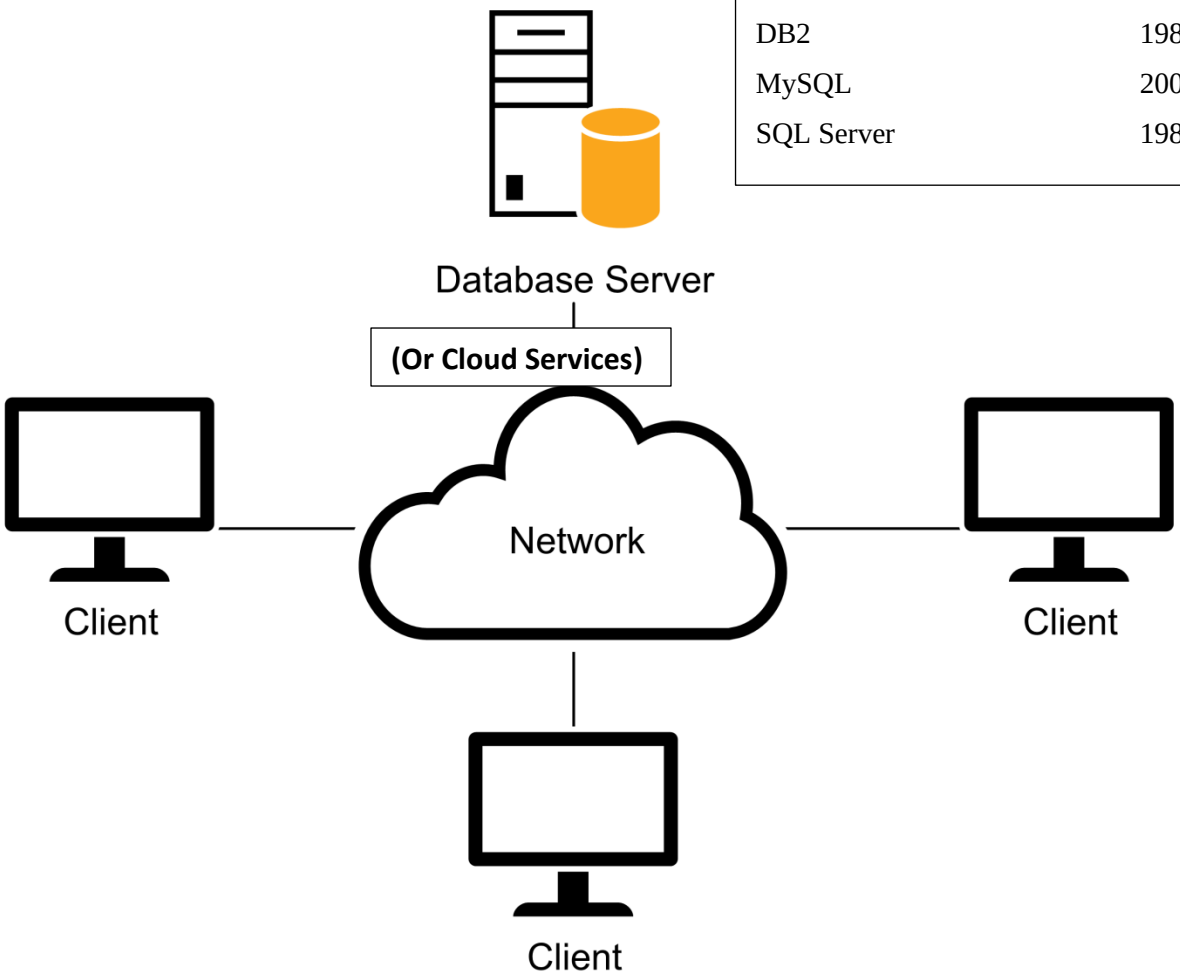
Cis 111 – Chapter 1 and 2 Notes

Topic #1: Database Management System

A database management system (**DBMS**) is system software for creating and managing *relational* databases. The DBMS provides users and programmers with a systematic way to **create**, **retrieve**, **update** and **manage data.**

- **Talk about history and future – value of data – in politics – in Bible info would incr**
- **IOT supplying data, big data – weather channel w sales data – AI not possible**

First database releases	
Oracle	1979
DB2	1985
MySQL	2000
SQL Server	1987



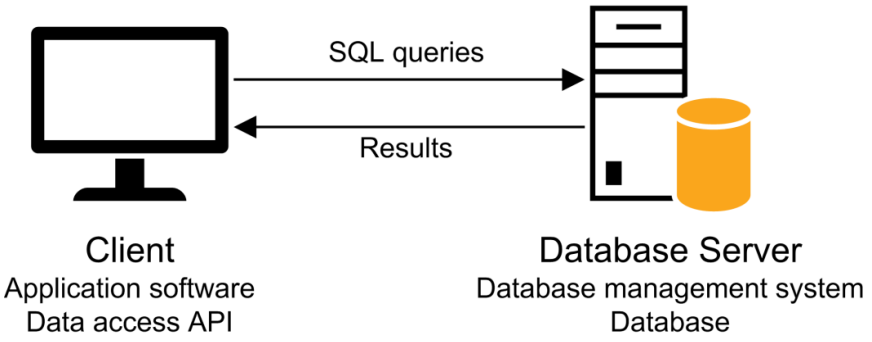
You can implement a SQL Server DBMS in the following ways:

1. **On the premise**, meaning, it is located somewhere on a computer network (LAN/WAN)
2. Implemented on the premises of a hardware service provider like Amazon (AWS), Google or Microsoft (**Windows Azure**), etc. The hardware, operating system, network, … are provided as a service. It is in the '**cloud'**.

