Web Application Development

2019
Backend concepts
BACK-END DEVELOPMENT & FRAMEWORKS IN SERVER SIDE SOFTWARE

FRAMEWORKS are libraries of server-side programming languages that construct the back-end structure of a site.

The "STACK" comprises the database, server-side framework, server, and operating system (OS).

APIS structure how data is exchanged between a database and any software accessing it.

https://www.upwork.com/hiring/development/a-beginners-guide-to-back-end-development/
MVC

Model
View
Controller
Model

- Model represents shape of the data.
- It maintains the data of the application.
- Model objects retrieve and store model state in a database
View

- View is a user interface.
- View display data using model to the user and also enables them to modify the data.

**NOTE:** Since we are utilizing multi-tiered architecture the “View” abstraction is useless on backend side and UI should be deferred to Front-end application entirely.
Controllers act is an interface between Model and View components to process all the business logic and incoming requests.

- Manipulate data using the Model component.
Databases
Relational Databases

- MySQL
- Sybase
- Oracle
- IMB DM2
- MS SQL
- MariaDB
- Postgres
- ...

- Relational databases consist of two or more tables with connected information, each with columns and rows.
- These connected tables are called database objects, and in order to create them and manage them, you need a relational database management system (RDBMS).
SQL

Structured Query Language

- Standardized programming language for accessing and manipulating databases.
- SQL writes programming that can manage data and stream data processing:
  - Executing queries, which are “questions” asked of the database
  - Retrieving data
  - Editing data: inserting, updating, deleting
  - Setting permissions
  - Creating new databases
SQL

Planning is the key

How your database is structured from day one will have major implications for the health of your system down the road.

Questions to consider include:

- What information will you have? How should it be stored?
- What data will your system need to retrieve regularly, and how?
NOSQL

Flexibility is the key

What happens when your data is inconsistent, incomplete, or massive? In these cases, you need a more flexible database solution.
NoSQL

NoSQL = “Not only SQL.”

Instead of tables, NoSQL databases are document-oriented.

This way, non-structured data (such as articles, photos, social media data, videos, for example, an entire blog post) can be stored in a single document that can be easily found but isn’t necessarily categorized into a bunch of pre-set fields.
RELATIONAL VS. NON-RELATIONAL DATABASES

A non-relational database does not incorporate the table model. Instead, data can be stored in a single document file.

A relational database table organizes structured data fields into defined columns.

https://www.upwork.com/hiring/data/a-guide-to-database-technology/
Authentication
Authentication

- Authentication is a process of ensuring and confirming user’s identity
- Authentication process begins when user tries to access a resource
Authentication

- HTTP Basic Auth
- Session
- JWT
HTTP Basic authentication is a method for the client to provide a username and a password when making a request.

- username and password are concatenated into a single string: `username:password`
- this string is encoded with Base64
- the `Basic` keyword is put before this encoded value
In the session based authentication, the server will create a session for the user after the user logs in.

The session id is then stored on a cookie on the user's browser.

While the user stays logged in, the cookie would be sent along with every subsequent request.

The server can then compare the session id stored on the cookie against the session information stored in the memory to verify user's identity and sends response with the corresponding state!
Session

Browser

Post /user/login
body:{username, pw}

Sends Cookie {sessionId} to browser

Send authenticate req with Cookie {sessionId}

Sends response

Server

Session stored in server memory

Check cookie to get user info from session
In the token based application, the server creates JWT with a secret and sends the JWT to the client.

The client stores the JWT (usually in local storage) and includes JWT in the header with every request.

The server would then validate the JWT with every request from the client and sends response.
JWT

Browser

Post /user/login
body: {username, pw}

Sends

JWT
to browser

Send authenticate req with
JWT in header

Sends response

Server

Create JWT with secret

Check JWT signature, get user info from JWT

Header
Questions?