SWINBURNE UNIVERSITY OF TECHNOLOGY

Week 3 – React.js

Acknowledgement of Country

We respectfully acknowledge the Wurundjeri People of the Kulin Nation, who are the Traditional Owners of the land on which Swinburne's Australian campuses are located in Melbourne's east and outer-east, and pay our respect to their Elders past, present and emerging.

We are honoured to recognise our connection to Wurundjeri Country, history, culture, and spirituality through these locations, and strive to ensure that we operate in a manner that respects and honours the Elders and Ancestors of these lands.

We also respectfully acknowledge Swinburne's Aboriginal and Torres Strait Islander staff, students, alumni, partners and visitors.

We also acknowledge and respect the Traditional Owners of lands across Australia, their Elders, Ancestors, cultures, and heritage, and recognise the continuing sovereignties of all Aboriginal and Torres Strait Islander Nations.

FAQ on Projects

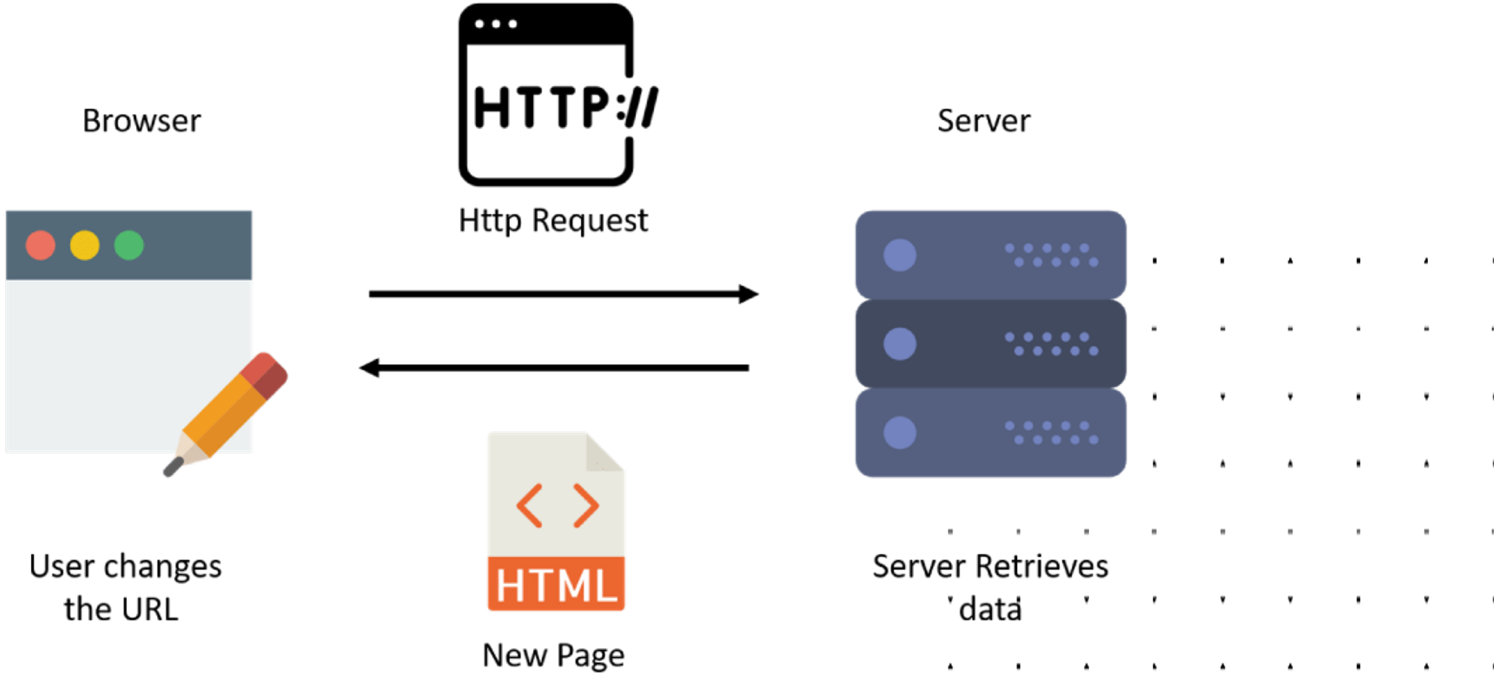
1. About the language you choose to develop the front-end page
2. About the Project Scope & Citation
3. About the Project Prototype
4. About the Project Data

Overall System Design

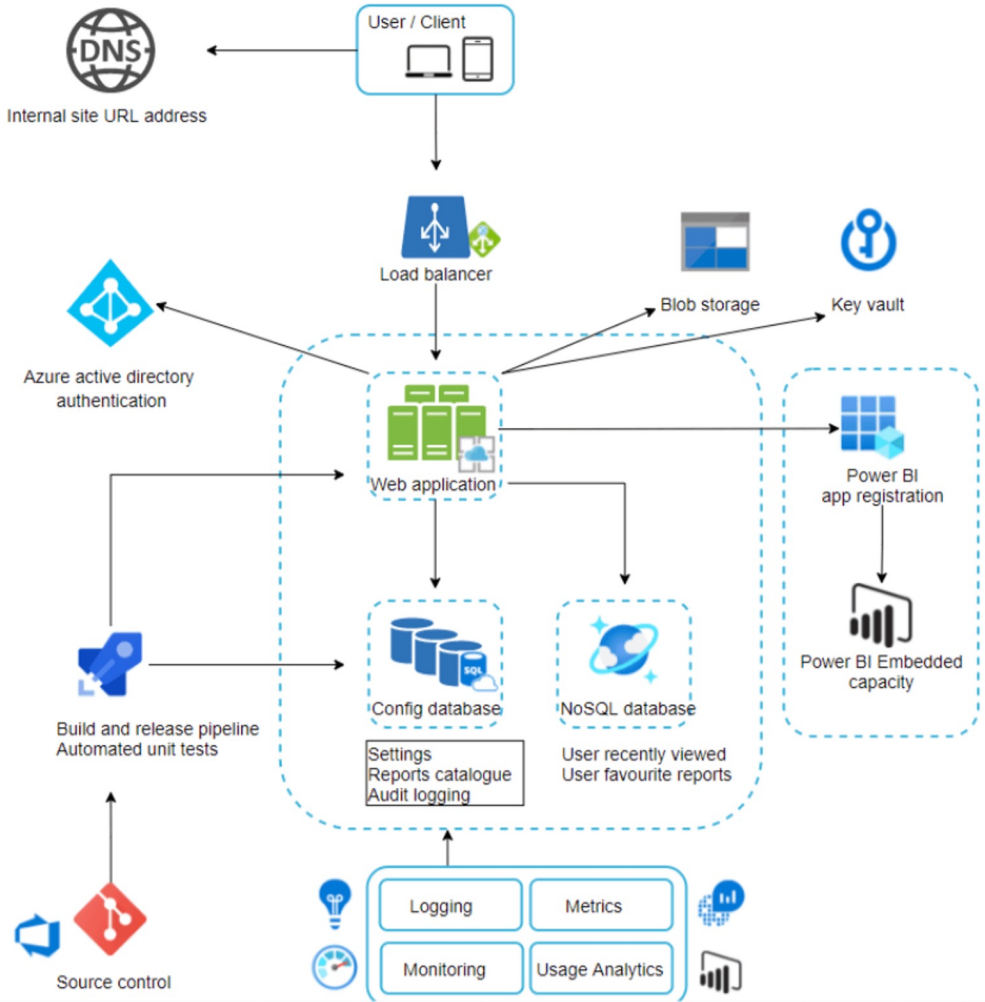
In a web system, the concept of ***Overall System Design*** involves creating a comprehensive blueprint that outlines the collaboration among various elements like components, modules, and services. This blueprint aims to ensure the intended features, performance, scalability, and ease of maintenance are achieved through a well-organized architecture and structure.