Topic #2: Structured Query Language - SQL

Each DBMS listed on the previous page uses a language in order to systematically create, retrieve, update and manage data within a database**.** It is called **Structured Query Language**, or simply, **SQL**. The process of submitting a SQL statement to a DBMS would work as follows…

- The application software communicates with the DBMS by **sending SQL queries** through the data access API.
  - The main part of this database language has stayed virtually the same for the 40 yrs
  - It is somewhat portable – meant to be English like
- When the DBMS receives a query, it provides a service like returning the requested data (the **query results**) to the client.



One very important objective of this course is to have you become very comfortable and familiar with the SQL language 😊

A SELECT statement that retrieves and sorts selected columns and rows

```
SELECT InvoiceNumber, InvoiceDate, InvoiceTotal,
    PaymentTotal, CreditTotal,
    InvoiceTotal - PaymentTotal - CreditTotal
    AS BalanceDue
FROM Invoices
WHERE InvoiceTotal - PaymentTotal - CreditTotal > 0
ORDER BY InvoiceDate;
```

The result set defined by the SELECT statement

	InvoiceNumber	InvoiceDate	InvoiceTotal	PaymentTotal	CreditTotal	BalanceDue
1	39104	2016-03-10 00:00:00	85.31	0.00	0.00	85.31
2	963253264	2016-03-18 00:00:00	52.25	0.00	0.00	52.25
3	31361833	2016-03-21 00:00:00	579.42	0.00	0.00	579.42
4	263253268	2016-03-21 00:00:00	59.97	0.00	0.00	59.97
5	263253270	2016-03-22 00:00:00	67.92	0.00	0.00	67.92
6	263253273	2016-03-22 00:00:00	30.75	0.00	0.00	30.75

- Note naming conventions and indentation – briefly mention comments

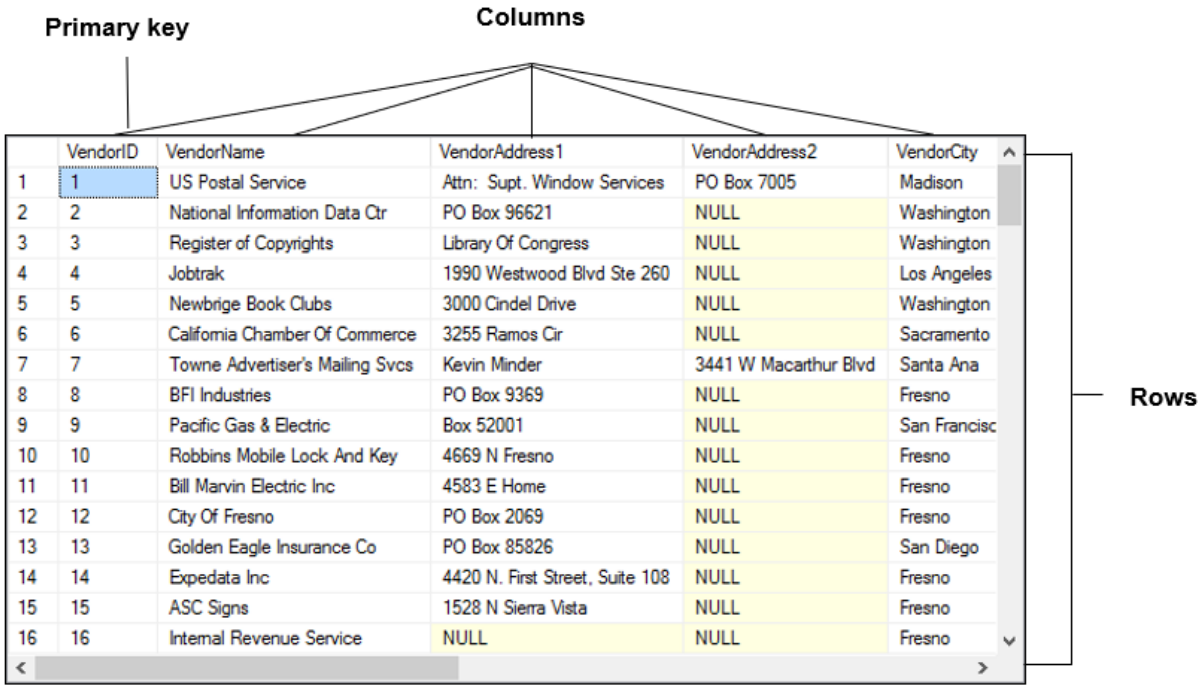
Topic #3: Relational Database Model

A relational database is a set of organized data that is designed and modeled relationally for effectively and efficiently retrieving the data. The data is said to be "normalized" when the data is designed and modeled in this manner.

Normalization, introduced in 1970 by Edgar F. Codd and enhanced by Raymond F. Boyce, is the method of relating tables in a relational database for the most effective utilization for inserts, deletes, and updates to the database that are used for online transaction processing (oltp). The higher the normalization, the less inconsistencies and anomalies.

Microsoft SQL Server uses a relational database model which uses table structures to store data and common fields to establish relationships between tables. Please review the following examples:

The Vendors table in an Accounts Payable (AP) database



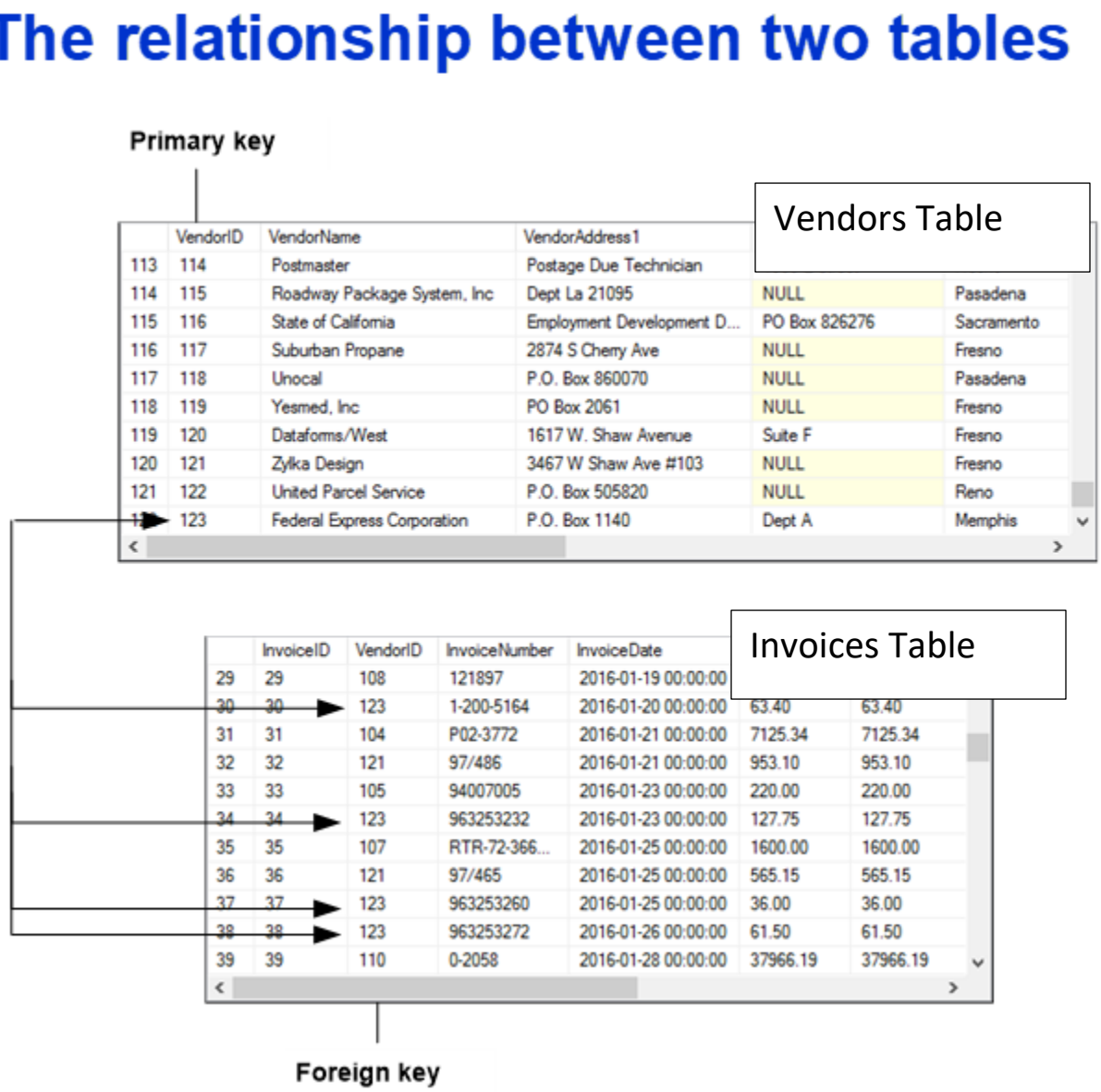
	VendorID	VendorName	VendorAddress1	VendorAddress2	VendorCity
1	1	US Postal Service	Attn: Supt. Window Services	PO Box 7005	Madison
2	2	National Information Data Ctr	PO Box 96621	NULL	Washington
3	3	Register of Copyrights	Library Of Congress	NULL	Washington
4	4	Jobtrak	1990 Westwood Blvd Ste 260	NULL	Los Angeles
5	5	Newbrige Book Clubs	3000 Cindel Drive	NULL	Washington
6	6	California Chamber Of Commerce	3255 Ramos Cir	NULL	Sacramento
7	7	Towne Advertiser's Mailing Svcs	Kevin Minder	3441 W Macarthur Blvd	Santa Ana
8	8	BFI Industries	PO Box 9369	NULL	Fresno
9	9	Pacific Gas & Electric	Box 52001	NULL	San Francisc
10	10	Robbins Mobile Lock And Key	4669 N Fresno	NULL	Fresno
11	11	Bill Marvin Electric Inc	4583 E Home	NULL	Fresno
12	12	City Of Fresno	PO Box 2069	NULL	Fresno
13	13	Golden Eagle Insurance Co	PO Box 85826	NULL	San Diego
14	14	Expedata Inc	4420 N. First Street, Suite 108	NULL	Fresno
15	15	ASC Signs	1528 N Sierra Vista	NULL	Fresno
16	16	Internal Revenue Service	NULL	NULL	Fresno

Table: Vendors

Columns (**fields**): VendorID, VendorName, VendorAddress1, etc.
Primary key: What uniquely identifies a vendor? _____
Records: Each vendor row is referred to as a single record.

Tables are related on a common field or fields. The example below shows the relationship between two tables: Vendors and Invoices

