



Software Design and Architecture

ASSIGNMENT 02

Architectural Evolution of REACT FRAMEWORK

Prepared For
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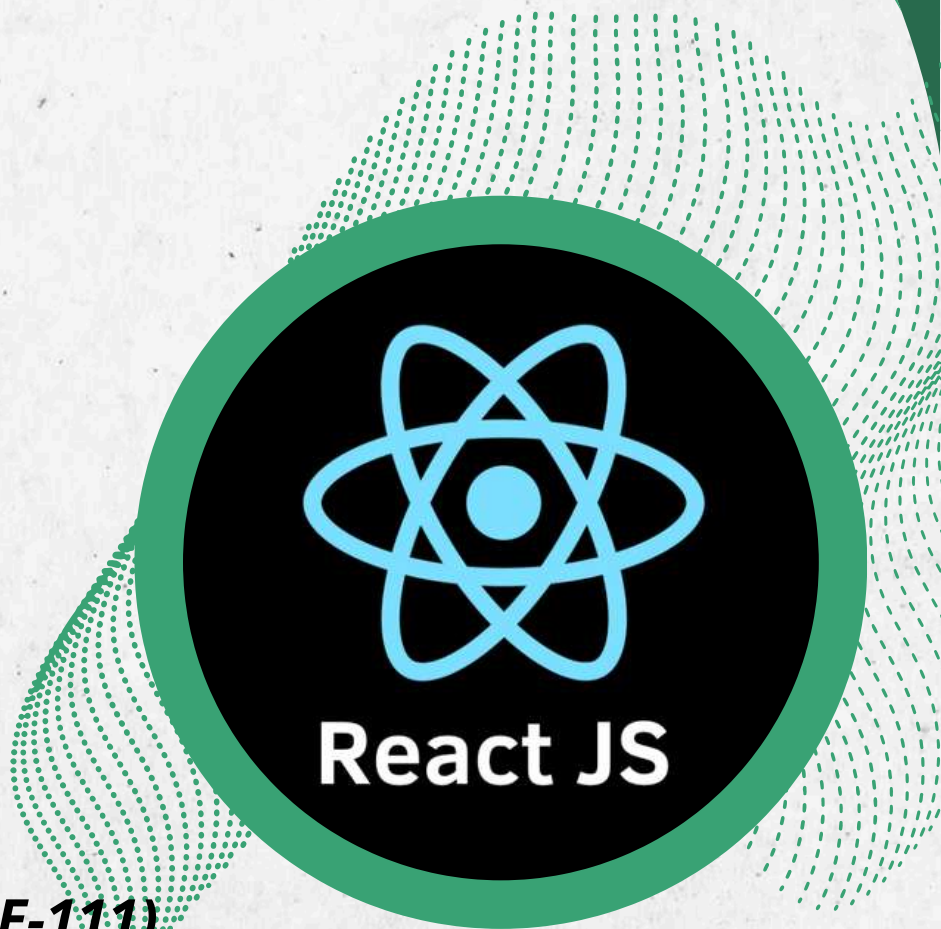
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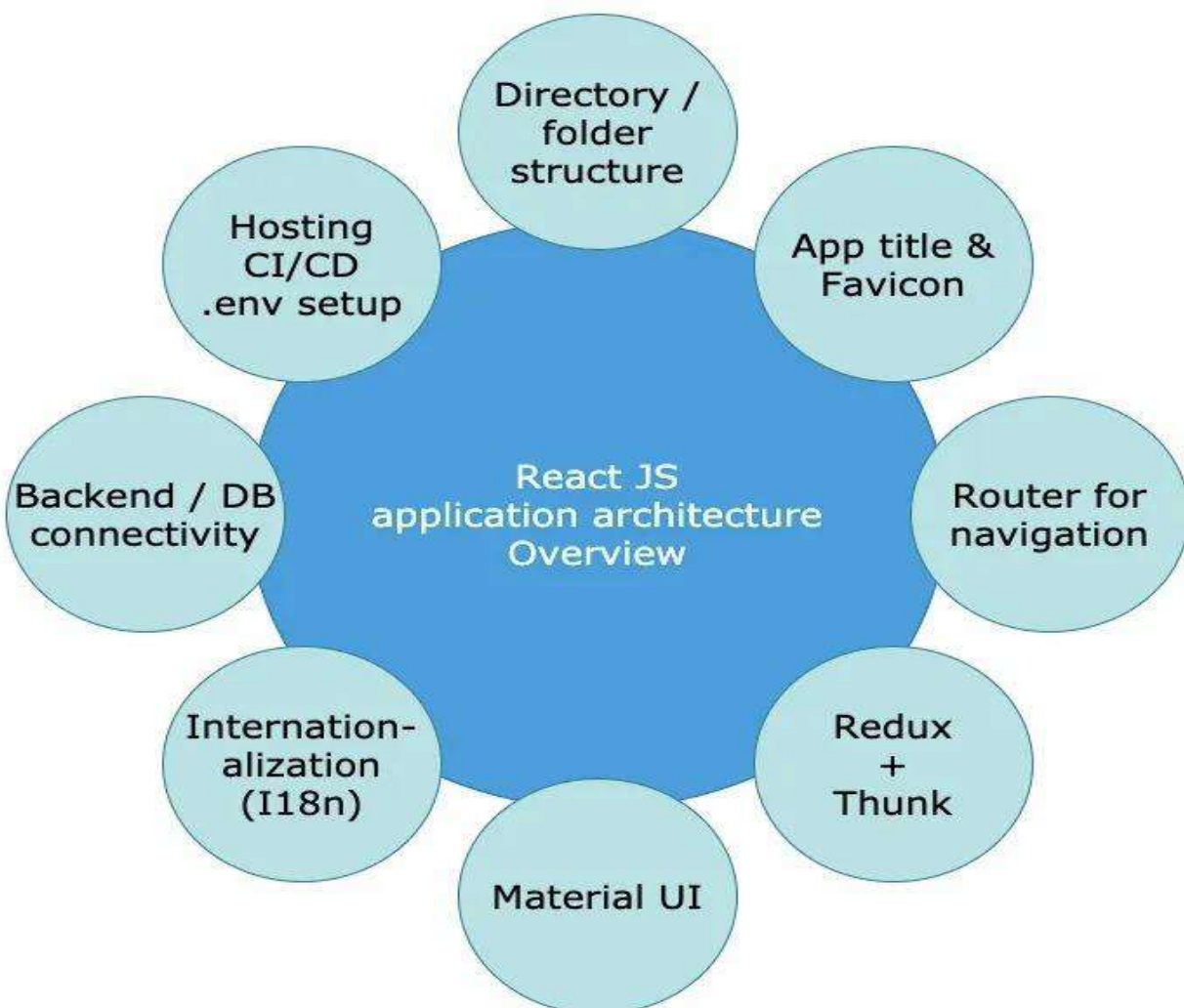


