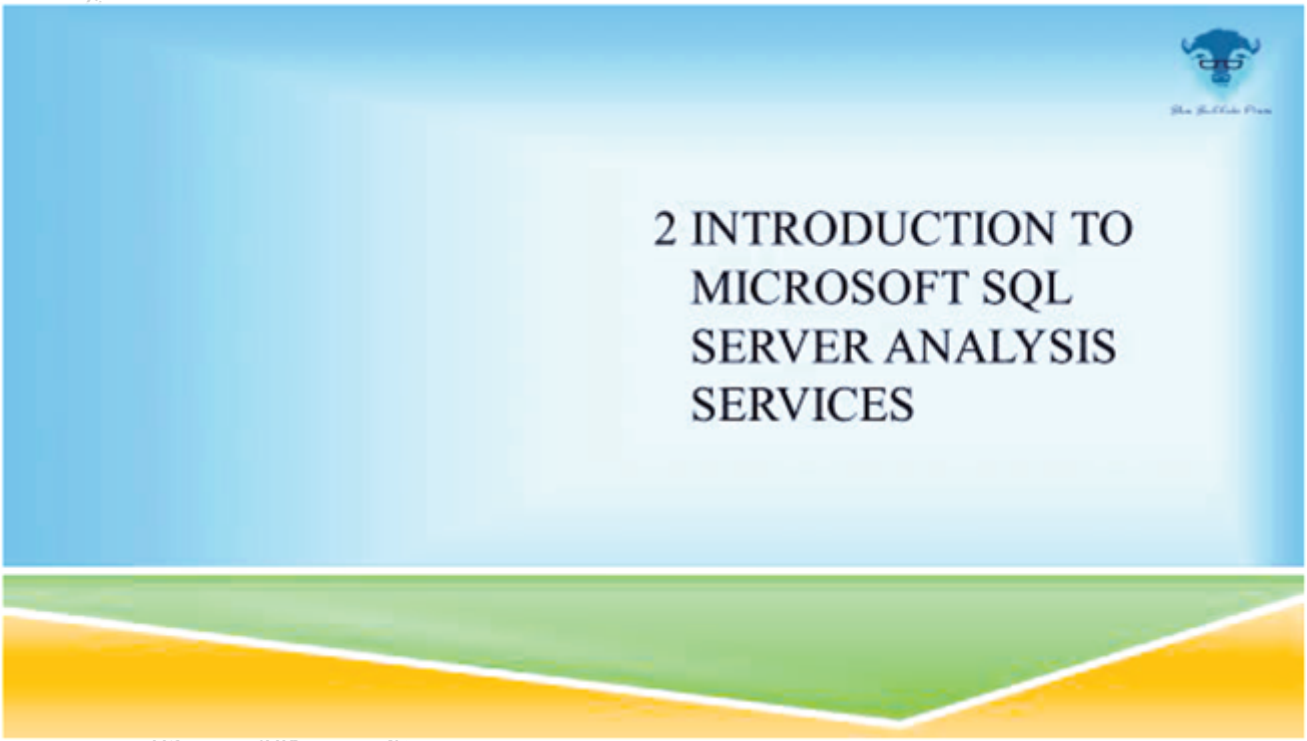
2 INTRODUCTION TO MICROSOFT SQL SERVER ANALYSIS SERVICES



MODULE OBJECTIVE

SQL Server Analysis Services (SSAS) is an online analytical processing (OLAP) database, a type of database that is highly optimized for the kinds of queries and calculations that are common in a business intelligence environment. In this module we aim to get you familiar with the recent changes, explore the architecture options, and explain the tools available.

MODULE TOPICS

COMMON ANALYSIS SERVICES SOLUTIONS

SSAS provides two different approaches for data modeling: multidimensional and tabular. While there is substantial overlap between them, there are also significant differences that will help you decide how to move forward. In this module, we discuss feature comparisons and explain each approach.

