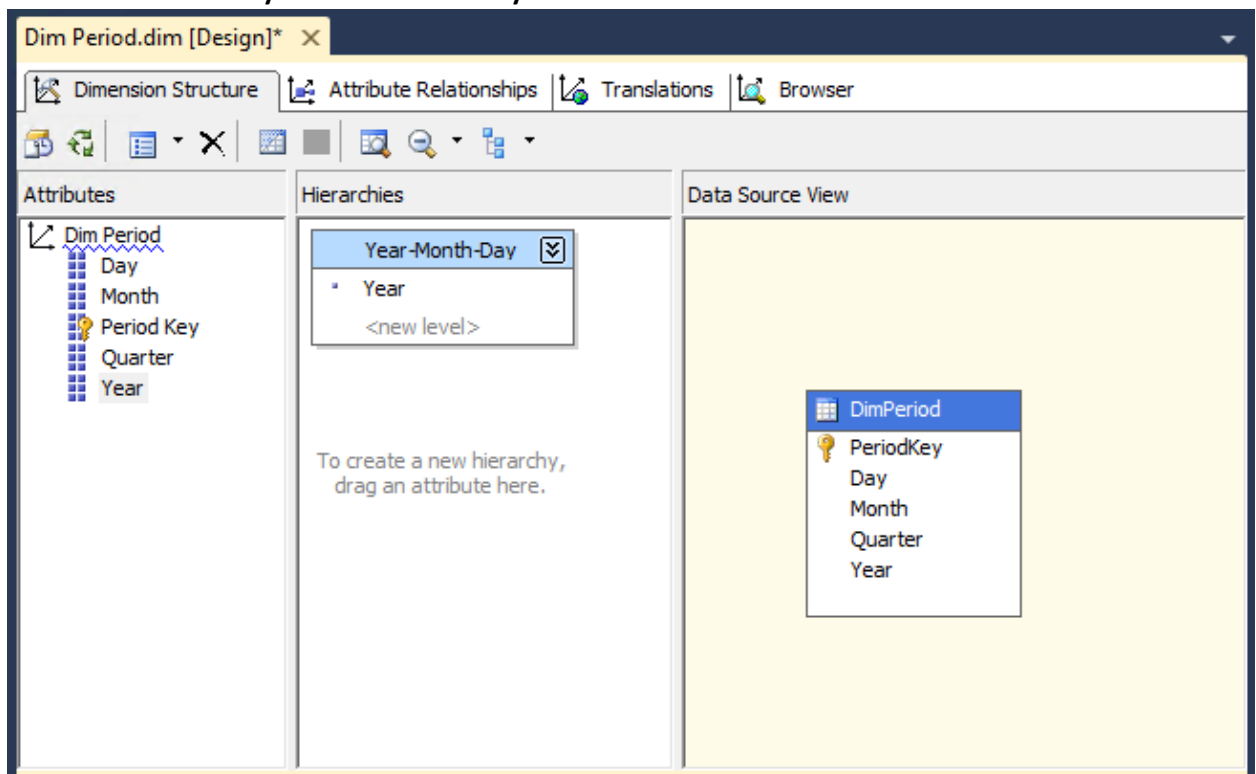
- 3) Drag the **Day, Month, Quarter** and **Year** columns from the **Data Source View** to the **Attributes** Section when you do your screen should look like this:



