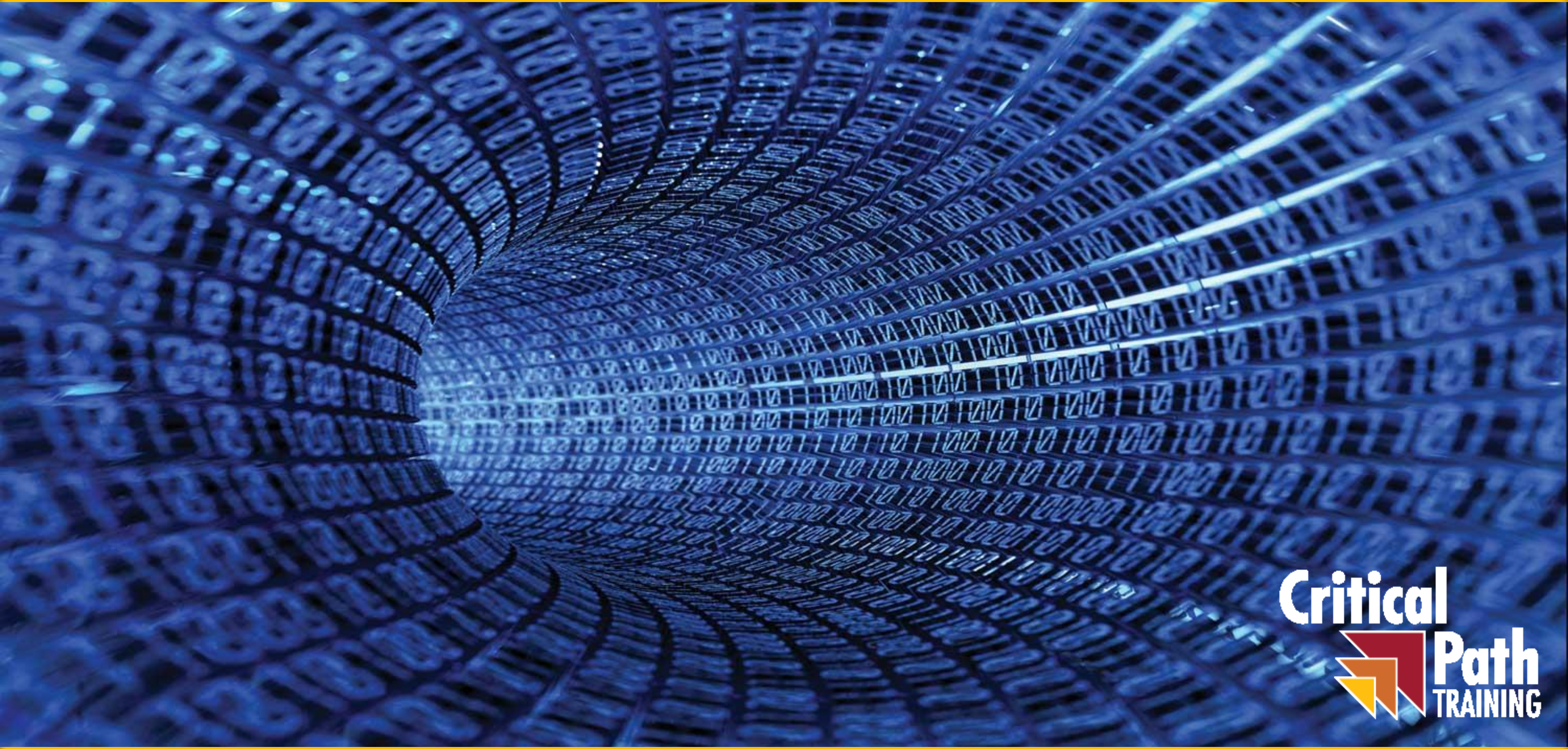
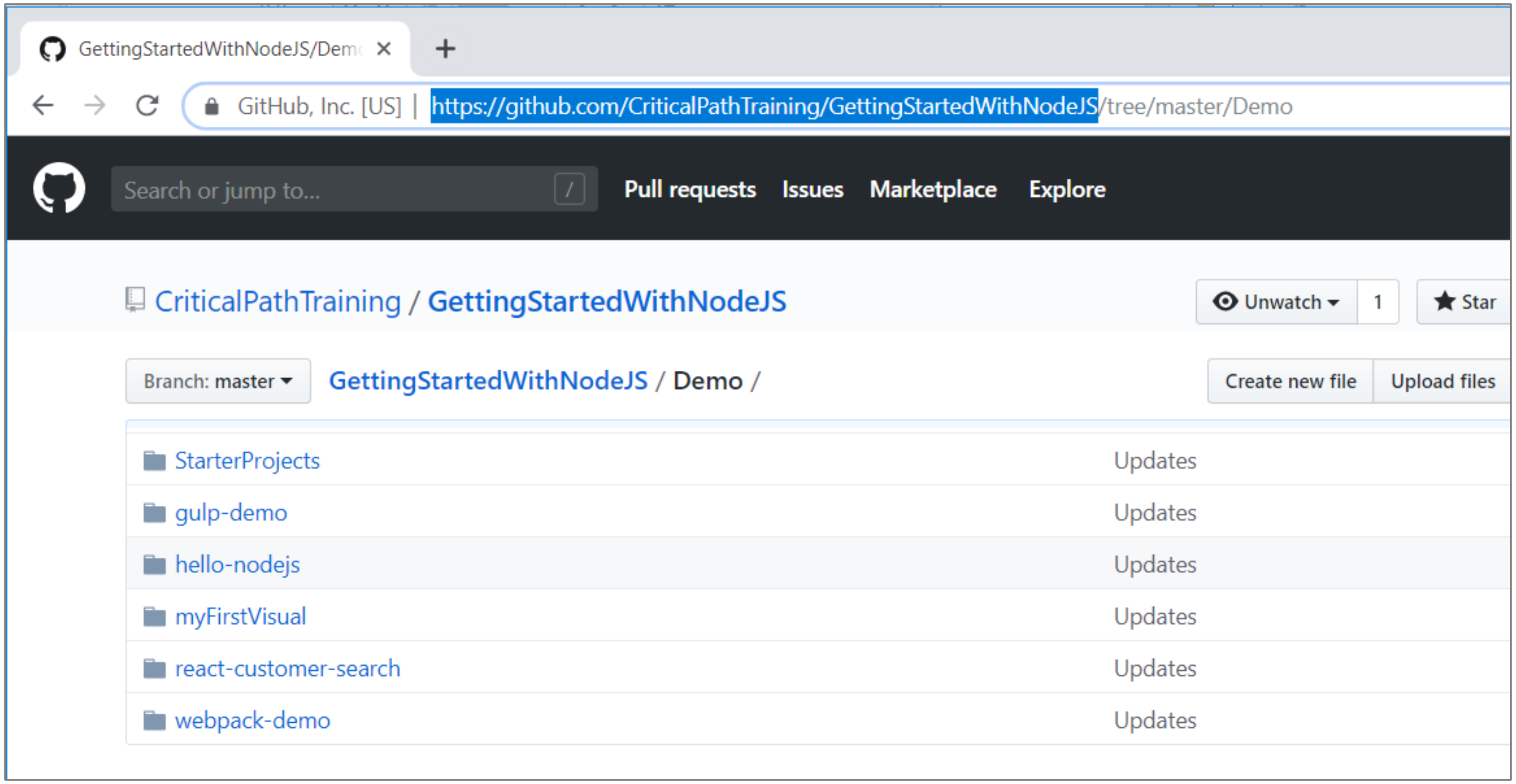
Getting Started with Node.js



Download the Slides and Code

- https://github.com/CriticalPathTraining/GettingStartedWithNodeJS


GettingStartedWithNodeJS/Demo

GitHub, Inc. [US] | https://github.com/CriticalPathTraining/GettingStartedWithNodeJS/tree/master/Demo

CriticalPathTraining / GettingStartedWithNodeJS

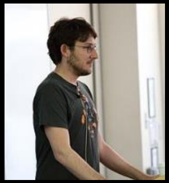
Branch: master

GettingStartedWithNodeJS / Demo /

StarterProjects	Updates
gulp-demo	Updates
hello-nodejs	Updates
myFirstVisual	Updates
react-customer-search	Updates
webpack-demo	Updates

Agenda

- Introduction to Node.JS and NPM
- Automating Build Tasks using Gulp
- Bundling Project Assets using Webpack
- Developing with React.js, TypeScript and Webpack
- Developing with SharePoint Framework
- Developing Custom Visuals for Power BI

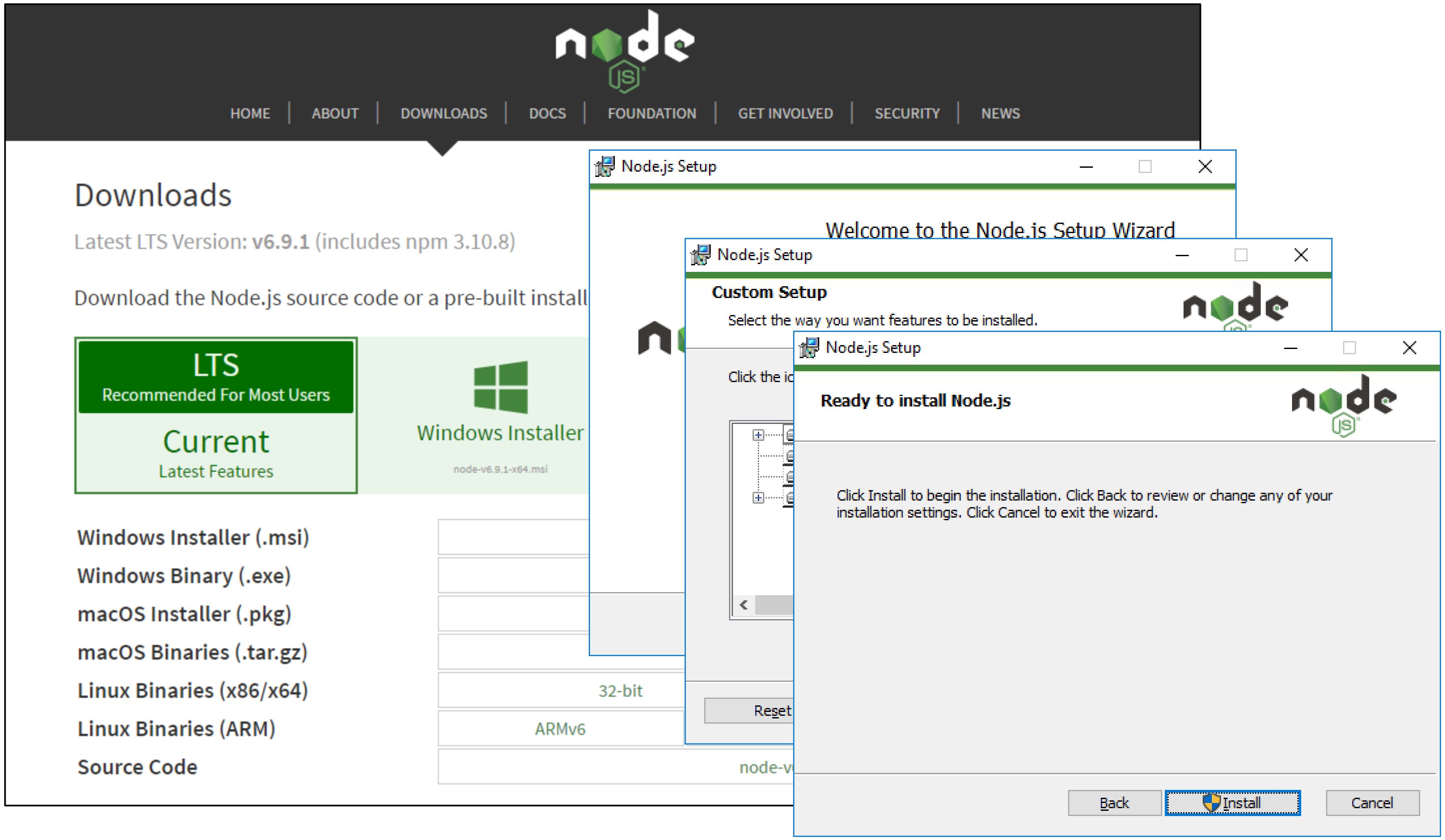


What is Node.js

- Node.js was created to develop server-side applications in JavaScript
  - Node.js was initially created by Ryan Dahl in 2009
  - Built using Google's V8 JavaScript engine
  - Created to solve Apache HTTP Server's inability to deal with concurrency
  - Node.js offers single-threaded, non-blocking, asynchronously programming
- JavaScript run-time environment based on Google V8 engine
  - JavaScript execution environment for web servers and development machines
  - It's free, cross-platform and open-source
  - Includes Node Package Manager (npm) and lots of available packages
- What are the primary motivations for using Node.js
  - Server-side development with web applications and web services
  - Development environment with package management
  - Development with SharePoint Framework (SPX) of Power BI custom visuals

Installing node.js

- https://nodejs.org/en/download/



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Downloads

Latest LTS Version: **v6.9.1** (includes npm 3.10.8)

Download the Node.js source code or a pre-built install

LTS
Recommended For Most Users

Current
Latest Features

Windows Installer
node-v6.9.1-x64.msi

Windows Installer (.msi)	
Windows Binary (.exe)	
macOS Installer (.pkg)	
macOS Binaries (.tar.gz)	
Linux Binaries (x86/x64)	32-bit
Linux Binaries (ARM)	ARMv6
Source Code	node-v

Node.js Setup

Welcome to the Node.js Setup Wizard

Node.js Setup

Custom Setup

Select the way you want features to be installed.

Click the ic

Reset

Node.js Setup

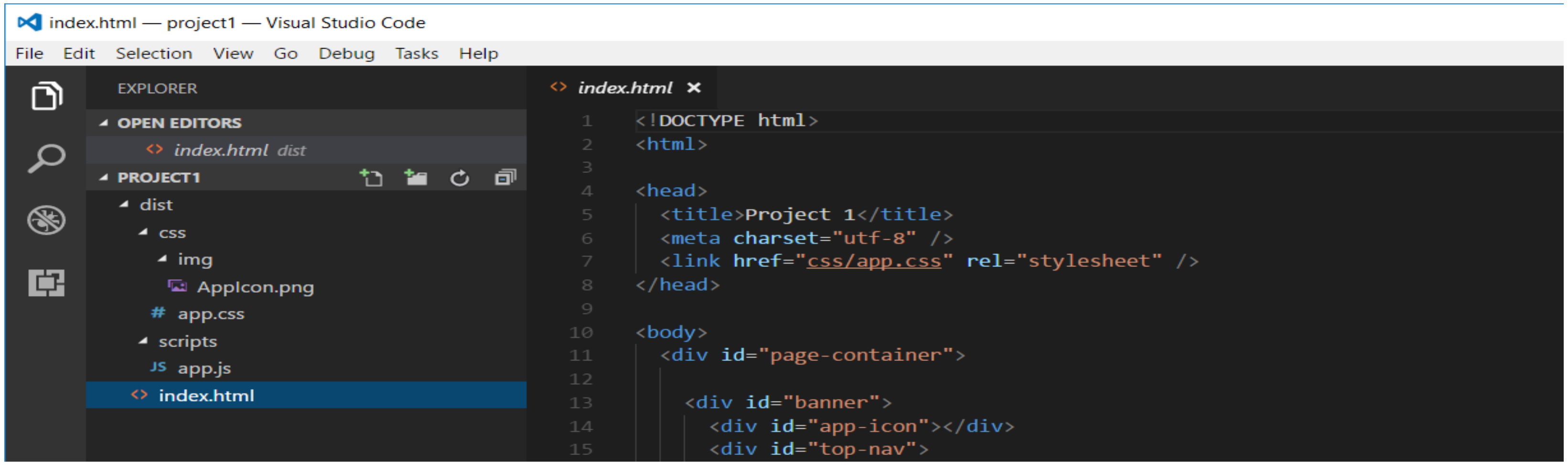
Ready to install Node.js

Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.

Back | Install | Cancel

Developing with Visual Studio Code

- Node.js is agnostic when it comes to developer IDE
  - There are many different IDEs that people use with Node.js
  - This course will be using Visual Studio Code

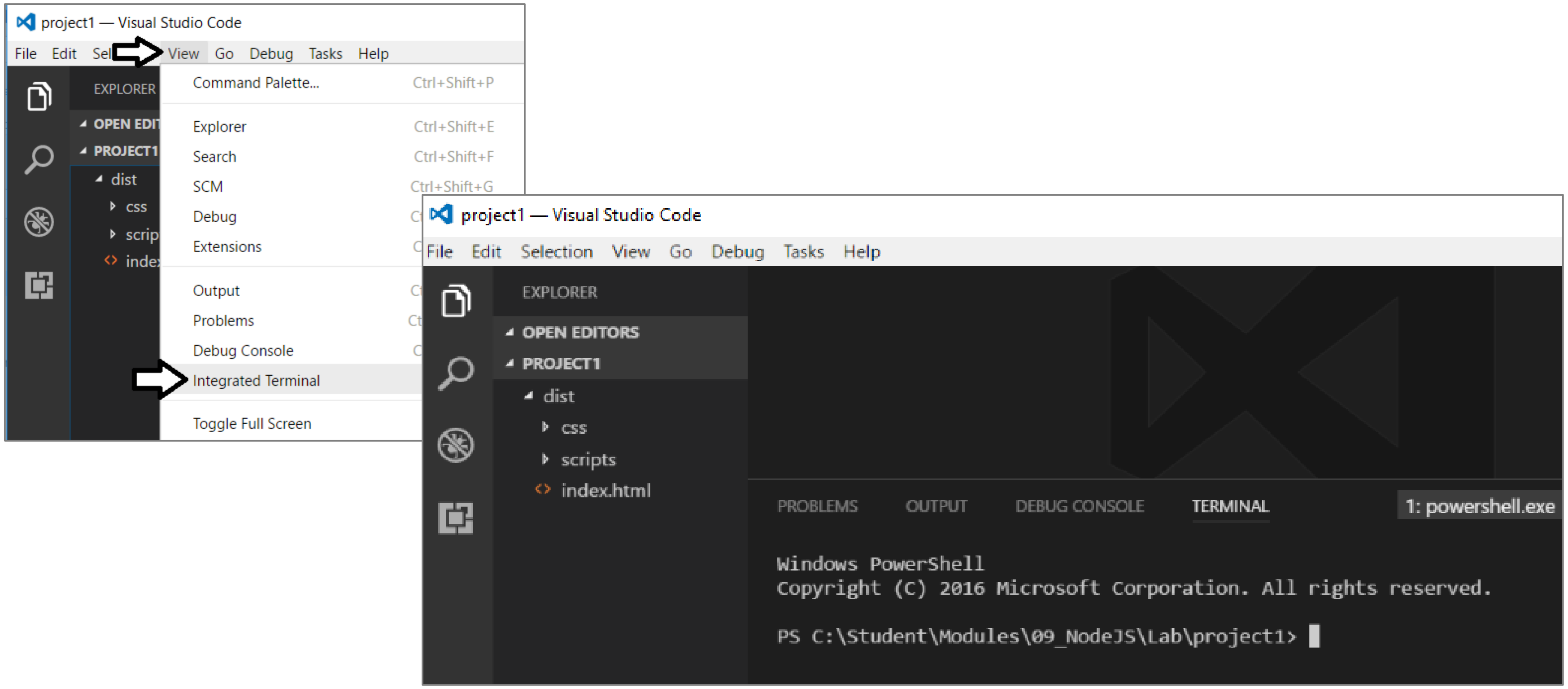


```
<!DOCTYPE html>
<html>

<head>
  <title>Project 1</title>
  <meta charset="utf-8" />
  <link href="css/app.css" rel="stylesheet" />
</head>

<body>
  <div id="page-container">

    <div id="banner">
      <div id="app-icon"></div>
      <div id="top-nav">
```

- Visual Studio is not a good fit for Node.js development
  - Visual Studio solution & project files incompatible with Node.js