SSAS offers a model development capability, as well as model deployment through database hosting on an Analysis Services instance. Model types consist of multidimensional and tabular. Database hosting supports the multidimensional and tabular solutions that you create, however database hosting also includes PowerPivot for SharePoint. PowerPivot for SharePoint is SSAS in SharePoint mode, where it operates as a service to SharePoint, helping to host and manage Excel Data Models that were generated in Excel and then saved to SharePoint. The role of SSAS in this environment is to load the data model into memory, refresh data from external data sources, and execute queries against the model. In this arrangement, Analysis Services functions behind the scenes. All connections and requests to SSAS are made by SharePoint, and only when an Excel workbook contains a data model.

Multidimensional and Tabular solutions are built using SQL Server Data Tools (SSDT) and are intended for corporate business intelligence (BI) projects that run on a standalone Analysis Services instance. Both solutions produce high performance analytical databases that integrate easily with Excel, Reporting Services reports, and other BI applications from Microsoft as well as third-party applications.

VERSION CHANGES OF SSAS FROM 2008-2014

SQL 2008

https://technet.microsoft.com/en-us/library/bb522628(v=sql.100).aspx [i]

- Aggregation Design Improvements
- Cube Design Improvements
- Dimension Design Improvements
- Backup and Restore Improvements
- Analysis Services Personalization Extensions
- New Samples Location

SQL 2008R2

https://technet.microsoft.com/en-us/library/bb522628(v=sql.105).aspx [ii]

Integration of Analysis Services with SharePoint

- **PowerPivot for SharePoint** A new version of Analysis Services that can be hosted within a SharePoint farm. The instance that is hosted in SharePoint is a highly modified version of Analysis Services with a new in-memory storage method that loads data on-demand and handles usage and resource demands without tuning. The hosted instance also includes a midtier web service that controls data refresh, data access, and monitoring.
- **PowerPivot for Excel** A client add-in that can be installed with Excel 2010. This add-in provides tools for building multidimensional data sets in Excel. The add-in combines a compressed data store, provided by an in-memory instance of Analysis Services, with existing Excel data visualization tools such as PivotTables and PivotCharts.
- **DAX**

  PowerPivot for Excel includes a new expression language, Data Analysis Expressions, that lets you easily create sophisticated calculations, use time intelligence, and perform lookups.

SQL 2012

https://technet.microsoft.com/en-us/library/bb522628(v=sql.110).aspx [iii]

SQL Server 2012 Service Pack 1 (SP1)

- **PowerPivot in Excel** PowerPivot in Microsoft Excel 2013 supports deeper integration with Excel and your data exploration workflows.
- **PowerPivot for SharePoint** A new architecture for SQL Server 2012 SP1 PowerPivot that supports a PowerPivot server outside a SharePoint 2013 farm. The new architecture leverages Excel Services for querying, loading, refreshing, and saving data. The PowerPivot server can still be installed on a server that also hosts SharePoint servers but it is not required. The new architecture is available when you deploy a new PowerPivot server with the slipstream version of SP1. The new architecture is not available when you deploy the patch version of SP1 onto an existing PowerPivot.
- **spPowerpivot.msi** A Windows Installer package (spPowerpivot.msi) that enhances the PowerPivot for SharePoint experience with additional features such as PowerPivot Gallery, schedule data refresh, and management dashboard. The .msi deploys Analysis Services client libraries, PowerPivot for SharePoint 2013 Configuration, and copies PowerPivot for SharePoint 2013 installation files to SharePoint servers.
- **Version Compatibility for Tabular models** SQL Server 2012 SP1 introduces new features for Analysis Services running in Tabular mode, including optimized storage for measures and KPIs, extended data categorizations, extended characters, hierarchy annotation, and improved support when importing from Data Market data feeds. In some cases, Tabular model projects being deployed may not be compatible with an Analysis Services deployment server instance. With SP1 applied, you can specify Compatibility Level when creating new Tabular model projects, when upgrading existing Tabular model projects, when upgrading existing deployed Tabular model databases, or when importing PowerPivot workbooks.
- **Import from PowerPivot in Excel 2013** You can now import PowerPivot in Excel 2013 workbooks into new Tabular model projects created in SQL Server Data Tools or directly in SQL Server Management Tools.