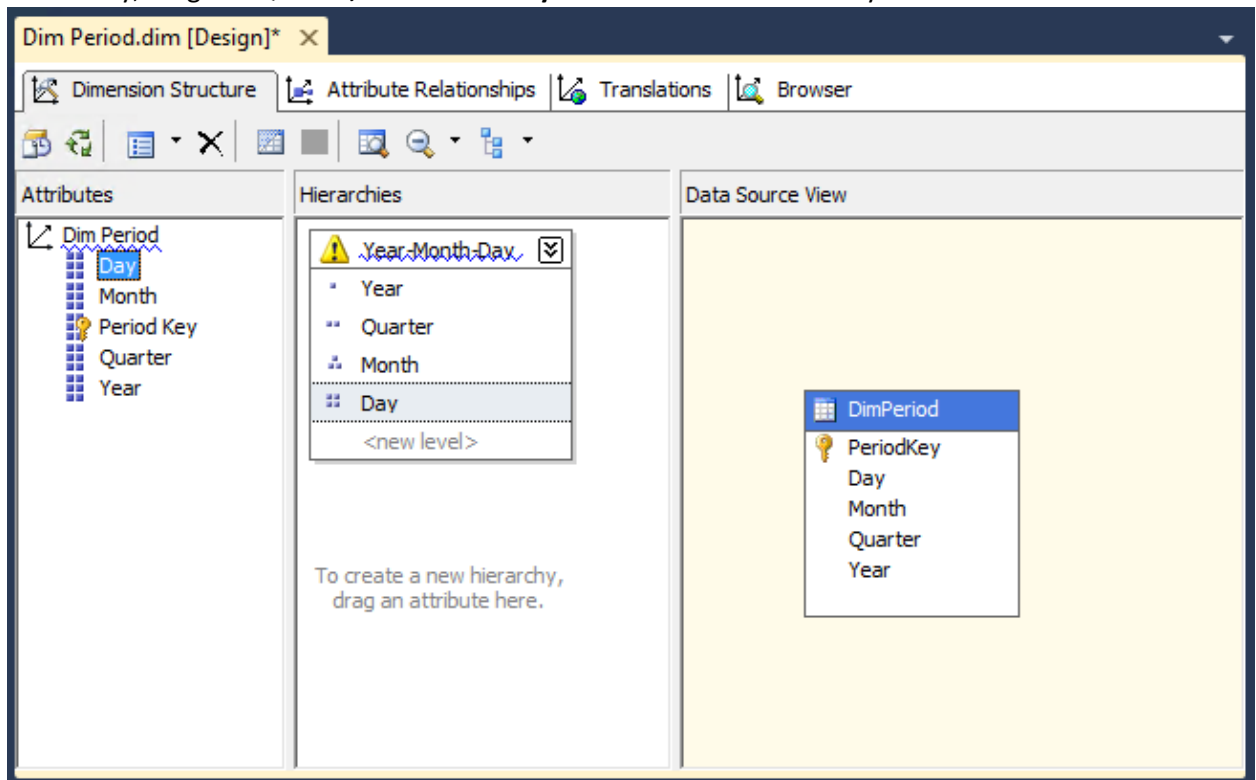
- 4) Next, drag the **Year** attribute (from the left) into the **Hierarchy** area. You should see this:




- 5) Rename the **Hierarchy** to **Year-Month-Day** like this:

