DAT225x

# Developing an Analysis Services Tabular Model

## Lab 02 | Creating the Tabular Project

Estimated time to complete this lab is 60 minutes

## Overview

In this lab, you will commence the development of a Tabular Project based on the SQL Server **AdventureWorksDW2016** database. This will involve preparing data, importing tables and configuring relationships.

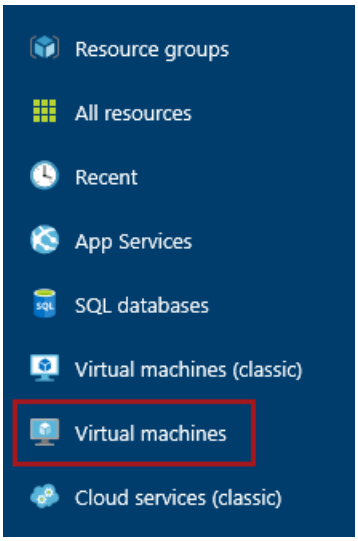
Note: The four labs in this course are accumulative. You cannot complete this lab if you did not successfully complete **Lab 01**.

# Getting Started

In this exercise, you will start the VM provisioned in **Lab 01**. You will then connect to the VM to complete the exercises in this lab.

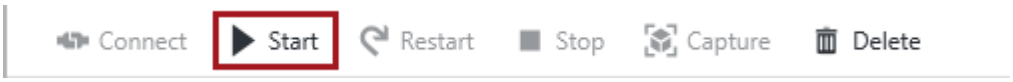
1. Sign in to the **Azure Portal** by using your subscription.

2. In the left pane, select **Virtual Machines**—do not select **Virtual Machines (Classic)**.



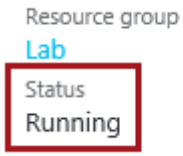

3. In the **Virtual Machines** blade, select the VM you provisioned in **Lab 01**.

4. In the VM blade, click **Start**.



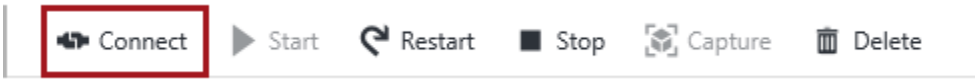

5. Wait for the VM status to update to **Running**.

   *It usually takes 1-2 minutes for the VM to start.*



6. To connect to the VM, click **Connect**.

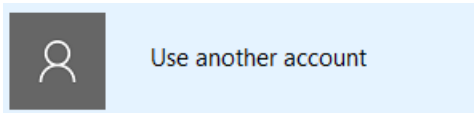
   *Take care not to use the RDP file downloaded in the previous lab. It is likely that a different IP address has be assigned.*




7. When prompted to open the Remote Desktop File, click **Open**.

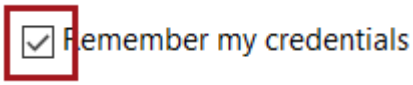
8. If prompted to connect to the unknown publisher, click **Connect**.

9. If prompted, in the **Windows Security** dialog window, click **Use Another Account**.



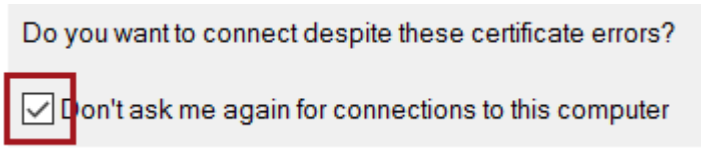

10. Enter the credentials you created for your VM.

11. Check the **Remember My Credentials** checkbox.




12. Click **OK**.

13. In the **Remote Desktop Connection** dialog window, check the **Don't Ask Me Again for Connections to This Computer** checkbox.




14. Click **Yes**.

# Exercise 1: Creating the Tabular Project

In this exercise, you will create the Tabular Project.

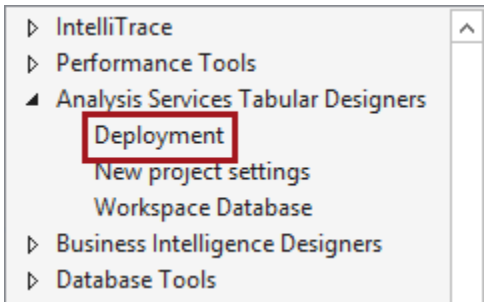
## Configuring the Analysis Services Options

In this task, you will launch SSDT and configure options that will be applied to new Tabular Projects.

1. To launch SSDT, on the task bar, click the **Visual Studio 2015** shortcut.

2. To configure the Analysis Services options, on the **Tools** menu, select **Options**.

3. In the **Options** window, expand the **Analysis Services Tabular Designers** group (you will need to scroll down the list to locate this group), and then select the **Deployment** page.



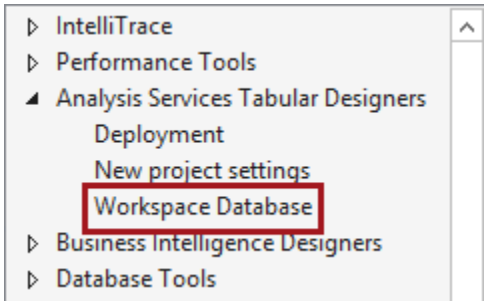

4. 4. In the **Default Deployment Server** dropdown list, select **localhost\TABULAR**.

   *This is the Analysis Services instance that you installed in **Lab 01**.*


5. Click **Test Connection**.

6. When the connection test has succeeded, click **OK**.

7. Select the **Workspace Database** page.




8. In the **Workspace Server** dropdown list, select **localhost\TABULAR**.


*When you work with the tabular model designer, you are working with a temporary Analysis Services database that automatically loads on a workspace server. It is also possible to use an integrated workspace which uses an internal Analysis Services instance in the background, and so does not require an instance of Analysis Services to be installed.*

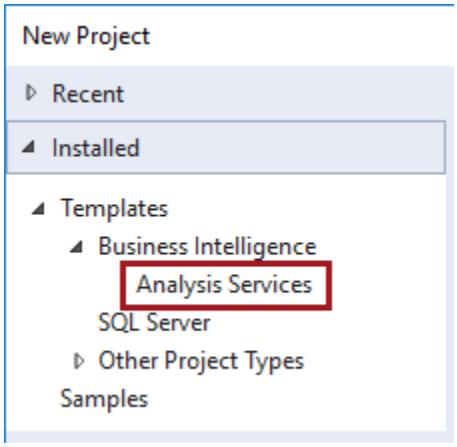
9. Click **OK**.

## Creating the Tabular Project

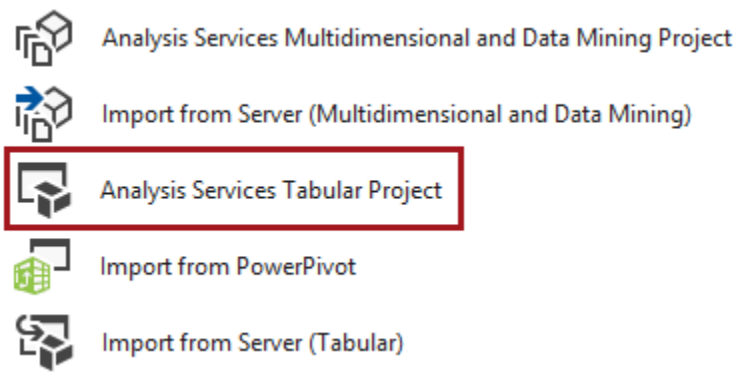
In this task, you will create the Tabular Project.

1. To create a solution, on the **File** menu, select **New | Project**.

2. In the **New Project** window, in the left pane, from inside the **Business Intelligence** group, select the **Analysis Services** template.

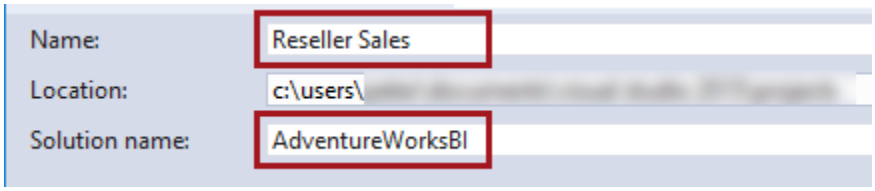


3. Select the **Analysis Services Tabular Project** template.



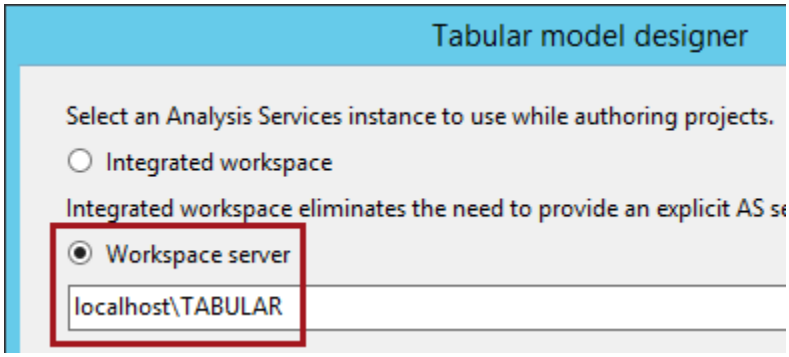

4. In the **Name** box, replace the text with **Reseller Sales**.

5. In the **Solution Name** box, replace the text with **AdventureWorksBI**.




6. Click **OK**.

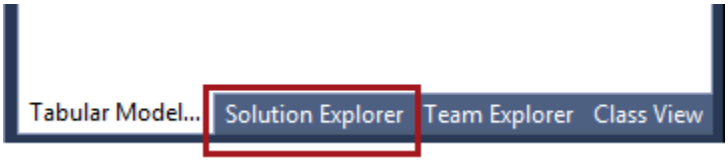
7. In the **Tabular Model Designer** window, notice that the project will use the default workspace server.



