

Databases: Background

In this section, we will discuss what databases are and their types. The topics to be discussed in this chapter are as follows:

- Introduction to databases
- SQL, its advantages and disadvantages
- NoSQL, its advantages and disadvantages

If the reader believes themselves to already be familiar with the listed concepts, then they can feel free to skip this section and move on to the rest of the chapter.

Introduction to Databases

Databases are the main method of storing and organizing volumes of related data in modern organizations, serving as the backbone of data management by providing structured environments for storing, retrieving, and updating information. Whether maintaining employee records, managing transactions in an e-commerce system, or supporting real-time data analytics, databases are essential for organized data storage and retrieval.

Today, databases come in a variety of forms, and are often tailored for specific needs. From traditional relational databases (SQL) designed to handle structured data with strict relationships, to flexible NoSQL databases, which excel at handling unstructured or semi-structured data in real-time applications.

SQL

Short for Structured Query Language, SQL databases organize data into tables that define relationships between different types of data. They offer a structured tabular format, providing a high level of consistency and reliability for applications where data integrity is crucial, such as finance and healthcare. It is ideal for data

that benefits from adhering to the ACID (Atomicity, Consistency, Isolation and Durability) set of properties.

Having consistent schema makes it easy to run queries on the stored data, which is where SQL gets its name from. All SQL databases regardless of their differences store data in tables that can be queried according to similar commands and principles.

However, the structured format offered by SQL databases mean that the type of database is ill suited for the handling of unstructured data, data that cannot easily be organized into a rigid database schema.

NoSQL

Short for Not Only SQL, NoSQL databases operate without a defined, rigid schema, the defining property of SQL databases. They store data in non-tabular formats, prioritizing flexibility and scalability, making them ideal for handling large volumes of unstructured databases.

Now, NoSQL databases come in many different flavors, and are often fundamentally different from one another. A full list of all the different types of NoSQL documents is beyond the scope of this book but some of the major ones include: **Document databases**, **Key-value databases** and **Graph databases**.

While this variety means NoSQL databases can handle a wider range and variety of data, it also means that there is no standard querying model/language that works across different types of NoSQL databases, with integration between different types of NoSQL databases often being a subject of particular hassle.