Intelligent Data Management with SQL Server

Session: 3

Introduction to SQL Server 2019

Objectives

- Describe an overview of SQL Server 2019
- Describe basic architecture and version history of SQL Server 2019
- Outline the process of connecting to SQL Server instances
- Define databases and list the key features of AdventureWorks2019 sample database
- Explain the components of SQL Server Management Studio GUI
- Explain script file creation and organization
- Explain the process to execute Transact-SQL queries

Introduction to SQL Server 2019

- SQL Server is an RDBMS developed by Microsoft.
  - Provides an enterprise-level data management platform
  - Includes numerous features and tools
  - Targeted for large scale Online Transaction Processing (OLTP), data warehousing and e-commerce applications
  - Provides support for Big data clusters in SQL server
  - Helps to store and manage huge amount of information

Features and Benefits of SQL Server

Strong Security

Policy-Based Management to detect security policies that are non-compliant. This feature allows only authorized personnel access to the database. Security audits and events can be written automatically to log files.

Better Performance

SQL Server has built-in transparent data compression feature along with encryption. SQL Server provides access control coupled with efficient permission management tools. It also offers an enhanced performance when it comes to data collection.

Multiple Editions and Pricing Models

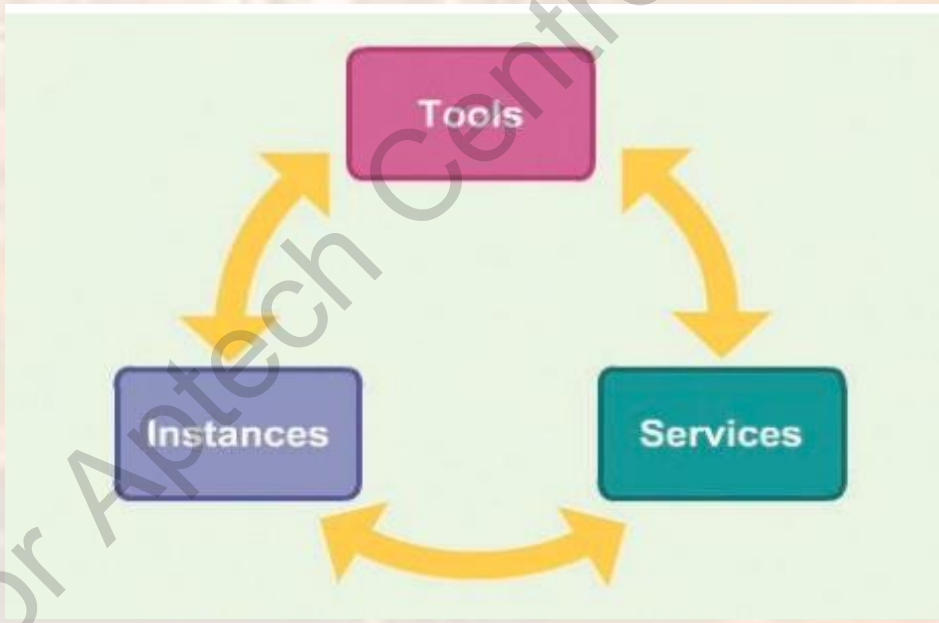
Microsoft has made available different editions of SQL Server for different kinds of users. These are also priced accordingly. Thus, from hobbyists to professional developers to enterprise users, there is an edition suitable for each one.

Simple and Easy Installation Process

SQL Server is simple to install with a one-click installation procedure and readable GUI having easy instructions for the layman.

Basic Architecture of SQL Server 2019 1-4

There are various components that form a part of SQL Server 2019. All the components come together to form the basic architecture of SQL Server 2019. These components can be represented under three major heads that are shown in figure:



Architecture of SQL Server

Basic Architecture of SQL Server 2019 2-4

Tools: There are a number of tools that are provided in SQL Server 2019 for development and query management of a database. The SQL Server Installation Center must be used to install SQL Server program features and tools. Features can also be modified or removed using SQL Server Installation Center.

Tool	Description
SQL Server Management Studio (SSMS)	One of the most important tools available in SQL Server 2019 is SSMS. SSMS is a GUI-based application provided with SQL Server 2019 that helps to create databases, database objects, query data, and manage the overall working of SQL Server.
SQLCMD	SQLCMD is a command-line tool that can be used in place of SSMS. It performs similar functions as SSMS, but in command format only.
SQL Server Installation Center	The SQL Server Installation Center tool can also be used to add, remove, and modify SQL Server programs.
SQL Server Configuration Manager	SQL Server Configuration Manager is used by database administrators to manage features of SQL software installed in client machines. This tool is not available to all users. It can be used to configure services, server protocols, client protocols, client aliases, and so on.
SQL Server Profiler	SQL Server Profiler is used to monitor an instance of the Database Engine or Analysis Services.
SQL Server Data Tools (SSDT)	SSDT is an Integrated Development Environment (IDE) used for Business Intelligence Components. It helps to design the database using a tool named Microsoft Visual Studio.
Connectivity Tools	Connectivity tools include DB-Library, Open Database Connectivity (ODBC), Object Linking and Embedding Database (OLE DB), and so on. These tools are used to communicate between the clients, servers, and network libraries.

Basic Architecture of SQL Server 2019 3-4

Services: There are various services that are executed on a computer running SQL Server. These services run along with the other Windows services and can be viewed in the task manager.

