



Data Definition Language (DDL) and SQL Data Types

.NET

*A software system used to maintain a relational database is called a Relational Database Management System (RDBMS). Many relational database systems use **Structured Query Language (SQL)** for querying and maintaining a database.*

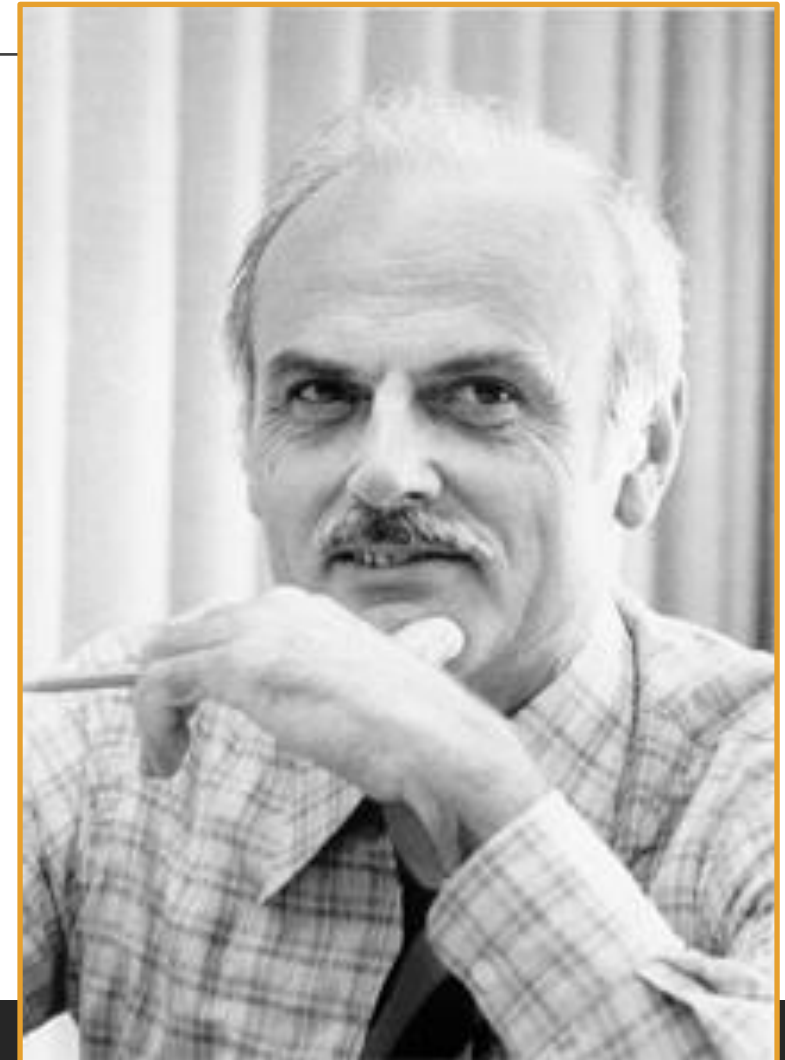
[HTTPS://DOCS.MICROSOFT.COM/EN-US/SQL/T-SQL/LANGUAGE-REFERENCE?](https://docs.microsoft.com/en-us/sql/t-sql/language-reference?)

(RDBMS) Relational Database Management System – History

https://en.wikipedia.org/wiki/Relational_database

Relational databases are based on the relational model of data, as proposed by E. F. Codd in 1970.

Edgar Frank "Ted" Codd (August 23, 1923 – April 18, 2003) was a British computer scientist and winner of the 1981 Turing Award.



SQL (Structured Query Language)