SQL Server 2012

Server Instance and Server Monitoring

- Server Modes for Analysis Services Instances: Multidimensional, Tabular, and SharePoint
- xVelocity In-Memory Analytics Engine (VertiPaq) for Tabular Model Databases
- Schema Rowsets for Analysis Services in Tabular Mode
- Event Tracing Infrastructure

Tabular Modeling

- Tabular Projects in SQL Server Data Tools
- Tabular Database Administration in SQL Server Management Studio
- Tabular Model Designer Diagram View
- Partitions in Tabular Models
- Security Roles in Tabular Models
- Row Level Security in Tabular Models
- Key Performance Indicators in Tabular Models
- Hierarchies in Tabular Models
- Large Tables in Tabular Models
- Images in Tabular Models
- DirectQuery Mode in Tabular Model Databases
- Memory Paging in Tabular Models
- DAX Functions in this Release

Multidimensional Modeling

- Removal of the 4 Gigabyte Limit on String Storage for MOLAP Engine
- Resource Usage Reporting for Multidimensional Databases
- Trace Events for Lock Usage and Contention in Multidimensional Databases
- DistinctCount Performance Improvement in ROLAP Processing

PowerPivot for Excel

- PowerPivot for Excel (SQL Server 2012)
- DAX Functions in this Release

PowerPivot for SharePoint

- PowerPivot Configuration Tool
- PowerShell for PowerPivot for SharePoint
- BI Semantic Model Connection Files in SharePoint
- PowerPivot for SharePoint Configuration Settings and Server Health Rules
- PowerPivot Workbook Auto-upgrade to Enable Data Refresh

Programmability

- DAX Functions in this Release
- PowerShell for AMO
- PowerShell for PowerPivot for SharePoint
- AMO and XMLA Extensions to Support Tabular Modeling
- CSDL Extensions to Support Tabular Modeling

Design Tools

- SQL Server Data Tools (SSDT) integration with Visual Studio

SQL 2014

https://technet.microsoft.com/en-us/library/bb522628(v=sql.120).aspx [iv]

- Updates to Design Tool Installation
- Features Recently Added: Power View for Multidimensional Models

ANALYSIS SERVICES INSTALLATION AND ARCHITECTURE: ONE PRODUCT, TWO MODELS

- Multidimensional Model (traditional SSAS)
- Tabular Business Intelligence Semantic Model (BISM)

Microsoft Analysis Services has been around for eons; at least in terms of hardware evolution. Originally it was designed for 32-bit servers, had one or two processors, and usually only one gigabyte or less of memory. Data storage was disk–based and

this was the only options we had available. Hardware has changed radically since the initial design of Analysis Services and so has the needs of business intelligence. Today we use memory–based columnar databases for increased performance.

With the advent of PowerPivot and self-service business intelligence coupled with deployment of the Excel PowerPivot workbook to SharePoint it made sense to utilize the technology that gave us PowerPivot in the server as well as giving us the tabular model.

MODEL FEATURES

The following table can be found at the link below to MSDN, and explains feature availability at the model level. **https://msdn.microsoft.com/en-us/library/hh212940.aspx** [v]

	Multidimensional	Tabular
Actions	**Yes**	No
Aggregation objects	**Yes**	No
Calculated Measures	**Yes**	Yes
Custom Assemblies	**Yes**	No
Custom Rollups	Yes	No
Distinct Count	**Yes**	Yes (via DAX) [1]
Drillthrough	**Yes**	Yes
Hierarchies	**Yes**	Yes
KPIs	**Yes**	Yes
Linked measure groups	**Yes**	No
Many-to-many relationships	**Yes**	No
Parent-child Hierarchies	**Yes**	Yes (via DAX)
Partitions	**Yes**	**Yes**
Perspectives	**Yes**	**Yes**
Semi-additive Measures	**Yes**	Yes

Translations	**Yes**	No
User-defined Hierarchies	**Yes**	Yes
Writeback	**Yes**	No

CHOOSING THE RIGHT MODEL

At a rough guess, either model will work equally well for about 60 percent to 70 percent of projects, but for the remaining 30 percent to 40 percent, the correct choice of model will be vital.

After you have started developing with one model in Analysis Services, there is no way of switching over to use the other; you have to start all over again from the beginning, possibly wasting much precious development time, so it is very important to make the correct decision as soon as possible. Many factors must be taken into account when making this decision. In this course we discuss them in a reasonable amount of detail. You can then bear these factors in mind, and when you have finished the course, you will be in a position to know whether to use the tabular model or the multidimensional model.