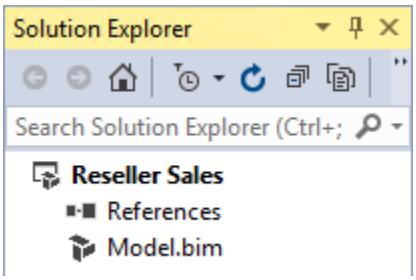

8. Notice that the compatibility level is set to 1200.


9. Click **OK**.

10. In the right pane, select **Solution Explorer**.



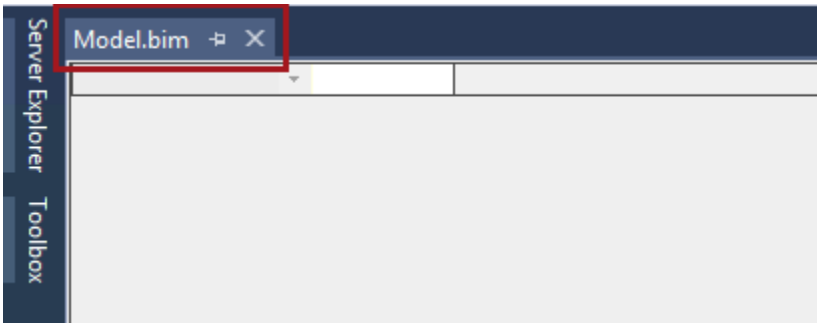

11. Notice that the **Reseller Sales** project consists of a single project item named **Model.bim**.




*The **Model.bim** item is the data model that you will commence developing in this lab.*

*Each tabular project consists of a single data model, and no additional data models can be added. When deployed for the first time, the project creates a database on the target Analysis Services instance. You will deploy the project later in the next lab.*

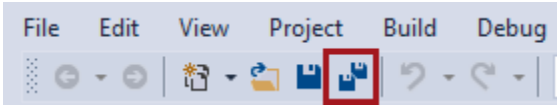
12. Notice that the **Model.bim** item was automatically opened upon project creation.




13. To save the project, on the **File** menu, select **Save All**.

*It is a good practice to regularly save the solution to protect your development effort in case of an unexpected application crash.*

*The **Save All** function is also available on the toolbar.*



# Exercise 2: Importing Data

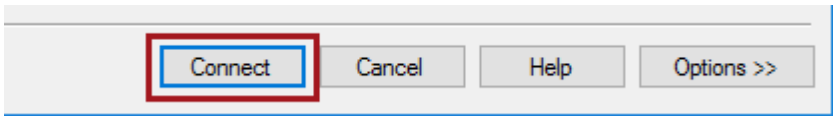
In this exercise, you will import data from a SQL Server database to create tables in your model. This will first involve creating a view to retrieve date data.

## Preparing the Data

In this task, you will launch SSMS and then execute a script to create a view.

1. To launch SSMS, on the task bar, click the **SQL Server Management Studio** shortcut.

2. In the **Connect to Server** dialog window, to connect **Object Explorer** to the database engine, click **Connect**.




3. To open a script file, on the **File** menu, select **Open | File**.

4. In the **Open File** window, navigate to the **F:\Labs\Lab02\Assets** folder.

5. Select **Script-01.sql**, and then click **Open**.

6. Review the script.

   *The script uses the **AdventureWorksDW2016** database to create a view named **vCorporateDate**. This view transforms the **DimDate** table data to deliver columns useful for model development. The final statement in the script will retrieve all columns and rows of the view.*

7. To execute the script, on the toolbar, click **Execute**.


8. In the result grid, review the query result.

   *A subset of the columns and rows will be loaded into your model.*

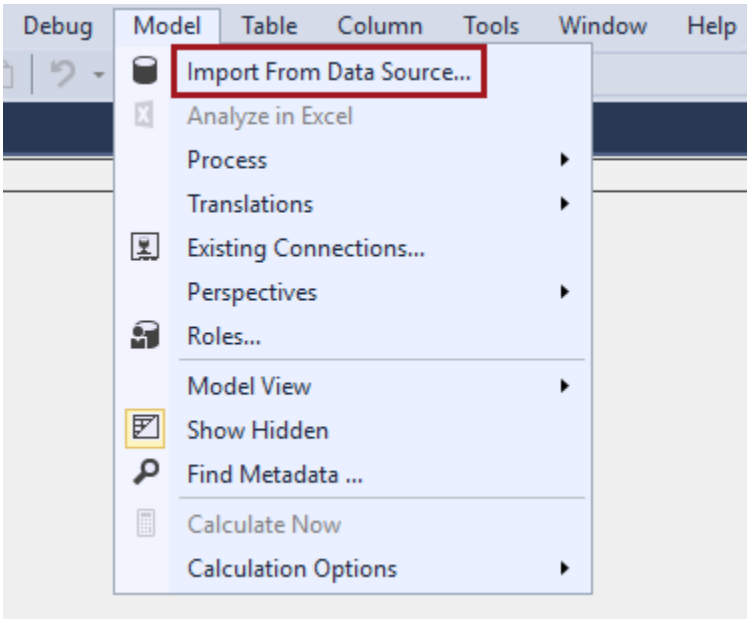
9. To close SSMS, on the **File** menu, select **Exit**.

10. If prompted to save the solution file, click **No**.

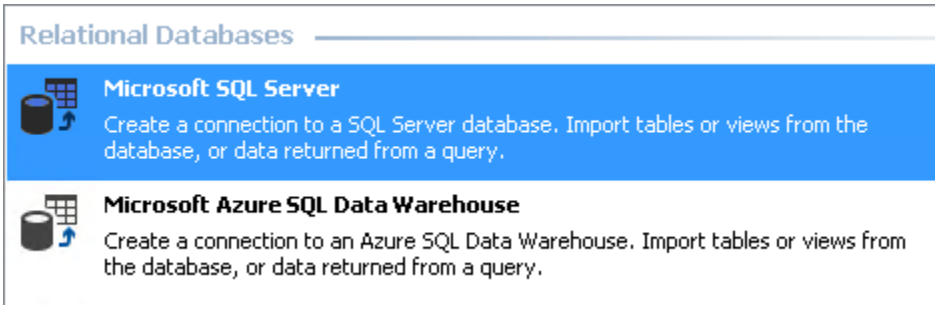
## Importing Data from SQL Server

In this task, you will import data from SQL Server to create model tables.

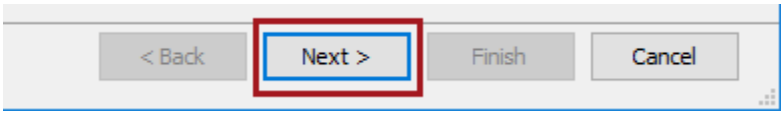
1. In SSDT, to launch the Table Import Wizard, on the **Model** menu, select **Import from Data Source**.




2. 3. In the **Table Import Wizard** window, at the **Connect to a Data Source** step, notice that **Microsoft SQL Server** is selected.



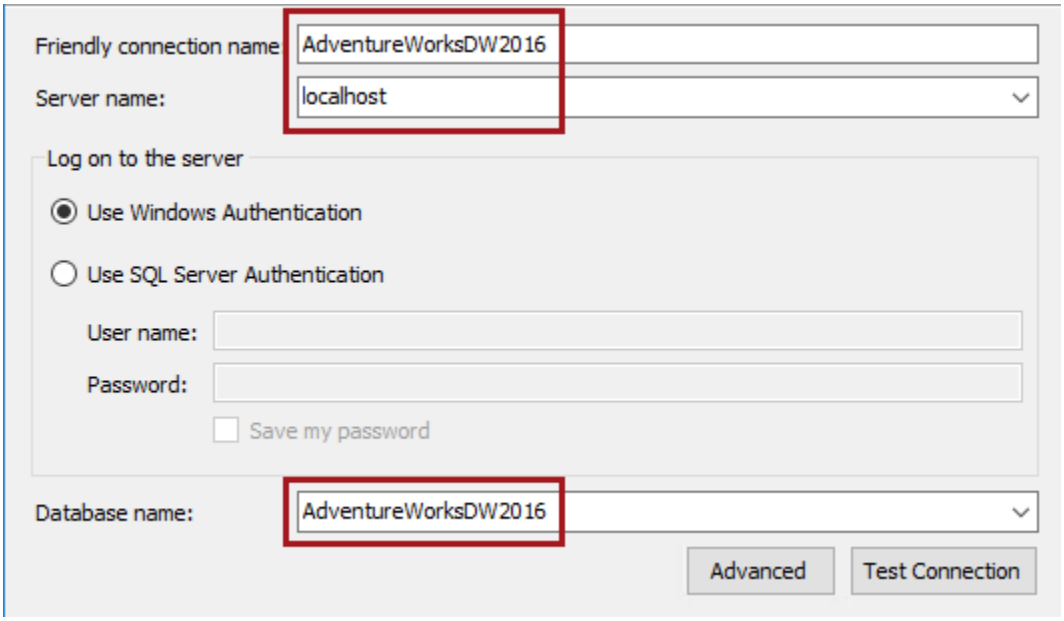

3. Click **Next**.



4. At the **Connect to a Microsoft SQL Server Database** step, in the **Server Name** dropdown list, enter **localhost** (do not open the dropdown list—it takes a long time for it to discover available instances).

