Data Definition Language SQL Data Types

.NET CORE

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

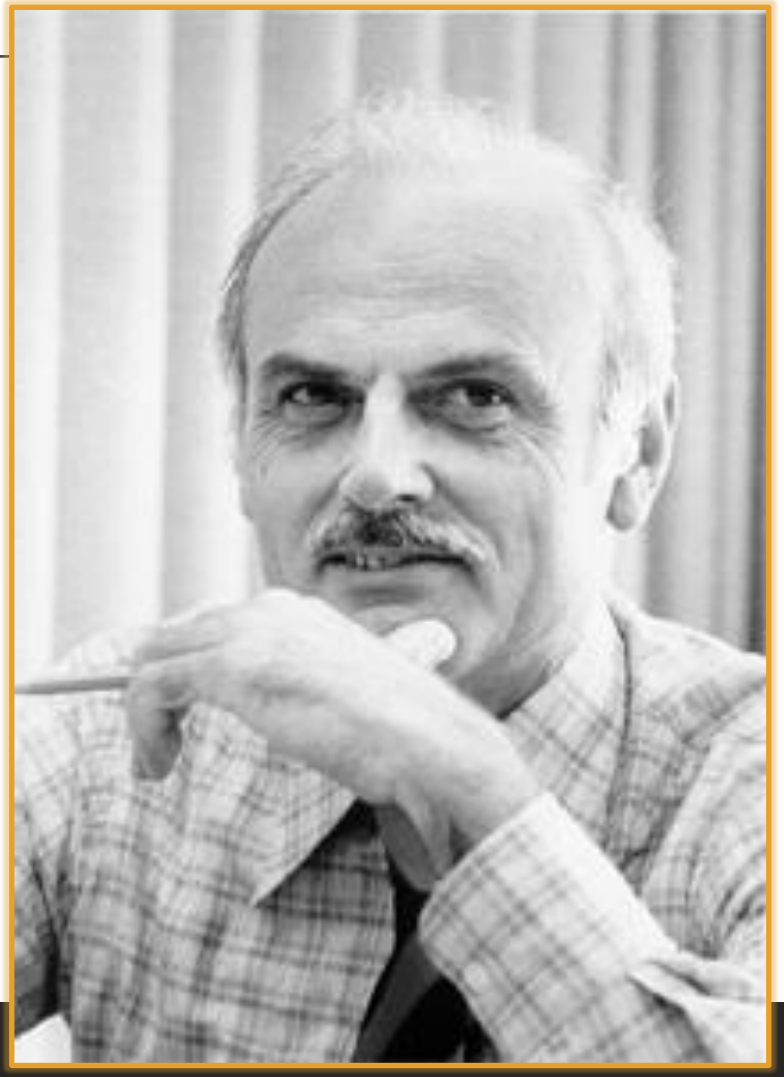
HTTPS://DOCS.MICROSOFT.COM/EN-US/SQL/T-SQL/LANGUAGE-REFERENCE?VIEW=SQL-SERVER-VER15

(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.



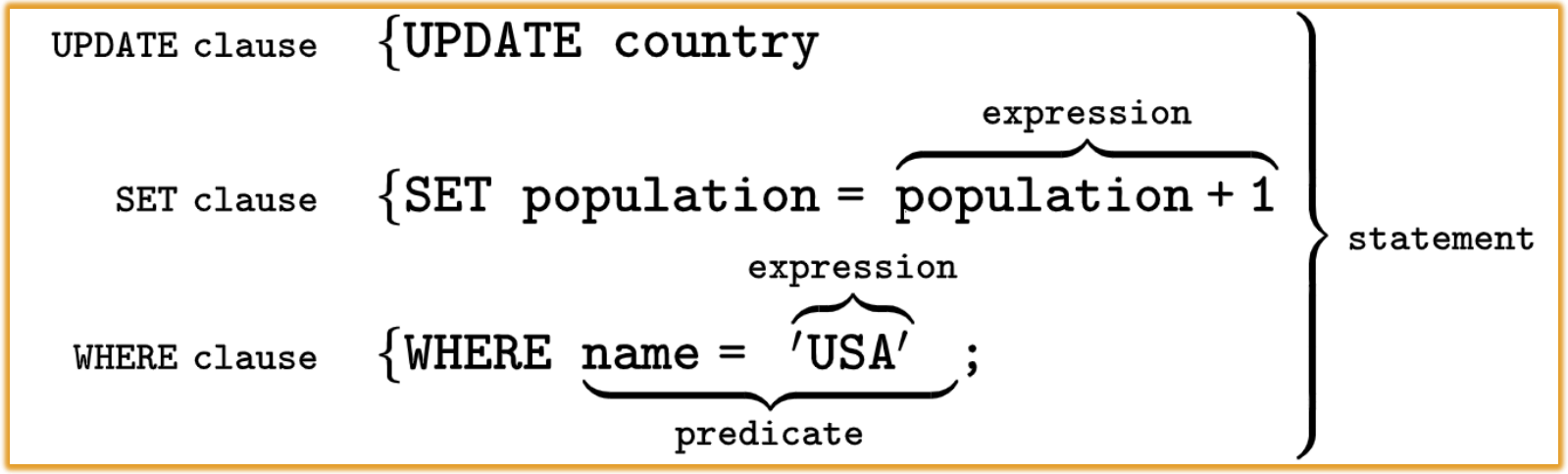
SQL (Structured Query Language)