EXPLORING ANALYSIS SERVICES TOOLS

SQL SERVER DATA TOOLS (SSDT)

The SQL Server Data Tools (SSDT) integrated within Visual Studio 2010 is the professional business intelligence development tool for both modes of Analysis Services 2012.

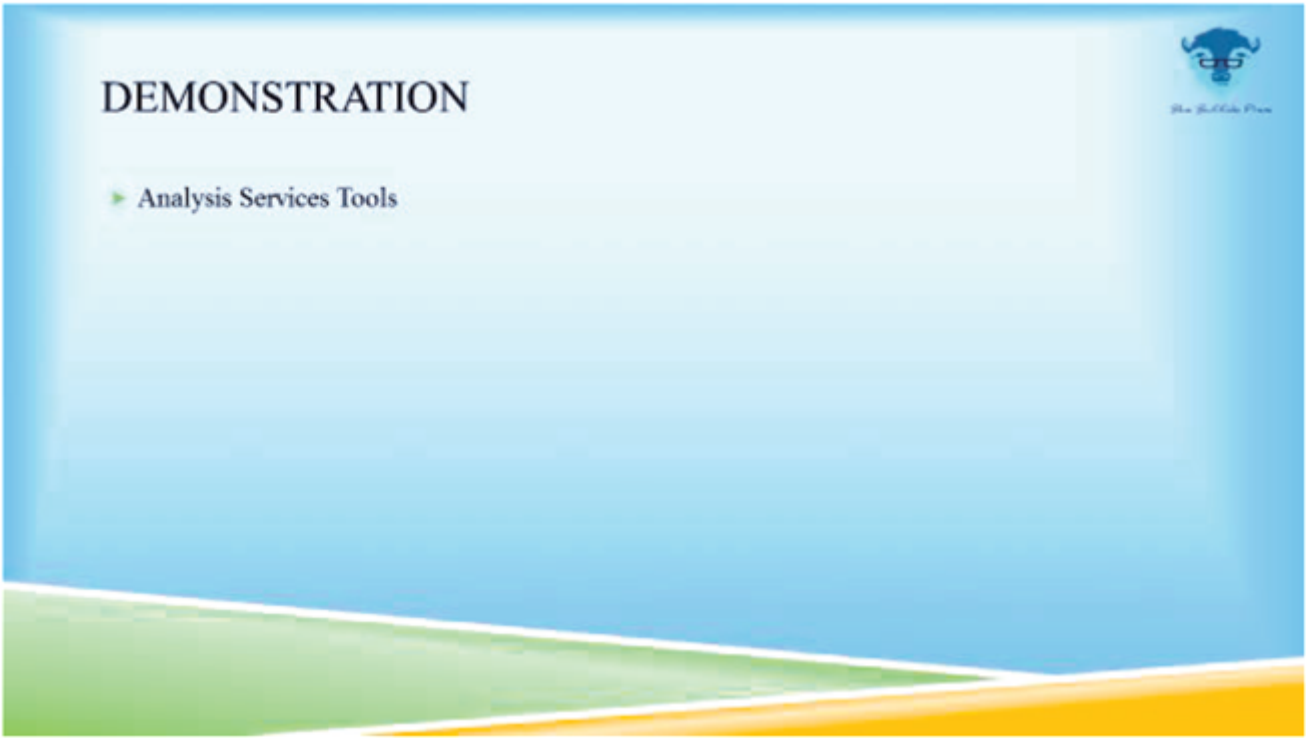
What Happened to Business Intelligence Development Studio (BIDS)? The Analysis Services extensions to Visual Studio for business intelligence application development were formerly known as Business Intelligence Development Studio (BIDS). In SQL Server 2012, those features are combined with new tools for creating SQL Server database projects, and that single tool is now called SQL Server Data Tools. From an Analysis Services viewpoint, this is just a rename. SQL Server Data Tools looks familiar to users of BIDS from previous versions of SQL Server.

SQL SERVER MANAGEMENT STUDIO (SSMS)

SQL Server Management Studio (SSMS) provides an integrated environment for managing SQL Server, Analysis Services, Integration Services, and Reporting Services.