SQL Server Database Engine	Database Engine is a core service that is used for storing, processing, and securing data. It is also used for replication, full-text search, and Data Quality Services (DQS). It contains tools for managing relational and eXtensible Markup Language (XML) data.
SQL Server Analysis Services (SSAS)	Analysis Services contain tools that help to create and manage Online Analytical Processing (OLAP). This is used for personal, team, and corporate business intelligence purposes. Analysis services are also used in data mining applications.
SQL Server Reporting Services (SSRS)	Reporting Services help to create, manage, publish, and deploy reports. These reports can be in tabular, matrix, graphical, or free-form format. Report applications can also be created using Reporting Services.
SQL Server Integration Services (SSIS)	Integration Services are used for moving, copying, and transforming data using different graphical tools and programmable objects. The DQS component is also included in Integration Services. Integration services help to build high-performance data integration solutions.
SQL Server Master Data Services	Master Data Services (MDS) are used for master data management. MDS is used for analysis, managing, and reporting information such as hierarchies, granular security, transactions, business rules, and so on.

Basic Architecture of SQL Server 2019 4-4

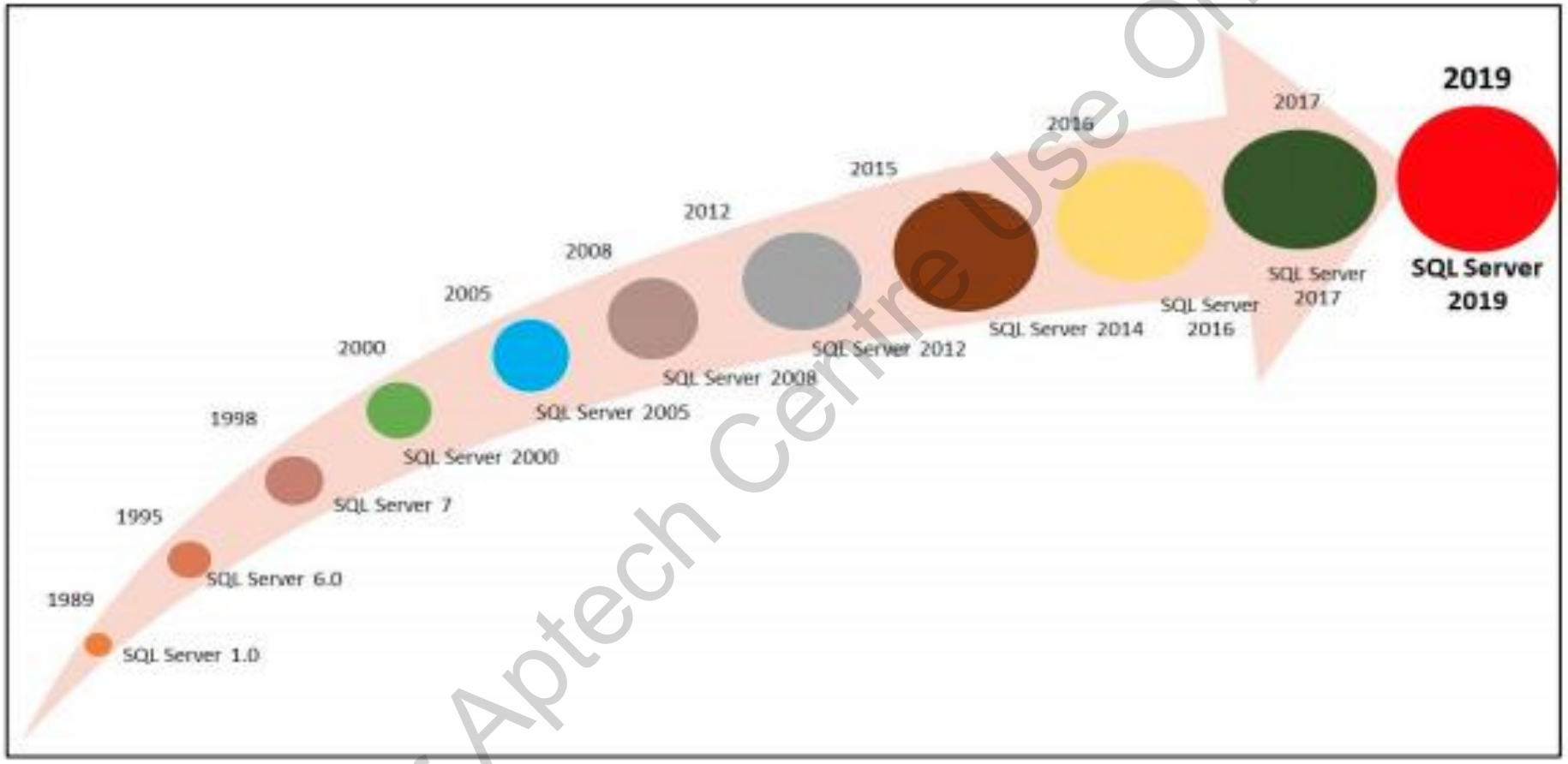
Instances: All the programs and resource allocations are saved in an instance.

An instance includes the following:

- Memory
- Configuration files
- CPU

- Each instance can be customized as per the requirement.
- Even permissions for each instance can be granted on individual basis.
- The resources can also be allocated to the instance accordingly, for example, the number of databases allowed.