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

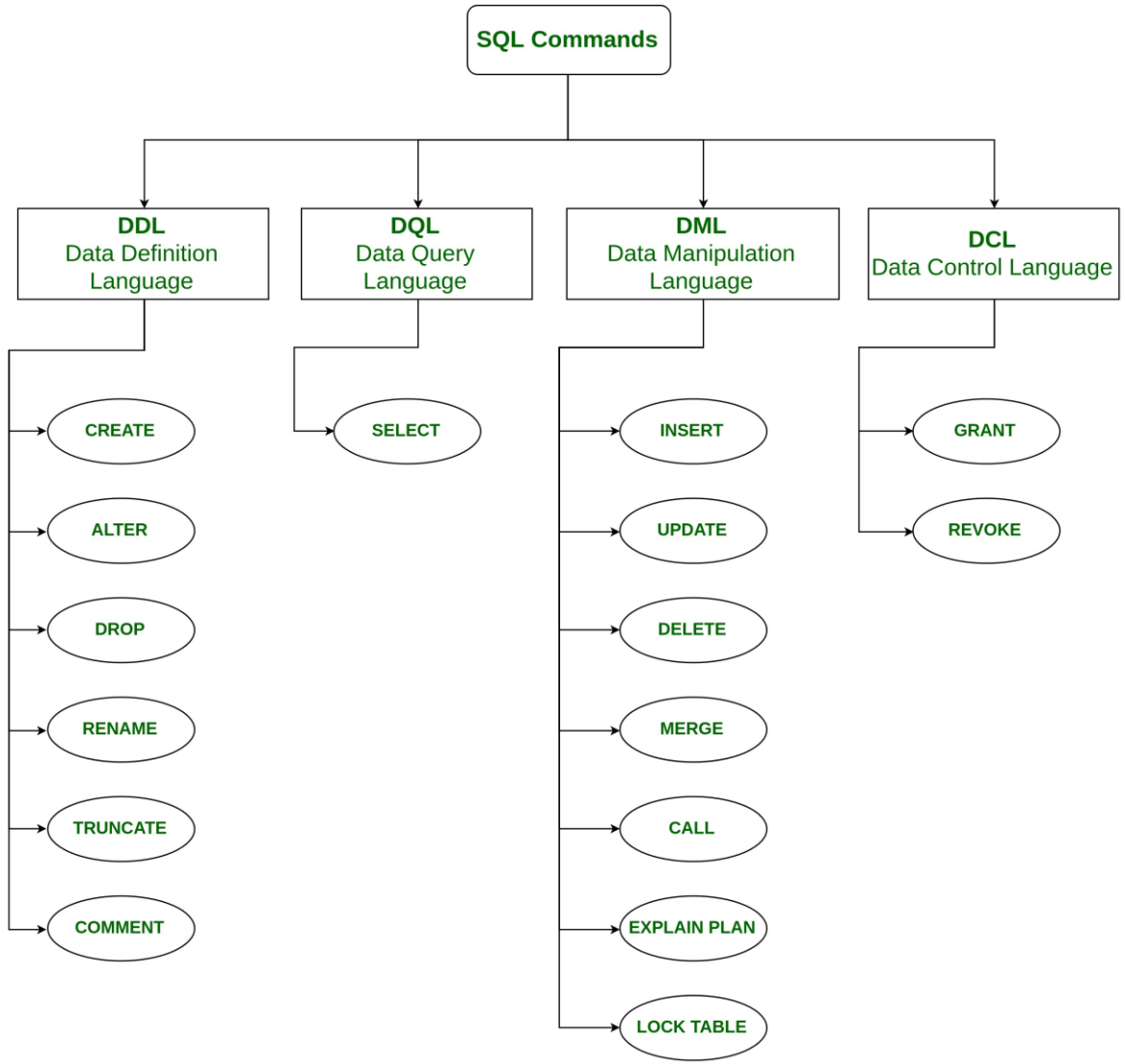
SQL was originally based upon relational algebra and tuple relational calculus. SQL is a declarative language. We say what data we want, not how to get it. We cannot manage how SQL obtains the data.
The scope of SQL includes data query, data manipulation (insert, update and delete), data definition (schema creation and modification), and data access control.

