علم داده ۲

جلسه چهلم - پایگاه داده

DATA SCIENCE 2

DATABASE | SQL

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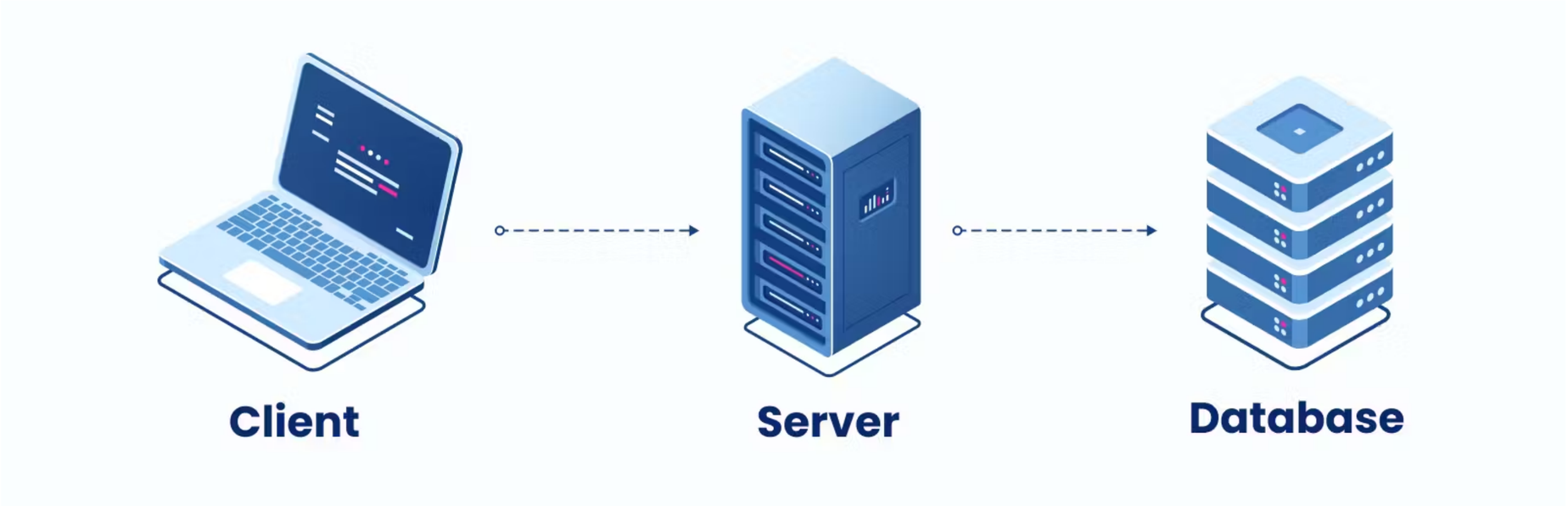
What is DataBase?