- ***Architecture***: Choose an appropriate architectural style, such as monolithic, microservices, serverless, or event-driven, based on the system's requirements and complexity.
- ***Components and Modules***: Identify the major components, modules, and services that make up the system. Define their responsibilities and interactions.
- ***Data Management:*** Design the data model, including database schemas, data storage mechanisms (relational databases, NoSQL databases, etc.), and data access patterns.
- ***User Interface (UI)***: Plan the user interface design, user experience (UX), navigation flow, and interaction patterns to ensure an intuitive and user-friendly interface.

Overall System Design

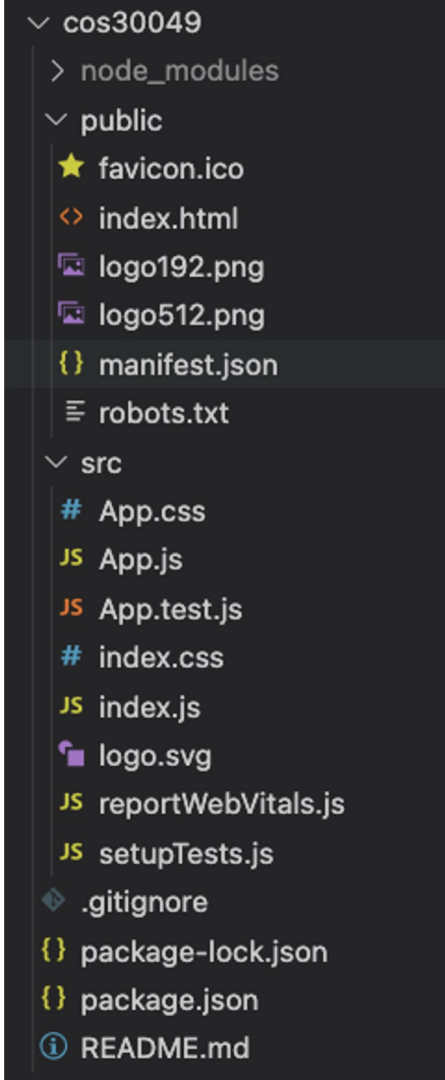


Overall System Design

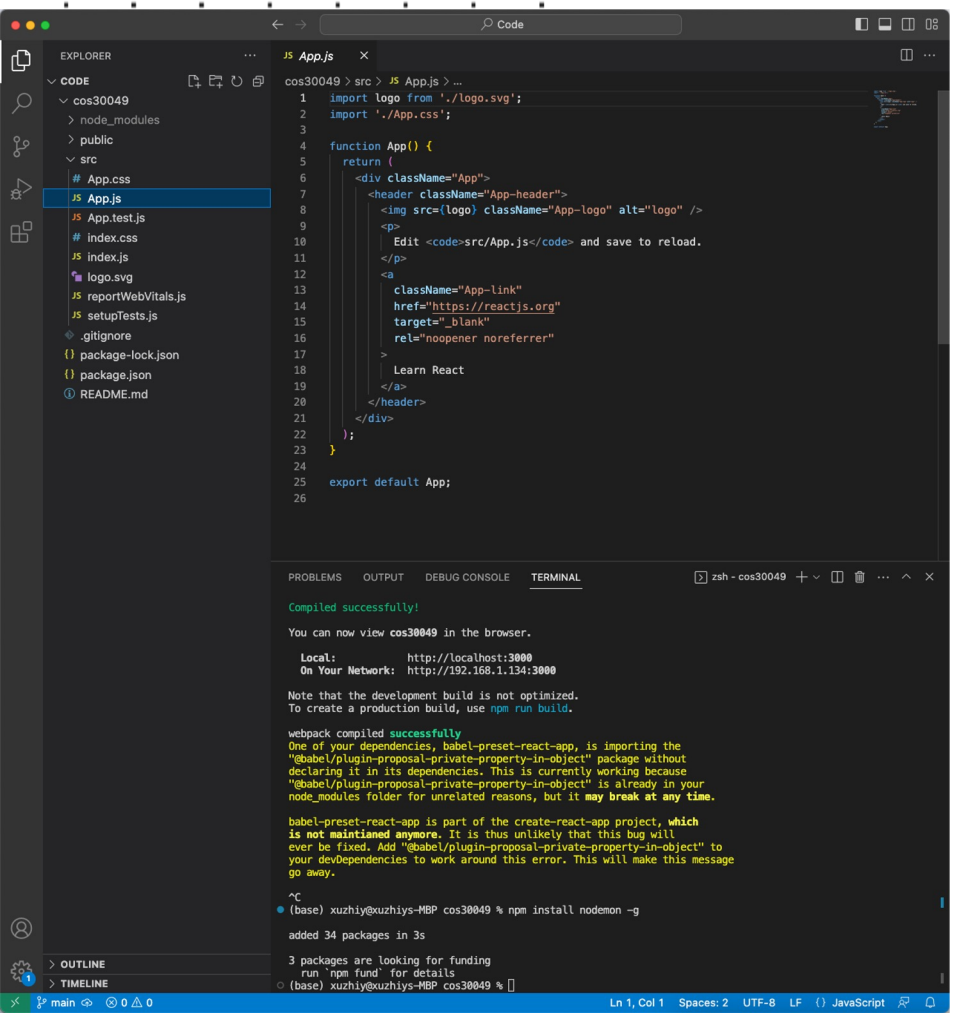


Structure of React

- node_modules: dependencies
- public folder: store static file (html, img, video …..)
- src folder: React source code, most of your codes should be here