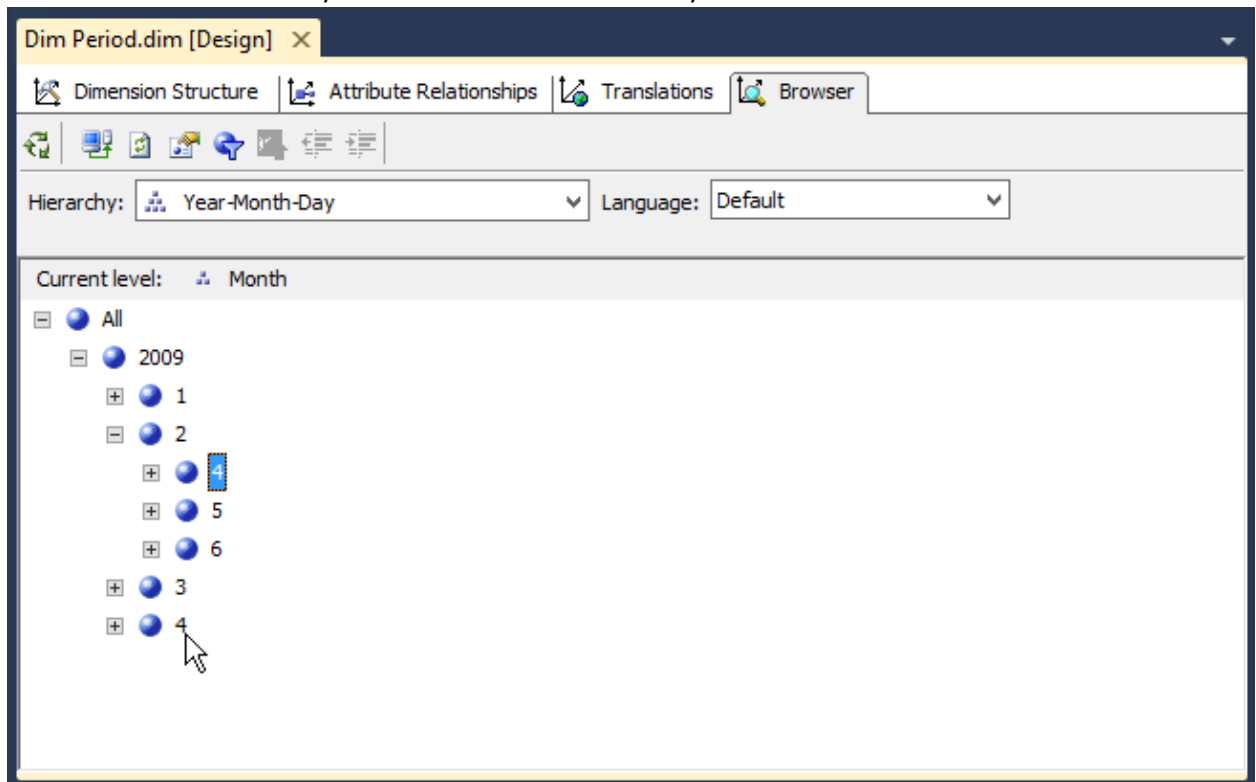


- 6) And finally, drag the **Quarter, Month** and **Day** columns into the hierarchy like so:



- 7) Let's process the dimension so we can see our hierarchy. Click the **process** button  in the toolbar. Click **Yes** when asked to build and deploy the project first.
- 8) At the **Process Dimension Screen** click **Run...** Close the two dialogs after the dimension processing is complete.

- 9) Click the **Browser** tab and you can view the data hierarchy in the dimension:



NOW YOU DO IT: Repeat the steps above to configure the Store, Product and Customer dimensions on your own.

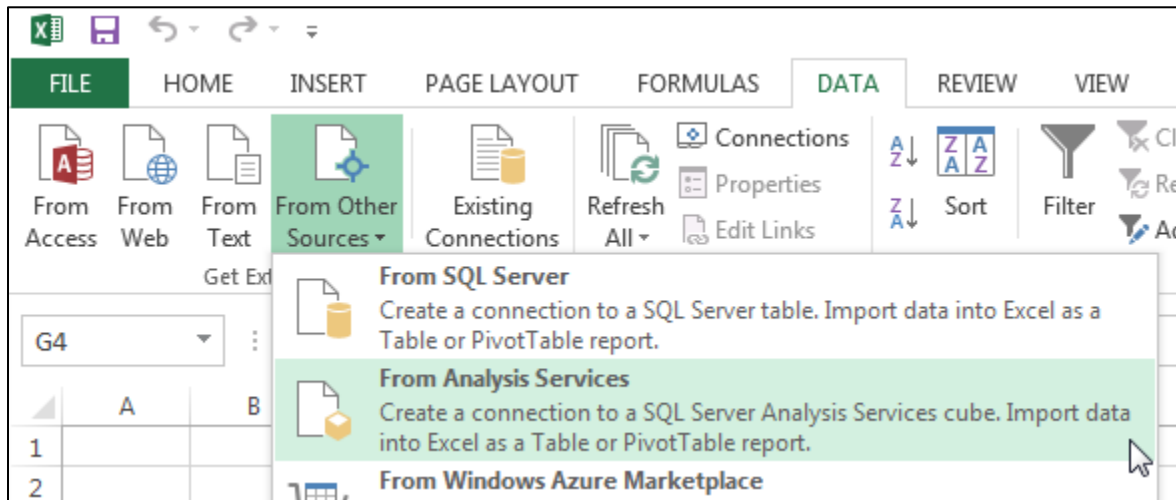
- **Store**
 - Attributes: **City, Manager, State, Store Key, Store Number, Zip Code**
 - Hierarchies: **State-City-Zip, Store-Manager**
- **Product**
 - Attributes: **Color, Description, Product Key, Size**
 - Hierarchies: **None**
- **Customer**
 - Attributes: **City, State, Zip Code**
 - Hierarchies: **State-City-Zip**

