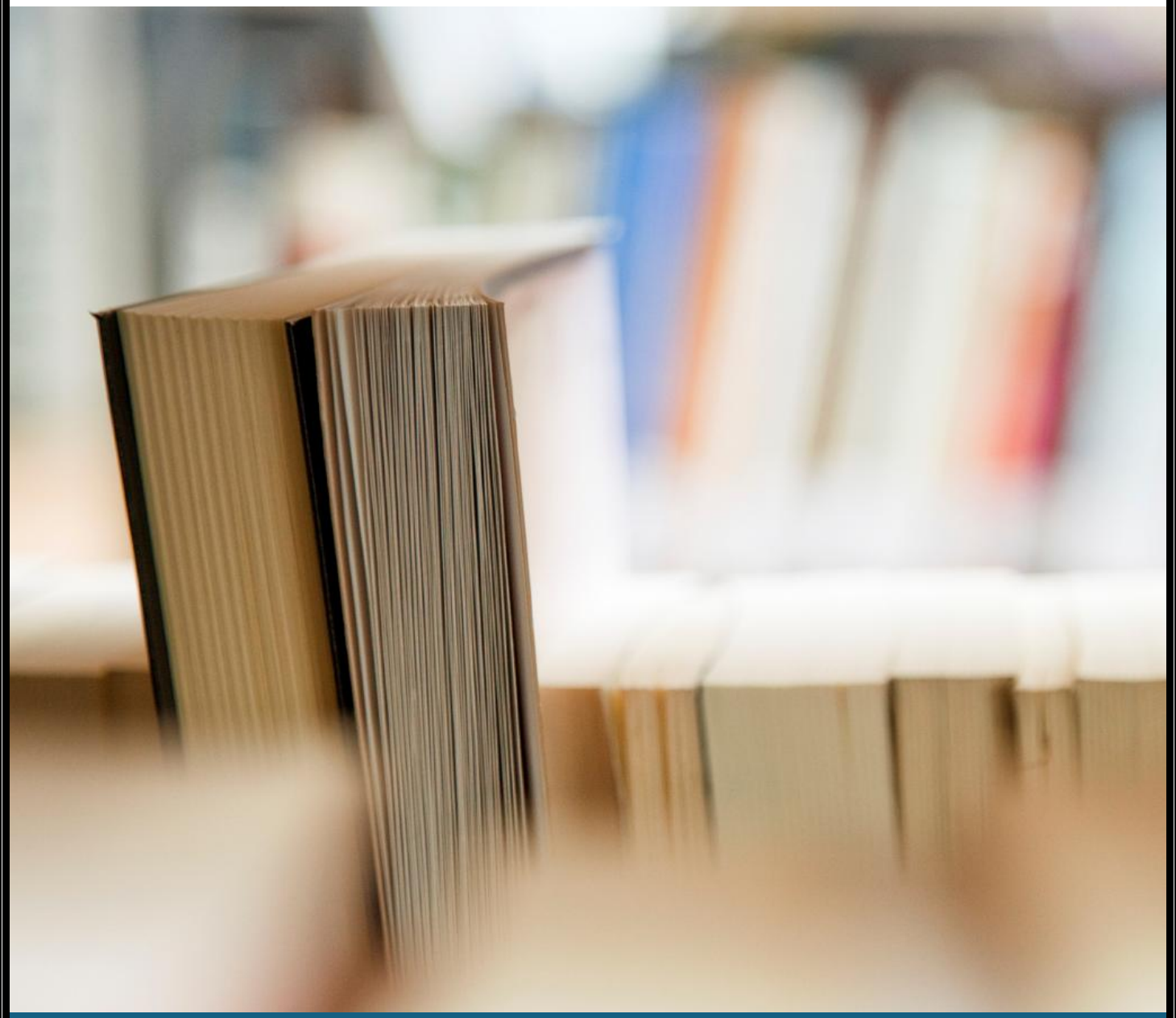

SDA ASSIGNMENT

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CUI

Architectural Evolution of React Framework

1. Introduction

React is a popular JavaScript library for building user interfaces, particularly single-page applications. Created by Facebook in 2013, React revolutionized front-end development with its virtual DOM, declarative syntax, and component-based architecture.