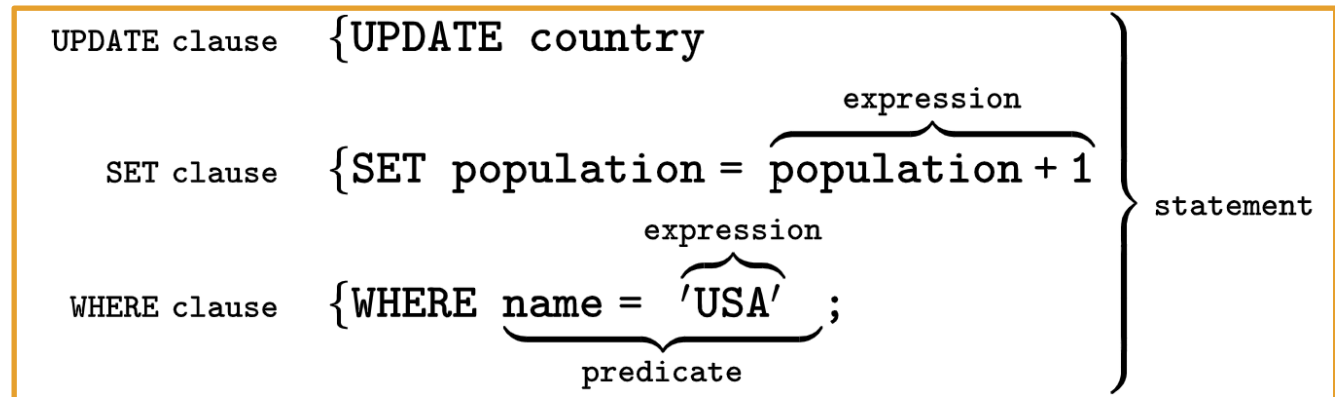
<https://en.wikipedia.org/wiki/SQL>

SQL was originally based upon relational algebra and tuple relational calculus. SQL is a declarative language. We say what data we want, not how to get it. We cannot manage how SQL obtains the data.

The scope of SQL includes data query, data manipulation (insert, update and delete), data definition (schema creation and modification), and data access control.

SQL consists of two main types of statements:

- Data Definition Language (DDL)
- Data Manipulation Language (DML).



Microsoft and T-SQL

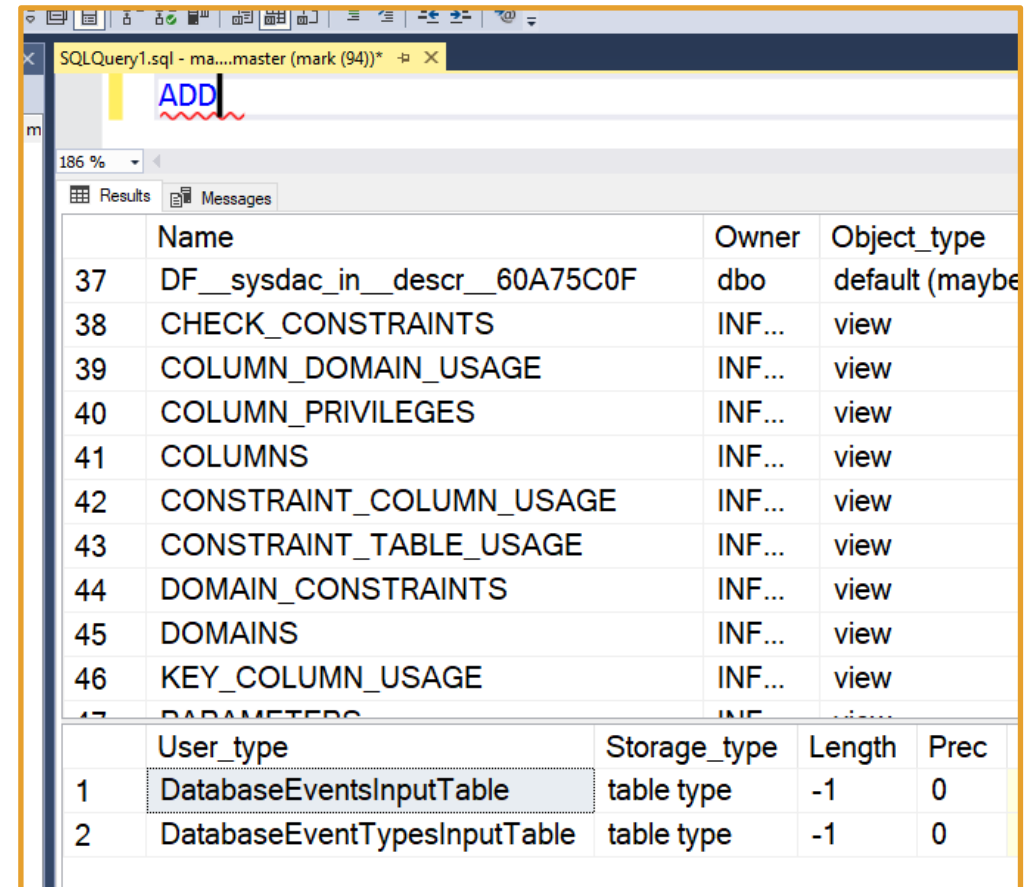
<https://docs.microsoft.com/en-us/sql/t-sql/language-reference?view=sql-server-ver15#tools-that-use-t-sql>

T-SQL is central to using Microsoft SQL products and services. All tools that communicate with a SQL database send T-SQL commands. SQL works on top of T-SQL.