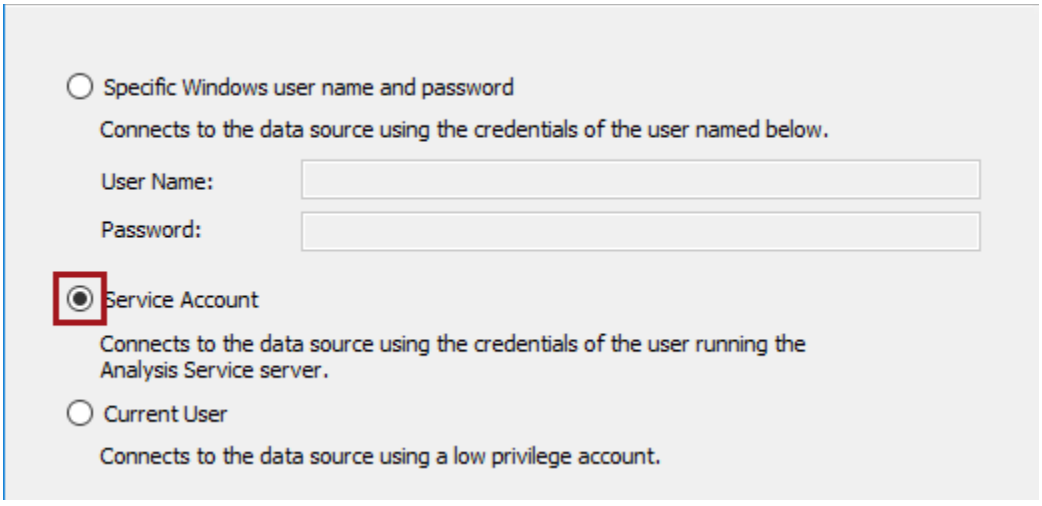
5. In the **Database Name** dropdown list, select the **AdventureWorksDW2016** database.

6. In the **Friendly Connection Name** box, modify the text to **AdventureWorksDW2016**.




7. Click **Next**.

8. At the **Impersonation Information** step, select the **Service Account** option.



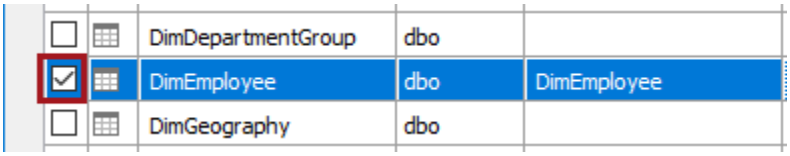

*It is a good practice to use the credentials of a dedicated domain account that has minimum privileges, just to read data. In this lab, the service account is used for convenience.*

9. Click **Next**.

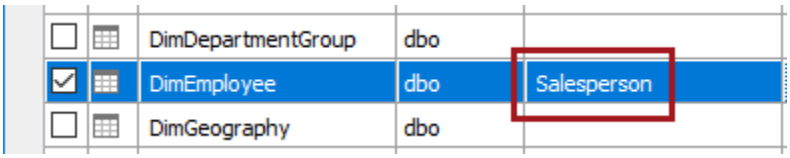
10. At the **Choose How to Import the Data** step, notice the default option to select from a list of tables and views, and then click **Next**.

    *You will create a table based on a query later in this exercise.*

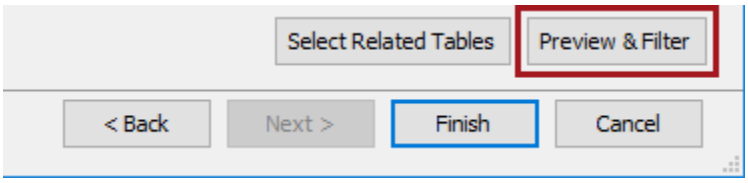
11. At the **Select Tables and Views** step, check the **DimEmployee** source table.



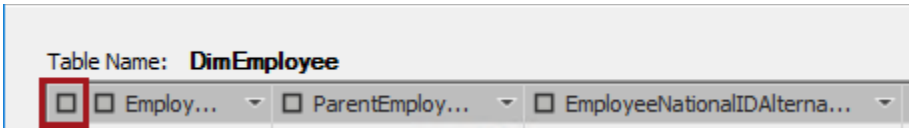

12. In the corresponding **Friendly Name** column, modify the text to **Salesperson**.




13. To preview and filter the data in the **DimEmployee** table, click **Preview & Filter**.




14. In the Table Import Wizard window, to unselect all columns, uncheck the checkbox located in the top-left corner.



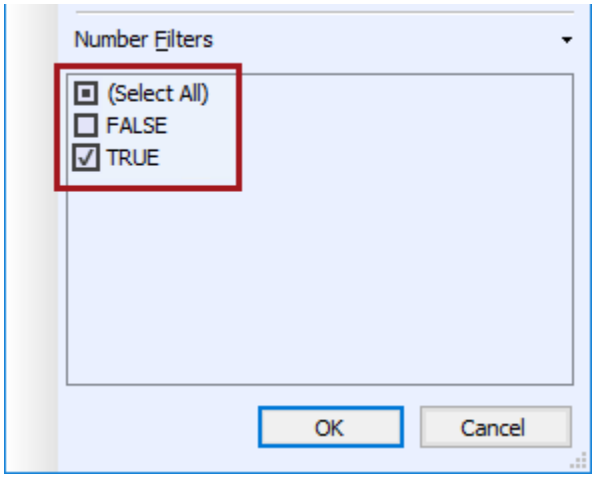

15. Select the following columns (check the checkbox in each column header).

    *You may need to widen some columns to reveal their name.*

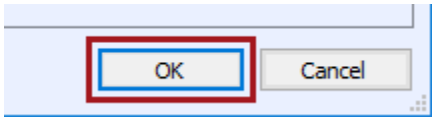
| Column |
| --- |
| EmployeeKey |
| SalesTerritoryKey |
| FirstName |
| LastName |
| LoginID |

16. To filter the table to include only salespeople rows, scroll horizontally to the very end of the columns to locate the **SalesPersonFlag** column (the sixth last column).

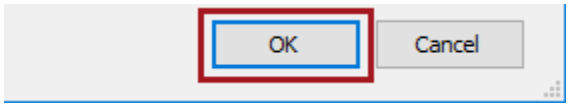
17. In the **SalesPersonFlag** column header, click the down-arrow, uncheck **(Select All)**, and then select **TRUE**.



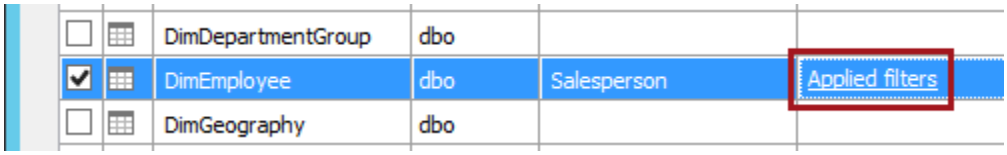

18. Click **OK**.




19. In the Table Import Wizard window, click **OK**.

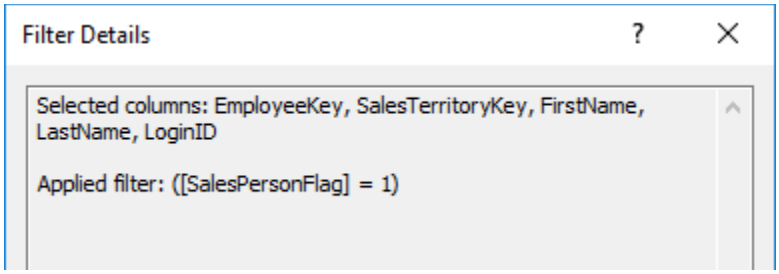



20. To review the column selection and filters, in the **DimEmployee** row in the grid, click the **Applied Filters** link.



