



DAT224x

Developing a Multidimensional Data Model

Lab 04 | Creating the Cube

Estimated time to complete this lab is 60 minutes

Overview

In this lab, you will develop the **Reseller Sales** cube that will comprise two measure groups and the five database dimensions developed in **Lab 03**. You will then enhance the cube with calculations and an action.

Note: The four labs in this course are accumulative. You cannot complete this lab if you did not successfully complete **Lab 03**.

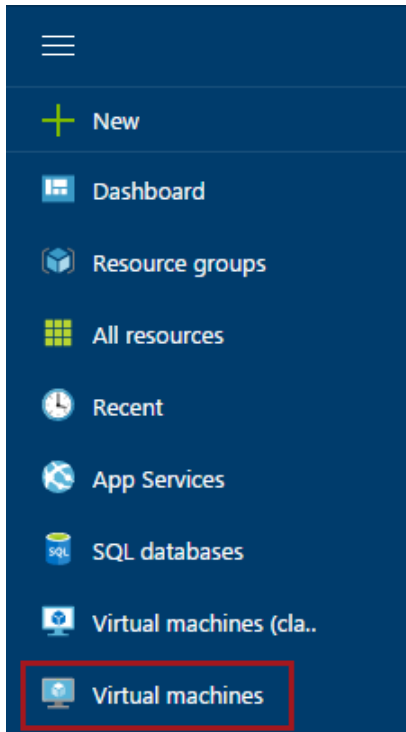
Getting Started

In this exercise, you will get started with the VM created in **Lab 01**.

Getting Started

In this task, you will start the VM, and then connect to it 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)**.

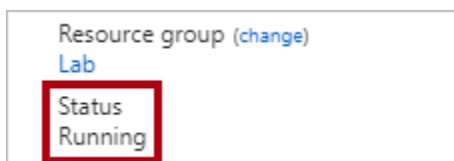


3. In the **Virtual Machines** blade, select the VM you provisioned in **Lab 01**.
4. In the VM blade, click **Start**.



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

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



- 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 been assigned.



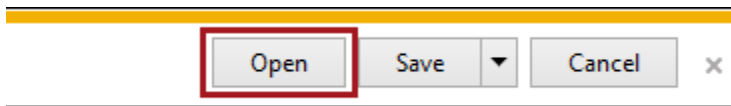
- In the **Connect to Virtual Machine** pane (located at the right), click **Download RDP File**.



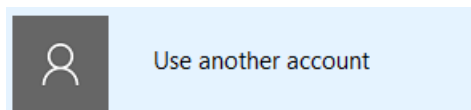
A Remote Desktop File (.rdp) file is downloaded to your computer.

This file can be used to reconnect to the remote desktop session, but note that if you deallocate the VM and later re-start the VM, it will be likely that a different IP address will be assigned.

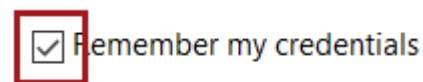
- If prompted by the web browser to open the Remote Desktop File, click **Open**, otherwise, locate the downloaded file, and then double-click it.



- If prompted to connect to the unknown publisher, click **Connect**.
- If prompted, in the **Windows Security** dialog window, click **Use Another Account**.

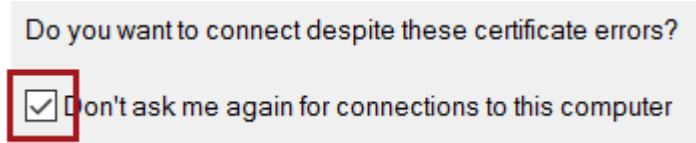


- Enter the credentials you created for your VM.
- Check the **Remember My Credentials** checkbox.



- Click **OK**.

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



15. Click **Yes**.

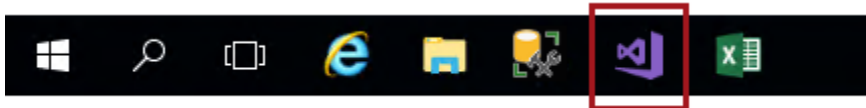
Exercise 1: Developing the Cube

In this exercise, you will develop the **Reseller Sales** cube that will comprise two measure groups and the five database dimensions developed in **Lab 03**.

Opening the Project

In this task, you will open the Multidimensional Project. Only complete this task if the project is not already open.

1. To launch SSDT, on the task bar, click the **Visual Studio 2017 (SSDT)** shortcut.



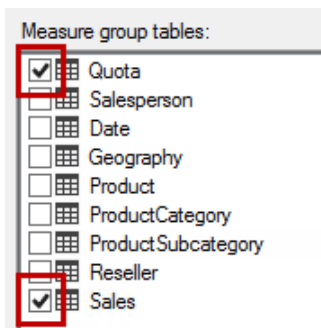
2. On the **File** menu, select **Recent Project and Solutions**, and then select the first project (representing the project you last opened).

*If required, the **F:\Labs\Lab03\Solution** folder contains the previous lab's solution.*

Creating the Cube

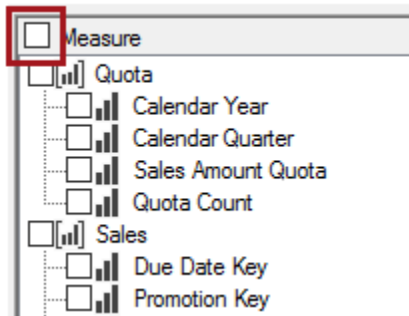
In this task, you will use the **Cube Wizard** to create the **Reseller Sales** cube.

1. In **Solution Explorer**, right-click the **Cubes** folder, and then select **New Cube**.
2. In the **Cube Wizard**, click **Next**.
3. At the **Select Creation Method** page, notice that the **Use Existing Tables** option is selected, and then click **Next**.
4. At the **Select Measure Group Tables** page, check both the **Quota** and **Sales** tables.



5. Click **Next**.

- At the **Select Measures** page, to deselect all proposed measures, uncheck the top most checkbox, next to the **Measure** header.