Integrated Terminal

- Use the Integrated Terminal to execute **npm** command



```
Windows PowerShell
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PS C:\Student\Modules\09_NodeJS\Lab\project1>
```
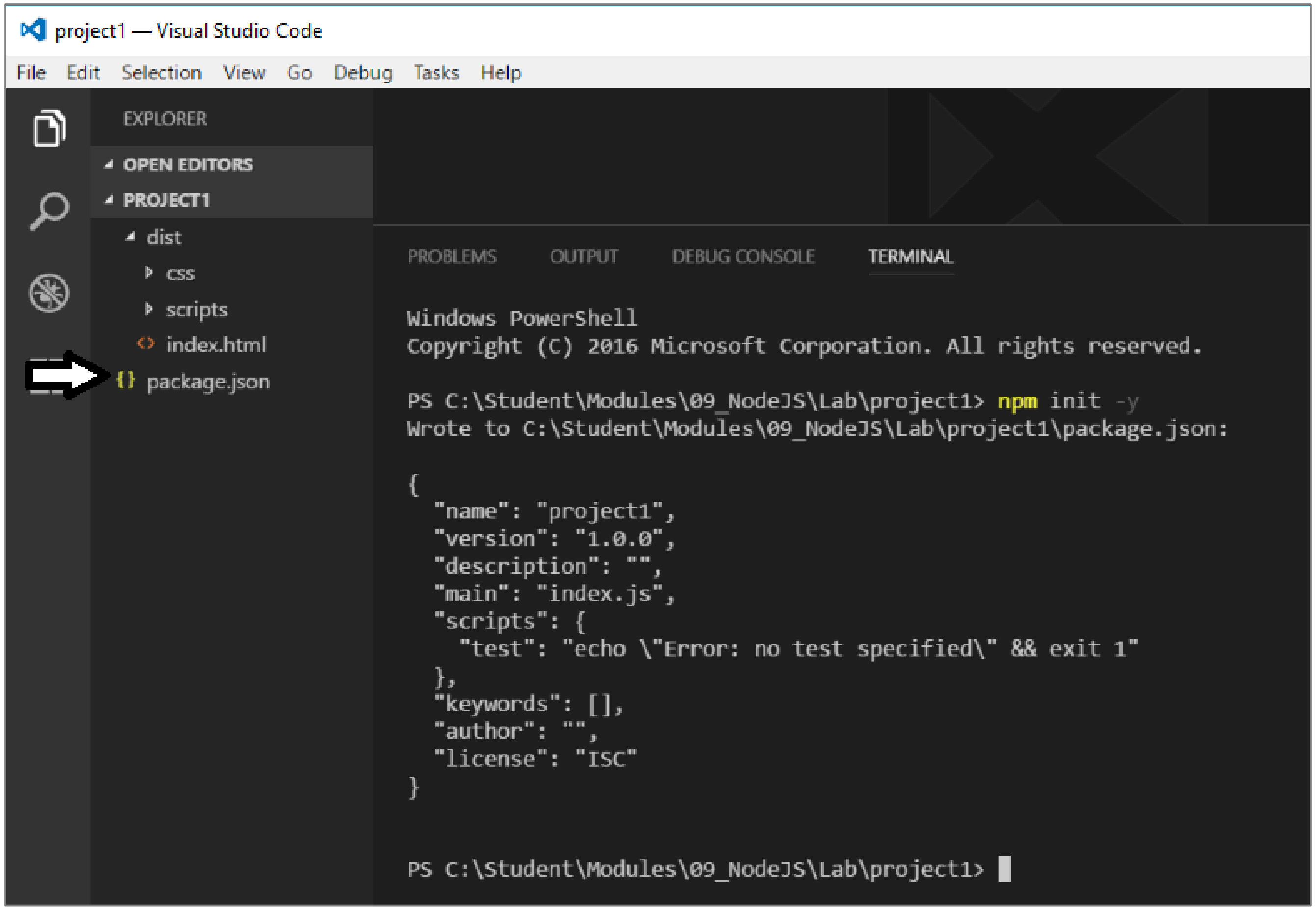

npm init

- Node.js projects initialized with **npm init** command
  - This command created the **package.json** file


project1 — Visual Studio Code
File Edit Selection View Go Debug Tasks Help
EXPLORER
OPEN EDITORS
PROJECT1
dist
css
scripts
index.html
package.json
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
Windows PowerShell
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PS C:\Student\Modules\09_NodeJS\Lab\project1> npm init -y
Wrote to C:\Student\Modules\09_NodeJS\Lab\project1\package.json:

{
  "name": "project1",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC"
}


PS C:\Student\Modules\09_NodeJS\Lab\project1>
```
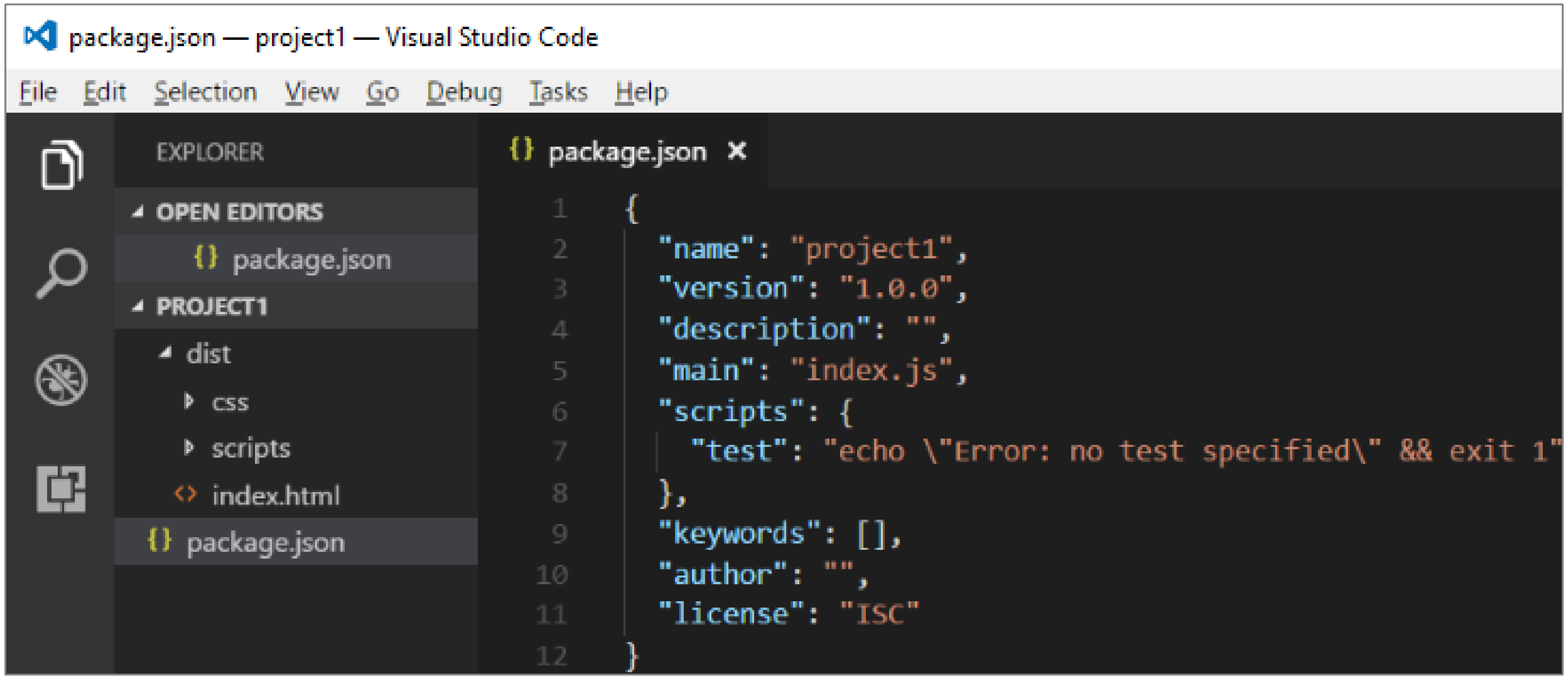
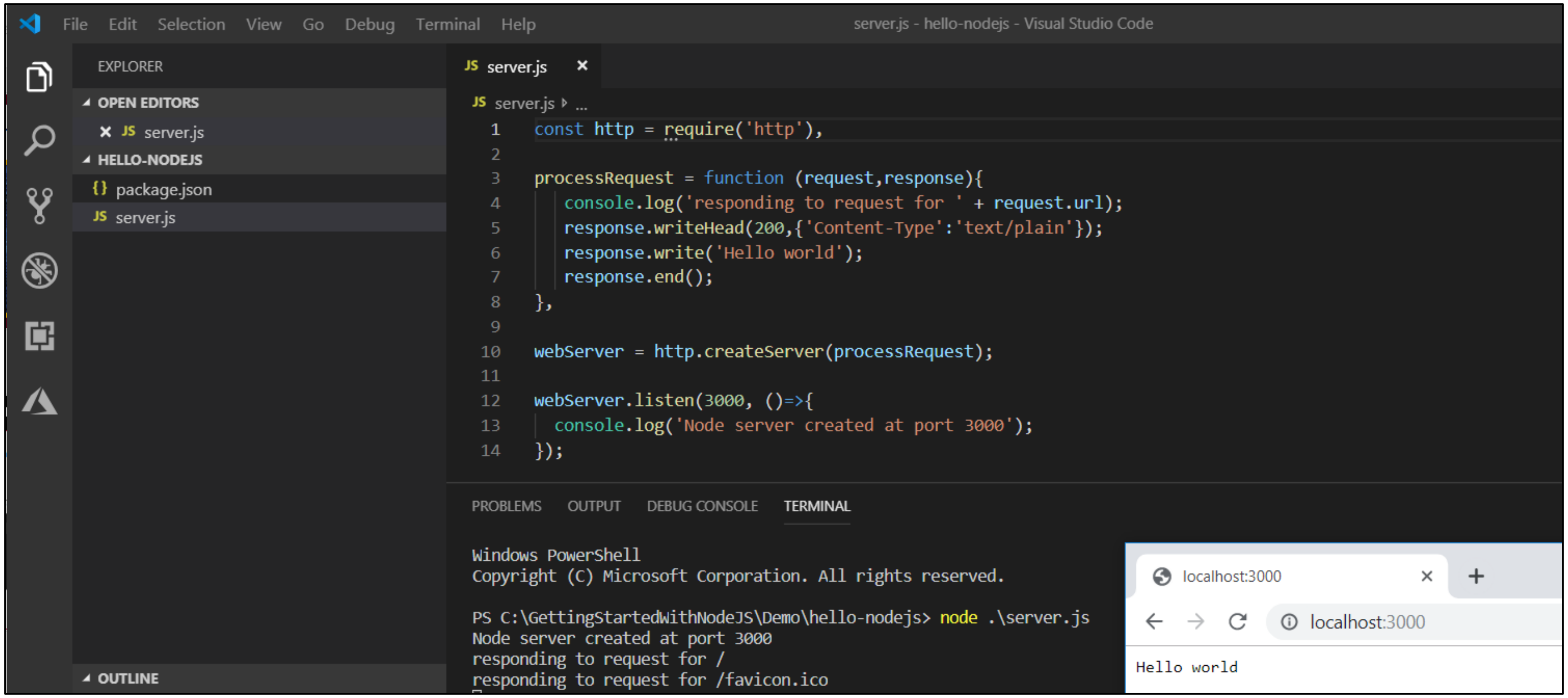

package.json

- **package.json** serves as project manifest file
  - Tracks project name and version number
  - Tracks installed package dependencies



```
{
  "name": "project1",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC"
}
```

Hello Node.js



```javascript
const http = require('http'),

processRequest = function (request,response){
    console.log('responding to request for ' + request.url);
    response.writeHead(200,{'Content-Type':'text/plain'});
    response.write('Hello world');
    response.end();
},

webServer = http.createServer(processRequest);

webServer.listen(3000, ()=>{
   console.log('Node server created at port 3000');
});
```

```
Windows PowerShell
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PS C:\GettingStartedWithNodeJS\Demo\hello-nodejs> node .\server.js
Node server created at port 3000
responding to request for /
responding to request for /favicon.ico
```
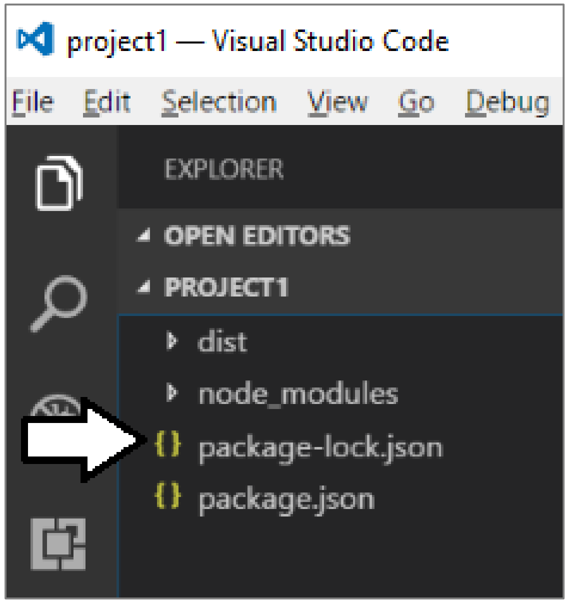

```
Hello world
```

Installing Packages

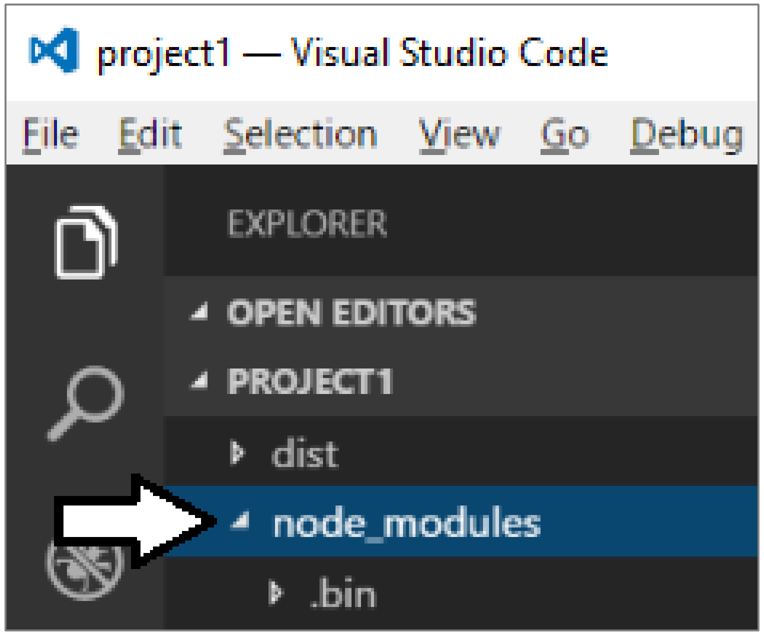
```
npm install browser-sync --save-dev
```

```
"devDependencies": {
  "browser-sync": "^2.18.12"
}
```



node_modules folder

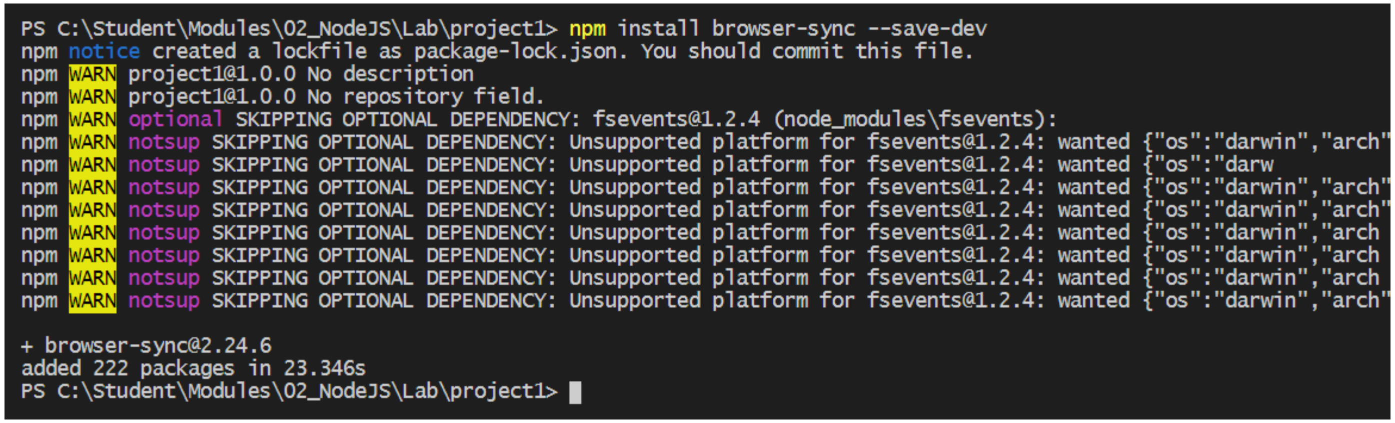
- Package files copied into **node_modules** folder
  - This folder often contain 100s of packages for a project
  - Contents of folder not saved into source control
  - Contents can be restored with **npm install** command


project1 — Visual Studio Code
File Edit Selection View Go Debug
EXPLORER
OPEN EDITORS
PROJECT1
dist
node_modules
.bin

Configuring a Server-side Web Server

- Node.js does not provide its own web server
  - Instead, you must install a npm package to provide web server
  - There are many different packages to choose from

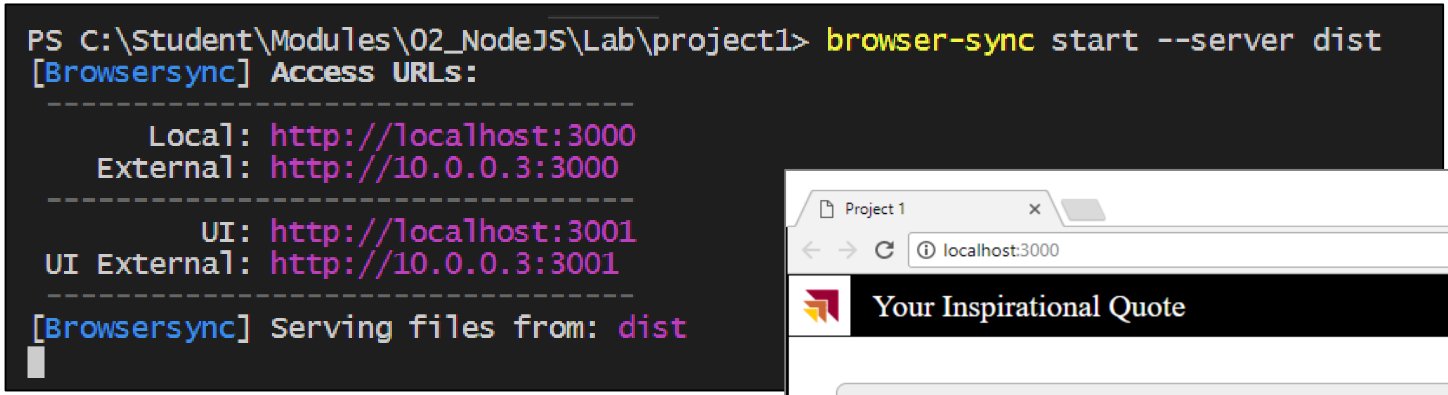
- Example packages which provide a web server for testing
  - http-server
  - express
  - Browser-sync *(this is the one we will be using)*



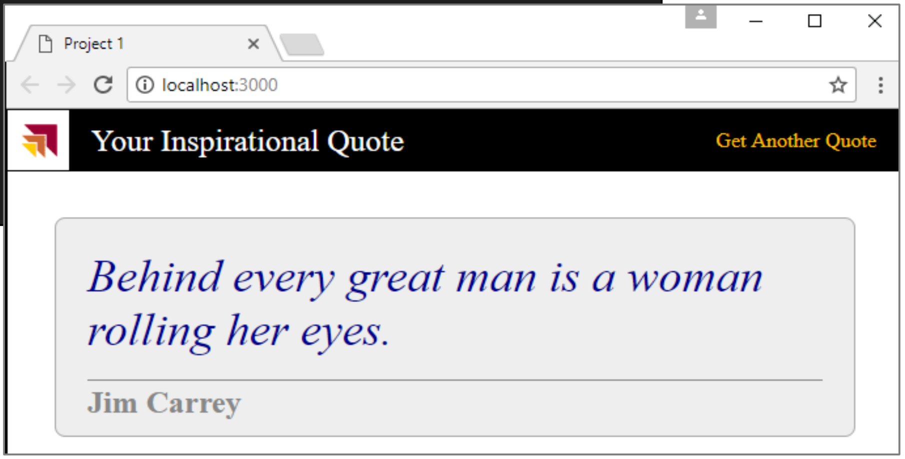
```
PS C:\Student\Modules\02_NodeJS\Lab\project1> npm install browser-sync --save-dev
npm notice created a lockfile as package-lock.json. You should commit this file.
npm WARN project1@1.0.0 No description
npm WARN project1@1.0.0 No repository field.
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.4 (node_modules\fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch"
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darw
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch"
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch"
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch"

+ browser-sync@2.24.6
added 222 packages in 23.346s
PS C:\Student\Modules\02_NodeJS\Lab\project1> █
```

Using browser-sync to Serve Content

- **browser-sync start** command used to start web server
  - **--server** parameters references root folder with **index.html**



