Introduction to Databases

- Data
- Information
- T-SQL
- Database Types
- Relational
- SQL Server

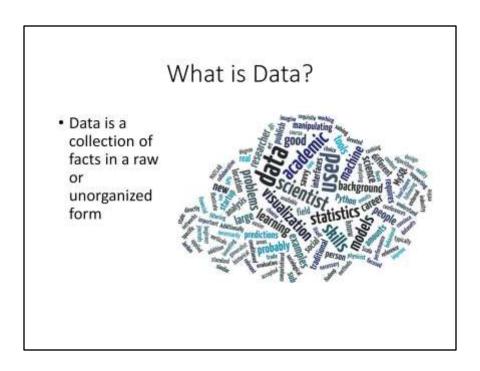
SQL Server

Hierarchical

Management Studio

- Database Objects
- ERD

This presentation will provide an introduction to databases and some of the terminology associated with databases. I will also talk about some of the Microsoft specific tools available for creating and working with databases.



Databases are used to store data. But what exactly is data? A good definition for data is a collection of facts in a raw or unorganized format. An analogy could be you finding all the pages of books from your local library torn out and scattered on the floor. All of the pages — or data — are still there, but it would not be easy to find the information you're looking for.

What is Information?

- · Information is data that is specific and organized for a purpose
- · Data presented within a context gives it meaning and relevance
- This leads to an increase in understanding and decrease in uncertainty



When you take data and organize it, this can lead to information. Information is data that presented in a context that gives it meaning and relevance. You can get information from a library because the data – or books – are organized in a specific manner that helps you find what you need.

What is a Database?

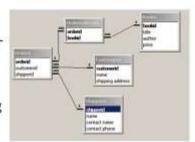
- A database is an organized or structured repository of data that allows for the easy retrieval, update and analysis of information
- Databases are usually organized as a group of linked data files (aka tables)



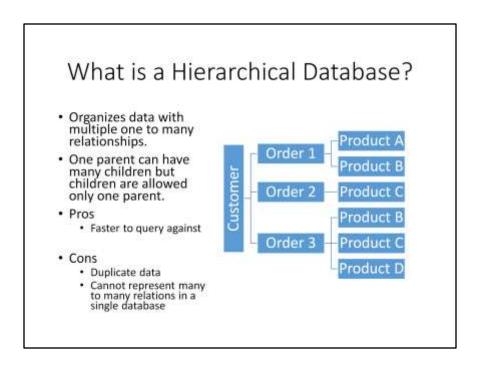
In the computer world, when we want to store data in a meaningful manner for future retrieval, we often use a database. A database is an organized repository of data that allows for the easy retrieval, update and analysis of information. In my library analogy, the library itself is the database.

What is a Relational Database?

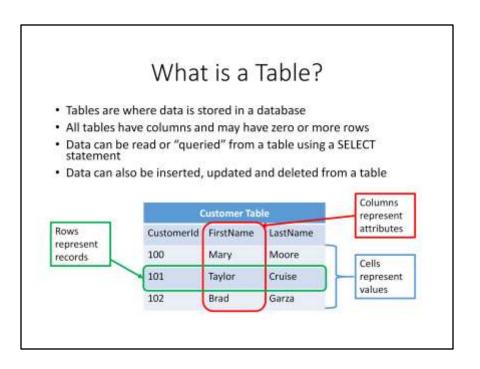
- A relational database is a collection of data items organized as a set of formallydescribed tables
- Data can be accessed or reassembled in many different ways without having to reorganize the database tables.
- The relational database was invented by E. F. Codd at IBM in 1970.



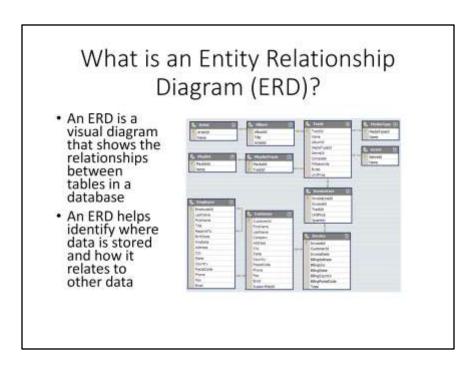
There are different kinds of database structures available for use in storing data. The most popular one, and the one we will be using for this course, is the relational database. A relational database in a collection of data organized as a set of tables. The benefit of relational databases is that data can be accessed and reassembled in many different ways without having to reorganize the underlying tables.