21. Verify that the details in the **Filter Details** window look like the following.

    *It is very important that you verify that the selected columns and any applied filters are configured correctly, otherwise later tasks in the labs will fail. Be sure to count the number of columns, and reconcile them by name.*

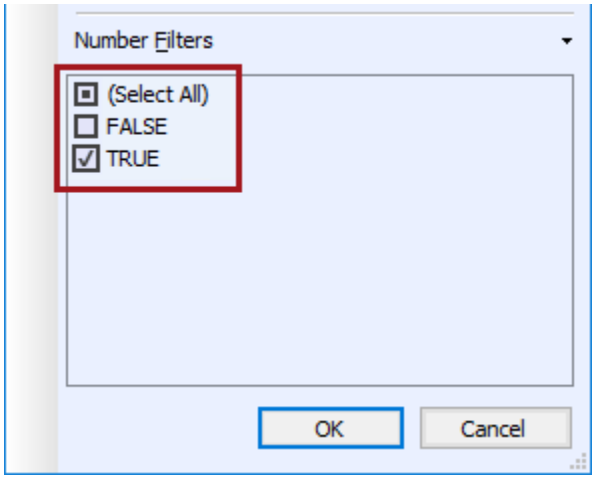



22. Click **OK**.

23. Check the **DimProduct** table, modify the **Friendly Name** column to **Product**, and then select only the following columns.

| Column |
| --- |
| ProductKey |
| ProductSubcategoryKey |
| EnglishProductName |
| Color |

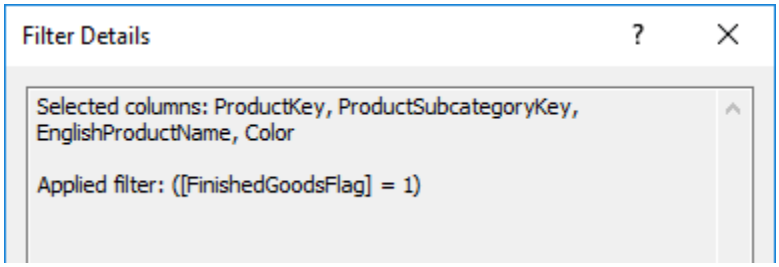
24. To filter the table to include only finished goods rows, in the **FinishedGoodsFlag** column header (located to the left of the **Color** column), click the down-arrow, uncheck **(Select All)**, and then select **TRUE**.




25. Click **OK**.

26. In the **Table Import Wizard** window, click **OK**.

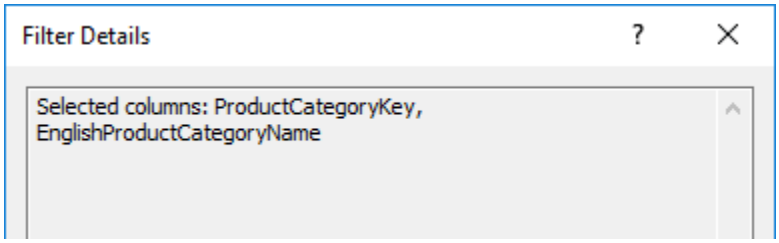
27. Review the column selection and filters, and verify that the details look like the following.




28. Select the **DimProductCategory** table, modify the **Friendly Name** column to **Category**, and then select only the following columns.

| Column |
| --- |
| ProductCategoryKey |
| EnglishProductCategoryName |

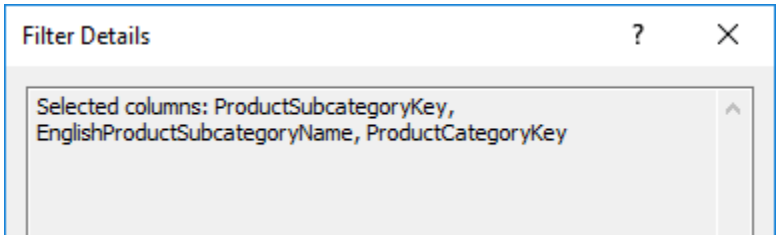
29. Review the column selection and filters, and verify that the details look like the following.




30. Select the **DimProductSubcategory** table, modify the **Friendly Name** column to **Subcategory**, and then select only the following columns.

| Column |
| --- |
| ProductSubcategoryKey |
| EnglishProductSubcategoryName |
| ProductCategoryKey |

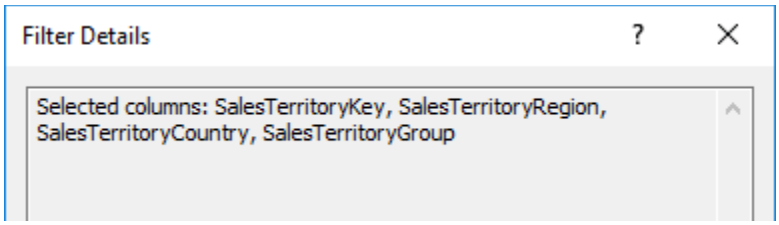
31. Review the column selection and filters, and verify that the details look like the following.



32. Select the **DimSalesTerritory** table, modify the **Friendly Name** column to **Region**, and then select only the following columns.

| Column |
| --- |
| SalesTerritoryKey |
| SalesTerritoryRegion |
| SalesTerritoryCountry |
| SalesTerritoryGroup |

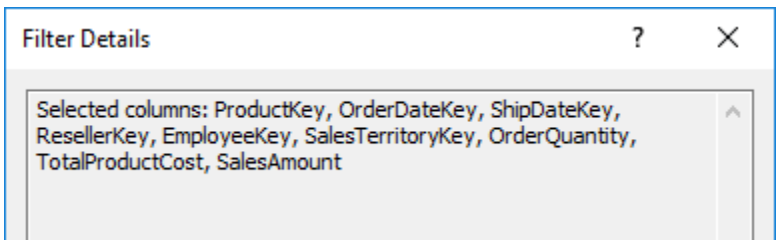
33. Review the column selection and filters, and verify that the details look like the following.




34. Select the **FactResellerSales** table, modify the **Friendly Name** column to **Sales**, and then select only the following columns.

| Column |
| --- |
| ProductKey |
| OrderDateKey |
| ShipDateKey |
| ResellerKey |
| EmployeeKey |
| SalesTerritoryKey |
| OrderQuantity |
| TotalProductCost |
| SalesAmount |

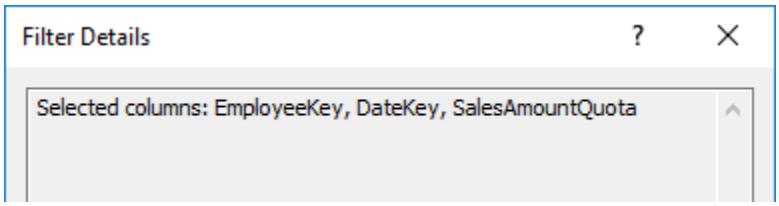
35. Review the column selection and filters, and verify that the details look like the following.



36. Select the **FactSalesQuota** table, modify the **Friendly Name** column to **Target**, and then select only the following columns.

| Column |
| --- |
| EmployeeKey |
| DateKey |
| SalesAmountQuota |

37. Review the column selection and filters, and verify that the details look like the following.



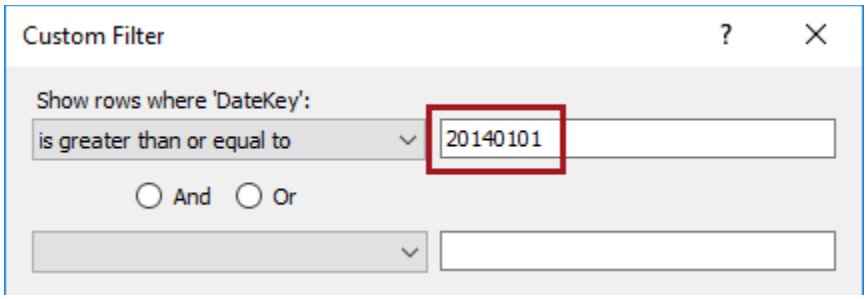

38. Select the **vCorporateDate** table (view), modify the **Friendly Name** column to **Date**, and then select only the following columns.

| Column |
| --- |
| DateKey |
| Date |
| DateLabel |
| MonthKey |
| MonthLabel |
| CalendarQuarterLabel |
| CalendarYearLabel |

39. In the **DateKey** column header, click the down-arrow, and then select **Number Filters | Greater Than or Equal To**.

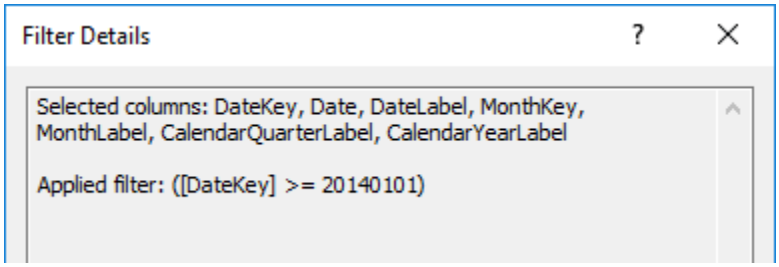
40. In the **Custom Filter** window, in the first box, enter **20140101**.