DEMONSTRATION

VIDEO: ANALYSIS SERVICES TOOLS



EXERCISE A.1: ANALYSIS SERVICES TOOLS

Objective: in this exercise, we will explore using both SQL Server Management Studio and SQL Server Data Tools.

A.1.1 Press **Windows** key.

A.1.2 In the **Start** screen enter SQ and notice a **Search** pane appears along with a list of all current apps installed containing the letters **SQ**.

A.1.3 Navigate to and right-click **SQL Server Management Studio**, then click **Pin to taskbar**.

A.1.4 Press **Esc**.

A.1.5 Back at desktop mode, navigate to the taskbar and start **SQL Server Management Studio**.

A.1.6 When **SQL Server Management Studio** opens, navigate to the **Connect to Server** dialog box, move to the **Server type** setting, use the corresponding drop-down arrow, and click **Analysis Services**.

A.1.7 Locate the **Server name** setting, use the corresponding drop-down arrow, and click **Quick**.

A.1.8 Click **Connect**.

A.1.9 Navigate to the **Object Explorer** pane on the left and review the results noticing the icon identifying the connection.

A.1.10 Expand **Databases**.

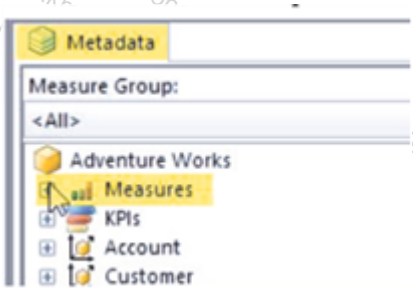
A.1.11 Expand **AdventureWorksDW2012Multidimensional-EE** database, and review the results.

A.1.12 Expand **Cubes** folder and review the results.

A.1.13 Click to select **Adventure Works** cube.

A.1.14 Right-click **Adventure Works** cube, and click **Browse**. Review the results.

A.1.15 Move to the **Metadata** pane on the left, and expand **Measures**.



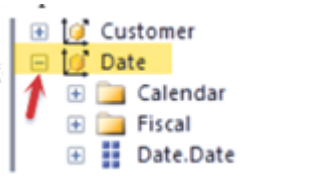
A.1.16 Expand **Internet Sales** folder.

A.1.17 Locate **Internet Gross Profit**, right-click the measure, and click **Add to**

Query. Review the results.

A.1.18 Collapse **Internet Sales** folder.

A.1.19 Expand **Date** dimension.



A.1.20 Expand **Fiscal** folder.

A.1.21 Locate **Date.Fiscal** hierarchy, right-click the hierarchy, and then click **Add to Query**. Review the results.

A.1.22 Navigate back to **Object Explorer** pane on the left, right-click **AdventureWorksDW2012Multidimensional-EE** database, and review the options available.

A.1.23 Click **Back Up…**.

A.1.24 When **Backup Database- AdventureWorksDW2012Multidimensional-EE** dialog box opens, review the options and settings available.

A.1.25 Click **Cancel**.

A.1.26 Navigate back to **Object Explorer** pane on the left, and expand **Data Sources** folder. Review the results.

A.1.27 Right-click **AdventureWorksDW2012** data source, review the options available, and then click **Properties**.

A.1.28 When **Data Source Properties - AdventureWorksDW2012** dialog box opens, review the current settings.

A.1.29 Locate the **Connection String** setting, hover your cursor onto the corresponding row, and review the connection string.

A.1.30 Click **Cancel**.

A.1.31 Move back to the **Object Explorer** pane on the left, and collapse **Databases** folder.

A.1.32 Click **Connect | Database Engine…**.

A.1.33 Navigate to the **Connect to Server** dialog box, locate the **Server name** setting, use the corresponding drop-down arrow, and click **Quick**.

A.1.34 Click **Connect**.

A.1.35 Navigate to the **Object Explorer** pane on the left and review the new connection.

A.1.36 Move to the new connection and expand **Databases** folder. Review the results and the databases listed, noticing that **AdventureWorksDW2012** is listed.

A.1.37 Expand **AdventureWorksDW2012** database, and review the options available.

A.1.38 Expand **Tables** folder. Review the tables listed.

A.1.39 Minimize **SQL Server Management Studio**.

A.1.40 Press **Windows** key.