SQL consists of two main types of statements:

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



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

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Data Definition Language (DDL) statements define the structure of the DB. Use these statements (and others) to create, alter, or drop data structures (tables) in 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*** a 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,
   ....
);
```

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

```
DROP TABLE table_name;
```

```
DROP TABLE Shippers;
```

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

SQL with SQL Server

In SQL, every object (e.g. 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)
);
```

SQL – Attribute 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 explicitly accepts NULL as a value. (NULL will be the default value)
PRIMARY KEY	value must be unique within this column
UNIQUE	implies NOT NULL and UNIQUE, and by default sets a ***CLUSTERED INDEX***.
FOREIGN KEY	by default sets a NONCLUSTERED INDEX
CHECK	enforces that some expression is true for every row
DEFAULT	configures a default value for that column
IDENTITY	this sets up an auto-incrementing default, AND prevents anyone from inserting their own value

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;
```

AGGREGATE Functions

https://docs.microsoft.com/en-us/sql/t-sql/functions/aggregate-functions-transact-sql?view=sql-server-ver15
https://docs.microsoft.com/en-us/sql/t-sql/functions/functions?view=sql-server-ver15#aggregate-functions

Aggregate functions:

- perform a calculation on a set of values and returns a single value.
- ignore null values (except for ***COUNT***).
- are often used with the ***GROUP BY*** clause of the ***SELECT*** statement.
- return the same value each time they are called.

APPROX_COUNT_DISTINCT	MIN
AVG	STDEV
CHECKSUM_AGG	STDEVP
COUNT	STRING_AGG
COUNT_BIG	SUM
GROUPING	VAR
GROUPING_ID	VARP
MAX	

These are Aggregate functions

AVG( ) - Average

https://docs.microsoft.com/en-us/sql/t-sql/functions/avg-transact-sql?view=sql-server-ver15

AVG( ) computes the average of a set of values by dividing the sum of those values by the count of nonnull values. If the sum exceeds the maximum value for the data type of the return value, ***AVG( )*** will return an error. ***AVG( )*** can have one or 2 arguments.

- ALL – (default) Applies the aggregate function to all values.
- DISTINCT - Specifies that AVG operates only on one unique instance of each value, regardless of how many times that value occurs.

EX. ‘ **SELECT AVG(ALL NumbersColumn) FROM TableName;** ’ returns the average of all numbers. Even duplicates.

```
SELECT AVG(VacationHours)AS 'Average vacation hours',
    SUM(SickLeaveHours) AS 'Total sick leave hours'
FROM HumanResources.Employee
WHERE JobTitle LIKE 'Vice President%';
```

COUNT( )

https://docs.microsoft.com/en-us/sql/t-sql/functions/count-transact-sql?view=sql-server-ver15

COUNT( ) returns the number of items found in a group. ***COUNT( )*** always returns an int data type value.

It has two possible arguments

- ALL - Applies the aggregate function to all values. ALL serves as the default.
- DISTINCT - Specifies that COUNT returns the number of unique nonnull values.

```
SELECT COUNT(DISTINCT Title)
FROM HumanResources.Employee;
GO
```

SUM( )

https://docs.microsoft.com/en-us/sql/t-sql/functions/sum-transact-sql?view=sql-server-ver15

SUM can be used with numeric columns only. Null values are ignored.

SUM( ) has two possible arguments

- ALL - Applies the aggregate function to all values. ALL is the default.
- DISTINCT - Specifies that SUM returns the sum of unique values.

```
SELECT Color, SUM(ListPrice), SUM(StandardCost)
FROM Production.Product
WHERE Color IS NOT NULL
    AND ListPrice != 0.00
    AND Name LIKE 'Mountain%'
GROUP BY Color
ORDER BY Color;
GO
```

```
Color
-------------- --------------------- ----------
Black          27404.84              5214.9616
Silver         26462.84              14665.6792
White          19.00                 6.7926
```

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(n)	Fixed-length, Unicode string
NVARCHAR(n)	variable-length Unicode string. (Use this unless you nee to use something else)

There are a variety of functions for strings e.g. 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-numerics

Data Type	Description
BIT	It's a bit. 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. unsigned = 0 to 4294967295 (Use this unless you need something else)

SQL – Float Data Types

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

Data Type	Description
FLOAT(size,d)	size = total digits. d = number of digits after the decimal point
FLOAT(p)	If *p* is from 0 to 24, the data type becomes FLOAT(). If *p* is from 25 to 53, the data type becomes DOUBLE()
DOUBLE(size, d)	size = total digits. d = number of digits after the decimal point.
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).

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-numerics

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