```
PS C:\Student\Modules\02_NodeJS\Lab\project1> browser-sync start --server dist
[Browsersync] Access URLs:
 --------------------------------------
       Local: http://localhost:3000
    External: http://10.0.0.3:3000
 --------------------------------------
          UI: http://localhost:3001
 UI External: http://10.0.0.3:3001
 --------------------------------------
[Browsersync] Serving files from: dist
```

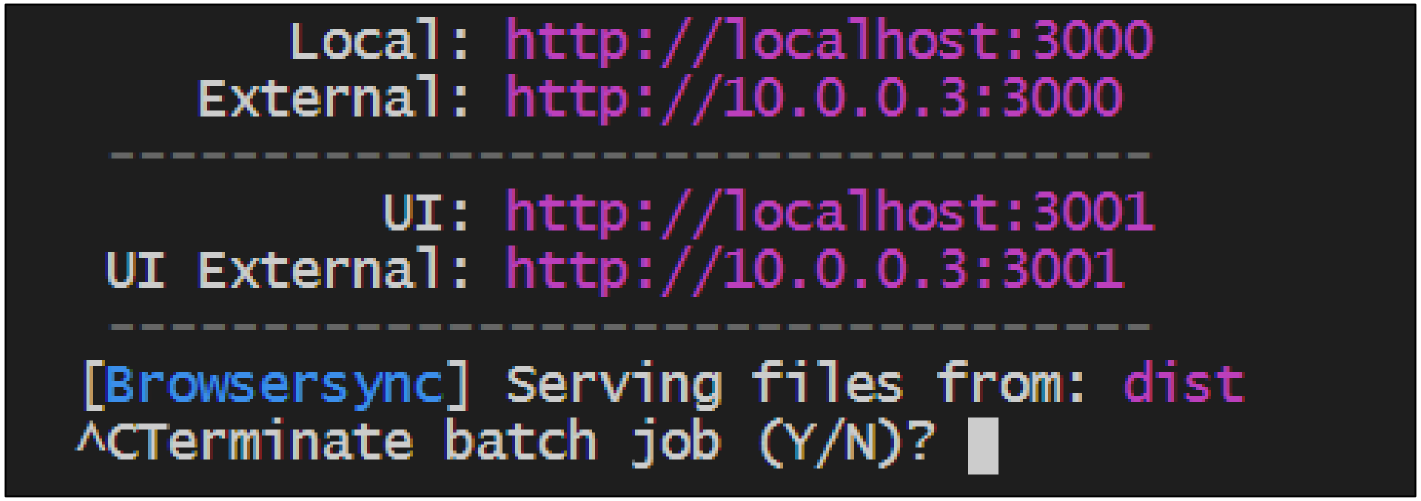


Behind every great man is a woman rolling her eyes.

Jim Carrey

Stopping the Web Server Session

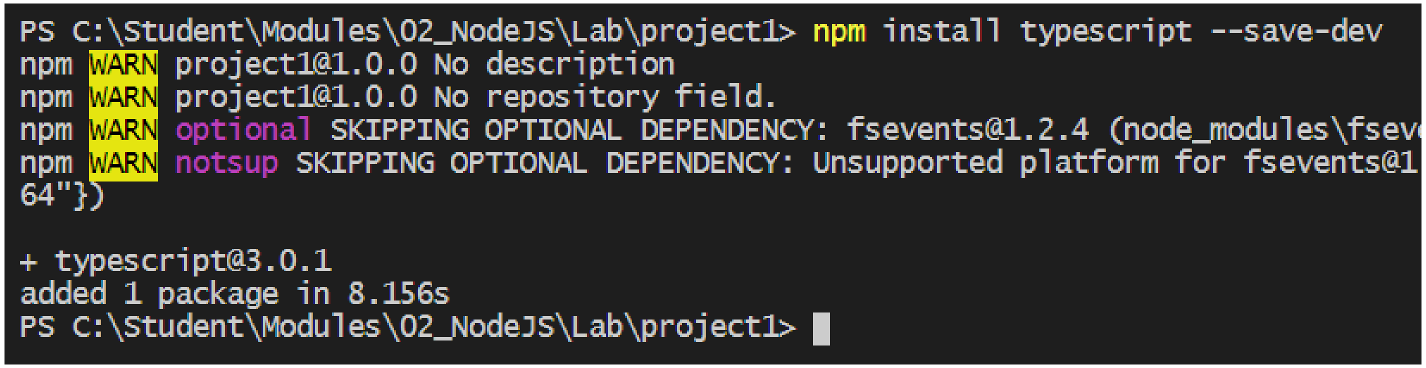
- Type **CTRL + C** into console to interrupt session



```
          Local: http://localhost:3000
       External: http://10.0.0.3:3000
 ------------------------------------
             UI: http://localhost:3001
    UI External: http://10.0.0.3:3001
 ------------------------------------
[Browsersync] Serving files from: dist
^CTerminate batch job (Y/N)? 
```

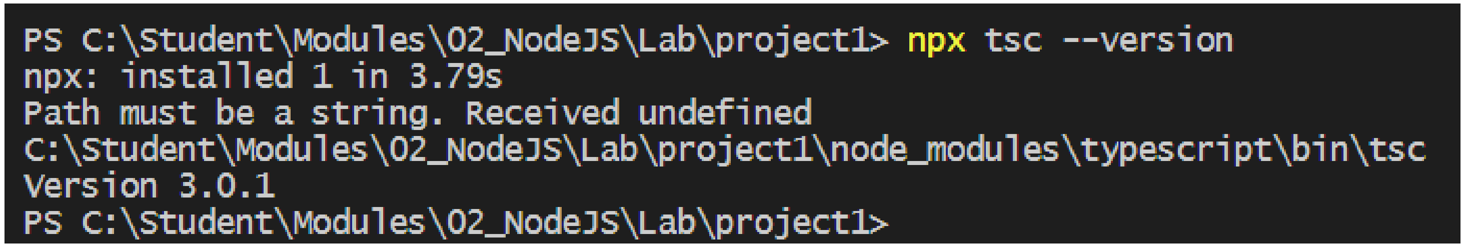
Installing the TypeScript Package

- typescript package must be installed into project
  - Installed just like any other npm package



```
PS C:\Student\Modules\02_NodeJS\Lab\project1> npm install typescript --save-dev
npm WARN project1@1.0.0 No description
npm WARN project1@1.0.0 No repository field.
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.4 (node_modules\fseve
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1
64"})

+ typescript@3.0.1
added 1 package in 8.156s
PS C:\Student\Modules\02_NodeJS\Lab\project1>
```

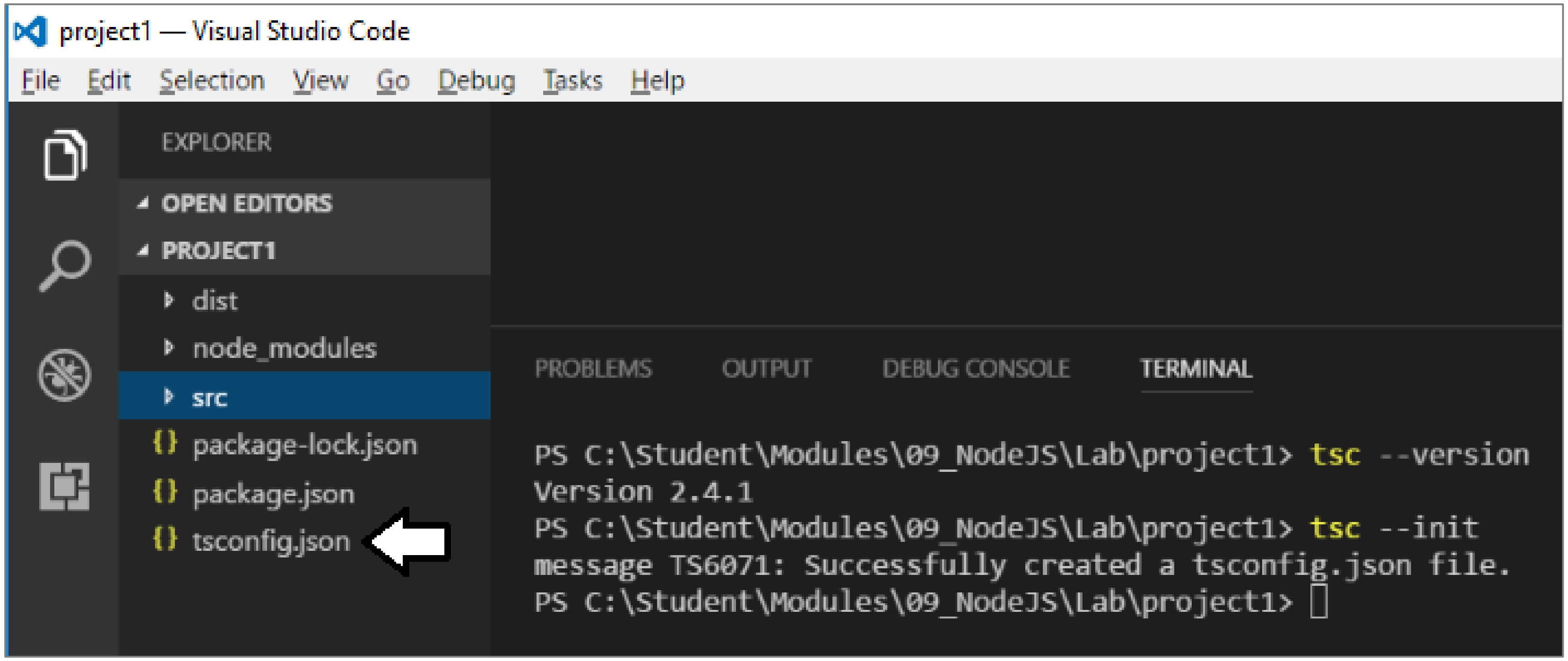
- Take note of version number of typescript package
  - typescript version may vary from one project to another
  - Determine project-specific version using **npx tsc --version**



```
PS C:\Student\Modules\02_NodeJS\Lab\project1> npx tsc --version
npx: installed 1 in 3.79s
Path must be a string. Received undefined
C:\Student\Modules\02_NodeJS\Lab\project1\node_modules\typescript\bin\tsc
Version 3.0.1
PS C:\Student\Modules\02_NodeJS\Lab\project1>
```

Generating tsconfig.json

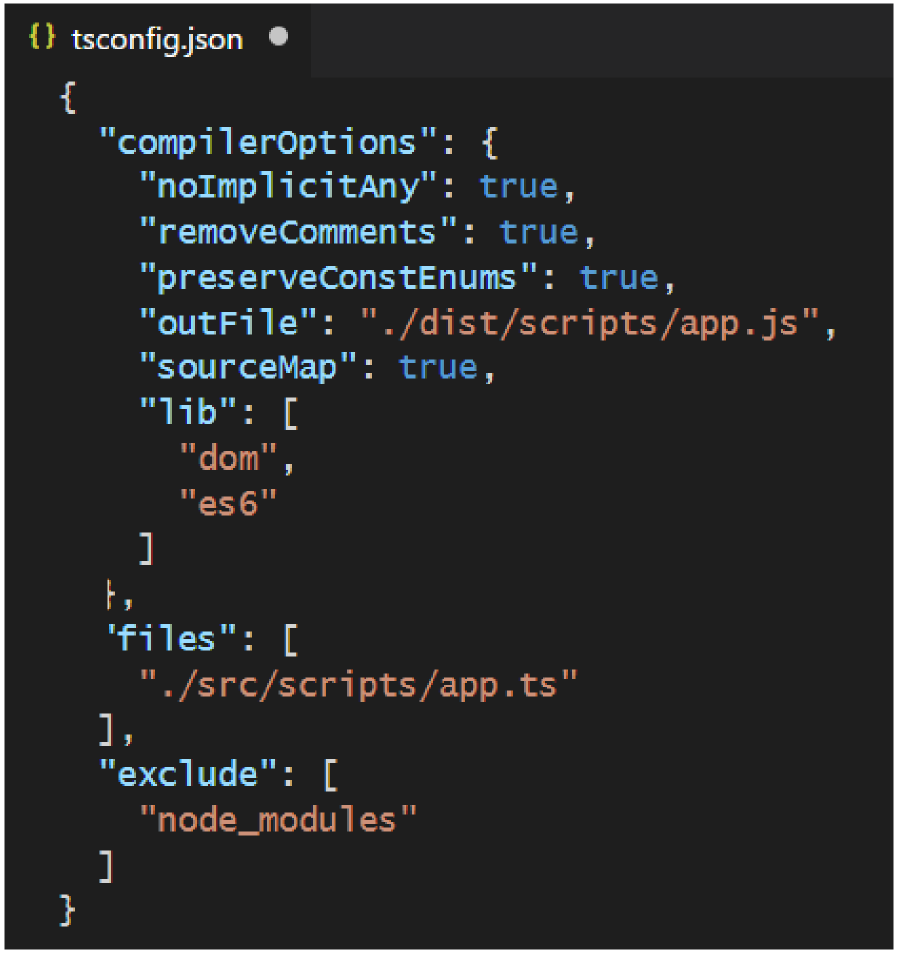
- Typescript compilation controlled using **tsconfig.json** file
  - Generated using **tsc --init** command



```
PS C:\Student\Modules\09_NodeJS\Lab\project1> tsc --version
Version 2.4.1
PS C:\Student\Modules\09_NodeJS\Lab\project1> tsc --init
message TS6071: Successfully created a tsconfig.json file.
PS C:\Student\Modules\09_NodeJS\Lab\project1>
```

tsconfig.json

- Example of a **tsconfig.json** file



tsconfig.json

```
{
  "compilerOptions": {
    "noImplicitAny": true,
    "removeComments": true,
    "preserveConstEnums": true,
    "outFile": "./dist/scripts/app.js",
    "sourceMap": true,
    "lib": [
      "dom",
      "es6"
    ]
  },
  "files": [
    "./src/scripts/app.ts"
  ],
  "exclude": [
    "node_modules"
  ]
}
```

Agenda

- ✓ Introduction to Node.JS and NPM
- ➢ Automating Build Tasks using Gulp
- Bundling Project Assets using Webpack
- Developing with React.js, TypeScript and Webpack
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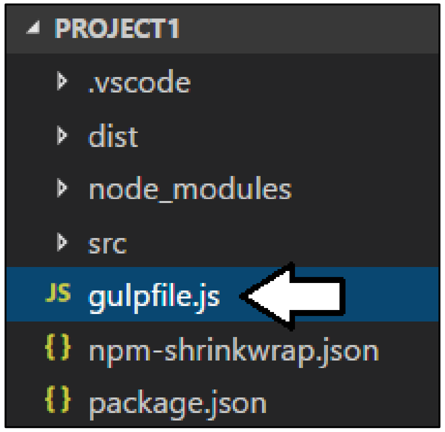
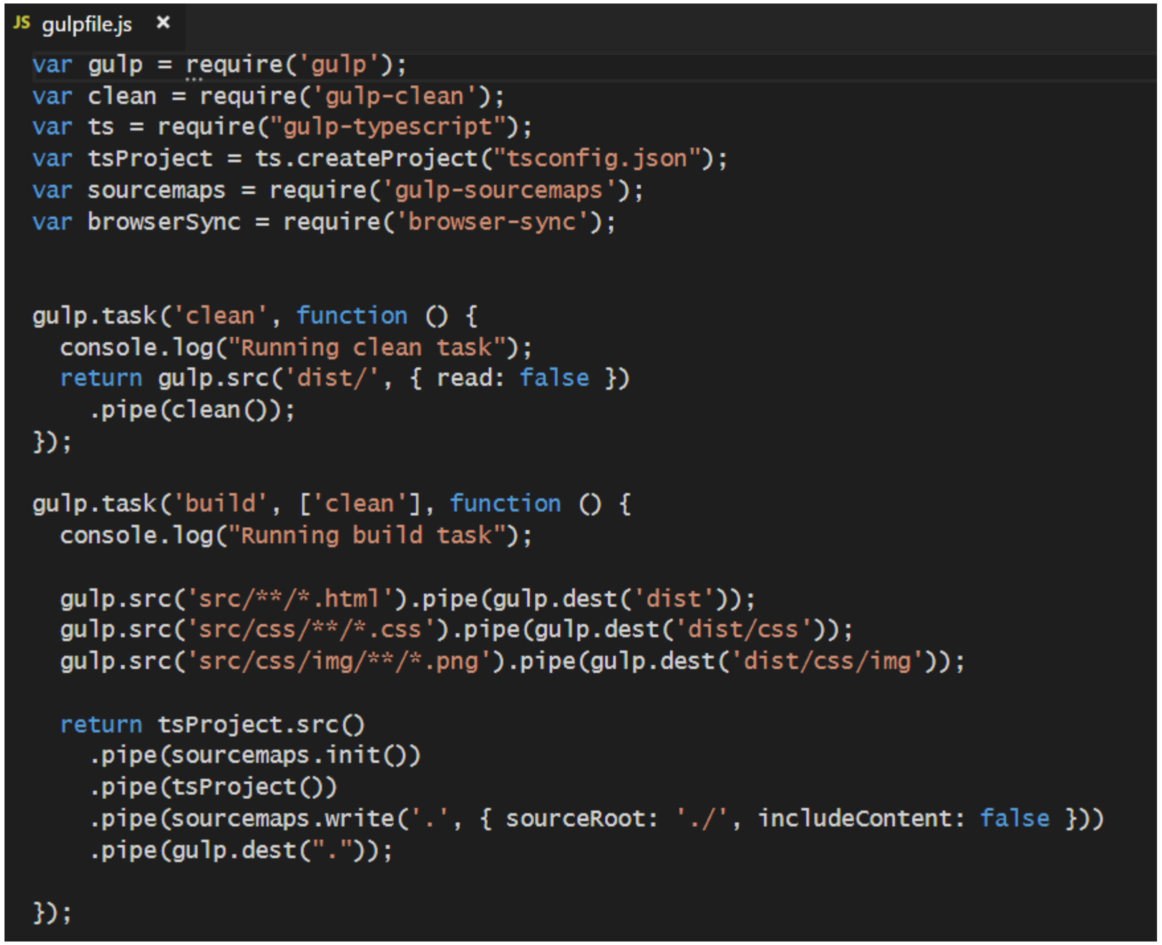
- Developing Custom Visuals for Power BI

gulpfile.js

- Gulp tasks are programmed inside **gulpfile.js**
  - **Gulpfile.js** must be added to root of project

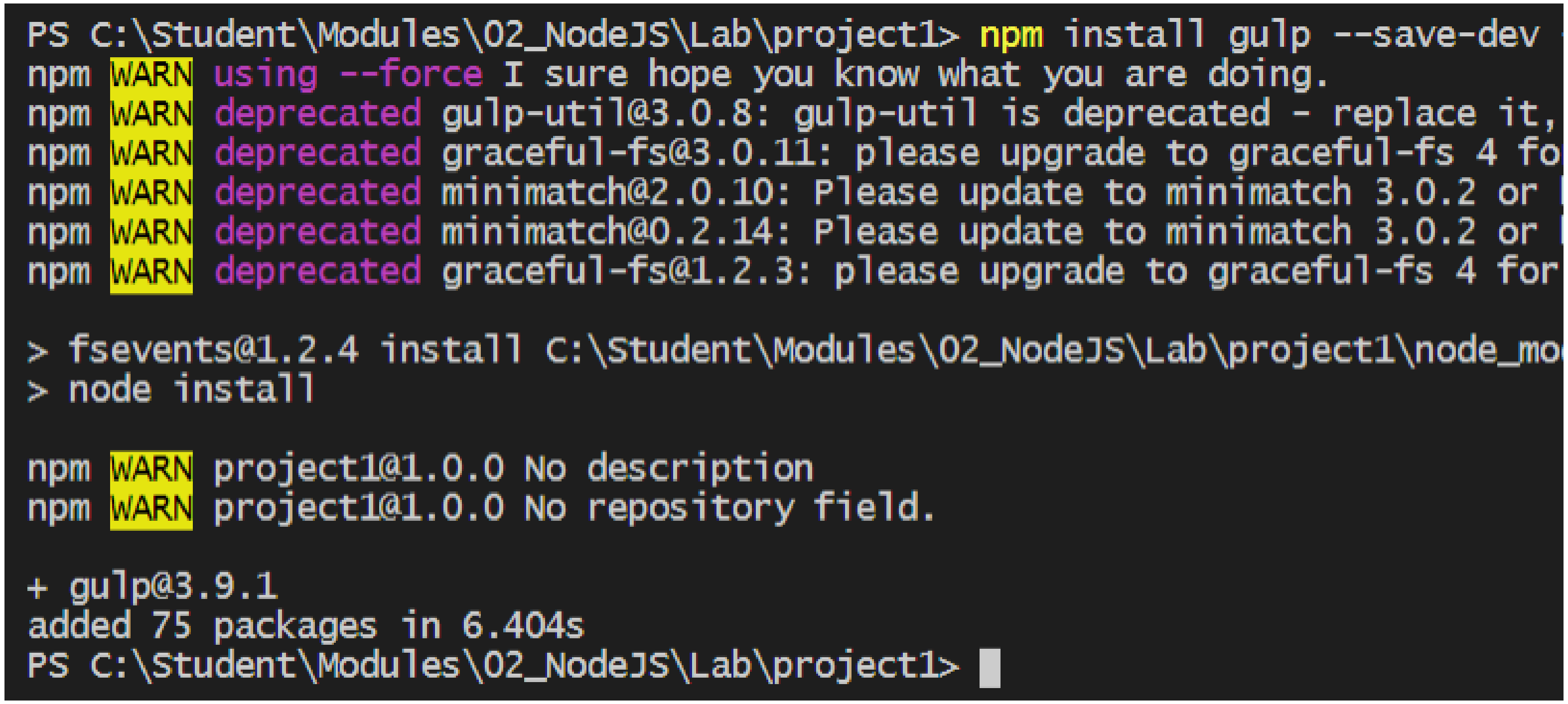




```
var gulp = require('gulp');
var clean = require('gulp-clean');
var ts = require("gulp-typescript");
var tsProject = ts.createProject("tsconfig.json");
var sourcemaps = require('gulp-sourcemaps');
var browserSync = require('browser-sync');


gulp.task('clean', function () {
  console.log("Running clean task");
  return gulp.src('dist/', { read: false })
    .pipe(clean());
});

gulp.task('build', ['clean'], function () {
  console.log("Running build task");

  gulp.src('src/**/*.html').pipe(gulp.dest('dist'));
  gulp.src('src/css/**/*.css').pipe(gulp.dest('dist/css'));
  gulp.src('src/css/img/**/*.png').pipe(gulp.dest('dist/css/img'));

  return tsProject.src()
    .pipe(sourcemaps.init())
    .pipe(tsProject())
    .pipe(sourcemaps.write('.', { sourceRoot: './', includeContent: false }))
    .pipe(gulp.dest("."));

});
```

Gulp as a Task Runner

- Gulp serves as a Task Runner
  - Compiles TypeScript files to JavaScript
  - Compiles SASS files to CSS
  - Bundles and minifies JavaScript and CSS files



```
PS C:\Student\Modules\02_NodeJS\Lab\project1> npm install gulp --save-dev
npm WARN using --force I sure hope you know what you are doing.
npm WARN deprecated gulp-util@3.0.8: gulp-util is deprecated - replace it,
npm WARN deprecated graceful-fs@3.0.11: please upgrade to graceful-fs 4 fo
npm WARN deprecated minimatch@2.0.10: Please update to minimatch 3.0.2 or
npm WARN deprecated minimatch@0.2.14: Please update to minimatch 3.0.2 or
npm WARN deprecated graceful-fs@1.2.3: please upgrade to graceful-fs 4 for

> fsevents@1.2.4 install C:\Student\Modules\02_NodeJS\Lab\project1\node_mo
> node install

npm WARN project1@1.0.0 No description
npm WARN project1@1.0.0 No repository field.

