Intelligent Data Management with SQL Server

Session: 5

Creating and Managing Databases

Objectives

- Explain about modification of system data
- Describe adding of filegroups and transaction logs
- Outline the process to create a database
- Describe how to drop a database
- Explain database snapshots

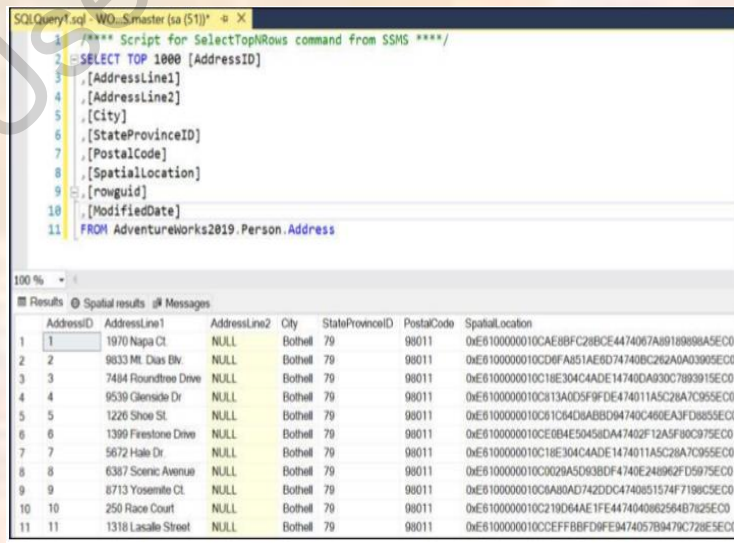
Modifying System Data

- Users can avail administrative tools to fully administer system and manage all users and database objects:

SSMS Administration utilities: Is the core administrative console for SQL Server installations. It enables to perform high-level administrative functions, schedule routine maintenance tasks, and so forth.

SQL Server Management Objects (SQL-SMO) API: Includes complete functionality for administering SQL Server in applications.

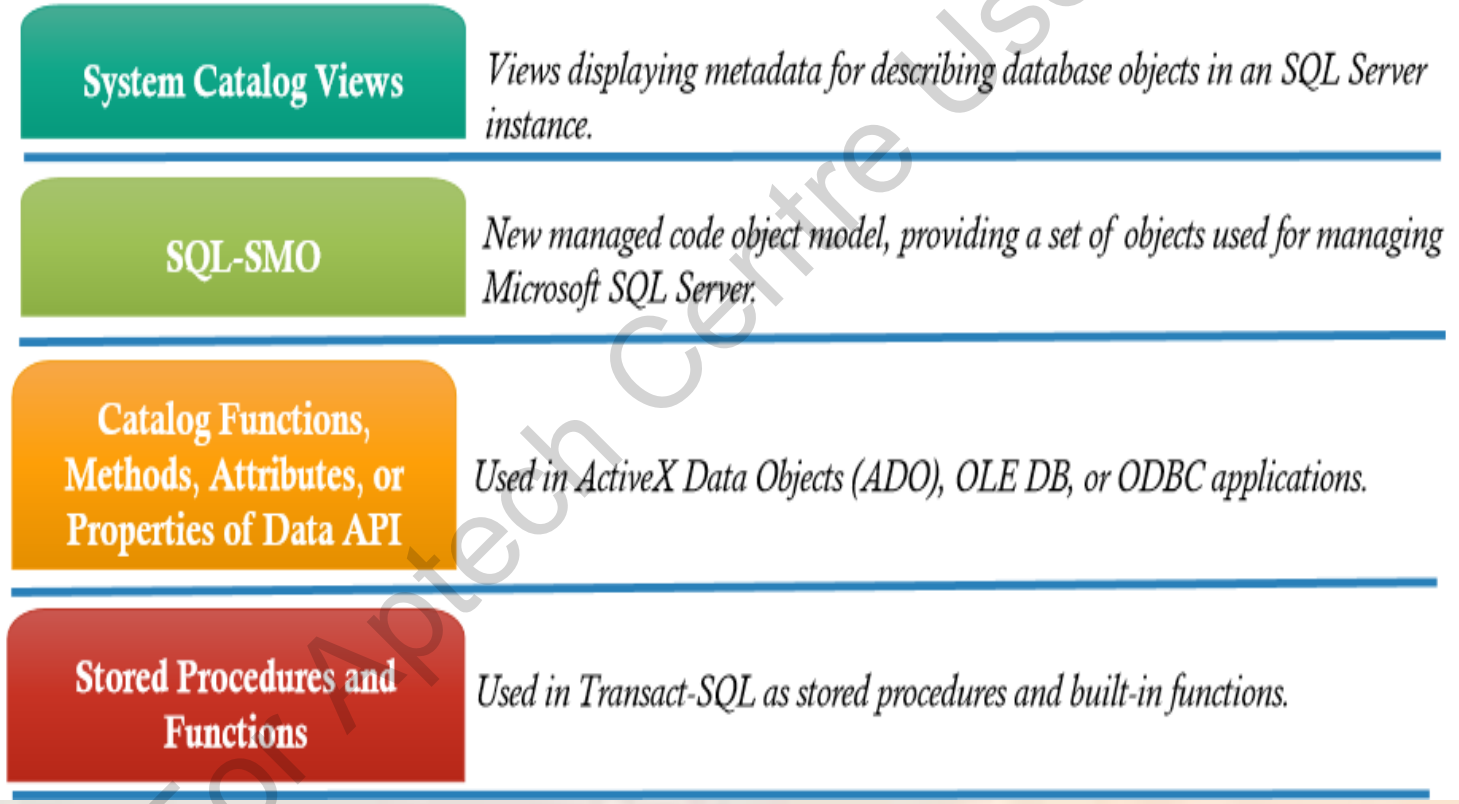
Transact-SQL scripts and stored procedures: Use system stored procedures and Transact- SQL DDL statements.