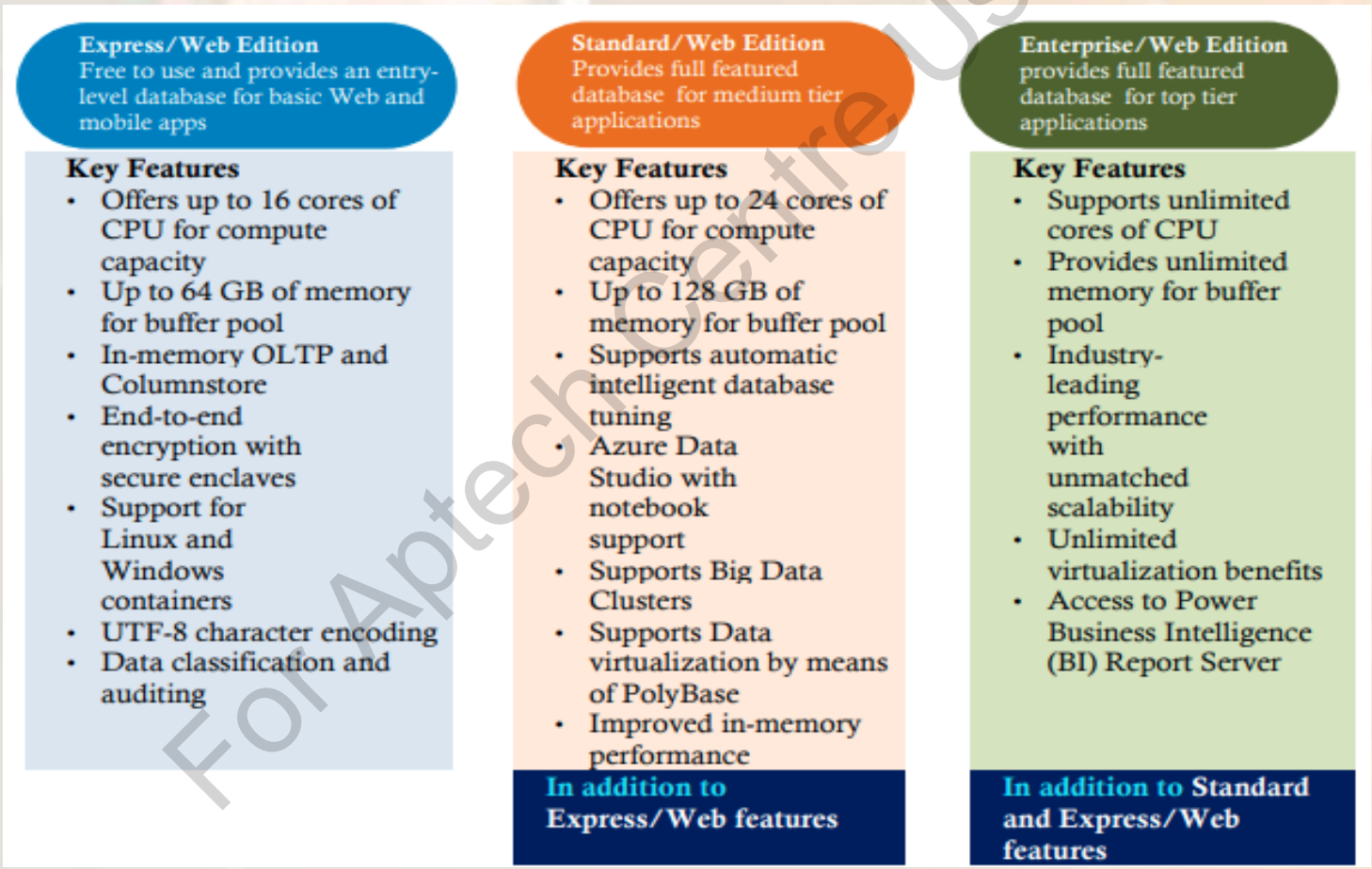
Version History of SQL Server



Version History of SQL Server

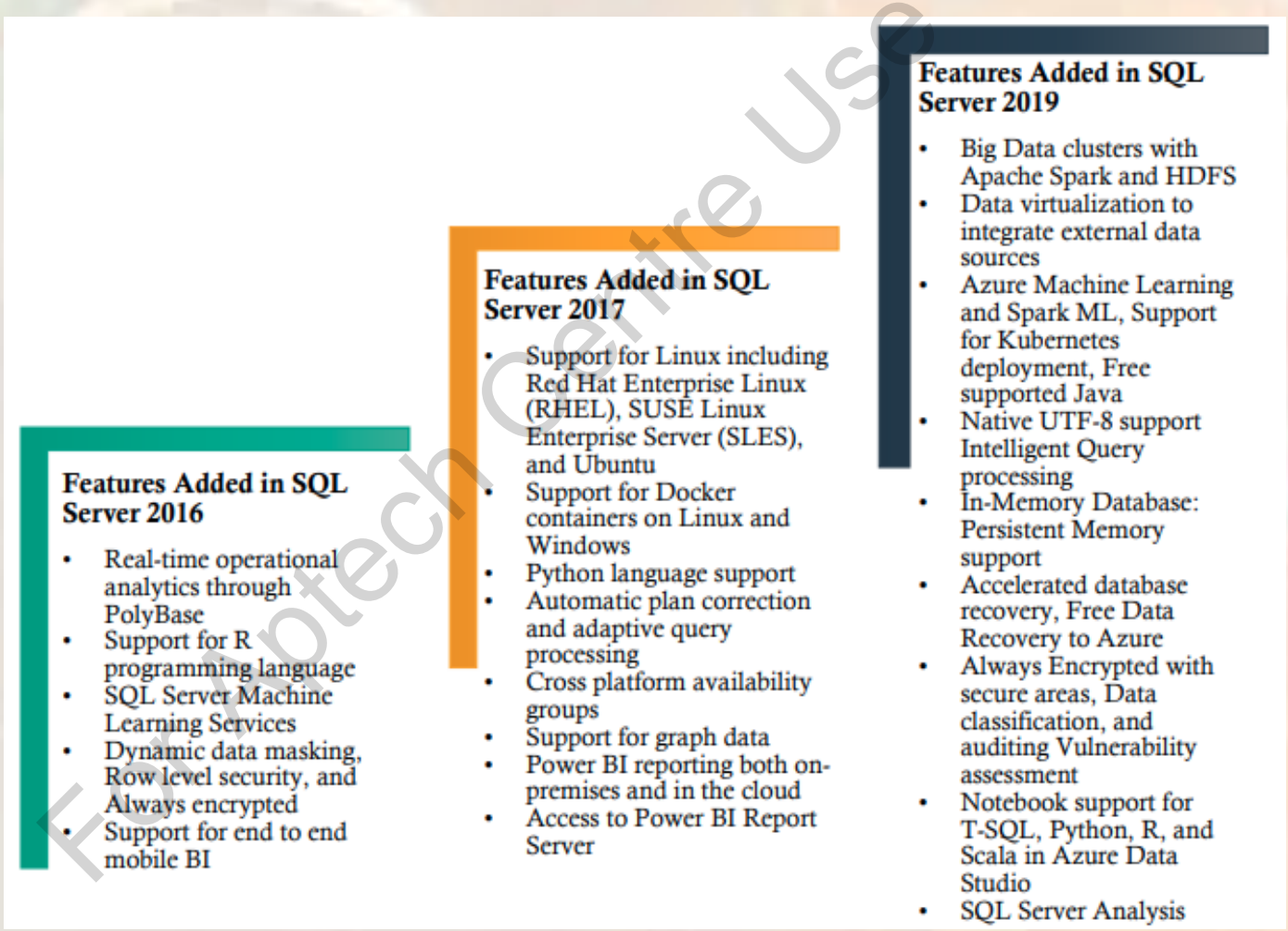
Editions of SQL Server 1-2

- Based on database requirements, an organization can choose from any of these editions of SQL Server 2019 that have been released.
- Main editions of SQL Server 2019 are as follows:



Editions of SQL Server 2-2