+ gulp@3.9.1
added 75 packages in 6.404s
PS C:\Student\Modules\02_NodeJS\Lab\project1>
```

Agenda

- ✓ Introduction to Node.JS and NPM
- ✓ Automating Build Tasks using Gulp
- ➢ Bundling Project Assets using Webpack
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WebPack

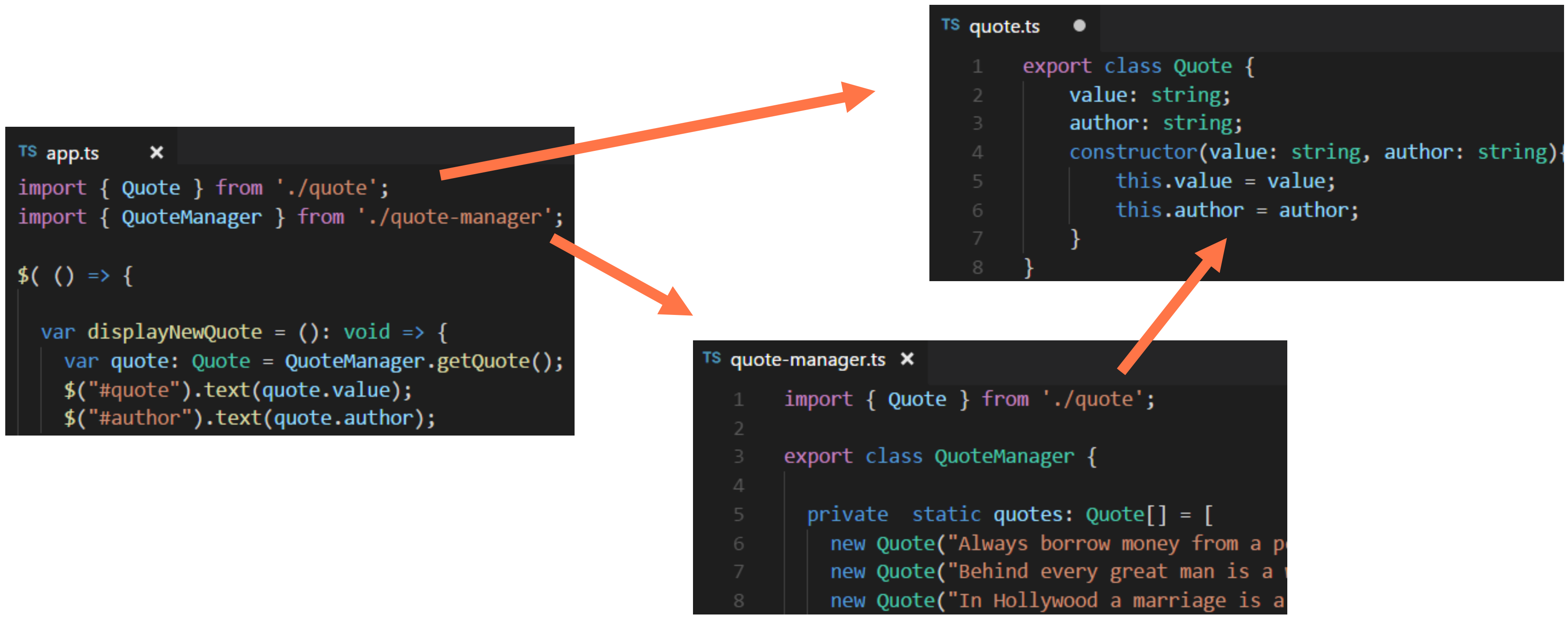
- WebPack serves as a bundling utility
  - Bundles many js/ts files into a single file
  - Can handle dynamic module loading
  - Provides a dev server for testing and debugging

- When using Webpack 4
  - Install packages for webpack and webpack-cli

```
npm install webpack webpack-cli --save-dev
```

Dynamic Module Loading

- Webpack controls dynamic module loading
  - Your project just references app.ts
  - Compiler dynamically determines other files to include



```
import { Quote } from './quote';
import { QuoteManager } from './quote-manager';

$( () => {

  var displayNewQuote = (): void => {
    var quote: Quote = QuoteManager.getQuote();
    $("#quote").text(quote.value);
    $("#author").text(quote.author);
```

```
export class Quote {
    value: string;
    author: string;
    constructor(value: string, author: string){
        this.value = value;
        this.author = author;
    }
}
```

```
import { Quote } from './quote';

export class QuoteManager {

  private  static quotes: Quote[] = [
    new Quote("Always borrow money from a p
    new Quote("Behind every great man is a 
    new Quote("In Hollywood a marriage is a
```

Webpack Loaders

- Loaders do two things
  - Identify which file or files should be transformed
  - Transform files and ad them to dependency graph

- Example loaders
  - awesome-typescript-loader
  - style-loader
  - css-loader
  - url-loader

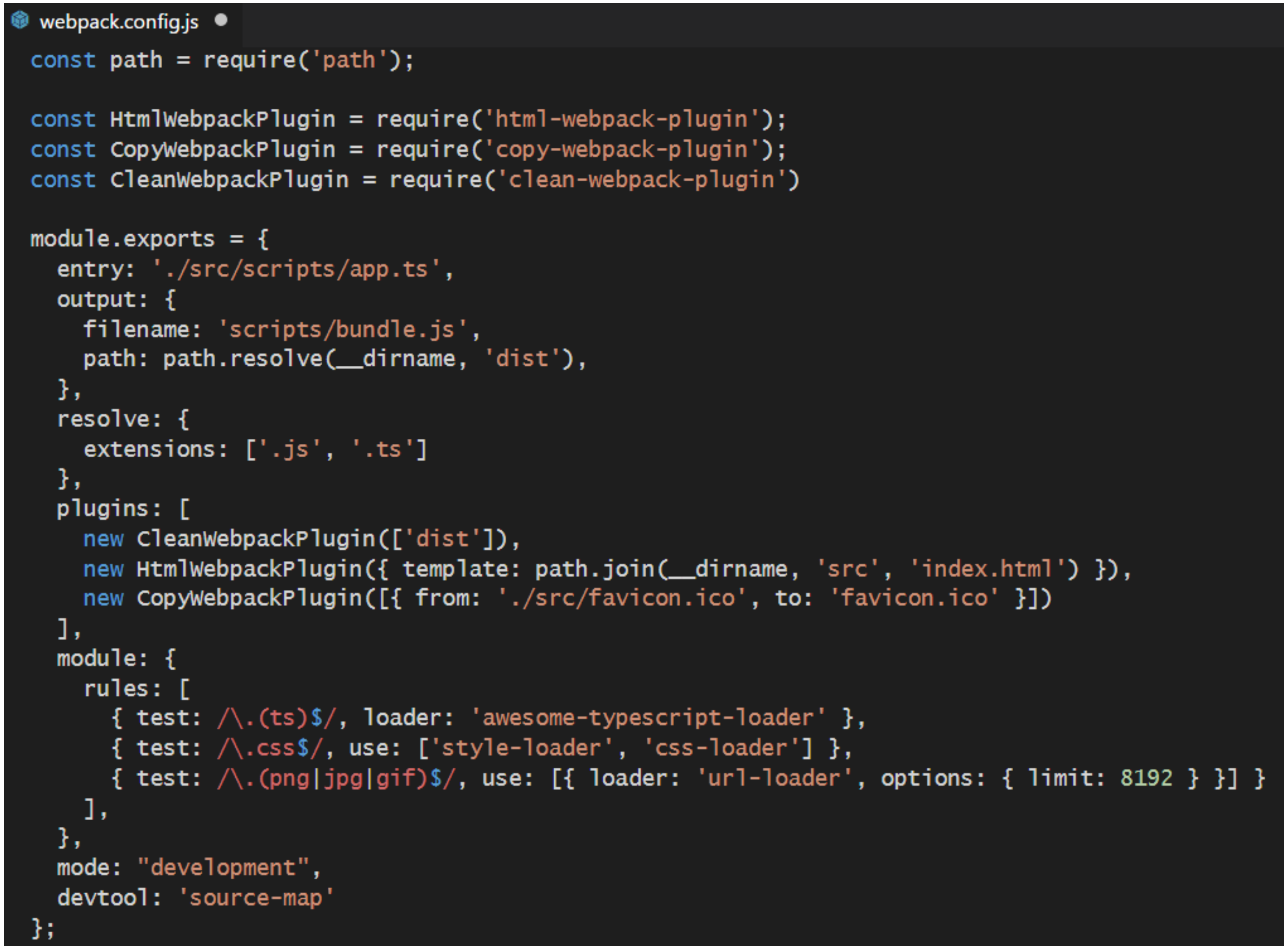
Webpack Plugins

- Webpack supports plugins in addition to loaders
  - commonly used to perform actions and custom functionality
  - Plugins act upon compilations or chunks of your bundled modules

- Examples Plugins
  - clean-webpack-plugin
  - copy-webpack-plugin
  - html-webpack-plugin

webpack.config.js

- Build process controlled through **webpack.config.js**

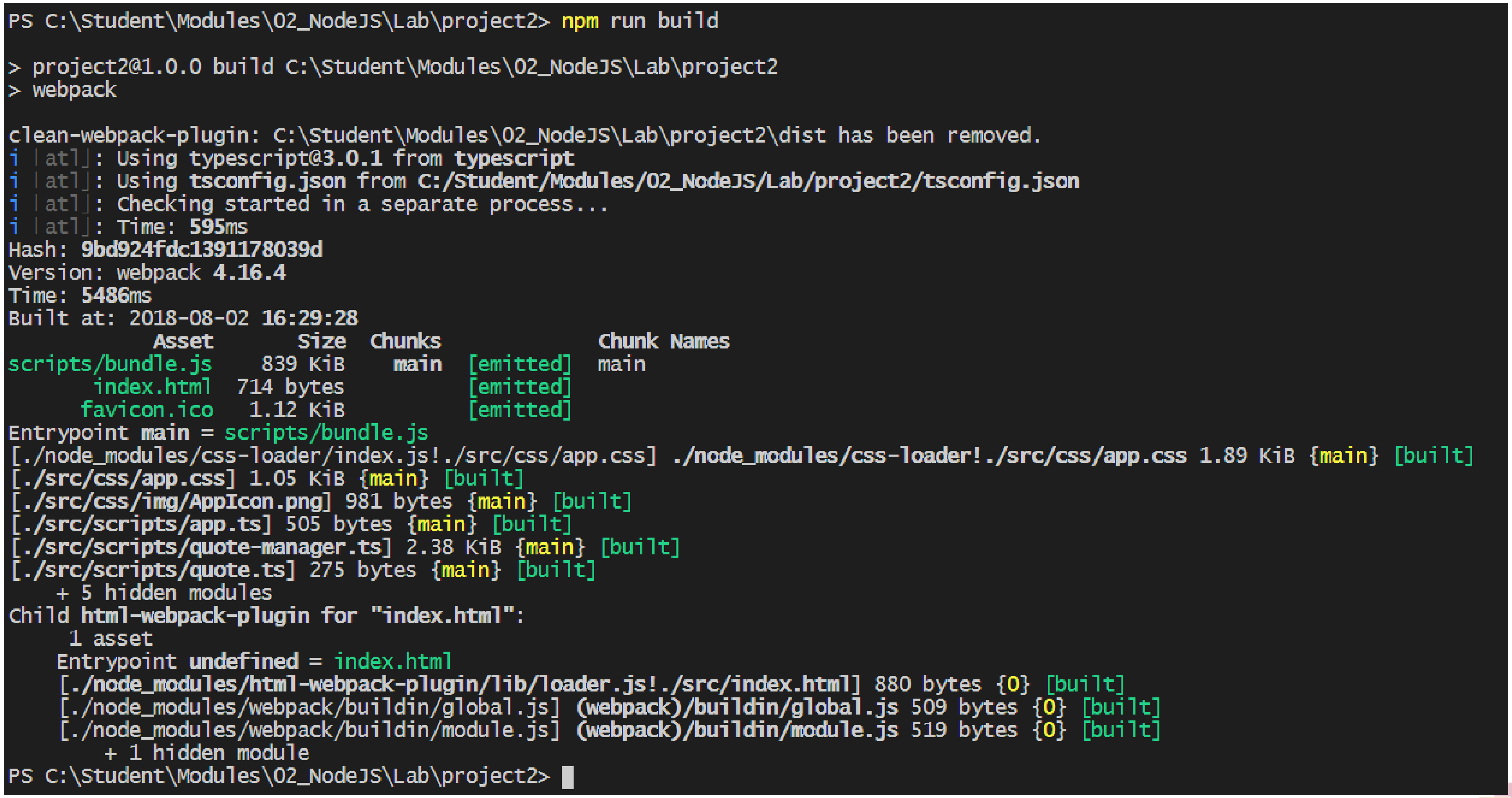


webpack.config.js ●

```
const path = require('path');

const HtmlWebpackPlugin = require('html-webpack-plugin');
const CopyWebpackPlugin = require('copy-webpack-plugin');
const CleanWebpackPlugin = require('clean-webpack-plugin')

module.exports = {
  entry: './src/scripts/app.ts',
  output: {
    filename: 'scripts/bundle.js',
    path: path.resolve(__dirname, 'dist'),
  },
  resolve: {
    extensions: ['.js', '.ts']
  },
  plugins: [
    new CleanWebpackPlugin(['dist']),
    new HtmlWebpackPlugin({ template: path.join(__dirname, 'src', 'index.html') }),
    new CopyWebpackPlugin([{ from: './src/favicon.ico', to: 'favicon.ico' }])
  ],
  module: {
    rules: [
      { test: /\.(ts)$/, loader: 'awesome-typescript-loader' },
      { test: /\.css$/, use: ['style-loader', 'css-loader'] },
      { test: /\.(png|jpg|gif)$/, use: [{ loader: 'url-loader', options: { limit: 8192 } }] }
    ],
  },
  mode: "development",
  devtool: 'source-map'
};
```

WebPack Builds

- Running build process generates files for distribution



```
PS C:\Student\Modules\02_NodeJS\Lab\project2> npm run build

> project2@1.0.0 build C:\Student\Modules\02_NodeJS\Lab\project2
> webpack

clean-webpack-plugin: C:\Student\Modules\02_NodeJS\Lab\project2\dist has been removed.
i ｢atl｣: Using typescript@3.0.1 from typescript
i ｢atl｣: Using tsconfig.json from C:/Student/Modules/02_NodeJS/Lab/project2/tsconfig.json
i ｢atl｣: Checking started in a separate process...
i ｢atl｣: Time: 595ms
Hash: 9bd924fdc1391178039d
Version: webpack 4.16.4
Time: 5486ms
Built at: 2018-08-02 16:29:28
            Asset       Size  Chunks             Chunk Names
scripts/bundle.js    839 KiB    main  [emitted]  main
       index.html  714 bytes          [emitted]
      favicon.ico   1.12 KiB          [emitted]
Entrypoint main = scripts/bundle.js
[./node_modules/css-loader/index.js!./src/css/app.css] ./node_modules/css-loader!./src/css/app.css 1.89 KiB {main} [built]
[./src/css/app.css] 1.05 KiB {main} [built]
[./src/css/img/AppIcon.png] 981 bytes {main} [built]
[./src/scripts/app.ts] 505 bytes {main} [built]
[./src/scripts/quote-manager.ts] 2.38 KiB {main} [built]
[./src/scripts/quote.ts] 275 bytes {main} [built]
    + 5 hidden modules
Child html-webpack-plugin for "index.html":
     1 asset
    Entrypoint undefined = index.html
    [./node_modules/html-webpack-plugin/lib/loader.js!./src/index.html] 880 bytes {0} [built]
    [./node_modules/webpack/buildin/global.js] (webpack)/buildin/global.js 509 bytes {0} [built]
    [./node_modules/webpack/buildin/module.js] (webpack)/buildin/module.js 519 bytes {0} [built]
        + 1 hidden module
PS C:\Student\Modules\02_NodeJS\Lab\project2> █
```

Webpack Dev Server

- Webpack provides its own development server
  - Install the webpack dev server package

```
npm install webpack-dev-server --save-dev
```

  - Run your project using the webpack dev server CLI

```
webpack-dev-server --open
```

Agenda

- ✓ Introduction to Node.JS and NPM
- ✓ Automating Build Tasks using Gulp
- ✓ Bundling Project Assets using Webpack
- ➢ Developing with React.js, TypeScript and Webpack
- Developing with SharePoint Framework
- Developing Custom Visuals for Power BI

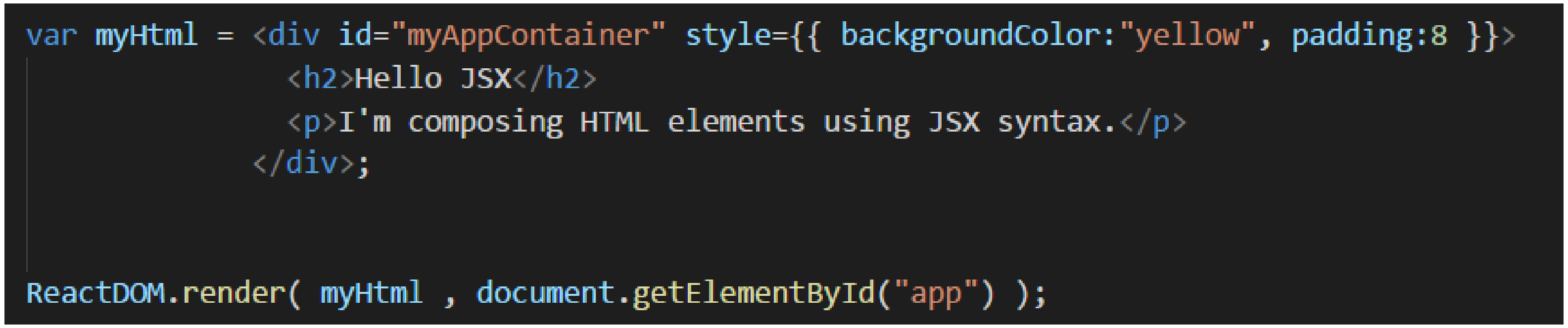
Introducing React

- React is a library for building user interfaces
  - Not as all-encompassing as a framework like Angular
  - Focused on building HTML-based user experiences
  - Based on reusable component-based architecture
  - Components *react* to state changes by updating UI
  - React uses shadow DOM for efficient event handling

- React was originally designed for Facebook
  - Also a good fit for building SPFx web parts

Understanding JSX (and TSX)

- JSX provides better syntax for HTML composition
  - JSX allows extends JavaScript with XML-like syntax
  - JSX syntax must be transpiled into JavaScript code

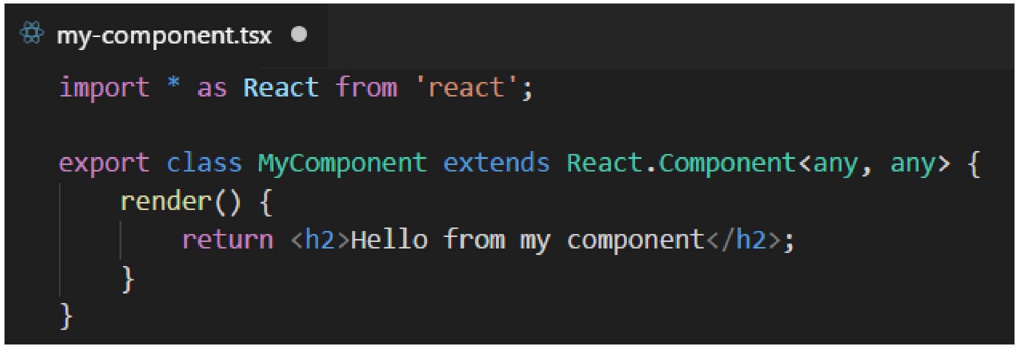