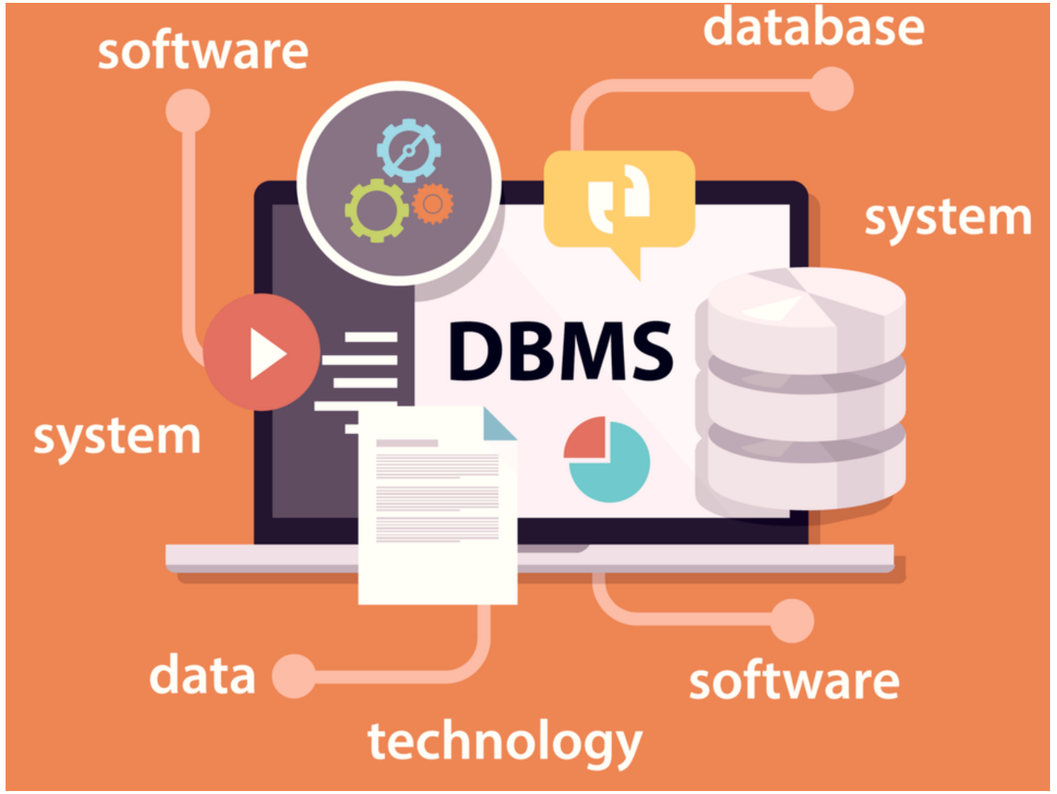
- A structured collection of data, managed and accessed electronically.



DataBase Management System (DBMS)

- **DBMS** is software that manages and controls access to the database.

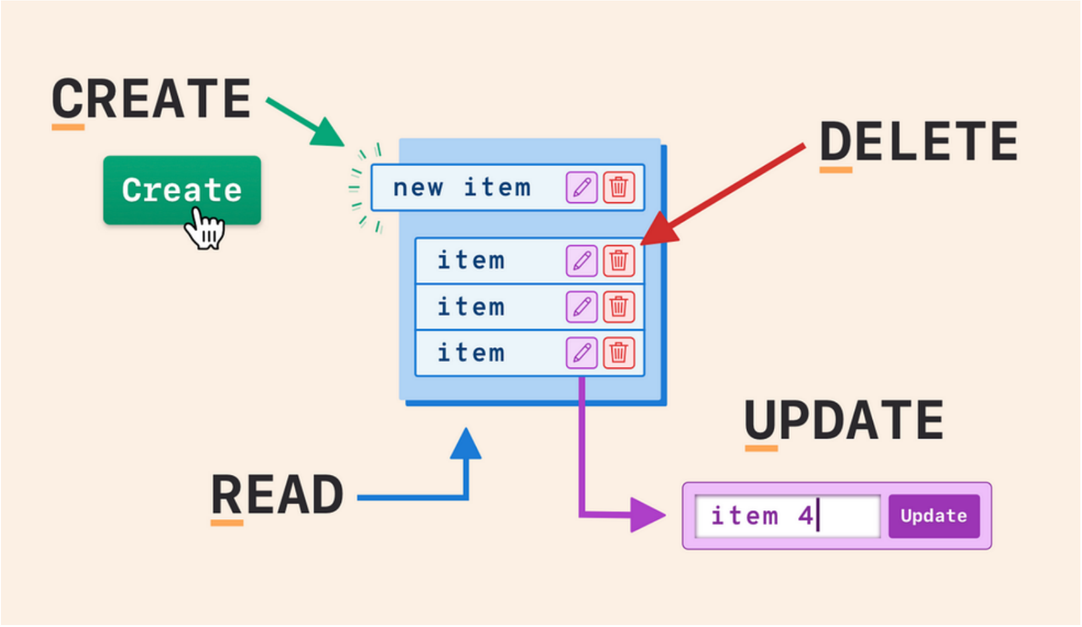
- **Data Interaction:** DBMS provides a structured way to store, retrieve, and manage large sets of data.
- **Concurrency Control:** Manages simultaneous data access, ensuring data integrity and consistency.
- **Security and Backup:** Facilitates data protection, disaster recovery, and maintains user permissions and roles.