Some of the Microsoft tools that issue T-SQL commands are:

- SQL Server Management Studio (SSMS)
- SQL Server Data Tools (SSDT)
- Azure Data Studio

*You can type a T-SQL keyword in the SSMS Query Editor window and press F1 to get data about any T-SQL Keyword.

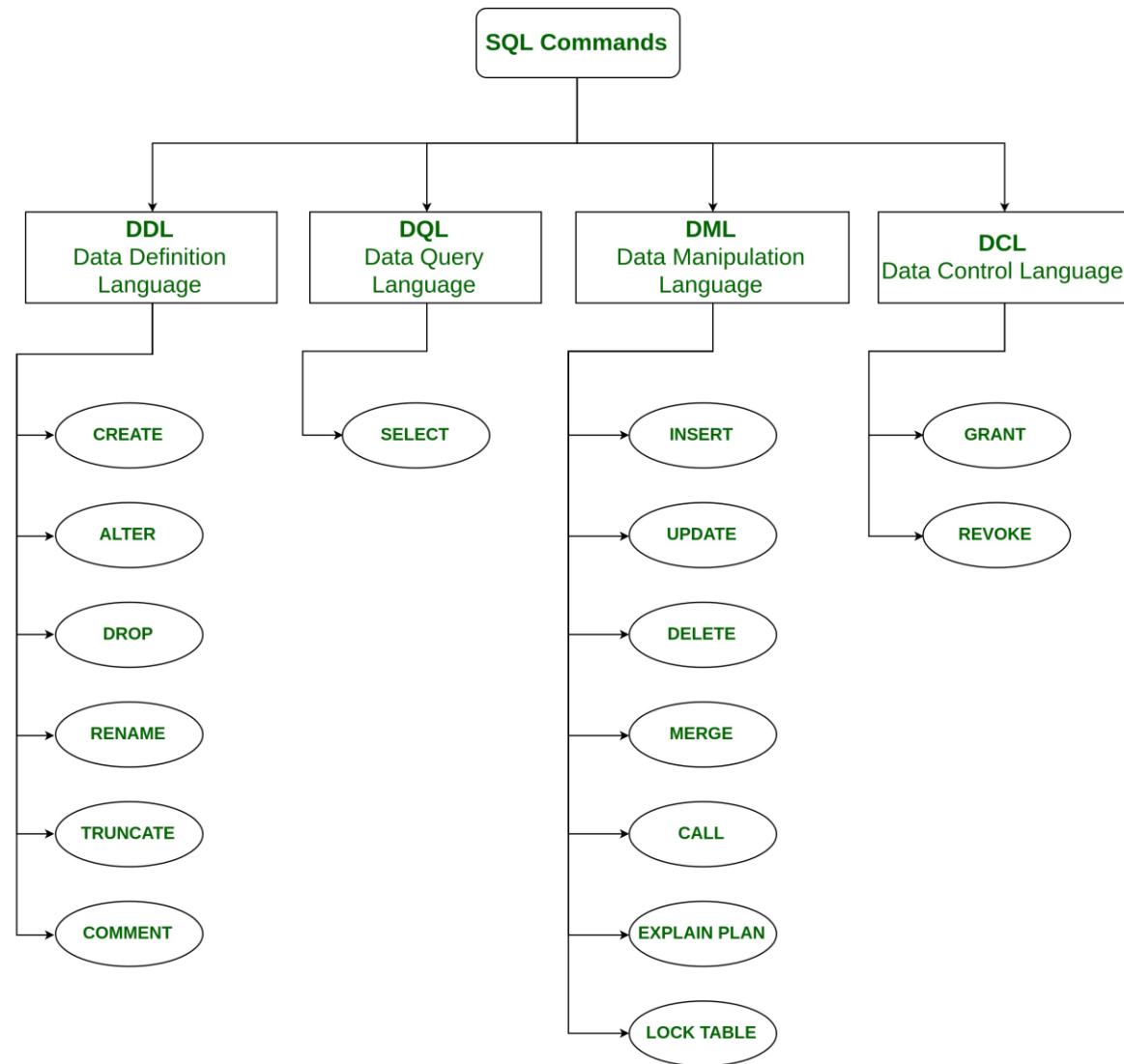


The screenshot shows the SQL Server Enterprise Edition interface. The Query Editor window displays the command 'ADD'. The 'Results' pane shows a list of system views and tables. The first table has columns 'Name', 'Owner', and 'Object_type'. The second table has columns 'User_type', 'Storage_type', 'Length', and 'Prec'.