    ***20140101*** *represents January 1, 2014 which is the earliest reseller sales order recorded in the data warehouse.*




41. Click **OK**.

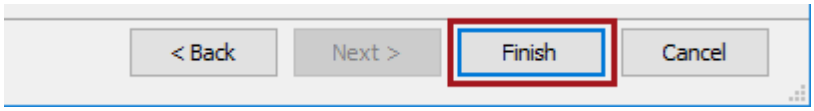
42. Review the column selection and filters, and verify that the details look like the following.



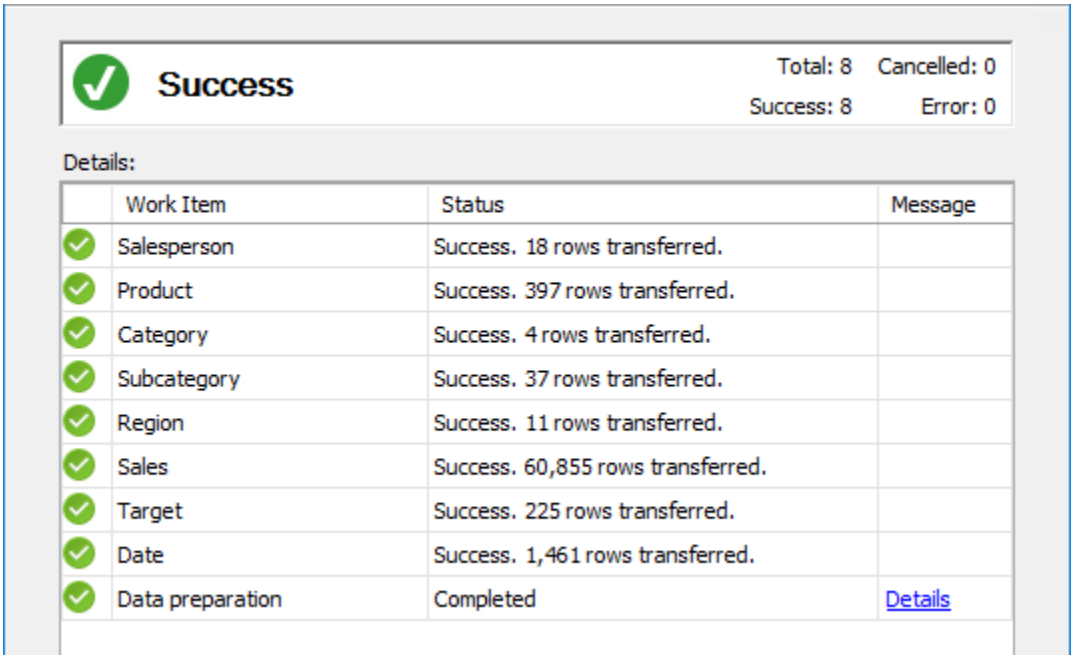

43. Before completing the import process, first verify that you have checked and configured eight tables, as follows.

| Table |
|---|
| DimEmployee |
| DimProduct |
| DimProductCategory |
| DimProductSubcategory |
| DimSalesTerritory |
| FactResellerSales |
| FactSalesQuota |
| vCorporateDate |

44. In the **Table Import Wizard** window, to add the table to the model, click **Finish**.

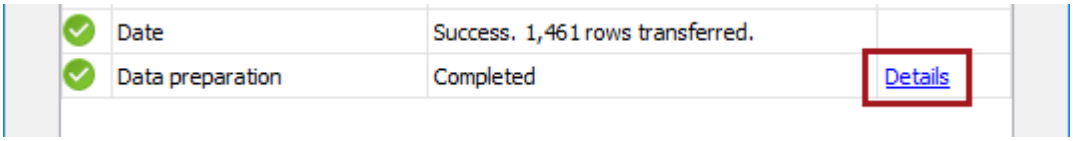


45. At the **Importing** step, verify that the status of each work item looks like the following.




46. Review the status and row count statistics for each table.

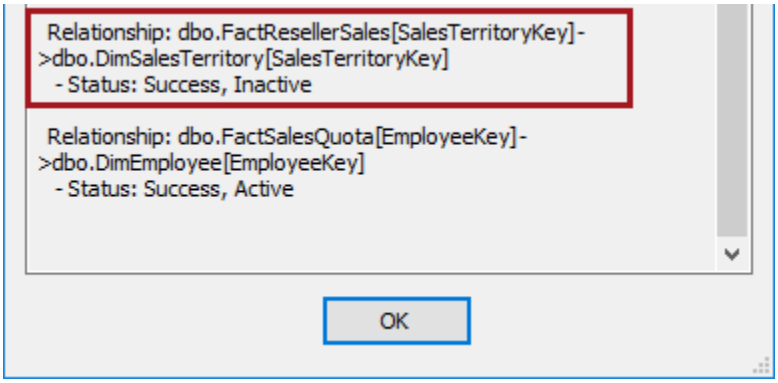
47. Click the **Details** link.



48. In the **Details** window, review the creation of model relationships.

    *The Table Import Wizard has created relationships for all foreign keys where the referenced and referencing columns have been included in the table's column selection.*

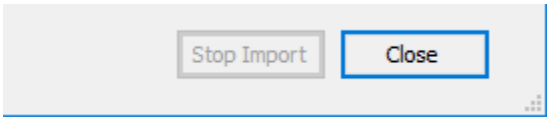
    *Notice the second last relationship created between the **FactResellerSales** table's **SalesTerritoryKey** column and the **DimSalesTerritory** table's **SalesTerritoryKey** column.*




    *This relationship is marked as inactive. Only one active path can exist, directly or indirectly, between two tables in the model. An active relationship already exists between the **FactResellerSales** and **DimEmployee** tables, and the **DimEmployee** table has an active relationship to the **DimSalesTerritory** table. Active relationships are used by default in client tools. You will explore this concept in more detail later in the next exercise.*

49. To close the **Details** window, click **OK**.

50. To close the **Table Import Wizard** window, click **Close**.




51. In **Tabular Model Explorer**, notice the eight tables inside the model designer.

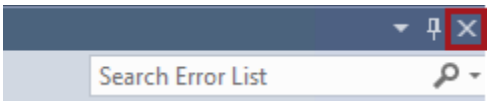

    *All data loaded into the data model is read-only. The only way to modify the data is to modify the source data and then either refresh an individual table, or refresh the data source that will refresh all tables that are based on that data source.*

    *It is also possible, if necessary, to modify the table properties that allow modifying the selection of columns and row filters.*

52. Notice the **Error List** pane at the bottom of the user interface, and review the warning.

53. To close the **Error List** pane, click the **X** located in the top right corner of the window.

    *This window opens automatically after certain designer processes. You may want to close this window to maximize the available model designer space.*




54. To save the project, on the **File** menu, select **Save All**.

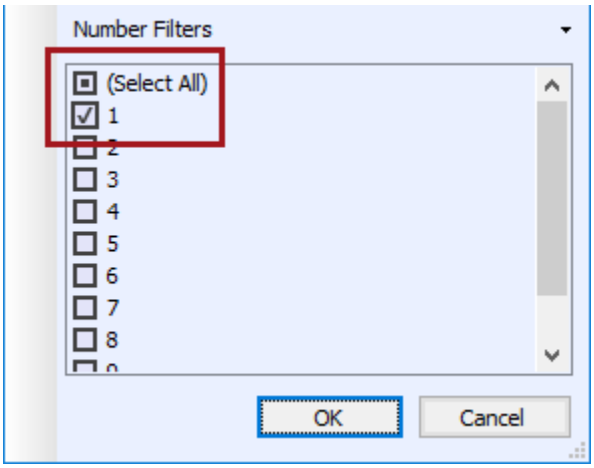
## Exploring the Sales Table

In this task, you will explore the data loaded into the **Sales** table.

1. Select the **Sales** table.
2. 

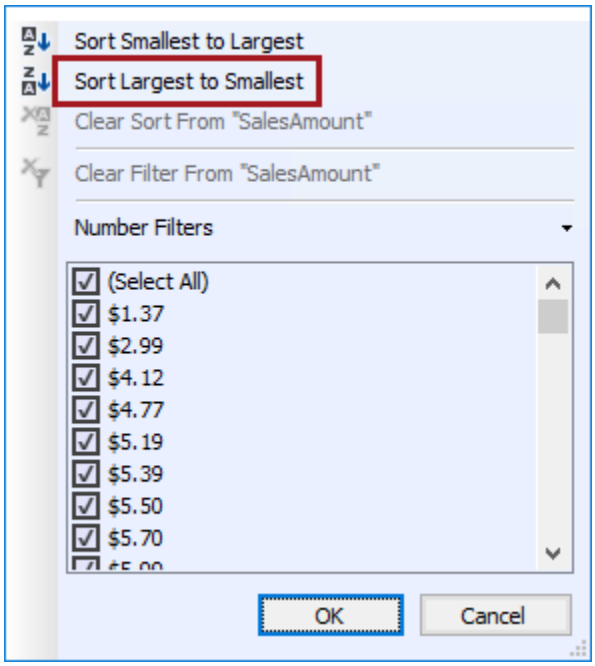
3. At the bottom-left corner, notice that this table has **60,855** rows.


