

Contents

Topics	Page No.
Unit-10: Introduction to ReactJS	1
10.0 Structure of Introduction to ReactJS.....	1
10.1 Learning Outcomes	1
10.2 Introduction to ReactJS	1
10.3 ReactJS features	2
10.4 ReactJS benefits and applications	3
10.4.1 Benefits of ReactJS	3
10.4.2 ReactJS applications	4
10.5 Advantages and Disadvantages of ReactJS	6
10.6 ReactJS v/s other Front-end technologies	7
10.7 ReactJS development environment setup	12
10.7.1 Methods/ways to Create a ReactJS Application	12
10.7.2 Installation of “Create React App” for Creating a React Application.....	13
10.8 Creating a new ReactJS project	18
10.9 Structure of the folder of ReactJS application	24
10.10 Self-Assessment Questions.....	25
10.11 Self-Assessment Activities	26
10.12 Multiple-Choice Questions.....	26
10.13 Key Answers to Multiple-Choice Questions.....	28
10.14 Summary	28
10.15 Keywords.....	29
10.16 Recommended Resources for Further Reading.....	29

UNIT 10– INTRODUCTION TO ReactJS

Structure of Introduction to ReactJS

- 10.1 Learning Outcomes
 - 10.2 Introduction to ReactJS
 - 10.3 ReactJS features
 - 10.4 ReactJS Benefits and Applications
 - 10.5 Advantages and disadvantages of ReactJS
 - 10.6 ReactJS Vs other front-end technologies
 - 10.7 ReactJS development environment setup
 - 10.8 Creating a new ReactJS project
 - 10.9 Structure of the folder of the ReactJS project
 - 10.10 Self-Assessment Questions
 - 10.11 Self-Assessment Activities
 - 10.12 Multiple-Choice Questions
 - 10.13 Key answers to multiple-choice questions
 - 10.14 Summary
 - 10.15 Keywords
 - 10.16 Recommended resources for further reading
-

10.1 Learning Outcomes:

After the successful completion of this unit, the student will be able to:

- Describe the features and benefits of using ReactJS [L2]
 - Discuss the advantages and disadvantages of ReactJS [L2]
 - Compare ReactJS with other front-end technologies [L4]
 - Setup ReactJS environment [L4]
 - Develop and execute a simple ReactJS application [L5]
-

10.2 Introduction to ReactJS

ReactJS is an open-source, component-based front-end library that enables developers to build robust user interfaces and reusable UI components. It was created by Facebook software engineer Jordan Walke. It was initially developed and maintained by Facebook and has been used later in a variety of its products, including WhatsApp and Instagram.

Facebook first developed ReactJS in 2011 for its newsfeed section and made it available to the public in May 2013.

ReactJS is a JavaScript library. By adopting a declarative approach, developers can efficiently describe the desired user interface and allow ReactJS to handle the underlying rendering and updating processes. This declarative nature simplifies the development workflow and enhances code maintainability. It focuses on the view layer of applications. React uses JavaScript XML (JSX), an extended syntax of JavaScript, for designing the user interface code. Babel is an inbuilt compiler that is used to transform the JSX code into JavaScript code during the compilation process.

React is also known as ReactJS and React.js.

10.3 React features

ReactJS is a popular JavaScript library for building user interfaces.

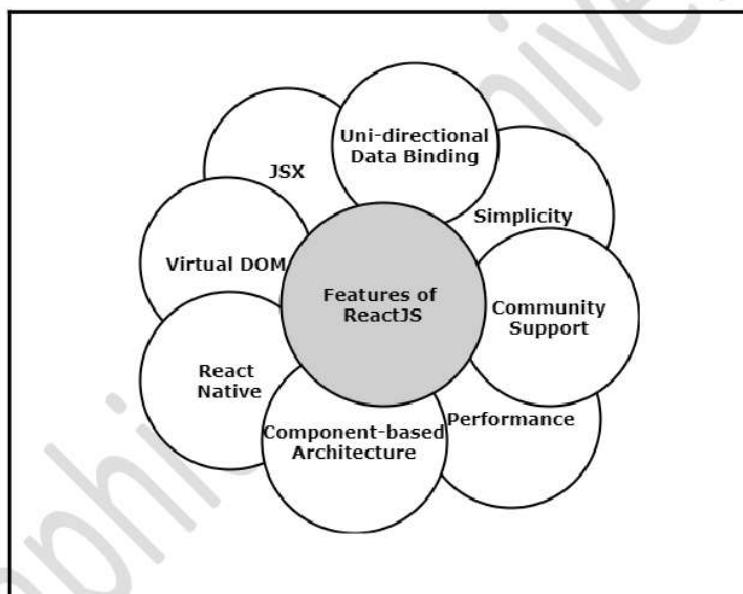


Figure 10.1: Features of ReactJS

Some of the key features of ReactJS include:

- Component-based architecture: ReactJS is based on a component-based architecture, which means that the user interface is broken down into small, reusable components. This makes it easier to manage complex UIs and encourages code reusability.
- Virtual DOM: ReactJS uses a virtual DOM (Document Object Model) to update the UI efficiently. The virtual DOM is a lightweight representation of the actual DOM, which allows ReactJS to update only the parts of the UI that have changed, rather than updating the entire UI.

- JSX: ReactJS uses a syntax extension called JSX, which allows one to write HTML-like code within JavaScript. This makes it easier to create and manage UI components.
- Simplicity and clean programming: React code is simple and easy to use and learn. The code is also reusable.
- Unidirectional data flow: ReactJS uses a unidirectional data flow, which means that data flows in a single direction from parent components to child components. This makes it easier to manage the state of the application and prevents unexpected changes in the data.
- React Native: ReactJS also has a mobile development framework called React Native, which allows the building of native mobile apps using the same ReactJS principles and syntax.
- High performance: ReactJS is known for its high performance due to the use of virtual DOM and an efficient rendering system.
- Community support: ReactJS has a large and active community, which means that there are many resources and libraries available to help to build the application.

10.4 ReactJS Benefits and Applications

10.4.1 Benefits of ReactJS

ReactJS offers several benefits for developers and businesses alike. Some of the key benefits of using ReactJS are:

- Improved productivity: ReactJS makes it easier to create and manage complex user interfaces by breaking them down into reusable components. This can help developers write code more efficiently and improve overall productivity.
- Enhanced performance: ReactJS uses a virtual DOM and efficient rendering system, which allows it to update only the parts of the UI that have changed, resulting in faster and smoother user experiences.
- Code reusability: ReactJS promotes code reusability, which can help save time and effort in the long run. Developers can reuse components across different parts of the applications, reducing the need for redundant code.
- Search Engine Optimization (SEO)-friendly: ReactJS supports server-side rendering, which can improve the SEO of the application by making it easier for search engines to crawl the content.
- Large community: ReactJS has a large and active community of developers, which means that there are many resources, libraries, and tools available to help build an application.

- Cross-platform support: ReactJS can be used to build both web and mobile applications, making it a versatile option for businesses looking to develop applications across different platforms.
- Easy to learn: ReactJS has a relatively simple and intuitive API, which makes it easy for developers to learn and start using.

10.4.2 ReactJS Applications

ReactJS is a popular JavaScript library for building modern web applications. Some categories of web applications that are developed using ReactJS include:

- Social media applications: Many social media applications like Facebook, Instagram, WhatsApp, and Twitter use ReactJS in their front-end development. These applications typically feature dynamic feeds, real-time updates, and interactive user interfaces.
- E-commerce websites: ReactJS can be used to create e-commerce websites with dynamic product catalogs, shopping carts, and checkout processes. ReactJS can also be integrated with backend technologies like Node.js to create a full-stack e-commerce application.
- Single-page applications (SPAs): ReactJS is commonly used to build SPAs, which are web applications that load a single HTML page and dynamically update the content as the user interacts with the application. SPAs built with ReactJS are known for their fast performance and smooth user experience.
- Data visualization applications: ReactJS can be used to create data visualization applications that display complex data in an easy-to-understand format. ReactJS can be integrated with other data visualization libraries like D3.js to create interactive charts, graphs, and maps.
- Progressive web applications (PWAs): ReactJS can be used to build PWAs, which are web applications that offer native-like capabilities like offline support, push notifications, and device access. PWAs built with ReactJS can be installed on a user's device and accessed from the home screen like a native mobile application.
- Online gaming applications: ReactJS can be used to create real-time multiplayer games that are played in the browser. ReactJS can be integrated with other gaming libraries like Phaser to create games with complex graphics and animations.
- Education applications: ReactJS can be used to create online learning platforms, educational games, and interactive tutorials. These applications typically feature dynamic content, real-time feedback, and personalized learning paths.