Step 5: Deploy and test an initial version of our cube with Excel

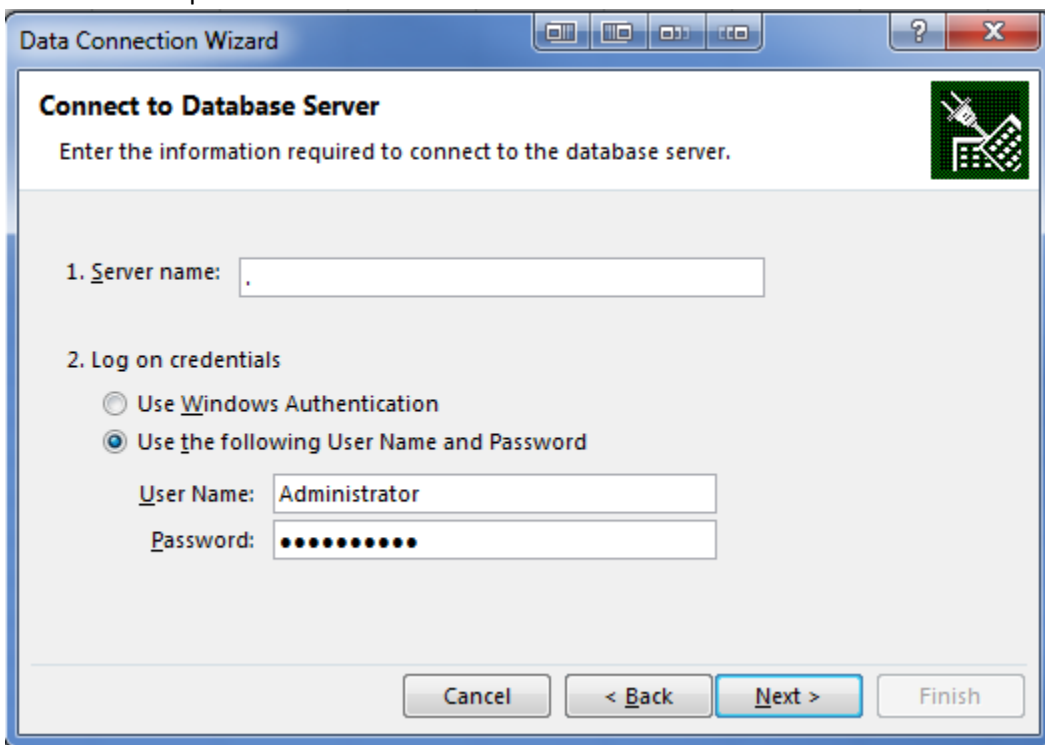
It's time to test an initial version of our cube:

- 1) From the menu, click **Build → Deploy DemoOLAP** This builds and deploys the cube to the analysis server.
- 2) Open Microsoft Excel from the Start menu.
- 3) Create a new blank workbook.

- 4) From the ribbon, select **DATA → Get External Data → From Other Sources → From Analysis Services**



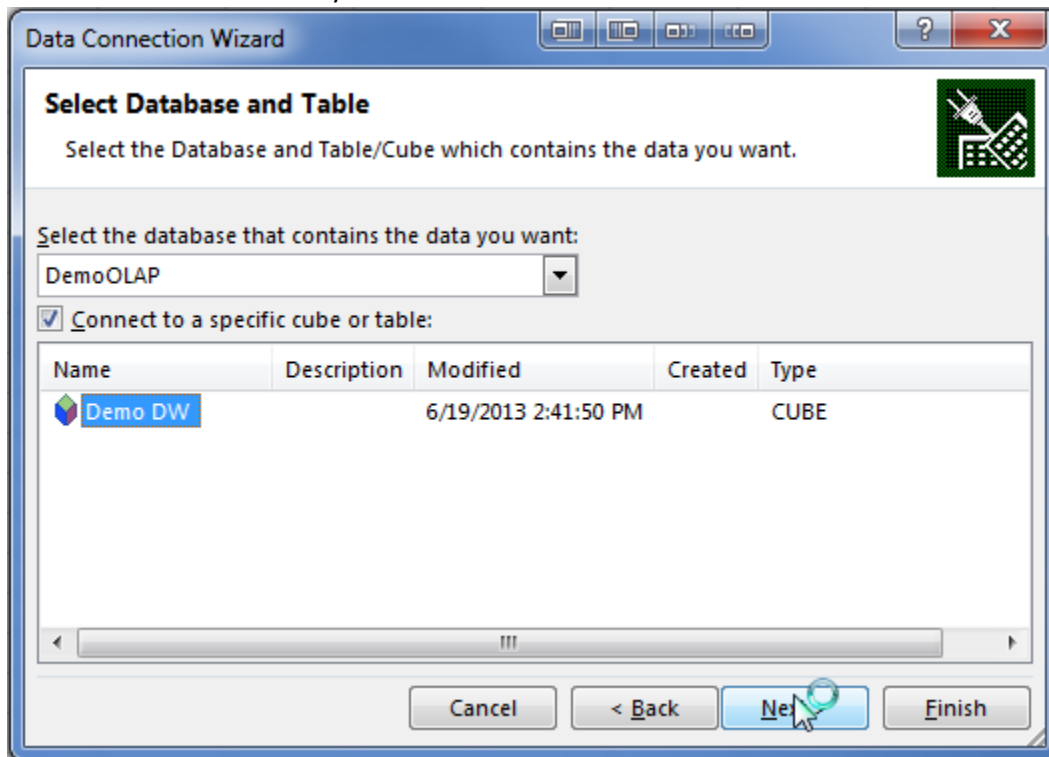
- 5) Under server name type . (yes, that's a period) for logon credentials, type in your Administrator user name and password.