A.1.41 In the **Start** screen enter SQ and notice a **Search** pane appears along with a list of all current apps installed containing the letters **SQ**.

A.1.42 Navigate to and right-click **SQL Server Data Tools**, then click **Pin to taskbar**.

A.1.43 Press **Esc**.

A.1.44 Back at desktop mode, navigate to the taskbar, right-click **SQL Server Data Tools** icon, right-click the new **SQL Server Data Tools** icon showing, and then click **Run as administrator**.

A.1.45 In the **User Account Control** dialog box, click **Yes**.

A.1.46 In the **Choose Default Environment Settings** dialog box, review the options available, then navigate to the **Choose your default environment settings** section, and click to select **Business Intelligence Settings**.

A.1.47 Click **Start Visual Studio**.

A.1.48 When **Microsoft Visual Studio** opens review the options and settings

available.

A.1.49 Click **New Project…**.

A.1.50 When the **New Project** dialog box opens, review the options and settings available.

A.1.51 Navigate to the left side of the dialog box, in the **Installed Templates** section, verify **Business Intelligence** is selected then move to the middle of the dialog box, and click to select **Analysis Services Multidimensional and Data Mining Project**.

A.1.52 Clear the check from the **Create directory for solution** check box.

A.1.53 Review the other settings and then click **OK**.

A.1.54 When the new project opens review the options and settings available.

A.1.55 Navigate to the **Solution Explorer** pane on the right and review the options available.

A.1.56 Move to the upper-left, click **File | Close Project**.

A.1.57 Navigate back to the upper-left, click **File | Open | Analysis Services Database…**.

A.1.58 In the **Connect To Database** dialog box, review the settings and options available.

A.1.59 Move to the **Server** text box and enter . .

A.1.60 Navigate to the **Database** setting, use the drop-down arrow provided and click to select **AdventureWorksDW2012Multidimensional-EE**.

A.1.61 Click **OK**.

A.1.62 Move to the **Solution Explorer** pane on the right, and review the results.

A.1.63 Locate the **Data Sources** folder, and double-click **AdventureWorksDW2012**.

A.1.64 When **Data Source Designer** dialog box opens, review the settings and options available.

A.1.65 Click **Edit…**.

A.1.66 When **Connection Manager** dialog box opens, review the current settings.

A.1.67 Click **Test Connection**.

A.1.68 In the **Connection Manager** dialog box advising **Test connection succeeded**, click **OK**.

A.1.69 Click **Cancel**.

A.1.70 Back in **Data Source Designer** dialog box, click **Impersonation Information** tab. Review the settings and options available.

A.1.71 Click **Cancel**.

A.1.72 Move to the **Solution Explorer** pane on the right, locate the **Cubes** folder, and double-click **Adventure Works**. Review the results.

A.1.73 Notice you see **Measures** and **Dimensions** panes on the left.

A.1.74 Also notice you see tabs along the top of the interface.

A.1.75 Click **Dimension Usage** tab. Review the results.

A.1.76 Notice the gray cells indicating there is currently no relationship configured for the measure group and corresponding dimension.

A.1.77 Click **Calculations** tab. Review the results.

A.1.78 Click **KPIs** tab. Review the results.

A.1.79 Click **Actions** tab. Review the results.

A.1.80 Click **Partitions** tab. Review the results.

A.1.81 Click **Aggregations** tab. Review the results.

A.1.82 Click **Perspectives** tab. Review the results.

A.1.83 Click **Translations** tab. Review the results.

A.1.84 Click **Browser** tab.

A.1.85 When the browser opens, move to the **Metadata** pane on the left, and expand **Measures**. Review the results.

A.1.86 Expand **Internet Sales** folder.

A.1.87 Locate **Internet Gross Profit**, right-click the measure, and click **Add to Query**. Review the results.

A.1.88 Collapse **Internet Sales** folder.

A.1.89 Expand **Date** dimension.

A.1.90 Expand **Fiscal** folder.