A few examples of web applications where ReactJS is used are :

- Facebook: Facebook's web application is built using ReactJS. The application features a dynamic news feed, real-time updates, and a complex user interface.
- Instagram: Instagram's web application is also built using ReactJS. The application features a dynamic photo feed, real-time updates, and a seamless user experience.
- WhatsApp: WhatsApp's web application is built using ReactJS. The application features a dynamic messaging interface, real-time updates, and a seamless user experience.
- Netflix: Netflix's web application is built using ReactJS. The application features a dynamic video streaming interface, real-time updates, and a personalized user experience.
- Airbnb: Airbnb's web application is built using ReactJS. The application features a dynamic search interface, real-time availability updates, and a user-friendly booking process.
- Dropbox: Dropbox, the cloud storage platform, uses ReactJS for its front end. The application features a dynamic file storage interface for managing files, sharing documents, and collaborating with team members.
- CodePen: CodePen is a social development environment for front-end developers that uses ReactJS for its front end. The application features a dynamic interface for creating and sharing HTML, CSS, and JavaScript code snippets.
- Shopify: Shopify, the e-commerce platform, uses ReactJS for its front end. The application features a dynamic interface for managing online stores, products, and sales.
- Uber: Uber, the ride-sharing platform, uses ReactJS for its front end. The application features a dynamic interface for requesting rides, tracking drivers, and managing payments.
- GitHub: GitHub, the popular code hosting platform, uses ReactJS for its front end. The application features a dynamic user interface for managing code repositories and collaborating on code projects.
- Salesforce: Salesforce, the customer relationship management platform, uses ReactJS for its front end. The application features a dynamic interface for managing customer data, sales leads, and marketing campaigns.
- SoundCloud: SoundCloud, the music streaming platform, uses ReactJS for its front end. The application features a dynamic interface for discovering and streaming music, creating playlists, and following other users.

ReactJS is a powerful and versatile library that can be used to create a wide range of modern web applications with dynamic user interfaces, real-time updates, and seamless user experiences. These applications are fast, responsive, and user-friendly.

10.5 Advantages and Disadvantages of ReactJS

Advantages of ReactJS:

- Reusability: ReactJS allows developers to create reusable UI components, making it easier to maintain and update applications because of its component-based approach. ReactJS shares the same principle with React Native, a framework for building native mobile applications. Developers familiar with ReactJS can use their knowledge to develop mobile apps for multiple platforms, reducing development time and effort.
- Virtual DOM efficiency: ReactJS uses a virtual DOM, which makes updates faster and more efficient by reducing the number of real DOM manipulations. Only the necessary components are updated and rendered.
- Large Community: ReactJS has a large and active community of developers, which provides support, documentation, and third-party libraries.
- SEO-friendly: ReactJS provides a server-side rendering option, making it easier to optimize web applications for search engines.
- Integration Capabilities: ReactJS can effortlessly integrate with other libraries, frameworks, or existing projects. This flexibility allows developers to leverage existing tools and libraries, such as Redux for state management or React Router for routing, enhancing the overall development experience.

Disadvantages of ReactJS:

- Steep Learning Curve: ReactJS has a complex syntax and requires a solid understanding of JavaScript, making it difficult for beginners to learn.
- JSX: ReactJS uses JSX, a syntax extension for JavaScript, which some developers may find unfamiliar or difficult to work with.
- Limited Functionality: ReactJS is primarily a view library, which means that developers need to use other tools and libraries for state management, routing, and other application features.
- Large File Size: ReactJS has a large file size, which can increase page load times and negatively impact performance.
- Lack of Documentation: Some developers have reported a lack of comprehensive documentation for ReactJS, which can make it difficult to troubleshoot issues or learn new features.

Overall, ReactJS is a powerful and popular library for building modern web applications. While it has some disadvantages, the advantages and flexibility of ReactJS make it a great choice for many developers and applications.

10.6 ReactJS vs. Other Front-End Technologies

When comparing ReactJS to other front-end technologies, it's important to consider the specific requirements of the project and the strengths of each technology. Features of ReactJS have already been discussed earlier.

Here's a comparison of ReactJS with some other popular front-end technologies:

ReactJS - AngularJS - Vue.js – jQuery:

AngularJS:

- It is a popular JavaScript framework developed by Google.
- AngularJS follows Model-View-Model (MVM) architecture pattern. It helps to separate concerns and promotes clean code organization. The model represents the data, the view handles the presentation, and the view model acts as an intermediary between the two.
- Full-featured framework for building complex web applications.
- Directives in AngularJS are powerful HTML extensions that allow developers to create custom elements and attributes. They provide a way to extend HTML with new functionality and declaratively define reusable components.
- Provides a complete solution with features like routing, dependency injection, and state management.
- AngularJS implements a powerful feature called two-way data binding, which allows the automatic synchronization of data between the model (JavaScript variables) and the view (HTML). Changes in the model update the view, and changes in the view update the model, eliminating the need for manual DOM manipulation.
- Offers a TypeScript-based development experience.
- Comes with a comprehensive set of official libraries and tools.
- AngularJS has built-in support for unit testing, making it easier to write testable code and conduct automated tests. It provides tools like Karma and Protractor for different types of testing, such as unit tests and end-to-end tests.
- AngularJS offers a robust templating system that allows developers to create dynamic views by binding data to HTML templates. It includes features like expressions, filters, and directives within templates to manipulate and display data in various ways.

- AngularJS has a large and active community of developers, which means there are plenty of resources, tutorials, and forums available for learning and getting help. The official AngularJS documentation is comprehensive and well-maintained, making it easier to understand and leverage the framework's capabilities.

Vue.js:

- Vue.js is a lightweight framework with a small bundle size. This makes it fast to download and quick to load in the browser, resulting in better performance.
- It has a gentle learning curve, which makes it accessible to developers of different skill levels. Its syntax is straightforward and intuitive, allowing developers to quickly grasp the core concepts and start developing applications. Provides an easy-to-understand syntax and clear documentation.
- Offers a component-based architecture similar to ReactJS.
- Vue.js allows developers to define styles within components using CSS.
- Vue.js supports server-side rendering, which means the initial rendering of the application can be done on the server before sending it to the client. SSR can improve search engine optimization (SEO) and provide better performance.
- Vue.js can be used to build not only web applications but also hybrid mobile applications and desktop applications using frameworks like Vue Native and Electron. This enables developers to leverage their Vue.js skills across different platforms.
- Vue.js provides filters that allow developers to format and manipulate data within templates. Filters can be applied to data bindings and are useful for transforming data before rendering it in the view.
- Allows developers to progressively adopt Vue.js in existing projects.
- Vue.js has a vibrant and active community of developers, which leads to a rich ecosystem of libraries, tools, and resources. There are numerous plugins and extensions available that provide additional functionality and integrations with other technologies.
- Vue.js offers various transition modes that control how elements are added or removed from the DOM during transitions. Developers can customize transition effects and define different transition durations and timing functions.
- Vue.js provides a browser extension called Vue Devtools that helps with debugging and inspecting Vue.js applications. It allows developers to inspect the component hierarchy, monitor state changes, and track performance, aiding in efficient development and debugging. Vue.js comes with built-in features like routing and state management.

jQuery

- jQuery uses regular DOM and thereby helps in HTML elements manipulation, making it easier to work with web pages.
- It simplifies event handling.
- jQuery makes styling web pages effortless by using CSS manipulation.
- It streamlines the usage of effects and animations, making them more accessible for developers.
- AJAX calls are made simpler through jQuery, thereby simplifying the process of asynchronous data retrieval.
- jQuery serves as a comprehensive library, offering various utilities and plugins for a wide range of tasks.
- It ensures consistent performance across major browsers, making jQuery code compatible and reliable.

