

# SQL ( Structured Query Language ) DOCUMENTATION

## **DATA BASE MANAGEMENT SYSTEM (DBMS):**

Database Management System (**DBMS**) is a software that acts as an interface for storing, updating, retrieving user's data while considering appropriate security measures. It consists of a group of programs which manipulate the database and also manage how it is organized and optimized.

Four Types of DBMS systems are:

- Hierarchical database
- Network database
- Relational database
- Object-Oriented database

**DBMS** examples include MySQL, PostgreSQL, Microsoft Access, SQL Server, FileMaker, Oracle, RDBMS, dBASE etc.

## **Introduction to SQL :**

Structured Query Language (**SQL**) is the set of statements with which all programs and users access data from a DataBase.

**RDBMS** (Relational DataBase Management System) acts as the basis for the SQL. The data in RDBMS is in the form of tables which consists of rows and columns.

A **record**, also called a row, is each individual entry that exists in a table. For example, there are 91 records in the above Customers table. A record is a horizontal entity in a table.

A **column** is a vertical entity in a table that contains all information associated with a specific field in a table.

**SQL**(pronounced as 'sequel') is a standardized programming language(domain-specific language) used for managing relational databases.

SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987.

## **Why SQL ?**

- SQL can execute queries against a database
- SQL can retrieve data from a database
- SQL can insert records in a database
- SQL can update records in a database
- SQL can delete records from a database
- SQL can create new databases
- SQL can create new tables in a database
- SQL can create stored procedures in a database
- SQL can create views in a database
- SQL can set permissions on tables, procedures, and views

## History of SQL

Dr. E. F. Codd published the paper, "A Relational Model of Data for Large Shared Data Banks", in June 1970 in the Association of Computer Machinery (ACM) journal, *Communications of the ACM*. Codd's model is now accepted as the definitive model for relational database management systems (RDBMS). The language, Structured English Query Language (SEQUEL) was developed by IBM Corporation, Inc., to use Codd's model. SEQUEL later became SQL (still pronounced "sequel"). In 1979, Relational Software, Inc. (now Oracle) introduced the first commercially available implementation of SQL. Today, SQL is accepted as the standard RDBMS language.

**Examples** : MySQL, Oracle, MS SQL Server etc

However, to be compliant with the ANSI standard, they all support at least the major commands (such as **SELECT**, **UPDATE**, **DELETE**, **INSERT**, **WHERE**) in a similar manner along with providing their own extensions to the SQL Standard.

## Sql Commands Category

We have different sql commands for different-different purpose. We can grouped Sql Commands into five major categories depending on their functionality.

### 1. Data Definition Language (DDL)

These SQL commands are used to create, modify, and drop the structure of database objects like table, view, procedure, indexes etc. In this category we have CREATE, ALTER, DROP and TRUNCATE commands.

Command	Description
Create	Used to create objects.
Alter	Used to modify the created object.
Drop	Used to delete the object.

For Example,

```
CREATE DATABASE DB1
CREATE DATABASE DB2
```

```
USE DB1
```

```
CREATE TABLE tblDemo (
  Id int primary key,
  Name char(20)
)
```

```
DROP TABLE tableDemo1;
DROP DATABASE DB2;
```

```
ALTER TABLE tableDemo ADD BloodGroup varchar(2);
ALTER TABLE DROP COLUMN BloodGroup;
```

```
ALTER TABLE tableDemo ADD log DATE;
ALTER TABLE tableDemo ALTER COLUMN log DATETIME;
```

## 2. Data Manipulation Language (DML)

These SQL commands are used to store, modify, and delete data from database tables. In this category we have INSERT, UPDATE, and DELETE commands.

Command	Description
Insert	Insert data into table.
Delete	Delete data from the table.
Update	Update data into a table.
Insert	Insert bulk data into a table.

For Example,

```
INSERT INTO tblDemo VALUES (1,'Abhishek')
DELETE FROM tblDemo WHERE Id = 4
UPDATE tblDemo SET Name = 'Sunny' WHERE Id = 6
```

## 3. Transaction Control Language (TCL)

These SQL commands are used to handle changes which affect the data in database. Basically we use these commands with in the transaction or to make a stable point during changes in database at which we can rollback the database state if required. In this category we have SAVEPOINT, ROLLBACK and COMMIT commands.

Command	Description
Commit	Used to save any transaction permanently.
Rollback	This command is used to restore the database to its last committed state.
Save Tran	This command is used to save the transaction so that we can roll back that transaction to the point whenever necessary.

## 4. Data Control Language (DCL)

These SQL commands are used to implement security on database objects like table, view, stored procedure etc. In this category we have GRANT and REVOKE commands

Command	Description
Grant	Provide user access to the Database or any other object.
Revoke	Take back the access from the user.

**KEYS in DBMS** is an attribute or set of attributes which helps you to identify a row(tuple) in a relation(table). They allow you to find the relation between two tables. Keys help you uniquely identify a row in a table by a combination of one or more columns in that table.

## Types of Keys in Database Management System

There are mainly seven different types of Keys in DBMS and each key has its different functionality:

- **Super Key** - A super key is a group of single or multiple keys which identifies rows in a table.
- **Primary Key** - is a column or group of columns in a table that uniquely identify every row in that table.
- **Candidate Key** - is a set of attributes that uniquely identify tuples in a table. Candidate Key is a super key with no repeated attributes.
- **Alternate Key** - is a column or group of columns in a table that uniquely identify every row in that table.
- **Foreign Key** - is a column that creates a relationship between two tables. The purpose of Foreign keys is to maintain data integrity and allow navigation between two different instances of an entity.
- **Compound Key** - has two or more attributes that allow you to uniquely recognize a specific record. It is possible that each column may not be unique by itself within the database.
- **Composite Key** - An artificial key which aims to uniquely identify each record is called a surrogate key. These kind of key are unique because they are created when you don't have any natural primary key.
- **Surrogate Key** - An artificial key which aims to uniquely identify each record is called a surrogate key. These kind of key are unique because they are created when you don't have any natural primary key.