Transact-SQL Query Window

Viewing System Database Data

Database applications can determine catalog and system information by using any of these approaches:



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.

Creating Databases Using Transact-SQL 1-3

To create a user-defined database, the information required is as follows:

- Name of the database
- Owner or creator of the database
- Size of the database
- Files and filegroups used to store it

Following is the syntax to create a user-defined database.

```
CREATE DATABASE DATABASE_NAME
[ ON
[ PRIMARY ] [ <filespec> [ ,...n ]
[ , <filegroup> [ ,...n ] ]
[ LOG ON { <filespec> [ ,...n ] } ]
]
[ COLLATE collation_name ]
]
[ ; ]
```

Creating Databases Using Transact-SQL 2-3

SQL Server databases use two files - an .mdf file, known as the primary database file, containing the schema and data and a .ldf file, which contains the logs. A database may also use secondary database file, which normally uses an .ndf extension.

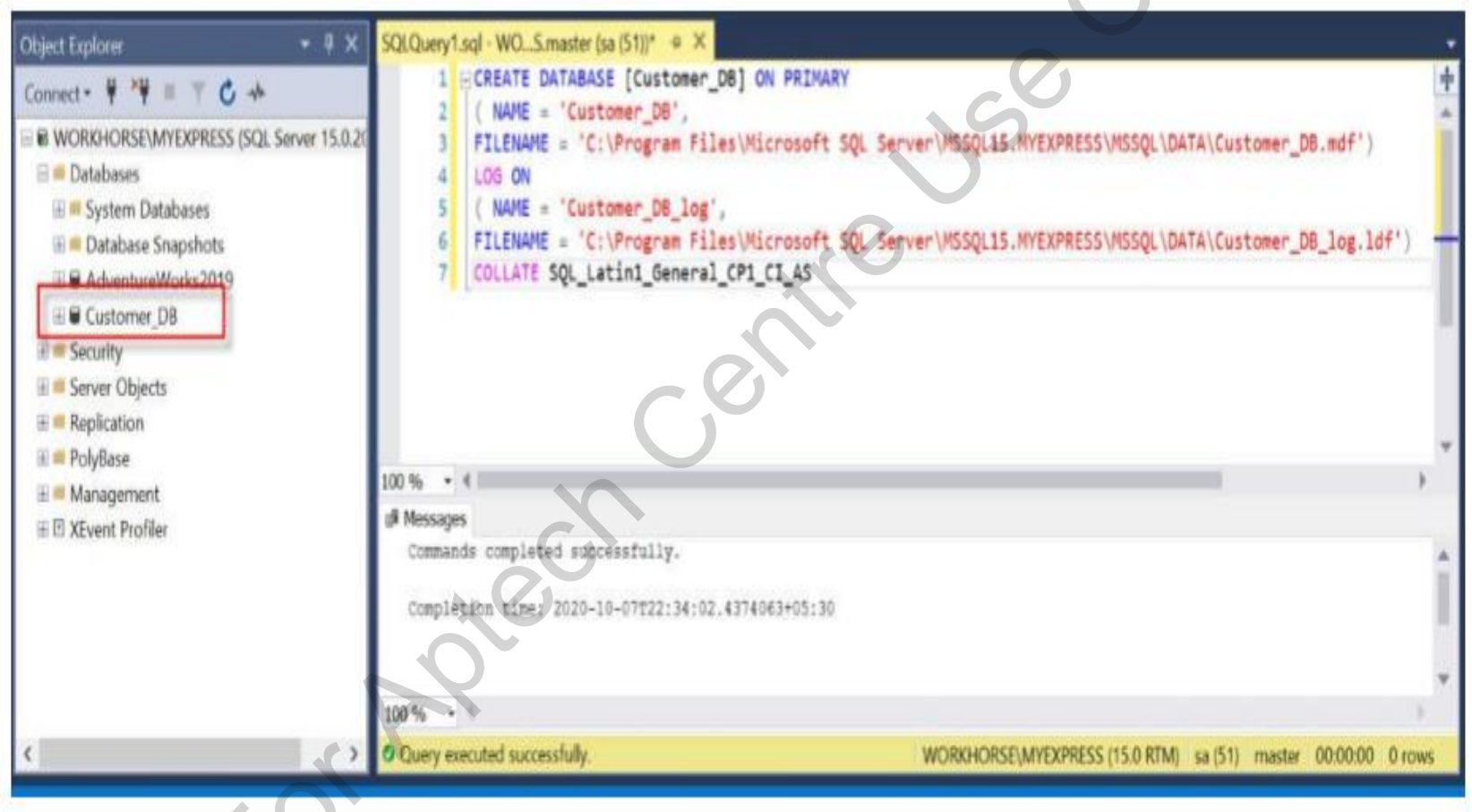
MDF stands for Master Database File.

- It contains main information of a database that are part of the server.
- This extension also points to various other files.
- Plays a crucial role in information storage.

LDF stands for Log Database File.

- Stores information related to transaction logs for main data file.
- Keeps track of changes that have been made in the database.

Creating Databases Using Transact-SQL 3-3



Customer_DB Database

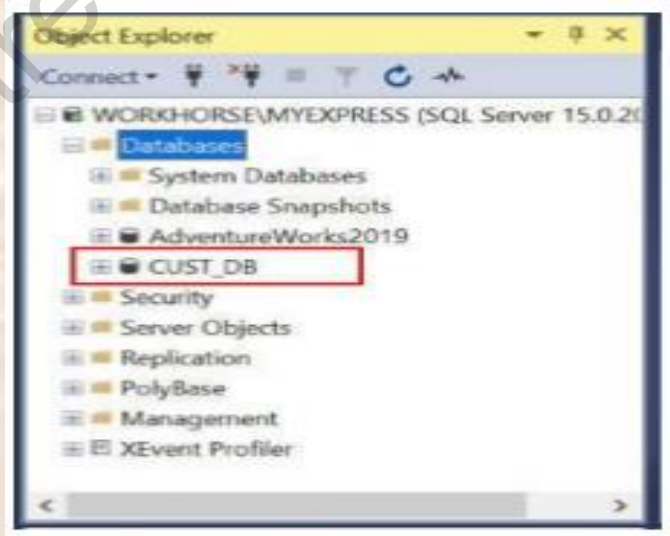
Modifying Databases

A user-define database does the following:

- It grows or diminishes
- Its size expands or shrinks automatically or manually

```
ALTER DATABASE database_name
{
<add_or_modify_files>
|<add_or_modify_filegroups>
|<set_database_options>
|MODIFY NAME=new_database_name
|COLLATE collation_name
}
[;]
```

Syntax to modify a database



New Database Name CUST_DB

Ownership of Databases

In SQL Server 2019, ownership of a user-defined database can be changed.

