Web Application Development

Front-End Development with Node.js

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Hanoi, Sept 2024

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Introduction

What is Front-End Development?

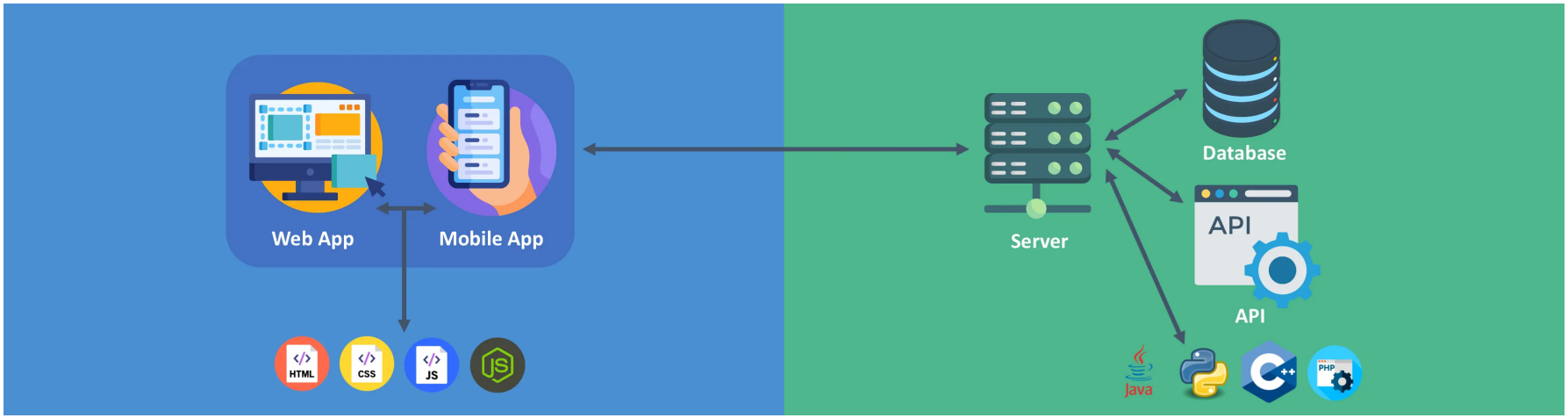
Front-End Development:

- Front-end refers to the part of a web application that users interact with directly.
- Typically built using HTML, CSS, and JavaScript.
- Focuses on user experience (UX) and user interface (UI) design.

Front-End Example

Front-End vs. Back-End Development

Front-End Development	Back-End Development
User-facing part of the app	Server-side logic and databases
Built with HTML, CSS, JS	Built with Node.js, Python, etc.
Handles UI/UX	Handles business logic



Node.js: Used for both back-end and front-end tooling.

FE Dev Tools

Recall: Role of Node.js in Front-End Development

Why Use Node.js for Front-End?

- **Build Tools:** Automate tasks like bundling and minification.
- **Package Management:** Install and manage front-end libraries using npm.
- **JavaScript Everywhere:** Unified language across front-end and back-end.

Recall: Node.js as a Build Tool

Common Build Tools:

- **Webpack:** Bundles JavaScript and assets.
- **Parcel:** Zero-config bundler for fast setup.
- **Gulp:** Automates repetitive tasks like minifying CSS/JS.

Why Bundle? Optimizes performance by reducing file size and load times.

Recall: npm (**N**ode **P**ackage **M**anager)

npm Overview:

- **npm** is the default package manager for Node.js.
- Used to install, manage, and version-control front-end and back-end libraries.