```
var myHtml = <div id="myAppContainer" style={{ backgroundColor:"yellow", padding:8 }}>
               <h2>Hello JSX</h2>
               <p>I'm composing HTML elements using JSX syntax.</p>
             </div>;


ReactDOM.render( myHtml , document.getElementById("app") );
```

- JSX/TSX is separate from React library
  - JSX/TSX commonly used in React development
  - Babel compiler used to transpile JSX to JavaScript
  - TypeScript compiler used to transpile TSX to JavaScript

Defining React Components using TypeScript

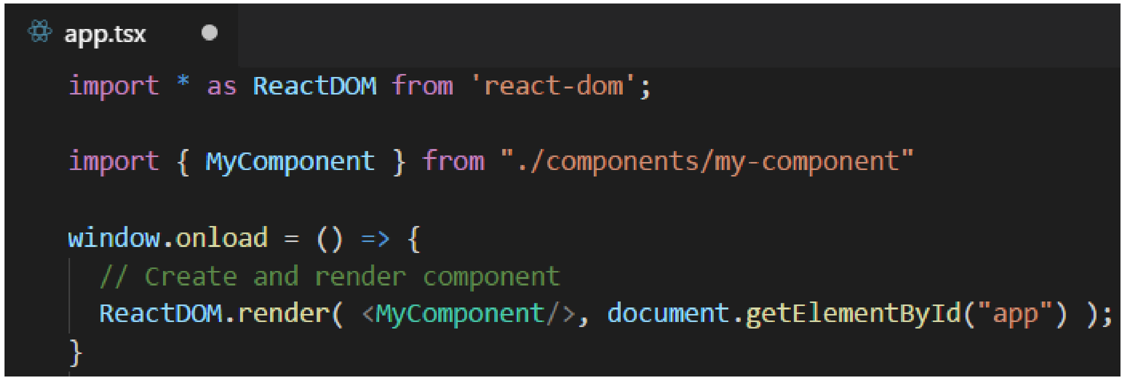
- Component is class extending `React.Component`
  - Component usually defined in its own **tsx** file
  - Component class must define **render** method



my-component.tsx

```
import * as React from 'react';

export class MyComponent extends React.Component<any, any> {
    render() {
        return <h2>Hello from my component</h2>;
    }
}
```

  - Component can be instantiated with JSX/TSX syntax



app.tsx

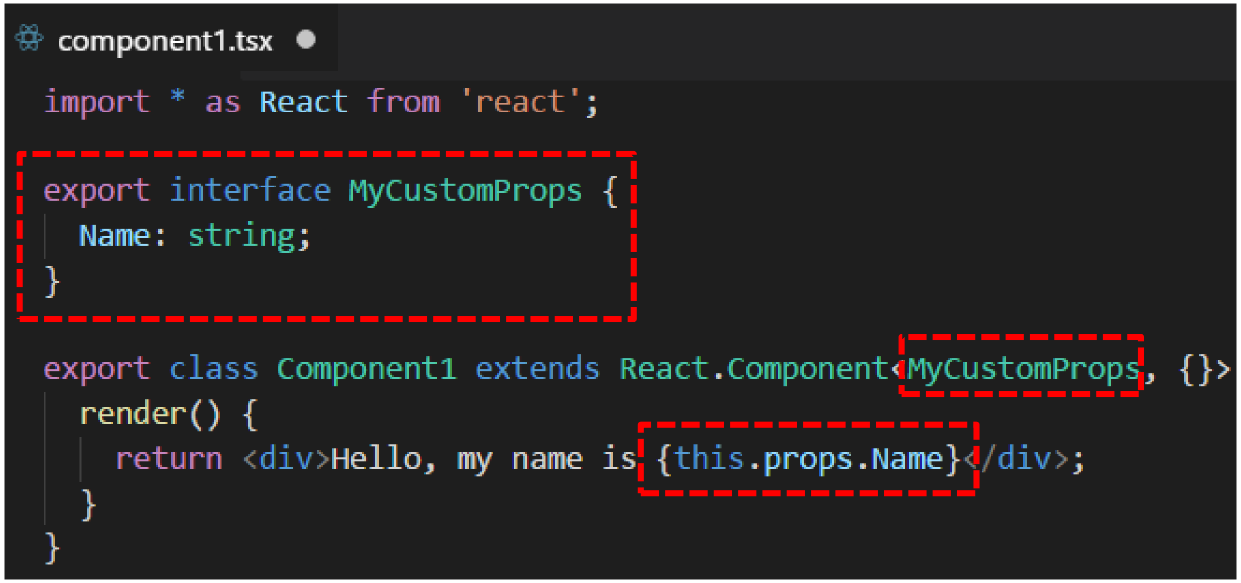
```
import * as ReactDOM from 'react-dom';

import { MyComponent } from "./components/my-component"

window.onload = () => {
  // Create and render component
  ReactDOM.render( <MyComponent/>, document.getElementById("app") );
}
```

Component Properties and State

- Component can contain properties and state
  - Properties are initialized by external components
  - Properties are read-only to hosting component
  - State is set internally by hosting component
  - Changing state triggers UI refresh by calling render
  - UI experience created by ***reacting*** to changes in state

React Component Properties

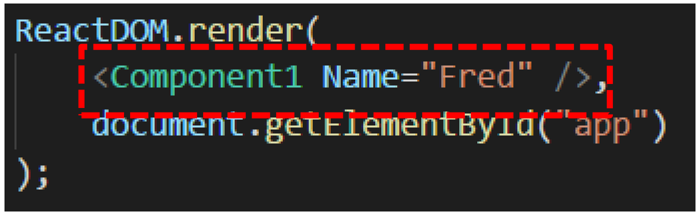
- Defining component with a property



component1.tsx

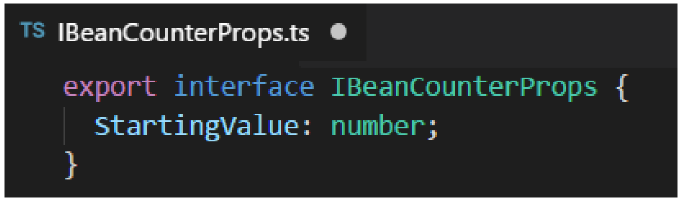
```
import * as React from 'react';

export interface MyCustomProps {
  Name: string;
}

export class Component1 extends React.Component<MyCustomProps, {}> {
  render() {
    return <div>Hello, my name is {this.props.Name}</div>;
  }
}
```

- Instantiating component with a property



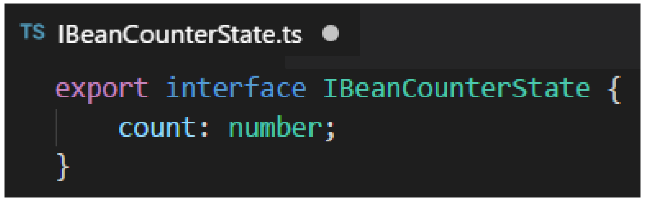
```
ReactDOM.render(
    <Component1 Name="Fred" />,
    document.getElementById("app")
);
```

Stateful Component



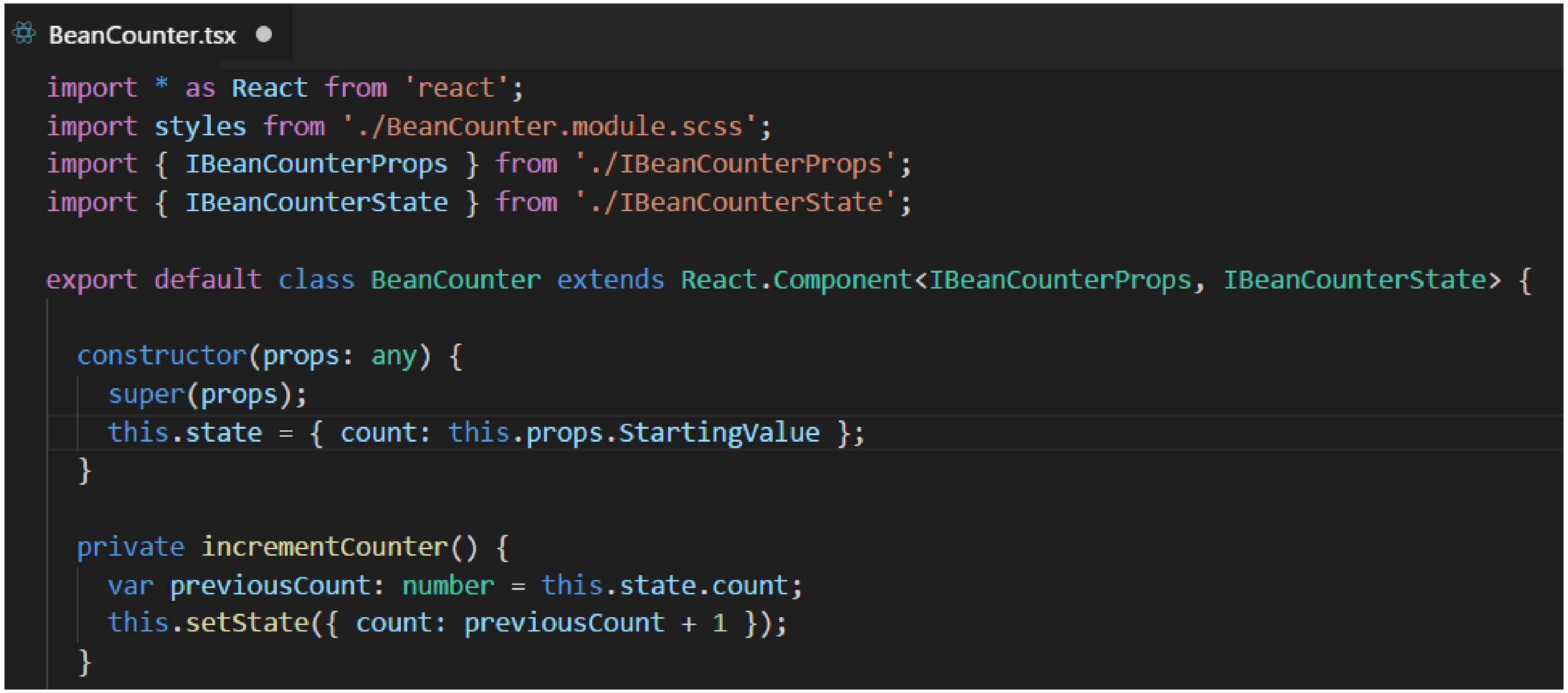
IBeanCounterProps.ts

```
export interface IBeanCounterProps {
  StartingValue: number;
}
```



IBeanCounterState.ts

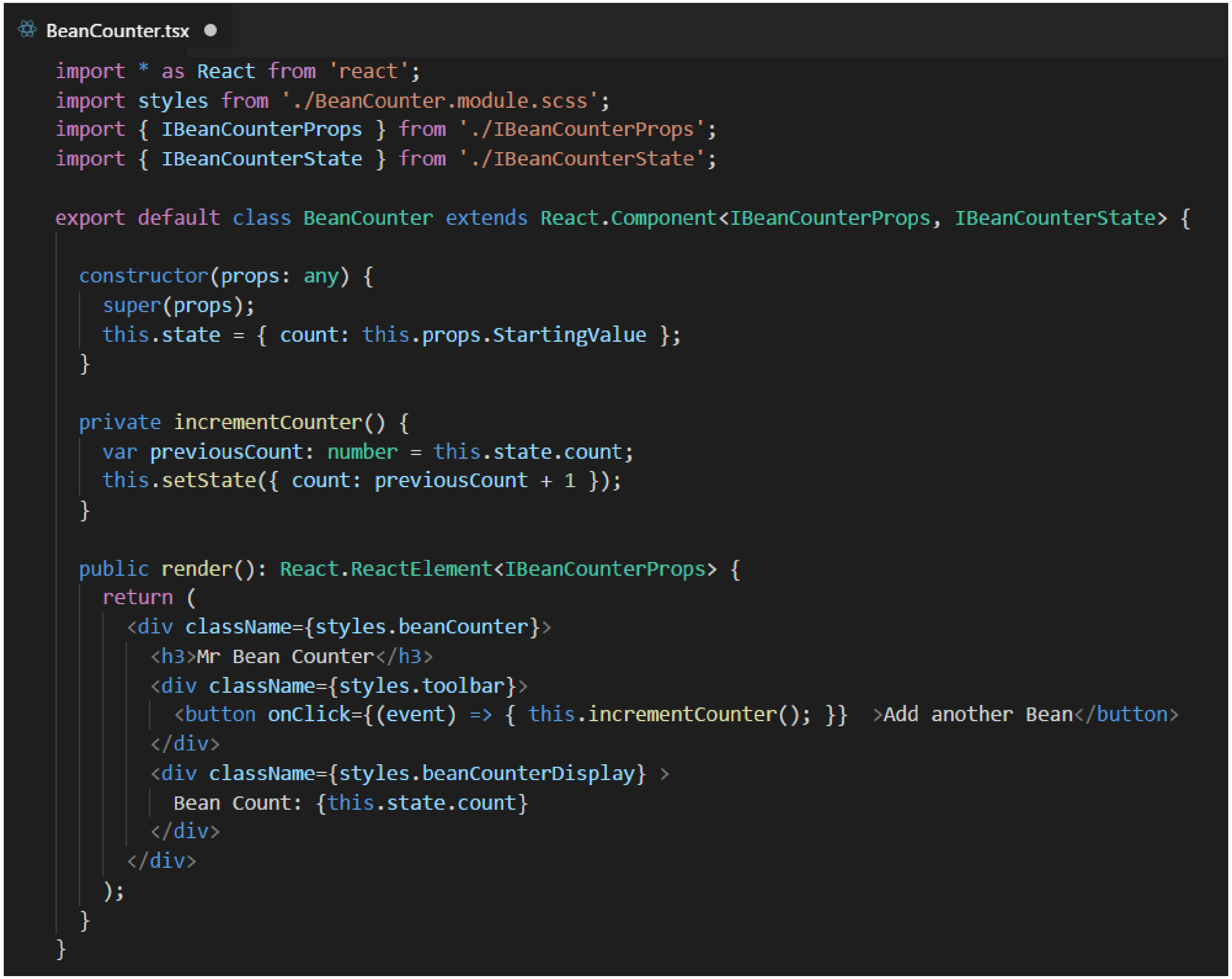
```
export interface IBeanCounterState {
    count: number;
}
```



BeanCounter.tsx

```
import * as React from 'react';
import styles from './BeanCounter.module.scss';
import { IBeanCounterProps } from './IBeanCounterProps';
import { IBeanCounterState } from './IBeanCounterState';

export default class BeanCounter extends React.Component<IBeanCounterProps, IBeanCounterState> {

  constructor(props: any) {
    super(props);
    this.state = { count: this.props.StartingValue };
  }

  private incrementCounter() {
    var previousCount: number = this.state.count;
    this.setState({ count: previousCount + 1 });
  }
```

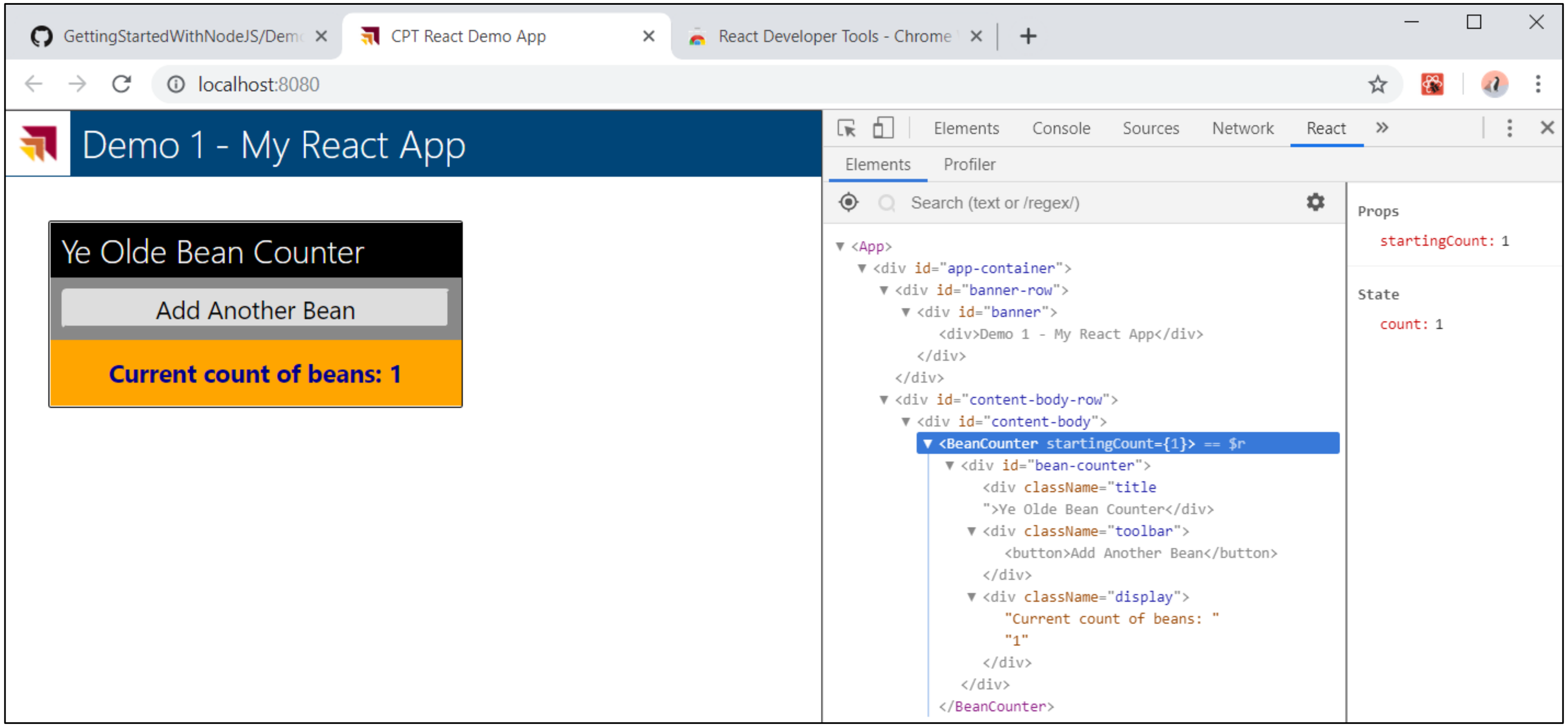
Stateful Component Rendering



BeanCounter.tsx ●