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React.js Architectural Evolution Report

1) Introduction

React.js, developed and maintained by Facebook (Meta), is one of the most widely used JavaScript libraries for building user interfaces. Over time, React.js has undergone significant architectural changes, improving performance, developer experience, and scalability.



2) Evolution of React.js by Releases

I. Group Member 1 (Hasham Khalid): Early Releases (v0.3.0 - v15.0.0)

Key Releases and Features:

1) React v0.3.0 (2013)

- Virtual DOM introduced for efficient UI rendering.
- JSX (JavaScript XML) for HTML-like syntax in JavaScript.

2) React v0.8.0 (2014)

- **Lifecycle methods introduced:** componentDidMount, componentWillUnmount.
- State management within class components.

3) React v15.0.0 (2016)

- Improved DOM Diffing Algorithm.
- Functional components introduced for simpler stateless components.

Architectural Insights:

- **Virtual DOM:** Enables React to update the UI efficiently.
- **JSX:** Simplifies UI development with JavaScript.

Contribution Statement:

"I focused on analyzing the foundational releases of React.js, highlighting key innovations such as Virtual DOM and JSX, and explaining their impact on web development."

II. Group Member 2 (Muhammad Asim Ilyas): Mid-stage Releases (v16.x - v16.8.x)

Key Releases and Features:

1) React v16.0.0 (2017)

- **React Fiber:** A complete re-architecture of React's reconciliation engine.
- **Error Boundaries:** Improved error handling for components.

