**React** is a **declarative, efficient, and flexible JavaScript library** **(not a framework)** for building user interfaces.

It’s ‘**V’** in **MVC**.

ReactJS is an **open-source, component-based front-end library** responsible only for the **view layer** of the application.

It is **maintained** by **Facebook**.

React is used to build **single-page applications (SPA).**

Facebook Software Engineer, **Jordan Walke**, created it in **2013.**

A React application is made of multiple components, each responsible for rendering a small, reusable piece of HTML.

Components can be nested within other components to allow complex applications to be built out of simple building blocks. A component may also maintain an internal state –

# How does React work

While building client-side apps, a team of Facebook developers realized that the **DOM is slow**.

*(The Document Object Model (****DOM****) is an application programming interface (****API****)* ***for HTML and XML documents****. It defines the* ***logical structure of documents*** *and the way a document is* ***accessed*** *and* ***manipulated****.).*

So, to make it faster, React implements a **virtual DOM** in **memory** that is basically a **DOM tree representation in JavaScript**. So, when it needs to read or write to the browser DOM, it will use the virtual representation of it. Then the virtual DOM will try to find the most **efficient** way to update the browser’s DOM.

React only changes what needs to be changed.

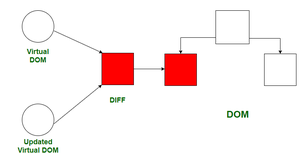
# ReactJS Reconciliation

Reconciliation is the process through which React updates the Browser DOM.

Important concepts behind the working of the Reconciliation process are:

1. Virtual DOM
2. Diffing Algorithm

* React stores a copy of Browser DOM which is called Virtual DOM.
* When we make changes or add data, React creates a new Virtual DOM and compares it with the previous one.
* Comparison is done by Diffing Algorithm. The cool fact is all these comparisons take place in the memory and nothing is yet changed in the Browser.
* After comparing, React goes ahead and creates a new Virtual DOM having the changes. It is to note that as many as 200,000 virtual DOM nodes can be produced in a second.
* Then it updates the Browser DOM with the least number of changes possible without rendering the entire DOM again. This changes the efficiency of an application tremendously.



# Two ways to add react to project

1. Including CDN’s in HTML, adding script tags in HTML documents, 3 scripts (react script, react-dom script & Babel).
2. By setting up the react environment using npx and npm(using Node.js).

**Problem 1:** Browser don’t understand the JSX

**Solution:** JSX, ES6, ES5 => Babel => Pure JS => Browser

Babel transpile (Software that converts the source code of one language into the source code of another) the code.

**Problem 2:** Browser don’t understand the import statements

**Solution:** webpack bundle all files (multiple js files, .png, .css files …) into single file (bundle.js, .png, .css …)

# React Execution flow

*Public* – index.html => *src* – index.js => app.js => *various components*

# Differences between npm and npx:

|  |  |
| --- | --- |
| **npm (node package manager)** | **npx(node package execute)** |
| If you wish to run package through npm then you have to specify that package in your package.json and installed it locally. | A package can be executable without installing the package, it is an npm package runner so if any packages that aren’t already installed it will installed automatically. |
| To use create-react-app in npm the commands are ***npm install create-react-app*** then ***create-react-app myApp***(Installation required). | But in npx you can use that without installing like ***npx create-react-app myApp***, this command is required in every app’s life cycle only once. |
| Npm is a tool that use to install packages. | Npx is a tool that use to execute packages. |
| Packages used by npm are installed globally you have to care about pollution for the long term. | Packages used by npx are not installed globally so you have to carefree for the pollution for the long term. |

| **Named export** | **Default export** |
| --- | --- |
| export class User {...} | export default class User {...} |
| import {User} from ... | import User from ... |

# JSX (JavaScript XML) | (JavaScript Extension)

JSX provide cleaner code of JavaScript in react.

JSX allows us to write HTML in React.

With JSX you can write expressions inside curly braces { }.

The expression can be a React variable, or property, or any other valid JavaScript expression. JSX will execute the expression and return the result.

**Rule:** A component can only return a single element

JSX will throw an error if the HTML is not correct, or if the HTML misses a parent/root element.

Alternatively, you can use a "**fragment**" to wrap multiple lines. This will prevent unnecessarily adding extra nodes to the DOM.

A fragment looks like an empty HTML tag: <></> | <React.Fragment></React.Fragment>

The class attribute is a much used attribute in HTML, but since JSX is rendered as JavaScript, and the class keyword is a reserved word in JavaScript, you are not allowed to use it in JSX.

Use attribute className instead.

**Components should be upper-case to differentiate HTML element with react components.**

# Render Function

The ReactDOM.render() function takes two arguments, HTML code and an HTML element.

The purpose of the function is to display the specified HTML code inside the specified HTML element.

# Components

Components are **independent** and **reusable bits of code**. They serve the same purpose as JavaScript functions, but work in **isolation** and return HTML via a render() function.

Class components were the only way to track state and lifecycle on a React component. Function components were considered "state-less".

With the addition of Hooks, Function components are now almost equivalent to Class components. The differences are so minor that you will probably never need to use a Class component in React.

### **Class Component**

A class component must include the extends React.Component statement. This statement creates an inheritance to React.Component, and gives your component access to React.Component's functions.

The component also requires a render() method, this method returns HTML.

class Car extends React.Component {

render() {

return <h2>Hi, I am a Car!</h2>;

}

}

### **Function Component**

A Function component also returns HTML, and behaves much the same way as a Class component, but Function components can be written using much less code, are easier to understand

function Car() {

return <h2>Hi, I am a Car!</h2>;

}

Note- ClassName should be upper camel case because in JSX it denotes component Instance and not an HTML element.

# Props

Props are arguments passed into React components.

Props are passed to components via HTML attributes.

props stand for properties.

**Note:** React Props are read-only! You will get an error if you try to change their value.

# 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.

# Hooks

Hooks allow function components to have access to state and other React features. Because of this, class components are generally no longer needed.

## **Hook Rules**

1. Hooks can only be called inside React function components. i.e., Hooks will not work in React class components.
2. Hooks can only be called at the top level of a component.
3. Hooks cannot be call inside if statements, loops, function etc. (No nesting and No conditional).
4. Hooks must be executed in exact same order.

**useState**

The React useState Hook allows us to track state in a function component.

State generally refers to data or properties that need to be tracking in an application.

Two parameters 1. Value (it denotes the state) 2. Function (to change the state)

Function should always take the previous value before altering the value.

Function overrides all previous values in useState().

If arrow function is passed inside useState() parameter it only runs once else if normal function is passed it runs each and every time thus leads in creating bulky software.

**useEffect**

The useEffect Hook allows you to perform side effects in your components whenever anything gets changes.

Some examples of side effects are: fetching data, directly updating the DOM, and timers.

useEffect accepts two arguments. The second argument is optional.

useEffect(<function>, <dependency>)

two parameters 1. function 2. array of values [] on what value change we need to take care

[] => changes on mount

[parameter1, parameter2 …] => changes if change occurs in parameter value.

Function must contain the return for cleanup process and improve performance. return () => {}

useRef useMemo useContext

React router – useNavigate, useParams, Router, Routes, route, link