Structure of React



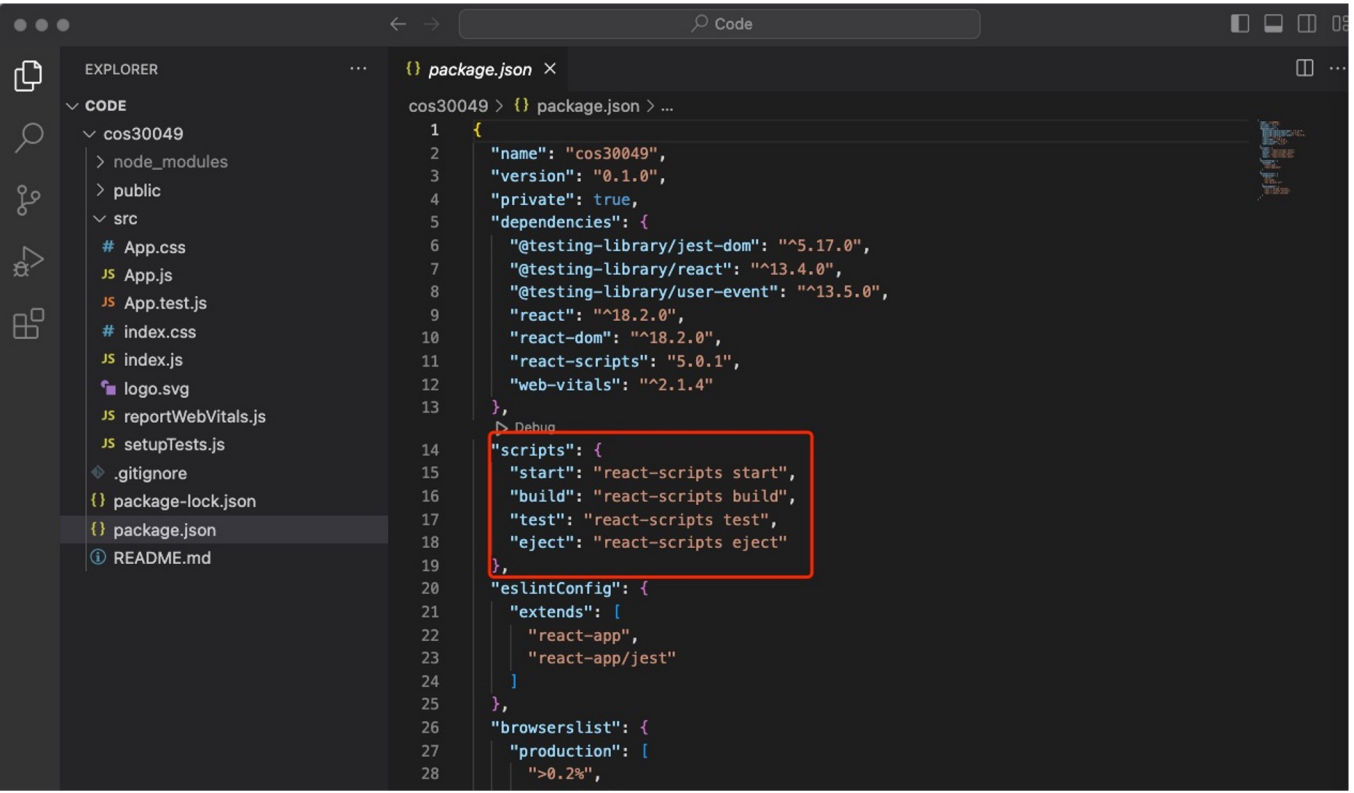
SWINBURNE UNIVERSITY OF TECHNOLOGY

App.js: The entry point of the React.js

Run the project: npm start

Image from CRVS Digitisation Guidebook

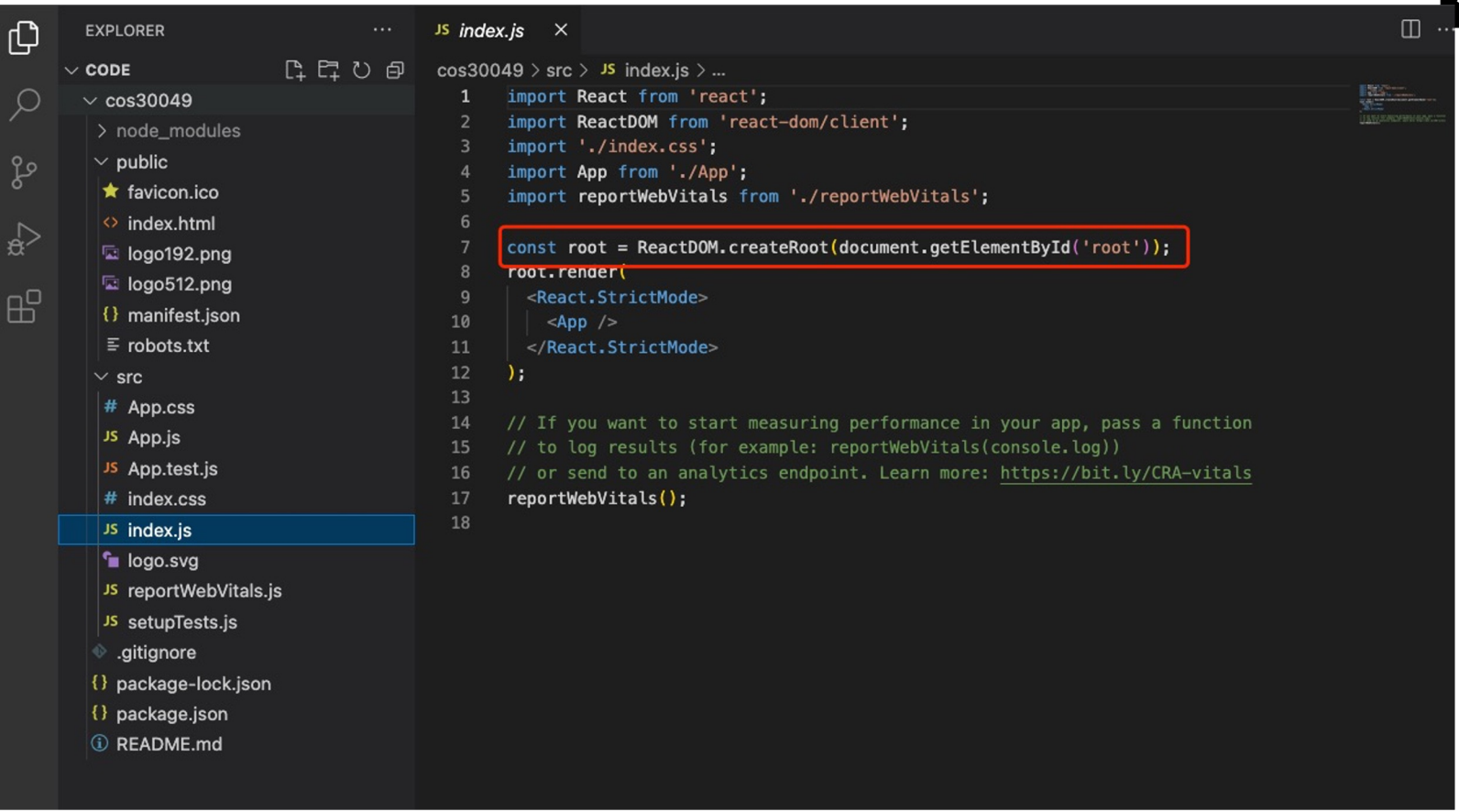
Structure of React



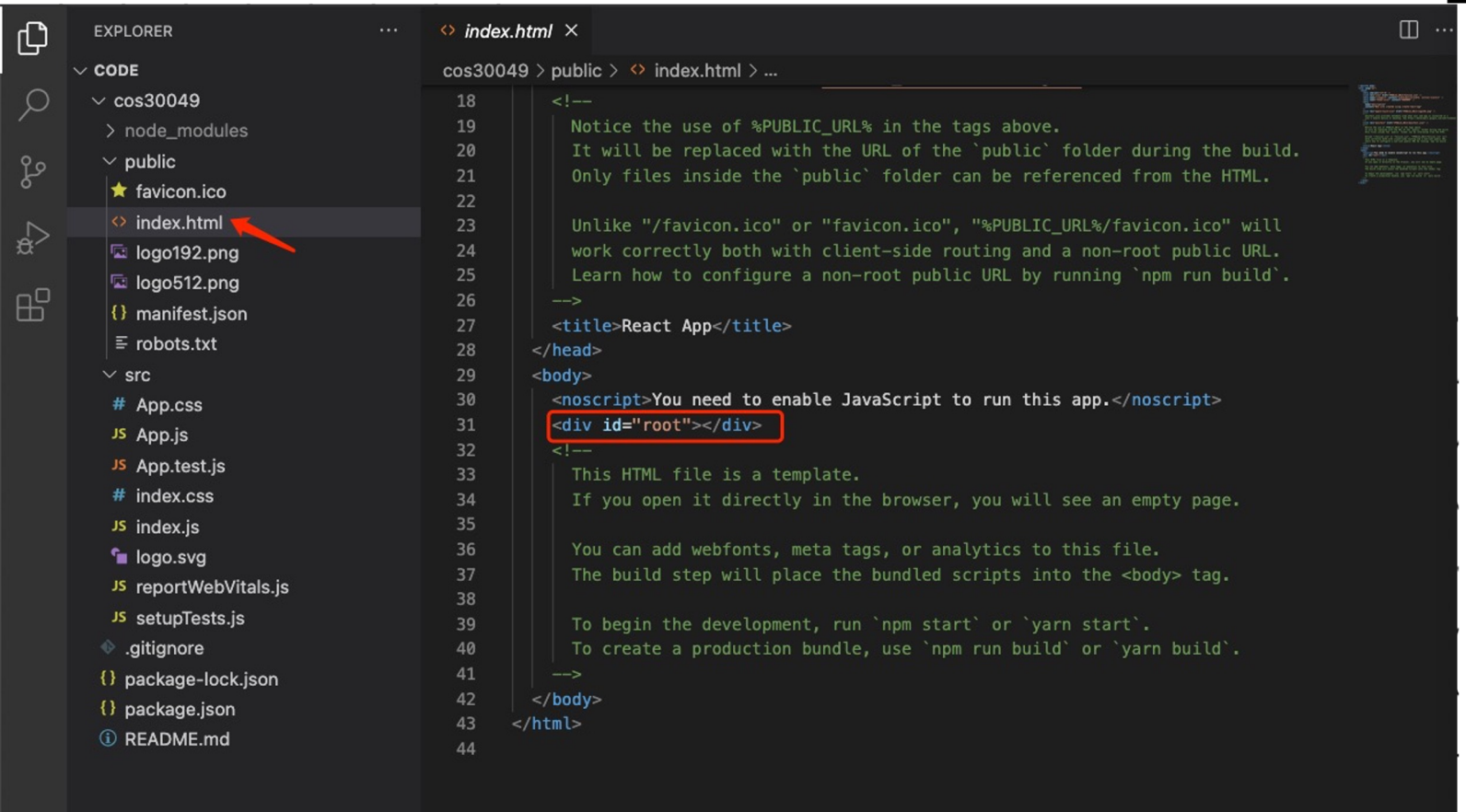
More commands can be found in package.json

