

# Understanding SQL, NoSQL, and MongoDB

## What is SQL?

SQL stands for **Structured Query Language**. It's a standard language used to interact with relational databases. You use SQL to create, read, update, and delete data in a structured way, often in tables that have rows and columns.

## Key Features of SQL Databases

### 1. Structured Data Format

- Data is stored in tables with rows and columns.
- Each table has a defined structure (schema).

### 2. Fixed Schema

- Before inserting data, the table structure must be defined.
- Data must follow this schema (e.g., data types, column names).

### 3. ACID Compliance

- Ensures data integrity through:
  - Atomicity – All operations in a transaction are completed or none.
  - Consistency – Data remains valid after a transaction.
  - Isolation – Transactions do not affect each other.
  - Durability – Changes are permanent after a transaction.

### 4. Powerful Query Language (SQL)

- Use SQL to:
  - Create and manage tables (DDL).
  - Insert, update, delete data (DML).
  - Retrieve data using SELECT queries (DQL).
  - Control user access (DCL).

### 5. Relational Integrity

- Supports primary keys, foreign keys, and constraints to maintain relationships between tables.

## What is NoSQL?

NoSQL means **Not Only SQL**. These databases don't use the traditional table format. Instead, they are designed to store all kinds of data — structured, semi-structured, or unstructured — and are good at handling large amounts of data quickly, especially across multiple computers.

### Key Features of NoSQL Databases:

#### 1. Flexible Schema

- You don't need to define a fixed structure before storing data.
- Different records can have different fields—great for handling evolving data.

#### 2. Variety of Data Models

- NoSQL supports multiple types of databases:
  - Document-based (e.g., MongoDB)
  - Key-value (e.g., Redis)
  - Column-family (e.g., Cassandra)
  - Graph-based (e.g., Neo4j)

#### 3. BASE Compliance

- Follows the BASE model instead of ACID:
  - Basically Available
  - Soft state
  - Eventually consistent

#### 4. Distributed and Cloud Friendly

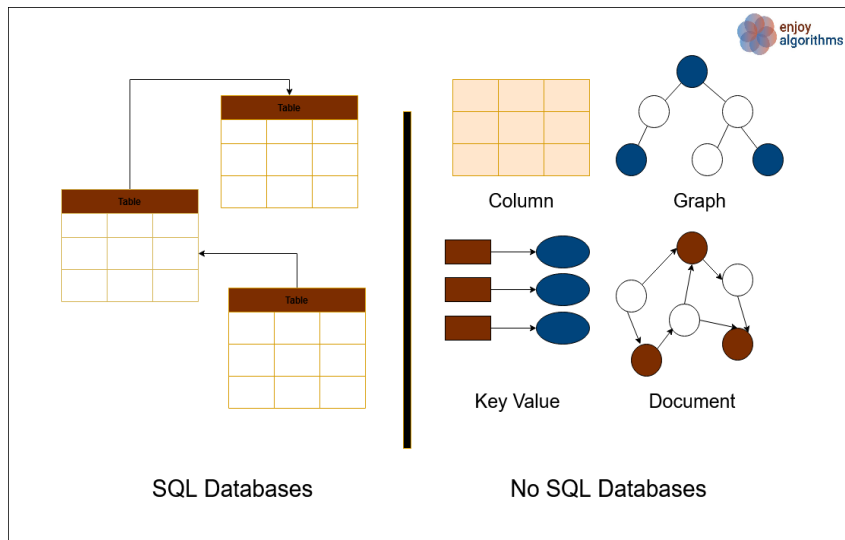
- Built for distributed environments and cloud-native apps.
- Data is replicated across multiple nodes for fault tolerance and high availability.

#### 5. Support for Big Data

- Efficiently handles large volumes of data from various sources.

#### 6. Open-Source and Community Driven

- Many NoSQL databases are open-source, with active communities and strong enterprise support.



SQL	NoSQL
Rational Database	Non- rational, Distributed Database
Vertically Scalable	Horizontally Scalable
Table Based Database	Document Based, Graph Based or Key- value Pair
Pre-Define Schema	Dynamic schema
Uses SQL	Uses UnQL (Unstructured Query Language)
Not Preferred for Large Datasets	Largely Preferred for large Datasets

## What is MongoDB?

**MongoDB** is a popular **NoSQL database** that stores data in a **document format** (similar to JSON). It is designed to be **flexible**, **scalable**, and **high-performing**, making it ideal for modern applications that handle large amounts of data, especially in real-time.

Instead of tables and rows (like in SQL), MongoDB stores data as **collections and documents**.

## Key Features of MongoDB:

### 1. Document-Based

- Stores data in documents, not rows and columns.
- Easy to read and write.

### 2. Flexible Structure

- No need for a fixed format (schema).
- You can store different types of data in the same collection.

### 3. Fast Performance

- Works quickly for reading and writing data.
- Uses indexes to make searches faster.

### 4. Scalable

- Can spread data across many servers using sharding.
- Good for handling big data and high traffic.

### 5. High Availability

- Uses replica sets to copy data on multiple servers.
- If one server fails, others keep working.

### 6. ACID Transactions

- Can make safe and reliable changes to multiple pieces of data at once.

## 7. Cloud Support – MongoDB Atlas

- MongoDB offers a cloud version that manages the database for you.
- It takes care of scaling, backups, and security.

## 8. Real-Time Updates

- Can track data changes in real time using Change Streams.
- Good for live dashboards and alerts.