- Ownership of system databases cannot be changed.
- The system procedure sp_changedbowner is used to change the ownership of a database.

```
sp_changedbowner [@loginame =] 'login'
```

Setting Database Options

Database-level options determine the characteristics of the database that can be set for each database

The options are unique to each database, so they do not affect other databases

Option Type	Description
Automatic options	Controls automatic behavior of database.
Cursor options	Controls cursor behavior.
Recovery options	Controls recovery models of database.
Miscellaneous options	Controls ANSI compliance.
State options	Controls state of database, such as online/offline and user connectivity.

Databases Options in SQL Server 2019

Filegroups 1-3

In SQL Server, data files are used to store database files

- For the sake of performance further subdivided into filegroups
- Used to group related files that together store a database object

Filegroup	Description
Primary	The filegroup that consists of the primary file. All system tables are placed inside the primary filegroup.
User-defined	Any filegroup that is created by the user at the time of creating or modifying databases.

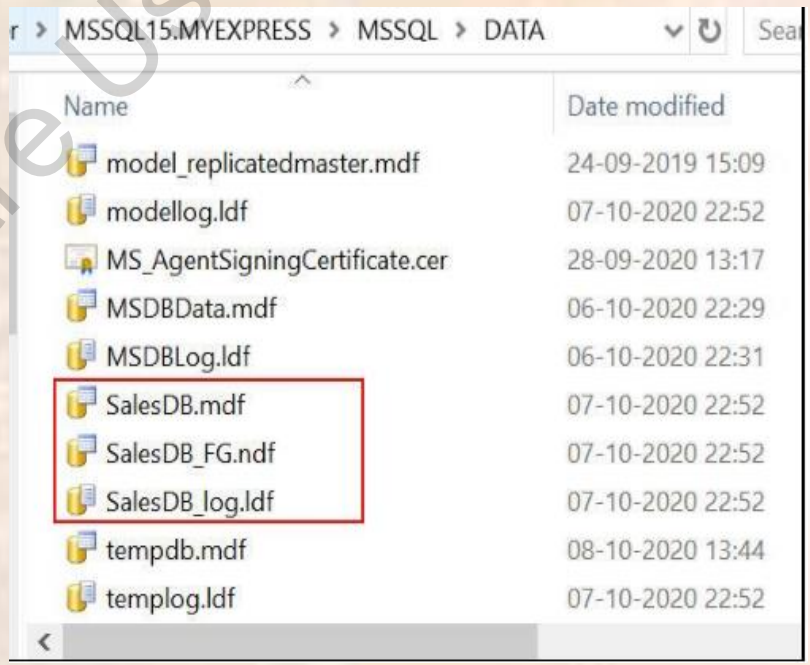
Filegroups in SQL Server 2019

Filegroups 2-3

Adding Filegroups to an existing database

- Filegroups can be created when the database is created for the first time or can be created later when more files are added to the database.
- However, files cannot be moved to a different filegroup after the files have been added to the database.

- A file cannot be a member of more than one filegroup at the same time.
- A maximum of 32,767 filegroups can be created for each database.
- Filegroups can contain only data files.
- Transaction log files cannot belong to a filegroup.

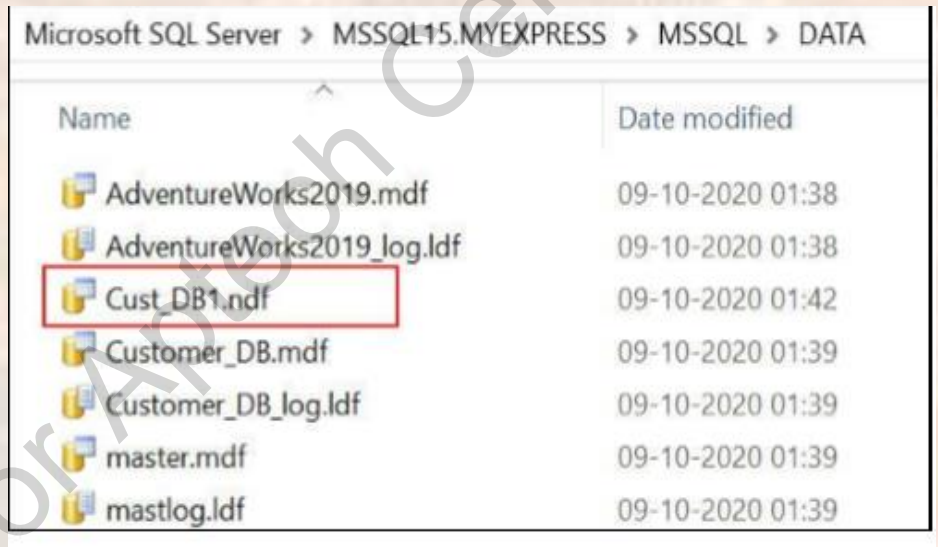


Filegroup Added When Creating SalesDB Database

Filegroups 3-3

Default Filegroup

Objects are assigned to the default filegroup when they are created in the database. The PRIMARY filegroup is the default filegroup.



