# Database OLAP Cube pada SQL Server

Ketika denger istilah OLAP dan Cube, saya langsung bertanya-tanya apa itu, dan kebetulan juga pekerjaan saya menuntut untuk mengetahui istilah tersebut ,

OLAP atau kepanjangan dari Online Analytical Processing. Jika kita sudah mengenah Data Warehouse. OLAP adalah bentuk lain dari datawarehous yang sudah dibuat sedemikian rupa untuk memudahkan dalam Bisnis Intellejen. User dapat melakukan pivoting, drill up dan drilldown sesuai dengan kebutuhan analisis.

OLAP menggabungkan data yang ada di datawarehous sehingga dengan cepat dapat dianalisis.

berikut konsep dasar dari OLAP :

* Cube
* Dimension table
* Dimension
* Hierarchy
* Level
* Fact table
* Measure
* Schema

**Cube**

Unit dasar dari storage dan analisis dalam analisis services adalah Cube. Cube adalah kumpulan dari data yang telah digabungkan untuk memudahkan query untuk mengembalikan data secara cepat. Contohnya, sebuah cube yang diminta digabungkan berdasarkan periode waktu dan judul,Cube membuat lebih cepat ketika anda menanyakan tentang oreder by week atau order by title.

Cube yang dibuat kedalam dimensions dan measures. Data untuk cube berasal dari kumpulan tabel bertingkat, kadang dinamakan star schema database. Dimesions dalam cube berasal dari dimension tables dalam database bertingkat, Sementara measures berasal dari fact tables dalam staging database.

**Dimension table**

Dimension table berada dalam staging database dan berisidata yang akan digunakan untuk mengelompokkan nilai yang diringkas. Dimension tabel berisi primary key dan atribut lain yang mendeskripsikan entiti yang tersimpan dalam tabel. COntohnya : Tabel customer yang berisikan informasi Kota, Negara dan Kode Pos untuk memungkinkan analisa sales secara geografis, atau sebuah tabel produk yang berisikan kategori dan product lines untuk membreak down perhitungan sales.

**Dimension**

Masing-masing cube mempunyai satu atau lebih dimensions, masing-masing berdasarkan pada satu atau lebih dimension tabel. Sebuah dimension menggabarkan sebuah kategori untuk analisa bisnis data L waktu atau kategori yang disebut diatas. Biasanya, sebuah dimensi mempunyai hirarki jadi hasil yang paling rendah dapat di “rolled up” ke hasil yang lebih tinggi. Contohnya, dalam level geografis anda mungkin mempunyai kota jumlah digabungkan ke total  negara bagian, atau negara bagian kedalam total negara.

**Hierarchy**

Sebuah hirarki dapat divisualisasikan dengan lambang plus(node tree). Sebuah chart perusahaan  adalah conto dari hirarki. masing-masing dimensi dapat berisi banyak hirarki. beberapa diantaranya adalah natural hirarki ( relasi parent-child antar atribut yang terjadi dalam data), lainnya adalah navigational hirarki ( relasi parent -child yang dibuat oleh developer )

**Level**

Masing-masing layer dalam hirarki dinamakan level. Contohnya, anda dapat menyebutnya level minggu atau level bulan pada hirarki waktu, dan level kota atau level negara pada hirarki geografis

**Fact table**

Sebuah fact table berada dalam staging database dan berisi informasi dasar yang akan dirangkum. Hal ini mungkin diminta berdasarkan detail informasi, arsip payroll, informasi keefektifan obat, atau hal lain yang disetujui untuk menjumlahkan dan merata-ratakan. Beberapa tabel yang anda gunakan dengan fungsi Sum atau Avg dalam total query adalah baik untuk fact table. Fact tables berisi fields untuk individual facts serta foreign key fields tergantung pada fakta-takta yang berkaitan dengan dimension tables.

**Measure**

Setiap cube akan berisi satu atau lebih measures, masing-masing berdasarkan pada kolom dalam fact table yang akan dianalisa. Contohnya, measures akan berisi seperu unit sales dan profit

**Schema**

Fact tables dan dimension table adalah berhubungan, dimana tidak mengherankan, mengingat bahwa Anda menggunakan tabel dimensi untuk informasi grup dari fact table. Hubungan dengan cube form adalahschema. Schema terdiri dari skema OLAP dasar: star dan snowflake. Dalam star schema, setiap dimensi tabel terhubung langsung ke fact table. pada snowflake skema, beberapa dimensi tabel berhubungan tidak secara langsung ke face table. Contohnya, Jika cube anda berisi detailOrder pada fact table, dengan customer dan Order sebagai dimension tables, dan customer terhubung ke order, yang gilirannya terhubung ke OrderDetail, ketika anda sepakat untuk menggunakan skema snowflake.