	Name	Owner	Object_type
37	DF__sysdac_in__descr__60A75C0F	dbo	default (maybe)
38	CHECK_CONSTRAINTS	INF...	view
39	COLUMN_DOMAIN_USAGE	INF...	view
40	COLUMN_PRIVILEGES	INF...	view
41	COLUMNS	INF...	view
42	CONSTRAINT_COLUMN_USAGE	INF...	view
43	CONSTRAINT_TABLE_USAGE	INF...	view
44	DOMAIN_CONSTRAINTS	INF...	view
45	DOMAINS	INF...	view
46	KEY_COLUMN_USAGE	INF...	view
47	PARAMETERS	INF...	view

	User_type	Storage_type	Length	Prec
1	DatabaseEventsInputTable	table type	-1	0
2	DatabaseEventTypesInputTable	table type	-1	0

Types of SQL Commands



Data Definition Language

<https://docs.microsoft.com/en-us/sql/t-sql/statements/statements?view=sql-server-ver15#data-definition-language>

Data Definition Language (DDL) statements define the structure of the DB. DDL statements create, alter, or drop the data structures (tables) of a database.

- [ALTER](#) - Modifies a table definition by altering, adding, or dropping columns and constraints.
- [CREATE](#) - creates a new database
- [DROP](#) - Removes one or more table definitions and all data, indexes, triggers, constraints, and permission specifications for those tables.

SQL – **Create** and **Drop** an empty DB

```
CREATE DATABASE databasename;
```

```
DROP DATABASE databasename;
```

*Deleting a database will result in complete loss of information stored in the database!

SQL – **Create** and **Drop** a table

```
CREATE TABLE table_name (  
    column1 datatype,  
    column2 datatype,  
    column3 datatype,  
    ....  
);
```

```
DROP TABLE table_name;
```

```
CREATE TABLE Persons (  
    PersonID int,  
    LastName varchar(255),  
    FirstName varchar(255),  
    Address varchar(255),  
    City varchar(255)  
);
```

```
DROP TABLE Shippers;
```

*Deleting a table will result in complete loss of information stored in the table!

SQL with SQL Server

In *SQL Server*, every table must be in a schema.

```
CREATE SCHEMA Poke;  
GO
```

```
--CREATE TABLE Poke.Pokemon;  
CREATE TABLE Poke.Pokemon (  
    PokemonId INT NOT NULL IDENTITY(1000, 1),  
    Name NVARCHAR(50) NOT NULL,  
    Height DECIMAL(6,2) NULL,  
    TypeId INT NOT NULL FOREIGN KEY REFERENCES Poke.Type (TypeId),  
    DateModified DATETIME2 NOT NULL DEFAULT (GETDATE()),  
    CONSTRAINT CK_Height_Nonnegative CHECK (Height IS NULL OR Height >= 0)  
);
```

Create a Table in SQL Server

<https://docs.microsoft.com/en-us/sql/t-sql/lesson-1-creating-database-objects?view=sql-server-ver15#create-a-table>

To create a table, you must provide:

1. a name for the table
2. name of each column
3. data type of each column
4. a unique primary key.
5. Is the field nullable?

```
CREATE TABLE dbo.Products
(ProductID int PRIMARY KEY NOT NULL,
ProductName varchar(25) NOT NULL,
Price money NULL,
ProductDescription varchar(max) NULL)
GO
```

```
CREATE TABLE dbo.Products
(ProductID int PRIMARY KEY NOT NULL,
ProductName varchar(25) NOT NULL,
Price money NULL,
ProductDescription varchar(max) NULL)
GO
```

SQL – String Data Types

<https://docs.microsoft.com/en-us/sql/t-sql/data-types/char-and-varchar-transact-sql?view=sql-server-ver15>

Data Type	Description
CHAR(n)	Fixed-length up to “n”, 0 to 255, Default 1
VARCHAR(n)	Variable length up to “n”. 0 to 65535
NCHAR(7)	Fixed-length, Unicode string
NVARCHAR(n)	variable-length Unicode string up to “n”. <small>*Use this unless you specifically need to use something else.</small>

There are a many functions to deal with strings:

- LEN(), SUBSTRING(), CHARINDEX(), REPLACE(), LOWER(), UPPER()

SQL – Integer Data Types

<https://docs.microsoft.com/en-us/sql/t-sql/data-types/data-types-transact-sql?view=sql-server-ver15#exact-numeric>