Image from CRVS Digitisation Guidebook

Structure of React

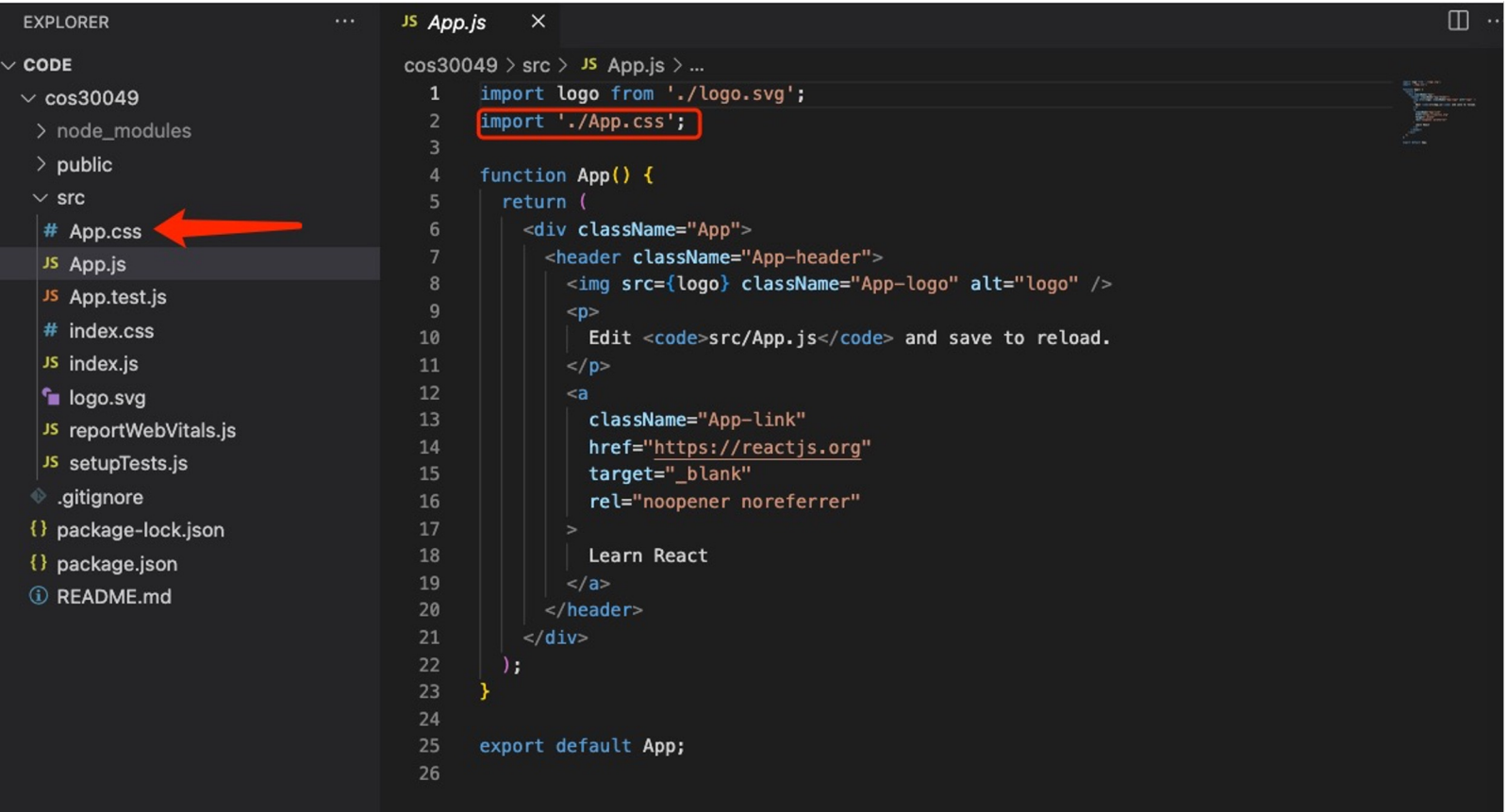


Structure of React



Styling in React

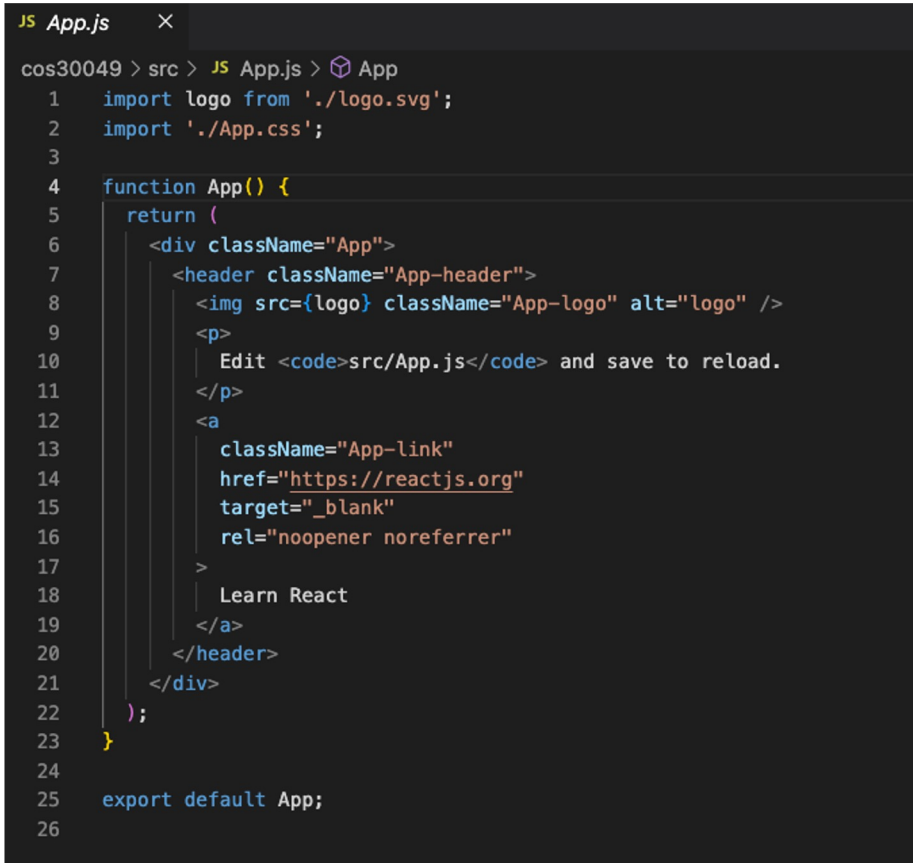
- You can define the elements' CSS in separate files.



Basic Concept of React

JSX (JavaScript XML) is a JavaScript syntax extension that allows you to write XML or HTML-like structures within your JavaScript code. In the context of React, JSX is widely used to describe the structure and appearance of UI components.

The purpose of JSX is to simplify the process of creating and rendering React components, making the code more readable and writable. It enables developers to write markup similar to HTML directly within JavaScript, without the need to manually construct virtual DOM elements.



