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Department of MCA

DBMS Schema Modification More Complex SQL Retrieval Queries

Course Name : 23CAT603 - DATA BASE MANAGEMENT SYSTEM

Class : I Year / I Semester

Unit IV – Schema Modification More Complex SQL Retrieval

Schema Modification More Complex SQL Retrieval

In Database Management Systems (DBMS), **Schema Modification** and **Complex SQL Retrieval Queries** are two important concepts that relate to the design and querying of databases.

1. Schema Modification in DBMS

Schema modification refers to changes made to the structure (or schema) of a database. A schema defines the tables, fields (attributes), relationships, constraints, and other structural elements that describe the database. Schema modification is typically performed using Data Definition Language (DDL) commands.

Types of Schema Modifications:

Adding New Tables: A new table can be added to the database schema using the CREATE TABLE command.

```
CREATE TABLE Customers
( CustomerID INT PRIMARY KEY,
  CustomerName VARCHAR(100),
  Address VARCHAR(255) );
```

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Altering Tables: This includes adding, dropping, or modifying columns or constraints in an existing table.

- **Adding a column**:

sql

```
ALTER TABLE Customers ADD Email VARCHAR(100);
```

- **Dropping a column**:

sql

```
ALTER TABLE Customers DROP COLUMN Email;
```

- **Modifying a column**:

sql

```
ALTER TABLE Customers MODIFY COLUMN CustomerName VARCHAR(150);
```

- **Dropping Tables**: To remove a table from the schema entirely:

sql

```
DROP TABLE Customers;
```

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- **Changing Constraints**: Constraints like PRIMARY KEY, FOREIGN KEY, CHECK, etc., can be modified.
- **Adding a constraint**:

sql
```
ALTER TABLE Customers ADD CONSTRAINT fk_Order FOREIGN KEY (CustomerID) REFERENCES Orders(CustomerID);
```

- **Renaming Objects**: A table or column can be renamed using commands like RENAME.

sql
```
ALTER TABLE Customers RENAME TO Clients;
```

Schema modification ensures that the database structure can evolve to meet new requirements, handle more data, or improve performance. It's crucial to manage schema changes carefully, as they can impact the integrity and performance of the database.

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2. Complex SQL Retrieval Queries

Complex SQL queries go beyond simple SELECT statements and are used to retrieve, manipulate, or join data from multiple tables. They often include advanced techniques like subqueries, joins, grouping, aggregation, and filtering.

Here are the key components of complex SQL retrieval queries:

1. Joins:

Joins are used to combine rows from two or more tables based on related columns. The most common types of joins are:

- **INNER JOIN**: Returns records that have matching values in both tables.

sql

SELECT Orders.OrderID, Customers.CustomerName FROM Orders INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID;

- **LEFT JOIN** (or **LEFT OUTER JOIN**): Returns all records from the left table and matched records from the right table. If no match is found, NULL is returned for columns from the right table.

sql

SELECT Customers.CustomerName, Orders.OrderID FROM Customers LEFT JOIN Orders ON Customers.CustomerID = Orders.CustomerID;

- **RIGHT JOIN** (or **RIGHT OUTER JOIN**): Similar to LEFT JOIN, but returns all records from the right table.
- **FULL OUTER JOIN**: Combines the results of both left and right joins, returning all records when there is a match in either left or right table.

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2. Subqueries:

A subquery is a query embedded within another query, and it can be used in SELECT, FROM, WHERE, or HAVING clauses.

- **Subquery in WHERE clause**:

sql

```
SELECT CustomerName FROM Customers WHERE CustomerID IN (SELECT CustomerID FROM Orders WHERE OrderDate > '2024-01-01');
```

- **Subquery in SELECT clause**:

sql

```
SELECT CustomerName, (SELECT COUNT(*) FROM Orders WHERE Orders.CustomerID = Customers.CustomerID) AS OrderCount FROM Customers;
```

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3. Grouping and Aggregation:

Aggregation functions such as COUNT(), SUM(), AVG(), MAX(), MIN() are used with GROUP BY to summarize data.

- **GROUP BY**:

sql

```
SELECT CustomerID, COUNT(*) AS TotalOrders FROM Orders GROUP BY CustomerID;
```

- **HAVING**: This clause is used to filter groups after aggregation.

sql

```
SELECT CustomerID, COUNT(*) AS TotalOrders FROM Orders GROUP BY CustomerID HAVING COUNT(*) > 5;
```

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4. Complex Filters:

Using multiple conditions in the WHERE clause can make queries more complex.

- Combining AND, OR, and NOT:

sql

```
SELECT * FROM Orders WHERE (OrderDate > '2024-01-01' AND CustomerID = 101) OR (TotalAmount > 500);
```

5. Union and Union All:

These are used to combine the results of two or more SELECT statements into a single result set.

- **UNION** removes duplicates:

sql

```
SELECT CustomerName FROM Customers UNION SELECT CustomerName FROM Suppliers;
```

- **UNION ALL** includes duplicates:

sql

```
SELECT CustomerName FROM Customers UNION ALL SELECT CustomerName FROM Suppliers;
```

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6. Case Statements:

A CASE statement is used to perform conditional logic within a query.

sql

SELECT CustomerName, CASE WHEN TotalAmount > 500 THEN 'VIP' ELSE 'Regular' END AS CustomerStatus FROM Customers;

7. Window Functions:

Window functions are used to perform calculations across a set of table rows that are related to the current row.

- **ROW_NUMBER()**:

sql

SELECT CustomerID, OrderID, ROW_NUMBER() OVER (PARTITION BY CustomerID ORDER BY OrderDate) AS RowNum FROM Orders;

Schema Modification in DBMS involves changing the structure of a database, such as adding, altering, or deleting tables, columns, and constraints.Complex SQL Retrieval Queries involve sophisticated querying techniques such as joins, subqueries, aggregations, and window functions to extract meaningful information from multiple tables in a database. These queries allow for powerful data analysis and manipulation.Together, schema modifications and complex queries enable the creation of flexible, high-performance database systems capable of handling intricate data relationships and operations.

References

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