2) React v16.3.0 (2018)

- **Context API:** Simplified state sharing between components.
- **StrictMode:** Tool for highlighting potential problems in an application.

3) React v16.8.0 (2019)

- **Hooks:** Introduced useState, useEffect, useContext.
- Enabled functional components to manage state and side effects.

Architectural Insights:

- **React Fiber:** Improved the efficiency of UI rendering.

- **Hooks:** Removed dependency on class components for managing state.

Contribution Statement:

"I analyzed React's mid-stage evolution, focusing on React Fiber and the revolutionary introduction of Hooks, enhancing performance and simplifying state management."

III. Group Member 3 (Noman Shakir): Modern Releases (v17.x - v18.x)

Key Releases and Features:

1) React v17.0.0 (2020)

- Focused on gradual upgrades for large-scale applications.
- Enhanced event delegation mechanism.

2) React v18.0.0 (2022)

- Concurrent Rendering: Improved responsiveness and rendering.
- Suspense for Data Fetching: Simplified asynchronous operations.

Architectural Insights:

- **Concurrent Rendering:** Allows rendering interruptions for better user experience.
- **Suspense:** Simplified asynchronous UI updates.

Contribution Statement:

"I explored React's modernization through features like Concurrent Rendering and Suspense, emphasizing their role in enhancing UI performance and responsiveness."

IV. Group Member 4 (Ferdous Gulzar): Latest Release and Future Plans (v19.x & beyond)

Key Releases and Features:

1) React v19.0.0 (Upcoming)

- Enhanced Server Components for better SSR (Server-Side Rendering).
- Improved Hydration for faster rendering after SSR.

2) Future Focus:

- More advanced Developer Tools.
- Improved debugging and runtime analysis tools.

Architectural Insights:

- **Server Components:** Minimized JavaScript sent to clients, improving performance.
- **Hydration:** Optimized rendering performance for SSR pages.

Contribution Statement:

"I studied React's future roadmap, emphasizing server-side rendering improvements and architectural optimizations for scalable applications."

