Introduction to SQL

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Outline

What is Database?

- Database is a organising collection of data
- For example a database of a college would be having a collection of data such as
  - Personal records of Students
  - Students performance history
  - Teachers data
  - Financial department data etc

Types of Databases

- **Basically there are two types of databases**
  - Relational Database
  - Non-relational Database
- **Non-relational databases**
  - Data is not organized in form of tables. Data is stored in form of key and value pairs.
  - The examples of non-relational databases are: JSON and XML.
  - **N.B. We cannot interact with non-relational databases using SQL**
- **Relational Databases**
  - In relational database, data is organized in form of tables. A table contains rows and columns of data.
  - Table has a unique key to identify each row of the table.

Database Management System (DBMS)

- A database management system is a software application which is used for managing different databases.
- It helps us to create and manage database.
- With the help of DBMS we take care following tasks.
  - Data Security.
  - Data Backup.
  - Manages huge amount of data.
  - Data export and import.
  - Serving multiple concurrent database requests.
  - Gives us a way to manage the data using programming languages.

What is SQL ?

- SQL stands for Structured Query Language, which is a standardised language for interacting with RDBMS (Relational Database Management System). Some of the popular relational database example are: MySQL, Oracle etc.
- SQL is used to perform C.R.U.D (Create, Retrieve, Update and Delete) operations on relational databases.
- SQL can also perform administrative tasks on database such as database security, backup, user management etc.

Types of SQL

SQL is a combination of the following different types of languages.

- Data Definition Language (DDL)
- Data Manipulate Language (DML)
- Data Control Language (DCL)
- Data Query Language (DQL)
- Transaction Control Language (TCL)

Data Definition Language (DDL)

- DDL is used to define the table schemas.
- All DDL commands are auto-committed, which means it saves all the changes permanently in the database.
- Following are the DDL commands being used to define database table.

Command	Description
create	to create new table or database
alter	for alteration
truncate	delete data from table
drop	to drop a table
rename	to rename a table

Data Manipulation Language (DML)

- DML commands are used for manipulating the data stored in the table and not the table itself.
- DML commands are not auto-committed. It means changes are not permanent to database, they can be rolled back.
- The DML commands used are:

Command	Description
insert	to insert a new row
update	to update existing row
delete	to delete a row
drop	to drop a table
merge	merging two rows or two tables

Data Control Language (DCL)

- Data control language are the commands to grant and take back authority from any database user.
- DCL commands in SQL are as follows:

Command	Description
grant	grant permission of right
revoke	take back permission.

Data Query Language (DQL)

- DQL is used to fetch the information from the database which is already stored there..
- Select is the only one DQL commands used in SQL.

Command	Description
select	retrieve records from one or more table

Transaction Control Language (TCL)

- These commands are to keep a check on other commands and their affect on the database.
- These commands can annul changes made by other commands by rolling the data back to its original state.
- It can also make any temporary change permanent.
- TCL commands used in SQL are.

Command	Description
commit	to permanently save
rollback	to undo change
savepoint	to save temporarily

Datatypes used in SQL

- In SQL, data types define what type of data a column can contain.
- Following are the few widely used datatypes in SQL.
  - Char.
  - Varchar
  - Boolean
  - Int
  - Real
  - Float
  - Double
  - Text
  - Date

SQL Syntax

- As data need be stored in database in organized manner, there is a requirement of SQL queries or statements to perform different operations in the database.
- SQL Statement:
  - SQL statement tells the database that what information you would like to retrieve or what operation you want to perform on the data.
- SQL statements are NOT case sensitive, but it can be made case sensitive.
- Semicolon at the end of the statement.

Create Command

- **create** is a DDL SQL command used to create a table or a database in relational database management system.
- **Syntax: create database ¡database_name¿: for creating database**

  create table ¡table_name¿
  (
  column_name data_type1,
  column_name data_type2,
  );
- **create** table command will tell the database system to create a new table with the given table name and column information.