Overall, ReactJS is known for its flexibility, efficiency, and large community support. It is a popular choice for building UI components and single-page applications. Angular and Vue.js, on the other hand, provide more comprehensive frameworks with additional features and tools. jQuery also has good library support making styling and event handling of web pages efficient and easy. The choice between these technologies ultimately depends on the specific requirements and preferences of the project and development team.

Differences in ReactJS and AngularJS

ReactJS and AngularJS are both popular JavaScript frameworks/libraries used for building web applications, but they have distinct differences in terms of their architecture, features, and approach to development.

Some key differences between ReactJS and AngularJS are given in Table 10.1.

Table 10.1: Comparison of ReactJS with AngularJS

	ReactJS	AngularJS
Language	JSX	HTML, JavaScript
Type	Open-Source JS Framework	Open Source MVC Framework
Data Binding	Uni-directional	Bi-directional
DOM	Virtual DOM	Regular DOM
Architecture	Encourages the use of component-based architecture	MVC Architecture

Dependencies	To manage dependencies external tools are used like Node Package Manager (npm) or Yarn.	Dependencies are managed using a built-in dependency injection (DI) system.
Performance	Since virtual DOM is used performance is fast	Slow
Routing	Routing can be handled by using third-party libraries like react-router	Has built-in routing capabilities provided by the AngularJS router module.
Best for	ReactJS excels in building SPAs where dynamic and interactive user interfaces are crucial.	AngularJS provides a comprehensive framework for building complex and feature-rich applications
Learning curve	ReactJS has a simpler learning curve compared to AngularJS. ReactJS has many APIs and focuses primarily on the view layer, making it easier to grasp/learn the fundamentals.	AngularJS, on the other hand, has a steeper learning curve due to its extensive feature set and the need to understand concepts like dependency injection and two-way data binding.

Differences in ReactJS and Vue.js:

Some key differences between ReactJS and Vue.js are given in Table 10.2.

Table 10.2: Comparison of ReactJS with Vue.js

	ReactJS	Vue.js
Language	JSX	HTML, JavaScript
Data Binding	React supports one-way data binding.	Vue supports both one-way and two-way data binding.
Rendering	ReactJS uses a virtual DOM to efficiently update and render the UI	Vue.js employs a reactive rendering system that directly updates the real DOM based on the dependencies.
Architecture	ReactJS follows a component-based architecture where the UI is composed of reusable and self-contained components.	Vue.js also follows a component-based architecture, but it provides more built-in features and conventions out of the box, such as reactivity and declarative rendering.

Size and performance	ReactJS, though is not as lightweight as Vue.js, is highly performant and optimized for efficient rendering due to its virtual DOM.	Vue.js is known for its small size and performance optimizations. It is designed to be lightweight and offers a minimal core library that can be extended with additional features as needed.
Reactivity	ReactJS requires explicit state management and relies on the concept of virtual DOM to efficiently update the view.	Vue.js offers built-in reactivity, which means that changes to the underlying data of a component automatically update the rendered view.
Learning curve	ReactJS has a steeper learning curve than Vue.js for beginners due to its JSX syntax and a more explicit setup process.	Vue.js has a gentle learning curve, making it relatively easier for beginners to grasp. It has clear and concise documentation, and its syntax is intuitive and familiar, resembling plain HTML and JavaScript.

Differences in ReactJS and jQuery:

Some key differences between ReactJS and jQuery are given in Table 10.3.

Table 10.3: Comparison of ReactJS with jQuery

	ReactJS	jQuery
Library size	It is around 95KB and takes more time for loading compared to jQuery	It's around 75KB and gets loaded faster than ReactJS
DOM	Virtual DOM	Regular DOM
Performance	Since virtual DOM is used performance is fast	Slow compared to ReactJS
Applications	ReactJS can be used for large applications	jQuery is not suitable for large applications
Event handling	Animations and event handling in complicated in ReactJS	Animations and event handling in easy in jQuery

Ultimately, the choice between ReactJS, AngularJS, and Vue.js depends on various factors such as project requirements, personal preference, ecosystem support, and the development team's expertise. ReactJS is widely used for its flexibility, large community, and extensive ecosystem, while Vue.js offers a simpler learning curve, elegant syntax, and optimized performance.

10.7 ReactJS development environment setup

To develop a ReactJS application one must be familiar with HTML, CSS, JavaScript fundamentals, and also the concepts of object-oriented programming. HTML is a markup language used to create web pages, CSS is used for styling the elements for better presentation, and JavaScript is used to add event-handling functionality. The concepts of object-oriented programming help to understand the declaration of classes and import the required libraries required for creating ReactJS applications. Any text editor can be used for writing the code but Visual Studio Code editor is the best option to get the view of all the folders and files that get created when developing a ReactJS application.

10.7.1 Methods/ways to Create a ReactJS Application

There are several ways to create a ReactJS application. Here are some of the most common ways:

- **Create React App:** Create React App is an officially supported tool by the React team. It sets up a new React project with a basic folder structure, configuration files, and a development server. This method is recommended for most beginners and small to medium-sized projects.
- **Manual Setup:** Alternatively, set up a React project manually by creating the required files and configuring the build process. This method provides more flexibility but requires more manual configuration. It is required to set up a build tool like Webpack or Parcel, configure Babel for JSX translation, and set up a development server manually.
- **Framework and libraries in ReactJS:** There are various pre-configured React frameworks available that provide a ready-to-use setup with additional features and configurations to develop a React application. React frameworks includes a set of commonly used libraries, build tools, and configurations to help get started quickly with React development. Frameworks can save time by setting up the project structure, build processes, and often include additional features like routing, state management, and styling.

Examples of popular React frameworks and libraries include Next.js and Gatsby.

- Next.js: Next.js is a popular React framework that provides server-side rendering, static site generation, and other advanced features out of the box. It simplifies the development of React applications by handling routing, code-splitting, and server-side rendering. Next.js comes with built-in support for CSS modules, API routes, and more.
- Gatsby: Gatsby is a static site generator that uses React and GraphQL. It allows to build fast and optimized websites by fetching data from various sources and generating static HTML, CSS, and JavaScript files. Gatsby provides features like automatic routing, image optimization, and a large plugin ecosystem for extending functionality.
- React Boilerplate: React Boilerplate is a highly opinionated boilerplate that includes a comprehensive set of tools and configurations for building scalable React applications. It integrates libraries like Redux for state management, CSS modules for styling, and Webpack for bundling. React Boilerplate aims to provide a production-ready setup with performance optimizations and code quality tools.

These are just a few examples, and there are many other React boilerplates available based on specific requirements and preferences. When choosing a boilerplate, consider factors like the features that are required, the complexity of the project, and the learning curve associated with the specific boilerplate.

- Code Editors: Visual Studio code editor is open source and can be downloaded. There are online code editors like CodeSandbox and CodePen that allow the creation and experimentation with React applications directly in the browser. These platforms provide a convenient way to quickly prototype or share React projects without requiring any local setup.

It is required to be familiar with React to choose the method that best suits the application. For beginners or small projects, using the Create React App is generally the recommended approach, as it provides a straightforward setup.

10.7.2 Installation of “Create React App” for Creating a React Application

To create a ReactJS application using “**Create React App**”, there are a few essential components and dependencies that need to be installed:- They are Node.js, Package Manager, and Visual Studio Code editor.