New File Cust_DB1 Created

Transaction Log 1-2

Recovery of individual transactions	An incomplete transaction is rolled back in case of an application issuing a ROLLBACK statement or the Database Engine detecting an error. The log records are used to roll back the modifications.
Recovery of all incomplete transactions when SQL Server is started	If a server that is running SQL Server fails, the databases may be left in an inconsistent state. When an instance of SQL Server is started, it runs a recovery of each database.
Rolling a restored database, file, filegroup, or page forward to the point of failure	The database can be restored to the point of failure after a hardware loss or disk failure affecting the database files.
Supporting transactional replication	The Log Reader Agent monitors the transaction log of each database configured for replications of transactions.
Supporting standby server solutions	The standby-server solutions, database mirroring, and log shipping depend on the transaction log.

Transaction Log 2-2

Working of Transaction Logs:

A database in SQL Server has at least one data file and one transaction log file. Data and transaction log information are kept separated, preferably on separate drives.

The rollback of each transaction is executed using following ways:

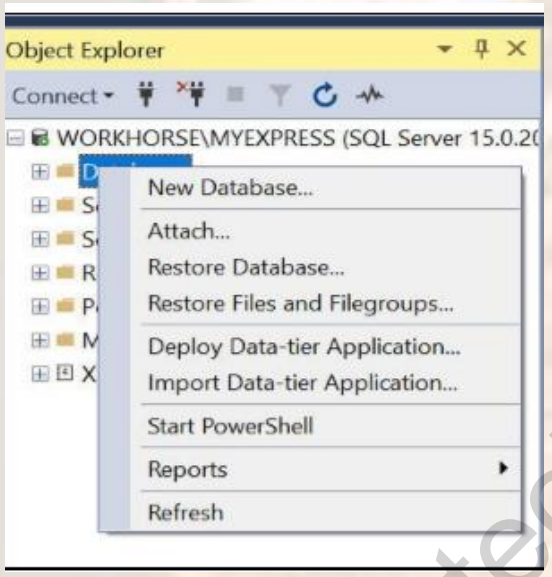
- A transaction is rolled forward when a transaction log is applied.
- A transaction is rolled back when an incomplete transaction is backed out.

Adding Log files to a database

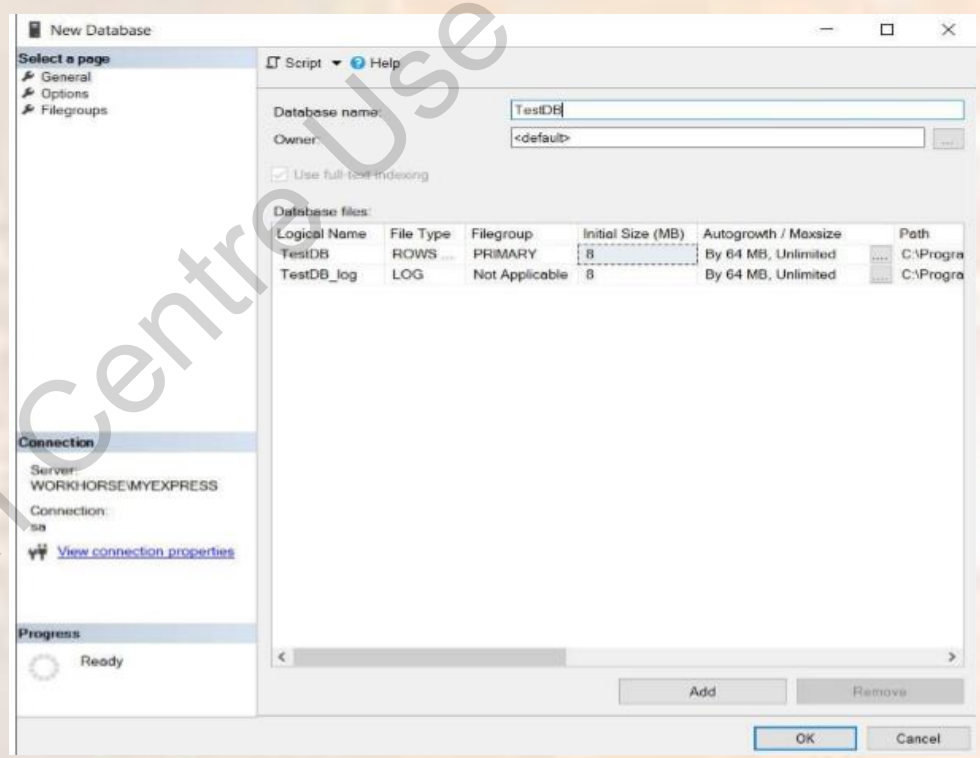
```
ALTER DATABASE database_name
{
...
}
[;]
<add_or_modify_files>::=
{
ADD FILE <filespec> [,...n]
[TO FILEGROUP {filegroup_name | DEFAULT}]
| ADD LOG FILE <filespec> [,...n]
| REMOVE FILE logical_file_name
| MODIFY FILE <filespec>
}
```

