

# Database Server Vs Database Client

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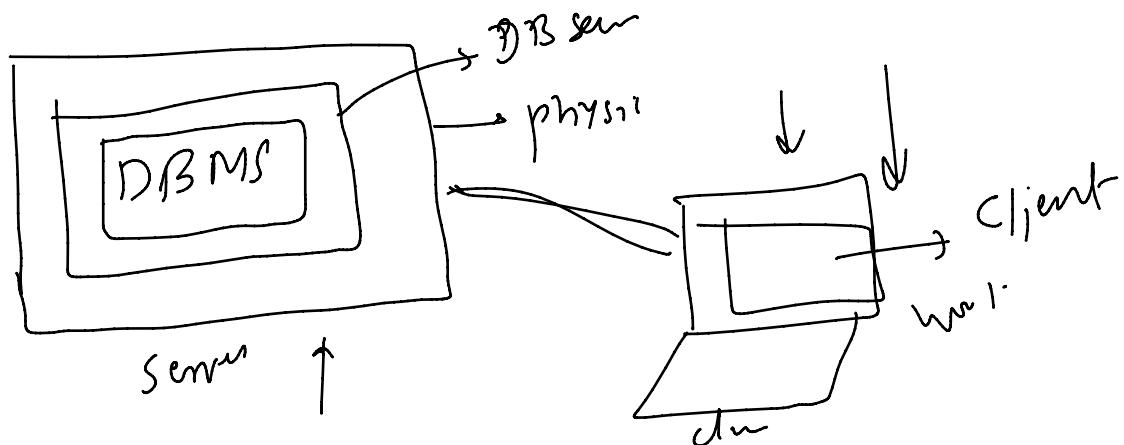
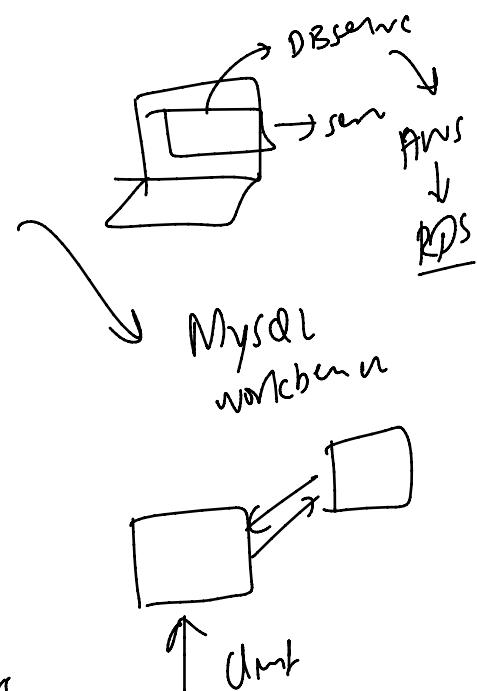
1. **Database Server:** A database server is a software application that provides access to a database over a network. It manages and processes requests from multiple clients, and performs tasks such as managing user authentication, concurrency control, and transaction management. A database server is typically installed on a dedicated computer or server, and is responsible for storing, managing, and processing data.

2. **Database Client:** A database client is a software application that connects to a database server and sends requests for data or database operations. It is the front-end interface that allows users to interact with the database, and provides tools such as query editors, data visualization, and reporting.

3. **Database:** A database is a collection of related data that is organized and stored in a structured format. It is designed to efficiently store, retrieve, and manage large amounts of data. A database can include multiple tables, indexes, and other objects that are used to manage and manipulate data.

4. **DBMS (Database Management System):** A DBMS is a software application that provides tools for creating, managing, and manipulating databases. It includes a variety of functions and features, such as data storage, data retrieval, data backup and recovery, user management, and security. The DBMS is responsible for managing the underlying database, and provides a mechanism for users to interact with the data.