With each subsequent version, enhancements are made and new features are added



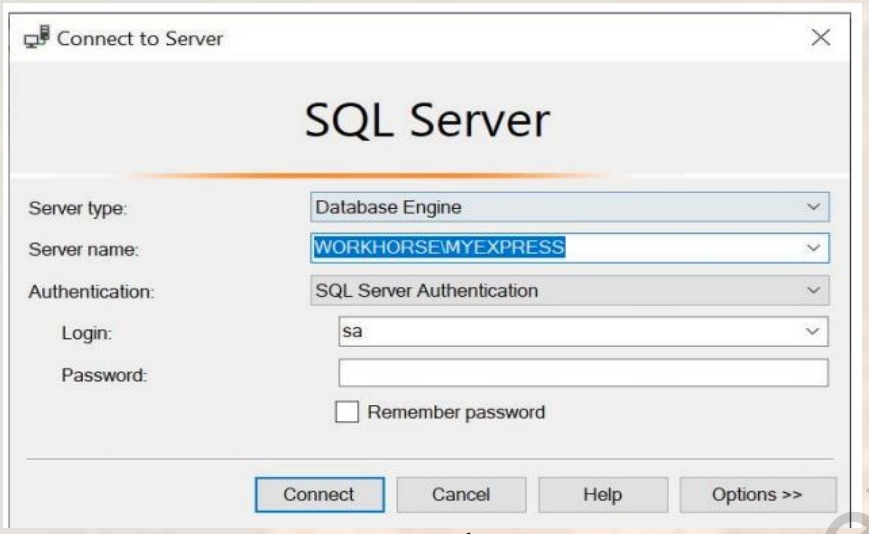
Connecting to SQL Server Instances 1-2

- SQL Server Management Studio (SSMS) is used to connect to SQL Server instances.
- SSMS is a tool used for
  - creating
  - querying
  - managing the databases

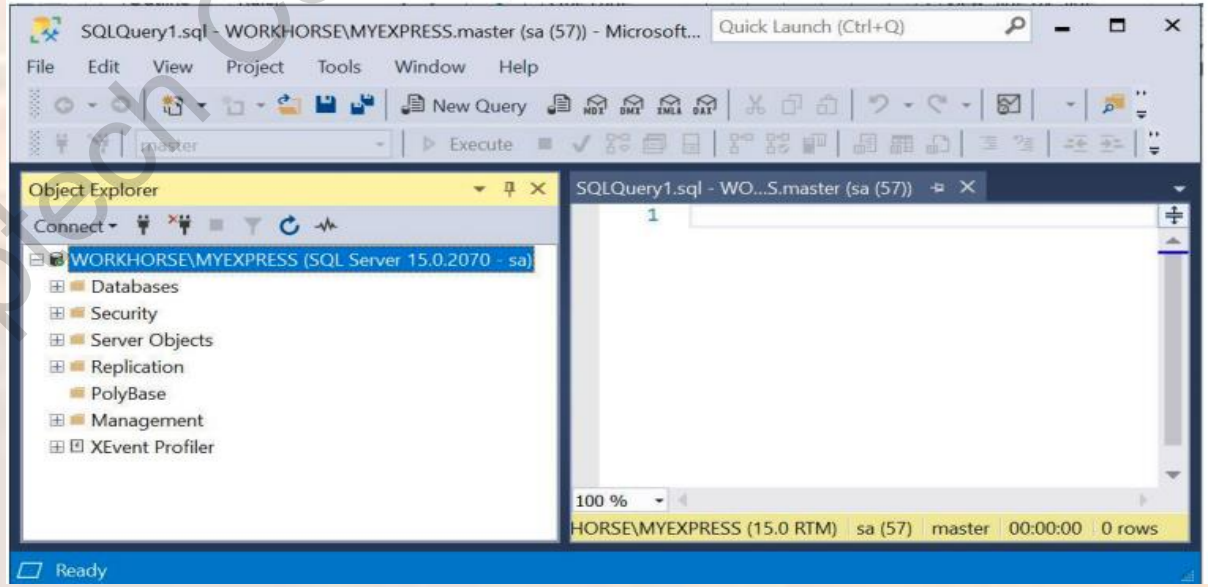
The steps for connecting to MYSQL Server are as follows:

- Locate the Microsoft SQL Server Management Studio tool on the list of programs on Start menu and start the tool.
- In the **Connect to Server** dialog box, select the **Server type** as **Database Engine**.
- Type the **Server name**.
- Select either **Windows Authentication** or **SQL Server Authentication**, provide the required **Login** and **Password**, and click **Connect**.

Connecting to SQL Server Instances 2-2



Connect to Server Dialog Box



SSMS Window

Introduction to Databases 1-2

A database is a collection of data stored in data files on a disk or some removable medium, which consists of data files to hold actual data

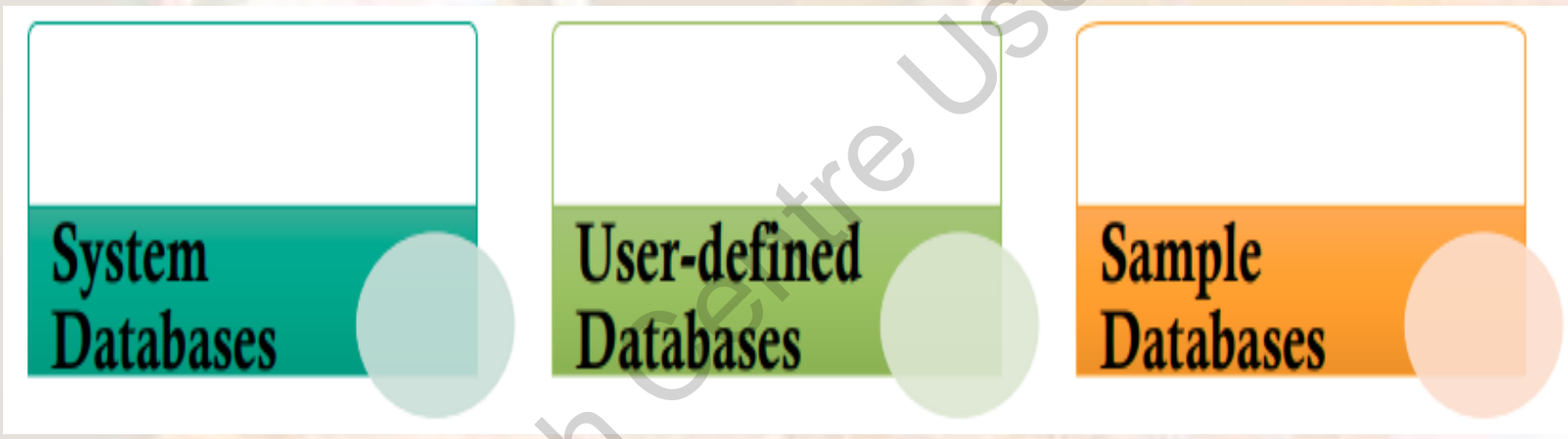
An SQL Server is made up of tables that stores sets of specific structured data

A table includes a set of rows (also called as records or tuples) and columns (also called as attributes)

Each column in the table is intended to store a specific type of information, for example, dates, names, currency amounts, and numbers.

Introduction to Databases 2-2

SQL Server 2019 supports three kinds of databases, which are as follows:



System Databases 1-2

SQL Server uses system databases to support different parts of the DBMS.

Each database supports the following:

- Has a specific role and stores job information that requires to be carried out by SQL Server
- Store data in tables, which contain the views, stored procedures, and other database objects
- Users can create their own databases, also called user-defined databases, and work with them

System Databases 2-2

Database	Description
master	The database records all system-level information of an instance of SQL Server.
msdb	The database is used by SQL Server Agent for scheduling database alerts and various jobs.
model	The database is used as a template for all databases to be created on the particular instance of SQL Server 2019.
resource	The database is a read-only database. It contains system objects included with SQL Server 2019.
tempdb	The database holds temporary objects or intermediate result sets.

System Databases

User-defined Databases

Using SQL Server 2019:

- Users can create their own databases, also called user-defined databases, and work with them.
- The purpose of these databases is to store user data.

