ENSF 381
Full Stack Web Development

Lecture 19: Introduction to React

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Outline

- Recap.
- React requirements.
- Creating Hello-react App.
- How React works.

Recap: React

- React is a free and open-source front-end JavaScript library.
- Created by Facebook/Meta.
- Allows to create reusable components.
- Used to create user interfaces (UI) through the composition of components.

React requirements

- Node and NPM: https://nodejs.org/en/download.
- Node.js and npm (Node Package Manager) manage dependencies, build and compile your code, and run a development server.
- React applications are typically created and managed using tools.
- Tools like Create React App use Node.js to start a development server that supports **hot-reloading**, allowing developers to see changes in real-time as they work on the code.
- NPM is used to install and manage the dependencies (React and other libraries) that your project relies on.

React requirements

Verify the installation of node and npm versions in the command line using:

Node:

```
node --version
```

NPM:

```
npm --version
```

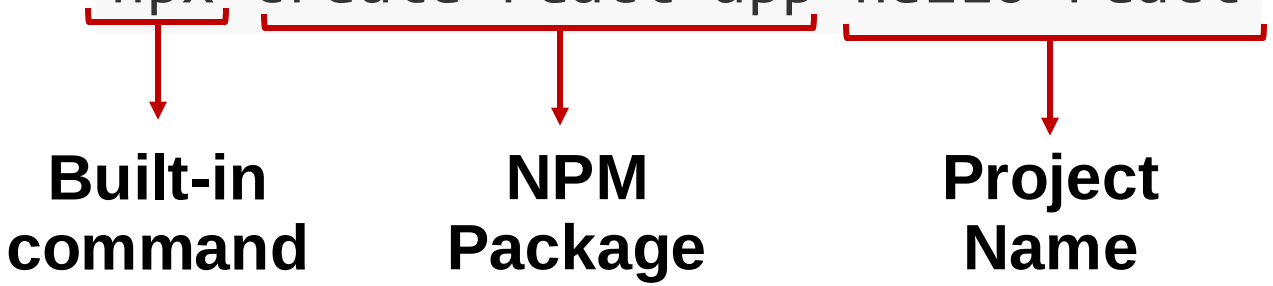
Output:

```
(base) Ahmads-MacBook-Pro:~ ahmadabdellatif$ node --version
v15.8.0
(base) Ahmads-MacBook-Pro:~ ahmadabdellatif$ npm --version
7.5.1
```

Creating your first React application

1. Open a terminal or command prompt on your machine.
2. Navigate to the directory (e.g., desktop) where you want to create your new React app and run the following command:

```
npx create-react-app hello-react
```



Creating your first React application

```
(base) Ahmads-MacBook-Pro:~ ahmadabdellatif$ cd desktop
(base) Ahmads-MacBook-Pro:desktop ahmadabdellatif$ npx create-react-app hello-react

Creating a new React app in /Users/ahmadabdellatif/Desktop/hello-react.

Installing packages. This might take a couple of minutes.
Installing react, react-dom, and react-scripts with cra-template...


added 1477 packages in 1m

217 packages are looking for funding
  run `npm fund` for details
npm notice
npm notice New major version of npm available! 7.5.1 -> 10.2.5
npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.2.5
npm notice Run npm install -g npm@10.2.5 to update!
npm notice

Initialized a git repository.

Installing template dependencies using npm...
```