## Constraints in SQL :

Syntax

```
CREATE TABLE tableName(  
    Column1 datatype constraint;  
)
```

The following constraints are commonly used in SQL:

- NOT NULL - Ensures that a column cannot have a NULL value
- UNIQUE - Ensures that all values in a column are different each row in a table
- CHECK - Ensures that the values in a column satisfies a specific condition
- DEFAULT - Sets a default value for a column if no value is specified
- INDEX - Used to create and retrieve data from the database very quickly

## Operators :

- SQL Arithmetic Operators
- SQL Bitwise Operators
- SQL Comparison Operators
- SQL Compound Operators
- SQL Logical Operators

## MS SQL Server :

It is a Relational DBMS which supports Structured Query Language with its own implementation of **transact-sql(t-sql)**. T-SQL is a Microsoft propriety language which has further capabilities of declaring variable, exception handling, stored procedure, etc.

It has an integrated environment to handle SQL databases, which is **SQL server management studio(SSMS)**. SSMS is the interface tool for the SQL Server, and it supports both 32 and 64 bit environments.

Key components of SQL Server :

- **Database Engine:** This part of SQL Server actually creates and drives relational databases.
- **SQL Server Analysis Services (SSAS):** SSAS is the data-analysis component of SQL Server. It can create OLAP (OnLine Analytical Processing) cubes — sophisticated programming objects for organizing data inside a relational database — and do data mining (pulling relevant data out of a database in response to an ad-hoc question).
- **SQL Server Reporting Services (SSRS):** SSRS is a component of SQL Server that provides reporting regardless of a database's operating system.
- **SQL Server Integration Services (SSIS):** SSIS is a component of SQL Server that does the Extract, Transform, and Load (ETL) process that cleans up and formats raw data from source systems for inclusion in the database as ready-to-use information.

## SELECT (Transact-SQL)

Retrieves rows from the database and enables the selection of one or many rows or columns from one or many tables in SQL Server. The full syntax of the SELECT statement is complex, but the main clauses can be summarized as:

```
SELECT select_list [ INTO new_table ]  
  
[ FROM table_source ] [ WHERE search_condition ]  
  
[ GROUP BY group_by_expression ]  
  
[ HAVING search_condition ]  
  
[ ORDER BY order_expression [ ASC | DESC ] ]
```

The UNION, EXCEPT, and INTERSECT operators can be used between queries to combine or compare their results into one result set.

## FROM clause plus JOIN, APPLY, PIVOT (Transact-SQL)

In Transact-SQL, the FROM clause is available on the following statements:

- DELETE
- UPDATE
- SELECT

## Joined table

A joined table is a result set that is the product of two or more tables. For multiple joins, use parentheses to change the natural order of the joins.

### Join type

Specifies the type of join operation.

#### INNER

Specifies all matching pairs of rows are returned. Discards unmatched rows from both tables. When no join type is specified, this is the default.

#### FULL [ OUTER ]

Specifies that a row from either the left or right table that does not meet the join condition is included in the result set, and output columns that correspond to the other table are set to NULL. This is in addition to all rows typically returned by the INNER JOIN.

#### LEFT [ OUTER ]

Specifies that all rows from the left table not meeting the join condition are included in the result set, and output columns from the other table are set to NULL in addition to all rows returned by the inner join.

#### RIGHT [OUTER]

Specifies all rows from the right table not meeting the join condition are included in the result set, and output columns that correspond to the other table are set to NULL, in addition to all rows returned by the inner join.

### PIVOT and UNPIVOT :

You can use the PIVOT and UNPIVOT relational operators to change a table-valued expression into another table. PIVOT rotates a table-valued expression by turning the unique values from one column in the expression into multiple columns in the output.

#### PIVOT :

A common scenario where PIVOT can be useful is when you want to generate cross-tabulation reports to give a summary of the data.

#### UNPIVOT :

UNPIVOT carries out almost the reverse operation of PIVOT, by rotating columns into rows.

### PREDICATES :

Is an expression that evaluates to TRUE, FALSE, or UNKNOWN. Predicates are used in the search condition of [WHERE](#) clauses and [HAVING](#) clauses, the join conditions of [FROM](#) clauses, and other constructs where a Boolean value is required.

- FREETEXT
- CONTAINS
- IS NULL

## Statements in SQL Server :

- General – insert, delete, update, merge, truncate etc
- Alter – keys, binding etc
- Backup and Restore
- Create – Index, Table etc
- Collations
- Drop
- Permission – Grant, Revoke etc
- Service Broker
- Set

## Triggers :

Triggers are used to execute a batch of SQL code when insert or update or delete commands are executed against a table. Triggers are automatically triggered or executed when the data is modified. It can be executed automatically on insert, delete and update operations.

There are four types of triggers and they are:

- Insert
- Delete
- Update
- Instead of

Covered the basic details of the SQL and SQL Server. Most of the SQL Server syntax is similar to the standard SQL but some additional features help in making the data analytics and query requests smoother.

~ L. N. S. S. Ravi Teja