AdventureWorks2019 Sample Database 1-2

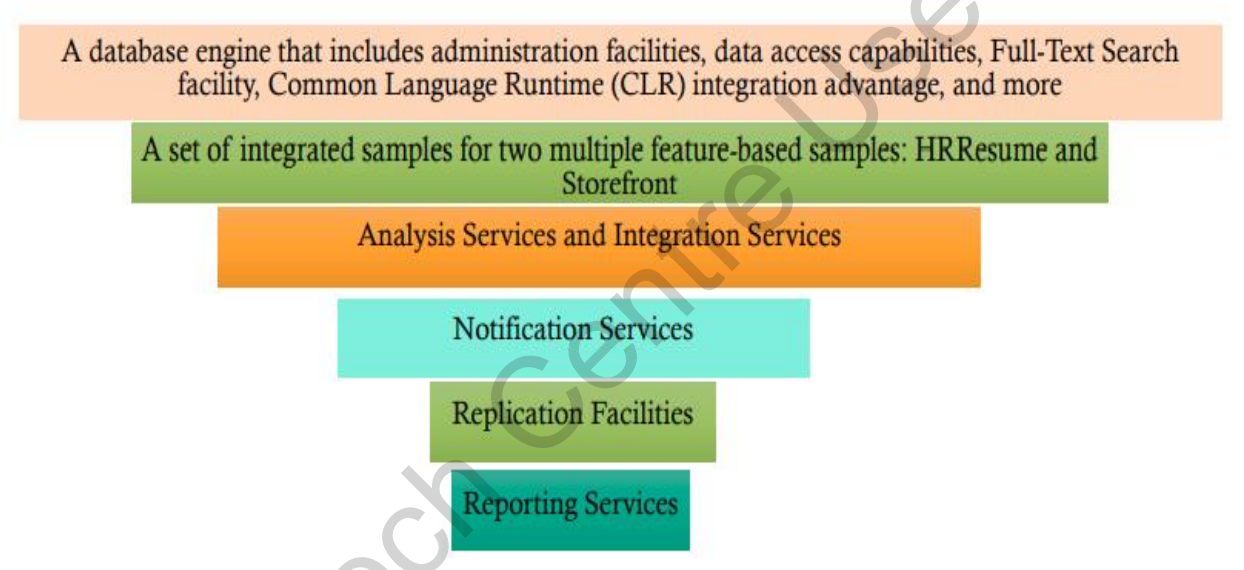
This database demonstrates use of new features introduced in SQL Server

The AdventureWorks2019 database schema covers many functional areas for a fictitious bicycle manufacturer.
These areas include:

- Customer/sales force automation and analysis
- Human resources
- Purchasing/Vendor Electronic Data Interchange
- Manufacturing work flow

AdventureWorks2019 Sample Database 2-2

The database comprises several features. Some of its key features are as follows:



The sample database consists of these parts:

- AdventureWorks2019: Sample OLTP database
- AdventureWorks2019DW: Sample Data warehouse
- AdventureWorks2019AS: Sample Analysis Services database

Understanding the SSMS User Interface

SSMS shows several menu options, toolbars, and panes.

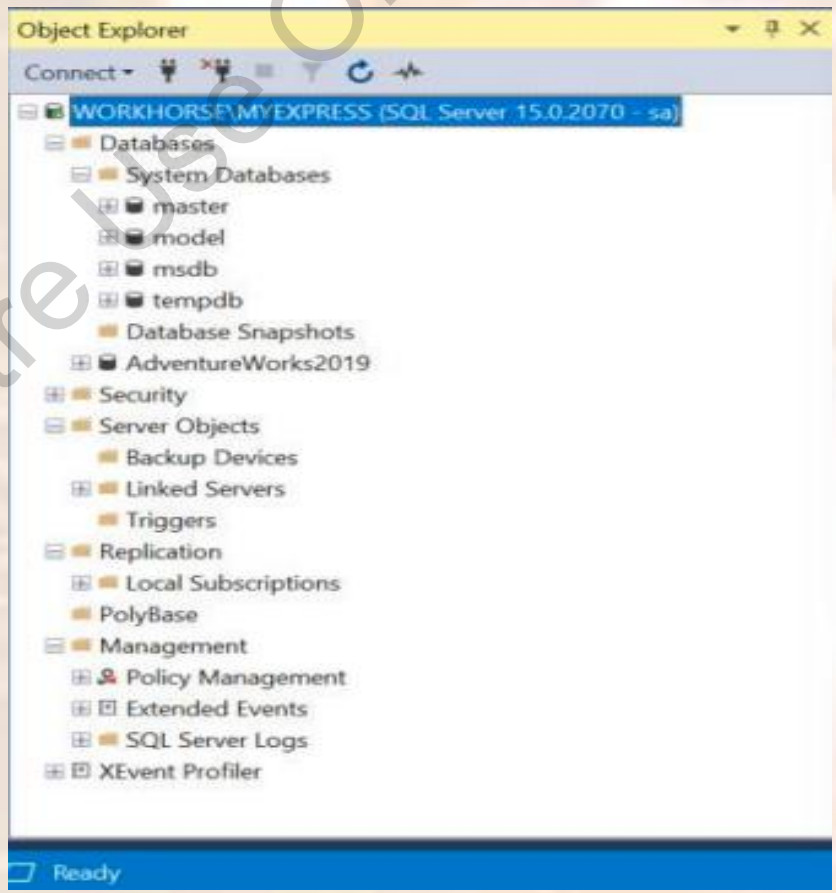
It displays all the objects in the server in a tabular format and providers a user interface to manage them.

Capabilities of Object Explorer vary slightly depending on the type of server.