Run your first React application

1. Navigate to the Project Directory (e.g., desktop):

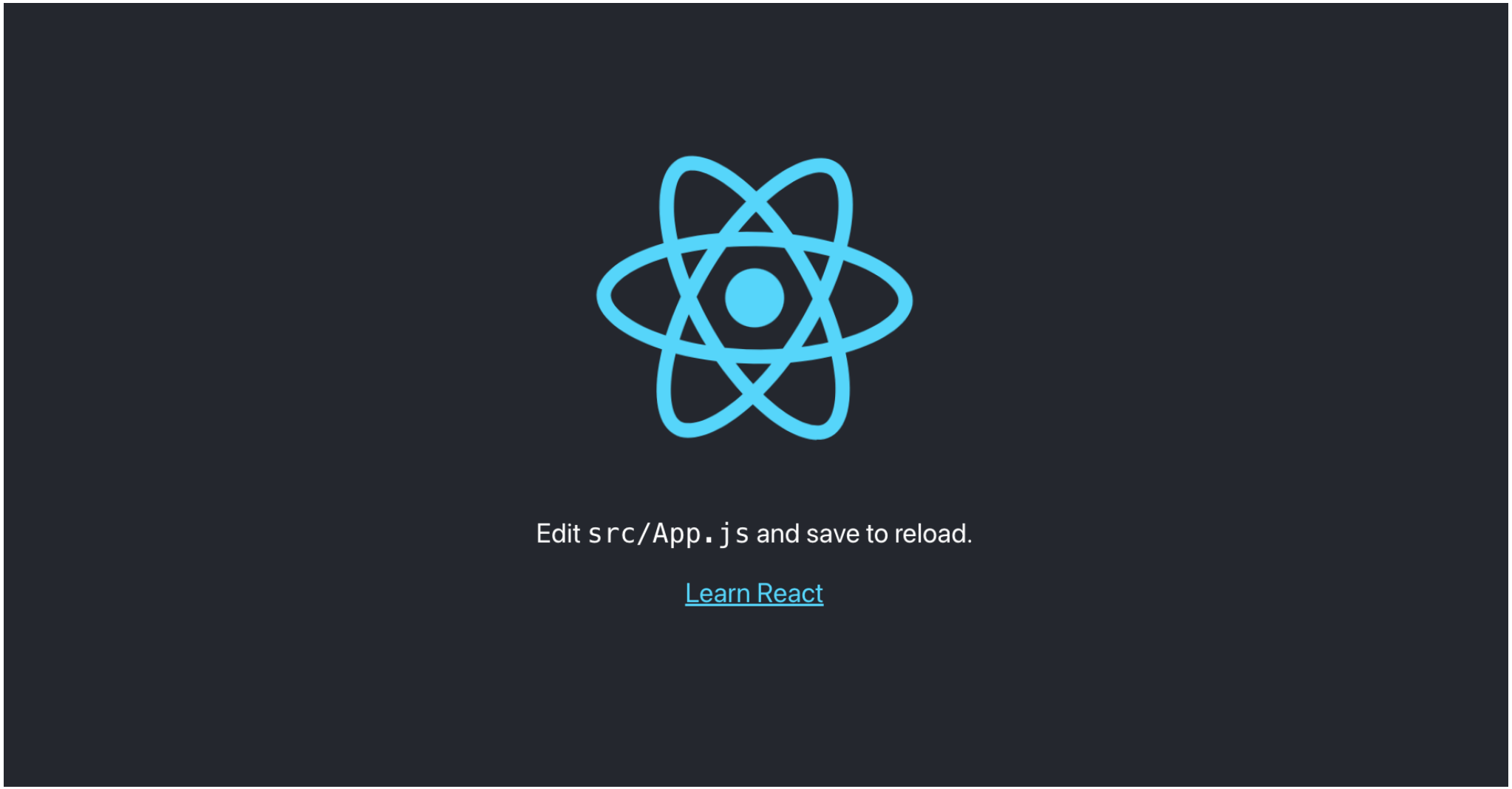
```
cd hello-react
```

2. Start the Development Server:

```
npm start
```

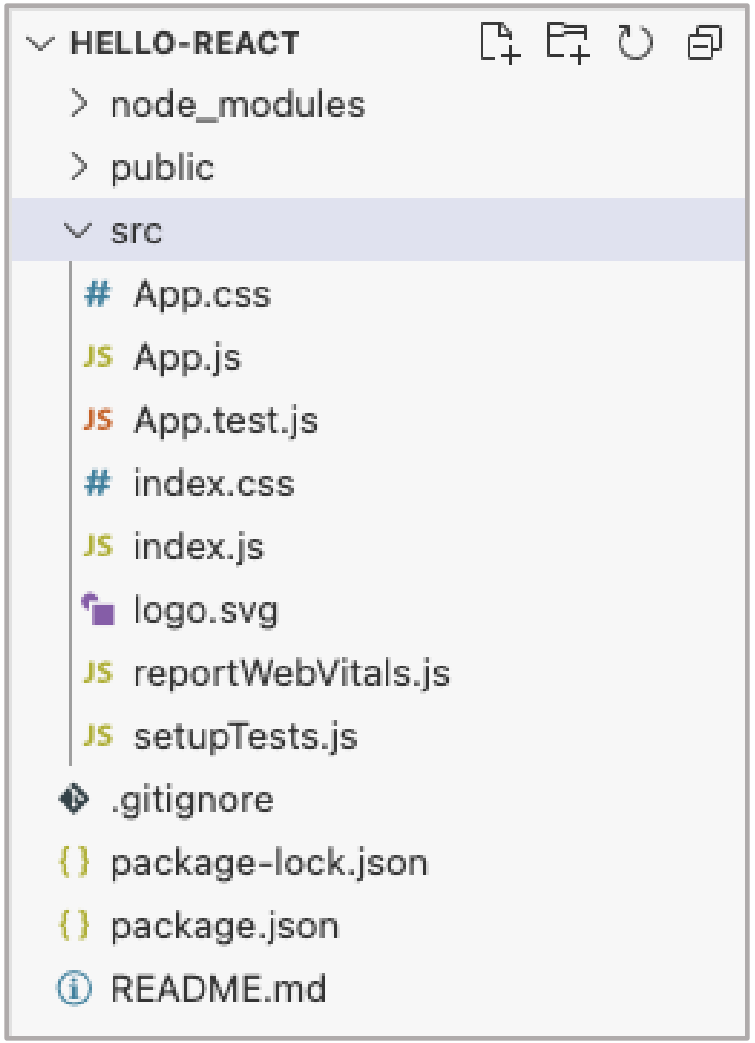
This command starts the development server and opens your React app in a new browser window. You can access it at http://localhost:3000/.

Run your first React application



React application folder structure

`npx create-react-app hello-react` creates the following folder structure:



React application folder structure

- Node_modules:
  - This directory houses all the Node packages installed through npm.
  - Due to the use of create-react-app, several node modules are already present in this folder.
  - This directory is typically managed by npm commands on the command line, involving installation and uninstallation.

- Public: contains development files including "public/index.html"

- package.json: presents the node package dependencies and various project configurations such as project name, version, entry point, and scripts.

React application folder structure

- Package-lock.json: provides a detailed description of the exact versions of packages and their dependencies in a Node.js project. Used to lock down the versions of packages to ensure consistent installations across different environments.

- README.md: provides instructions and useful information about the project. It is a markdown file.

React application folder structure

- Our React code will be mainly located in the "Src" folder.
- src/App.js file is used to implement React components.
- We will split up components into multiple files.
- Each file maintains one or more components.

React application folder structure

- src/App.test.js file contains the tests for the applications.
- src/index.js is the main file and considered as the entry point to the React world.
- src/index.css and src/App.css files used for styling the application and components.

Useful commands

- All project-specific commands are located in the "scripts" property of your package.json:

```
"scripts": {
  "start": "react-scripts start",
  "build": "react-scripts build",
  "test": "react-scripts test",
  "eject": "react-scripts eject"
},
```

- npm start: runs the start script specified in the scripts section of the package.json file.
- npm run build: typically used to build and prepare a project for deployment.
- npm test: runs tests as defined in the scripts section of the package.json file.
- npm run eject: allowing developers to take full control of the project's configuration.

How React works?