Another database type is the hierarchical database. A hierarchical database is a way of organizing data with multiple one to many relationships. The structure is based on the rule that one parent can have many children but children are allowed only one parent. True hierarchical databases are limited in how they can store data because they cannot represent a many to many relationship.



Tables are the core of any database, because tables are where you physically store all database data. A table looks very similar to a spreadsheet. It will have one or more columns which define the attributes of what is being stored. Each row in a table represents a record that is being stored. It is possible for a table to have no records and therefore be an empty table. The cell where a row and a column meet is called a value. Databases are designed to easily read, insert, update and delete rows and values from a table.



In a relational database, tables are often physically or logically tied to one another. A way to display the relationships between tables in a database is through the use of an Entity Relationship Diagram. The entity relationship diagram on this page is for the Chinook sample database which we will be using in this course.

Other Database Objects Views ☐ Chinook Act like tables Database Diagrams · Can reference data from multiple sources Stored Procedures Views Container for SQL code Synonyms Multiple complex statements can be Programmability contained in a single stored procedure Stored Procedures User Defined Functions Functions · Snippets of reusable code

Tables are considered a database object. There are other types of database objects that are useful to know about. The 3 most popular ones are views, stored procedures and user defined functions. Views are similar to tables, except instead of storing data, they reference data from other sources. It is possible for a view to reference data from many different tables at the same time. Stored procedures are containers for storing and executing SQL code. They come in handy for running code that needs to be executed on a regular basis. User defined functions come in different flavors. They are generally used to store snippets of code that can be reused within a larger SQL statement.

What is SQL Server?

- SQL Server is Microsoft's name for their database server product
- There are several versions of SQL Server available from SQL Server Express which is used for desktops, to SQL Server Enterprise which is used by large corporations
- The difference between versions lies primarily in the amount of CPU and Memory available for use, as well as special abilities available only in the Enterprise version



SQL Server is the name Microsoft gave their database server product. There are multiple versions of SQL Server. Some are free to use and designed for small databases while others are designed for large companies and can cost thousands of dollars to license. The main differences between the versions are how much CPU and memory the server software can use. There are also some additional toolsets that only come with the pricier versions of SQL Server. It is important to note that the query language behind all SQL Sever versions is the same.

What is T-SQL?

- Stands for Transact-Structured Query Language
- Is Microsoft's version of the SQL language
- T-SQL conforms to the ANSI (American National Standards Institute) compliance standards for SQL
- Has some additional functionality unique to T-SQL

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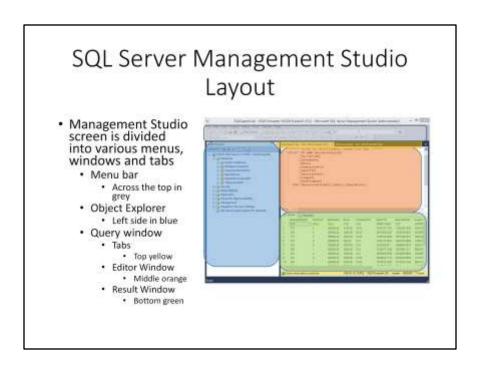
SQL is the language used to speak to databases, and learning the basics of SQL will cover the majority of what you will be learning in this course. Microsoft SQL Server uses a dialect of SQL called Transact-SQL. Transact-SQL complies with the standards for SQL prescribed by the American National Standards Institute. However T-SQL does have some functionality that is not present in the standard or other dialects of SQL. It is important to note that all the major database companies like Oracle and IBM also have their own SQL dialects.

SQL Server Management Studio (SSMS) • SQL Server

- SQL Server
 Management studio
 (SSMS) is a client tool
 used for connecting to
 your SQL Servers
- You can connect to a local server on your desktop or to a remote server.
- SSMS is a free download from Microsoft.