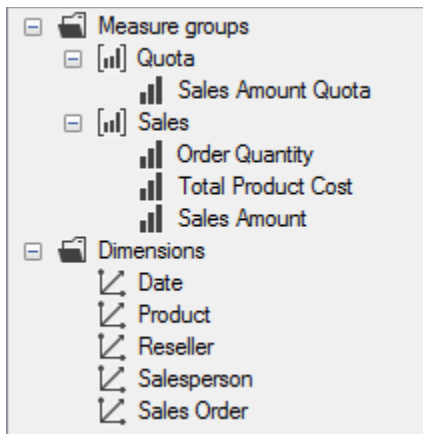


*Each measure, except for the last proposed measure in each measure group, will be configured to use the **Sum** aggregate function. The last measure in each measure group will be configured to use the **Count** aggregate function.*

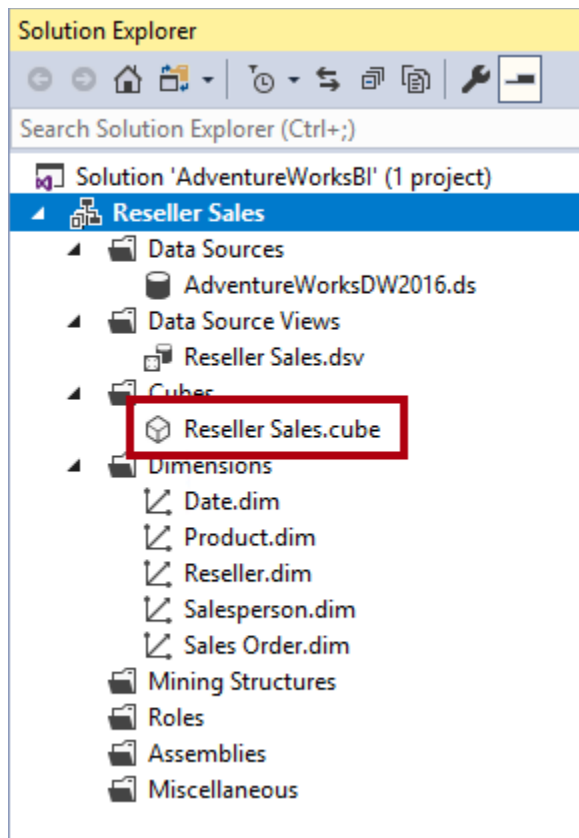
- Check only the following four measures.

Measure Group	Measure
Quota	Sales Amount Quota
Sales	Order Quantity
Sales	Total Product Cost
Sales	Sales Amount

- Click **Next**.
- At the **Select Existing Dimensions** page, notice that all five database dimensions developed in **Lab 03** will be included in the cube, and then click **Next**.
- At the **Completing the Wizard** step, in the **Preview** pane, verify that the cube will consist of two measure groups, four measures and five dimensions.



11. Click **Finish**.
12. In **Solution Explorer**, notice the addition of the **Reseller Sales** cube, and that the cube designer opens automatically.



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

Exploring the Cube Designer

In this task, you will explore the cube designer.

1. In the **Reseller Sales** cube designer, in the **Cube Structure** tab, notice the three panes.
 - The **Measures** pane displays the cube measure groups and measures
 - The **Dimensions** pane displays all cube dimensions
 - The **Data Source View** pane represents the data source view that the cube is based on, and the tables are colored according to role: yellow for measure group, and blue for dimension

2. To deploy and process the cube, in **Solution Explorer**, right-click the **Reseller Sales** project, and then select **Deploy**.

While the cube designer has a built-in browser, it does not provide sufficient features and functionality to properly test the design of the cube. A more effective way to test the cube is by using Excel and creating PivotTable reports. This is the browsing method you will use in this lab.

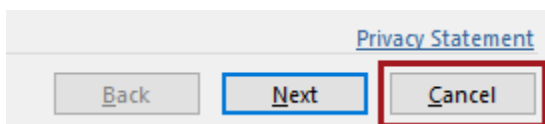
Browsing the Cube in Excel

In this task, you will use Excel to connect to the **Reseller Sales** cube, and then create a PivotTable to explore the cube design.

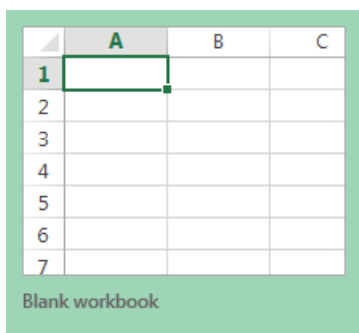
1. To open Excel, on the desktop taskbar, click the **Excel 2016** shortcut.



2. When prompted to activate office, click **Cancel**.



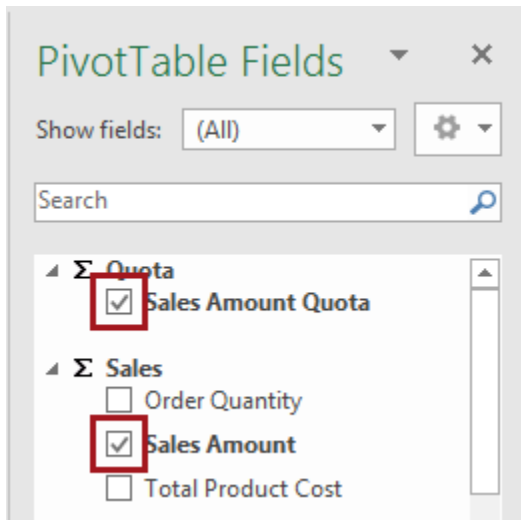
3. To create a new workbook, click the **Blank Workbook** template.



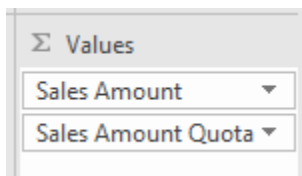
4. To rename the worksheet, right-click the **Sheet1** worksheet tab, and then select **Rename**.
5. Replace the worksheet name text with **Sales Performance**, and then press **Enter**.
6. To re-open an Analysis Services connection, on the **Data** ribbon tab, from inside the **Get External Data** group, click **Existing Connections**.
7. In the **Existing Connections** window, select the **Reseller Sales** connection.

*This is the connection you created in **Lab 01**. If the connection is not available, return to **Exercise 3 of Lab 01** to create the connection.*

8. Click **Open**.
9. In the **Import Data** window, to create a PivotTable report based on the connection, click **OK**.
10. In the **PivotTable Fields** pane (located at the right), notice the structure of the **Reseller Sales** cube.
11. To configure the PivotTable report, in the **PivotTable Fields** pane, check the **Sales Amount** and then **Sales Amount Quota** fields.