- Notice how a table is a matrix, like excel



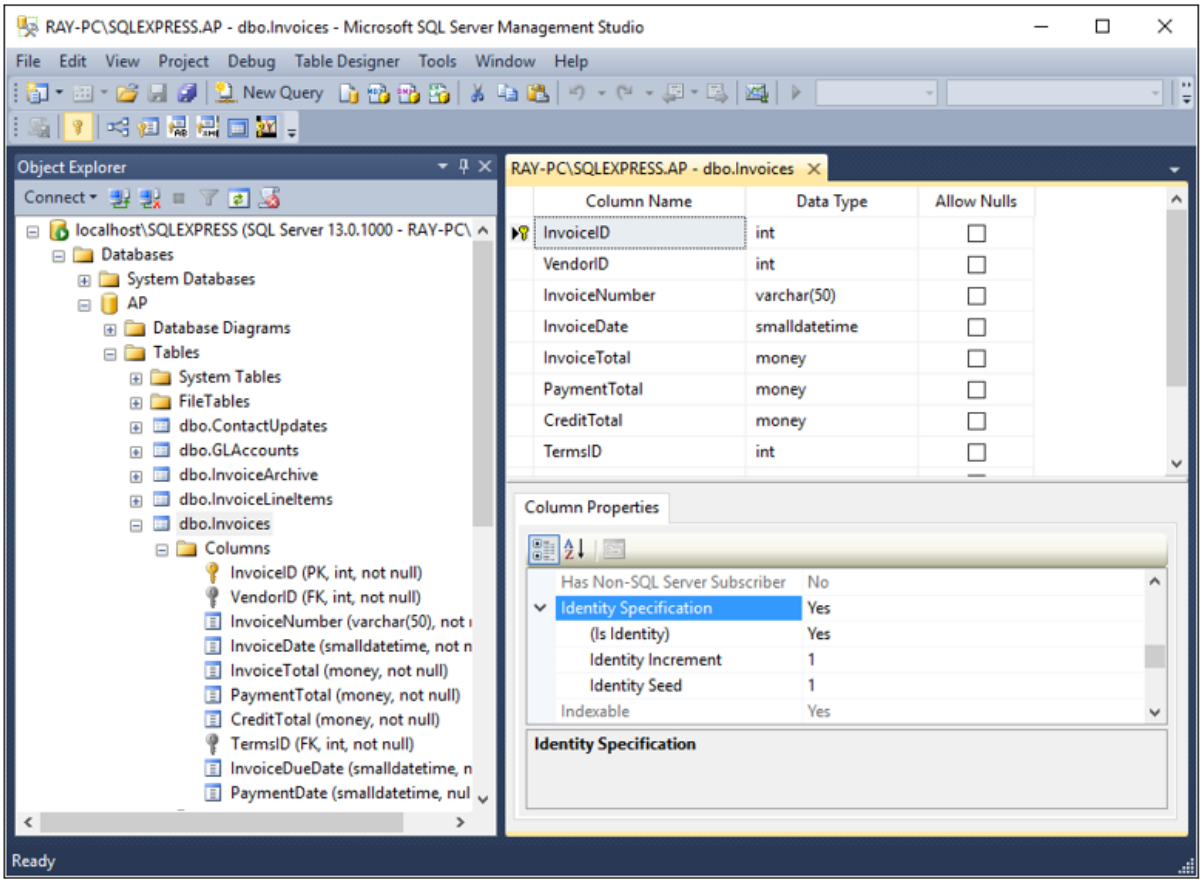
The common field between the tables Vendors and Invoices is the _____ field. This field is defined as the _____ key for the Vendors table and a _____ key for the Invoices table. This is an example of a _____ to _____ relationship since one Vendor in the vendors table can be found many times in the Invoices table.

- Vendor ID, why not Vendor Name? – primary, foreign – parent/child

Topic #4: Table Structure

When working with the SQL language it is very important to know about each table structure contained in a database. The following is an example of a table structure for the Invoices table:

The columns of the Invoices table



Common SQL Server data types

integer data types
- bit
- int, bigint, smallint, tinyint

decimal data types
- money, smallmoney
- decimal, numeric
- float, real
- datetime, smalldatetime

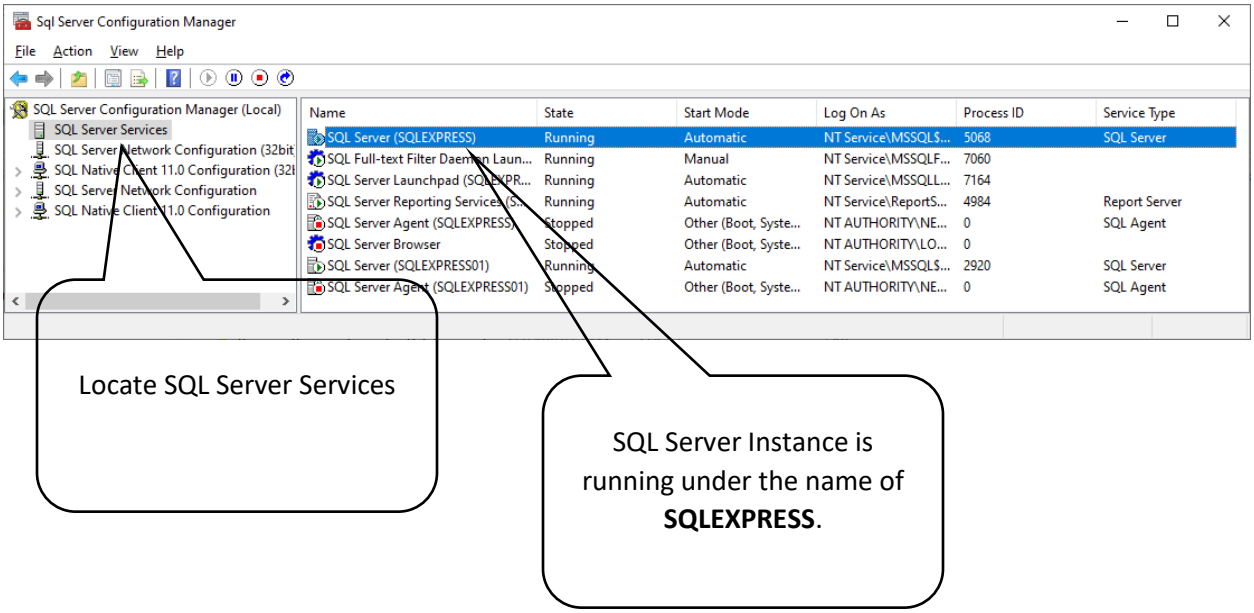
string data types
- char, varchar
- nchar, nvarchar