Create Command

- Example :
- CREATE TABLE Student
  (
  student_id INT,
  name VARCHAR(100),
  age INT
  );
- The above command will create a table named Student in the current database with 3 columns, namely student_id, name, age of datatypes integer, varchar that can hold upto 100 characters and integer respectively.

Alter Command

alter command is used for altering the table structure, such as

- To add a column to existing table.
- To rename any existing column or table name.
- To change datatype of any column or to modify its size.
- To drop a column from the table.

Alter Command: Add new column

alter command is used for altering the table structure, such as

- Using **ALTER command we can add a column to any existing table**
- Syntax: **ALTER TABLE table_name ADD(column_name datatype);**
- Example:**ALTER TABLE student ADD(address VARCHAR(200));**

ALTER Command: Add multiple new Columns

alter command is used for altering the table structure, such as

- ALTER TABLE table_name ADDD(
  column_name1 datatype1,
  column_name2 datatype2,
  column_name3 datatype3
  );
- Example: ALTER TABLE student ADD(
  father_name VARCHAR(60),
  mother_name VARCHAR(60),
  dob DATE);
- The above command will add three new columns to the student table.

ALTER Command: Add multiple new Columns

- ALTER command can add a new column to an existing table with a default value too. The default value is used when no value is inserted in the column.
- Syntax: ALTER TABLE table_name ADD(column-name1 datatype1 DEFAULT some_value);
- Example: ALTER TABLE student ADD(dob DATE DEFAULT '01-Jan-99');
- The above command will add a new column with a preset default value to the table student.

ALTER Command: Modify an existing Column

- ALTER command can also be used to modify data type of any existing column.
- Syntax: **ALTER TABLE table_name modify column_name datatype;**
- Example: **ALTER** TABLE student MODIFY address varchar(300);
- The above command will modify the address column of the student table, to now hold up to 300 characters.

ALTER Command: Rename a Column

- Syntax: **ALTER TABLE TABLE_NAME RENAME COLUMN NAME1 TO COLUMN_NAME2;**

ROLL_NO	NAME	AGE
1	Ram	20
2	Abhi	21

ALTER TABLE Student **RENAME COLUMN** NAME TO FIRST_NAME;

ROLL_NO	FIRST_NAME	AGE
1	Ram	20
2	Abhi	21

AlterCommand: Drop and Modify Usage

- Drop command : DROP COLUMN is used to drop column in a table;
- Syntax: ALTER TABLE table_name DROP COLUMN column_name;
- Modify command : It is used to modify the existing columns in a table.
- Syntax: ALTER TABLE table_name MODIFY column_name column_type;

DROP, TRUNCATE

- DROP : delete a whole database or just a table.
- Syntax: DROP object object_name
- where, an object can be a table or a database
- TRUNCATE : is used to mark the extents of a table for deallocation (empty for reuse).
- Syntax: TRUNCATE TABLE table_name;

DML: Insert Into command

- The INSERT INTO statement of SQL is used to insert a new row in a table.
- Syntax:
- INSERT INTO table_name VALUES (value1, value2, value3,. . .); table_name: name of the table.
- Syntax: TRUNCATE TABLE table_name;value1, value2,.. : value of first column, second column,. . . for the new record.

DML: update

- The UPDATE statement in SQL is used to update the data of an existing table in database.
- Syntax: UPDATE table_name SET column1 = value1, column2 = value2,WHERE condition;
- table_name: name of the table column1: name of first , second, third column.
- value1: new value for first, second, third column.
- condition: condition to select the rows for which the values of columns needs to be updated.
- WHERE clause is used to select the rows for which the columns are.

DML: update (continues. . .)

- Student

ROLL_NO	FIRST_NAME	AGE
1	Ram	20
2	Abhi	21

- Example: UPDATE Student SET NAME = 'PRATIK' WHERE Age = 20;

ROLL_NO	FIRST_NAME	AGE
1	Pratik	20
2	Abhi	21

References

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