2. Selection of Framework/Software

React was chosen for its significant influence on modern front-end development and its well-documented architectural evolution. Its journey from simple UI rendering to supporting modern development paradigms like server-side rendering and React Server Components provides a rich case study.

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3. Architectural Evolution

Release 0.3.0 (Initial Release)

- **Release Date**: May 2013
- **Major Features**:
    - Introduction of the Virtual DOM for efficient UI updates.
    - Declarative, component-based structure.
    - JSX syntax to combine HTML-like tags with JavaScript logic.
- **Architectural Diagram**:
- [Browser DOM]
- | (Virtual DOM diffing)
- [Virtual DOM]
- | (Re-render triggered by state changes)

[React Components]

- **Release Notes**:
    - Simplified DOM manipulation for developers.
    - Encouraged reusable UI components.

Release 15.0.0

- **Release Date**: April 2016

- **Major Features**:
    - Enhanced component lifecycle methods (e.g., componentWillMount, componentDidMount).
    - Preparation for React Fiber rendering engine.
- **Architectural Diagram**:
- [React Components]
- | (Lifecycle Methods)
- -> Mounting (componentDidMount)
- -> Updating (shouldComponentUpdate)
- -> Unmounting (componentWillUnmount)
- [Virtual DOM]
- | (Efficient updates via initial Fiber concepts)

[Browser DOM]

- **Release Notes**:
    - Focused on performance improvements.
    - Enhanced developer debugging tools.

Release 16.0.0 (React Fiber)

- **Release Date**: September 2017
- **Major Features**:
    - Introduction of React Fiber, a new reconciliation algorithm.
    - Support for incremental rendering for better animations.
- **Architectural Diagram**:
- [React Fiber Renderer]
- |
- [Component Tree]
- |
- [Incremental Rendering Mechanism]
- |

[Browser DOM]

- **Release Notes**:
    - Enabled smooth, asynchronous rendering.
    - Improved error boundaries with componentDidCatch.

Release 17.0.0

- **Release Date**: October 2020
- **Major Features**:
    - Streamlined updates for compatibility with React Server Components.
    - Incremental updates for modern browser standards.
- **Architectural Diagram**:
- [React Components]
- |
- [React Server Components (Optional)]
- |
- [Server Rendering Pipeline]
- |

[Client-Side React Rendering]

- **Release Notes**:
    - Enhanced compatibility and stability.
    - Focused on non-breaking changes for seamless transitions.

Release 18.0.0

- **Release Date**: March 2022
- **Major Features**:
    - Full support for concurrent rendering and server-side streaming.
    - Introduction of useTransition for better user experience during updates.
    - Automatic state batching for optimized updates.
- **Architectural Diagram**:

- [Concurrent Rendering Mechanism]
- |
- [React Fiber Renderer]
- |
- [Automatic State Batching]
- |

[Browser DOM]

- **Release Notes**:
    - Improved developer experience.
    - Emphasized performance optimization and modern features.

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4. Team Contributions

- **Member 1(ABDULLAH):** Researched and documented releases from 0.3.0 to 10.0.0.
- **Member 2(ALI BASHIR):** Compiled features and architectural diagrams for releases 10.0.0 to 15.0.0.
- **Member 3(ABDUL GHAFFAR):** Created illustrations and diagrams for architectural changes.
- **Member 4(Muzammil Ahmed):** Compiled features and architectural diagrams for releases 10.0.0 to 18.0.0.

Conclusion

Reacts architectural evolution highlights its adaptability and focus on improving developer experience. From the virtual DOM to concurrent rendering, React has consistently pushed the boundaries of front-end development.

DIAGRAM:

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