Topic #5: SQL Server Management Studio - SSMS

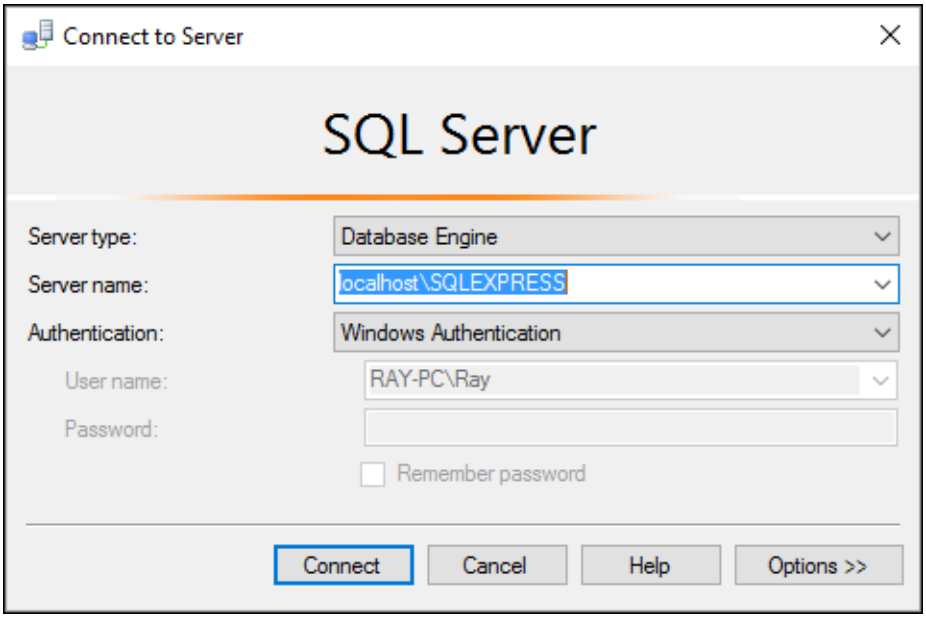
The instructor has provided a separate set of notes that you can follow to setup a SQL Server instance on your home computer along with the SQL Server Management Studio (SSMS) tool. The following are screen shots of some important windows that you will use throughout the course:

The **Configuration Manager** indicates how many SQL Server instances are running on a computer. This will be available after completing the installation process for SQL Server 2019 Express and can be found on your Start menu structure. You will most likely have one instance running which in the example below is named **SQLEXPRESS**.

The SQL Server Configuration Manager (Services)



To run **SSMS (SQL Server Management Studio)**, you will click the Windows Start icon, scroll down to the **Microsoft SQL Server Tools** folder and launch **Microsoft SQL Server Management Studio 18**. Once in SSMS, you will have to start a new instance by connecting to the server named **localhost\SQLEXPRESS**. The following is an example:



CONNECTING AT HOME

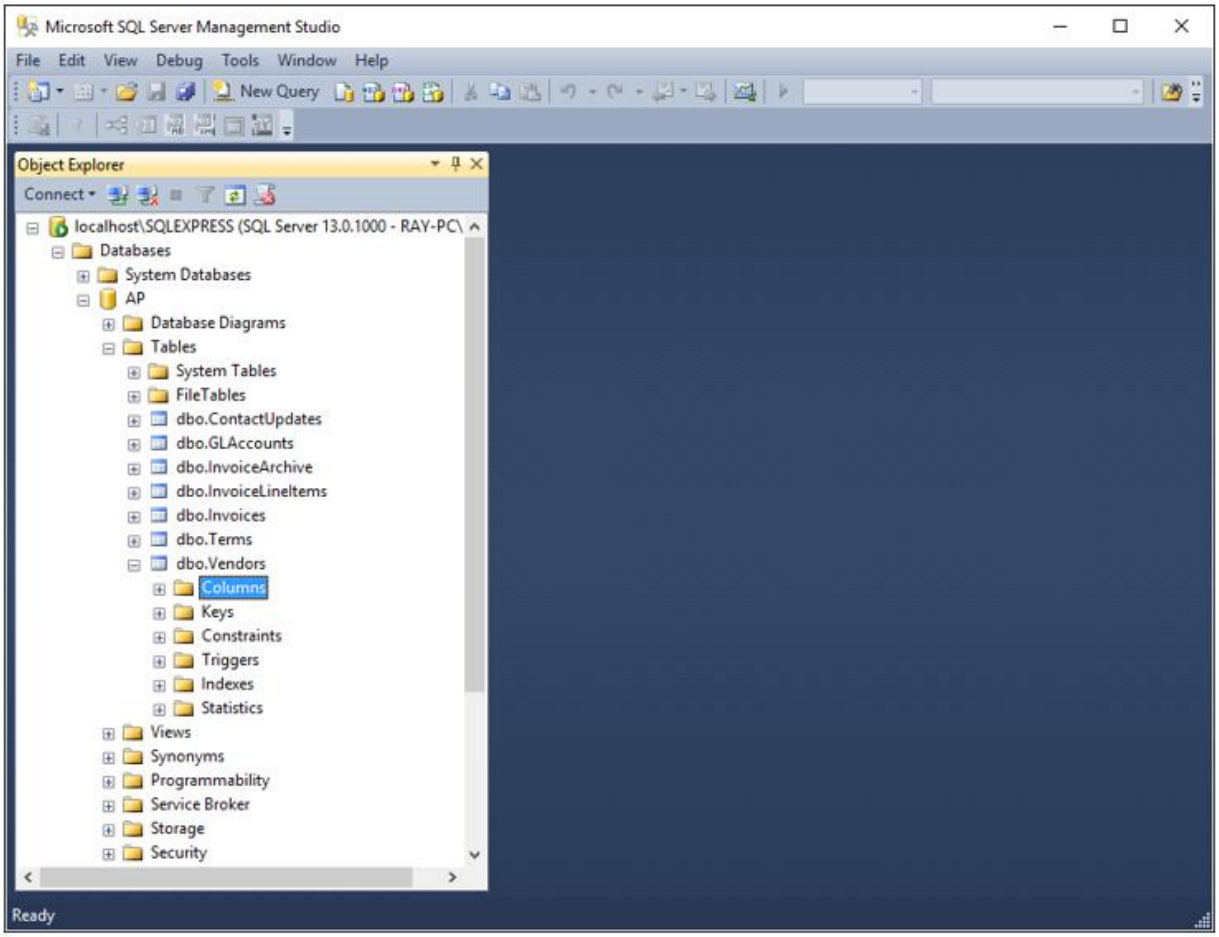
- ✓ The **Server name** will be your computer name\SQLEXPRESS. This should be prefilled for you after you launch SSMS.
- ✓ **Authentication**: When you are doing the work at home you will always use Windows Authentication. During the installation process of SQL Server 2019 Express your windows account was automatically added to the SQL Server instance, therefore, you will not be prompted for a username and password.

