Databases in Web Development

An overview of the use of databases in web applications.

In the previous chapter, we discussed the basic structure and underlying protocols of a web page. Now, we will begin looking into what goes into forming a web page. To start with, we will talk about databases and database management systems (DBMS) and the role they play in making the web applications you see all around you, including this one! We know databases are essentially tables used to store and access data, but we now need to look at how these tables fit into the context of web application development. Before we can start talking about what the purpose of a database in a web application is, we must first outline the two kinds of websites that exist.

Static vs. dynamic web pages

Websites may be classified into one of two types:

1. Static
2. Dynamic

Static websites are ones that only display information such as text or pictures on their web pages that users cannot interact with.

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Dynamic websites, on the other hand, allow for user interaction, and that is where Databases come into the picture. Think of any website you've visited today. How many of them required for you to sign in or allowed you to click on a button that retrieved some information, perhaps even a new web page, for you? This information that web applications are able to display to you or process to allow you to access other information needs to be stored somewhere. That somewhere is a database associated with the web application.

Basic Structure of a Dynamic Website
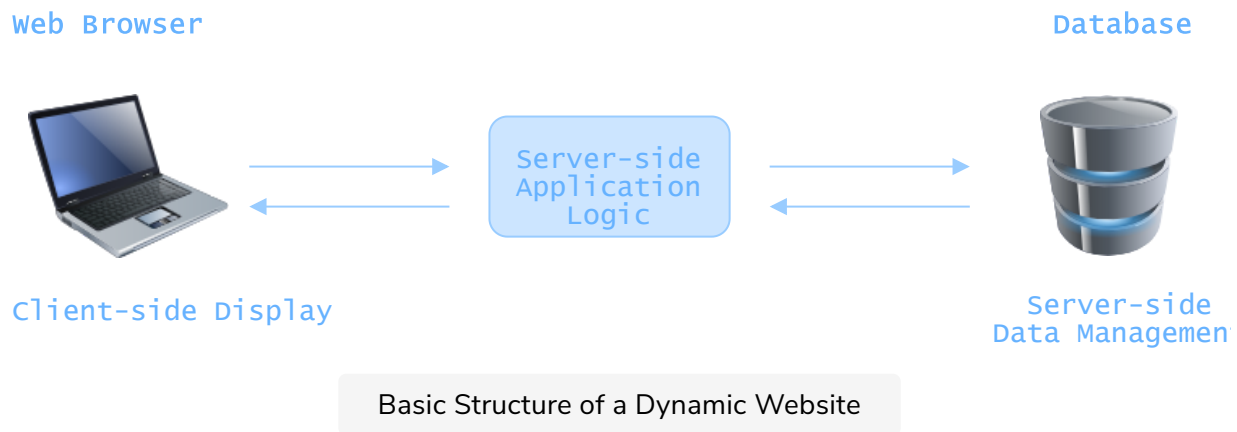
DBMS in web applications

DBMS, short for Database Management System, is essentially a sort of nuance added to web development that allows data to be separated from the logic of the application and stored separately to be retrieved and processed when required. What this means is that the data is stored in a database that has an entirely autonomous system governing it. The application then makes calls to this database for any required data without having to integrate large amounts of handling code within the application code itself. Database management systems are, therefore, important to developers because they provide a highly efficient method for handling multiple types of data, without interfering with the application's code.

Types of DBMS

Database Management Systems can be categorized into one of two types:

1. SQL
2. NoSQL

SQL

SQL databases, also known as *relational databases*, use structured query language (SQL) for defining and manipulating data. On the one hand, this is extremely useful since SQL is one of the most versatile and widely-used options available, thus making it a safe choice and especially great for complex queries. On the other hand, it can be restrictive, too, since SQL requires that you use predefined schemas to determine the structure of your data before you work with it. Moreover, data is always stored as a table in SQL databases, which leads to inefficient and complicated data retrievals. In addition, all of your data must follow the same structure. This can require significant effort and may lead to a highly complicated data processing code that can affect the quality of the overall application.

Some common SQL databases that we will be discussing in this chapter include:

1. MySQL
2. PostgreSQL
3. MariaDB

NoSQL

NoSQL databases, also known as *non-relational databases*, have a dynamic schema for unstructured data, and data is stored in many ways, including key-value pairs, documents and, even graphs. This flexibility means that you don't have to define the structure of your data explicitly and each data set can have its own unique structure without having to worry about writing extraneous lines of code to process this data to match a specific predefined structure. These databases can grow dynamically, and the structure of data can vary from database to database.

Popular NoSQL databases that we will be covering in this chapter include:

1. MongoDB
2. Apache CouchDB
3. Redis

Test your understanding!

1 Which of the following is NOT true about dynamic websites?

That covers all we need to know about the role of databases and database management systems in web development. Now, we will move on to look at specific examples of both types of databases and list the pros and cons of both.