React Basics-Level 1

Pre-requisites

1	HTML
2	CSS
3	Advance JavaScript ES6

Agenda

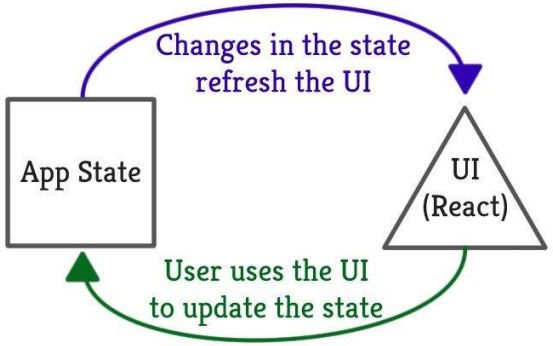
1	Introduction/Installation/Features
2	Components development using JSX
3	Working with Bootstrap and JQuery
4	Props,State and Component life Cycle
5	Hooks (useState)
6	Handling Events
7	Keys, List and Conditional Rendering
8	Working with Forms, controlled and uncontrolled components

Introduction/Installation/Features

React JS

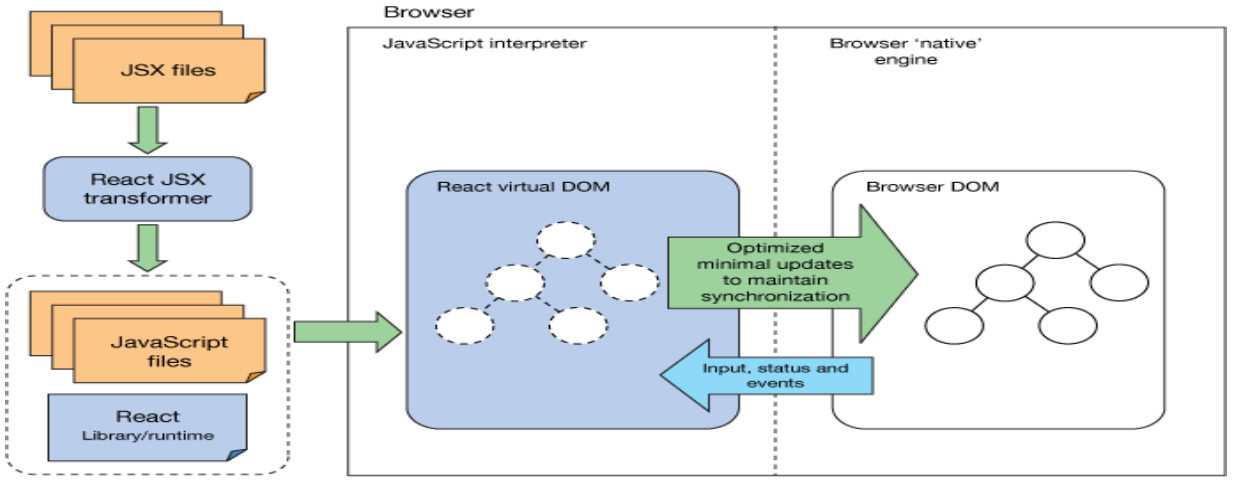
Overview

- **What is React?**
  - Developed by Facebook in 2011
  - Open Sourced in 2015 and has a large community
  - **"A javascript Library for building User Interfaces"**
  - Declarative, efficient, and flexible JavaScript library for building user interfaces
  - compose complex UIs from small and isolated pieces of code called “components”.
  - React implements one-way data flow which makes it easy
  - Uses Flux is a pattern that helps keeping your data unidirectional.
  - solve one problem: **building large applications with data that changes over time**
    - Extremely fast, because it uses a virtual DOM, and syncs only the changed parts with the underlying page



React JS contd...

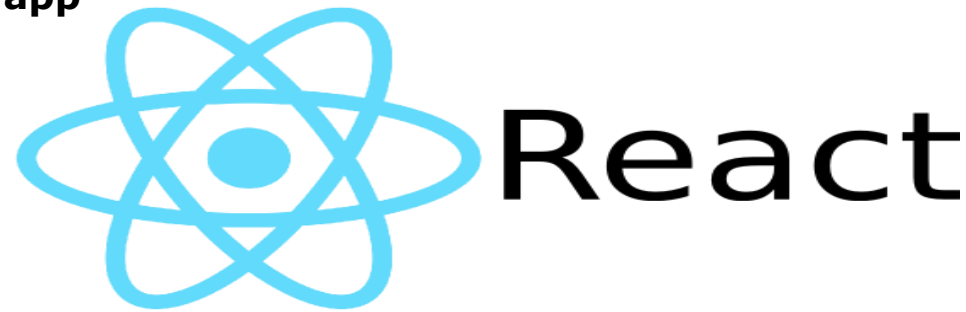
- **What is React JS?**
  - a front-end framework used by Facebook internally for managing user interface
    - main function is to bind HTML elements to data and once this data changes, updating the interface so that you don't have to bind this data manually
  - It is only the view layer and is all about modular, composable components
  - solve one problem: **building large applications with data that changes over time**
    - Extremely fast, because it uses a virtual DOM, and syncs only the changed parts with the underlying page