1. Install Node.js: ReactJS is built on top of Node.js, so Node.js has to be installed on the machine. Node.js is a JavaScript runtime that allows to run JavaScript code outside of a web browser. So the first step is to download and install Node.js on the system.

To download the Node.js installer from the official website (<https://nodejs.org>), follow the link <https://nodejs.org/en/download/>.

2. Package Manager: Node.js comes with npm (Node Package Manager) installed by default. npm is a package manager that allows to install and manage dependencies for the ReactJS application. Use npm to install React and other libraries.
3. Text Editor or Integrated Development Environment (IDE): A text editor or an IDE is required to write the ReactJS code. There are many options available, such as Visual Studio Code, Sublime Text, Atom, or WebStorm. Choose an editor that is comfortable or try out different ones to see which suits the requirements. Visual Studio code editor can be downloaded from <https://code.visualstudio.com/download> for free.

I. Steps to install Node.js

1. Download the Node.js .msi installer 32bit/64bit depending on the system environment from the official website: <https://nodejs.org/en/download/>.



Figure 10.2: Downloading Node.js from <https://nodejs.org> site

2. After downloading the Windows installer 64bit .msi file - node-v18.17.1-x64, double click on to start the installation of Node.js and npm

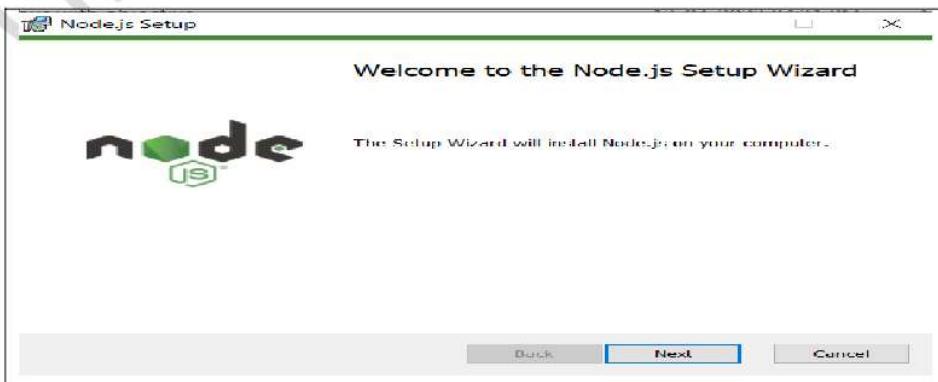


Figure 10.3: Setup wizard for installing Node.js

3. Follow the installation wizard and complete the installation process.

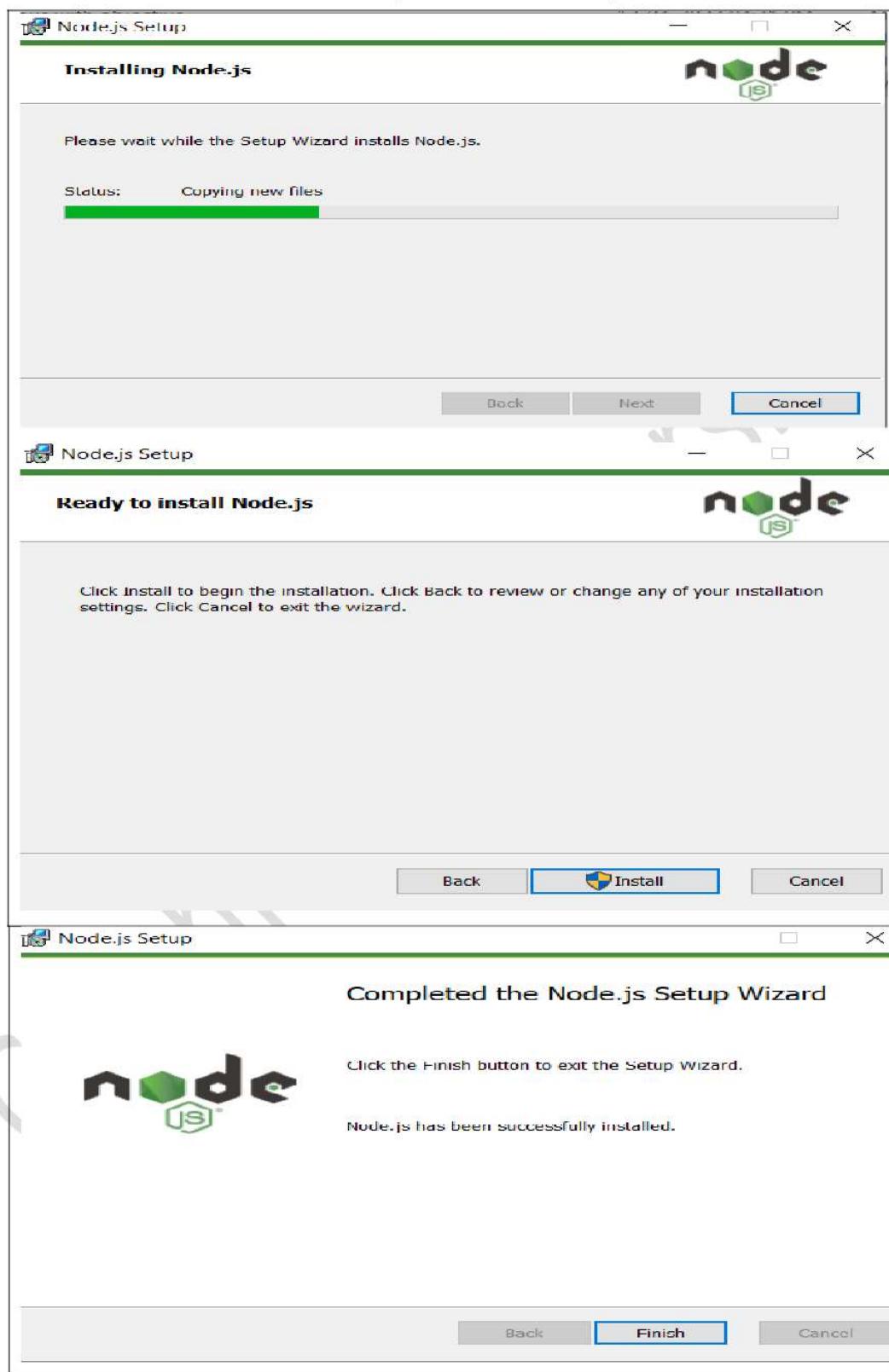


Figure 10.4: Installation of Node.js and its completion using the setup wizard

4. To confirm Node.js is installed successfully, at the command prompt type the command to verify the version that is installed

```
E:\>node -v
```

V18.17.1

```
E:\>npm -v
```

9.6.7

Here node version is V18.17.1 and the npm version is 9.6.7

Along with [Node.js](#), Node Package Manager ([npm](#)) is also installed by default. JavaScript Packages are installed with npm. [npm](#) keeps track of all the project details. A tool called [npx](#) is installed by default that runs the executable packages.

5. Install ReactJS using the npm package manager by giving the following command at the command prompt

```
E:\>npm install -g create-react-app
```

The installation is completed if no errors are displayed

Create-react-app is a fantastic tool for beginners. It allows you to quickly create and run React projects without the need for manual configuration setup. This tool takes care of all the necessary dependencies and technical stuff, like Webpack and Babel, required for ReactJS. It simplifies the process of setting up the development environment and provides a great experience for developers. Additionally, it optimizes the application for production, ensuring it runs smoothly.

II. Steps to install Visual Studio Code Editor

1. From <https://code.visualstudio.com/docs/setup/windows> download Visual Studio Code installer. The file [VSCodeUserSetup-x64-1.78.2](#) gets downloaded



Figure 10.5: Download Visual Studio Installer for Windows

2. Double-click on the file [VSCodeUserSetup-x64-1.78.2](#) and follow the installation setup wizard and complete the installation process.