Praktek Mendefinisikan Cube pada Data Warehouse dgn SQL Server

# Lesson 2: Defining and Deploying a Cube

After you define a data source view in your Microsoft Analysis Services project, you are ready to define an initial Analysis Services cube.

You can define a cube and its dimensions in a single pass using the Cube Wizard. Alternatively, you can define one or more dimensions and then use the Cube Wizard to define a cube that uses those dimensions. If you are designing a complex solution, you generally start by defining the dimensions. For more information, see Designing Dimensions or Designing Cubes.

Completed projects for all of the lessons in this tutorial are available online. You can jump ahead to any lesson by using the completed project from the previous lesson as a starting point. Click here to download the sample projects that go with this tutorial. This lesson contains the following tasks:

Defining a Dimension

In this task, you use the Dimension Wizard to define a dimension.

Defining a Cube

In this task, you use the Cube Wizard to define an initial Analysis Services cube.

Adding Attributes to Dimensions

In this task, you add attributes to the dimensions that you created.

Reviewing Cube and Dimension Properties

In this task, you review the structure of the cube that you defined by using the Cube Wizard.

Deploying an Analysis Services Project

In this task, you deploy the Analysis Services project to your local instance of Analysis Services, and learn about certain deployment properties.

Browsing the Cube

In this task, you browse the cube and dimension data by using Excel or the MDX query designer.

## Defining a Dimension

In the following task, you will use the Dimension Wizard to build a Date dimension.

This lesson requires that you have completed all the procedures in Lesson 1.

### Procedures

1. In Solution Explorer (on the right side of Microsoft Visual Studio), **right-click Dimensions**, and then **click New Dimension**. The Dimension Wizard appears.
2. **On the Welcome** to the Dimension Wizard page, **click Next**.
3. On the Select Creation Method page, verify that the **Use an existing table option is selected**, and then **click Next**.
4. On the Specify Source Information page, **verify that the Adventure Works DW 2012 data source view is selected**.
5. In the **Main table list**, **select Date**.
6. **Click Next**.
7. On the **Select Dimension Attributes page**, **select the check boxes next to the following attributes**:
	* Date Key
	* Full Date Alternate Key
	* English Month Name
	* Calendar Quarter
	* Calendar Year
	* Calendar Semester
8. **Change** the setting of the **Full Date Alternate Key** attribute's **Attribute Type column** fromRegular **to Date.**

To do this, **click Regular** in the Attribute Type column. Then **click the arrow to expand** the options. Next, **click Date** > **Calendar** > **Date**. **Click OK**.

**Repeat these steps to change the attribute type of the attributes as follows**:

* English Month Name to Month
* Calendar Quarter to Quarter
* Calendar Year to Year
* Calendar Semester to Half Year
1. Click Next.
2. On the Completing the Wizard page, in the Preview pane, you can see the Date dimension and its attributes.
3. **Click Finish to complete the wizard**.

In Solution Explorer, in the Analysis Services Tutorial project, the Date dimension appears in the Dimensions folder. In the center of the development environment, Dimension Designer displays the Date dimension.

1. On the File menu**, click Save All**.

## Defining a Cube

The Cube Wizard helps you define the measure groups and dimensions for a cube. In the following task, you will use the Cube Wizard to build a cube.

### Procedures

1. In Solution Explorer, **right-click Cubes**, and then **click New Cube**. The Cube Wizard appears.
2. **On the Welcome** to the Cube Wizard page, **click Next**.
3. On the Select Creation Method page, **verify that the Use existing tables option is selected**, and then **click Next**.
4. On the Select Measure Group Tables page, **verify that the Adventure Works DW 2012** data source view **is selected**.
5. **Click Suggest** to have the cube wizard suggest tables to use to create measure groups.