*Selecting measures will automatically place them into the **Values** drop zone.*



12. Notice that both fields have been added to the PivotTable report.
13. Notice also that the field values are not well formatted.
14. In the **PivotTable Fields** pane, scroll down the field list, and notice that there are three date dimensions: **Date**, **Order Date** and **Ship Date**.

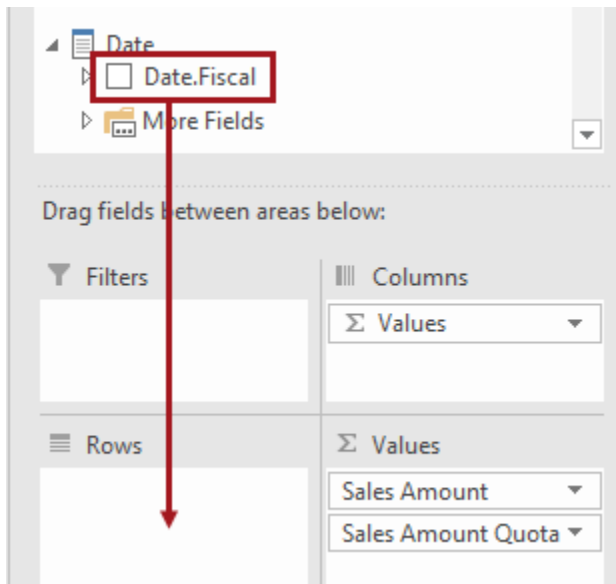
The three different date dimensions are likely to confuse the user.

15. Notice also that the **Sales Order** dimension is listed, and that this is dimension that could potentially contain millions of members.

*Recall that the **Sales Order** dimension consists of a single attribute for the **Sales Order Line**, and that the purpose of adding this dimension to the cube is to support a drillthrough action that you will create later in this lab.*

As the attribute hierarchy could consist of millions of members (sales order lines), it is inappropriate to allow a user to attempt to explore the hierarchy membership.

16. In the **PivotTable Fields** pane, in the **Date** dimension, drag the **Date.Fiscal** hierarchy to the **Rows** drop zone.



17. Notice that the **Fiscal** hierarchy has been added to the PivotTable report.
18. In the PivotTable report, notice that the same **Sales Amount** value repeats for each fiscal year.
19. Right-click the **FY2015** member (cell **A3**), and then select **Expand/Collapse | Expand to "Month"**.
20. Notice that the same **Sales Amount** value repeats for all fiscal time periods.
21. Notice also that the **Sales Amount Quota** value for **2014 Jul** is **3600000**.

*The quota values stored in the **FactSalesQuota** table are stored by using the first date of the first month in the fiscal quarter. The cube has not been configured to understand that sales quota values are stored at the fiscal quarter grain.*

You will address these issues in the following tasks. You will then return to the PivotTable and refresh the data to review the updates you have made to the cube design.

22. Leave Excel open.

Configuring the Cube Measures

In this task, you will rename the measures and apply format strings.

1. Switch to Visual Studio.
2. To rename and format all measures, right-click inside an empty area of the **Measures** pane (located at the top-left corner), and then select **Show Measures In | Grid**.

While the grid view occupies more screen space, it has the advantage of allowing the common properties of all cube measures to be viewed and modified. It also allows multi-selection of measures to modify the measure properties in bulk.

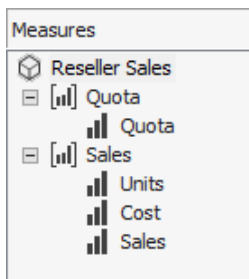
3. Rename the measures based on the following table.

Measure Name	New Measure Name
Sales Amount Quota	Quota
Order Quantity	Units
Total Product Cost	Cost
Sales Amount	Sales

4. To format all measures, select the first measure, and then while pressing the **Shift** key, select the last measure.
5. In the **Properties** pane, for the **FormatString** property, enter **#,#**. (Do not enter the period.)

Analysis Services uses the VB.NET format codes. This format string will format numeric values with a comma as the thousand separator. For more information on format string content, refer to <http://msdn.microsoft.com/en-us/library/ms146084.aspx>.

6. To revert the measures to tree view, right-click inside an empty area of the **Measures** pane, and then select **Show Measures In | Tree**.
7. Verify that the cube has four measures, each named with a single word.



8. To save the solution, on the **File** menu, select **Save All**.

Exercise 2: Configuring the Cube Dimension Usage

In this exercise, you will develop the **Reseller Sales** cube dimension usage to remove an unnecessary cube dimension, to configure a non-key granularity relationship, and to hide a cube dimension.

Preparing the Data Source View

In this task, you will prepare the data source view by creating a named query. The named query will introduce a new column to compute the fiscal quarter key value required to configure the dimension usage in next task.

1. Open the **Reseller Sales** data source view.
2. In the **Tables** pane, right-click the **Quota** table, and then select **Replace Table | With New Named Query**.
3. In the **Create Named Query** window, in the **Name** box, replace the text with **Quota**.
4. To hide the diagram and grid panes, click the following toolbar buttons.



5. Replace the query in the SQL pane with the following.

You can copy the query from the **F:\Labs\Lab04\Assets\Snippets.txt** file.

T-SQL

```
SELECT
    [q].[DateKey]
    , [q].[EmployeeKey]
    , [q].[SalesAmountQuota]
    , (([d].[FiscalYear] * 10) + [d].[FiscalQuarter]) AS [FiscalQuarter_Key]
FROM
    [dbo].[FactSalesQuota] AS [q]
    INNER JOIN [dbo].[DimDate] AS [d]
        ON [d].[DateKey] = [q].[DateKey];
```

A named query is required in order to join the **FactSalesQuota** table to the **DimDate** table. This allows a column named **FiscalQuarter_Key** to be based on an expression that uses the **FiscalYear** and **FiscalQuarter** columns, and this will allow the **Date** dimension to relate to the facts in the **FactResellerSalesQuota** table.

