Types of Databases: Different Models of Data Organization

Introduction

This lesson explores the different ways databases can be structured to store and manage information. While the core purpose of a database is always the same, the method of organizing the data—known as the **database model**—can vary significantly. We'll focus on the two main types used today: Relational and NoSQL databases, and explain how they differ in their approach to data.

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1. Relational Databases

The **relational database** is the most common type and is based on a simple, yet powerful, concept. Data is organized into one or more **tables** (or "relations") consisting of **rows** and **columns**.

- **Rows** represent a single record or entry (e.g., a specific customer).
- **Columns** represent attributes of that record (e.g., customer name, address).

These tables are linked together by using **keys**. A **primary key** is a unique identifier for a row in a table, while a **foreign key** is a field in one table that refers to the primary key of another. This system allows you to create relationships between different pieces of data. For example, a "Customers" table can be linked to an "Orders" table using a Customer ID, so you can easily see which customer placed which order.

This model is ideal for structured data where relationships are clear and predictable, such as in financial systems, e-commerce, and inventory management. They use a standard query language called **SQL** (Structured Query Language) to manage and retrieve data.

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2. NoSQL Databases

NoSQL (short for "Not Only SQL") databases were created to handle the massive amounts of unstructured and semi-structured data generated by modern applications. Unlike relational databases, they do not rely on a rigid, tabular structure. Instead, they offer more flexible data models.

There are several types of NoSQL databases, but the most common are:

- **Document Databases**: These store data in flexible, document-like formats, often using **JSON** (JavaScript Object Notation). Each "document" can have a different structure, which is great for storing varied data like user profiles or product catalogs.
- **Key-Value Stores**: The simplest type of NoSQL database, it stores data as a collection of **key-value pairs**. It's like a dictionary or a simple filing system where you access a value using a unique key.
- **Graph Databases**: These are designed to store and navigate relationships between data points. Data is represented as a network of **nodes** (entities) and **edges** (relationships). This is perfect for

social networks, recommendation engines, and fraud detection.

NoSQL databases are known for their ability to **scale horizontally** by adding more servers, making them well-suited for big data and real-time applications that need to handle high volumes of traffic, such as social media platforms.