MySQL, Oracle, SQL, PostgreSQL

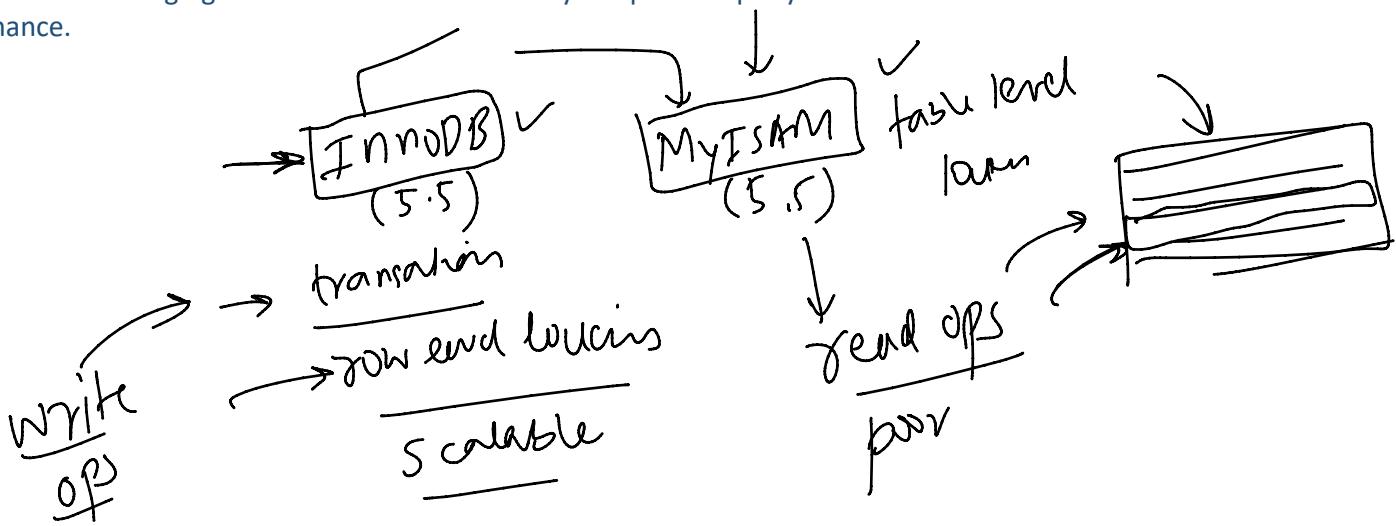


# What are Database Engines

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A database engine, also known as a database management system (DBMS) engine, is the software component of a DBMS that is responsible for managing the storage, organization, and retrieval of data in a database. It is the core component of a DBMS that provides the necessary tools and services for creating, modifying, and querying the database.

A database engine typically includes several key components, such as a query optimizer, transaction manager, storage manager, and buffer manager. The query optimizer is responsible for optimizing SQL queries to retrieve data from the database efficiently, while the transaction manager ensures that multiple transactions are executed correctly and consistently. The storage manager handles the physical storage of the data on disk or in memory, and the buffer manager is responsible for managing the cache of data in memory to optimize query performance.



# Components of DBMS

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## 1. Database Engine

2. Security and Access Control - used to manage user permissions and access rights to the database.
3. Backup and Recovery - used to create backups of the database and recover the data in case of failures.
4. Data Dictionary - used to store metadata about the database schema and data
5. User Interface - used to provide a graphical interface to interact with the database.



# What is Collation

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Collation refers to the rules and algorithms used to compare and sort characters in a database. It determines how character strings are compared and sorted, including the order of the characters, the treatment of case sensitivity, and the handling of accent marks or other special characters.

Collation is important in database management because it affects the way queries are executed and results are returned. If the collation of a database is not set correctly, queries may return incorrect results or the database may not sort data properly.

1. Binary: Compares strings byte by byte. It is case-sensitive and accent-sensitive.
2. Case-insensitive: Compares strings without regard to case, but is accent-sensitive.
3. Accent-insensitive["café" and "cafe"]: Compares strings without regard to accents, but is case-sensitive.
4. Case- and accent-insensitive: Compares strings without regard to case or accents.
5. Unicode: Supports Unicode character sets, and is available in multiple variants, such as utf8mb4\_unicode\_ci, utf8mb4\_unicode\_520\_ci, utf8mb4\_unicode\_520\_ci\_ai, etc.

Diff between COUNT(\*) and COUNT(col) ←

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Select COUNT(\*) from Table  
↓ rows #

# Dealing with NULL values

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1. How it deals with NON NULL values
2. Order By
3. Group By - NULL values are treated as a separate group and are not included in any group that contains non-NULL values.
4. Aggregate

When performing aggregate operations in MySQL, NULL values are treated differently depending on whether or not the GROUP BY clause is used.

Without GROUP BY:

- If the aggregate function is SUM, AVG, MAX, MIN, or COUNT, NULL values are ignored and not included in the calculation.
- If the aggregate function is GROUP\_CONCAT or CONCAT, NULL values are included in the result, but a NULL value is returned if all the values being concatenated are NULL.

With GROUP BY:

- If the aggregate function is COUNT, NULL values are not included in the count for each group. However, if you use COUNT(\*) instead of COUNT(column), then NULL values are included in the count.
- If the aggregate function is SUM, AVG, MAX, or MIN, NULL values are ignored and not included in the calculation for each group. If a group contains only NULL values, then the result for that group will be NULL.
- If the aggregate function is GROUP\_CONCAT or CONCAT, NULL values are included in the result for each group, but a NULL value is returned if all the values being concatenated in a group are NULL.

- How to find null values?
- How to replace null values?