Basic Concept of React

cos30049 > src > JS App.js > App

```
1   import logo from './logo.svg';
2   import './App.css';
3
4   function App() {
5
6     let test_text = "this is test text"
7
8     return (
9       <div className="App">
10        <header className="App-header">
11          <img src={logo} className="App-logo" alt="logo" />
12          <p>
13            Edit <code>src/App.js</code> and save to reload.
14          </p>
15          <a
16            className="App-link"
17            href="https://reactjs.org"
18            target="_blank"
19            rel="noopener noreferrer"
20          >
21            {test_text}
22          </a>
23        </header>
24      </div>
25    );
26  }
27
28  export default App;
29
```

How you will build your front-end website ?

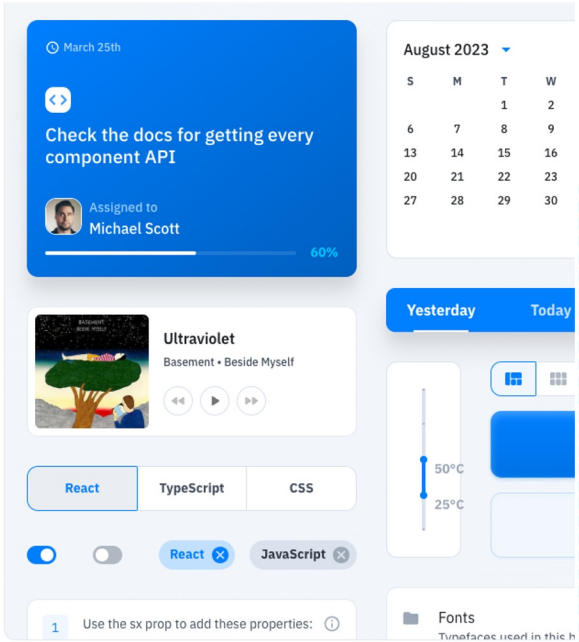
Material-UI

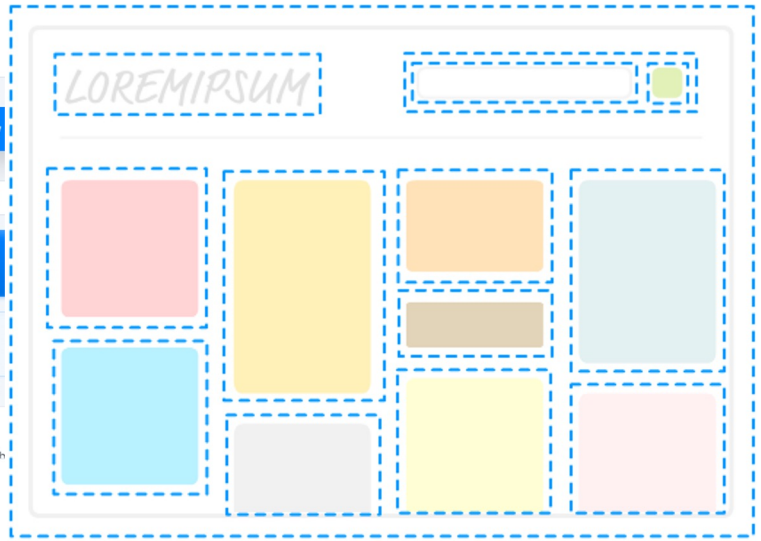
SWINBURNE UNIVERSITY OF TECHNOLOGY

Move faster with intuitive React UI tools

MUI offers a comprehensive suite of free UI tools to help you ship new features faster. Start with Material UI, our fully-loaded component library, or bring your own design system to our production-ready components.

Discover the Core libraries ›

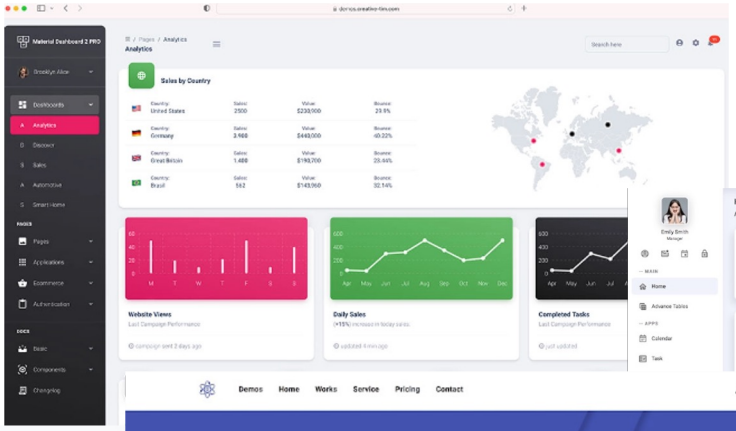


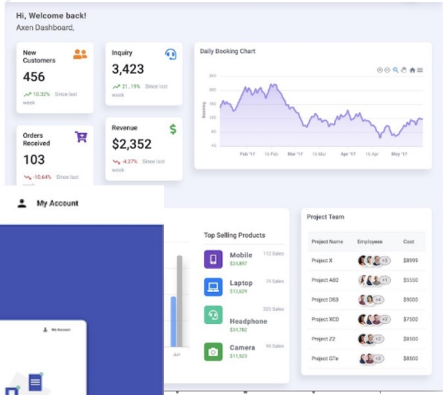


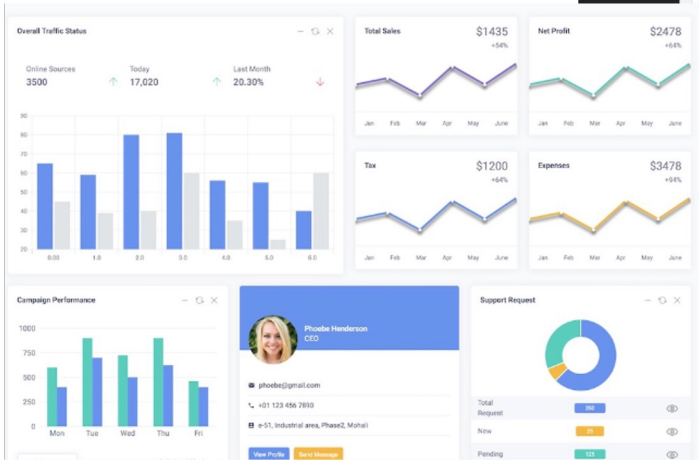
That's a lot of COMPONENTS!

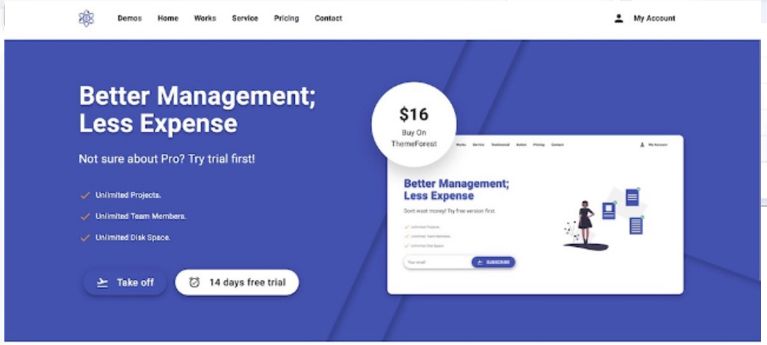
Material-UI

Material UI is beautiful by design and features a suite of customization options that make it easy to implement your own custom design system on top of our components.









Material-UI

Material UI is beautiful by design and features a suite of customization options that make it easy to implement your own custom design system on top of our components.