React JS

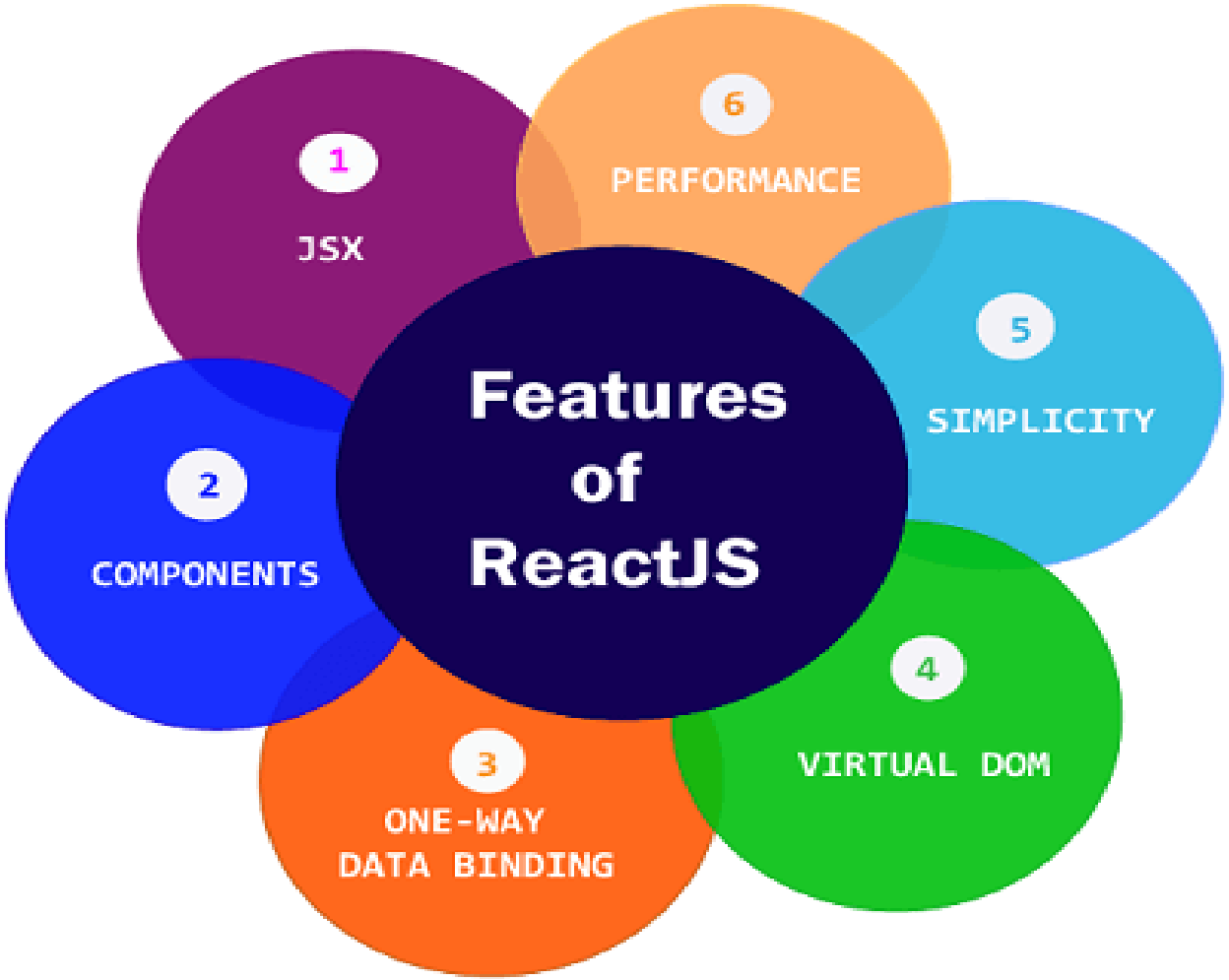
Overview

- **Advantages**
  - Uses virtual DOM which is a JavaScript object. Improves apps performance, since JavaScript virtual DOM is faster than the regular DOM.
  - Can be used on client and server side(With node js) also on the client side
  - Component and data patterns improve readability, which helps to maintain larger
- **Limitations**
  - Covers only the view layer of the app, hence you still need to choose other technologies to get a complete tooling set for development.
  - Uses inline templating and JSX, which might seem awkward to some developers
  - **React is a view layer library, not a framework like Backbone, Angular etc.**
  - **You can't use React to build a fully-functional web app**



React Features

--provides a Virtual DOM
--Uses JSX
--Component based
--Cross Platform
--one way data Flow



