Unit - II

SQL: Queries and Constraints

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UNIT-II

- **SQL: Queries and Constraints:** Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to View, Destroying / Altering Tables and Views, Cursors, Triggers and Active Databases.

What is SQL

- SQL stands for **Structured Query Language**.
- It is designed for managing data in a relational database management system (RDBMS).
- It is pronounced as S-Q-L or sometime **See-Qwell**.
- SQL is a database language, it is used for database creation, deletion, fetching rows, and modifying rows, etc.
- SQL is based on relational algebra and tuple relational calculus.

Why to Learn SQL?

- SQL is Structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in a relational database.
- SQL is the standard language for Relational Database System.
- All the Relational Database Management Systems (RDMS) like MySQL, MS Access, Oracle, Sybase, Informix, Postgres and SQL Server use SQL as their standard database language.
- Also, they are using different dialects, such as –
  - **MS SQL Server using T-SQL,**

Why SQL is required

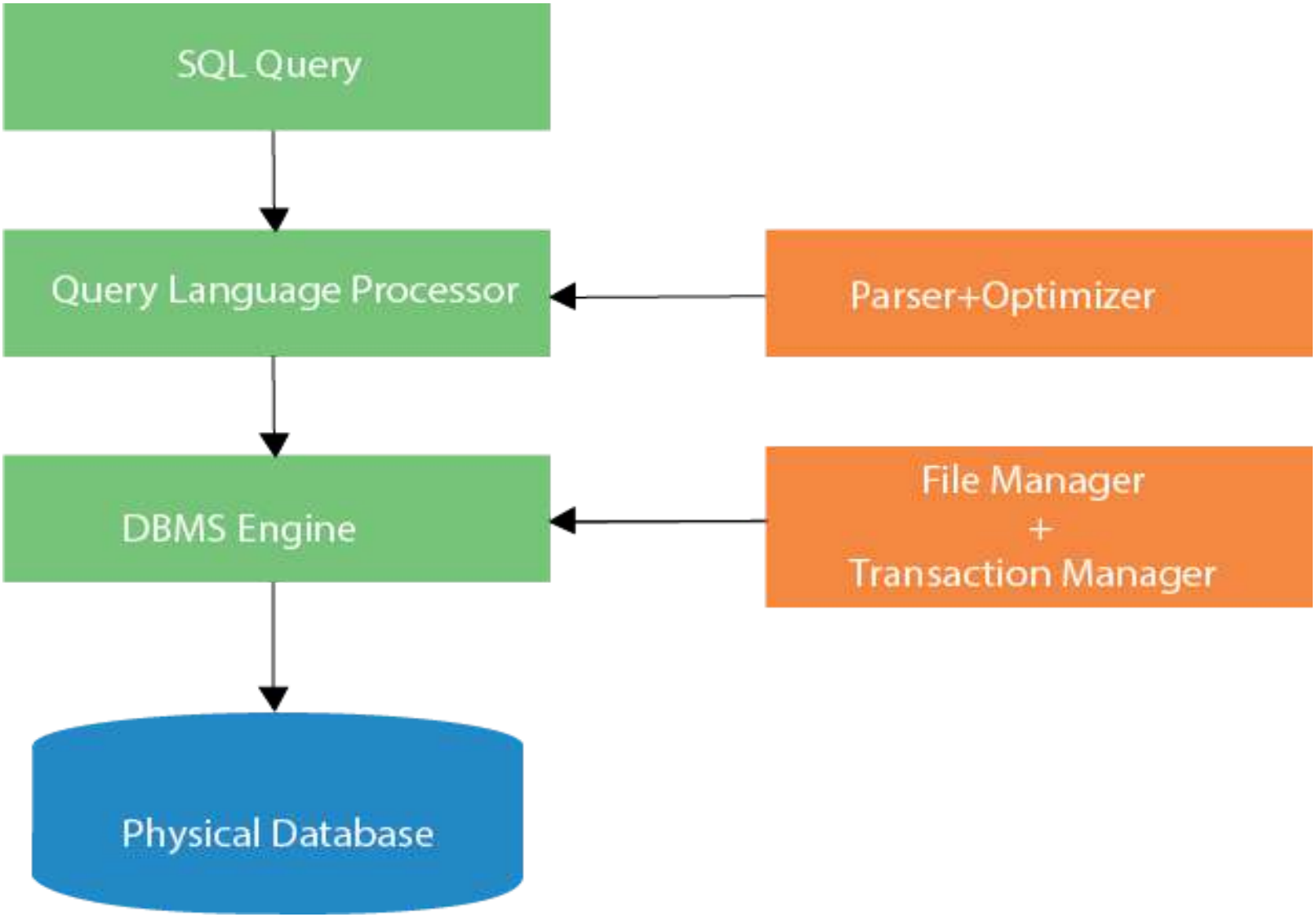
- To create new databases, tables and views
- To insert records in a database
- To update records in a database
- To delete records from a database
- To retrieve data from a database

SQL Rules:

- SQL follows the following rules:
  1. Structure query language is not case sensitive. Generally, keywords of SQL are written in uppercase.
  2. Statements of SQL are dependent on text lines. We can use a single SQL statement on one or multiple text line.
  3. Using the SQL statements, you can perform most of the actions in a database.
  4. SQL depends on tuple relational calculus and relational algebra.