6. To run the query, on the toolbar, click **Run**.

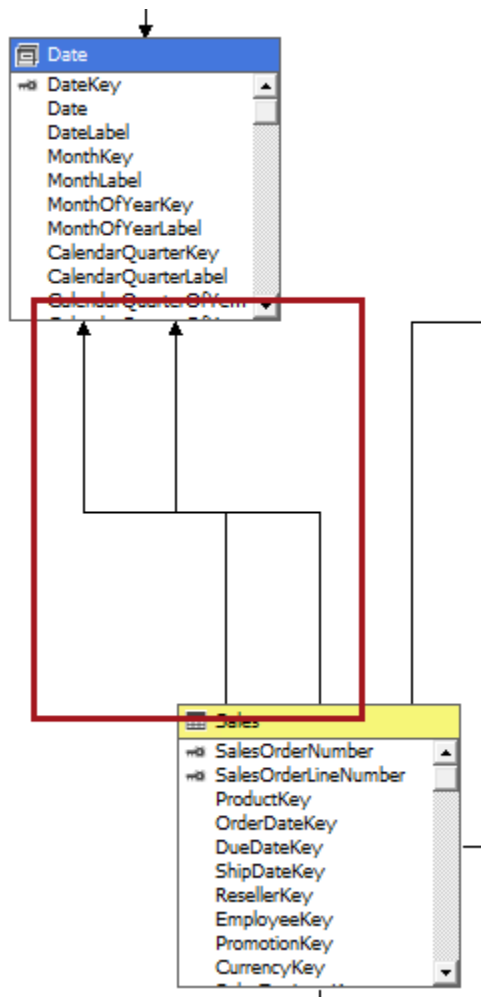


7. Click **OK**.
8. To save the solution, on the **File** menu, select **Save All**.

Configuring the Cube Dimension Usage

In this task, you will configure the cube dimension usage to configure relationships between the **Date** cube dimension, to remove a redundant cube dimension, and to modify the granularity attribute for the **Quota** measure group and the **Date** cube dimension.


1. In **Solution Explorer**, in the **Dimensions** folder, notice that there are five database dimensions, all developed in **Lab 03**.
2. Switch to the **Reseller Sales** cube designer.
3. In the cube designer's **Dimensions** pane, notice that there are seven cube dimensions.
4. In the **Data Source View** pane of the cube designer, notice that there are two relationships between the **Sales** table and the **Date** table (based on the **OrderDateKey** and **ShipDateKey** columns), and one relationship between the **Quota** table and the **DimDate** table (based on the **DateKey** column).



The **Cube Wizard** has detected these three relationships and has automatically created three cube dimensions. When a single database dimensions (**Date**) is used multiple times within a cube, the cube dimensions are referred to as role-playing dimensions.

5. Select the **Dimension Usage** tab (the second tab in the cube designer).
6. Notice that the grid projects the cube measure groups on the columns, and the cube dimensions on the rows.

When there is a relationship between the measure group and the cube dimension, the granularity attribute (the dimension attribute used to relate to the measure group) is displayed.

With the exception of a regular relationship, the relationship type is indicated by an icon, as is the case with the relationship with the **Sales Order** cube dimension. The  icon represents a fact relationship (recall that the **Sales Order** dimension was based on the **Sales** table).

Tip: You can hover the cursor over a relationship to reveal details of the relationship in a tooltip.

7. Notice that the **Date** cube dimension relates to only one measure group (**Quota**).
8. To create a new relationship, select the cell at the intersection of the **Sales** measure group and the **Date** cube dimension, and then click the ellipsis.
9. In the **Define Relationship** window, in the **Select Relationship Type** dropdown list, select **Regular**.
10. In the **Granularity Attribute** dropdown list, select **Date**.

11. In the **Measure Group Columns** dropdown list, select **OrderDateKey**

The screenshot shows a configuration window for a cube relationship. At the top, a dropdown menu is set to 'Regular'. Below this, the 'Granularity attribute' is set to 'Date'. The 'Dimension table' is 'DimDate' and the 'Measure group table' is 'FactResellerSales'. The 'Relationship' section contains a table with two columns: 'Dimension Columns' and 'Measure Group Columns'. Under 'Dimension Columns', 'DateKey' is listed. Under 'Measure Group Columns', 'OrderDateKey' is selected from a dropdown list. Red boxes highlight the 'Regular' dropdown, the 'Date' granularity attribute, and the 'OrderDateKey' selection.

The configured relationship uses the granularity of **Date** attribute (sales are stored at date level). The selection of the granularity attribute updates the **Relationship** grid with the columns defined for the selected attribute's key columns (**DateKey**). The key columns must then be mapped to column(s) in the measure group table.

This configuration requires that users be educated about what the **Date** cube dimension means when analyzing measures from the **Sales** measure group. It means they are analyzing by order date.

12. Click **OK**.
13. Notice that both the **Salesperson** and **Date** cube dimensions can now be used to analyze the measures in all cube measure groups.

The **Date (Order Date)** cube dimension is now redundant and can be removed.

14. Right-click the **Date (Order Date)** cube dimension, and then select **Delete**.
15. In the **Delete Objects** window, to confirm the deletion, click **OK**.
16. Select the relationship between the **Quota** measure group and the **Date** cube dimension, and then click the ellipsis.

17. In the **Define Relationship** window, in the **Granularity Attribute** dropdown list, select **Fiscal Quarter**.

Granularity attributes:	Fiscal Quarter
Dimension table:	DimDate
Measure group table:	FactSalesQuota

18. In the **Measure Group Columns** dropdown list, select the **FiscalQuarter_Key** column.

Relationship:	
Dimension Columns	Measure Group Columns
FiscalQuarterKey	FiscalQuarter_Key

The **FiscalQuarter_Key** column was included in the named query in the previous task.

19. Click **OK**.

The cube now understands that the measure values stored in the **Quota** measure group are at fiscal quarter granularity.

20. Select the **Sales Order** cube dimension.
21. In the **Properties** pane, set the **Visible** property to **False**.
22. Verify that your dimension usage consists of two measure groups, and six cube dimensions.

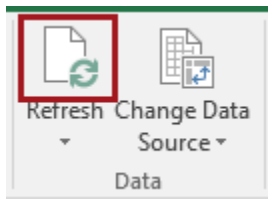
Measure Groups		
Dimensions	[n] Quota	[n] Sales
Date	Fiscal Quarter	Date
Salesperson	Salesperson	Salesperson
Sales Order		Sales Order Line
Date (Ship Date)		Day
Reseller		Reseller
Product		Product

23. Deploy the project.

Reviewing the Cube Design in Excel

In this task, you will refresh the PivotTable report to explore the modifications made to the cube design in this lab.