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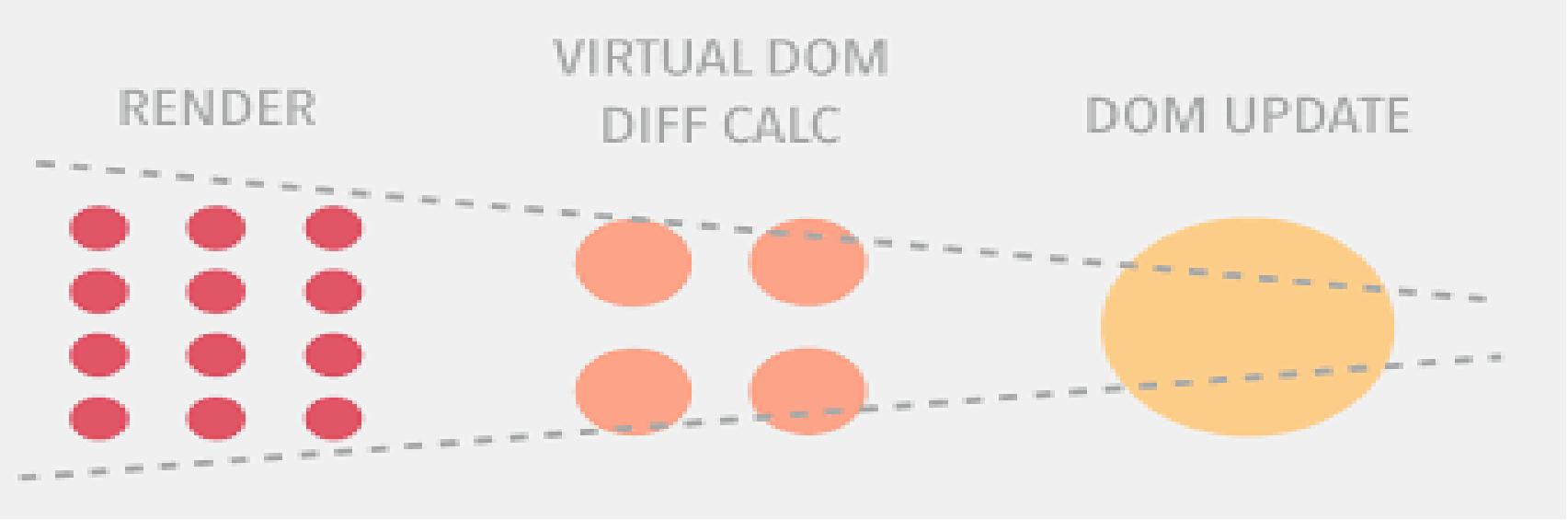
React JS

- Working of Virtual DOM
- step 1: Whenever anything may have changed, the entire UI will be re-rendered in a Virtual DOM representation.
- step 2:The difference between the previous Virtual DOM representation and the new one will be calculated.
- step 3:The real DOM will be updated with what has actually changed. This is very much like applying a patch.



ReactJS Installation

- Step 1 : **npm install -g create-react-app**
  - **Npx create-react-app**
- Step 2: **create-react-app reactproject**

- **NOTE:** We can combine the above two steps in a single command using **npx**. The npx is a package runner tool which comes with npm 5.2 and above version.

- **npx create-react-app reactproject**

- Strat the server using the below command
  npm start

- if we want to make the project for the production mode, type the following command. This command will generate the production build, which is best optimized.
- $ **npm build**

Some node commands

- NPM - Package manager
- NPX - Package runner
- npm create-react-app my-app executes the local create-react-app package from your machine, so you first have to install it globally on your system with npm install -g create-react-app.
- If you run npx create-react-app my-app and don’t have create-react-app globally on your system, it will get downloaded and not installed globally. This is great if you don’t want to pollute your system with global packages that you only run once every two months.
- Installing packages
  - npm install –save react-bootstrap

React Application Structure

- **node_modules:** It contains the React library and any other third party libraries needed.
- **public:** It holds the public assets of the application. It contains the index.html where React will mount the application by default on the element.
- **src:** It contains the App.css, App.js, App.test.js, index.css, index.js, and serviceWorker.js files. Here, the App.js file always responsible for displaying the output screen in React.
- **package-lock.json:** It is generated automatically for any operations where npm package modifies either the node_modules tree or package.json. It cannot be published. It will be ignored if it finds any other place rather than the top-level package.
- **package.json:** It holds various metadata required for the project. It gives information to npm, which allows to identify the project as well as handle the project?s dependencies.
- **README.md:** It provides the documentation to read about React topics.