4. To filter the data for a single region, in the **SalesTerritoryKey** column header, click the down arrow, uncheck **(Select All)**, and then check **1**.




5. Click **OK**.
6. Notice that the filtered table row count is **7,872** rows.

7. To sort the rows by descending **SalesAmount** value, in the **SalesAmount** column header, click the down-arrow, and then select **Sort Largest to Smallest**.




8. Click **OK**.

## Lab Check

**Lab 02 ► Creating the Tabular Project**

What is the exact value of the largest sales amount recorded for the region with **SalesTerritoryKey** 1? _____

What was the quantity associated with the largest sales amount in the region? _____

9. To reset the table sort, on the toolbar, click the **Clear Sort** button.

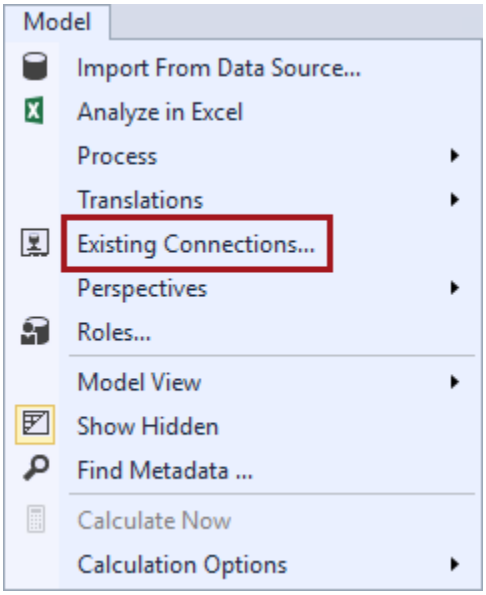
10. To remove all table filters, on the toolbar, click the **Clear All Filters** button.

*It is important to understand that filtering and sorting data in Data View of the model designer does not alter the data already imported into the tables. It enables exploration of the data only.*

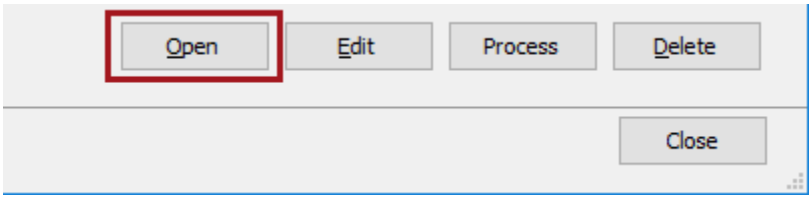
## Importing an Additional Table

In this task, you will create an additional table by importing a query.

1. On the **Model** menu, select **Existing Connections**.

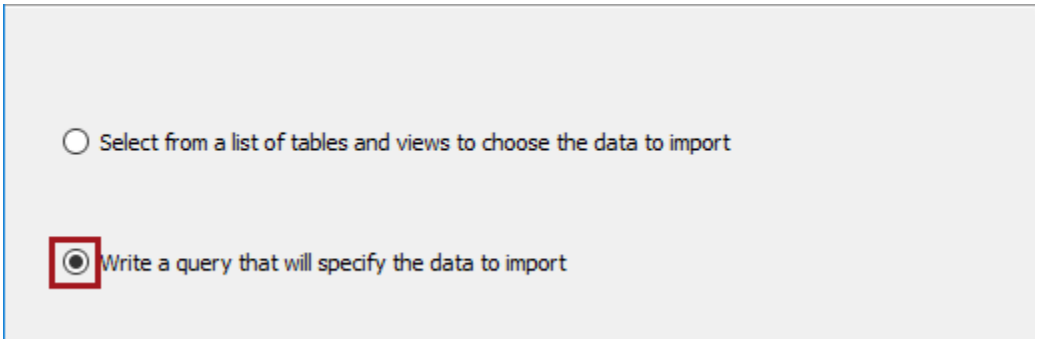



2. In the **Existing Connections** window, notice that the **AdventureWorksDW2016** connection is selected, and then click **Open**.



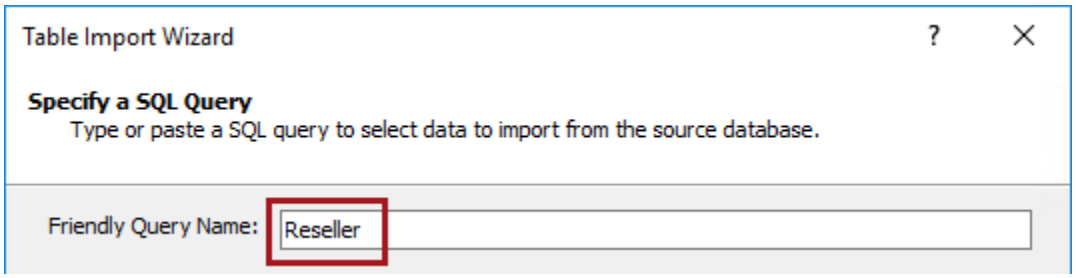

*Opening a connection re-launches the Table Import Wizard by using that connection.*

3. In the **Table Import Wizard** window, at the **Choose How to Import the Data** step, select the **Write a Query That Will Specify the Data to Import** option.

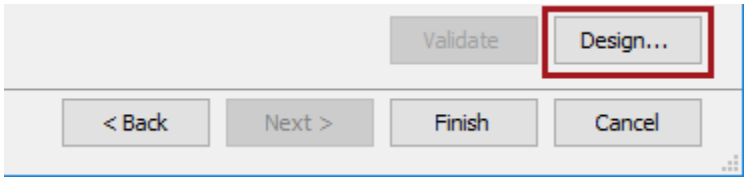



4. Click **Next**.

5. At the **Specify a SQL Query** step, in the **Friendly Query Name** box, modify the text to **Reseller**.



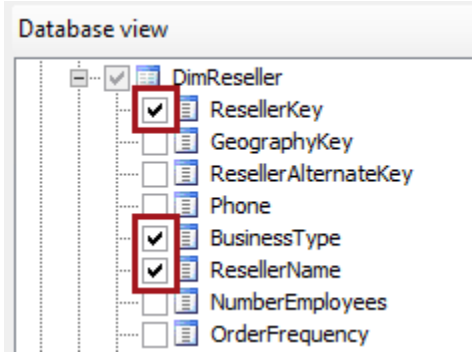

6. To author a query, click **Design**.




7. In the **Table Import Wizard** window, in the **Database View** pane (located at the left), expand the **Tables**, and then expand the **DimReseller** table.

8. Check only the following columns (in this order).

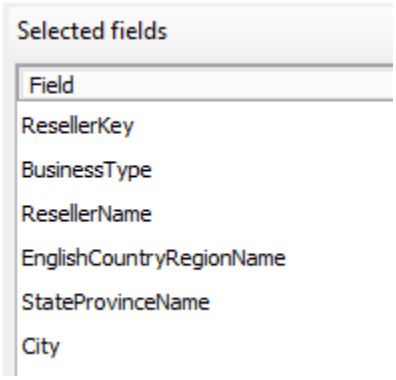
| Column |
| --- |
| ResellerKey |
| BusinessType |
| ResellerName |



9. Expand the **DimGeography** table, and then select only the following columns (in this order).

| Column |
| --- |
| EnglishCountryRegionName |
| StateProvinceName |
| City |

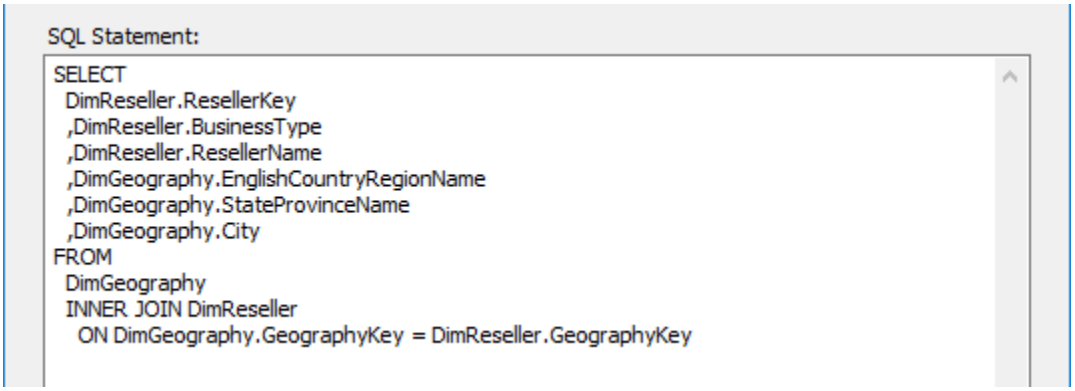
10. Verify that the **Selected Fields** pane looks like the following.