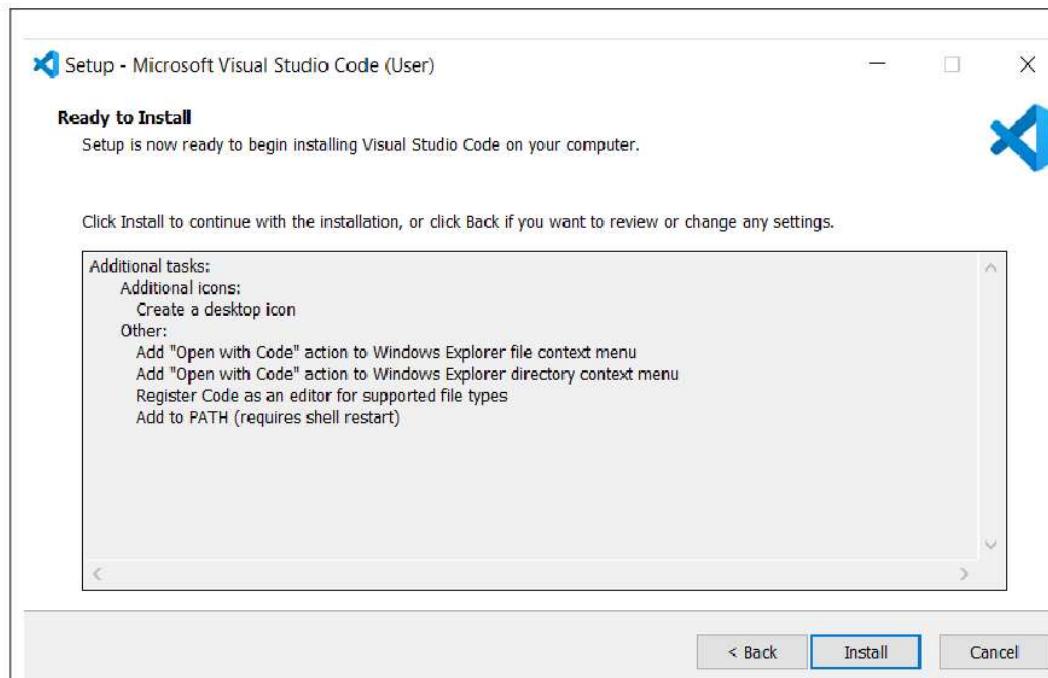


Figure 10.6: Installation of Visual Studio Code using the setup wizard

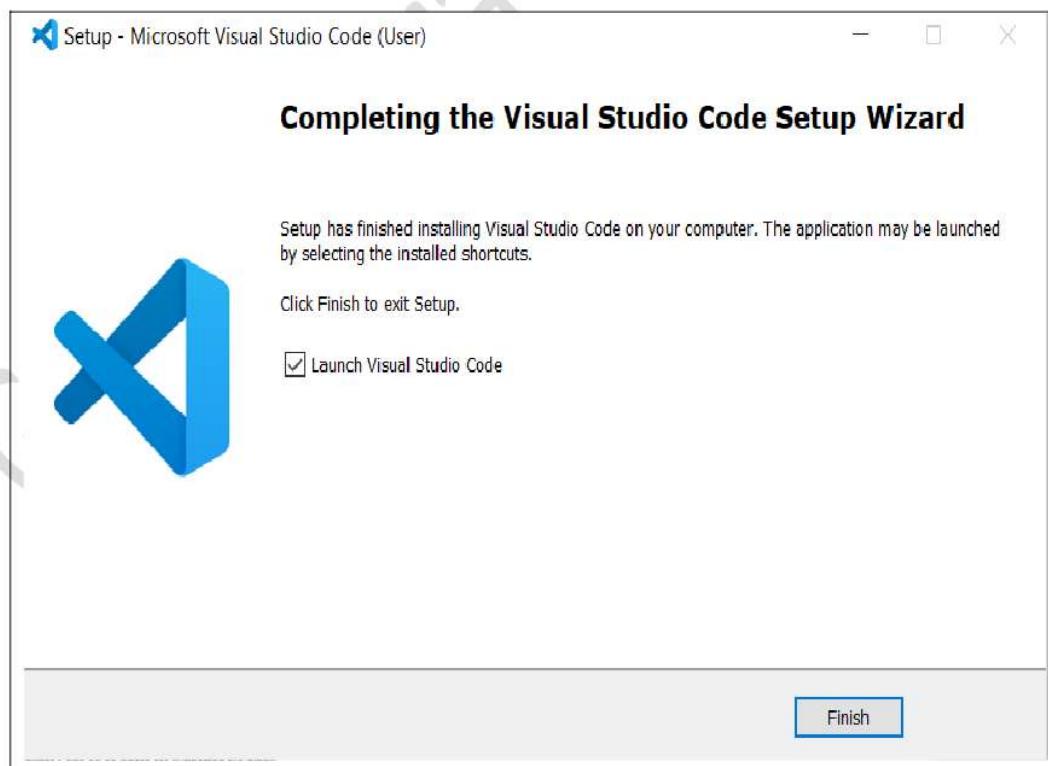


Figure 10.7: Completing Installation of Visual Studio Code using the setup wizard

10.8 Creating a new ReactJS project using "create-react-app"

Steps for creating a ReactJS project using "create-react-app"

1. To create a ReactJS project by using "create-react-app", at the command prompt type

E:\Reactexamples>create-react-app myreactapp

or

E:\Reactexamples>npx create-react-app myreactapp

This will create a new react project by the name `myreactapp`. Once the project gets created, the following output is displayed as shown in Figure 10.8.

```
Success! Created myreactapp at E:\Reactexamples\myreactapp
Inside that directory, you can run several commands:

npm start
  Starts the development server.

npm run build
  Bundles the app into static files for production.

npm test
  Starts the test runner.

npm run eject
  Removes this tool and copies build dependencies, configuration files,
  and scripts into the app directory. If you do this, you can't go back!

We suggest that you begin by typing:

cd myreactapp
npm start

Happy hacking!
```

Figure 10.8: Output after creating the “myreactapp” project

2. Change to the new project directory created by the project `myreactapp` by giving the command at the command prompt

E:\Reactexamples>cd myreactapp

This project folder `myreactapp` contains many files and sub-folders within it as shown in Figure 10.9 and Figure 10.10.



Figure 10.9: Files and subfolders created for the “myreactapp” project

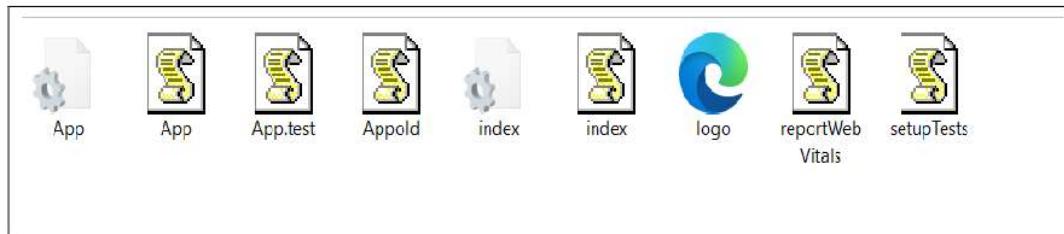


Figure 10.10: Files created in the “src” folder of the “myreactapp” project

3. The folder `E:\Reactexamples\myreactapp\src` contain the file `App.js` file which is always responsible for displaying the output screen in React. So changes can be made in the `App.js` file which is the home page to display the message on the screen.