The wizard examines the tables and suggests InternetSales as a measure group table. *Measure group tables, also called fact tables, contain the measures you are interested in, such as the number of units sold.*

1. **Click Next**.
2. On the Select Measures page, review the selected measures in the Internet Sales measure group, and then **clear the check boxes for the following measures**:
	* Promotion Key
	* Currency Key
	* Sales Territory Key
	* Revision Number

*By default, the wizard selects as measures all numeric columns in the fact table that are not linked to dimensions*. However, *these four columns are not actual measures*. *The first three are key values that link the fact table with dimension* *tables* that are not used in the initial version of this cube.

1. **Click Next**.
2. On the Select Existing Dimensions page, make sure the **Date dimension that you created earlier is selected**, and then **click Next**.
3. On the Select New Dimensions page, select the new dimensions to be created. To do this, verify that the Customer, Geography, and Product check boxes are selected, and then **clear the InternetSales check box**.
4. **Click Next**.
5. On the Completing the Wizard page, **change the name of the cube** to **Analysis Services Tutorial**. In the Preview pane, you can see the InternetSales measure group and its measures. You can also see the Date, Customer, and Product dimensions.
6. **Click Finish to complete the wizard**.

In Solution Explorer, in the Analysis Services Tutorial project, the Analysis Services Tutorial cube appears in the Cubes folder, and the Customer and Product database dimensions appear in the Dimensions folder. Additionally, in the center of the development environment, the Cube Structure tab displays the Analysis Services Tutorial cube.

1. On the toolbar of the Cube Structure tab, **change the Zoom level to 50 percent**, so that you can more easily see the dimensions and fact tables in the cube.

Notice that the fact table is yellow and the dimension tables are blue.

1. On the File menu**, click Save All**.

## Adding Attributes to Dimensions

Now that you have defined dimensions, you can populate them with attributes that represent each data element in the dimension. Attributes are commonly based on fields from a data source view. When adding attributes to a dimension, you can include fields from any table in the data source view. In this task, you will use Dimension Designer to add attributes to the Customer and Product dimensions. The Customer dimension will include attributes based on fields from both the Customer and Geography tables.

### Adding Attributes to the Customer Dimension

1. **Open Dimension Designer for the Customer dimension**. To do this, **double-click the Customer dimension** in the Dimensions node of Solution Explorer.
2. In the Attributes pane, **notice the Customer Key** and **Geography Key** attributes that were created by the Cube Wizard.
3. On the toolbar of the Dimension Structure tab, make sure the **Zoom icon** to view the tables in the Data Source View pane is **set at 100 percent**.
4. **Drag the following columns** from the **Customer** **table** in the Data Source View pane **to** the **Attributes** **pane**:
	* BirthDate
	* MaritalStatus
	* Gender
	* EmailAddress
	* YearlyIncome
	* TotalChildren
	* NumberChildrenAtHome
	* EnglishEducation
	* EnglishOccupation
	* HouseOwnerFlag
	* NumberCarsOwned
	* Phone
	* DateFirstPurchase
	* CommuteDistance
5. **Drag the following columns** from the **Geography table** in the Data Source View pane **to the Attributes pane**:
	* City
	* StateProvinceName
	* EnglishCountryRegionName
	* PostalCode
6. On the File menu, **click Save All**.

### Adding Attributes to the Product Dimension

1. **Open Dimension Designer for the Product dimension**. **Double-click the Product dimension** in Solution Explorer.
2. In the Attributes pane, **notice the Product Key attribute** that was created by the Cube Wizard.
3. On the toolbar of the Dimension Structure tab, make sure the **Zoom icon to** view the tables in the Data Source View pane is set at **100 percent**.
4. **Drag the following columns** from the **Product table** in the Data Source View pane **to the Attributes pane**:
	* StandardCost
	* Color
	* SafetyStockLevel
	* ReorderPoint
	* ListPrice
	* Size
	* SizeRange
	* Weight
	* DaysToManufacture
	* ProductLine
	* DealerPrice
	* Class
	* Style
	* ModelName
	* StartDate
	* EndDate
	* Status
5. On the File menu**, click Save All**.

## Reviewing Cube and Dimension Properties

After you have defined a cube, you can review the results by using Cube Designer. In the following task, you review the structure of the cube in the Analysis Services Tutorial project.

### Procedures

1. To open the Cube Designer, **double-click the Analysis Services Tutorial cube** in the Cubes node of Solution Explorer.
2. **In the Measures pane** of the Cube Structure tab in Cube Designer, **expand the Internet Sales measure group** to reveal the defined measures.

You can change the order by dragging the measures into the order that you want. The order you create affects how certain client applications order these measures. The measure group and each measure that it contains have properties that you can edit in the Properties window.