Role and Structure of Object Explorer in SQL Server 1-2

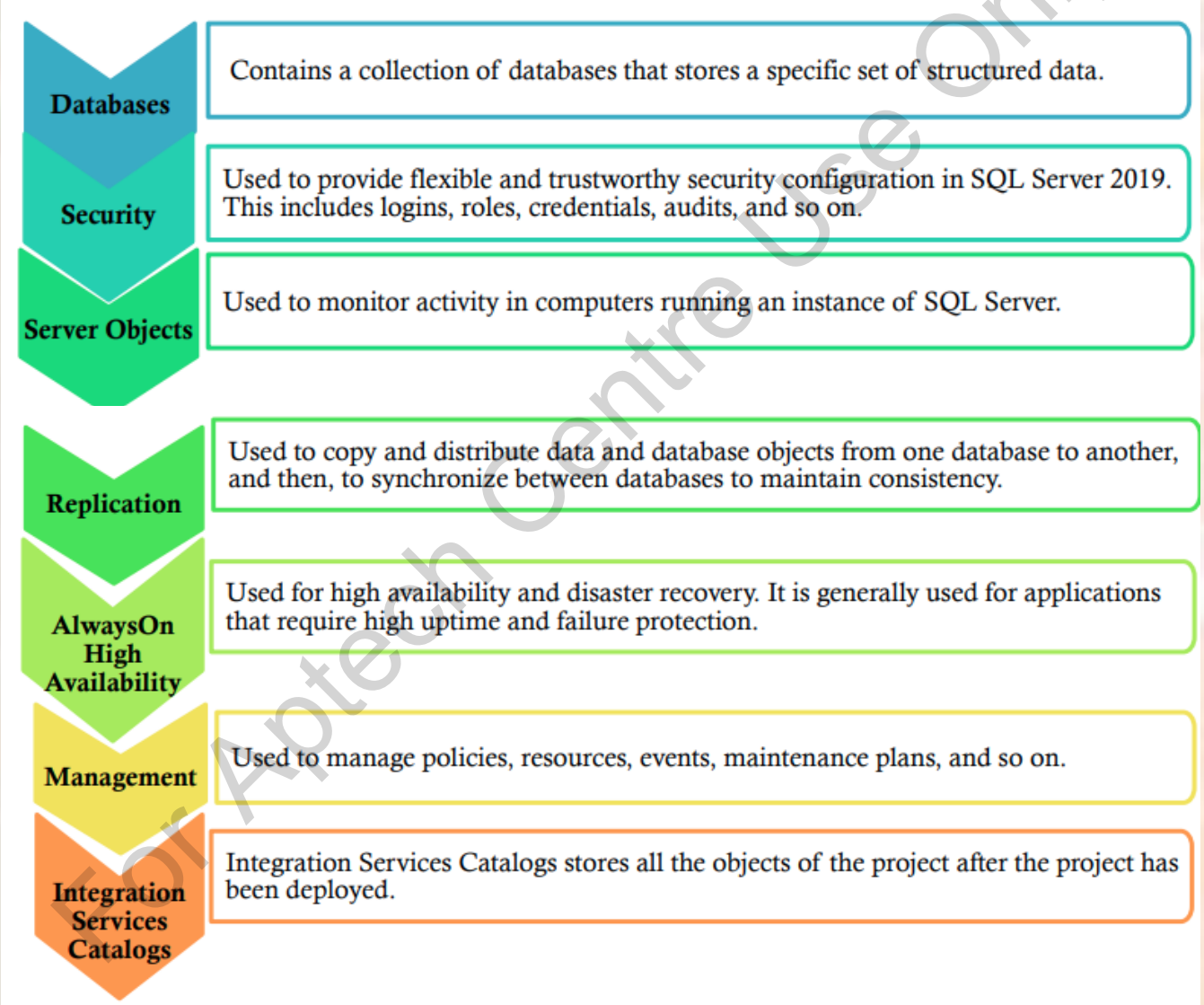
The structure includes
- Databases
- Security
- server objects
- Replications
- AlwaysOn High Availability
- Management
- Integration Services Catalogs

- Object Explorer can be accessed through SSMS by connecting to the database server.



