Building React Application

Understanding React Compiler and Builder

React is a UI library that helps us build modern front-end applications using components and JSX (a syntax extension that looks like HTML).

However:

- Browsers cannot understand JSX or modern ES6+ syntax directly.
- The React compiler (like Babel, SWC, or esbuild) translates JSX into plain JavaScript:

```
const element = <h1>Hello</h1>;
// becomes
const element = React.createElement("h1", null, "Hello");
```

Builder (Bundler)

We need the builder or bundler (like Vite, Webpack, or Parcel):

- Combines all your JavaScript, CSS, and assets into a few optimized files.
- Serves them efficiently to the browser.

In short:

- Compiler → Translates JSX into valid JavaScript
- Builder/Bundler → Packages and optimizes everything for the browser

Common React Builders

We will use Webpack/CRA & Vite in this course.

Builder	Description	Notes
Webpack/CRA	Classic and flexible bundler	Used in Create React App
Vite	Next-gen builder using ES modules and esbuild	Super fast startup
Parcel	Zero-config bundler	Easy for small apps
Next.js	Full React framework (SSR + routing)	Built on top of Webpack
Rollup	Library bundler	Often used for React component

Tools to Make React Apps

Webpack/CRA (Create React App)

When we use CRA to create React app, it creates a directory as follows.

```
npx create-react-app myapp
```

- Automatically sets up React, Babel, and Webpack for you — so you can start coding immediately.

```
myapp/
├── public/
│   ├── index.html
│   └── ...
└── src/
    ├── index.js
    └── App.js
```

Vite

Vite exists because modern JavaScript frameworks (like React, Vue, Svelte, etc.) outgrew the old Webpack-based build systems such as Create React App (CRA).

- It was built to make development faster, simpler, and more efficient.
- Vite uses a modern, fast bundler (ESBuild + Rollup) to start almost instantly.

```
npm create vite@latest myapp -- --template react
cd myapp
npm install
npm run dev
```

Vite React Directory Structure

The React directory structure from Vite is different from CRA.

- index.html sits at the project root, not inside public/.
- Vite relies on ES modules directly, so the entry file is src/main.jsx or src/index.jsx.
- The vite.config.js defines build and dev server options (aliases, plugins, etc.).
- The root package.json manages scripts such as vite, build, and preview.

This is the standard minimal setup for a Vite + React app.

```
simple-vite/
├── index.html
├── package.json
├── run.sh
├── src
│   ├── App.jsx
│   └── index.jsx
└── vite.config.js
```

Vite package.json & vite.config.js

```
{
  "scripts": {
    "start": "vite",
    "build": "vite build"
  },
  "dependencies": {
    "react": "^18.2.0",
    "react-dom": "^18.2.0"
  },
  "devDependencies": {
    "@vitejs/plugin-react": "^4.0.0",
    "vite": "^4.3.0"
  }
}
```

```
import { defineConfig } from 'vite'
import react from '@vitejs/plugin-react'

export default defineConfig({
  plugins: [react()],
})
```

Comparison

Tool	Command	Speed	Config	Notes
CRA (Create React App)	`npx create-react-app myapp`	Slower	Hidden	Stable but aging (Webpack-based)
Vite	`npm create vite@latest myapp -- --template react`	Fast	Simple	Recommended modern setup (ESBuild + Rollup)

- **CRA**: Great for beginners, but slower and less flexible.
- **Vite**: Modern, lightweight, and extremely fast — now the preferred tool.

Building React App

npx react-scripts

We can use `npx react-scripts`.

```
npx react-scripts build
```

When you have react-scripts installed and can run it as scripts.