IMPORTANT: Your credentials may be different from this screenshot. They should match the administrator's user name and password for your virtual machine.

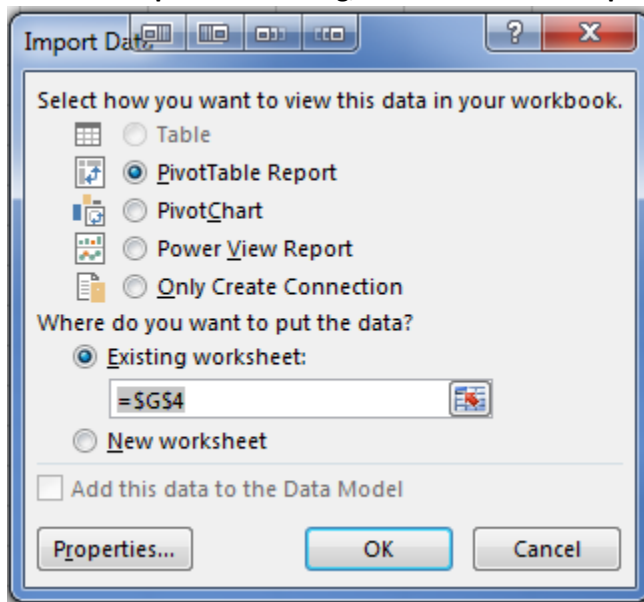
When you've completed the **Data Connection Wizard** click **Next>**

- 6) Select the **DemoOLAP** Analysis Services database and the **Demo DW** cube.



After you've make your selections, click **Next>** then **Finish** to save the data connection.

- 7) From the **Import Data** dialog, select **PivotTable Report** and **Existing Worksheet**



Click **OK** after you have made your selections.

- 8) Let's build out a sample pivot table report:
- Drag **Dollars Sold** to **VALUES**
 - Drag **Customer State-City-Zip** to **Rows**
 - Drag **Period Year-Month-Day** to **Columns**
- Your Pivot Table Fields should look like this:

FILTERS 	COLUMNS Year-Month-... ▼
ROWS State-City-Zip ▼	VALUES Dollars Sold ▼

And your pivot table will look like this:

	A	B	C	D	E	F	G
1	Dollars Sold	Column Labels ▼					
2		2009				2009 Total	Grand Total
3	Row Labels ▼	+1	+2	+3	+4		
4	+ MA				5300	5300	5300
5	+ NJ		1000	4000		5000	5000
6	- NY	4500	2500			7000	7000
7	+ New York		2500			2500	2500
8	+ Syracuse	4500				4500	4500
9	+ PA			2400		2400	2400
10	+ TX			2400	4300	6700	6700
11	Grand Total	4500	3500	8800	9600	26400	26400

Congratulations you've built, deployed and tested your first analysis services cube!

Part 3: On Your Own: Build an SSAS Cube for Northwind Product Inventory.

In this part, try to build out an SQL Server Analysis Services project for the Northwind Product Inventory analysis star schema we populated in part 2 of the previous ETL lab.

1. Use SQL Server data tools to build out your analysis services project
2. Deploy it to your SQL Analysis Services Server
3. When you're finished, zip up BOTH your part 2 and part 3 solutions and submit them online to the drop box in our LMS.

Good Luck!