```tsx
import * as React from 'react';
import styles from './BeanCounter.module.scss';
import { IBeanCounterProps } from './IBeanCounterProps';
import { IBeanCounterState } from './IBeanCounterState';

export default class BeanCounter extends React.Component<IBeanCounterProps, IBeanCounterState> {

  constructor(props: any) {
    super(props);
    this.state = { count: this.props.StartingValue };
  }

  private incrementCounter() {
    var previousCount: number = this.state.count;
    this.setState({ count: previousCount + 1 });
  }

  public render(): React.ReactElement<IBeanCounterProps> {
    return (
      <div className={styles.beanCounter}>
        <h3>Mr Bean Counter</h3>
        <div className={styles.toolbar}>
          <button onClick={(event) => { this.incrementCounter(); }}  >Add another Bean</button>
        </div>
        <div className={styles.beanCounterDisplay} >
          Bean Count: {this.state.count}
        </div>
      </div>
    );
  }
}
```

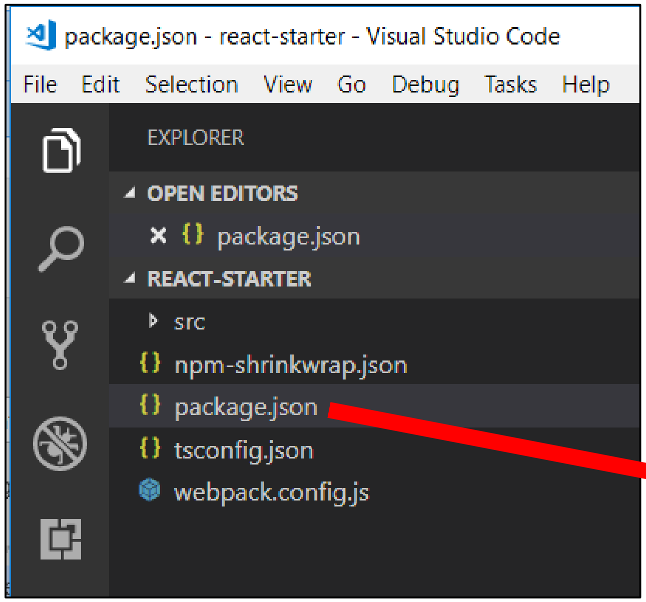
Chrome Developers Tools for React

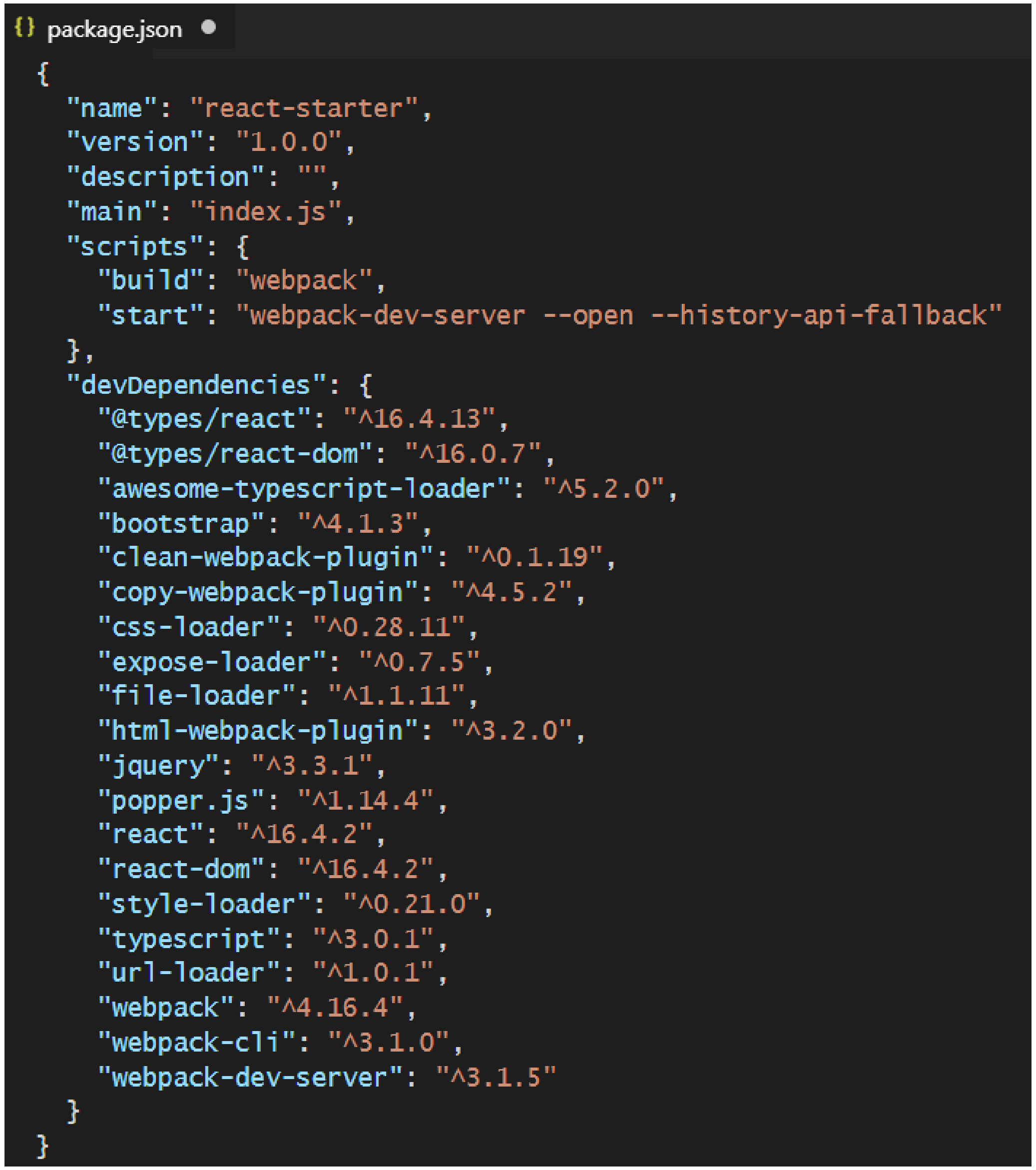


```
▼ <App>
  ▼ <div id="app-container">
    ▼ <div id="banner-row">
      ▼ <div id="banner">
          <div>Demo 1 - My React App</div>
        </div>
      </div>
    ▼ <div id="content-body-row">
      ▼ <div id="content-body">
        ▼ <BeanCounter startingCount={1}> == $r
          ▼ <div id="bean-counter">
              <div className="title
              ">Ye Olde Bean Counter</div>
            ▼ <div className="toolbar">
                <button>Add Another Bean</button>
              </div>
            ▼ <div className="display">
                "Current count of beans: "
                "1"
              </div>
            </div>
          </BeanCounter>
```

```
Props
  startingCount: 1

State
  count: 1
```

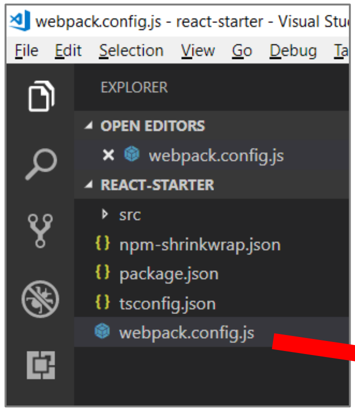
Starter Project - package.json

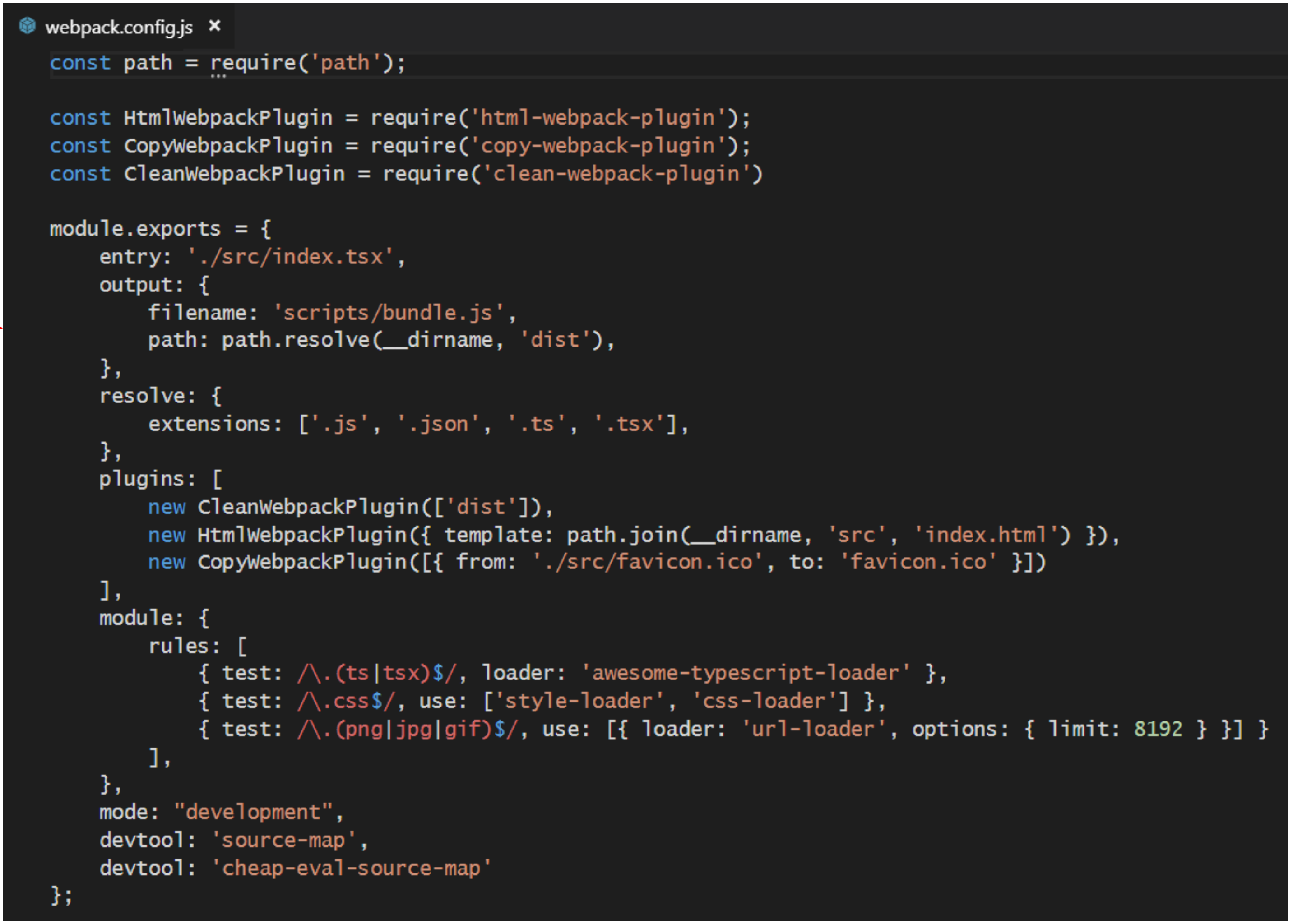




```
{
  "name": "react-starter",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "build": "webpack",
    "start": "webpack-dev-server --open --history-api-fallback"
  },
  "devDependencies": {
    "@types/react": "^16.4.13",
    "@types/react-dom": "^16.0.7",
    "awesome-typescript-loader": "^5.2.0",
    "bootstrap": "^4.1.3",
    "clean-webpack-plugin": "^0.1.19",
    "copy-webpack-plugin": "^4.5.2",
    "css-loader": "^0.28.11",
    "expose-loader": "^0.7.5",
    "file-loader": "^1.1.11",
    "html-webpack-plugin": "^3.2.0",
    "jquery": "^3.3.1",
    "popper.js": "^1.14.4",
    "react": "^16.4.2",
    "react-dom": "^16.4.2",
    "style-loader": "^0.21.0",
    "typescript": "^3.0.1",
    "url-loader": "^1.0.1",
    "webpack": "^4.16.4",
    "webpack-cli": "^3.1.0",
    "webpack-dev-server": "^3.1.5"
  }
}
```

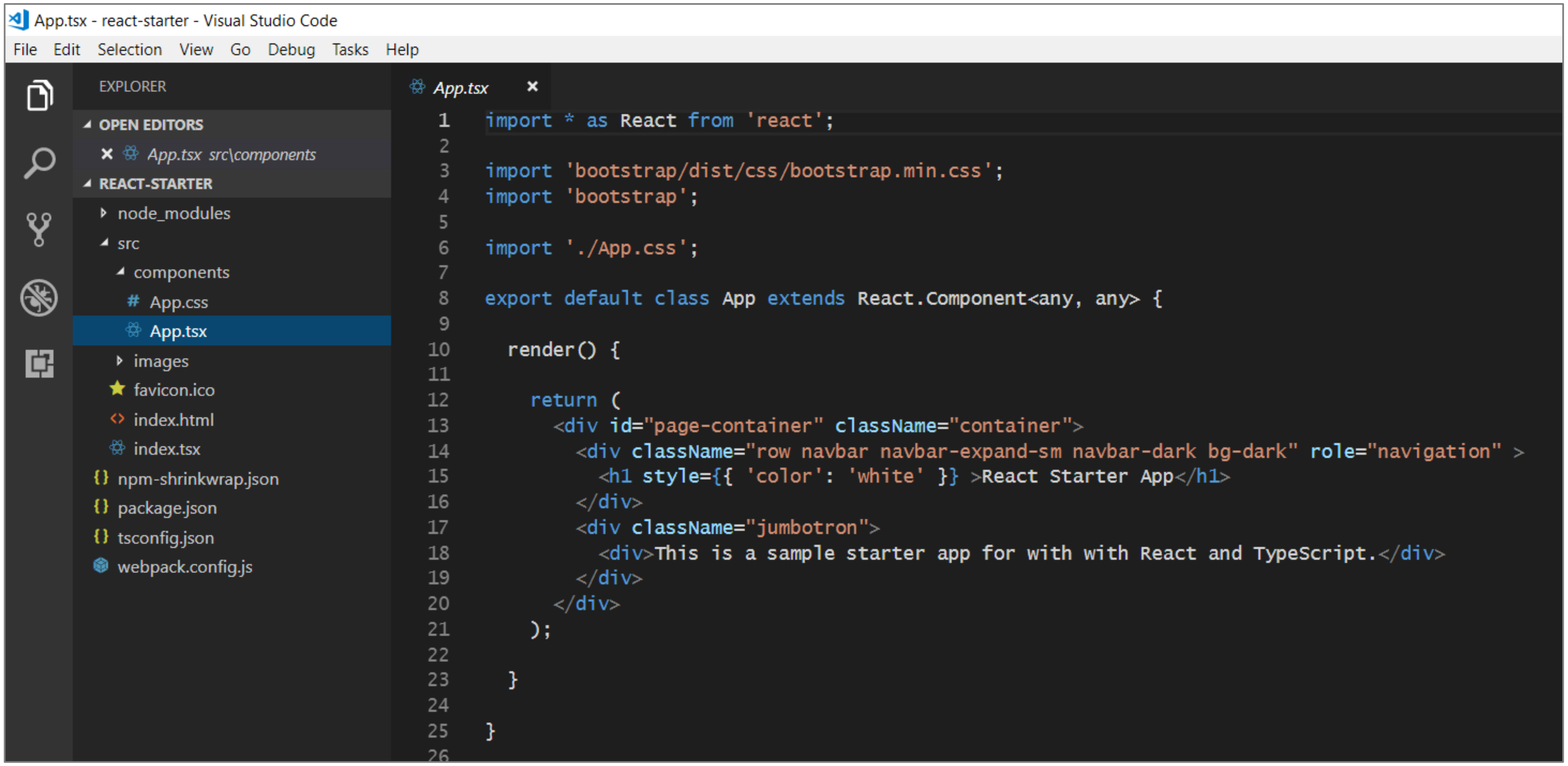
Starter Project - webpack.config.js





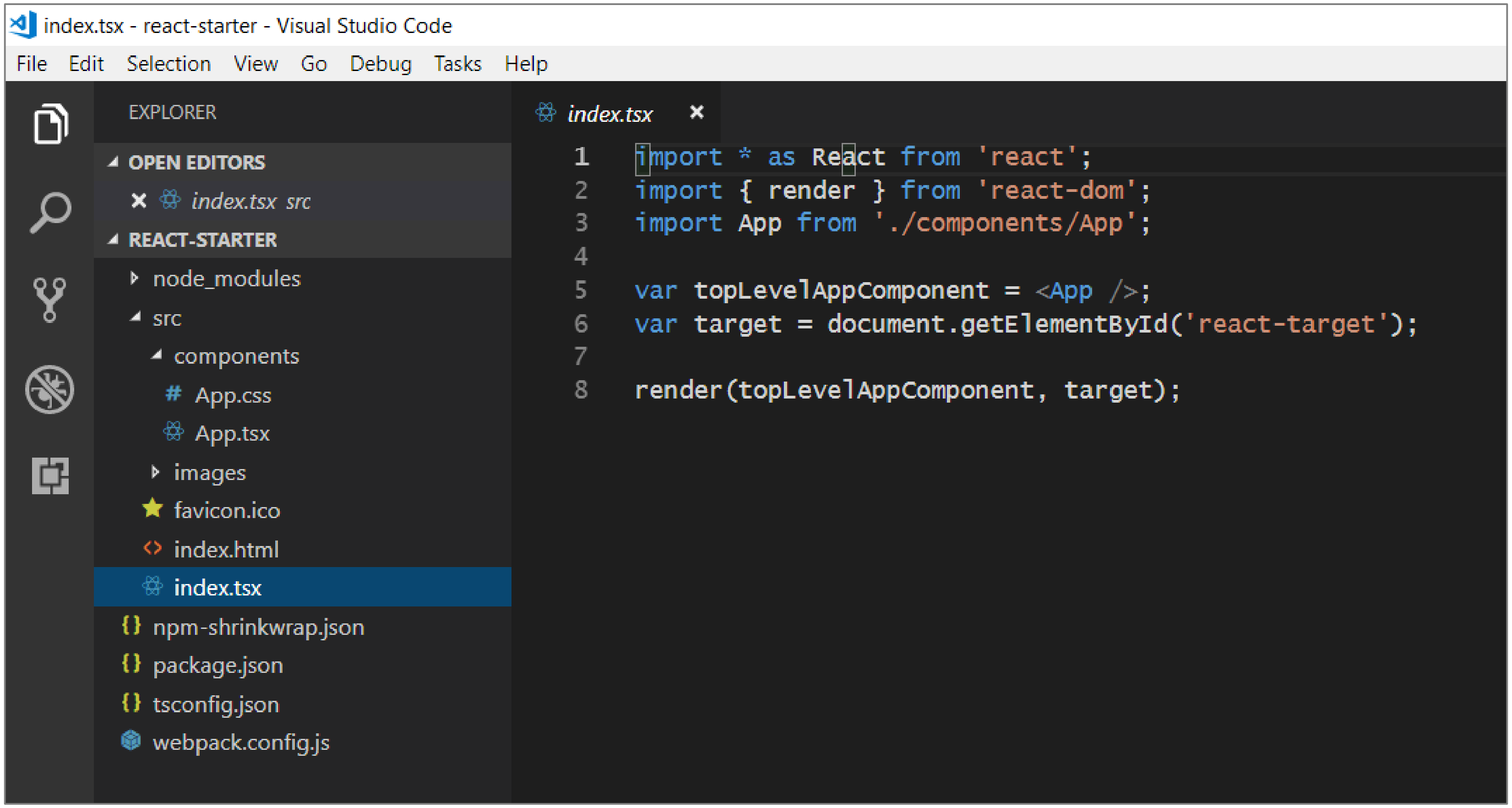
```
const path = require('path');

const HtmlWebpackPlugin = require('html-webpack-plugin');
const CopyWebpackPlugin = require('copy-webpack-plugin');
const CleanWebpackPlugin = require('clean-webpack-plugin')

module.exports = {
    entry: './src/index.tsx',
    output: {
        filename: 'scripts/bundle.js',
        path: path.resolve(__dirname, 'dist'),
    },
    resolve: {
        extensions: ['.js', '.json', '.ts', '.tsx'],
    },
    plugins: [
        new CleanWebpackPlugin(['dist']),
        new HtmlWebpackPlugin({ template: path.join(__dirname, 'src', 'index.html') }),
        new CopyWebpackPlugin([{ from: './src/favicon.ico', to: 'favicon.ico' }])
    ],
    module: {
        rules: [
            { test: /\.(ts|tsx)$/, loader: 'awesome-typescript-loader' },
            { test: /\.css$/, use: ['style-loader', 'css-loader'] },
            { test: /\.(png|jpg|gif)$/, use: [{ loader: 'url-loader', options: { limit: 8192 } }] }
        ],
    },
    mode: "development",
    devtool: 'source-map',
    devtool: 'cheap-eval-source-map'
};
```

The Top-level App Component



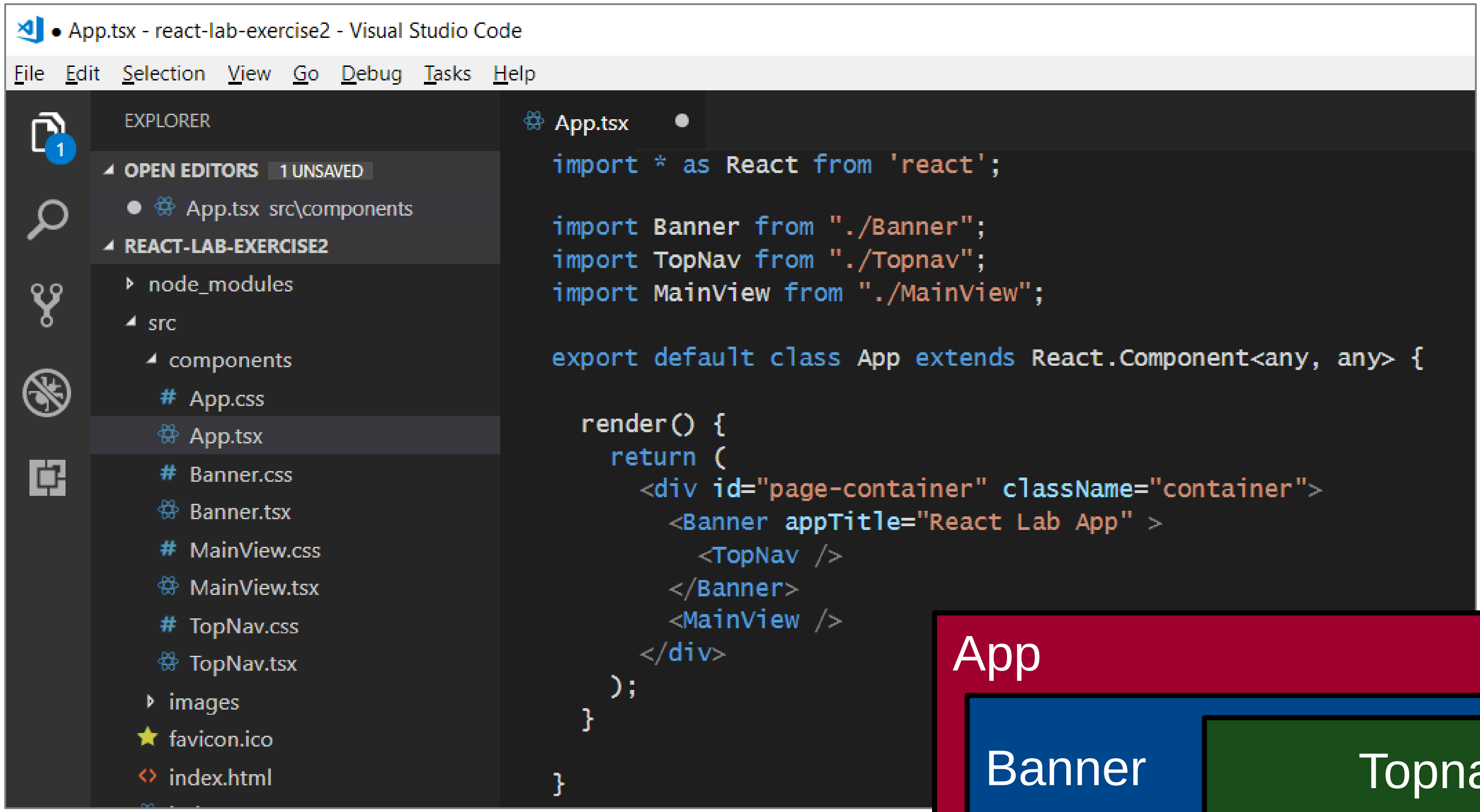
```
import * as React from 'react';

import 'bootstrap/dist/css/bootstrap.min.css';
import 'bootstrap';

import './App.css';

export default class App extends React.Component<any, any> {

  render() {

    return (
      <div id="page-container" className="container">
        <div className="row navbar navbar-expand-sm navbar-dark bg-dark" role="navigation" >
          <h1 style={{ 'color': 'white' }} >React Starter App</h1>
        </div>
        <div className="jumbotron">
          <div>This is a sample starter app for with with React and TypeScript.</div>
        </div>
      </div>
    );