- To work with React, we **need to include React library** for creating views: `import React from 'react';`

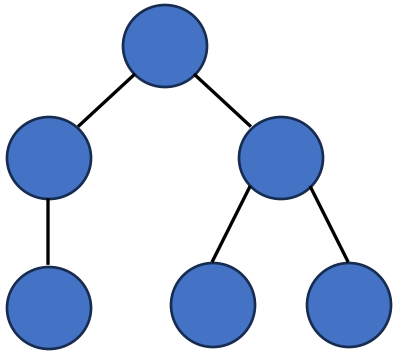
- React establishes a virtual DOM in memory, where it performs all required manipulations before applying changes to the actual browser DOM.

- React does not **directly** manipulate the browser's DOM.

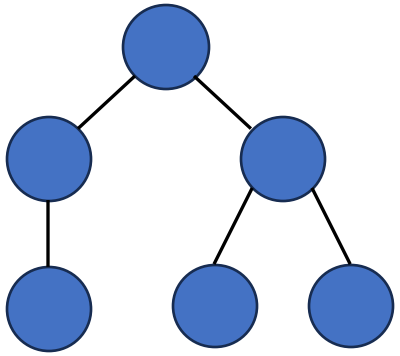
How React works?

- A mechanism that allows React to efficiently manage updates to the user interface by first making changes in a virtual representation and then selectively applying those changes to the actual DOM.
- When changes occur in a React application, React first makes these changes in the virtual DOM rather than directly manipulating the browser's DOM.
- React then performs a process called "reconciliation" to identify the differences between the current virtual DOM and its previous state.
- Only the specific changes or differences identified in the virtual DOM are then applied to the actual DOM.
- This strategy contributes to a more responsive and performant web application.

Virtual DOM

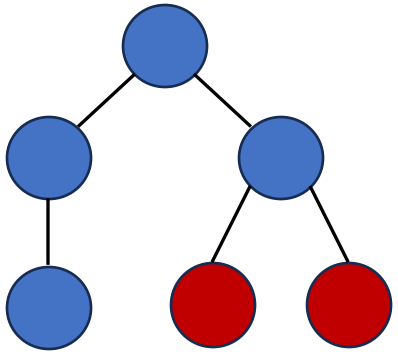


Virtual DOM

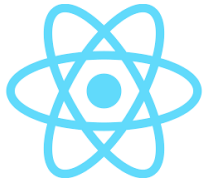


Real/Browser DOM

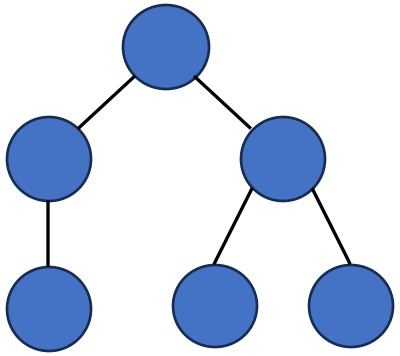
Virtual DOM



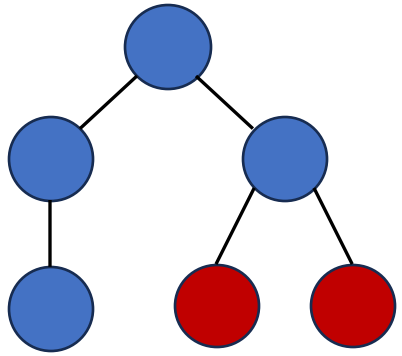
Virtual DOM



Compare



Real/Browser DOM



Real/Browser DOM

Integrated Development Environment

- Integrated Development Environment (IDE) is a software application that provides comprehensive facilities to developers for software development.

- Some key components and functionalities typically found in an IDE:
  - Code Editor
  - Debugger
  - Compiler/Interpreter Integration
  - …

- We will use Visual Studio Code: https://code.visualstudio.com/download

Questions

Reminder: The deadline for Assignment 2 is **today at 11:59 PM**.