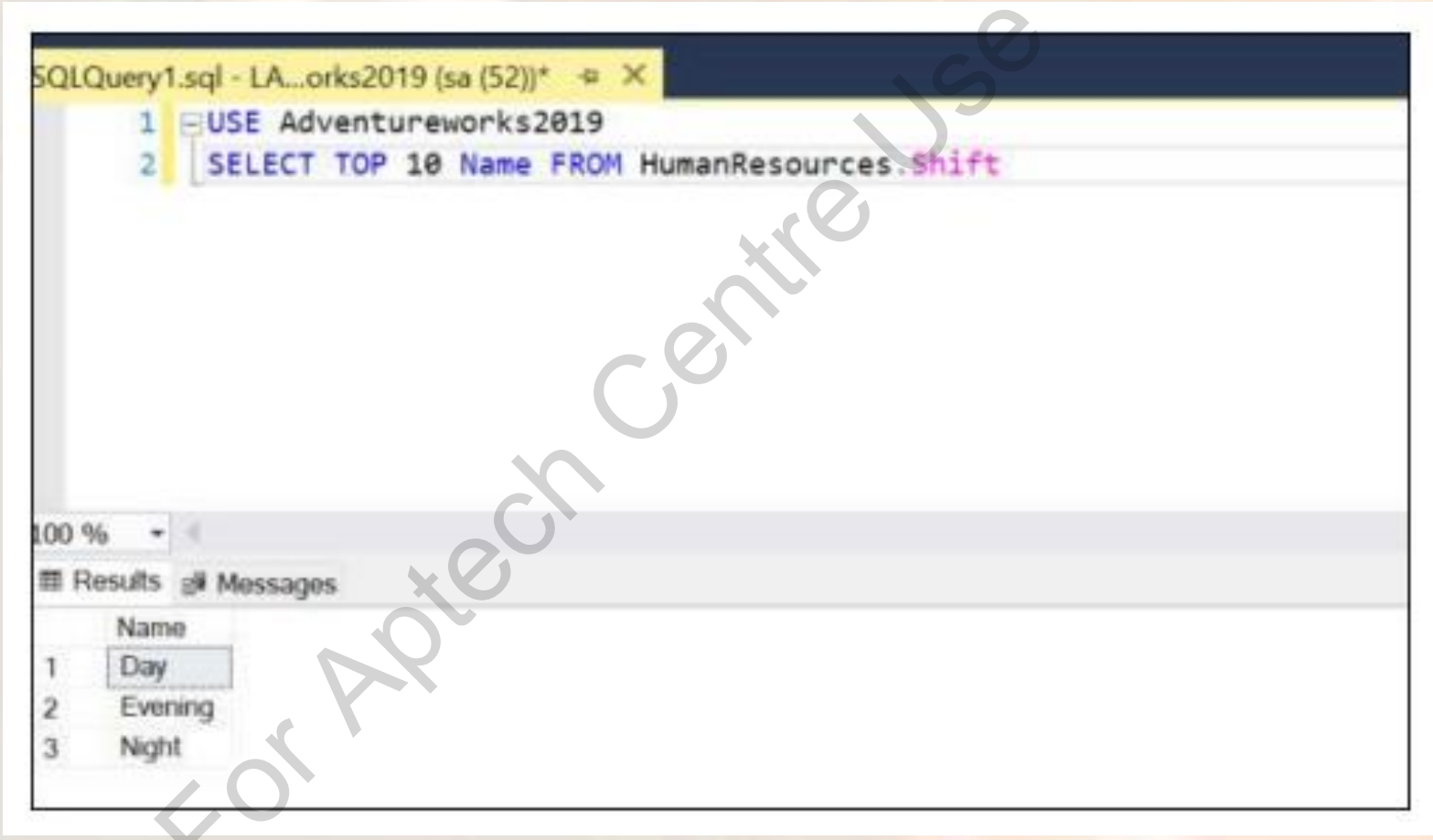
Object Explorer

Role and Structure of Object Explorer in SQL Server 2-2



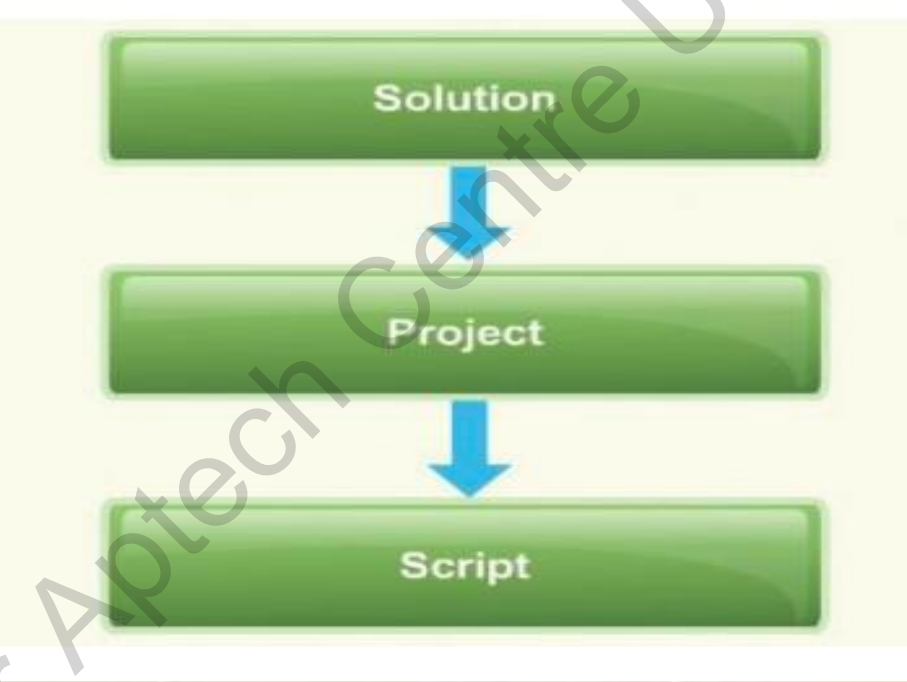
Query Window

Query window is the area where you can type Transact-SQL (T-SQL) queries. Results of your queries also appear in this window.



Creating and Organizing Script Files 1-2

- Script files are files that contain a set of SQL commands.
- A script file can contain one or more SQL statements.
- The script files are stored in .sql format in SQL Server.



Conceptual Layers

Creating and Organizing Script Files 2-2

```
USE [AdventureWorks2019]
GO
INSERT INTO [Person].[Person]
           ([BusinessEntityID]
           ,[PersonType]
           ,[NameStyle]
           ,[Title]
           ,[FirstName]
           ,[MiddleName]
           ,[LastName]
           ,[EmailPromotion]
           ,[ModifiedDate])
     VALUES(21907
           ,'EM'
           ,0
           ,'Mr.'
           ,'John'
           ,'Gareth'
           ,'Hopkins'
           ,0
           ,'2020-10-10')
GO
```

Code Snippet

Transact-SQL Queries

Queries typed in Transact-SQL and saved as .sql files can be executed directly in the SSMS query window.

Steps to execute Transact-SQL queries are as follows:

1. In the query window, select the code to be executed.

2. On the SSMS toolbar, click Execute.
   OR
   On the Query menu, click Execute.
   OR
   Press F5 or Alt+X or Ctrl+E.

Query results can be displayed in three different formats. The three formats available are grid, text, and file view.

Summary

- Basic architecture of SQL Server 2019 includes tools, services, and instances.
- Three major editions of SQL Server are Express, Standard, and Enterprise.
- The structure of Object Explorer includes databases, security, server objects, replications, AlwaysOn High Availability, Management, Integration Services Catalogs, and so on.
- SSMS is used to connect to SQL Server instances. SSMS is a tool used for developing, querying, and managing the databases.
- Script files should be stored in .sql format in SQL Server 2019.
- Queries typed in Transact-SQL and saved as .sql files can be executed directly into the SSMS query window.