1. Switch to Excel.
2. To refresh the PivotTable, on the **PivotTable Tools | Analyze** contextual ribbon, from inside in the **Data** group, click **Refresh**.



3. Notice that the measures were removed from the PivotTable.
Recall that the measures were renamed in the previous exercise.
4. In the **PivotTable Fields** pane, notice that there are now only two date dimensions: **Date** and **Ship Date**.
5. Notice also that the **Sales Order** dimension is no longer listed.
6. Select the **Sales** and **Quota** measures.
7. Notice the numeric formatting of the fields, and that the **Sales** values appear correctly.

8. However, notice that the **Quota** values at month level repeat their fiscal quarter value.

	A	B	C
1	Row Labels ▾	Sales	Quota
2	⊕ FY2014	8,065,435	7,225,000
3	⊖ FY2015	24,144,430	21,970,000
4	⊖ FY2015 Q1	4,069,186	3,600,000
5	⊕ 2014 Jul	713,117	3,600,000
6	⊕ 2014 Aug	1,900,789	3,600,000
7	⊕ 2014 Sep	1,455,280	3,600,000
8	⊖ FY2015 Q2	4,153,820	3,960,000
9	⊕ 2014 Oct	882,900	3,960,000
10	⊕ 2014 Nov	2,269,117	3,960,000
11	⊕ 2014 Dec	1,001,804	3,960,000

*The PivotTable report repeats the quota values at the month level because the **Quota** measure group stores values at the fiscal quarter grain. Analysis Services does not understand how to represent data beneath the grain of the measure group, so by default it repeats the granularity level values.*

You will implement a solution with a scoped assignment to address this undesirable behavior in the next exercise.

Exercise 3: Enhancing the Cube with Calculations

In this exercise, you will enhance the Reseller Sales cube with calculated members, a named set, a scoped assignment, and a key performance indicator (KPI).

Creating a Calculated Member

In this task, you will create the **Profit** calculated member.

1. Switch to Visual Studio.
2. In the **Reseller Sales** cube designer, select the **Calculations** tab.
3. To create a calculated member, on the **Cube** menu, select **New Calculated Member**.
4. In the **Name** box, replace the text with **[Profit]**.

It is common when defining calculated members, and other cube objects, to enclose the object name in square brackets. The brackets are optional. However, they are required if the object name is a reserved word, commences with a number, or contains a space or special characters. It is a standard practice to enclose all object names in square brackets.

5. In the **Parent Hierarchy** dropdown list, notice that **Measures** is selected.

*Calculated members created on the **Measures** hierarchy (dimension) are commonly called calculated measures. This is the most common hierarchy used to create calculated members.*

6. In the following steps, in the **Expression** box, you will construct the following expression.

MDX

```
[Measures].[Sales] - [Measures].[Cost]
```

7. To construct the expression, in the **Calculation Tools** pane (located at the bottom-left), expand the **Measures** folder, and then expand the **Sales** measure group.
8. Drag the **Sales** measure into the **Expression** box.
9. In the **Expression** box, position the cursor at the end of the expression, then enter a space, following by the minus symbol, followed by another space.
10. From the **Calculation Tools** pane, drag the **Cost** measure into the **Expression** box, and drop it at the end of the expression.

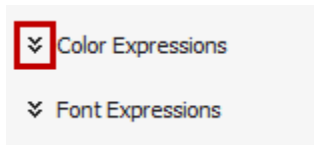
⤴ Expression

```
[Measures].[Sales] - [Measures].[Cost]
```

11. In the **Format String** box, enter **"#,#"**. (Do not enter the period, but do enter the double-quotes.)

The format string must be enclosed in double quotes.

12. In the **Associated Measure Group** dropdown list, select **Sales**.
13. To configure a color expression, expand the **Color Expressions** group.



14. In the **Fore Color** box, enter the following expression.

*You can copy the expression from the **F:\Labs\Lab04\Assets\Snippets.txt** file.*

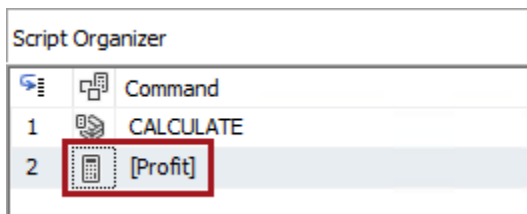
MDX

```
IIF([Measures].[Profit] < 0, 255, 0)
```

*The expression tests whether the **Profit** measure is less than zero. If it is less than zero it returns 255 (which is the RGB code for red), otherwise it returns zero (black).*

To the right of the color boxes, notice the color picker button to select a color and insert the RGB code into the expression.

15. In the **Script Organizer** pane (located at the left), notice the addition of the **[Profit]** command.



Creating Additional Calculated Members

In this task, you will create additional calculated members by adding them directly to the cube's MDX script.

1. To switch to script view, on the **Cube** menu, select **Show Calculations In | Script**.
2. At the top of the script, notice the **CALCULATE** statement.

*The **CALCULATE** statement is included automatically in the cube's MDX script. It tells each cell in the cube to aggregate from lower granularity cells. It should not be removed.*

3. Directly beneath the CALCULATE statement, notice the command created in the previous task to add the **Profit** calculated member.
4. Directly beneath the **Profit** calculated member, enter the following additional calculated members.