SQL Process

- When you are executing an SQL command for any RDBMS, the system determines the best way to carry out your request and SQL engine figures out how to interpret the task.
- There are various components included in this process.
- These components are –
  - **Query Dispatcher**
  - **Optimization Engines**
  - **Classic Query Engine**
  - **SQL Query Engine, etc.**
- A classic query engine handles all the non-


SQL Query
Query Language Processor
Parser+Optimizer
DBMS Engine
File Manager
+
Transaction Manager
Physical Database

Characteristics of SQL

- SQL is easy to learn.
- SQL is used to access data from relational database management systems.
- SQL can execute queries against the database.
- SQL is used to describe the data.
- SQL is used to define the data in the database and manipulate it when needed.
- SQL is used to create and drop the database and table.
- SQL is used to create a view, stored procedure, function in a database.
- SQL allows users to set permissions on tables, procedures, and views.

Advantages of SQL

- **High speed**
  - Using the SQL queries, the user can quickly and efficiently retrieve a large amount of records from a database.
- **No coding needed**
  - In the standard SQL, it is very easy to manage the database system. It doesn't require a substantial amount of code to manage the database system.
- **Well defined standards**
  - Long established are used by the SQL databases that are being used by ISO and ANSI.
- **Portability**
  - SQL can be used in laptop, PCs, server and even some mobile phones.
- **Interactive language**
  - SQL is a domain language used to communicate with the database. It is also used to receive answers to the complex questions in seconds.
- **Multiple data view**
  - Using the SQL language, the users can make different

SQL statement

- SQL statements are started with any of the SQL commands/keywords like SELECT, INSERT, UPDATE, DELETE, ALTER, DROP etc. and the statement ends with a semicolon (;).
- **Example of SQL statement:**

SELECT "column_name" **FROM** "table_name";

- SELECT student_ID from Student;

SQL Commands

- These are the some important SQL command:
  - **SELECT**: it extracts data from a database.
  - **UPDATE**: it updates data in database.
  - **DELETE**: it deletes data from database.
  - **CREATE TABLE**: it creates a new table.
  - **ALTER TABLE**: it is used to modify the table.
  - **DROP TABLE**: it deletes a table.
  - **CREATE DATABASE**: it creates a new database.
  - **ALTER DATABASE**: It is used to modify a database.
  - **INSERT INTO**: it inserts new data into a database.

Form of basic SQL Query

- It presents the syntax of simple SQL query and explains its meaning through a conceptual evaluation strategy