CONNECTING AT Henry Ford College

- ✓ **Server name: cissql**
- ✓ **Authentication: SQL Server Authentication – to avoid having the instructor setup every student's windows account within the cissql instance a separate SQL Server account was created for all students to use on all CIS lab computers.**
- ✓ **Username and password will be supplied by instructor**

Once you are connected you can use the **Object Explorer** window to work with any databases that you have created or attached to your SQL Server instance.

The Management Studio and the Object Explorer



The default directory for SQL Server 2019 databases

```
C:\Program Files\Microsoft SQL Server\
MSSQL15.SQLEXPRESS\MSSQL\DATA
```

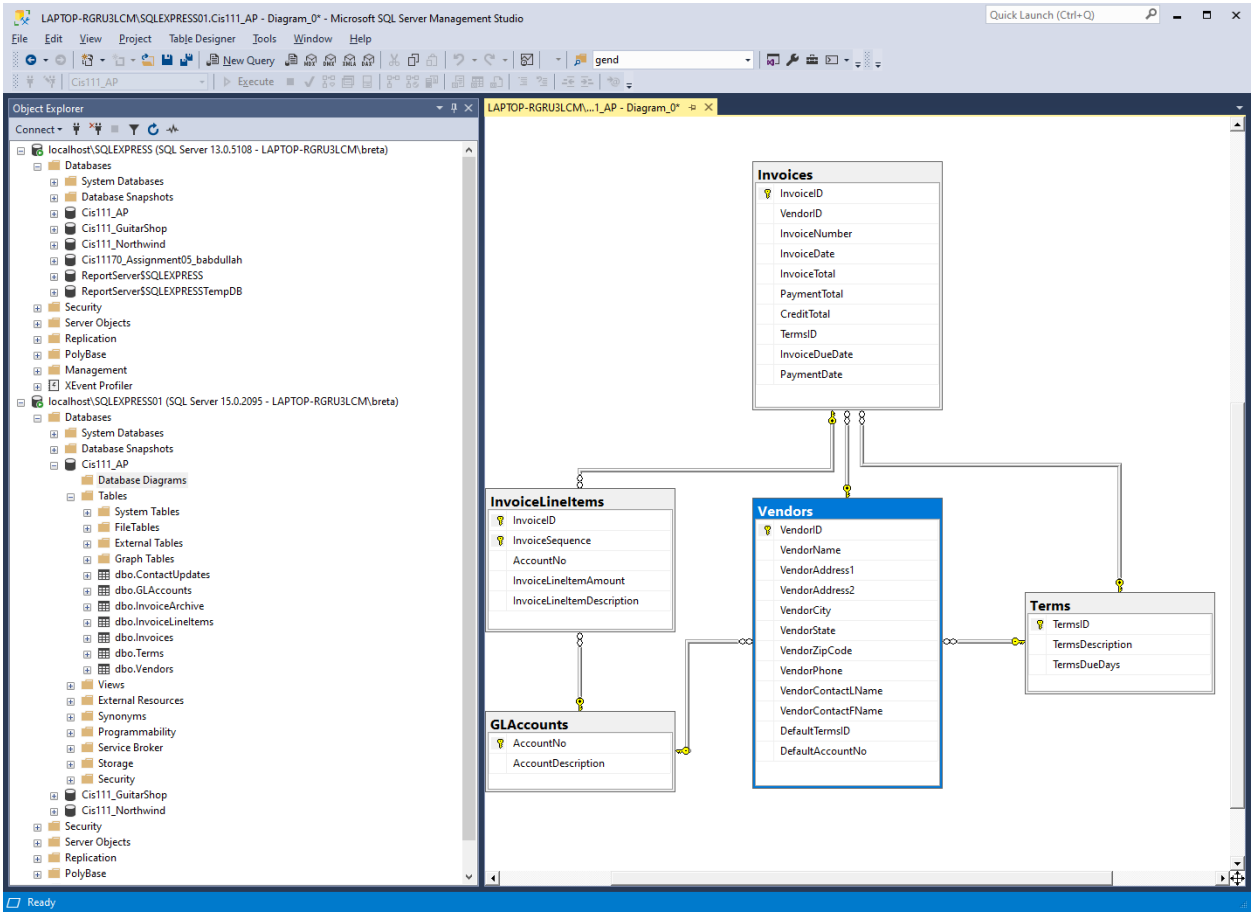
Two Types of SQL Statements:

- **SQL Statements used to work with data – Data Manipulation Language (DML)**
  - **Examples are: SELECT, INSERT, UPDATE, DELETE**
- **SQL Statements used to work with database objects – Data Definition Language (DDL)**
  - **Examples are: CREATE, ALTER, DROP**

One helpful task to do after creating all table structures of a database is to create a **database diagram** to show table structures and their relationships.

