

1. Define SPA and its Benefits

SPA (Single Page Application):

A Single Page Application is a web application that loads a single HTML page and dynamically updates content as the user interacts with the app, without refreshing the entire page.

Benefits of SPA:

- **Faster Navigation:** Only content changes, not the whole page reload.
- **Smooth User Experience:** Transitions and interactions feel more seamless.
- **Reduced Server Load:** Only one initial page load, subsequent data fetched via APIs.
- **Better Mobile Performance:** Less data exchange leads to improved speed on mobile.

2. Define React and Identify Its Working

React:

React is a JavaScript library developed by Facebook for building fast and interactive user interfaces, especially for SPAs.

How React Works:

- Uses a **component-based architecture** (UI is split into reusable pieces).
- Utilizes a **virtual DOM** to track and apply only necessary updates to the actual DOM.
- **Unidirectional data flow:** Data flows from parent to child components for predictable behavior.

3. Differences Between SPA and MPA

Feature	SPA (Single Page Application)	MPA (Multi Page Application)
Page Loading	Loads a single HTML page	Loads a new page for each interaction
Performance	Faster after initial load	Slower due to full-page reloads
User Experience	Smooth and dynamic	Traditional, may involve flickers
Development	Often uses frameworks like React	Built with server-side rendering
SEO Optimization	Harder (requires SSR or pre-render)	Easier (each page is separate HTML)

4. Pros & Cons of Single-Page Application

Pros:

- Fast, interactive experience.
- Minimal reloads and better caching.
- Great for mobile apps.
- Easier to create dynamic features.

Cons:

- SEO challenges.
- Initial load time may be high.
- Complex security handling.
- Requires good routing and state management.

5. Explain About React

React is:

- A **JavaScript library** for building user interfaces.
- Based on **declarative programming** – you describe what UI should look like.
- Built with **components**, which are independent and reusable.
- Efficient due to the **virtual DOM**.
- Often used for **SPAs** but can be used in MPAs too.

React is not a full framework – you typically use it with tools like React Router (for navigation) and Redux or Context API (for state management).

6. Define Virtual DOM

Virtual DOM (VDOM):

A virtual representation of the real DOM kept in memory. React uses the virtual DOM to determine what parts of the real DOM need to change.

Working:

1. UI is rendered to the virtual DOM.
2. When state/props change, React creates a new virtual DOM.
3. React compares the new virtual DOM with the previous one (diffing).
4. Only the **changed parts** are updated in the real DOM (efficient and fast).

7. Features of React

- **JSX (JavaScript XML):** Syntax extension to write HTML in JavaScript.
- **Component-Based Architecture:** Reusable and modular code.
- **Virtual DOM:** Efficient updates and rendering.
- **Unidirectional Data Flow:** Predictable data movement.
- **Hooks:** Functional components can manage state and side effects.
- **React Router:** Enables routing in SPAs.
- **Strong Ecosystem:** Supported by a wide range of tools and libraries.