**WEEK6**

**1. Define SPA and its benefits**

A **Single Page Application (SPA)** is a web application or website that interacts with the user by dynamically rewriting the current page, rather than loading entire new pages from a server.

**Benefits of SPA:**

* **Faster Navigation**: Only the necessary content is updated, reducing load time.
* **Smooth User Experience**: Feels more like a desktop or mobile app.
* **Reduced Server Load**: Fewer full-page reloads result in better performance.
* **Caching**: SPAs can store data locally for quicker access.
* **Reusable Components**: Common UI elements can be reused throughout the app.

**2. Define React and identify its working**

**React** is a JavaScript library developed by Facebook for building user interfaces, particularly for SPAs. It follows a component-based and declarative approach.

**How React Works:**

* **Component-Based**: The UI is divided into small, reusable pieces called components.
* **Virtual DOM**: React creates a virtual copy of the real DOM and uses it to track changes.
* **Efficient Updates**: It updates only the changed parts of the DOM using a process called reconciliation.

**3. Identify the differences between SPA and MPA**

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| **Feature** | **SPA (Single Page Application)** | **MPA (Multi Page Application)** |
| Page Reloads | No full reloads; dynamic content update | Reloads the entire page on navigation |
| Speed | Faster after initial load | Slower navigation due to full page loads |
| Development Focus | Frontend-heavy (uses JS frameworks) | Backend-heavy (traditional approach) |
| SEO (Search Engine) | More difficult (without SSR) | Easier to optimize |
| Example Frameworks | React, Angular, Vue | PHP, ASP.NET, Java Spring MVC |

**4. Explain Pros and Cons of Single Page Application**

**Pros:**

* Fast and responsive user experience
* Reusable frontend code
* Smooth transitions without full-page reload
* Well-suited for mobile-like applications

**Cons:**

* SEO can be difficult without server-side rendering (SSR)
* Initial load time may be longer
* Handling browser history and navigation is more complex
* Requires JavaScript to be enabled in the browser

**5. Explain about React**

**React** is a popular open-source JavaScript library used to build fast, responsive, and interactive user interfaces, primarily for web applications.

**Key Points:**

* Developed and maintained by Facebook
* Follows a component-based architecture
* Uses JSX (JavaScript XML) to write HTML in JavaScript
* Efficiently updates and renders components using the virtual DOM
* Can be used for SPAs, mobile apps (React Native), and server-side rendering (Next.js)

**6. Define Virtual DOM**

The **Virtual DOM (VDOM)** is a lightweight, in-memory representation of the real DOM.

**How it Works:**

* React builds a virtual DOM tree in memory
* When the UI changes, React compares the new virtual DOM with the previous one (diffing)
* It identifies what has changed and updates only those parts in the real DOM (reconciliation)
* This improves rendering performance and makes updates more efficient

**7. Explain Features of React**

* **JSX**: Enables writing HTML-like syntax directly within JavaScript.
* **Component-Based Architecture**: Encourages the creation of modular, reusable UI components.
* **Virtual DOM**: Enables fast and efficient updates to the user interface.
* **Unidirectional Data Flow**: Data flows from parent to child components, making the application predictable and easier to debug.
* **Lifecycle Methods**: Provide hooks for running code at specific points during a component's life.
* **Hooks**: Allow functional components to manage state and side effects.
* **Fast Rendering**: Optimized through virtual DOM and the diffing algorithm.
* **Strong Ecosystem**: Supported by a large community and compatible with tools like Redux, React Router, etc.