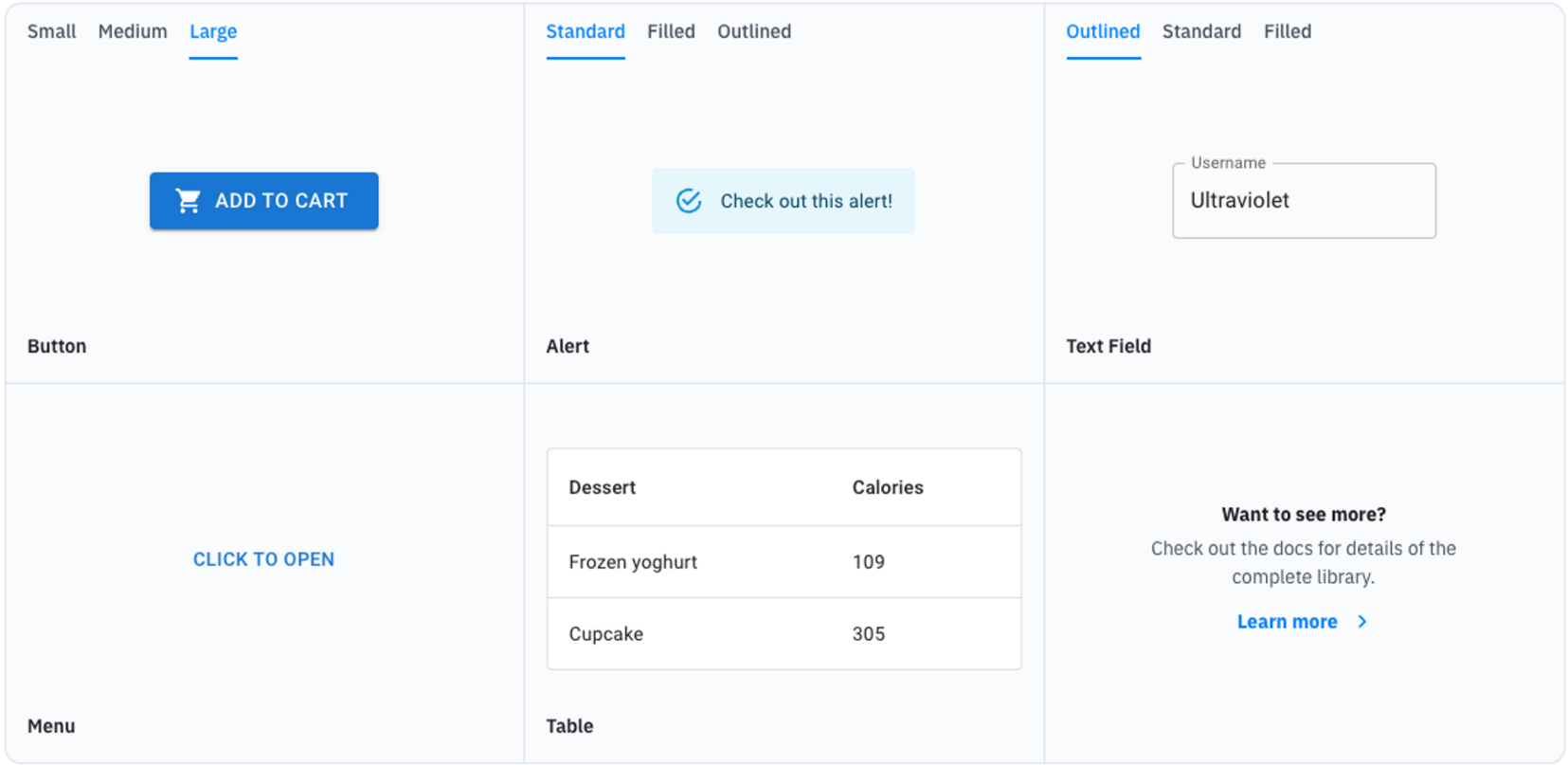
- **Responsive Design:** Material-UI components are designed to be responsive, adapting to different screen sizes from mobile to desktop, providing a seamless user experience.
- **Interactive Experience:** Material-UI components come with built-in animations and transition effects, enhancing the interaction between users and the application.
- **Rapid Development**: By using Material-UI, you can quickly create applications with a modern look without needing to write extensive CSS code from scratch.

Material-UI

Material UI is beautiful by design and features a suite of customization options that make it easy to implement your own custom design system on top of our components.

- **Consistent Design Language**: Material-UI follows the Material Design guidelines, providing a consistent and visually appealing design language that gives your application a modern and unified look.
- **Rich Component Library**: Material-UI offers an extensive collection of reusable components like buttons, input fields, navigation bars, cards, and more. This enables developers to rapidly build complex UI interfaces.
- **High Customizability**: While Material-UI offers default designs and styles, you can easily customize the appearance and behavior of components to meet specific project requirements.

Material-UI Elements Sample



Material-UI Usage

Run one of the following commands to add Material UI to your project:

npm yarn pnpm

```
npm install @mui/material @emotion/react @emotion/styled
```

To use the font Icon component or the prebuilt SVG Material Icons (such as those found in the icon demos), you must first install the Material Icons font. You can do so with npm, or with the Google Web Fonts CDN.

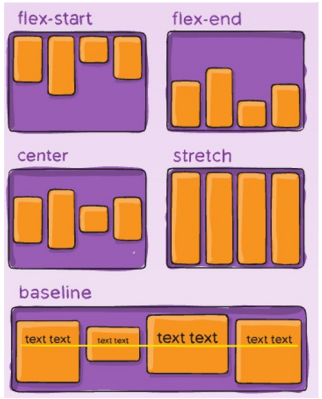
npm yarn pnpm

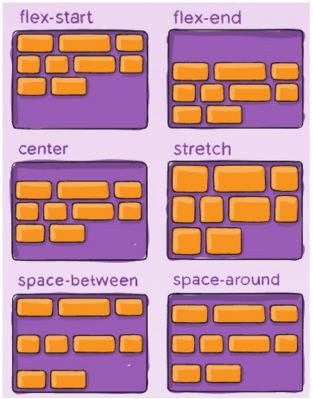
```
npm install @mui/icons-material
```

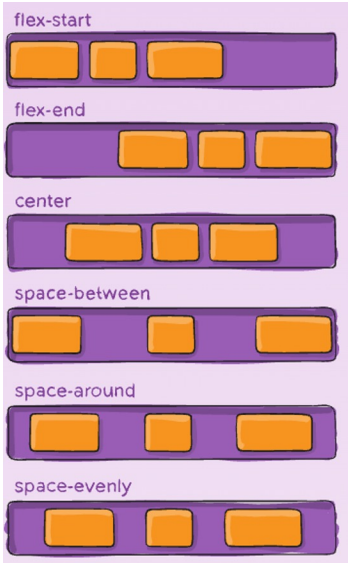
Material-UI Usage

Material-UI's grid system is employed to manage the arrangement of screens within your application. Instead of creating your own styles to control the layout of Material-UI components, you have the option to utilize the Grid component. Underneath, this component employs CSS flexbox attributes to manage adaptable layouts.

Flexbox, short for Flexible Box Layout, is a CSS module used for designing layouts. It provides a more flexible and efficient approach to arranging, aligning, and distributing elements, especially useful for building complex responsive layouts and arrangements. The goal of Flexbox is to offer developers a more intuitive and powerful layout tool to address many of the challenges posed by traditional CSS layout methods.







Material-UI Grid

In React, "**Grid**" typically refers to CSS Grid layout, which is a CSS technique used to create complex grid-based layouts. CSS Grid allows you to divide an area into rows and columns and place content within the intersections of these rows and columns, creating flexible and multi-dimensional layouts.

- **Grid Container and Grid Items**: You can declare a container element as a grid container, and its child elements become grid items. The grid container defines the overall structure of the grid, while grid items are the content placed within grid cells.
- **Row and Column Definitions**: By setting the grid-template-rows and grid-template-columns properties on the grid container, you can define the sizes and quantities of rows and columns. You can use fixed values, percentages, auto, etc.

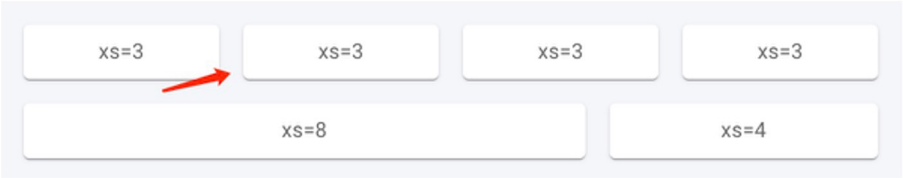
Material-UI Grid

In React, "**Grid**" typically refers to CSS Grid layout, which is a CSS technique used to create complex grid-based layouts. CSS Grid allows you to divide an area into rows and columns and place content within the intersections of these rows and columns, creating flexible and multi-dimensional layouts.