  }

}
```

Bootstrapping the App Component



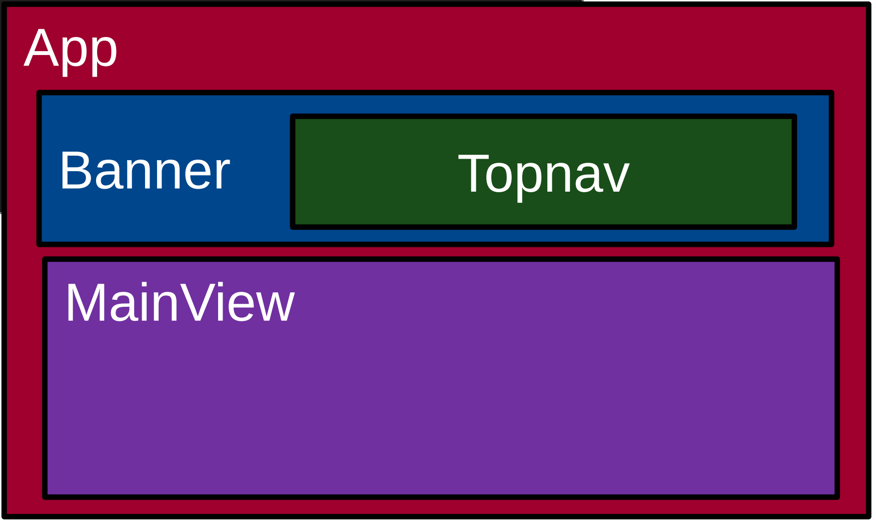
```
import * as React from 'react';
import { render } from 'react-dom';
import App from './components/App';

var topLevelAppComponent = <App />;
var target = document.getElementById('react-target');

render(topLevelAppComponent, target);
```

React Component Hierarchies



• App.tsx - react-lab-exercise2 - Visual Studio Code

```
import * as React from 'react';

import Banner from "./Banner";
import TopNav from "./Topnav";
import MainView from "./MainView";

export default class App extends React.Component<any, any> {

  render() {
    return (
      <div id="page-container" className="container">
        <Banner appTitle="React Lab App" >
          <TopNav />
        </Banner>
        <MainView />
      </div>
    );
  }

}
```

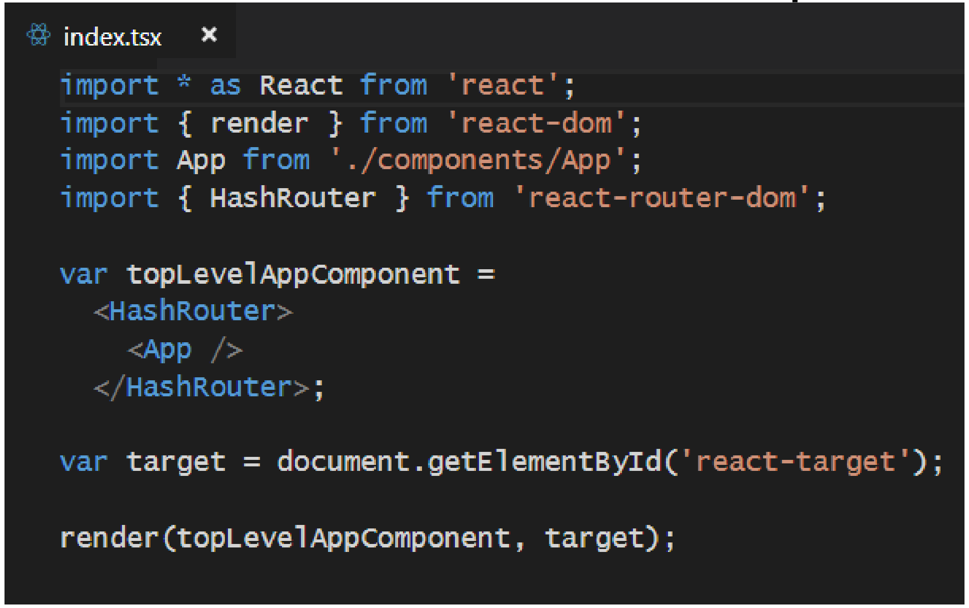


React Router

- Used to create route map in single page application (SPA)
  - Installed as a pair of npm packages

```
npm install react-router @types/react-router --save-dev

npm install react-router-dom @types/react-router-dom --save-dev
```

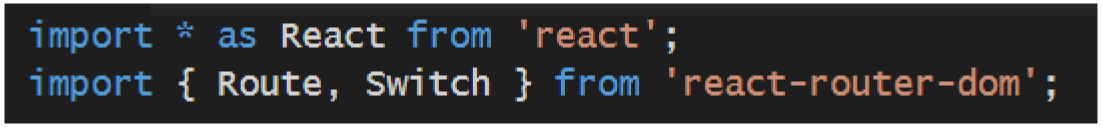
- Router must be added in as top-level component above App


index.tsx

```
import * as React from 'react';
import { render } from 'react-dom';
import App from './components/App';
import { HashRouter } from 'react-router-dom';

var topLevelAppComponent =
  <HashRouter>
    <App />
  </HashRouter>;

var target = document.getElementById('react-target');

render(topLevelAppComponent, target);
```

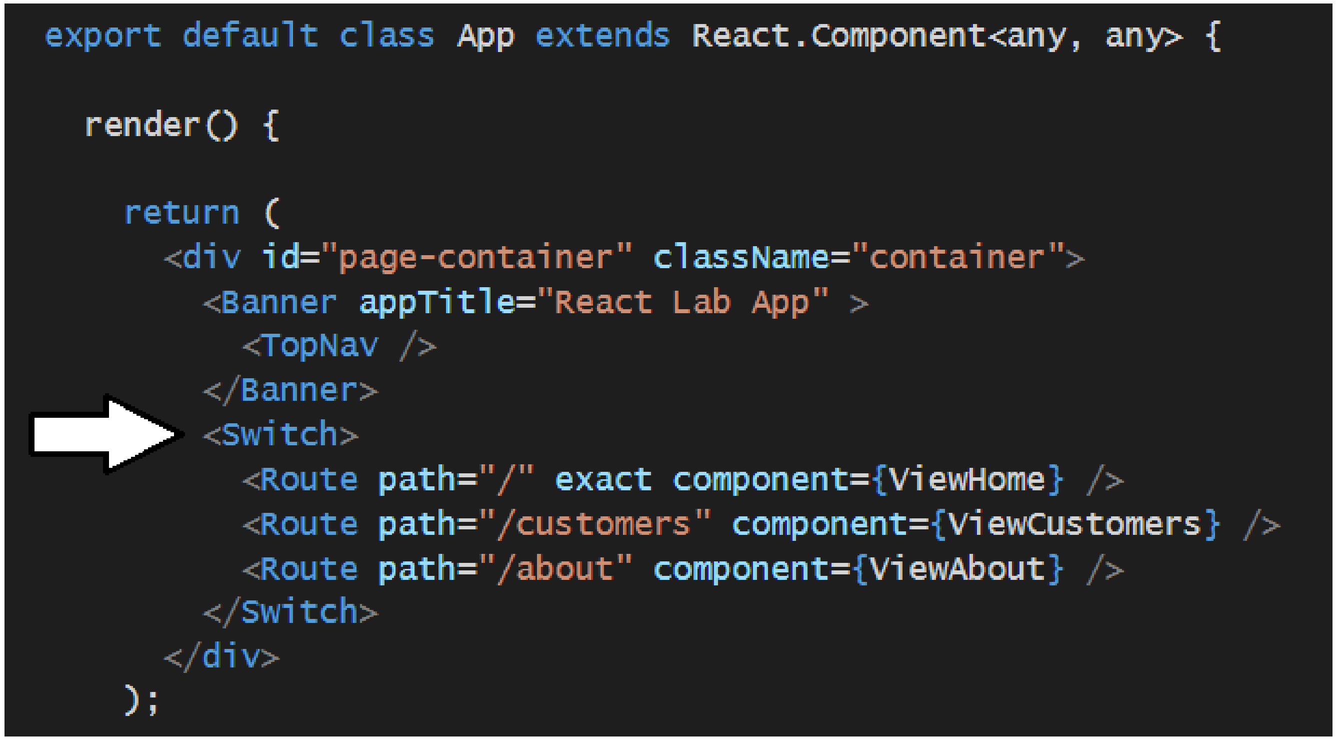
Using React Router

- Import Route and Switch components



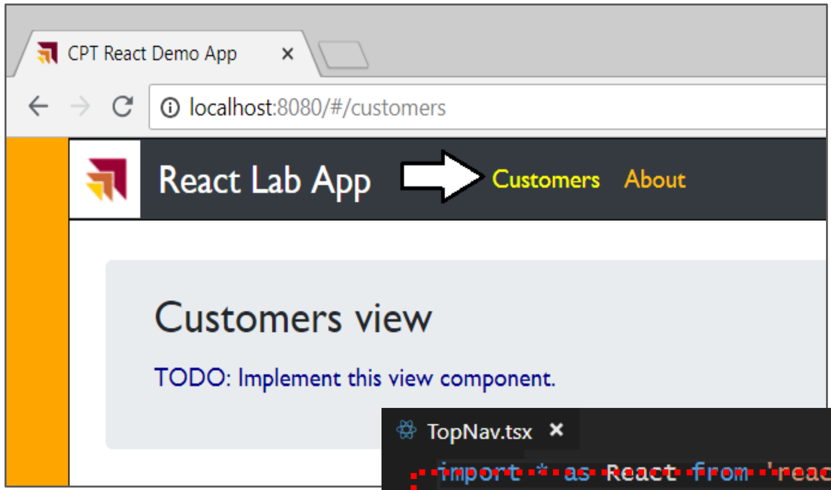
```
import * as React from 'react';
import { Route, Switch } from 'react-router-dom';
```

- Create route map in HTML output



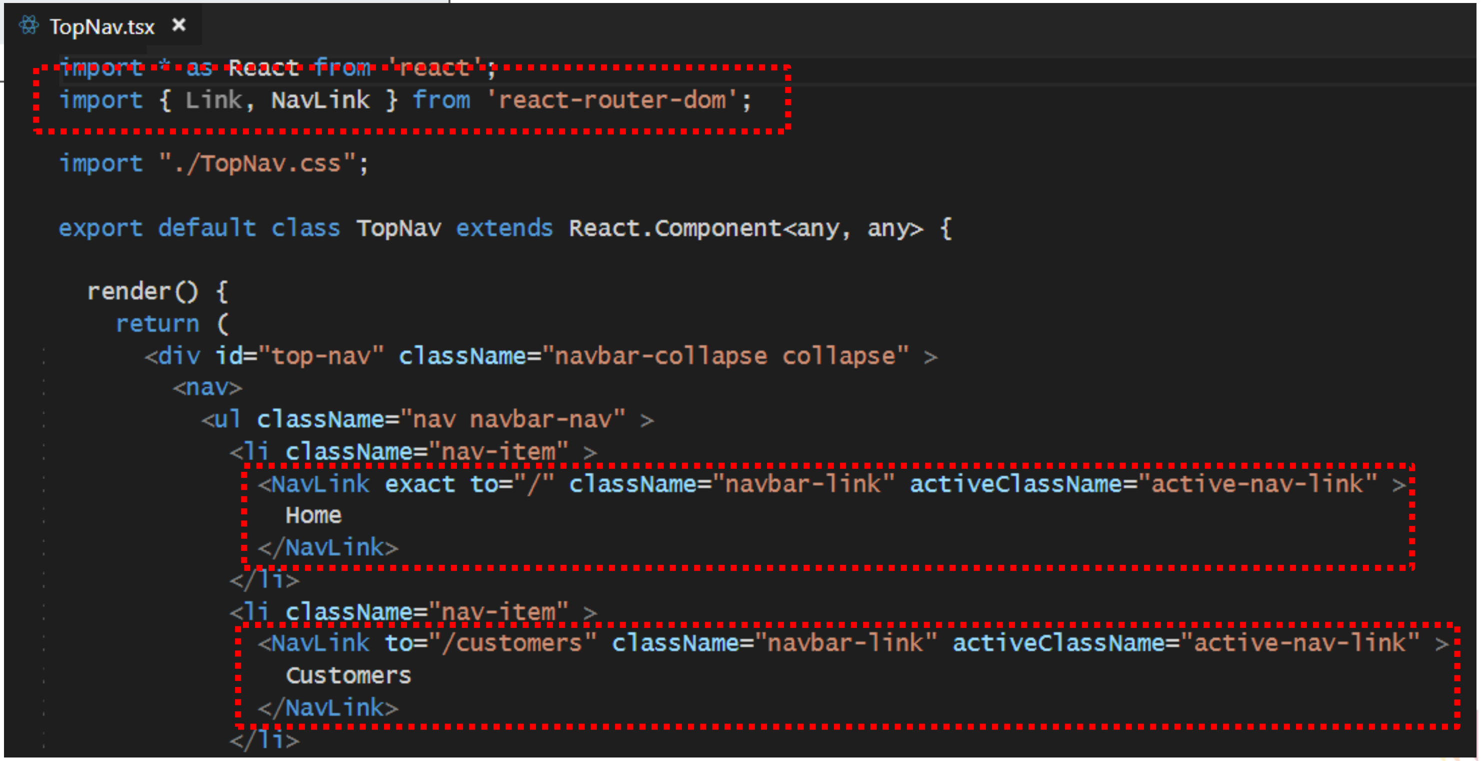
```
export default class App extends React.Component<any, any> {

  render() {

    return (
      <div id="page-container" className="container">
        <Banner appTitle="React Lab App" >
          <TopNav />
        </Banner>
        <Switch>
          <Route path="/" exact component={ViewHome} />
          <Route path="/customers" component={ViewCustomers} />
          <Route path="/about" component={ViewAbout} />
        </Switch>
      </div>
    );
```

Creating Route Links



Customers view

TODO: Implement this view component.



```
import * as React from 'react';
import { Link, NavLink } from 'react-router-dom';

import "./TopNav.css";

export default class TopNav extends React.Component<any, any> {

  render() {
    return (
      <div id="top-nav" className="navbar-collapse collapse" >
        <nav>
          <ul className="nav navbar-nav" >
            <li className="nav-item" >
              <NavLink exact to="/" className="navbar-link" activeClassName="active-nav-link" >
                Home
              </NavLink>
            </li>
            <li className="nav-item" >
              <NavLink to="/customers" className="navbar-link" activeClassName="active-nav-link" >
                Customers
              </NavLink>
            </li>
```

Component Lifecycle

- componentWillUpdate
  - executed before component is rendered
- componentDidUpdate
  - executed after component is rendered
- componentWillMount
  - executed before node is added to the DOM
- componentDidMount
  - executed after node is added to the DOM
- componentWillUnmount
  - executed before node is removed from the DOM
- shouldComponentUpdate(newProps, newState)
  - executed before component is updated

Calling a Web Service using the Fetch API

```
getCustomers(): Promise<ICustomer[]> {
  const restUrl =
    "http://subliminalsystems.com/api/Customers/?" +
    "$select=CustomerId,LastName,FirstName,EmailAddress,WorkPhone,HomePhone,Company" +
    "&$filter=(CustomerId+le+12)&$top=200";
  return fetch(restUrl)
    .then(response => response.json())
    .then(response => {
      console.log(response.value);
      return response.value;
    });
}
```

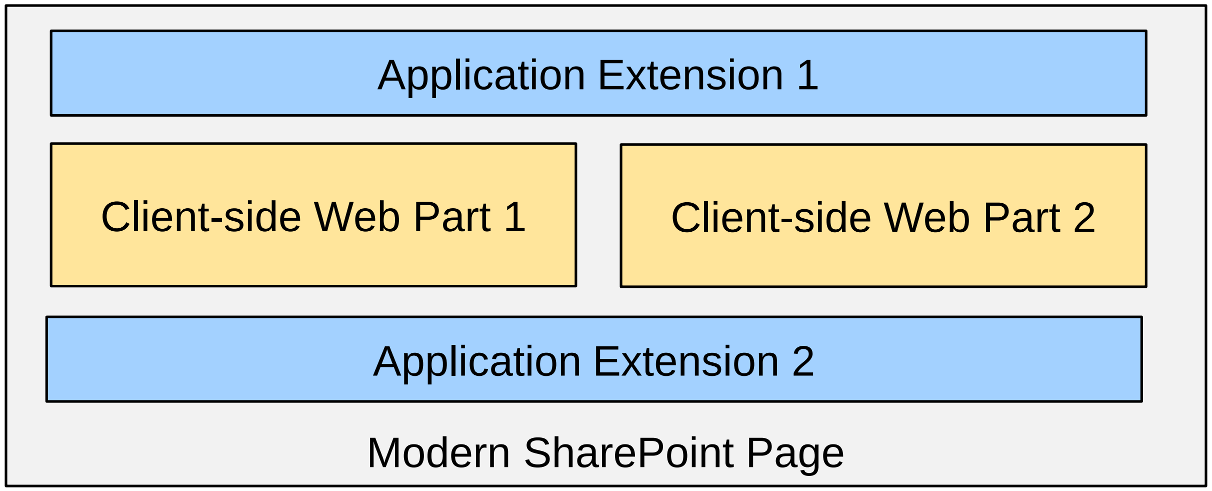
```
getCustomer(customerId: string): Promise<ICustomerDetail> {
  const restUrl = "http://subliminalsystems.com/api/Customers(" + customerId + ")";
  return fetch(restUrl)
    .then(response => response.json())
    .then(response => {
      console.log(response);
      return response;
    });
}
```

Agenda

- ✓ Introduction to Node.JS and NPM
- ✓ Automating Build Tasks using Gulp
- ✓ Bundling Project Assets using Webpack
- ✓ Developing with React.js, TypeScript and Webpack
- ➢ Developing with SharePoint Framework
- • Developing Custom Visuals for Power BI

SharePoint Framework Component Types

- SPFx allows you to create several styles of webparts
  - Standard Webparts
  - React Webparts
- SPFx also provides several other Application Extensions
  - Application Customizer
  - Field Customizers
  - Command Sets



Installing Packages for SPFx Development

- Install Gulp (version 3)

```
npm install -g gulp
```

- Install Yeoman

```
npm install -g yo
```

- Install Yeoman Template for SPFx

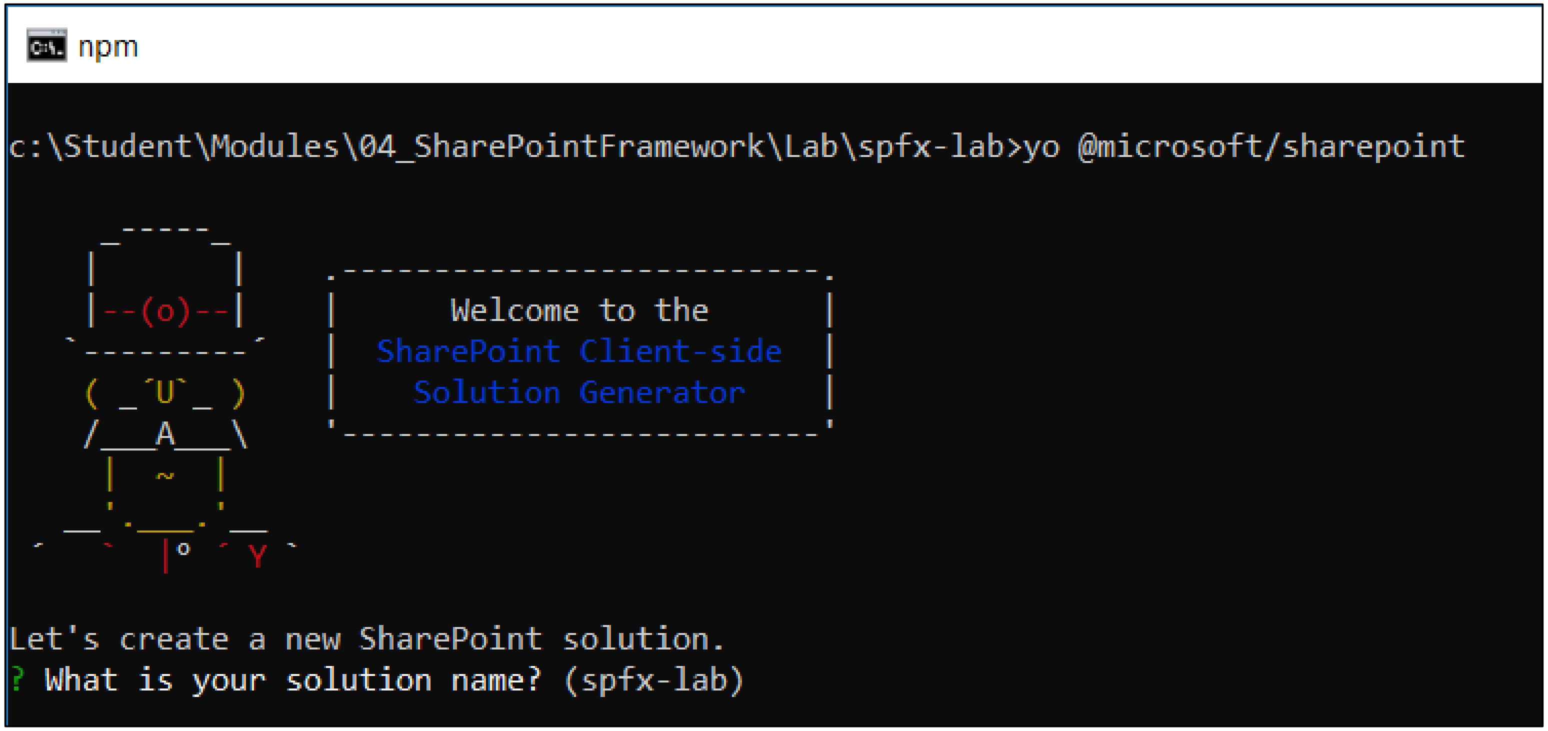
```
npm install -g @microsoft/generator-sharepoint
```

Using the SPFx Yeoman Template

- SPFx projects created with Yeoman template