*You can copy the commands from the **F:\Labs\Lab04\Assets\Snippets.txt** file.*

MDX

```
CREATE MEMBER CURRENTCUBE.[Measures].[Profit%] AS
    DIVIDE([Measures].[Profit], [Measures].[Sales])
    ,FORMAT_STRING = "Percent"
    ,FORE_COLOR = IIF([Measures].[Profit%] < 0, 255, 0)
    ,VISIBLE = 1
    ,ASSOCIATED_MEASURE_GROUP = 'Sales';
CREATE MEMBER CURRENTCUBE.[Measures].[Variance] AS
    [Measures].[Sales] - [Measures].[Quota]
    ,FORMAT_STRING = "#,#"
    ,FORE_COLOR = IIF([Measures].[Variance] < 0, 255, 0)
    ,VISIBLE = 1
    ,ASSOCIATED_MEASURE_GROUP = 'Quota';
CREATE MEMBER CURRENTCUBE.[Measures].[Variance%] AS
    DIVIDE([Measures].[Variance], [Measures].[Quota])
    ,FORMAT_STRING = "Percent"
    ,FORE_COLOR = IIF([Measures].[Variance%] < 0, 255, 0)
    ,VISIBLE = 1
    ,ASSOCIATED_MEASURE_GROUP = 'Quota';
CREATE MEMBER CURRENTCUBE.[Measures].[Sales YTD] AS
    SUM(YTD([Date].[Fiscal].CURRENTMEMBER), [Measures].[Sales])
    ,FORMAT_STRING = "#,#"
    ,VISIBLE = 1
    ,ASSOCIATED_MEASURE_GROUP = 'Sales';
```

5. To switch back to form view, on the **Cube** menu, select **Show Calculations In | Form**.
6. Review the commands in the **Script Organizer** pane.
7. Deploy the project.

Reviewing the Calculated Members in Excel

In this task, you will add some calculated members to the **Sales Performance** report.

1. Switch to Excel.
2. To refresh the PivotTable, ensure that the PivotTable is in focus, and then on the **PivotTable Tools | Analyze** contextual ribbon tab, from inside the **Data** group, click **Refresh**.
3. In the **PivotTables Fields** pane, notice the new measures available in both the **Quota** and **Sales** measure groups.
4. To add measures to the PivotTable report, check the **Variance**, **Variance%**, **Profit** and **Profit%** measures.
5. In the PivotTable, notice the addition of the measures, their formats and the color formatting applied to negative values.

Creating the Sales YTD Report

In this task, you will create a new report to review the **Sales YTD** measure.

1. To add a new worksheet, to the right of the **Sales Performance** worksheet tab, click the **New Sheet** button.



2. Rename the new worksheet to **Sales YTD**.
3. To add a PivotTable, on the **Data** ribbon tab, from inside the **Get External Data** group, click **Existing Connections**.
4. In the **Existing Connections** window, notice that the **Reseller Sales** connection defined in the workbook is selected, and then click **Open**.
5. In the **Import Data** window, notice that the **PivotTable Report** option is selected, and then click **OK**.

- Configure the PivotTable based on the following.

*Tip: To add a measure to the **Values** zone, simply check the measure. To add a hierarchy to the **Filters**, **Columns** or **Rows** drop zones, either drag them to the drop zone, or right-click the hierarchy, and then select the appropriate menu option.*

Drop Zone	Fields
Values	Sales Sales Sales Sales YTD
Rows	Date.Fiscal

- In the PivotTable, to expand the **FY2015** member to the **Month** level, right-click the **FY2015** member (cell **A3**), and then select **Expand/Collapse | Expand to "Month"**.
- To hide the **Quarter** level, right-click the **FY2015 Q1** member (cell **A4**), and then select **Show/Hide Fields | Quarter**.
- To relocate the **FY2015** subtotals to the bottom of the months, on the **PivotTable Tools | Design** contextual ribbon tab, from inside the **Layout** group, click **Subtotals**, and then select **Show All Subtotals at Bottom of Group**.
- To apply data bars, select the first monthly **Sales** value (cell **B4**), then on the **Home** ribbon tab, from inside the **Styles** group, click **Conditional Formatting**, then select **Data Bars**, and then select the blue (first) gradient fill option.
- To apply the data bar to all **Sales** cells at the **Month** level, click the smart tag to the right cell **B4**, and then select the **All Cells Showing "Sales" Values for "Month"** option.

	A	B	C
1	Row Labels	Sales	Sales YTD
2	+ FY2014	8,065,435	8,065,435
3	- FY2015		
4	+ 2014 Jul	713,117	713,117
5	+ 2014 Aug	1,900,789	2,613,906
6	+ 2014 Sep	1,455,280	4,069,186
7	+ 2014 Oct	882,900	4,952,086

- Repeat the last two steps to apply green data bars to the **Sales YTD** monthly values.
- To improve the look of the data bars, widen columns **B** and **C**.

14. Notice that the accumulation of the **FY2015** monthly sales eventually equals the **FY2015** subtotal.

	A	B	C
1	Row Labels	Sales	Sales YTD
2	± FY2014	8,065,435	8,065,435
3	± FY2015		
4	± 2014 Jul	713,117	713,117
5	± 2014 Aug	1,900,789	2,613,906
6	± 2014 Sep	1,455,280	4,069,186
7	± 2014 Oct	882,900	4,952,086
8	± 2014 Nov	2,269,117	7,221,203
9	± 2014 Dec	1,001,804	8,223,006
10	± 2015 Jan	2,393,690	10,616,696
11	± 2015 Feb	3,601,191	14,217,887
12	± 2015 Mar	2,885,359	17,103,246
13	± 2015 Apr	1,802,154	18,905,400
14	± 2015 May	3,053,816	21,959,216
15	± 2015 Jun	2,185,213	24,144,430

Creating a Named Set

In this task, you will create the **Top 10 Resellers** named set.

1. Switch to Visual Studio.
2. In the **Reseller Sales** cube designer, in the **Calculations** tab, in the **Script Organizer**, select the **[Sales YTD]** command.

New calculations will be inserted after the selected command.

3. To create a named set, on the **Cube** menu, select **New Named Set**.
4. In the **Name** box, replace the text with **[Top 10 Resellers]**.

5. In the **Expression** box, enter the following expression.

You can copy the expression from the **F:\Labs\Lab04\Assets\Snippets.txt** file.

MDX

```
TOPCOUNT([Reseller].[Reseller].[Reseller].MEMBERS, 10, [Measures].[Sales])
```

The **TOPCOUNT** function has been configured to retrieve the first 10 members by **Sales** from the **Reseller** dimension's **Reseller** hierarchy at the **Reseller** level. (Recall that attribute hierarchies include a single level named the same as the hierarchy.)

This named set is an example of dynamic set, in that it is evaluated every time it is used in a query (i.e. the top ten resellers could be different when evaluated in different time periods or geographic regions).

6. Deploy the project.

Creating the Top 10 Resellers Report

In this task, you will create a new report to review the **Top 10 Resellers** named set.