  The basic form of an SQL query is as follows

  SELECT[DISTINCT] select-list

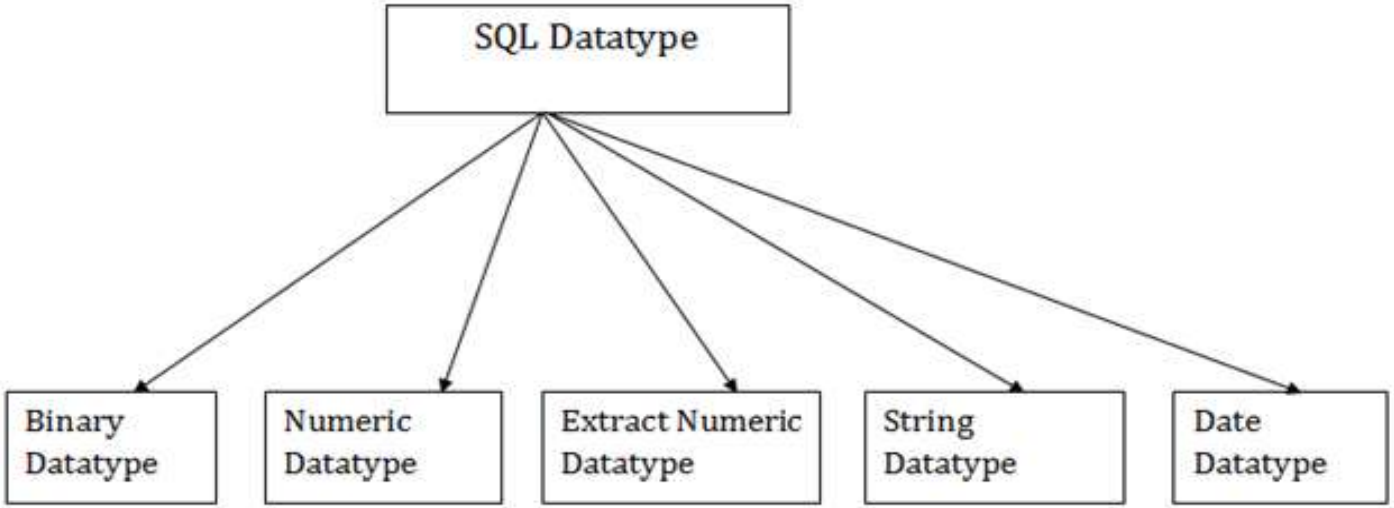
  FROM from-list

  WHERE qualification

- SELECT clause, specifies columns to be retained in the result.
- FROM clause specifies the cross product of the table.
- WHERE clause specifies selection condition on the table mentioned in the FROM clause.

SQL Data Types

- SQL Datatype is used to define the values that a column can contain.
- Every column is required to have a name and data type in the database table.



1. Binary Datatypes

There are Three types of binary Datatypes which are given below:

Data Type	Description
binary	It has a maximum length of 8000 bytes. It contains fixed-length binary data.
varbinary	It has a maximum length of 8000 bytes. It contains variable-length binary data.
image	It has a maximum length of 2,147,483,647 bytes. It contains variable-length binary data.

2. Approximate Numeric Datatype :

The subtypes are given below:

Data type	From	To	Description
float	-1.79E + 308	1.79E + 308	It is used to specify a floating-point value e.g. 6.2, 2.9 etc.
real	-3.40e + 38	3.40E + 38	It specifies a single precision floating point number

3. Exact Numeric Datatype

The subtypes are given below:

Data type	Description
int	It is used to specify an integer value.
smallint	It is used to specify small integer value.
bit	It has the number of bits to store.
decimal	It specifies a numeric value that can have a decimal number.
numeric	It is used to specify a numeric value.

4. Character String Datatype

The subtypes are given below:

Data type	Description
char	It has a maximum length of 8000 characters. It contains Fixed-length non-unicode characters.
varchar	It has a maximum length of 8000 characters. It contains variable-length non-unicode characters.
text	It has a maximum length of 2,147,483,647 characters. It contains variable-length non-unicode characters.

5. Date and time Datatypes

The subtypes are given below:

Datatype	Description
date	It is used to store the year, month, and days value.
time	It is used to store the hour, minute, and second values.
timestamp	It stores the year, month, day, hour, minute, and the second value.

SQL Operators

- SQL statements generally contain some reserved words or characters that are used to perform operations such as comparison and arithmetical operations etc. These reserved words or characters are known as operators.

- Generally there are three types of operators in SQL:
  1. SQL Arithmetic Operators
  2. SQL Comparison Operators
  3. SQL Logical Operators

SQL Arithmetic Operators

- Let's assume two variables "a" and "b". Here "a" is valued 50 and "b" valued 100.

Operators	Descriptions	Examples
+	It is used to add containing values of both operands	a+b will give 150
-	It subtracts right hand operand from left hand operand	a-b will give -50
*	It multiply both operand's values	a*b will give 5000
/	It divides left hand operand by right hand operand	b/a will give 2
%	It divides left hand operand by right hand operand and returns reminder	b%a will give 0

SQL Comparison Operators

Let's take two variables "a" and "b" that are valued 50 and 100.

Operator	Description	Example
=	Examine both operands value that are equal or not,if yes condition become true.	(a=b) is not true
!=	This is used to check the value of both operands equal or not,if not condition become true.	(a!=b) is true
< >	Examines the operand's value equal or not, if values are not equal condition is true	(a<>b) is true
>	Examine the left operand value is greater than right Operand, if yes condition becomes true	(a>b) is not true
<	Examines the left operand value is less than right Operand, if yes condition becomes true	(a
>=	Examines that the value of left operand is greater than or equal to the value of right operand or not,if yes condition become true	(a>=b) is not true
<=	Examines that the value of left operand is less than or equal to the value of right operand or not, if yes condition becomes true	(a<=b) is true
!<	Examines that the left operand value is not less than the right operand value	(a!
!>	Examines that the value of left operand is not greater than the value of right operand	(a!>b) is true

SQL Logical Operators

Operator	Description
ALL	this is used to compare a value to all values in another value set.
AND	this operator allows the existence of multiple conditions in an SQL statement.
ANY	this operator is used to compare the value in list according to the condition.
BETWEEN	this operator is used to search for values, that are within a set of values
IN	this operator is used to compare a value to that specified list value
NOT	the NOT operator reverse the meaning of any logical operator
OR	this operator is used to combine multiple conditions in SQL statements
EXISTS	the EXISTS operator is used to search for the presence of a row in a specified table
LIKE	this operator is used to compare a value to similar values using wildcard operator

SQL Set Operation

- The SQL Set operation is used to combine the two or more SQL SELECT statements.
- Types of Set Operation
  1. Union
  2. UnionAll
  3. Intersect
  4. Minus

1. Union

- The SQL Union operation is used to combine the result of two or more SQL SELECT queries.
- In the union operation, all the number of data type and columns must be same in both the tables on which UNION operation is being applied.
- The union operation eliminates the duplicate rows from its resultset.