Component development using JSX

React JS

JSX Overview

- **What is JSX?**
  - JSX is an inline markup that looks like HTML and gets transformed to JavaScript
    - JSX expression starts with an HTML-like open tag, and ends with the corresponding closing tag. JSX tags support the XML self close syntax so you can optionally leave the closing tag off.
  - It is a preprocessor step that adds XML syntax to JavaScript
  - React can be used without JSX but JSX makes React a lot more elegant(it is a concise and familiar syntax for defining tree structures with attributes)
  - It’s actually a declarative syntax that’s used to express the virtual DOM.
    - JSX gets interpreted and converted to virtual DOM, which gets diffed against the real DOM.
    - Rather than rewrite the whole DOM tree, only the differences get applied. That makes React renders fast.

React JS

JSX Overview

- **What is JSX?**
  - Really just JavaScript with HTML in the render methods
  - Use className instead of class
  - Components are written in JSX
  - Helps in creating a virtual DOM by returning HTML
  - It is faster because it performs the optimization while compiling code into javascript
  - It is typesafe most of the errors can be caught during compilation

- Bindings:
  - Mustache syntax **{}**
  - Bind to props

- Note : JSX is optional

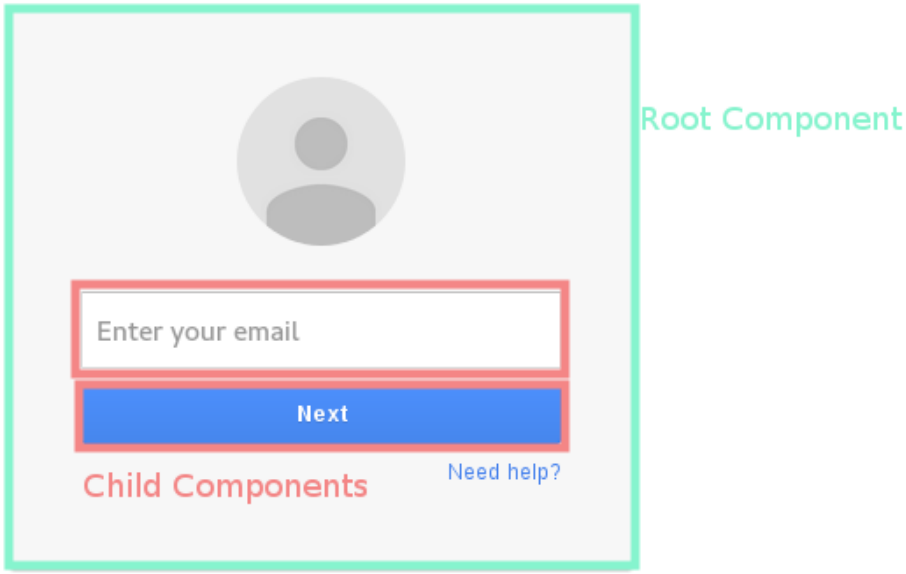
React JS

React VS Angular

Technology	AngularJS	React
Developer	Google	Facebook
Technology type	Full-fledged MVC framework written in JavaScript	JavaScript library (View in MVC; requires Flux to implement architecture)
Concept	Brings JavaScript into HTML Works with the real DOM Client-side rendering	Brings HTML into JavaScript Works with the virtual DOM Server-side rendering
Data binding	Two-way data binding	One-way data binding
Dependencies	Manages dependencies automatically	Requires additional tools to manage dependencies
Language	JavaScript + HTML	JavaScript + JSX
Last version	AngularJS 1.6.0 RC2	React 16
Suits best	Best for SPAs that update single view at a time	Best for SPAs that update many views at a time

React JS

- **Components**
  - React is all about modular, composable components
    - Components are just like functions(Simple functions that take in “props” and “state”)
  - React encourages reusable components which can be integrated into your project
  - Example: A login system can be broken down into one root component with several child components.



React JS

- **Creating Components**
  - We can create a new component class using React.createClass.
  - Components must implement render(a function that tells the component what to render).
  - Example:

```
var HelloWorld = React.createClass({
    render: function(){
            return ( <h1>Hello World!</h1> );
    }
});
```

    - React.renderComponent() instantiates the root component, starts the framework, and injects the markup into a raw DOM element, provided as the second argument

JSX

```
React.renderComponent(
    <HelloWorld />, document.getElementById('container')
);
```

    - React components that will eventually render to HTML
    - Once the component is created we need to render the component so that its visible on the page using the React.renderComponent

React JS

- **Components**
  - Components can only render a single root node. If you want to return multiple nodes they must be wrapped in a single root

```
render: function() {
      return ( <div>
                  <h1> Hello World </h1>
                  <h1> Again… Hello</h1>
                  </div> );
  }
```

Types of Components

- There ate two types of Components
  - 1. Functional
    - --do not maintain state
    - --static data
  - 2. class based
    - --data changes over time
    - --dynamic data
    - --maintain the state data

Bootstrap and Jquery application

Adding Bootstrap to React Application

- Refer to the online documentation
  - https://react-bootstrap.github.io/getting-started/introduction