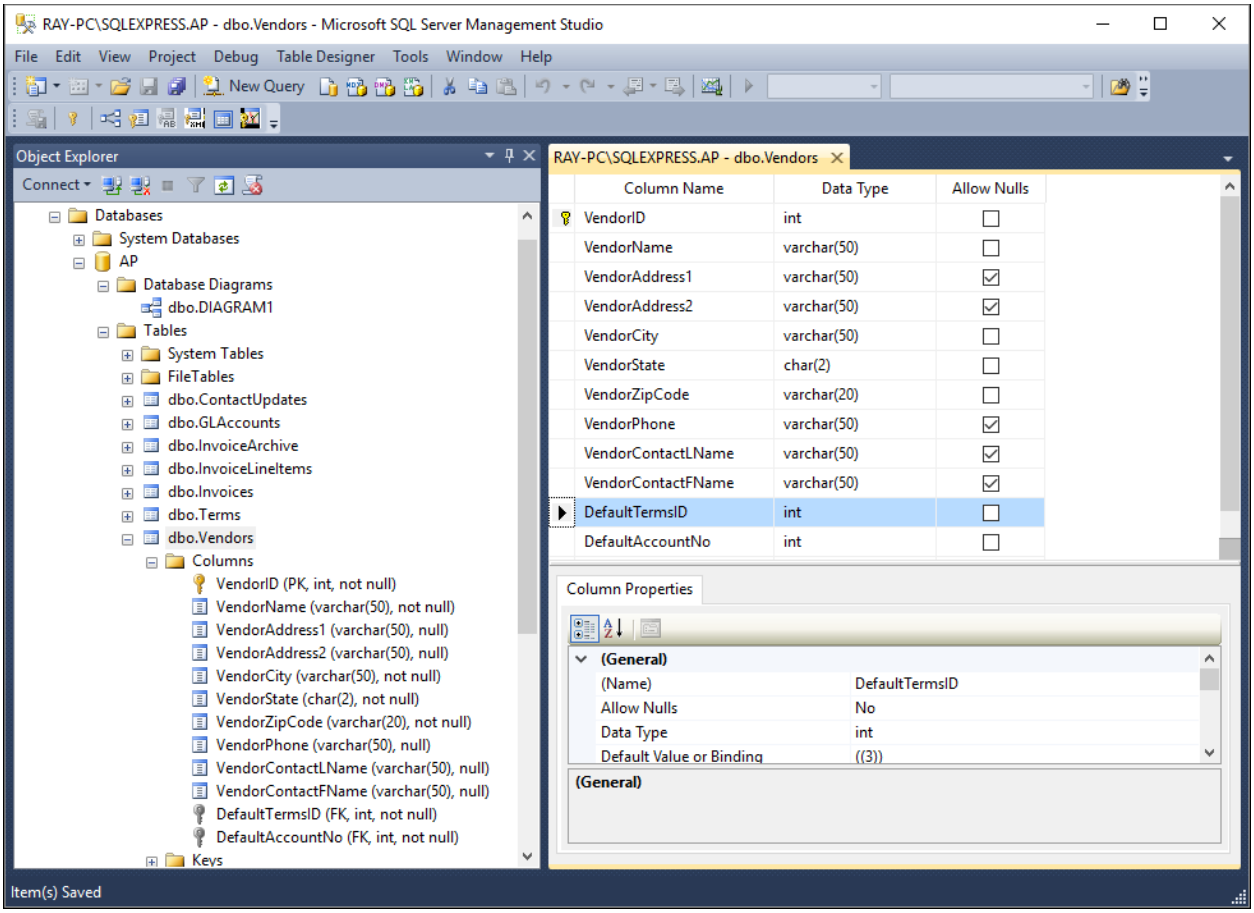
How is this done? Right-click the Database Diagram folder of a specific database and select New Database Diagram

The relationships in the AP database



There are times when you will need to view the **design** of the table structure, especially if you want to know the characteristics of a column.

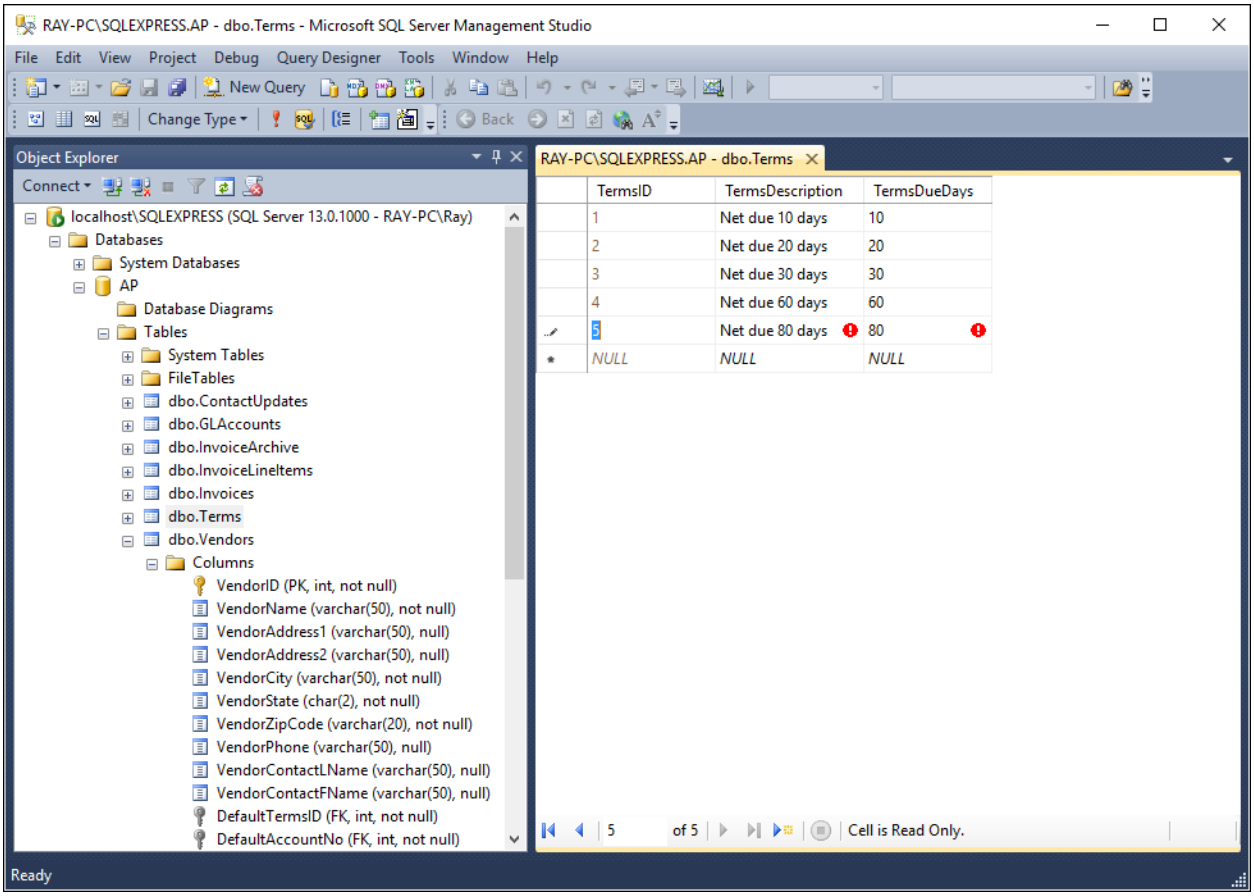
How is this done? Locate the table, right-click it, and then click **Design**.