- **Placing Content**: Using the grid-row and grid-column properties, you can determine where grid items are placed in terms of rows and columns and how many rows and columns they span. You can also use the grid-area property to assign a name to a grid area and reference that name within grid items.
- **Automatic Layout:** CSS Grid provides automatic layout capabilities, adjusting the layout dynamically based on the sizes and content of grid items.
- **Grid Gaps**: You can use the grid-row-gap and grid-column-gap properties to set spacing between rows and columns, creating better spacing arrangements.

Material-UI Grid

```
<Grid container spacing={2}>

   <Grid item xs={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={8}>
    <Item>xs=8</Item>
  </Grid>
  <Grid item xs={4}>
    <Item>xs=4</Item>
  </Grid>

</Grid>
```



the Grid component includes a ***spacing*** prop that allows you to control the spacing between its items. This prop defines the spacing between grid items in terms of a CSS spacing scale provided by Material-UI. The available values for the spacing prop are usually integers ranging from 0 to 10.

Material-UI Grid

```
<Grid container spacing={2}>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

</Grid>
```

xs, sm, md, and lg are breakpoint values that represent different screen sizes. They are used to specify how the layout of grid items should adapt and change as the screen size changes.

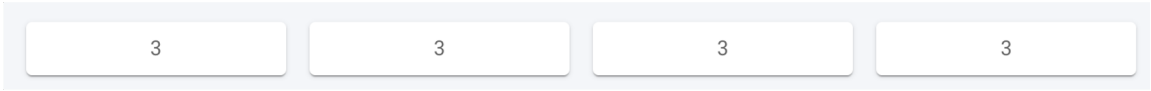
Each breakpoint (a key) matches with a fixed screen width (a value):

- ***xs***, extra-small: 0px
- ***sm***, small: 600px
- ***md***, medium: 900px
- ***lg***, large: 1200px
- ***xl***, extra-large: 1536px

Material-UI Grid

```
<Grid container spacing={2}>

   <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

</Grid>
```

lg sample

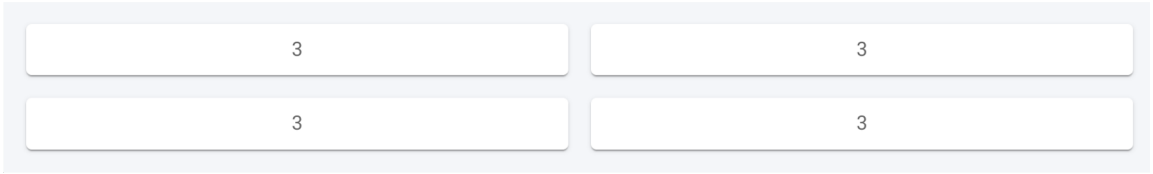


md sample

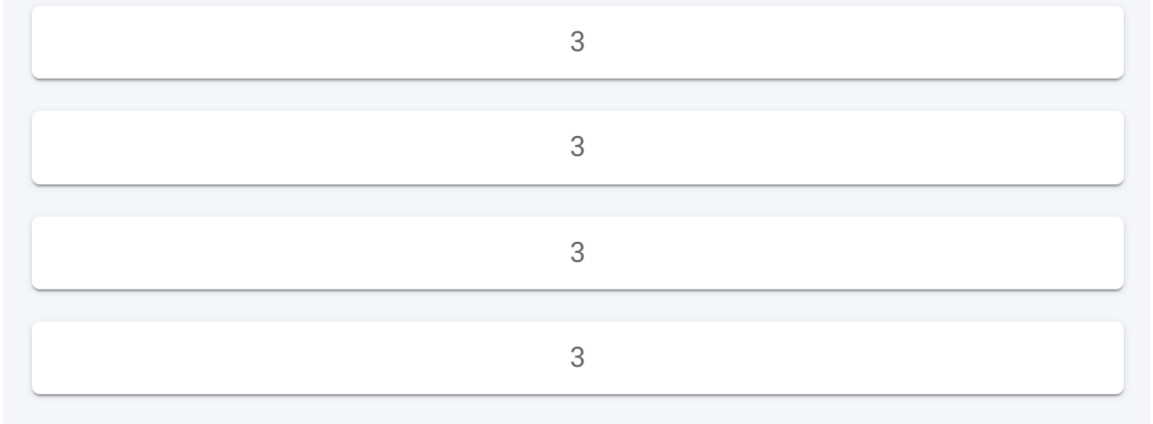
Material-UI Grid

```
<Grid container spacing={2}>

   <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

</Grid>
```

sm sample



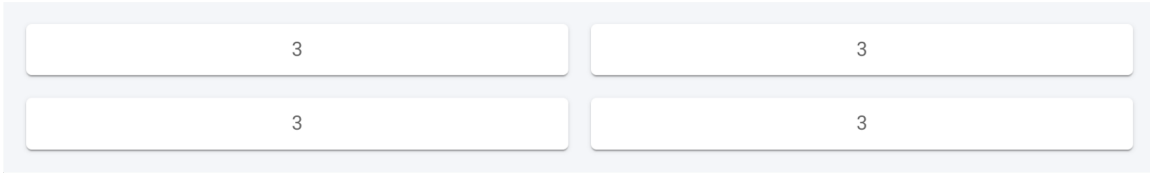
xs sample



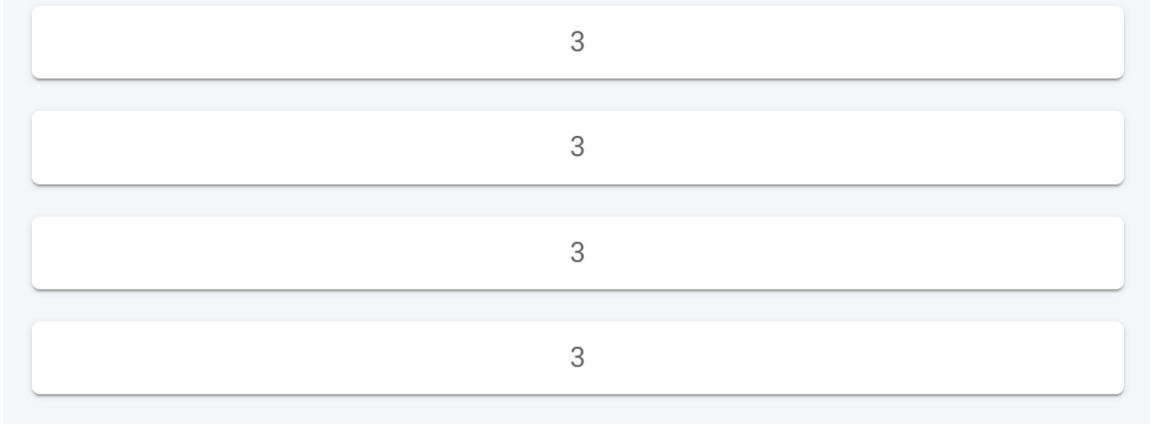
Material-UI Grid

```
<Grid container spacing={2}>

   <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

  <Grid item xs={12} sm={6} md={4} lg={3}>
    <Item>xs=3</Item>
  </Grid>

</Grid>
```