Creating Databases Using SSMS 1-2

When a database is created, data files should be as large as possible based on maximum amount of data, which is expected in the database.

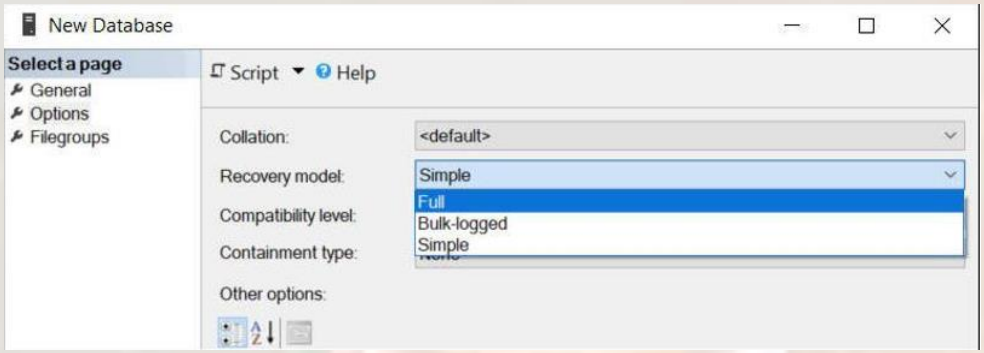


New Database Option

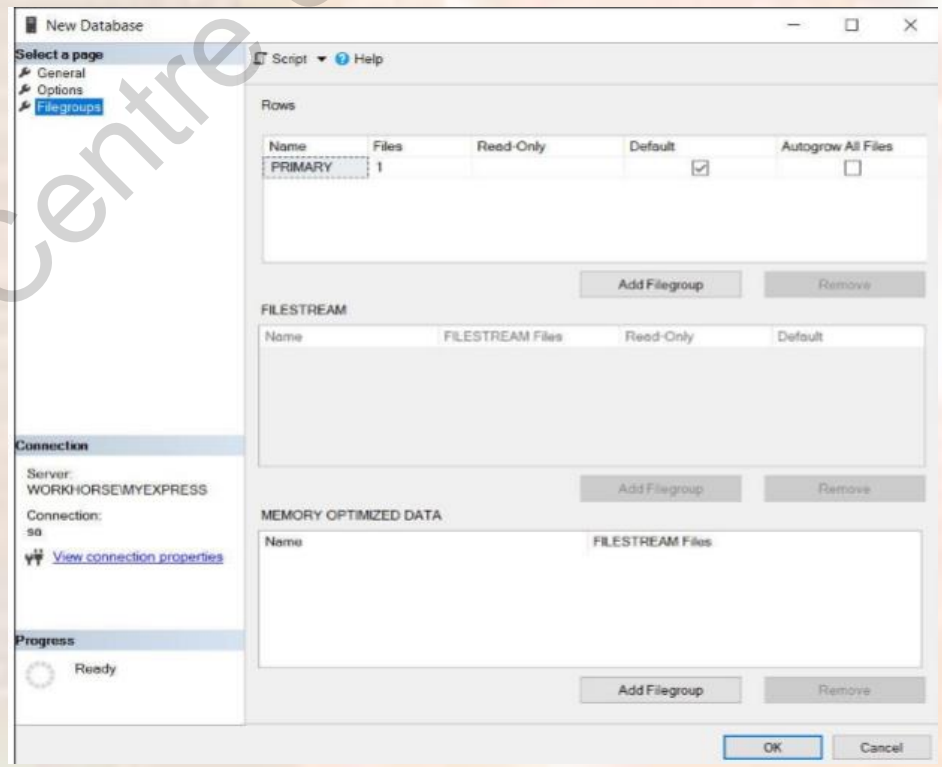


New Database Window

Creating Databases Using SSMS 2-2



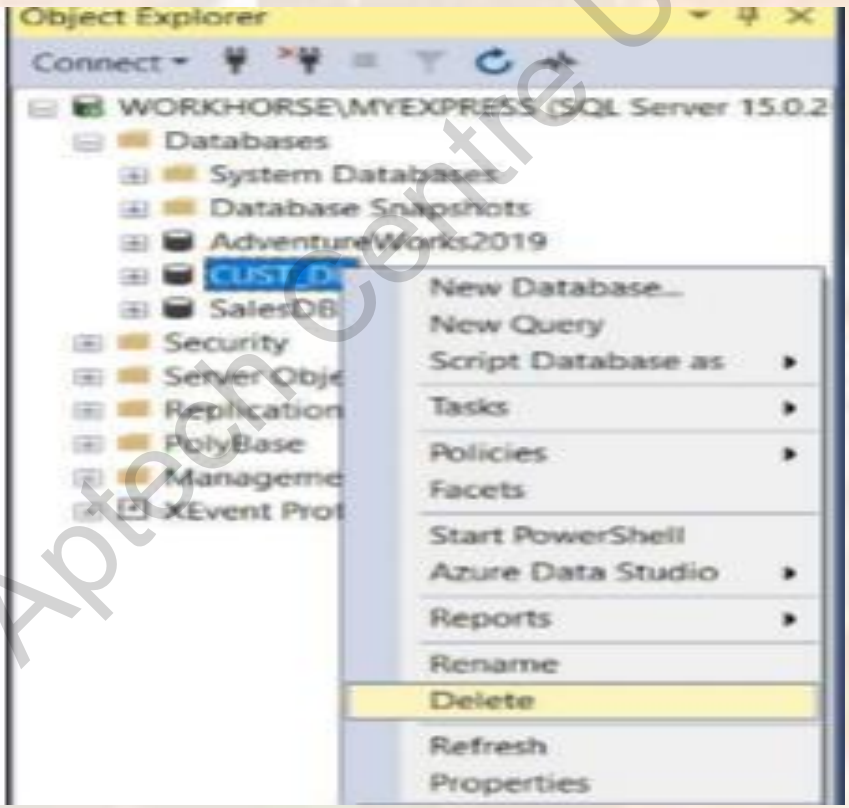
Recovery Model



Adding a Filegroup

Dropping a Database

A full backup of the database must be taken before dropping a database. A deleted database can be re-created only by restoring a backup.



Delete a Database

Creating Database Snapshots

Database snapshot feature was first introduced in Microsoft SQL Server 2005

- It is a feature that provides a read-only, static view of a SQL Server database.
- If a user makes a mistake in a source database, the source database can be reverted to the previous state when the snapshot was created.

Advantages	Disadvantages
• Provide a convenient, read-only copy of data. • When queried, no deterioration of performance. • Snapshot files are small and are very quick to create.	• Snapshot backup cannot be created. • Snapshot must exist on the same database server as that of the source database. • A new user cannot be granted access to the data in a snapshot.

Summary

- SQL Server uses system databases to support different components of the DBMS.
- The SQL Server data files are used to store database files, which are further subdivided into filegroups for the sake of performance.
- Databases can be created and dropped using SSMS or Transact-SQL.
- The CREATE DATABASE statement with various options can be used to create databases.
- ALTER DATABASE and DROP DATABASE are used to modify and delete a database respectively.
- A transaction log in SQL Server records all transactions and the database modifications made by each transaction.
- Objects are assigned to the default filegroup when they are created in the database. The PRIMARY filegroup is the default filegroup.
- A database snapshot is a read-only, static view of a SQL Server database.