Step 1: From the command prompt move to your project folder and install the bootstrap package

- Adding bootstrap
  - D:\nodeprojects\reactlevel1>npm install react-bootstrap bootstrap
- Step 2:Adding stylesheet in index.html before </head>

<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.4.1/css/bootstrap.min.css" integrity="sha384-Vkoo8x4CGsO3+Hhxv8T/Q5PaXtkKtu6ug5TOeNV6gBiFeWPGFN9MuhOf23Q9Ifjh" crossorigin="anonymous" />

- Step 3: Now lets try applying style on a button
  - In App.js import the required Class eg Button

import { Button } from 'react-bootstrap';

  - Add some style on the Button in the div element using the variant

<Button variant="primary">Hello World Primary</Button>

- <Button variant="success">Hello World Success</Button>
- <Button variant="danger">Hello World Danger</Button>

Props,state and Component Life cycle

props

- **React** allows us to pass information to a Component using something called **props** (stands for properties).
- **Props** are basically kind of global variable or object.
- We can pass props to any component as we declare attributes for any HTML tag. Have a look at the below code snippet:
  <DemoComponent sampleProp = "HelloProp" />
- We can access any props inside from the component's class to which the props is passed. The props can be accessed as shown below:
  - this.props.*propName*;
- The 'this.props' is a kind of global object which stores all of a components props. The *propName*, that is the names of props are keys of this object.
- We can use the *propType* for validating any data we are receiving from props.
- Demo

props

- **Component Properties**
  - Component properties are known as props
    - Props are the "arguments" to your components
    - React encourages reusable components which can be integrated into your project
  - attributes are available in our component as **this.props** and can be used in our render method to render dynamic data and any nested elements as **this.props.children**

```
var HelloWorld = React.createClass({
   render: function(){
      return (
         <h1>Hello, {this.props.msg}!</h1>
      );
   }

React.renderComponent(
         <HelloWorld msg="Welcome to Syntel." />,
         document.getElementById('container'));
});
```

state

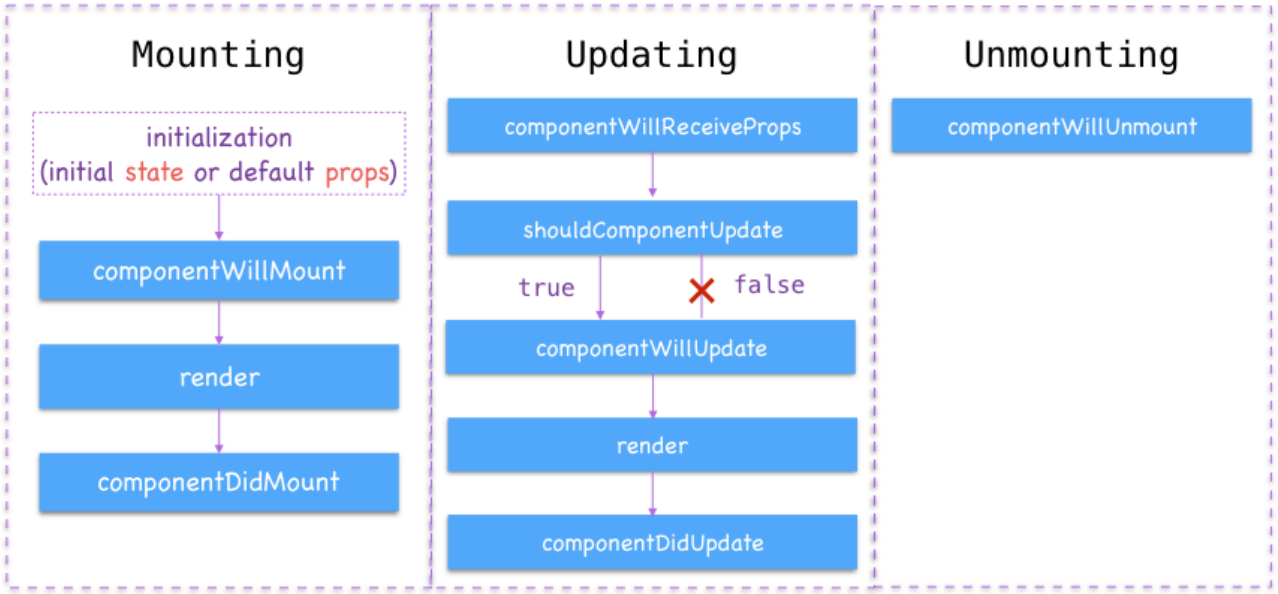
- **React** components has a built-in **state** object.
- The **state** object is where you store property values that belongs to the component.
- When the **state** object changes, the component re-renders.
- The state object is initialized in the constructor
  - **class Car extends React.Component { constructor(props) {**
    - **super(props);**
    - **this.state = {brand: "Ford"}; }**
    - **render() { return (<h1>My Car</h1>);**
    - **}**

    }

Component life cycle

Components

- **Component Lifecycle**
  - The render method is the only required spec for creating a component, but there are several lifecycle methods & specs
    - They notify us of important milestones in our component's life, and we can use these notifications to simply pay attention or change what our component is about to do
  - Can be categorized into 4 phases:
    - Initialization
    - Mounting
    - Updation
    - Unmounting



Component life cycle contd..