1. **In the Dimensions pane** of the Cube Structure tab in Cube Designer, **review the cube dimensions** that are in the Analysis Services Tutorial cube.

**Notice** that although only three dimensions were created at the database level, as displayed in Solution Explorer, there are five cube dimensions in the Analysis Services Tutorial cube.

**The cube contains more dimensions than the database because** the Date database dimension is used as the basis for three separate date-related cube dimensions, based on different date-related facts in the fact table. These date-related dimensions are also called **role playing dimensions**.

The three date-related cube dimensions let users dimension the cube by three separate facts that are related to each product sale: the product order date, the due date for fulfillment of the order, and the ship date for the order. By reusing a single database dimension for multiple cube dimensions, Analysis Services simplifies dimension management, uses less disk space, and reduces overall processing time.

1. In the Dimensions pane of the Cube Structure tab, **expand Customer**, and then **click Edit** **Customer** to open the dimension in Dimension Designer.

Dimension Designer contains these tabs: Dimension Structure, Attribute Relationships, Translations, and Browser. Notice that the Dimension Structure tab includes three panes: Attributes, Hierarchies, and Data Source View. The attributes that the dimension contains appear in the Attributes pane. For more information, see Defining and Configuring Dimension Attributes, Defining and Configuring a Multilevel Hierarchy, and Defining and Configuring an Attribute Relationship.

1. To switch to Cube Designer, **right-click the Analysis Services Tutorial cube** in the Cubes node in Solution Explorer, and then **click View Designer**.
2. In Cube Designer, **click the Dimension Usage tab**.

In this view of the Analysis Services Tutorial cube, you can see the cube dimensions that are used by the Internet Sales measure group. Also, you can define the type of relationship between each dimension and each measure group in which it is used.

1. **Click the Partitions tab**.

The Cube Wizard defines a single partition for the cube, by using the multidimensional online analytical processing (MOLAP) storage mode without aggregations. With MOLAP, all leaf-level data and all aggregations are stored within the cube for maximum performance. Aggregations are precalculated summaries of data that improve query response time by having answers ready before questions are asked. You can define additional partitions, storage settings, and writeback settings on the Partitions tab. For more information, see Partitions, Aggregations and Aggregation Designs (SSAS), and Designing Partition Storage and Aggregations.

1. **Click the Browser tab**.

Notice that the cube cannot be browsed because it has not yet been deployed to an instance of Analysis Services. At this point, the cube in the Analysis Services Tutorial project is just a definition of a cube, which you can deploy to any instance of Analysis Services. When you deploy and process a cube, you create the defined objects in an instance of Analysis Services and populate the objects with data from the underlying data sources.

1. In Solution Explorer, **right-click Analysis Services Tutorial** in the Cubes node, and then **click View Code**. You might need to wait.

The XML code for the Analysis Services Tutorial cube is displayed on the Analysis Services Tutorial.cube [XML] tab. This is the actual code that is used to create the cube in an instance of Analysis Services during deployment. For more information, see How to: View the XML Code for an Analysis Services Project.

1. **Close the XML code tab**.

## Deploying an Analysis Services Project

To view the cube and dimension data for the objects in the Analysis Services Tutorial cube in the Analysis Services Tutorial project, you must deploy the project to a specified instance of Analysis Services and then process the cube and its dimensions. Deploying an Analysis Services project creates the defined objects in an instance of Analysis Services. Processing the objects in an instance of Analysis Services copies the data from the underlying data sources into the cube objects. For more information, see Deploying a Project and Configuring Project Properties.

At this point in the development process, you generally deploy the cube to an instance of Analysis Services on a development server. Once you have finished developing your business intelligence project, you will generally use the Analysis Services Deployment Wizard to deploy your project from the development server to a production server. For more information, see Planning an Analysis Services Deployment and Using the Analysis Services Deployment Wizard. In the following task, you review the deployment properties of the Analysis Services Tutorial project and then deploy the project to your local instance of Analysis Services.

### Procedures

1. In Solution Explorer, **right-click the Analysis Services Tutorial project**, and then **click Properties**. The Analysis Services Tutorial Property Pages dialog box appears and displays the properties of the Active(Development) configuration. You can define multiple configurations, each with different properties. For example, a developer might want to configure the same project to deploy to different development computers and with different deployment properties, such as database names or processing properties. Notice the value for the Output Path property. This property specifies the location in which the XMLA deployment scripts for the project are saved when a project is built. These are the scripts that are used to deploy the objects in the project to an instance of Analysis Services.
2. **In the Configuration Properties node** in the left pane, **click Deployment**.