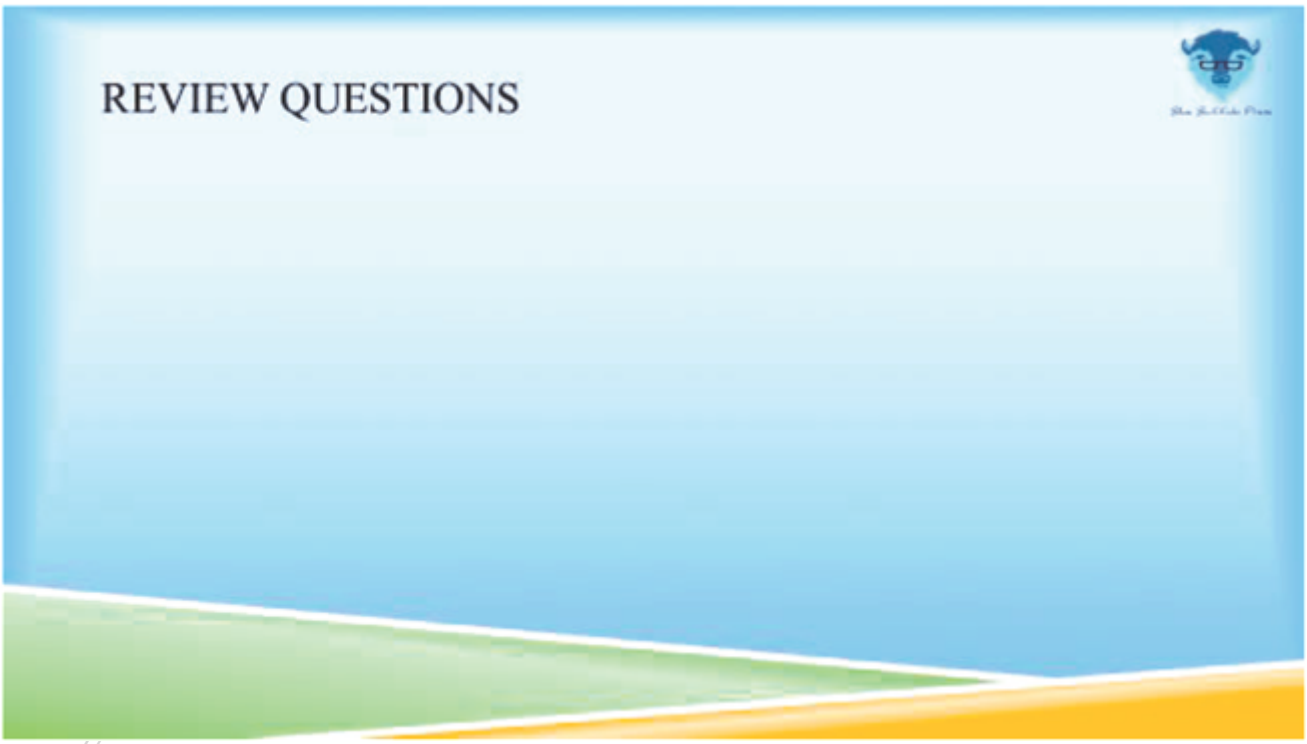
A.1.91 Locate **Date.Fiscal** hierarchy, right-click the hierarchy, and then click **Add to Query**. Review the results.

A.1.92 Leave **SQL Server Management Studio** open, but close **SQL Server Data Tools**.

MODULE REVIEW

MODULE OBJECTIVE

Analysis Services is an online analytical processing (OLAP) database, a type of database that is highly optimized for the kinds of queries and calculations that are common in a business intelligence environment. In this module we aim to get you familiar with the recent changes, explore the architecture options, and explain the tools available.



REVIEW QUESTIONS

1. True or False: SQL Server Analysis Services (SSAS) is an online analytical processing (OLAP) database, a type of database that is highly optimized for the kinds of queries and calculations that are common in a business intelligence environment.