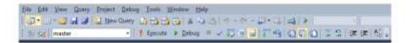


SQL Server Management Studio is a client tool used for connecting to Microsoft SQL Servers. Management Studio is not the database itself. It is a tool for connecting to databases. If you downloaded SQL Server Express, you likely have Management Studio and the SQL Server database engine running on the same computer. But it is entirely possible for Management Studio to connect to remote SQL Servers, or even multiple database servers at the same time. Management Studio is where you will be writing the queries you create in this course.



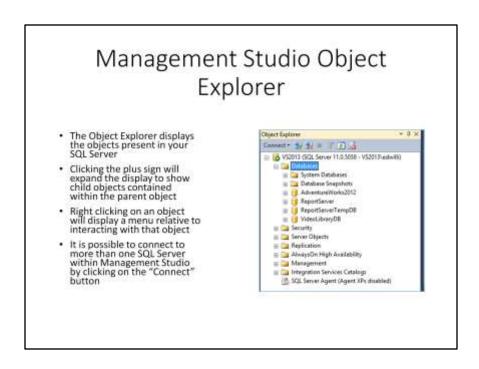
After you start up SQL Server Management Studio, there are 3 major regions on the application screen to take note of. The first is the menu bar which runs across the top of the screen. Second is the Object Explorer which usually is docked on the left side of the screen. This will contain information about the SQL Servers you are connected to. The third region is the Query Window which is divided into 3 sub-regions. The editor window is highlighted in orange. This is where you write your queries. The result window is highlighted in green. This is where you view the results of your queries. The tabs running across the top indicate there are multiple query windows open. One for each tab.

Management Studio Menu Bar

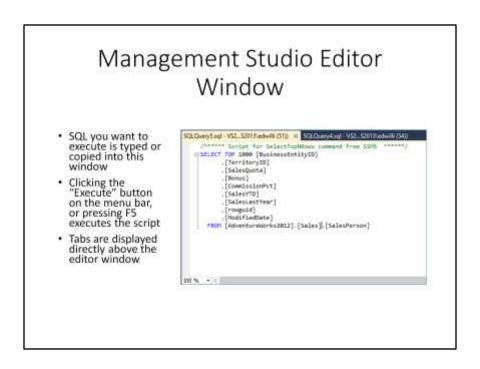


- The menu bar contains buttons and menus for interacting with your database and SQL scripts
- Hovering over a button will activate a tool tip showing the button description and its keyboard shortcut (if it has one)
- NOTE: Several buttons on the menu are for administrative features we won't be discussing in this course

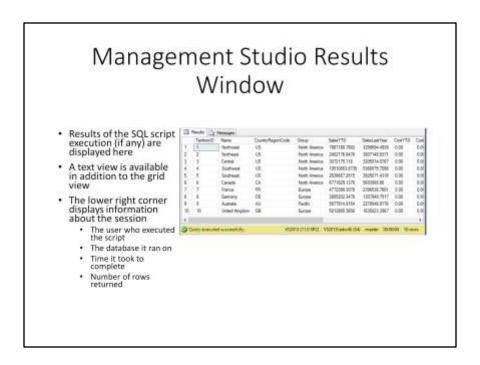
The menu bar contains many important buttons as well as information on which database a query will be executed against. The two buttons you will probably use the most are the New Query button and the Execute button. If you hover your mouse over the menu buttons a tool tip will appear providing a brief description of the button as well as the keyboard shortcut if one exists.



The Object Explorer displays any active connections you have to SQL Servers as well as information about the databases and their database objects on those servers. Information on databases is displayed in a tree view. You can click on the plus signs to display objects within the parent object. Right clicking an object will bring up a menu specific to interacting with that object.



The Editor Window is where you write your queries. Any SQL you want to execute is typed or copied into this window. You can execute a query by clicking the Execute button on the menu bar. If you wish to create a new query window, you can do so by clicking the New Query button on the menu bar. Each new query window will have its on tab. You can navigate between queries by clicking on the tabs.



Below the editor window is the results window. This window will appear the first time you execute the query. The results window usually has two tabs. The Results tab contains the result set of any query you executed, while the Messages tab contains information regarding the execution of the query. Directly below the results window is a line that displays information about the specific query results and its connection.

Summary

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 - Hierarchical
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- SQL Server
- T-SQL
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Management Studio

This concludes the introduction to databases presentation.