Review the deployment properties for the project. By default, the Analysis Services Project template configures an Analysis Services project to incrementally deploy all projects to the default instance of Analysis Services on the local computer, to create an Analysis Services database with the same name as the project, and to process the objects after deployment by using the default processing option. For more information, see Configuring Project Properties.

**Note**

If you want to deploy the project to a named instance of Analysis Services on the local computer, or to an instance on a remote server, change the Server property to the appropriate instance name, such as **<ServerName>\<InstanceName>**.

1. **Click OK**.
2. In Solution Explorer, **right-click the Analysis Services Tutorial project**, and then **click Deploy**. You might need to wait.

**Note**

**If you get errors** during deployment, use SQL Server Management Studio to check the database permissions. The account you specified for the data source connection must have a login on the SQL Server instance. Double-click the login to view User Mapping properties. The account must have db\_datareader permissions on the AdventureWorksDW2012 database.

SQL Server Data Tools (SSDT) builds and then deploys the Analysis Services Tutorial project to the specified instance of Analysis Services by using a deployment script. The progress of the deployment is displayed in two windows: the **Output** window and the **Deployment Progress – Analysis Services Tutorial** window.

Open the Output window, if necessary, by clicking Output on the View menu. The Output window displays the overall progress of the deployment. The Deployment Progress – Analysis Services Tutorial window displays the detail about each step taken during deployment. For more information, see Building a Project and Deploying a Project.

1. **Review** the **contents of the Output window** and the **Deployment Progress – Analysis Services Tutorial** window to verify that the cube was built, deployed, and processed without errors.
2. **To hide the Deployment Progress** - Analysis Services Tutorial window, **click the Auto Hide icon** (it looks like a pushpin) on the toolbar of the window.
3. **To hide the Output window**, **click the Auto Hide icon** on the toolbar of the window.

You have successfully deployed the Analysis Services Tutorial cube to your local instance of Analysis Services, and then processed the deployed cube.

## Browsing the Cube

After you deploy a cube, the cube data is viewable on the Browser tab in Cube Designer, and the dimension data is viewable on the Browser tab in Dimension Designer. Browsing cube and dimension data is way to check your work incrementally. You can verify that small changes to properties, relationships, and other objects have the desired effect once the object is processed. While the Browser tab is used to view both cube and dimension data, the tab provides different capabilities based on the object you are browsing. For dimensions, the Browser tab provides a way to view members or navigate a hierarchy all the way down to the leaf node. You can browse dimension data in different languages, assuming you have added the translations to your model. For cubes, the Browser tab provides two approaches for exploring data. You can use the built-in MDX Query Designer to build queries that return a flattened rowset from a multidimensional database. Alternatively, you can use an Excel shortcut. When you start Excel from within SQL Server Data Tools, Excel opens with a PivotTable already in the worksheet and a predefined connection to the model workspace database. Excel generally offers a better browsing experience because you can explore cube data interactively, using horizontal and vertical axes to analyze the relationships in your data. In contrast, the MDX Query Designer is limited to a single axis. Moreover, because the rowset is flattened, you do not get the drilldown that an Excel PivotTable provides. As you add more dimensions and hierarchies to your cube, which you will do in subsequent lessons, Excel will be the preferred solution for browsing data.

### Procedures

To Browse the deployed cube

1. **Switch to Dimension Designer for the Product dimension** in SQL Server Data Tools (SSDT). To do this, **double-click the Product dimension** in the Dimensions node of Solution Explorer.
2. **Click the Browser tab** to display the All member of the Product Key attribute hierarchy. In lesson three, you will define a user hierarchy for the Product dimension that will let you browse the dimension.
3. **Switch to Cube Designer** in SQL Server Data Tools (SSDT). To do this, **double-click the Analysis Services Tutorial cube** in the Cubes node of Solution Explorer.
4. **Select the Browser tab**, and then **click the Reconnect icon** on the toolbar of the designer.

The left pane of the designer shows the objects in the Analysis Services Tutorial cube. On the right side of the Browser tab, there are two panes: the upper pane is the Filter pane, and the lower pane is the Data pane. In an upcoming lesson, you will use the cube browser to do analysis.