Data can be modified within SSMS.

How is this done? Locate the table, right-click it, and then click **Edit Top 200 rows**.

PLEASE DO NOT MODIFY DATA AT HFC!!!



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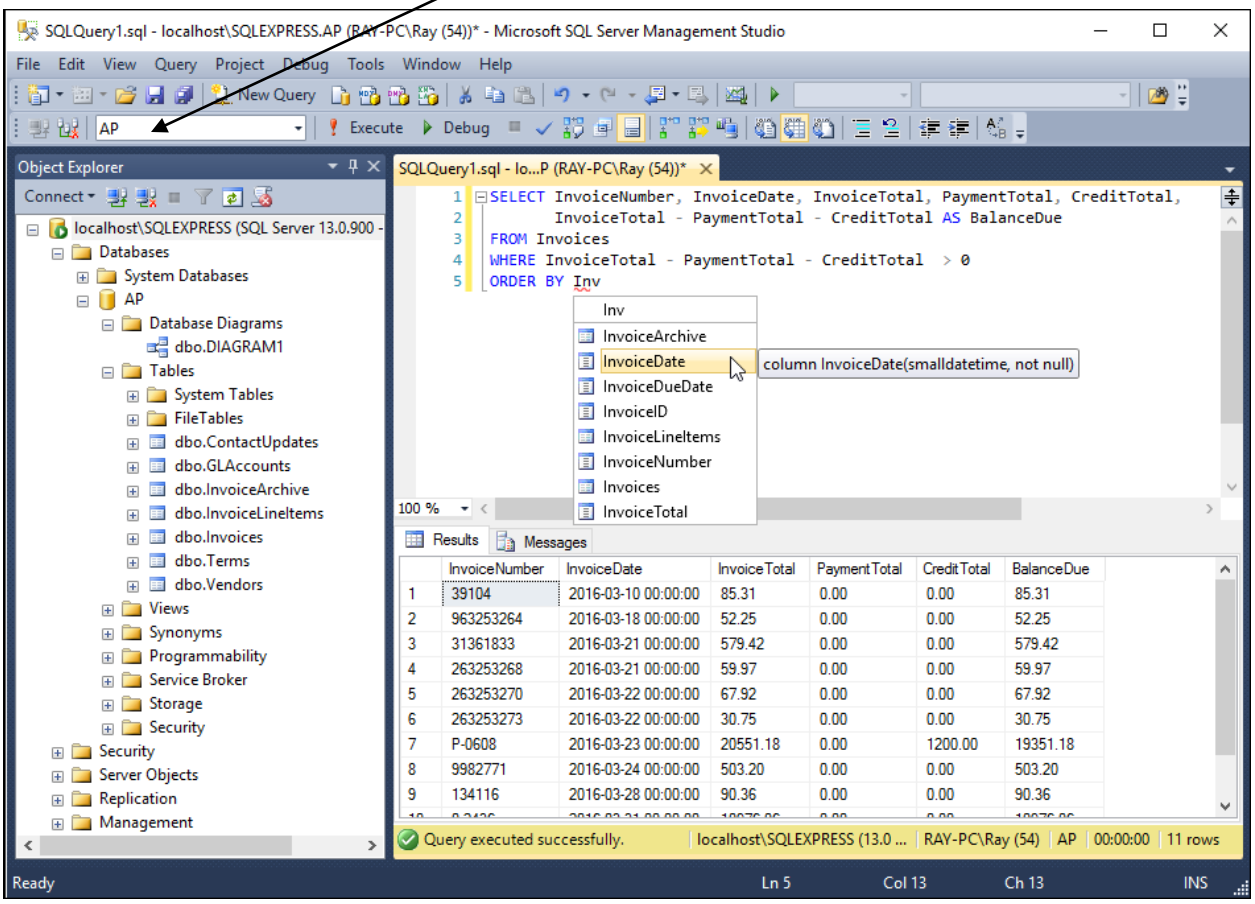
Code and execute a SQL query such as a Select statement.

How is this done? Click the New Query toolbar button. Code your SQL statement.

NOTE: It is always important to know which database you are using!!!



Yes, you will receive errors :(

How is this done? Code an invalid SQL statement.