Example:

Syntax

```
SELECT column_name FROM table1
UNION
SELECT column_name FROM table2;
```

Example:

The First table

ID	NAME
1	Jack
2	Harry
3	Jackson

The Second table

ID	NAME
3	Jackson
4	Stephan
5	David

Union SQL query will be:

```
SELECT * FROM First
UNION
SELECT * FROM Second;
```

The resultset table will look like:

ID	NAME
1	Jack
2	Harry
3	Jackson
4	Stephan
5	David

2. Union All

- Union All operation is equal to the Union operation. It returns the set without removing duplication and sorting the data.
- **Syntax:**

```
SELECT column_name FROM table1
UNION ALL
SELECT column_name FROM table2;
```

Example: Using the above First and Second table.

Union All query will be like:

```
SELECT * FROM First
UNION ALL
SELECT * FROM Second;
```

The resultset table will look like:

ID	NAME
1	Jack
2	Harry
3	Jackson
3	Jackson
4	Stephan
5	David

3. Intersect

- It is used to combine two SELECT statements. The Intersect operation returns the common rows from both the SELECT statements.
- In the Intersect operation, the number of datatype and columns must be the same.
- It has no duplicates and it arranges the data in ascending order by default.
- **Syntax**

```
SELECT column_name FROM table1
INTERSECT
SELECT column_name FROM table2;
```

- **Example:**
- **Using the above First and Second table.**
- Intersect query will be:

```
SELECT * FROM First
INTERSECT
SELECT * FROM Second;
```

The resultset table will look like:

ID	NAME
3	Jackson

4. Minus

- It combines the result of two SELECT statements. Minus operator is used to display the rows which are present in the first query but absent in the second query.
- It has no duplicates and data arranged in ascending order by default.
- **Syntax:**

```
SELECT column_name FROM table1
MINUS
SELECT column_name FROM table2;
```

Example

- **Using the above First and Second table.**
- Minus query will be:

```
SELECT * FROM First
MINUS
SELECT * FROM Second;
```

The resultset table will look like:

ID	NAME
1	Jack
2	Harry

SQL Sub Query

- A Sub query is a query within another SQL query and embedded within the WHERE clause.
- **Important Rule:**
  - A sub query can be placed in a number of SQL clauses like WHERE clause, FROM clause, HAVING clause.
  - You can use Sub query with SELECT, UPDATE, INSERT, DELETE statements along with the operators like =, <, >, >=, <=, IN, BETWEEN, etc.
  - A sub query is a query within another query. The outer query is known as the main query, and the inner query is known as a sub query.
  - Sub queries are on the right side of the comparison operator.
  - A sub query is enclosed in parentheses.
  - In the Sub query, ORDER BY command cannot be used. But GROUP BY command can be used to perform the same function as ORDER BY

1. Sub queries with the Select Statement

- SQL subqueries are most frequently used with the Select statement.
- **Syntax**

```
SELECT column_name
FROM table_name
WHERE column_name expression operator
( SELECT column_name  from table_name
  WHERE ... );
```

2. Subqueries with the INSERT Statement

- SQL subquery can also be used with the Insert statement. In the insert statement, data returned from the subquery is used to insert into another table.
- In the subquery, the selected data can be modified with any of the character, date functions.
- **Syntax:**

```
INSERT INTO table_name (column1, column
  2, column3....)
SELECT *
FROM table_name
WHERE VALUE OPERATOR
```

3. Subqueries with the UPDATE Statement

- The subquery of SQL can be used in conjunction with the Update statement.
- When a subquery is used with the Update statement, then either single or multiple columns in a table can be updated.
- **Syntax**

```
UPDATE table
SET column_name = new_value
WHERE VALUE OPERATOR
  (SELECT COLUMN_NAME
  FROM TABLE_NAME
  WHERE condition);
```

4. Subqueries with the DELETE Statement

- The subquery of SQL can be used in conjunction with the Delete statement just like any other statements mentioned above.
- **Syntax**

```
DELETE FROM TABLE_NAME
WHERE VALUE OPERATOR
  (SELECT COLUMN_NAME
  FROM TABLE_NAME
  WHERE condition);
```

THANK YOU