C.R.U.D

- **CRUD** stands for Create, Read, Update, and Delete, which are the four basic operations that can be performed on data in a database.

- **Create**: This operation involves adding or inserting new data into the database.
- **Read**: This refers to retrieving or viewing existing data from the database.
- **Update**: This involves modifying or altering existing data in the database.
- **Delete**: This operation involves removing existing data from the database.



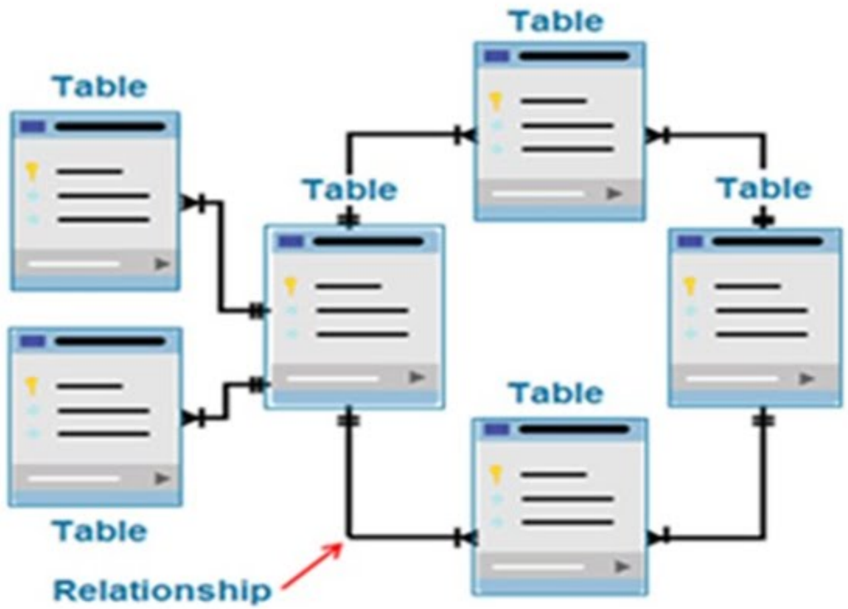
Service Providers

Company	Database Products
Oracle Corporation	Oracle Database, MySQL
Microsoft Corporation	SQL Server
IBM	Db2, Informix
SAP	SAP HANA, SAP Adaptive Server
Amazon	Amazon RDS, Amazon DynamoDB
Google	Google Cloud SQL, Google Cloud Bigtable, Google Cloud Spanner
MongoDB Inc.	MongoDB
Apache	Apache Cassandra, Apache Hadoop
Redis Labs	Redis
Couchbase	Couchbase Server
PostgreSQL Global Development Group	PostgreSQL

RDBMS

- A Relational Database Management System (RDBMS) is a type of database management system that stores data in a structured format, using rows and columns. It allows users to create, read, update, and delete data in a relational database.

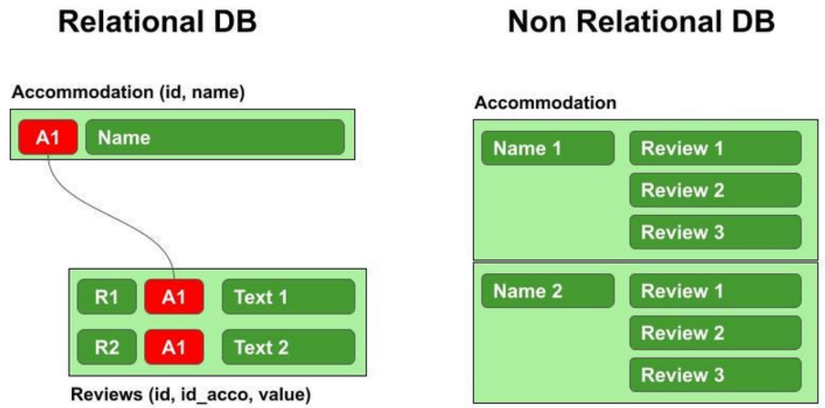
- **Structured Data:** RDBMS organizes data into predefined tables consisting of rows and columns, making data manipulation and queries more efficient.
- **Data Integrity:** Enforces data consistency and accuracy using constraints, relationships, and normalization.
- **Support for SQL:** Almost all RDBMS use SQL (Structured Query Language) for querying and maintaining the database.