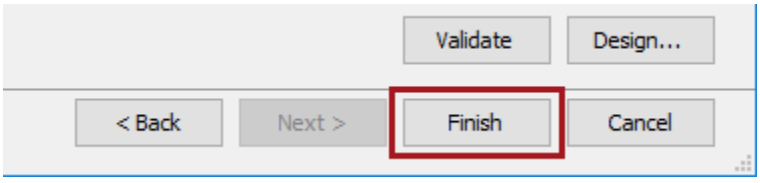

*The Auto Detect feature has automatically identified the relationship between the two tables and will construct an appropriate join clause to relate the data in these tables.*

11. Click **OK**.

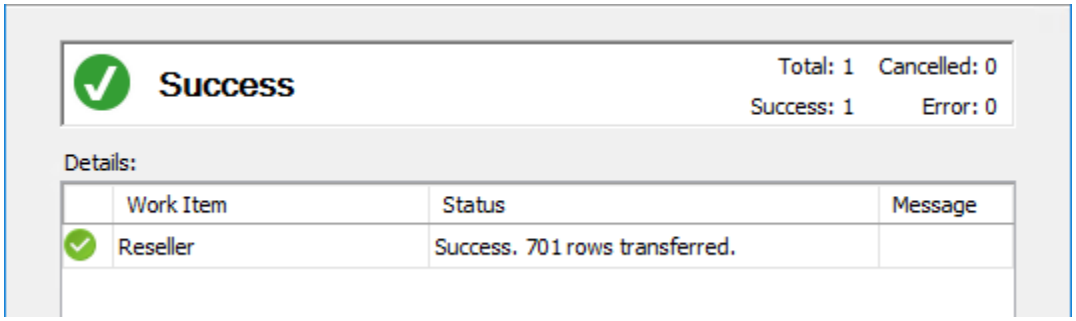
12. In the **Table Import Wizard** window, notice that a query statement that has been added to the **SQL Statement** box.




13. Click **Finish**.

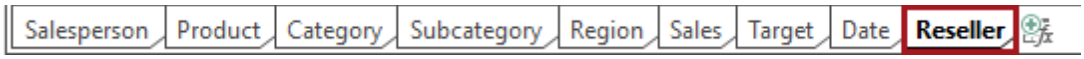


14. At the **Importing** step, verify that the status looks like the following.




15. Click **Close**.

16. Notice the addition of the **Reseller** table.




17. To save the project, on the **File** menu, select **Save All**.

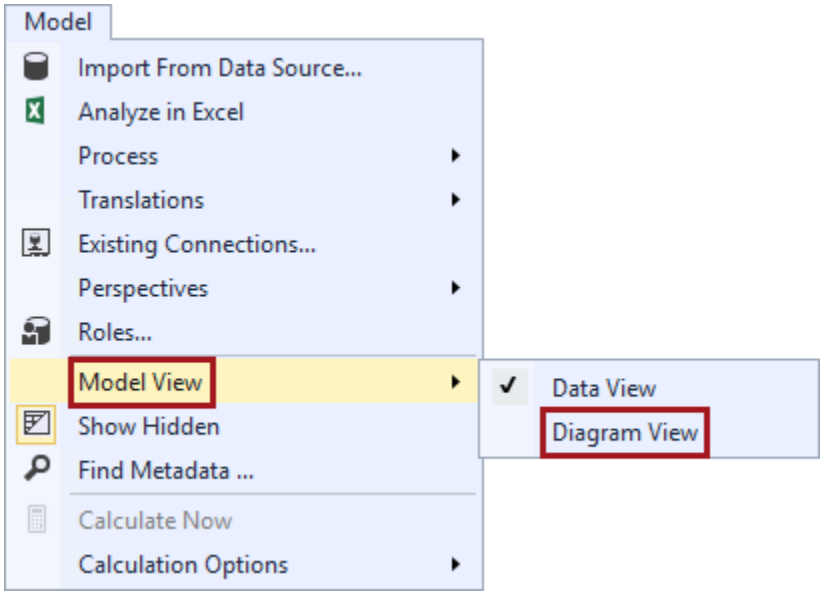
# Exercise 3: Configuring Relationships

In this exercise, you will review the model relationships created by the Table Import Wizard, and then configure additional relationships.

## Reviewing the Model Relationships

In this task, you will review the model relationships created by the Table Import Wizard.

1. To view the model in Diagram View, on the **Model** menu, select **Model View | Diagram View**.



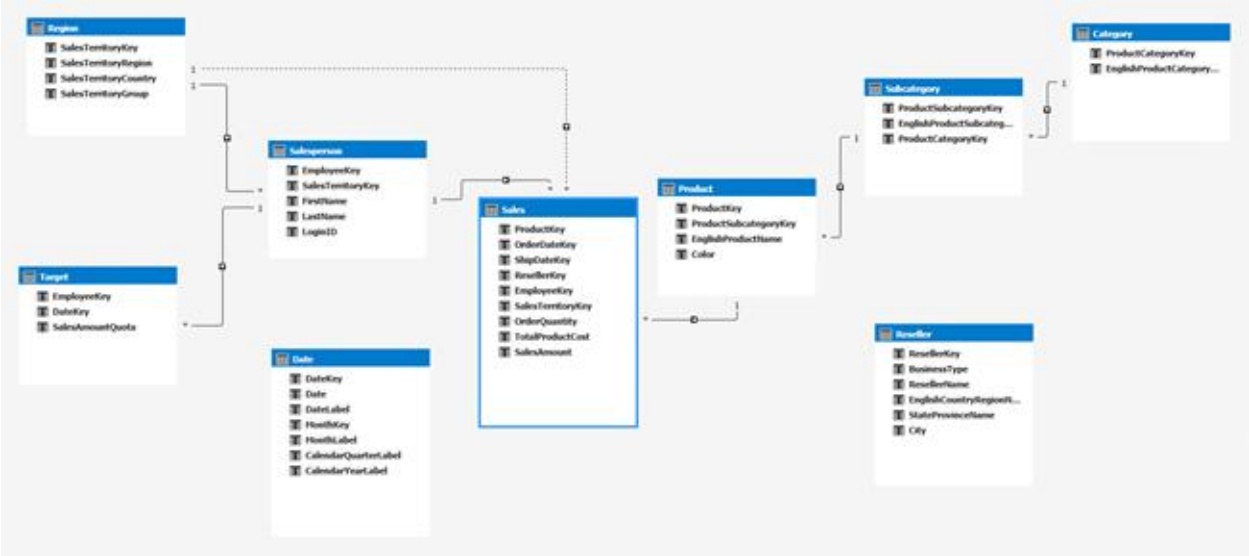

*Tip: It is also possible to toggle between Data View and Diagram View by clicking the icons located at the bottom-right corner.*

*Diagram View is a useful way to visualize the model's tables and relationships. Beyond the model layout, this view exposes useful functionality to enhance the design of the data model. Oftentimes this functionality is available in Data View (the default view consisting of the tables and rows).*

*Note that calculated columns and measures can only be defined in Data View, and hierarchies can only be defined in Diagram View.*

2. If you cannot see all nine tables in the diagram, use the zoom controls located at the bottom of the designer.

3. First, reposition and resize the tables to resemble the following layout.



4. Notice the following facts:

   - All relationships are one-to-many (notice the 1 and * decorations)
   - All relationships filter in a single direction (notice the sign arrow head on each relationship)
   - The relationship between the **Region** and **Sales** tables is dotted, meaning it is an inactive relationship (recall that an active relationship path already exists between the two tables, via the **Salesperson** table)
   - The **Date** and **Reseller** tables are not related to any tables.

## Configuring the Model Relationships

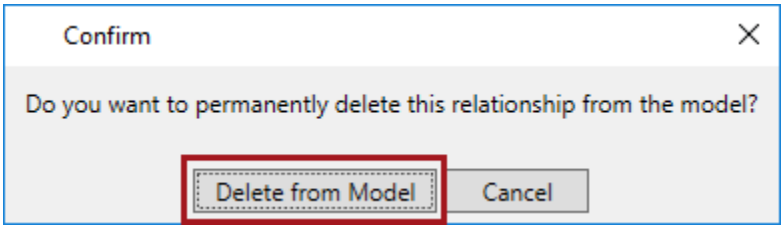
In this task, you will configure the model relationships.