# DELETE Vs TRUNCATE

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- DELETE is a Data Manipulation Language (DML) statement, whereas TRUNCATE is a Data Definition Language (DDL) statement. This means that TRUNCATE requires the ALTER TABLE privilege, whereas DELETE requires the DELETE privilege on the table.
- DELETE can be rolled back using a transaction log, which means that you can undo the changes made by DELETE if necessary. TRUNCATE, on the other hand, cannot be rolled back because it does not generate a transaction log.
- DELETE is slower than TRUNCATE because it generates transaction log entries for each deleted row. If you need to delete a large number of rows, TRUNCATE may be a better option for performance reasons.
- If you use foreign key constraints in your database, DELETE can cause integrity issues if you delete rows that are referenced by other tables. In this case, you should use TRUNCATE or disable the foreign key constraints before using DELETE.

# Non-equi joins

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In a non equi join, the join condition is based on operators other than equality. Specifically, the join condition can use operators such as greater than, less than, or not equal to, among others. Non equi joins are useful when you need to join tables on columns with similar but not identical data, or when you need to join tables based on a range of values rather than an exact match.

# Natural Joins

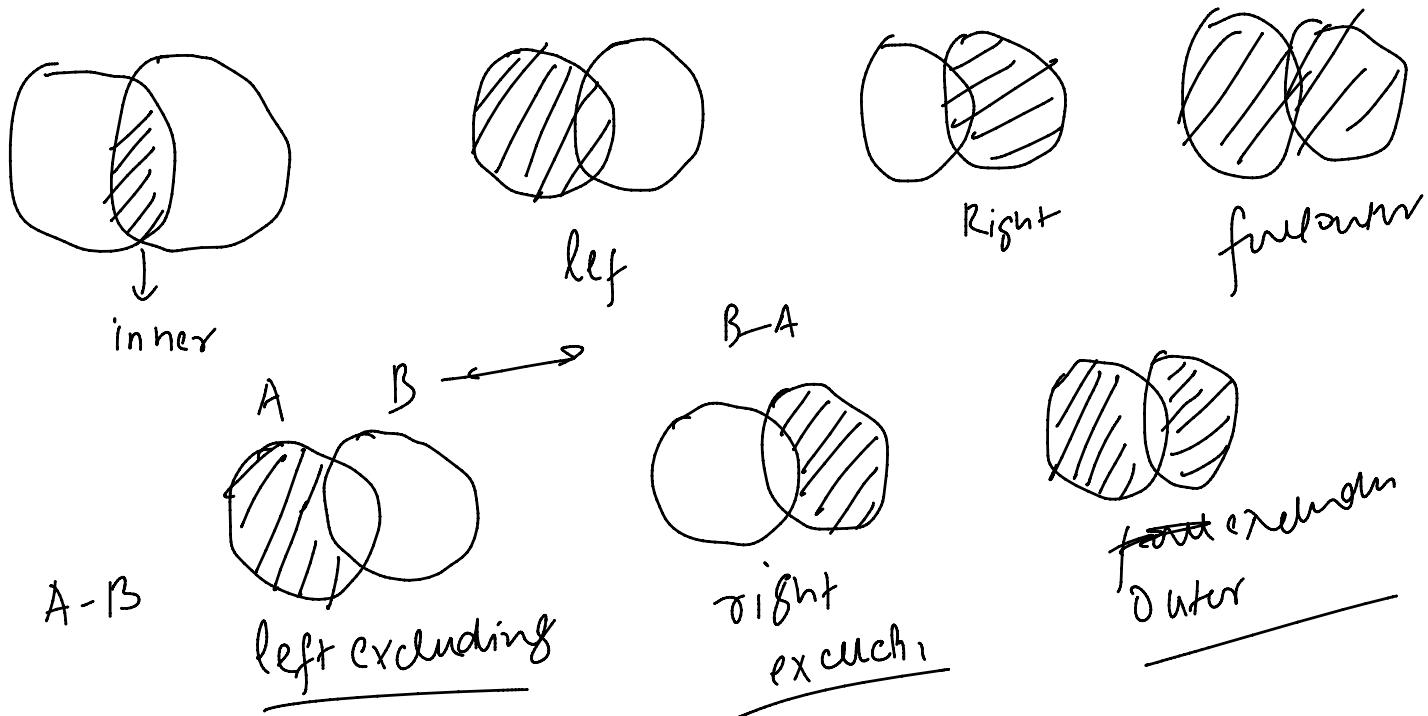
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A natural join is a type of join in SQL where two tables are joined based on the columns with the same name and data type. In other words, it is a join where the join condition is implicitly based on the column names that exist in both tables, and it eliminates the duplicate columns from the result set.

## Anti Joins

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An excluding join, also known as an anti-join, is a type of join operation in SQL that returns only the rows from one table that do not have any matching rows in another table. In other words, it returns the rows that are not included in the result set of an inner join between the two tables.





# Removing Duplicate Rows

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1. Find duplicate values
2. Delete duplicate

# Metadata Queries

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- How to see all the tables of a database
- How to print col names
- How to see all the constraints of a table (Homework)
- copy table definition -> How to create empty tables with the same structure as another table?