1. Switch to Excel.
2. Create a new worksheet named **Top 10 Resellers**.
3. Add a PivotTable based on the **Reseller Sales** workbook connection to cell **\$A\$1**.

Configure the PivotTable based on the following.

Drop Zone	Fields
Values	Sales Sales
Filters	Date.Fiscal
Rows	Sets Top 10 Resellers

4. Click the **Date.Fiscal** filter (cell **B1**) dropdown, expand the **All** member, select the **FY2014** member, and then click **OK**.
5. Notice that the reseller members are sorted alphabetically.

The **Reseller** attribute is configured to sort members by name.

6. To sort the resellers by descending sales order, right-click the first **Sales** value (cell **B4**), and then select **Sort | Sort Largest to Smallest**.
7. Take note of the first three resellers, and then modify the **Date.Fiscal** filter to **FY2015**.
8. Notice that the top three resellers in **FY2014** are different from those in **FY2015**.

Creating a Scoped Assignment

In this task, you will create a scoped assignment to calculate monthly quota values.

1. Switch to Visual Studio.
2. To activate the **Cube** menu, click in an empty area of the cube designer.
3. To switch to script view, on the **Cube** menu, select **Show Calculations In | Script**.
4. Directly beneath the **Top 10 Resellers** named set, enter the following scoped assignment.

*You can copy the scoped assignment from the **F:\Labs\Lab04\Assets\Snippets.txt** file.*

MDX

```
SCOPE ([Measures].[Quota], [Date].[Fiscal].[Month].MEMBERS);  
    THIS = [Date].[Fiscal].CURRENTMEMBER / 3;  
END SCOPE;
```

*The red squiggly is a bug and can be ignored. The scoped assignment isolates cube cells at the intersection of the **Quota** measure and members at the **Month** level of the **Date** dimension's **Fiscal** hierarchy. The **THIS** command is used to assign a formula to the scoped cells.*

5. Deploy the project.

Reviewing the Sales Performance Report

In this task, you will refresh the **Sales Performance** report to review the monthly quota values.

1. Switch to Excel.
2. Select the **Sales Performance** worksheet.
3. Before refreshing the PivotTable, notice that the monthly quota values are the same as the quarter quota value. Notice also, as a result of this, that the **Variance** and **Variance%** measures are extremely off target.
4. To refresh the PivotTable, ensure that the PivotTable is in focus, and then on the **PivotTable Tools | Analyze** contextual ribbon tab, from inside the **Data** group, click **Refresh**.

- In the PivotTable, notice that the monthly quota values are now one third of the quarter values, and that the **Variance** and **Variance%** measures are looking healthier.

	A	B	C
1	Row Labels	Sales	Quota
2	± FY2014	8,065,435	7,225,000
3	± FY2015		
4	± FY2015 Q1		
5	± 2014 Jul	713,117	1,200,000
6	± 2014 Aug	1,900,789	1,200,000
7	± 2014 Sep	1,455,280	1,200,000
8	± FY2015 Q2		
9	± 2014 Oct	882,900	1,320,000
10	± 2014 Nov	2,269,117	1,320,000
11	± 2014 Dec	1,001,804	1,320,000

Creating a KPI

In this task, you will create the **Sales Performance** KPI.

- Switch to Visual Studio.
- In the **Reseller Sales** cube designer, select the **KPIs** tab.
- To create a KPI, on the **Cube** menu, select **New KPI**.
- In the **Name** box, replace the text with **Sales Performance**.

Unlike a calculated member or named set, the KPI is not an object that is directly referenced by expressions or used in queries. Therefore, its name is never placed in square brackets.

- In the **Associated Measure** group dropdown list, select **Quota**.
- From the **Calculation Tools** pane, drag the **Sales** measure into the **Value Expression** box.
- Drag the **Quota** measure into the **Goal Expression** box.
- In the **Status Indicator** dropdown list, select **Shapes** (the first item).

⤴ Status

Status indicator:

 Shapes

The **Shapes** indicator is a tri-state indicator, meaning that it has three states. The status expression must use an MDX expression to return 1, 0 or -1. 1 means on track; 0 means slightly off track; and, -1 means off track.

9. In the **Status Expression** box, enter the following expression.

*You can copy the expression from the **F:\Labs\Lab04\Assets\Snippets.txt** file.*

MDX

```
CASE
  WHEN ISEMPTY([Measures].[Variance%]) THEN NULL
  WHEN [Measures].[Variance%] >= 0 THEN 1
  WHEN [Measures].[Variance%] >= -0.1 THEN 0
  ELSE -1
END
```

10. In the **Trend Expression** box, enter the following expression.

*You can copy the expression from the **F:\Labs\Lab04\Assets\Snippets.txt** file.*

MDX

```
CASE
  WHEN ISEMPTY([Measures].[Variance%]) THEN NULL
  WHEN [Measures].[Variance%] > ([Date].[Fiscal].PREVMEMBER,
    [Measures].[Variance%]) THEN 1
  WHEN [Measures].[Variance%] = ([Date].[Fiscal].PREVMEMBER,
    [Measures].[Variance%]) THEN 0
  ELSE -1
END
```

*This expression returns 1 when the current time period's **Variance%** value is greater than the previous time period's value; 0 when there is no change, and -1 when the current time period's **Variance%** value is less than the previous time period's value.*

11. Deploy the project.

Reviewing the KPI in Excel

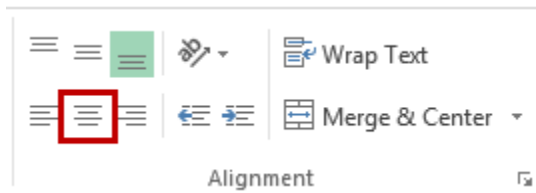
In this task, you will add the **Sales Performance** KPI status and trend metrics to the **Sales Performance** report.

1. Switch to Excel.
2. In the **Sales Performance** worksheet, refresh the PivotTable.
3. In the **PivotTable Fields** pane, expand the **KPIs** group, and then expand the **Sales Performance** KPI.
4. Notice that the **Value** and **Goal** metrics are already checked.