3) Group Member Contributions Summary

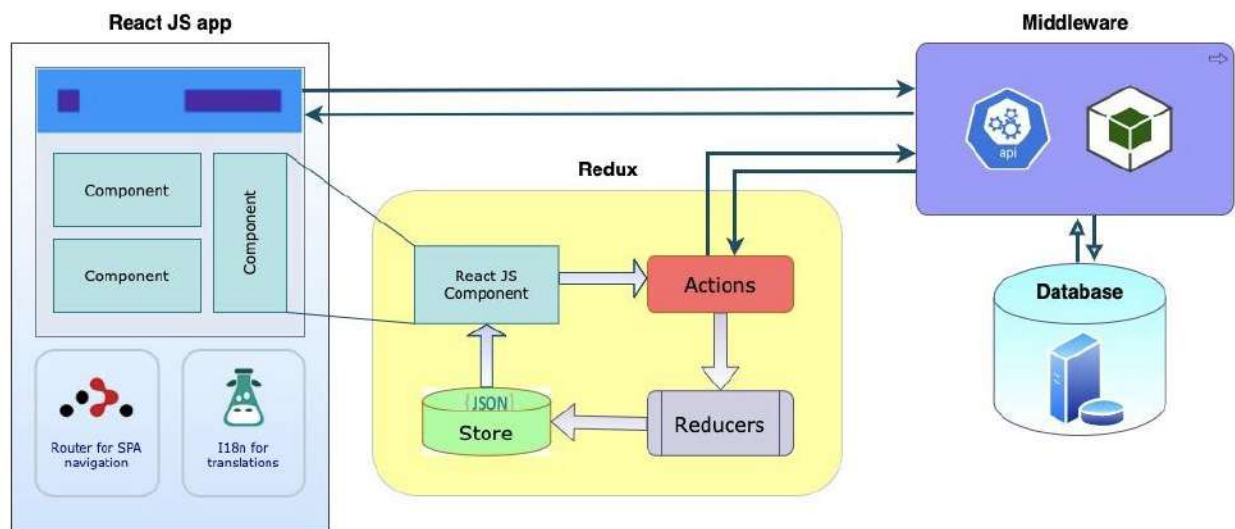
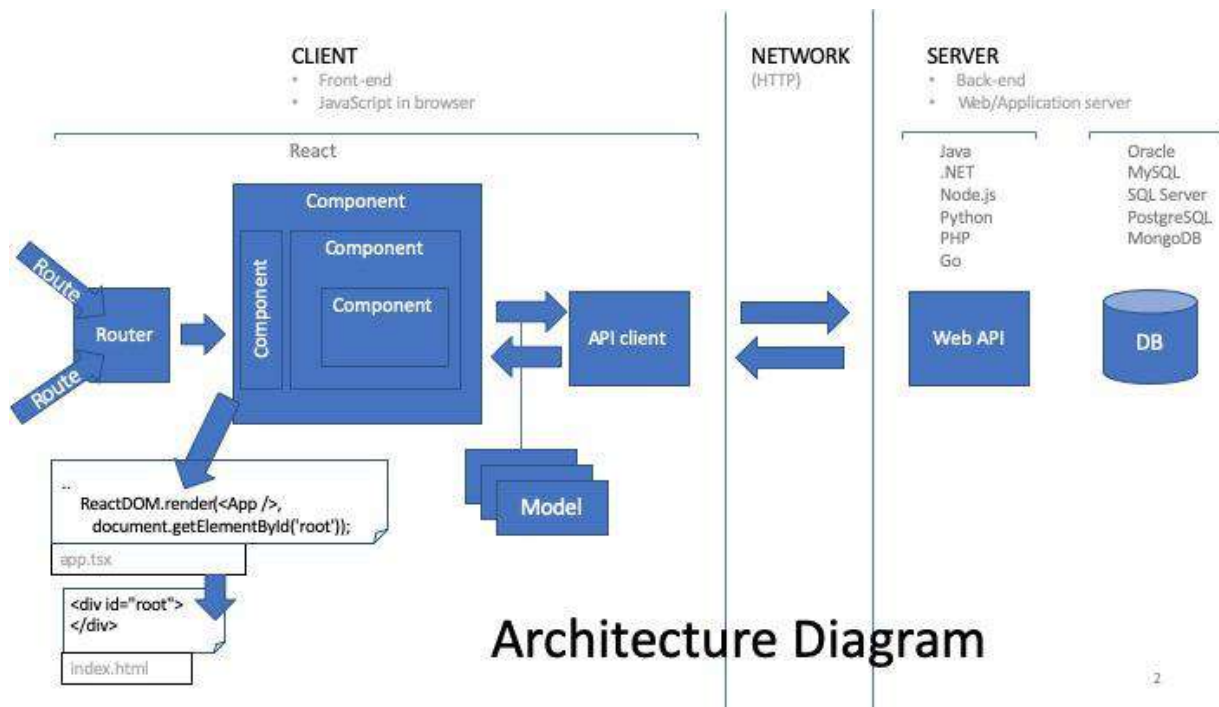
Member	Contribution
Member 1 (Hasham Khalid)	Early React releases, Virtual DOM, JSX
Member 2 (Muhammad Asim Ilyas)	Mid-stage evolution, React Fiber, Hooks
Member 3 (Noman Shakir)	Modern architecture, Concurrent Rendering, Suspense
Member 4 (Ferdous Gulzar)	Latest releases, Server Components, Hydration

4) Architectural Evolution Overview

React.js Architectural Timeline Summary:

Version	Key Features	Architectural Changes
v0.3.0 - v15.0.0	Virtual DOM, JSX, Class Components	Initial architecture design
v16.x - v16.8.x	React Fiber, Hooks, Context API	Enhanced rendering and state management
v17.x - v18.x	Concurrent Rendering, Suspense	Optimized performance and SSR
v19.x & beyond	Server Components, Hydration	Advanced SSR and performance

5) Architecture Diagram:



6) Conclusion

React.js has revolutionized modern web development with its consistent architectural improvements, offering developers an efficient, scalable, and powerful library for building UIs.