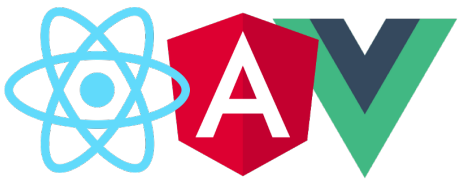
npm Command Examples:

```
npm init  // Initialize a new project
npm install <package>  // Install a package
npm start  // Start the project
```

Common FE Libraries

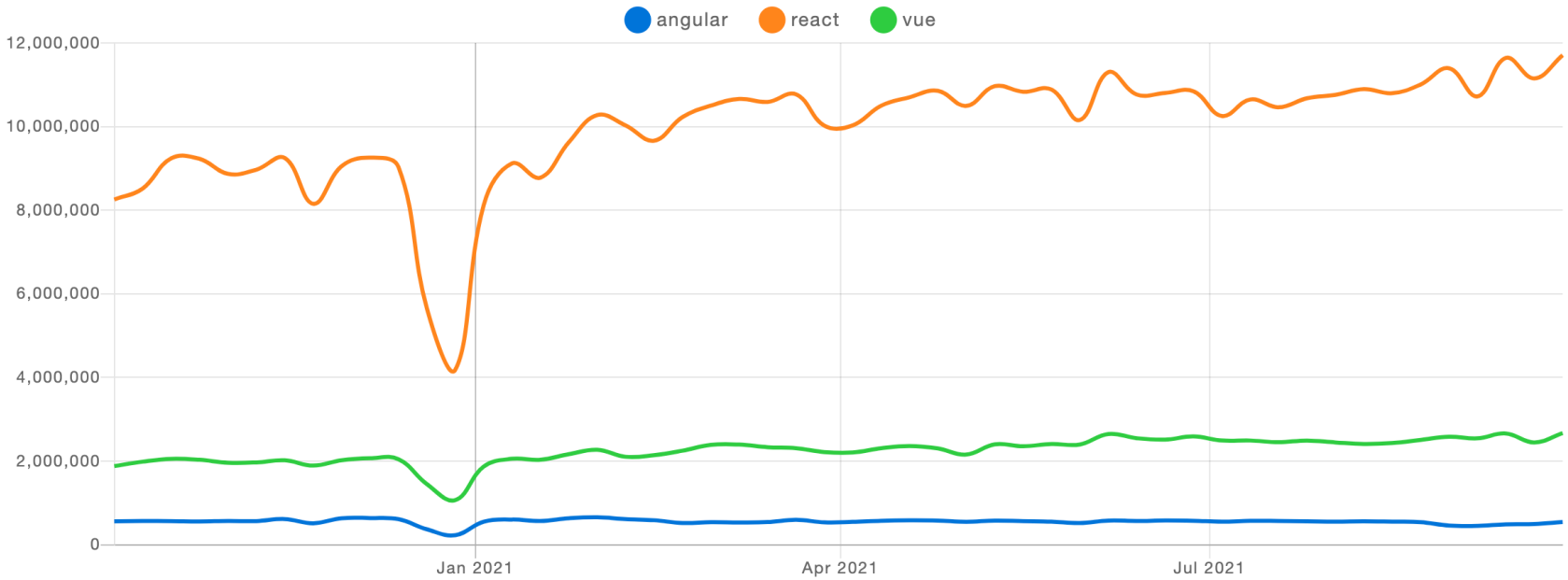
Some Common Front-End Libraries:

- **React**: A powerful and flexible JavaScript library developed by Facebook.
- **Vue.js**: A lightweight, progressive JavaScript framework designed to be easy to integrate into existing projects.
- **Angular**: A comprehensive JavaScript framework developed by Google, designed for building complex and large-scale web applications.



Common FE Libraries (cont.)

Statistics:



Installing Front-End Libraries with npm

How to Install Front-End Libraries:

- npm allows easy installation of JavaScript libraries like React, Vue.js, or Angular.

Example: Installing React:

```
npm install react react-dom
```

Note: The `package.json` file keeps track of installed packages.

Hand-on Some Sample Projects

Project Structure Overview

Typical Front-End Project Structure:

- `src/`: Contains your source files (HTML, CSS, JS).
- `dist/`: Contains bundled files for production.
- `node_modules/`: Installed npm packages.
- `package.json`: Project metadata and dependencies.