*The PivotTable recognizes that the measures used by the **Value** and **Goal** metrics relate to measures already added to the PivotTable.*

5. Select the **Status** and **Trend** metrics.

6. To rename the fields, in cell **H1**, replace the text with **Status**.
7. In cell **I1** (letter **I**), replace the text with **Trend**.
8. Multi-select the columns guides for columns **H** and **I**.
9. Right-click the selected columns, and then select **Column Width**.
10. In the **Column Width** window, in the **Column Width** box, replace the value with **10**, and then click **OK**.
11. On the **Home** ribbon tab, from inside the **Alignment** group, click the **Center**.



Lab-based Knowledge Check

Lab 04 ► PivotTable Review

What exact variance percent from quota was achieved in **2015 May**?

You may need data from this step to answer a Lab-based Knowledge Check associated with this module.

At this time, we recommend that you open the **Module 2 Lab-based Knowledge Check** portion of the course in EdX to answer the questions as you complete this lab.

Exercise 4: Creating an Action

In this exercise, you will enhance the **Reseller Sales** cube with an action.

Creating a Drillthrough Action

In this task, you will create the **Sales Drillthrough** action. The action will target all measures in the **Sales** measure group and drillthrough to display sales order line details to support loopback analysis with the source sales system.

1. Switch to Visual Studio.
2. In the **Reseller Sales** cube designer, select the **Actions** tab.
3. To create a drillthrough action, on the **Cube** menu, select **New Drillthrough Action**.
4. In the **Name** box, replace the text with **Sales Drillthrough**.
5. In the **Measure Group Members** dropdown list, select **Sales**.
6. In the **Drillthrough Columns** section, in the **Dimensions** dropdown list, select **Date**.
7. In the **Return Columns** dropdown list, select the **Date** attribute, and then click **OK**.
8. Repeat the last two steps to select the following dimensions and attributes.

Dimension	Attribute
Sales Order	Sales Order Line
Measures	Units Cost Sales

Dimensions	Return Columns
Date	Date
Sales Order	Sales Order Line
Measures	Units, Cost, Sales

*The sole reason for adding the **Sales Order** dimension to the **Reseller Sales** cube in **Lab 03** was to support this drillthrough action configuration.*

9. Expand **Additional Properties** (located at the bottom of the form).

10. In the **Caption** box, enter **Drillthrough to Sales Details**.
11. Deploy the project.

Reviewing the Drillthrough Action

In this task, you will launch the action from the **Sales Performance** report.

1. Switch to Excel.
2. In the **Sales Performance** worksheet, refresh the PivotTable.
3. Right-click the sales value for **2014 Jul** (cell **B5**) and then select **Additional Actions | Drillthrough to Sales Details**.
4. Notice that the drillthrough results is presented in a new worksheet.
5. Review the drillthrough result.

Lab-based Knowledge Check

Lab 04 ► Drillthrough Result Review

How many units were sold for order line **SO45038-01**?

You may need data from this step to answer a Lab-based Knowledge Check associated with this module.

At this time, we recommend that you open the **Module 2 Lab-based Knowledge Check** portion of the course in EdX to answer the questions as you complete this lab.

6. To delete the drillthrough worksheet, right-click the worksheet tab, and then select **Delete**.
7. When prompted to confirm the deletion, click **Delete**.

You have now completed the lab.

*When you are ready, you should complete the **Finishing Up** exercise to delete the VM.*

Finishing Up

In this exercise, you will delete the VM.

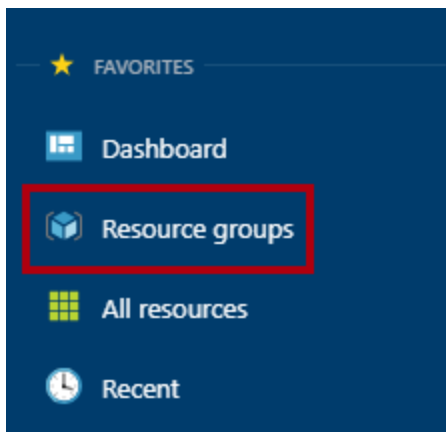
Finishing Up

In this task, you will delete the **Lab** resource group, which will delete the VM.

1. Close the remote desktop window.
2. In the **Azure Portal** Web browser page, open the left pane.



3. Select **Resource Groups**.



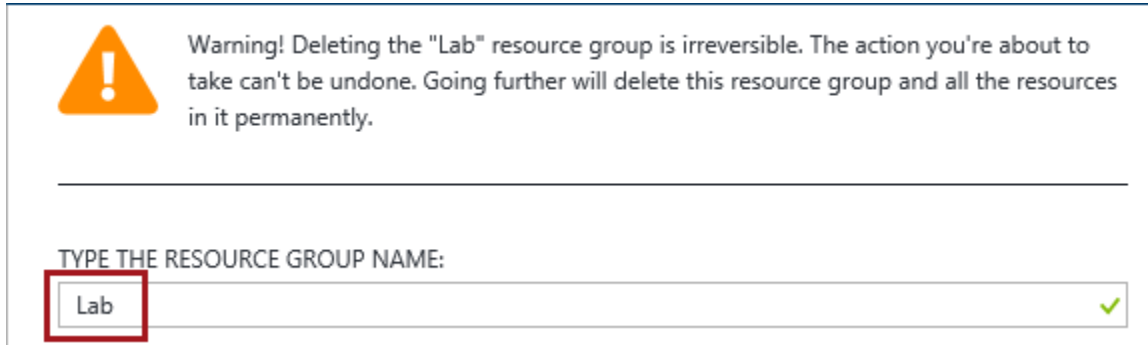
4. In the **Resource Groups** blade, select the **Lab** resource group.



5. In the **Lab** blade, click **Delete Resource Group**.



- When prompted to delete the resource group, in the **Type the Resource Group Name** box, enter **Lab**.



A warning dialog box with a yellow triangle icon containing an exclamation mark. The text reads: "Warning! Deleting the 'Lab' resource group is irreversible. The action you're about to take can't be undone. Going further will delete this resource group and all the resources in it permanently." Below the text is a horizontal line. Underneath the line is the label "TYPE THE RESOURCE GROUP NAME:" followed by a text input field. The input field contains the text "Lab" and has a green checkmark at the end. The "Lab" text is highlighted with a red rectangular box.

- Click **Delete**.



A dialog box with two buttons: "Delete" and "Cancel". The "Delete" button is blue with white text and is highlighted with a red rectangular box. The "Cancel" button is light blue with blue text.

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