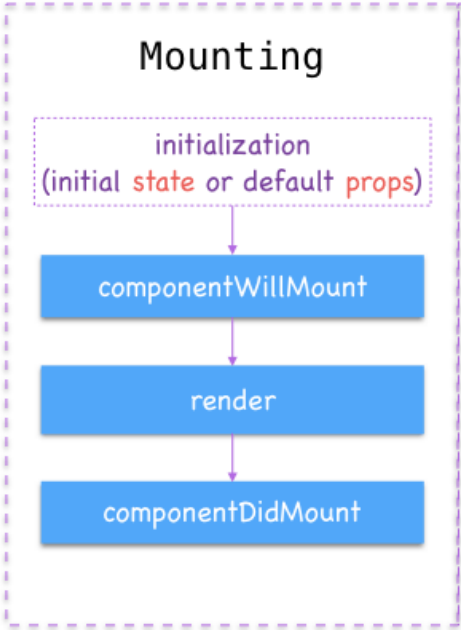
Components

- **Components Lifecycle**
  - **Initialization**
    - The initialization phase is where we define defaults and initial values for **this.props** and **this.state**
    - **getDefaultProps()**:
      - method is called once and cached before any instance of the component are created.
      - method returns an object which properties values will be set on **this.props** if that prop is not specified by the parent component.
    - **getInitialState():**
      - method is also invoked once, right before the mounting phase.
      - return value of this method will be used as initial value of **this.state** and should be an object.

Component life cycle contd..

Components

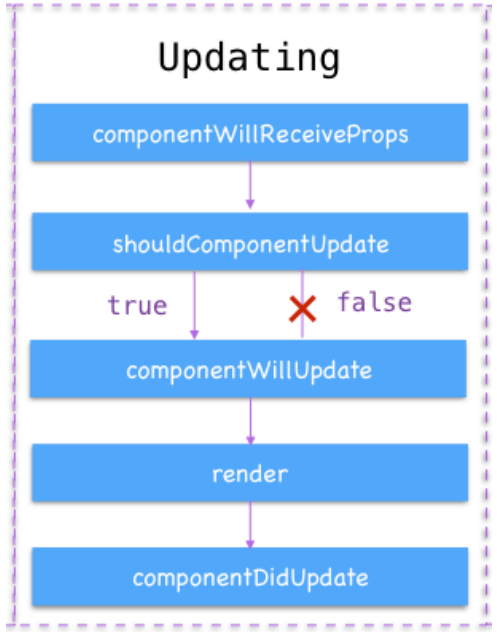
- **Components Lifecycle**
  - **Mounting**
    - **componentWillMount()**
      - invoked once and immediately before the initial rendering occurs, hence before React inserts the component into the DOM
      - **Note:** calling **this.setState()** within this method will not trigger a re-render
    - **componentDidMount()**
      - last step in the Birth/Mount life cycle phase
      - method is called once all our children Elements and our Component instances are mounted onto the DOM
  - is executed after the first render only on the client side. This is where AJAX requests and DOM or state updates should occur.



Component life cycle contd..

Components

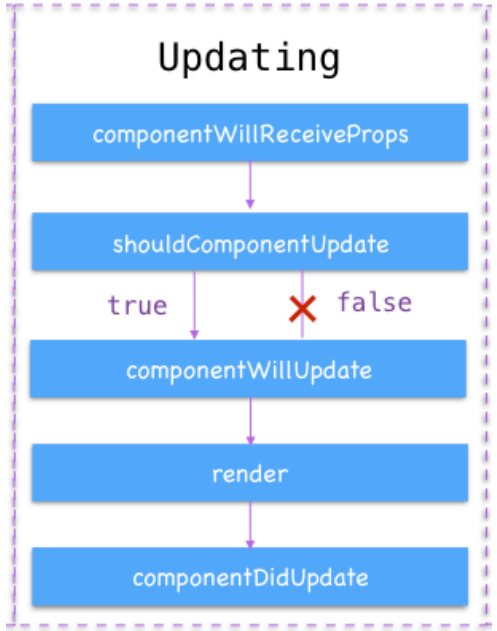
- **Components Lifecycle**
  - **Updation**
    - component updating phase is when an user trigger updations like state value change trough a function executed on user events like onClick, onChange etc which triggers a set of component state/props change usually and the component render occurs updating the DOM accordingly
  - **componentWillReceiveProps()**
    - method is called when props are passed to the Component instance.
      - Here we could extract the new props and allows us to check and see if new props are coming in and we can make choices based on the data
    - Method can be skipped if the Update is triggered by just a state change.