For displaying the message “**Hello world! My first ReactJS Application**” edit the file `App.js` and make the changes as shown in Figure 10.11

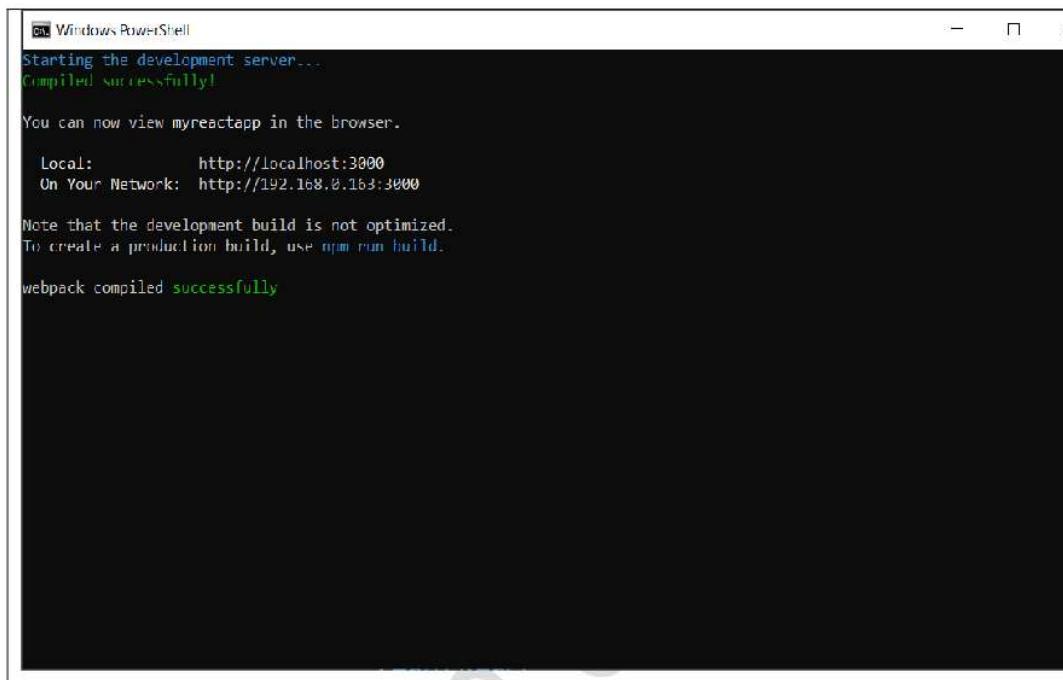
```
import logo from './logo.svg';
import './App.css';
function App() {
  return (
    <div className="App">
      <header className="App-header">
        <img src={logo} className="App-logo" alt="logo" />
        <p>
          Hello, world! My first ReactJS Application
        </p>
        <a className="App-link"
          href="https://reactjs.org"
          target="_blank"
          rel="noopener noreferrer">
          Learn React
        </a>
      </header>
    </div>
  );
}
export default App;
```

Figure 10.11: Code Snippet of `App.js` file

4. Start the server by giving the following command at the command prompt

E:\Reactexamples\myreactapp>[npm start](#)

The server gets started and displays the messages as follows if no errors are present.



```
Windows PowerShell
Starting the development server...
Compiled successfully!

You can now view myreactapp in the browser.

Local:          http://localhost:3000
On Your Network:  http://192.168.0.163:3000

Note that the development build is not optimized.
To create a production build, use npm run build.

webpack compiled successfully
```

Figure 10.12: Server started successfully

5. Run the application by opening the browser and giving the URL <http://localhost:3000>

The following output gets displayed with a black background.

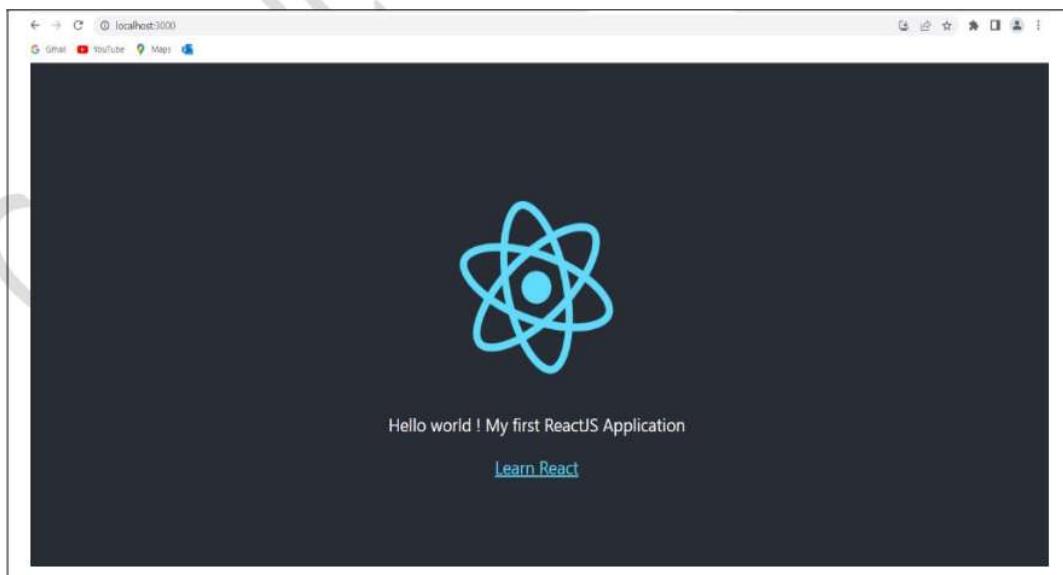


Figure 10.13: Output of "myreactapp" project with black background

6. To change the background color to “**blue**” make the following changes in the “[App.css](#)” file as follows

```
.App-header {  
    background-color: blue;      // default is #282c34  
    min-height: 100vh;  
    display: flex;  
    flex-direction: column;  
    align-items: center;  
    justify-content: center;  
    font-size: calc(10px + 2vmin);  
    color: white;  
}
```

Figure 10.14: Code Snippet of App.css file

7. Run the application by opening the browser and giving the URL <http://localhost:3000>
The following output gets displayed with a blue background.

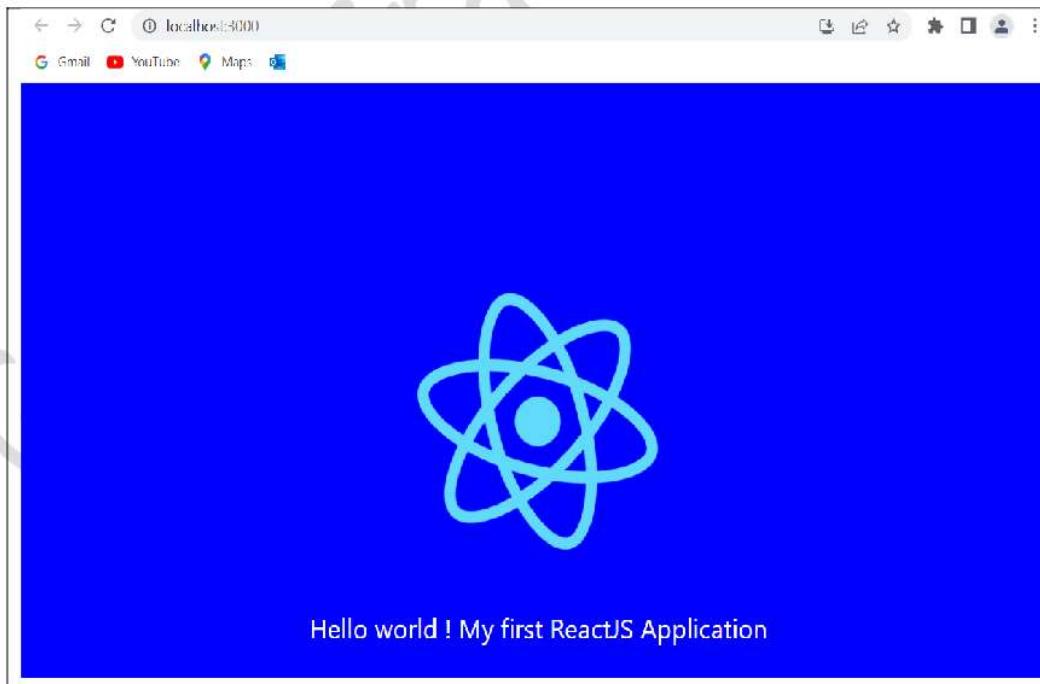


Figure 10.15: Output of “[myreactapp](#)” project after changing the background color to “blue”.