NRDBMS

- A Non-Relational Database Management System (NoSQL or NRDBMS) is a database system that allows for storage and manipulation of data that isn't structured in the traditional tabular format used by relational databases.

- **Flexible Data Models:** NRDBMS are designed to handle diverse data types like key-value, document, column-family, and graph formats, making them suitable for unstructured or semi-structured data.
- **Scalability:** They are known for their ability to scale out horizontally, often used in big data applications which require handling of massive amounts of data across multiple servers.
- **Speed and Performance:** Generally, NoSQL databases can ingest, store, and retrieve data faster than traditional RDBMS, particularly for certain types of applications such as real-time web applications.



SQL Queries

- A query is a request for data or information from a database. In the context of a Relational Database Management System (RDBMS) like MySQL, queries are often written in SQL (Structured Query Language). A SQL query can be used to obtain data, manipulate it, and control access to it.

Query Category	Description
Data Definition Language (DDL)	These queries are used to define or modify the structure of the database objects. Examples of DDL queries include CREATE, ALTER, and DROP.
Data Manipulation Language (DML)	These queries are used to retrieve, insert, delete, and update data in the database. Examples include SELECT, INSERT, UPDATE, and DELETE.
Data Control Language (DCL)	These queries are used to control access to data within the database and handle permissions. Examples include GRANT and REVOKE.
Transaction Control Language (TCL)	These queries are used to manage transactions within a database. Examples include COMMIT, ROLLBACK, and SAVEPOINT.
Data Query Language (DQL)	This is often considered a subset of DML, specifically focused on retrieving data. The primary example is the SELECT statement.

Data Definition Language (DDL)

- **DDL** is a type of SQL command used to define and manage the structure of a database, including creating, altering, and deleting database objects.
- **Common Commands:** The primary DDL commands include CREATE, ALTER, and DROP. CREATE is used to create new database objects like tables and indices, ALTER is used to modify existing database objects, and DROP is used to delete existing database objects.
- **No Implicit Commit:** In MySQL, unlike some other DBMS, DDL statements do not implicitly commit the current transaction. If a DDL statement is executed in the middle of a transaction, the transaction is automatically committed.
- **Impact:** DDL operations have a significant impact on the database structure. For example, dropping a table not only removes the table structure but also all the data stored in it. Therefore, these operations should be used carefully.
- **Reversibility:** DDL commands like DROP and ALTER are generally not reversible. Once performed, the changes cannot be rolled back. This is another reason to exercise caution when using these commands.

Data Manipulation Language (DML)

- **DML** is a subset of SQL commands used for manipulating data within database objects like tables. This includes retrieving, inserting, deleting, and modifying data.
- **Common Commands:** The primary DML commands are SELECT, INSERT, UPDATE, and DELETE. SELECT is used to retrieve data, INSERT to add new data, UPDATE to modify existing data, and DELETE to remove data.
- **Transactional Nature:** DML statements can be grouped into transactions, which are units of work that can be committed or rolled back. If a transaction is rolled back, all the changes made in that transaction are undone.
- **Consistency Maintenance:** DML commands help maintain database consistency by ensuring only valid data, adhering to defined rules and constraints, is allowed to enter or stay in the database.
- **Data Interaction:** DML provides an interface to interact with the data. It's what users often use to query the database, making it a crucial part of day-to-day database operations.

MySQL

https://dev.mysql.com/downloads/