Component life cycle contd..

Components

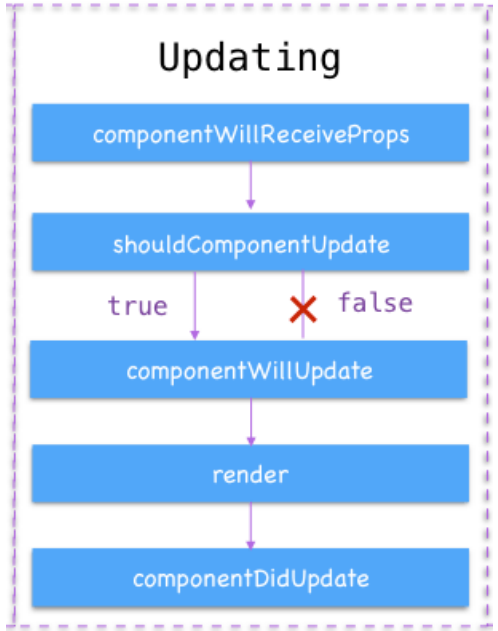
- **Components Lifecycle**
  - **Updating**
    - **shouldComponentUpdate()**
      - allows your Component to exit the Update life cycle if there is no reason to apply a new render.
      - Whenever a component's state changes, React re-renders the component and all its children. Often times, the component and its children barely change yet we need to render everything causing an inefficient code rendering.
      - method checks the current props and state, compares it to the next props and state and then returns true if they are different, or false if they are the same. Based on the Boolean value, rendering can be avoided when it isn't needed



Component life cycle contd..

Components

- **Components Lifecycle**
  - **Updating**
    - **componentWillUpdate()**
      is called just before rendering.
      - method is passed in two arguments: nextProps and nextState
      - **method** is called every time a re-render is required, such as when **this.setState()** is called. Unlike **componentWillMount()** we get access to the next props and state.
      - this method is called before **render()**. Because we have not rendered yet, our Component's access to the Native UI (DOM, etc.) will reflect the old rendered UI. Is executed before rendering, on both the server and the client side.
    - **componentDidUpdate()**
      - Useful when an operation needs to happen after the DOM is updated and the update queue is emptied
      - most common use case would be, updating the DOM in response to prop or state changes.