8. To display the “Graphic Era” logo and a welcome message from Graphic Era make the following changes in the “[App.js](#)” file in the [src](#) folder.

The new logo file “[geulogo.png](#)” should also be placed in the [src](#) folder

```
import logo from './geulogo.png';
import './App.css';
function App() {
  return (
    <div className="App">
      <header className="App-header">
        <img src={logo} className="App-logo" alt="logo" />
        <p>
          Welcome to Graphic Era University
        </p>
      </header>
    </div>
  );
}
export default App;
```

Figure 10.16: Code Snippet of App.js file

9. Run the application by opening the browser and giving the URL <http://localhost:3000>

The following output gets displayed with the Graphic Era logo and new welcome message.

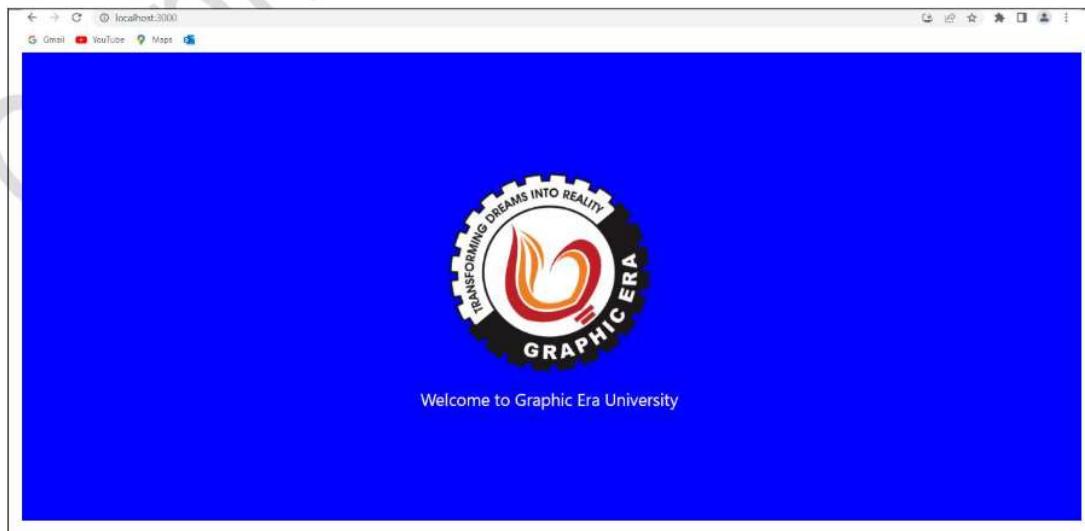


Figure 10.17: Output of “[myreactapp](#)” project after changing the default logo

10. Build the project [myreactapp](#) by giving the command at the command prompt

```
E:\Reactexamples\myreactapp>npm run build
```

Building the project creates a “**build**” directory and the code is bundled that can be deployed to external servers. After the build is complete the following output gets displayed as shown in Figure 10.18.

```
E:\Reactexamples\myreactapp>npm run build

> myreactapp@0.1.0 build
> react-scripts build

Creating an optimized production build...
Compiled successfully.

File sizes after gzip:

 46.6 kB  build\static\js\main.0e501aa0.js
 1.78 kB  build\static\js\787.16f177e3.chunk.js
 538 B    build\static\css\main.b45566c1.css

The project was built assuming it is hosted at /.
You can control this with the homepage field in your package.json.

The build folder is ready to be deployed.
You may serve it with a static server:

  npm install -g serve
  serve -s build

Find out more about deployment here:

  https://cra.link/deployment

E:\Reactexamples\myreactapp>
```

Figure 10.18: “Build” completed successfully

10.9 Structure of ReactJS application folder

In a React application, the root directory consists of several files and folders with specific purposes as shown in Figure 10.19, when the folder is opened in Visual Studio Code Editor.

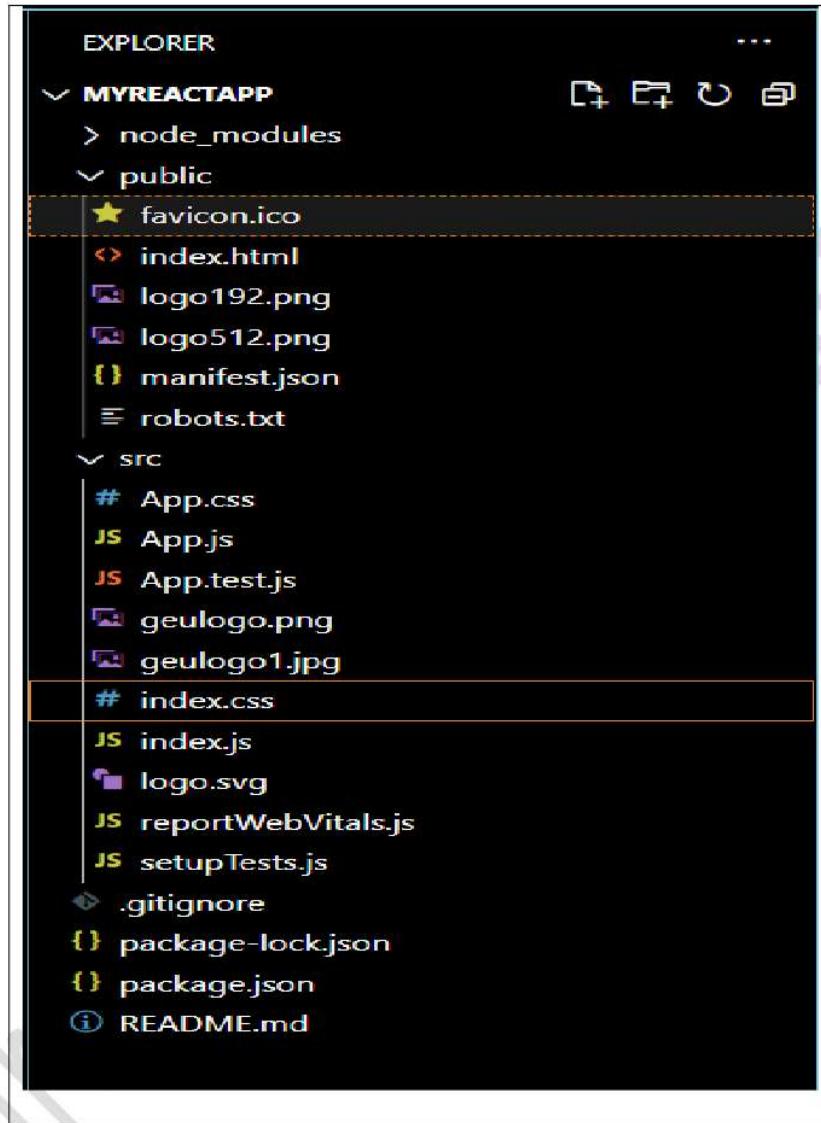


Figure 10.19: Structure of React Application Folder “myreactapp” in VS Code Editor

- **node_modules:** This directory contains the React library and any other third-party libraries required for the application.
- **public:** The public folder contains the assets of the application that are publicly accessible. It includes the index.html file, which serves as the entry point for the React application and mounts it on the default root element (<div id="root"></div>), image files, and manifest files in JSON format.

- **src:** The src folder contains various files such as App.css, App.js, App.test.js, index.css, index.js, and serviceWorker.js. Among these, the App.js file plays a crucial role in rendering the output screen in React. In general, the React JavaScript code of the project is contained in the “**src**” folder.
- **package.json:** The package.json file contains metadata essential for the project. It includes information required by npm to identify the project and manage its dependencies effectively.
- **package-lock.json:** This file is automatically generated during npm package operations when there are modifications to the node_modules tree or package.json. It provides detailed information about the installed package versions and ensures consistent installations. It is not meant for publishing and is typically ignored during version control.
- **README.md:** The README.md file serves as the documentation for the React project. It provides information and instructions for developers to understand various React topics and aspects of the application.