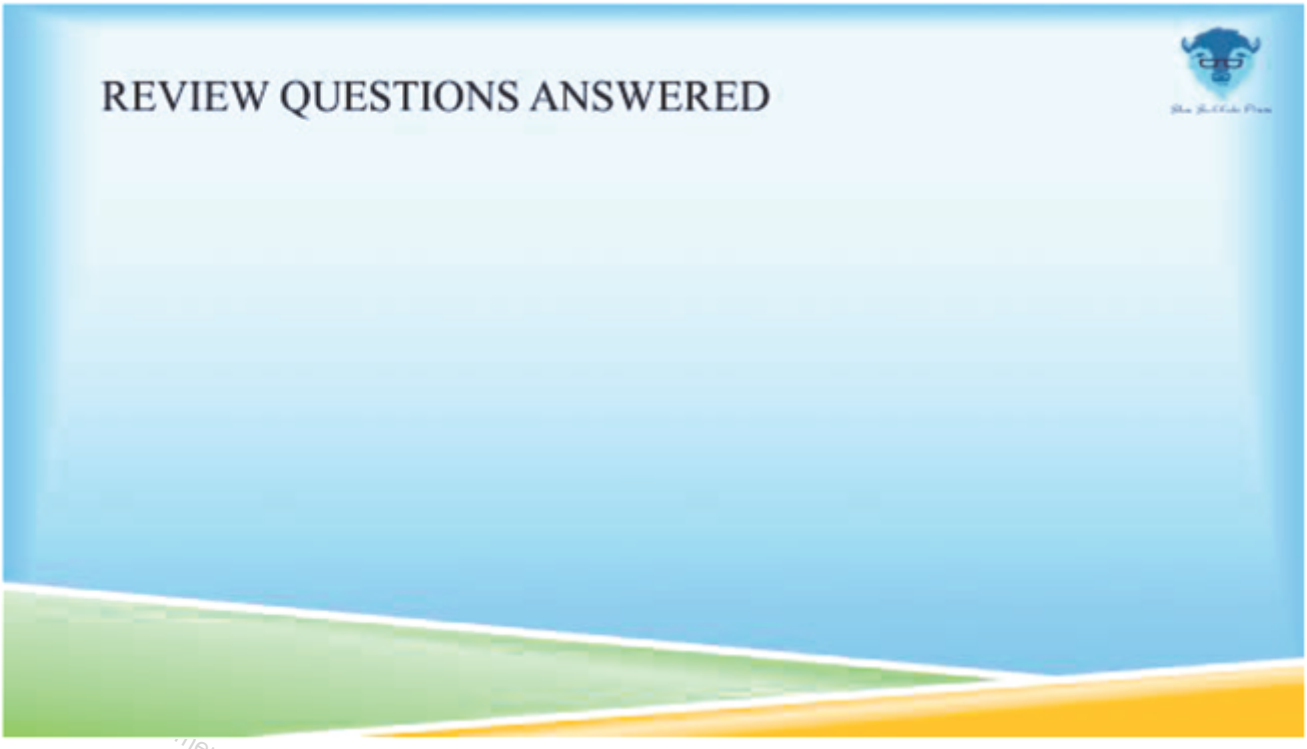
2. SSAS provides two different approaches for data modeling: _____ and _____.

3. _____ _____ is SSAS in SharePoint mode, where it operates as a service to

   SharePoint, helping to host and manage Excel Data Models that were generated in Excel and then saved to SharePoint.

4. Multidimensional and Tabular solutions are built using ____ _____ _____ _____and are intended for corporate business intelligence (BI) projects that run on a standalone Analysis Services instance.

5. ____ _____ _____ _____ provides an integrated environment for managing SQL Server, Analysis Services, Integration Services, and Reporting Services.



REVIEW QUESTIONS ANSWERED

1. True or False: SQL Server Analysis Services (SSAS) is an online analytical processing (OLAP) database, a type of database that is highly optimized for the kinds of queries and calculations that are common in a business intelligence environment.

   a. True

2. SSAS provides two different approaches for data modeling: _____ and _____.

   a. Multidimensional and Tabular

3. _____ ___ _____ is SSAS in SharePoint mode, where it operates as a service to SharePoint, helping to host and manage Excel Data Models that were generated in Excel and then saved to SharePoint.

   a. PowerPivot for SharePoint

4. Multidimensional and Tabular solutions are built using ____ _____ _____ _____and are intended for corporate business intelligence (BI) projects that run on a standalone Analysis Services instance.

   a. SQL Server Data Tools (SSDT)

5. ____ _____ _____ _____ provides an integrated environment for managing SQL Server, Analysis Services, Integration Services, and Reporting Services.

   a. SQL Server Management Studio (SSMS)