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

```
npm run build
```

It generates static files in the `build` directory.

```
build
├── asset-manifest.json
├── index.html
└── static
    └── js
        ├── main.694b8843.js
        ├── main.694b8843.js.LICENSE.txt
        └── main.694b8843.js.map
```

Vite

Vite package.json has the build script command.

```
  "scripts": {
    "start": "vite",
    "build": "vite build"
  },
```

So, `npm run build` runs the `vite build` command.

```
npm run build
```

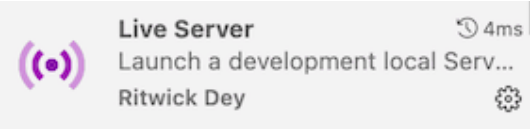
It generates static files in the `dist` directory.

```
dist
├── assets
│   └── index-2f9f4b48.js
└── index.html
```

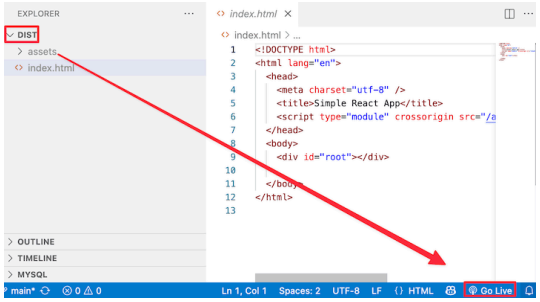
Using Tools

VSCode for React Web App

1. Install Liver Server Extension



2. Open the build (CRA) or dist (Vite) directory with VSCode.



Run the server using the build/dist directory

We can install the serve app.

```
npm install -g serve
```

Then we can build the React app and run it.

```
npm run build # create build directory
server -s build
```

For vite:

```
npm run build # create dist directory
server -s dist
```

Or we can use `npx`.

```
> npx serve -s build # CRA
> npx serve -s dist  # Vite
```

```
   Serving!

   - Local:    http://localhost:3000
   - Network:  http://192.168.86.37:3000

   Copied local address to clipboard!
```

Minimal React App Structure

We need to have:

1. package.json to install React packages
2. public/index.html for placeholder.
   - ./index.html when using Vite.
3. src/index.js as the starting point.
4. src/App.js as the main application.

```
├── package.json
├── public
│   └── index.html
└── src
    ├── App.js
    └── index.js
```

package.json

- depedencies (react/react-dom/react-scripts).
- scripts (start and build).
- browserslist to control which browsers your app targets.

```
{
  "name": "simple",
  "version": "0.1.0",
  "dependencies": {
    "react": "^19.2.0",
    "react-dom": "^19.2.0",
    "react-scripts": "5.0.1"
  },
  "scripts": {
    "start": "react-scripts start",
    "build": "react-scripts build"
  },
  "browserslist": {
    "production": [">0.2%", "not dead", "not op_mini all"],
    "development": ["last 1 chrome version", "last 1 firefox version", "last 1 safari version"]
  }
}
```

For Vite

```
{
  "name": "simple-vite",
  "version": "1.0.0",
  "description": "Simple React Vite",
  "scripts": {
    "start": "vite",
    "build": "vite build"
  },
  "dependencies": {
    "react": "^18.2.0",
    "react-dom": "^18.2.0"
  },
  "devDependencies": {
    "@vitejs/plugin-react": "^4.0.0",
    "vite": "^4.3.0"
  }
}
```

public/index.html

The HTML template that React injects the app into — usually has a `<div id="root"></div>`.

```
<!DOCTYPE html>
<html lang="en">
  ...
  <body>
    <div id="root"></div>
  </body>
</html>
```

For Vite:

```
...
  <body>
    <div id="root"></div>
    <script type="module" src="/src/index.jsx"></script>
  </body>
</html>
```

src/index.js

This is the starting point to find the HTML placeholder, and add React component `App`.

```
import React from 'react';
import ReactDOM from 'react-dom/client';
import App from './App';

const root = ReactDOM.createRoot(document.getElementById('root'));
root.render(
  <React.StrictMode>
    <App />
  </React.StrictMode>
);
```

src/App.js

This is the highest level React component.

- You can add any React components in this component.

```
function App() {
  return (
    <div className="App">
      Hello
    </div>
  );
}
export default App;
```

vite.config.js (Only Vite)

```
import { defineConfig } from 'vite'
import react from '@vitejs/plugin-react'

export default defineConfig({
  plugins: [react()],
})
```