Command to Create Project Structure:

```
npm init  // Creates package.json
mkdir src dist  // Create directories
```

Creating a Basic Front-End with Node.js Tools

HTML and JavaScript Setup:

- Create an HTML file (`index.html`) inside `src/`.
- Create a JavaScript file (`app.js`) inside `src/`.

Example HTML File:

```
1  <!DOCTYPE html>
2  <html>
3      <head>
4      <title>Node.js Front-End</title>
5      </head>
6      <body>
7      <h1>Hello, Front-End with Node.js!</h1>
8      <script src="app.js"></script>
9      </body>
10 </html>
```

Using Webpack to Bundle Front-End Code

Setting Up Webpack:

- Install Webpack using npm:

```
npm install webpack webpack-cli --save-dev
```

- Create a `webpack.config.js` file to define entry points and output files.

Example Webpack Configuration:

```
module.exports = {
    entry: './src/app.js',
    output: {
        filename: 'bundle.js',
        path: __dirname + '/dist'
    }
};
```

Running and Testing the Front-End

Steps to Run the Front-End:

1. Bundle the project using Webpack:

```
npm run build
```

2. Open the `index.html` file in a browser to see the output.

Testing and Debugging Tips:

- Use the browser's developer tools (Console, Network) for debugging.

React Overview

What is React?

- A JavaScript library for building user interfaces.
- Developed by Facebook, widely used for single-page applications (SPAs).
- Component-based architecture: Reusable, independent UI components.

Setting Up React with Node.js

Installing React via npm:

```
npm install react react-dom
```

Basic React Component:

```
1  import React from 'react';
2  import ReactDOM from 'react-dom';
3
4  function App() {
5      return <h1>Hello, React!</h1>;
6  }
7
8  ReactDOM.render(<App />, document.getElementById('root'));
```

Integrating React with Webpack

Webpack Configuration for React:

```
module.exports = {
    entry: './src/index.js',
    output: {
        filename: 'bundle.js',
        path: __dirname + '/dist'
    },
    module: {
        rules: [
        { test: /\.js$/, use: 'babel-loader' }
        ]
    }
};
```

Babel: Used to transpile modern JavaScript (ES6+) and JSX into browser-compatible JS.

Deploying the Front-End Application

Deployment Strategies:

- Host on platforms like Netlify, Vercel, or GitHub Pages.
- Serve as static files from a back-end server (e.g., using Express.js).

Production Build:

```
npm run build  // Creates optimized production build
```

Deploy the contents of the `dist/` directory.

Recap of Node.js for Front-End

Key Points:

- Node.js is crucial for managing and building front-end assets.
- Tools like npm, Webpack, and Gulp automate front-end tasks.
- Front-end libraries like React integrate easily with Node.js.

Question and Next Steps

Discussion

Any Questions?

Next Steps: Front-End Development

- Review the code examples we covered in class.
- Explore more advanced front-end frameworks (Vue.js, Angular).
- Learn state management with React (Redux, Context API).
- Experiment with modern JavaScript features and CSS preprocessors (Sass).

Midterm Announcement

- Choose your group (6 people maximum) in the same class page [Deadline: October 4th, 2024]
- The topics will be assigned randomly, visit this google spreedsheet `https://docs.google.com/spreadsheets/d/1X3gZ2CB0LDxNv_hprwek1V9XVuRaa9V5gdHrVC8n3iM/edit?usp=sharing` to see your topic
  - Visit `https://github.com/VietKQ-usth/WebDev2024` and folk this repo.
  - Every team member has to commit your work.

Midterm Announcement (cont.)

- Requirements:
  - Friendly UI design, understandable, not to complex
  - Fancy UI effects/animations (bonus)
  - Should contain all the pages to serve all use cases from the assigned topic
- Prepare for a presentation (5 minutes per group maximum).

Thank you for listening!