1. Select the inactive relationship between the **Region** and **Sales** tables.

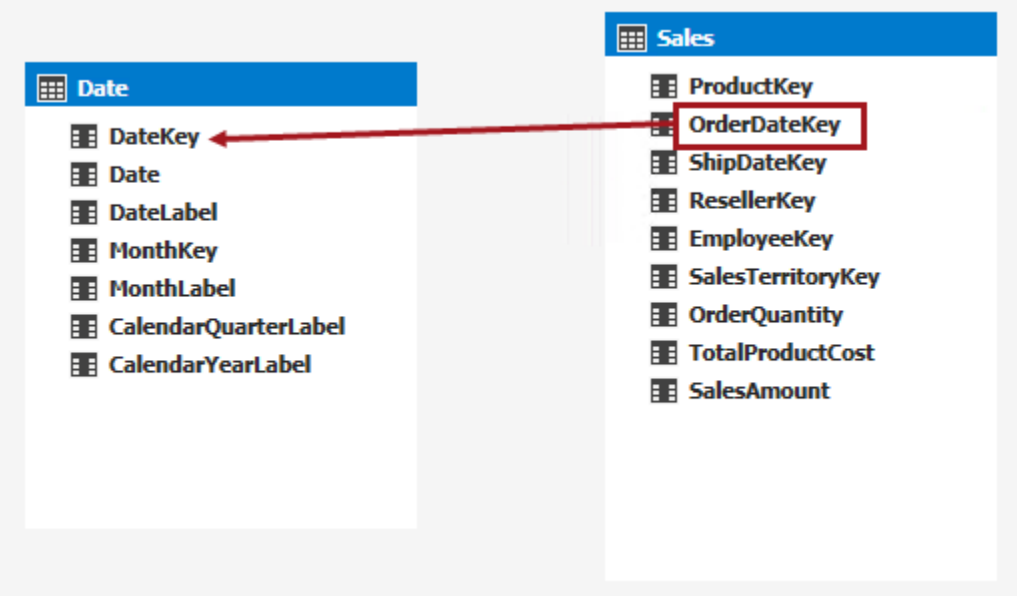
2. To delete the relationship, press the **Delete** key.

   *The inactive relationship would allow analysis of sales by sales territory, which could be different to the sales territory to which the salesperson is assigned. This is not a requirement in your model.*

3. When prompted to confirm the deletion, click **Delete from Model**.



4. To create a relationship between the **Sales** and **Date** tables, from the **Sales** table, drag the **OrderDateKey** column on to the **DateKey** column of the **Date** table.




5. Create a second relationship between the two tables by dragging the **ShipDateKey** column to the **DateKey** column.

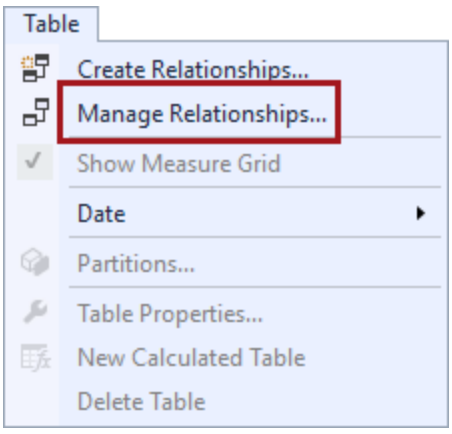
6. Notice that the second relationship is inactive (dotted line).

   *This is not a preferred configuration, as inactive relationships can only be navigated when calculation logic explicitly requests it. In the next lab, you will remove this relationship and create a second date table with a calculated table.*

7. Create a relationship between the **Target** and **Date** tables between the **DateKey** columns.

8. Create a relationship between the **Sales** and **Reseller** tables between the **ResellerKey** columns.

9. To manage relationships, on the **Table** menu, select **Manage Relationships**.



10. Notice that you can create, edit and delete relationships in this window.

11. Verify that the model has ten relationships.

| Active | Table 1 | Cardinality | Filter Direction | Table 2 |
|---|---|---|---|---|
| Yes | Product [ProductSubcategoryKey] | Many to One (*:1) | << To Product | Subcategory [ProductSubcategoryKey] |
| Yes | Sales [EmployeeKey] | Many to One (*:1) | << To Sales | Salesperson [EmployeeKey] |
| Yes | Sales [OrderDateKey] | Many to One (*:1) | << To Sales | Date [DateKey] |
| Yes | Sales [ProductKey] | Many to One (*:1) | << To Sales | Product [ProductKey] |
| Yes | Sales [ResellerKey] | Many to One (*:1) | << To Sales | Reseller [ResellerKey] |
| No | Sales [ShipDateKey] | Many to One (*:1) | << To Sales | Date [DateKey] |
| Yes | Salesperson [SalesTerritoryKey] | Many to One (*:1) | << To Salesperson | Region [SalesTerritoryKey] |
| Yes | Subcategory [ProductCategoryKey] | Many to One (*:1) | << To Subcategory | Category [ProductCategoryKey] |
| Yes | Target [DateKey] | Many to One (*:1) | << To Target | Date [DateKey] |
| Yes | Target [EmployeeKey] | Many to One (*:1) | << To Target | Salesperson [EmployeeKey] |

12. Click **Close**.

13. To save the project, on the **File** menu, select **Save All**.

*You have now completed the lab. In the next lab, you will enhance the model by setting friendly column names, hiding column not intended for reporting, sorting column values, marking date tables, creating hierarchies, and adding business logic and a KPI.*

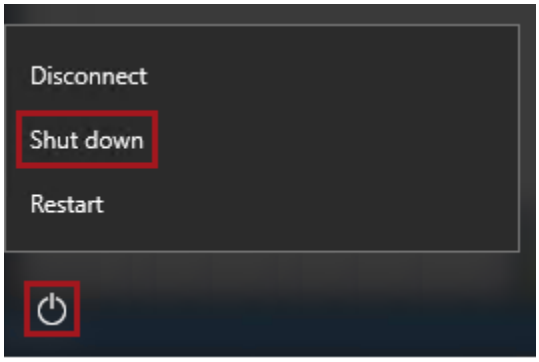
*If you are not immediately continuing with the next lab, you should complete the* ***Finishing Up*** *exercise to shut down and stop the VM.*

# Finishing Up

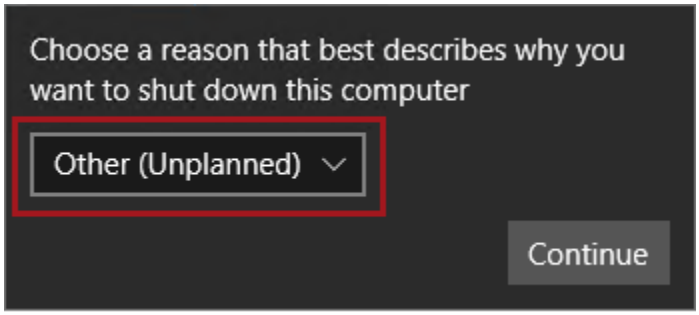
In this exercise, you will shut down and stop the VM.

1. Close all open applications.

2. Press the **Windows** key, and then in the **Start** page, located at the bottom-left, click the **Power** button, and then select **Shut Down**.

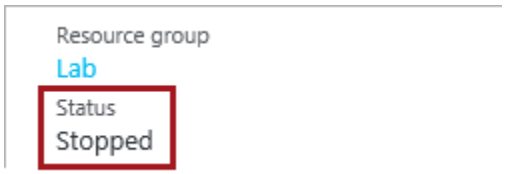



3. When prompted to choose a reason, to accept the default.




4. Click **Continue**.

5. In the **Azure Portal** Web browser page, wait until the status of the VM updates to **Stopped**.

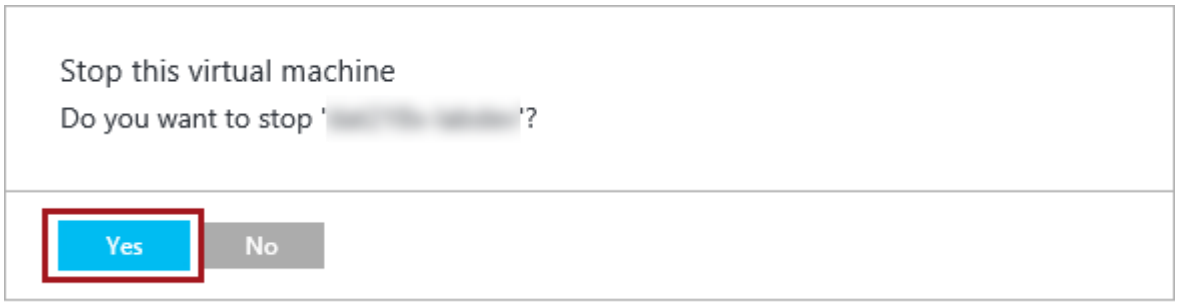



*In this state, however, the VM is still billable.*

6. Optionally, to deallocate the VM, click **Stop**.

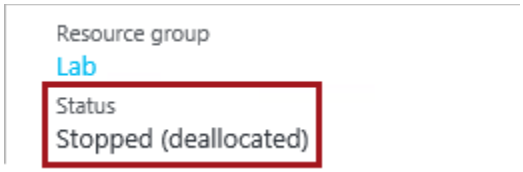
   *Deallocation will take some minutes to complete, and also extends the time required to restart the VM. Consider deallocating the VM if you want to reduce costs, or if you choose to complete the next lab after an extended period.*


7. When prompted to stop the VM, click **Yes**.




   *The deallocation can take several minutes to complete.*

8. Verify that the VM status updates to **Stopped (Deallocated)**.




   *In this state, the VM is now not billable—except for a relatively smaller storage cost.*

   *Note that a deallocated VM will likely acquire a different IP address the next time it is started.*

9. Sign out of the **Azure Portal**.