These files and folders are vital components of a React application, enabling proper organization, configuration, and functionality.

10.10 Self-Assessment Questions

- Q1. What is ReactJS? List and explain some notable features of ReactJS.[8 marks, L2]
- Q2. Explain the concept of a virtual DOM in ReactJS and its advantages.[4 marks, L2]
- Q3. What are the benefits of using ReactJS for front-end development? [6 marks, L2]
- Q4. Explain how ReactJS supports reusability and component-based architecture.
[4 marks, L2]
- Q5. Give some examples of real-world applications built with ReactJS.[6 marks, L2]
- Q6. Discuss the advantages and disadvantages of using ReactJS. [8 marks, L2]
- Q7. Compare and contrast ReactJS with AngularJS. [6 marks, L2]
- Q8. What are the key differences between ReactJS and Vue.js? [6 marks, L2]
- Q9. What are the differences between ReactJS and jQuery? [5 marks, L2]
- Q10. Explain the prerequisites and steps for setting up a ReactJS development environment. [4 marks, L2]
- Q11. Describe the steps to install Node.js and npm (Node Package Manager) for ReactJS.
[6 marks, L2]
- Q12. Explain the steps involved in creating a new ReactJS project using Create React App (CRA). [8 marks, L2]
- Q13. Discuss the typical folder structure of a ReactJS project. [6 marks, L2]

Q14. What are some common files and directories found in the “src” folder, and discuss the significance of each one of them in brief. [6 marks, L2]

10.11 Self-Assessment Activities

- A1. Create a ReactJS application to display the “Graphic Era” logo and the message “Welcome to Graphic Era University”.
- A2. Compare ReactJS with other front-end technologies. Which front-end would you choose to develop an application of your choice? Justify your answer.

10.12 Multiple-Choice Questions

1. ReactJS is primarily used for _____. [1 mark, L1]
 - a) Server-side scripting
 - b) Back-end development
 - c) Front-end development
 - d) Database management
2. What is the concept of a virtual DOM in ReactJS? [1 mark, L2]
 - a) A simulated version of the browser's Document Object Model
 - b) A server-side rendering technique
 - c) A database management system
 - d) A design pattern for component communication
3. Which of the following is a notable feature of ReactJS? [1 mark, L2]
 - a) Poor Performance
 - b) Component-based architecture
 - c) MVC architecture
 - d) Virtual Private Network (VPN) support
4. ReactJS uses the _____ concept to efficiently update the user interface. [1 mark, L1]
 - a) Virtual DOM
 - b) Physical DOM
 - c) Shadow DOM
 - d) HTML templates
5. In which type of application is ReactJS commonly used? [1 mark, L2]
 - a) Command-line applications

- b) Machine learning models
 - c) Database management systems
 - d) Single-page applications (SPAs)
6. _____ is a characteristic of ReactJS that makes it easy to learn. [1 mark, L1]
- a) Complex syntax and extensive configuration files
 - b) A large number of built-in UI components
 - c) A simple and intuitive API
 - d) Integration with multiple programming languages
7. Which one of the following is not an advantage of ReactJS? [1 mark, L2]
- a) Reusability
 - b) Inefficiency
 - c) Flexibility
 - d) Large Community
8. Which one of the following is a disadvantage of ReactJS? [1 mark, L2]
- a) Reusability
 - b) Flexibility
 - c) Large Community
 - d) Steep Learning Curve
9. _____ is a recommended tool for managing JavaScript dependencies in a ReactJS project. [1 mark, L1]
- a) npm (Node Package Manager)
 - b) jest
 - c) Bower
 - d) Grunt
10. Which command is used at the command prompt to create a new ReactJS project with Create React App (CRA)? [1 mark, L2]
- a) E:\>create-react-project your-app-name
 - b) E:\>start-react-app your-app-name
 - c) E:\>new-react-project your-app-name
 - d) E:\>npx create-react-app your-app-name

10.13 Key Answers to Multiple-Choice Questions

1. ReactJS is primarily used for Front-end development. [c]
2. The concept of a virtual DOM in ReactJS is a simulated version of the browser's Document Object Model. [a]
3. Component-based architecture is a notable feature of ReactJS. [b]
4. ReactJS uses the Virtual DOM concept to efficiently update the user interface. [a]
5. In which type of application is ReactJS commonly used? - Single-page applications (SPAs). [d]
6. A simple and intuitive API is a characteristic of ReactJS that makes it easy to learn. [c]
7. Inefficiency is not an advantage of ReactJS. [b]
8. Steep Learning Curve is a disadvantage of ReactJS. [d]
9. Node Package Manager (npm) is a recommended tool for managing JavaScript dependencies in a ReactJS project. [a]
10. E:\>npx create-react-app your-app-name command is used at the command prompt to create a new ReactJS project with Create React App (CRA). [d]

10.14 Summary

ReactJS is an open-source, component-based front-end library that enables developers to build robust user interfaces. It was originally created by Facebook software engineer Jordan Walke. It was initially developed and maintained by Facebook and has been used later in a variety of its products, including WhatsApp and Instagram.

ReactJS is a JavaScript library that allows developers to create reusable UI components using a declarative, efficient, and flexible approach. It focuses on the view layer of applications.

Some of the key features of ReactJS include Component-based architecture, Virtual DOM, JSX, Unidirectional data flow, React Native, High performance, and Community support.

ReactJS offers several benefits for developers and businesses alike. Some of the key benefits of using ReactJS are- Improved productivity, Enhanced performance, Code reusability, Search Engine Optimization (SEO)-friendly, Large community, Cross-platform support, and ease to learn.

Advantages of ReactJS: Reusability, Efficiency, Flexibility, Large Community, SEO-friendly.

Disadvantages of ReactJS: Steep Learning Curve, JSX, Limited Functionality, Large File Size, Lack of Documentation. Overall, ReactJS is a powerful and popular library for

building modern web applications. While it has some disadvantages, the advantages and flexibility of ReactJS make it a great choice for many developers and applications.

ReactJS is known for its flexibility, efficiency, and large community support. It is a popular choice for building UI components and single-page applications. Angular and Vue.js, on the other hand, provide more comprehensive frameworks with additional features and tools. The choice between these technologies ultimately depends on the specific requirements and preferences of the project and development team.

For beginners or small projects, using “**Create React App**” is generally the recommended approach, as it provides a simple and straightforward setup. “**Create-react-app**” is a fantastic tool for beginners. It allows you to quickly create and run React projects without the need for manual configuration setup. This tool takes care of all the necessary dependencies and technical stuff, like Webpack and Babel, required for ReactJS. It simplifies the process of setting up the development environment and provides a great experience for developers. Additionally, it optimizes the application for production, ensuring it runs smoothly.

10.15 Keywords

- ReactJS
- Virtual DOM
- JSX (JavaScript XML)
- AngularJS
- Vue.js
- Create-react-app
- Node Package Manager (npm)

10.16 Recommended resources for further reading

Text Book(s)

1. Vasan Subramanian, “Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React and Node”, 2nd Edition, Apress.
2. Azat Mardan, 2017, “React Quickly_ Painless web apps with React, JSX, Redux, and GraphQL”, Manning Publications.

References

- Alex Banks and Eve Porcello, 2020, “Learning React Modern Patterns for Developing React Apps”, O'Reilly.

- Eddy Wilson, 2018, "MERN Quick start guide: Build Web applications with MongoDB, Express.js, React and Node", Packt publishing.
- David Hows, 2014, Peter Membrey & Eelco Plugge, "MongoDB Basics", Apress.
- Joe Morgan, "How to code in React.js", DigitalOcean.

--*--

Graphic Era University