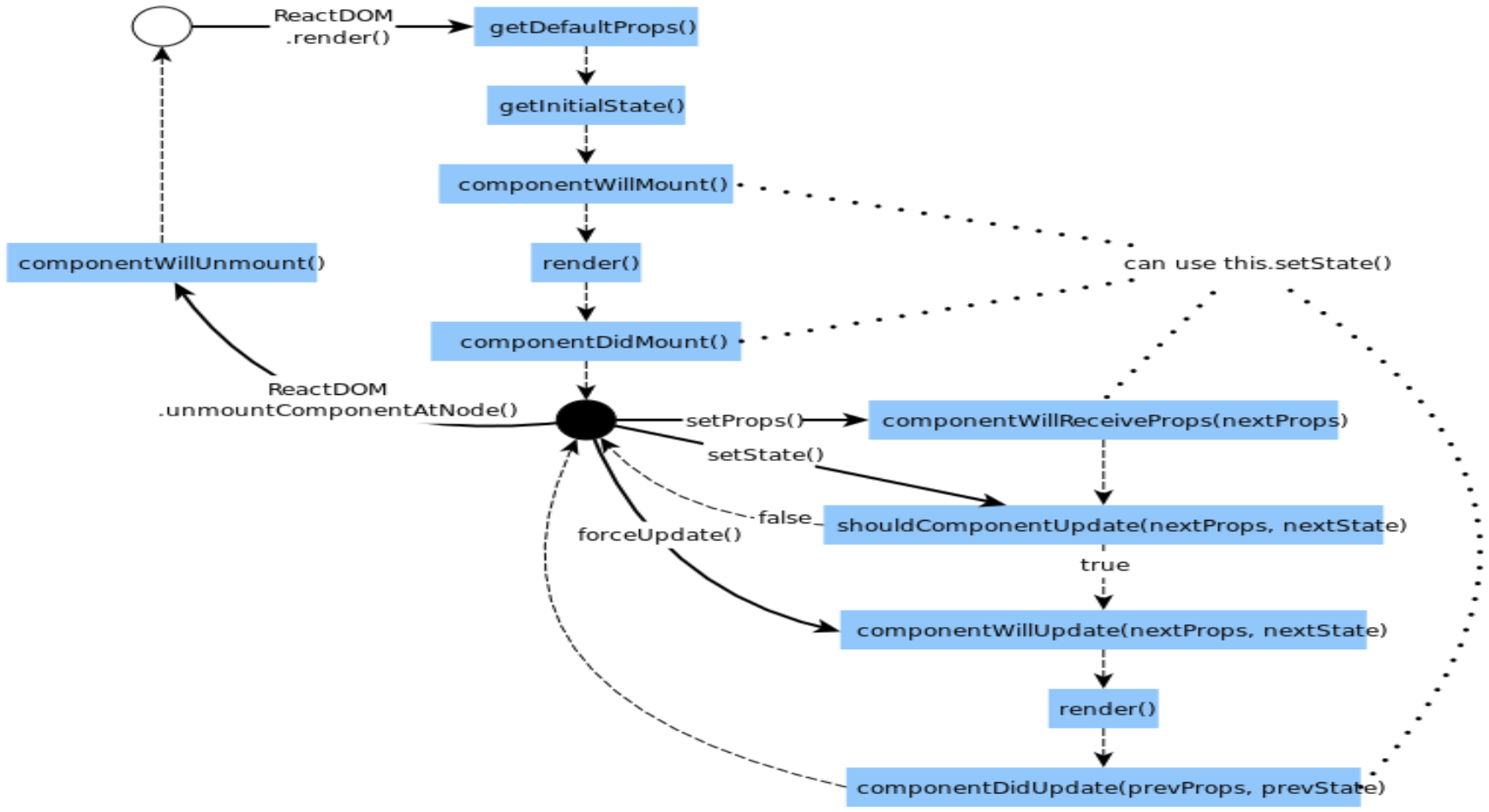


React JS

Components

- **Components Lifecycle**
  - **Unmounting**
    - react component undergoes the Unmounting Phase, while the component is deleted/removed from the DOM, and any last updations and functions to be executed while the component is being removed shall be done in the Unmounting phase
  - **componentWillUnmount()**
    - component is almost done and is going to be removed/deleted. Maybe forever or conditionally like show and remove.
      - Here you can cancel any outgoing network requests, or remove all event listeners associated with the component.
    - Basically, clean up anything to do that solely involves the component.

Complete flow of execution



Component life cycle contd..

- Demo 1
- Demo 2

Hooks- useState

ReactJs hooks

- **Hooks** are the new feature introduced in the **React** 16.8 version.
- It allows you to use state and other **React** features without writing a class.
- **Hooks** are the functions which "**hook** into" **React** state and lifecycle features from function components
- It does not work inside classes.
- Hooks are backward-compatible, which means it does not contain any breaking changes. Also, it does not replace your knowledge of React concepts.
- React Hooks installation
  - $ npm install react@16.8.0-alpha.1 --save
  - $ npm install react-dom@16.8.0-alpha.1 --save
- Hook uses useState() functional component for setting and retrieving state.
- Demo

Events

Event Handling in jsx

- **Steps in Event Handling**
- Step 1Bind the event

  this.increase = this.increase.bind(this);

- Step 2: Implement the event handler where we react to the event
- **Event Handler:**

```
increase(e) {
   this.setState({
     count: this.state.count + 1
   });
 }
```

Step 3:: Listen for the event on the Control.

```
<button onClick={this.increase} style={buttonStyle}>+</button>
```

List, keys and Conditional rendering

Working with Keys

- React **keys** are useful when working with dynamically created components
- Also used when when your lists are altered by the users.
- Setting the **key** value will keep your components uniquely identified after the change.
- Code snippet:

```
render() {
    return (
      <div>
        <div>
          {this.state.data.map((dynamicComponent, i) => <Content
            key = {i} componentData = {dynamicComponent}/>)}
        </div>
      </div>
    );
  }
```

Conditional rendering

- n **React**, you can create distinct components that encapsulate behavior you need. Then, you can render only some of them, depending on the state of your application.
- **Conditional** rendering in **React** works the same way conditions work in JavaScript.
- There are different methods to implement Conditional rendering
  - Using if..else
  - Using element variable
  - Using switch statement
  - Ternary operators
  - Using Enhanced JSX
- Demo

Forms, Controlled Uncontrolled components

Working with Forms

- In HTML form elements such as <input>, <textarea>, and <select> typically maintain their own state and update it based on user input.
- In React, mutable state is typically kept in the state property of components, and only updated with setState()
- An input form element whose value is controlled by React in this way is called a “controlled component”.

- Demo 1: Handling input Text in a Form
- Demo 2: Handling a select control in the form

Controlled vs Uncontrolled components

- A controlled component is bound to a value, and its changes will be handled in code by using **event-based callbacks**.
- It is similar to the traditional HTML form inputs.

SN	Controlled	Uncontrolled
1.	It does not maintain its internal state.	It maintains its internal states.
2.	Here, data is controlled by the parent component.	Here, data is controlled by the DOM itself.
3.	It accepts its current value as a prop.	It uses a ref for their current values.
4.	It allows validation control.	It does not allow validation control.
5.	It has better control over the form elements and data.	It has limited control over the form elements and data.

Thank You

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