Data Type	Description
BIT	It's a bit. Values 1 to 64. Default 1
TINYINT	Signed = -128 to 127. unsigned = 0 to 255
BOOL	Max 255 bytes. 0 = false, 1 = true
SMALLINT	Max 65535 bytes
INT	signed = -2147483648 to 2147483647. (Use this unless you need something else) unsigned = 0 to 4294967295
BIGINT	-2 ⁶³ (-9,223,372,036,854,775,808) to 2 ⁶³ -1 (9,223,372,036,854,775,807)

SQL –Data Types with decimals

<https://docs.microsoft.com/en-us/sql/t-sql/data-types/data-types-transact-sql?view=sql-server-ver15#approximate-numeric>

Data Type	Description
FLOAT(n)	n is the number of bits that are used to store the floats <i>mantissa</i> and dictates the precision and storage size. If n is specified, it must be a value between 1 and 53 . Default is 53 .
DECIMAL(size, d)	An exact fixed-point number. size = total digits(default 10, max 65). d = number of digits after the decimal point(default 0, max 30).

Note:

Float stores an approximate value and decimal stores an exact value. In summary, exact values like money should use decimal, and approximate values like scientific measurements should use float.

SQL – Date and Time Data Types

<https://docs.microsoft.com/en-us/sql/t-sql/data-types/date-and-time-types?view=sql-server-ver15>

Data Type	Description
DATE	Format: YYYY-MM-DD. From '1000-01-01' to '9999-12-31'
DATETIME(fsp)	Format: YYYY-MM-DD hh:mm:ss. Add DEFAULT and ON UPDATE in the column definition to get automatic initialization and updating to the current date and time
TIMESTAMP(fsp)	The number of seconds since the Unix epoch. Format: YYYY-MM-DD hh:mm:ss. Automatic initialization and updating with DEFAULT CURRENT_TIMESTAMP and ON UPDATE CURRENT_TIMESTAMP in the column definition.
TIME(fsp)	hh:mm:ss. From '-838:59:59' to '838:59:59'
YEAR	1901 to 2155, and 0000. MySQL 8.0 does not support year in two-digit format.
DATETIMEOFFSET	For storing intervals of time. Use YEAR() to extract parts of the dates/times, DATEPART(YEAR FROM '2019-01-01') or DATEPART(YEAR, '2019-01-01')

SQL – Currency Data Types

<https://docs.microsoft.com/en-us/sql/t-sql/data-types/data-types-transact-sql?view=sql-server-ver15#exact-numeric>

Data Type	Description
MONEY	From -922,337,203,685,477.5808 to 922,337,203,685,477.5807 prints with '\$'
SMALLMONEY	From -214,748.3648 to 214,748.3647 prints with '\$'

SQL – Table Constraints

<https://docs.microsoft.com/en-us/sql/t-sql/statements/alter-table-table-constraint-transact-sql?view=sql-server-ver15>

<i>UNIQUE(columns)</i>	Makes sure all the values in a column are unique.
<i>REFERENCES tablename(colName)</i>	Denotes the Primary Key that a Foreign Key column references. This is checked to maintain referential integrity when changing values.
<i>CHECK(condition)</i>	Enforces that some expression is true for every row in a column.
<i>PRIMARY KEY(columns)</i>	Allows you to define a primary key made up of multiple columns.

SQL – Column Constraints

<https://docs.microsoft.com/en-us/sql/t-sql/statements/alter-table-table-constraint-transact-sql?view=sql-server-ver15>

NOT NULL	Column does not accept NULL as a value
NULL	Column accepts NULL as a value. NULL will be the default value.
PRIMARY KEY	Value must be unique within this column.
UNIQUE	NOT NULL, UNIQUE, and by default sets a CLUSTERED INDEX .
FOREIGN KEY	By default, sets a NONCLUSTERED INDEX
DEFAULT(value)	Configures a default value for that column
IDENTITY(start, inc)	Sets up an auto-incrementing column and prevents insertion of a value. Default Clustered but not unique. You must also use PRIMARY KEY to ensure uniqueness.
EXCLUSION	Ensures that if any two rows are compared on the specified column, not all comparisons return TRUE. This is dependent on other constraints.

ALTER Table

<https://docs.microsoft.com/en-us/sql/t-sql/statements/alter-table-transact-sql?view=sql-server-ver15>

ALTER TABLE

- modifies a table definition by altering, adding, or dropping columns and constraints.
- reassigns and rebuilds partitions or disables and enables constraints and triggers.

```
ALTER TABLE Poke.Pokemon ADD  
Active BIT NOT NULL DEFAULT 1;
```

```
ALTER TABLE Addresses  
DROP COLUMN ZipCode;
```