sm sample



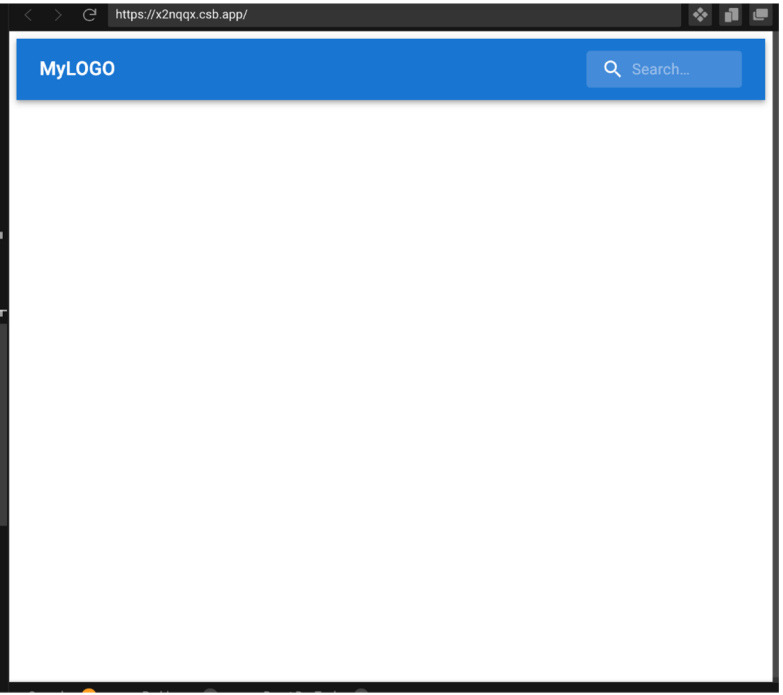
xs sample



Material-UI App Bar

App Bars serve as the foundational element in any Material-UI application. They establish context and typically remain visible to users as they navigate through the app.

```jsx
export default function SearchAppBar() {
  return (
    <Box sx={{ flexGrow: 1 }}>
      <AppBar position="static">
        <Toolbar>
          <Typography
            variant="h6"
            noWrap
            component="div"
            sx={{ flexGrow: 1, display: { xs: "none", sm: "block" } }}
          >
            MyLOGO
          </Typography>
          <Search>
            <SearchIconWrapper>
              <SearchIcon />
            </SearchIconWrapper>
            <StyledInputBase
              placeholder="Search…"
              inputProps={{ "aria-label": "search" }}
            />
          </Search>
        </Toolbar>
      </AppBar>
    </Box>
  );
}
```



Material-UI App Bar

flex-grow is a property used in CSS Flexbox layout that specifies the distribution ratio of flexible items within the available space. When the container doesn't have enough space to accommodate all flexible items, flex-grow determines how each item receives additional space.

This property takes a number as a value, indicating the relative proportion of allocation. By default, the flex-grow value of a flexible item is 0, which means it won't receive any additional space.

For example, if a container has two flexible items, one with flex-grow: 1 and another with flex-grow: 2, when there is available extra space, the second item will receive twice as much space as the first item.

```
<Box sx={{ flexGrow: 1 }}>
  <AppBar position="static">
    <Toolbar>
      <Typography
        variant="h6"
        noWrap
        component="div"
        sx={{ flexGrow: 1, display: { xs: "none", sm: "block" } }}
      >
        MyLOGO
      </Typography>
      <Search>
        <SearchIconWrapper>
          <SearchIcon />
        </SearchIconWrapper>
        <StyledInputBase
          placeholder="Search…"
          inputProps={{ "aria-label": "search" }}
        />
      </Search>
    </Toolbar>
  </AppBar>
</Box>
```

Material-UI App Bar

SWINBURNE UNIVERSITY OF TECHNOLOGY

<Typography> : Use typography to present your design and content as clearly and efficiently as possible.

sx={{ flexGrow: 1, display: { xs: "none", sm: "block" } }} is a style attribute used in Material-UI's Grid component. This syntax is employed to control the visibility of elements at different screen sizes (breakpoints).

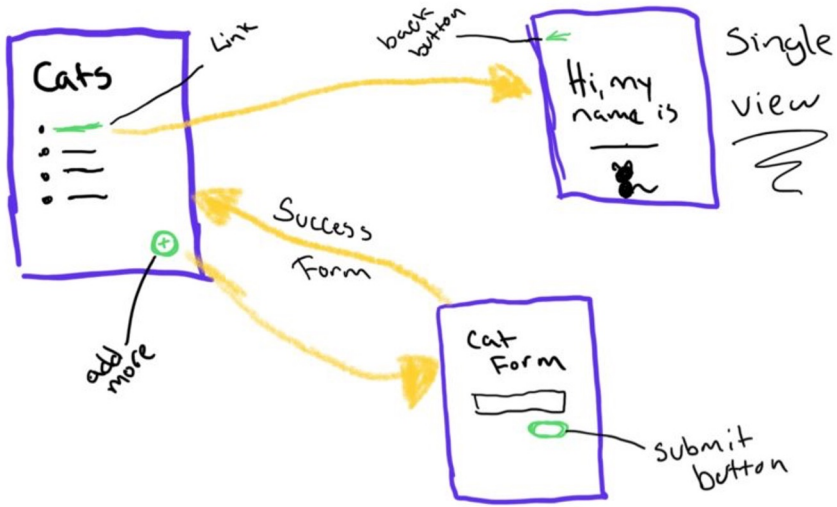
- **"none" and "block"** are values for the CSS display property. "none" indicates that the element is not displayed and does not occupy space, while "block" means the element is displayed and occupies layout space.

```
<Box sx={{ flexGrow: 1 }}>
  <AppBar position="static">
    <Toolbar>
      <Typography
        variant="h6"
        noWrap
        component="div"
        sx={{ flexGrow: 1, display: { xs: "none", sm: "block" } }}
      >
        MyLOGO
      </Typography>
      <Search>
        <SearchIconWrapper>
          <SearchIcon />
        </SearchIconWrapper>
        <StyledInputBase
          placeholder="Search…"
          inputProps={{ "aria-label": "search" }}
        />
      </Search>
    </Toolbar>
  </AppBar>
</Box>
```

Material-UI Page Navigation

When building modern Single-Page Applications (SPAs), navigation and transitions between pages are crucial functionalities. React ***Router*** is a library designed for managing routing and navigation within React applications, making it easier and more flexible to implement page transitions and navigation in SPAs.

```
npm install react-router-dom
```



Key concepts and features of React Router

- Route Management: React Router allows you to define different routes in your application, with each route corresponding to a specific page or component. By using the Route component, you can associate paths with the components to render. This enables React Router to automatically load the appropriate component based on changes in the URL.

- Nested Routes: You can create complex page structures and nested layouts within a page by using nested Route components. This allows you to build hierarchically organized and interactive user interfaces.

- Navigation Links: Use the Link component to create navigation links, enabling users to click on links to transition from one page to another. The Link component handles URL and route matching, ensuring users are directed to the correct path.

Key concepts and features of React Router

- Parameter Passing: Route parameters can be used to pass data, such as passing a product ID in the URL and loading corresponding data in a component.
- Programmatic Navigation: In addition to user-initiated navigation through links, you can programmatically navigate, for instance, automatically redirecting to another page after processing a form submission.
- Route Guards: React Router provides mechanisms for performing actions before switching pages, such as validating user identity or checking permissions.

Material-UI Page Navigation

```
import React from 'react';
import { BrowserRouter as Router, Route } from 'react-router-dom';
import Home from './Home';
import About from './About';

function App() {
  return (
    <Router>
      <Route path="/" exact component={Home} />
      <Route path="/about" component={About} />
    </Router>
  );
}

export default App;
```

SWINBURNE UNIVERSITY OF TECHNOLOGY

Material-UI Page Navigation

The Link component is built on top of the Typography component, meaning that you can use its props.

```
import React from 'react';
import { Link } from 'react-router-dom';

function Navigation() {
  return (
    <div>
      <Link to="/">Home</Link>
      <Link to="/about">About</Link>
    </div>
  );
}

export default Navigation;
```

Learning Resources

MUI Documentation
https://mui.com/material-ui/getting-started/

What is Flexbox ?
https://css-tricks.com/snippets/css/a-guide-to-flexbox/

What is the Grid system ?
https://mui.com/material-ui/react-grid/

Breakpoints in MUI
https://mui.com/material-ui/customization/breakpoints/

Link in MUI
https://mui.com/material-ui/react-link/

Image from CRVS Digitisation Guidebook