```
yo @microsoft/sharepoint
```

- Template provides wizard-like experience when creating new project

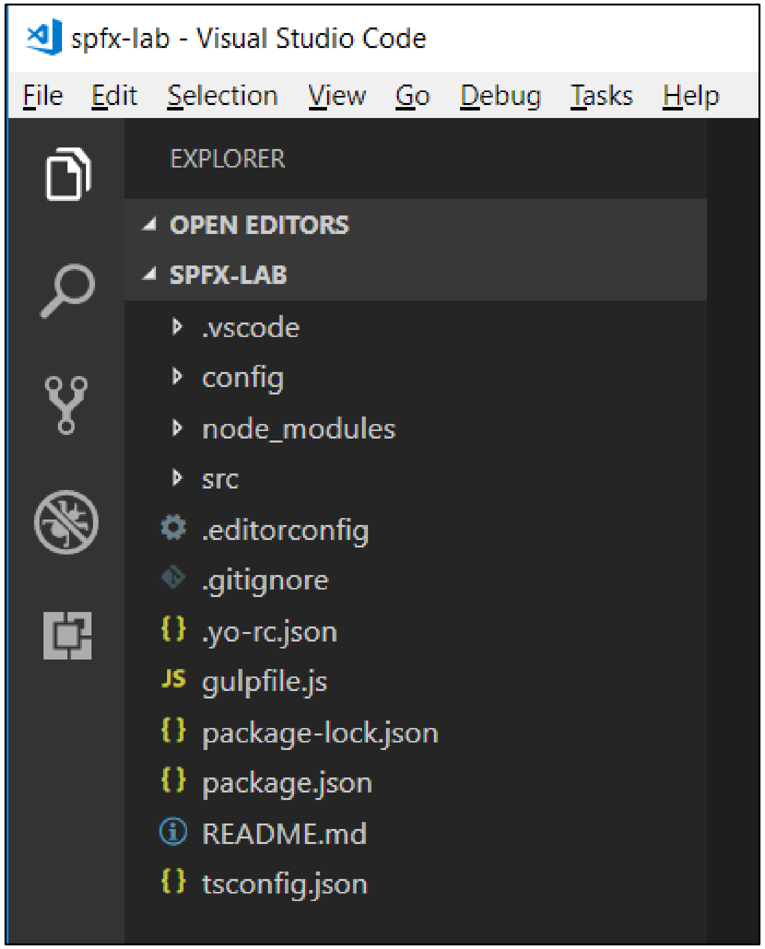


npm

```
c:\Student\Modules\04_SharePointFramework\Lab\spfx-lab>yo @microsoft/sharepoint

     _-----_
    |       |    .--------------------------.
    |--(o)--|    |      Welcome to the      |
   `---------´   |  SharePoint Client-side  |
    ( _´U`_ )    |    Solution Generator    |
    /___A___\    '--------------------------'
     |  ~  |
   __'.___.'__
 ´   `  |° ´ Y `

Let's create a new SharePoint solution.
? What is your solution name? (spfx-lab)
```

SharePoint Framework Project Structure

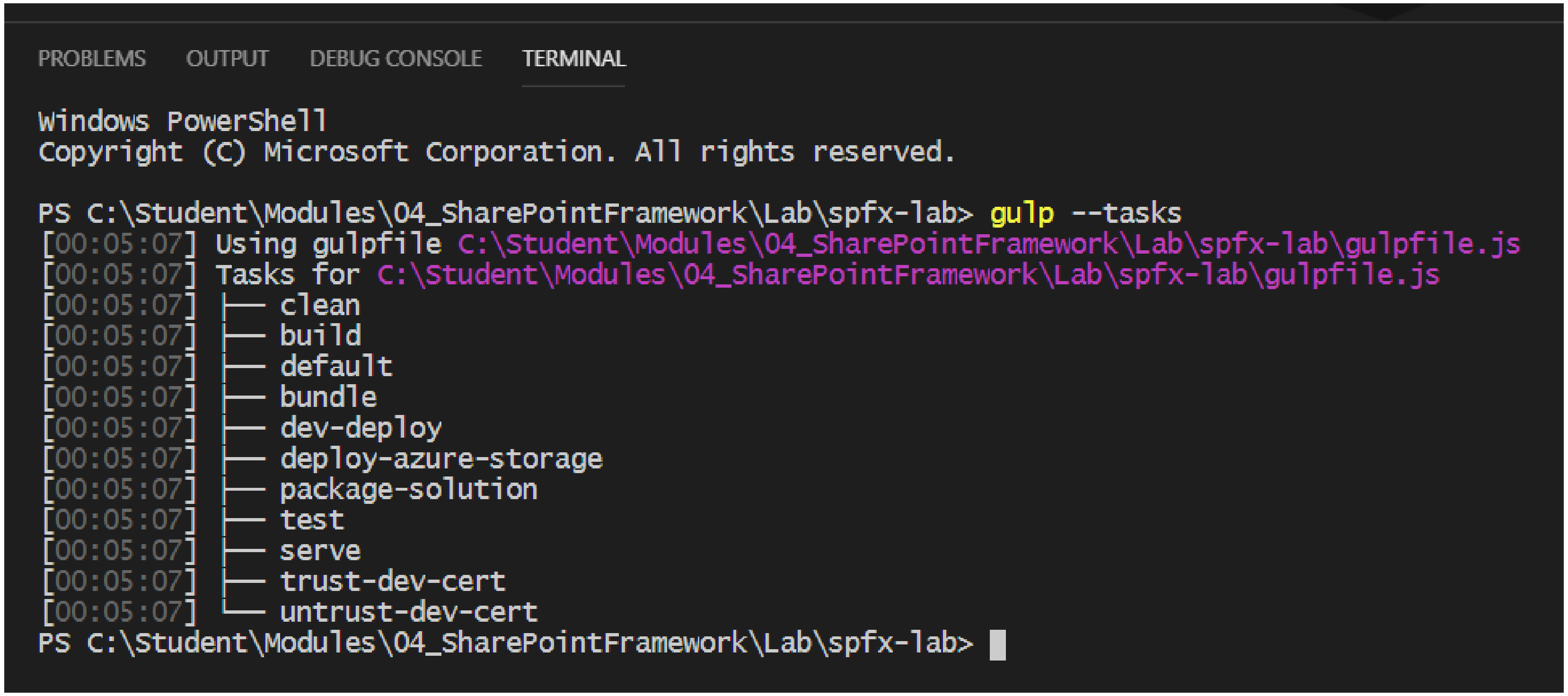
- Project created as Node.js project


spfx-lab - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
EXPLORER
OPEN EDITORS
SPFX-LAB

```
.vscode
config
node_modules
src
.editorconfig
.gitignore
.yo-rc.json
gulpfile.js
package-lock.json
package.json
README.md
tsconfig.json
```

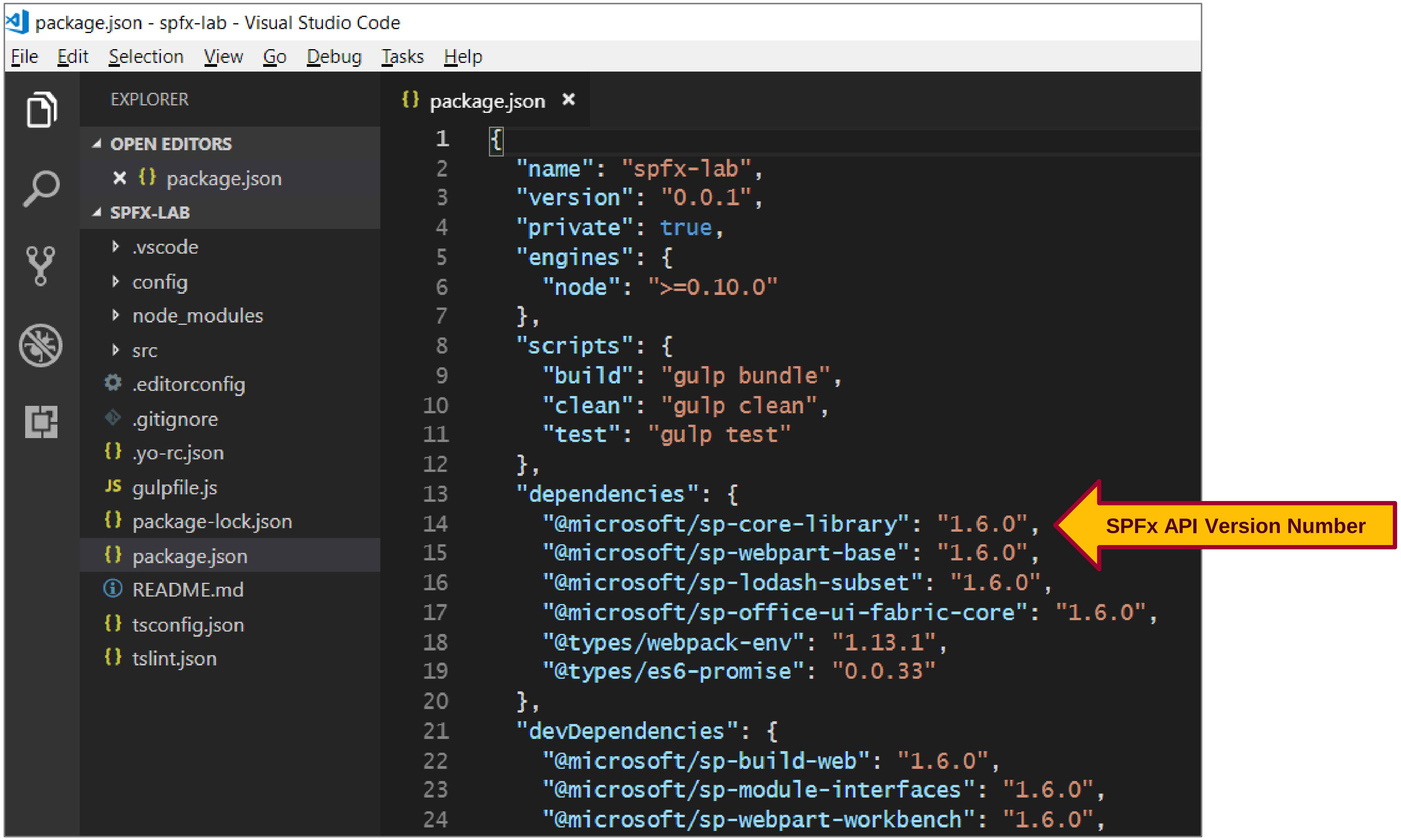
SharePoint Framework Adds Gulp Tasks

- Run **gulp --tasks** to see SPFx gulp tasks added to project



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Student\Modules\04_SharePointFramework\Lab\spfx-lab> gulp --tasks
[00:05:07] Using gulpfile C:\Student\Modules\04_SharePointFramework\Lab\spfx-lab\gulpfile.js
[00:05:07] Tasks for C:\Student\Modules\04_SharePointFramework\Lab\spfx-lab\gulpfile.js
[00:05:07] ├── clean
[00:05:07] ├── build
[00:05:07] ├── default
[00:05:07] ├── bundle
[00:05:07] ├── dev-deploy
[00:05:07] ├── deploy-azure-storage
[00:05:07] ├── package-solution
[00:05:07] ├── test
[00:05:07] ├── serve
[00:05:07] ├── trust-dev-cert
[00:05:07] └── untrust-dev-cert
PS C:\Student\Modules\04_SharePointFramework\Lab\spfx-lab>
```

Package.json



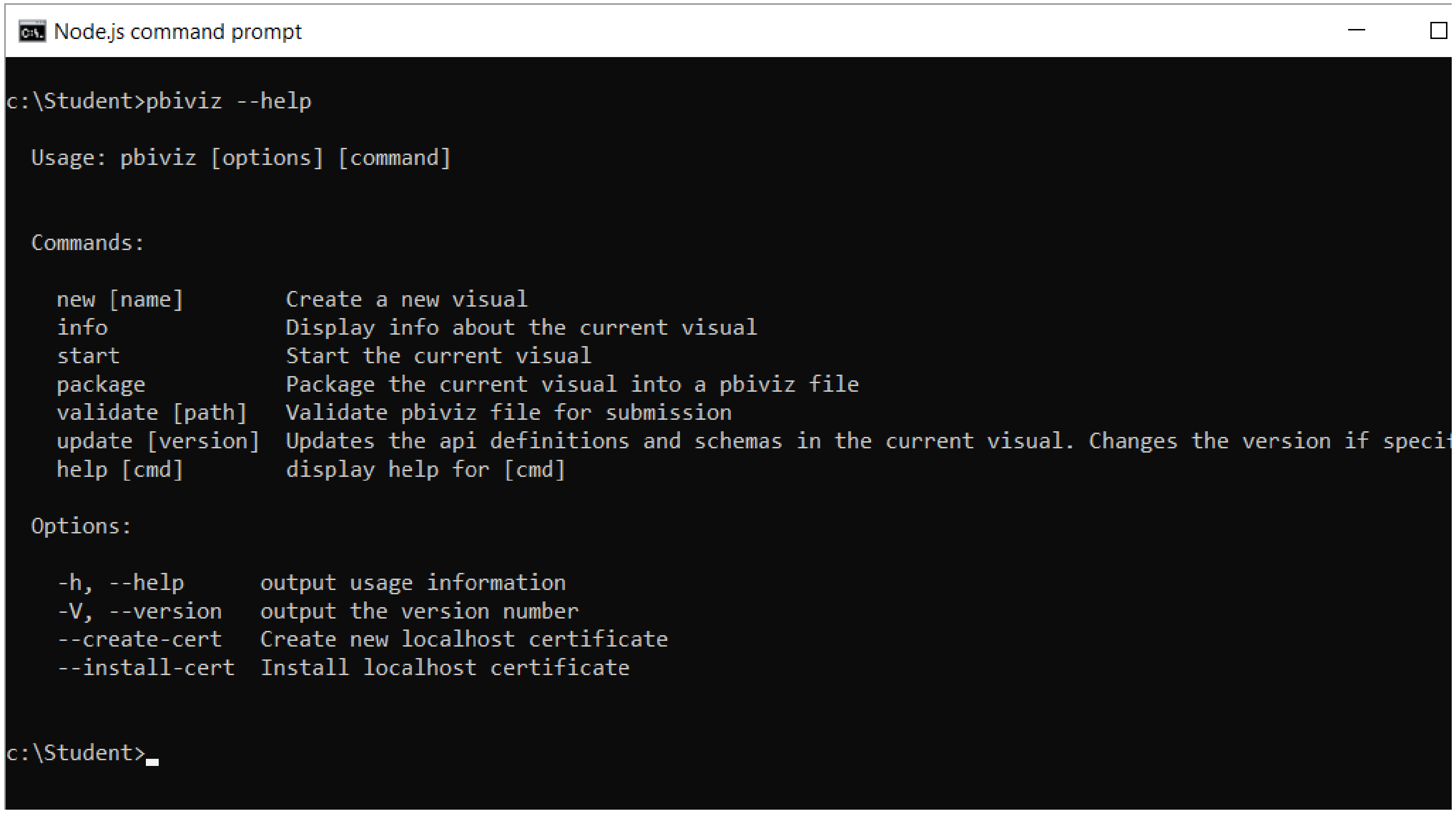
```
{
  "name": "spfx-lab",
  "version": "0.0.1",
  "private": true,
  "engines": {
    "node": ">=0.10.0"
  },
  "scripts": {
    "build": "gulp bundle",
    "clean": "gulp clean",
    "test": "gulp test"
  },
  "dependencies": {
    "@microsoft/sp-core-library": "1.6.0",
    "@microsoft/sp-webpart-base": "1.6.0",
    "@microsoft/sp-lodash-subset": "1.6.0",
    "@microsoft/sp-office-ui-fabric-core": "1.6.0",
    "@types/webpack-env": "1.13.1",
    "@types/es6-promise": "0.0.33"
  },
  "devDependencies": {
    "@microsoft/sp-build-web": "1.6.0",
    "@microsoft/sp-module-interfaces": "1.6.0",
    "@microsoft/sp-webpart-workbench": "1.6.0",
```

Agenda

- ✓ Introduction to Node.JS and NPM
- ✓ Automating Build Tasks using Gulp
- ✓ Bundling Project Assets using Webpack
- ✓ Developing with React.js, TypeScript and Webpack
- ✓ Developing with SharePoint Framework
- ➢ Developing Custom Visuals for Power BI

Getting Started with PBIVIZ

- PBIVIZ.EXE is a command-line utility
  - You execute PBIVIZ commands from the NODE.JS command line

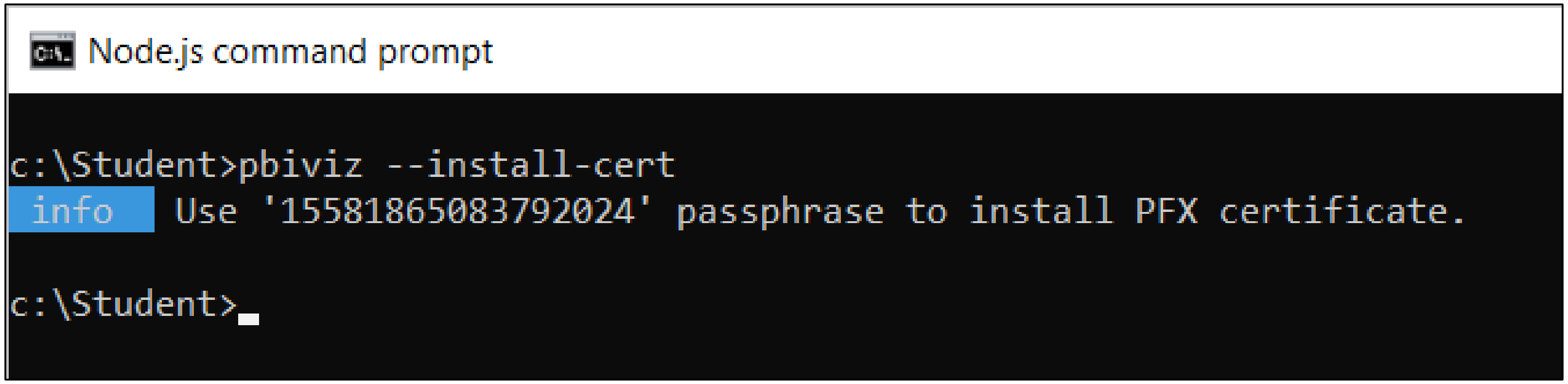


Node.js command prompt

```
c:\Student>pbiviz --help

  Usage: pbiviz [options] [command]


  Commands:

    new [name]        Create a new visual
    info              Display info about the current visual
    start             Start the current visual
    package           Package the current visual into a pbiviz file
    validate [path]   Validate pbiviz file for submission
    update [version]  Updates the api definitions and schemas in the current visual. Changes the version if speci
    help [cmd]        display help for [cmd]

  Options:

    -h, --help      output usage information
    -V, --version   output the version number
    --create-cert   Create new localhost certificate
    --install-cert  Install localhost certificate


c:\Student>_
```

Installing the SSL Certificate

- Installing certificate enables SSL through https://localhost
  - Installing certificate is a one time operation – not once per project
  - SSL certificate installed using **pbiviz --install-cert** command
  - Running **--install-cert** command starts Certificate Import Wizard



Node.js command prompt

```
c:\Student>pbiviz --install-cert
 info   Use '15581865083792024' passphrase to install PFX certificate.

c:\Student>_
```

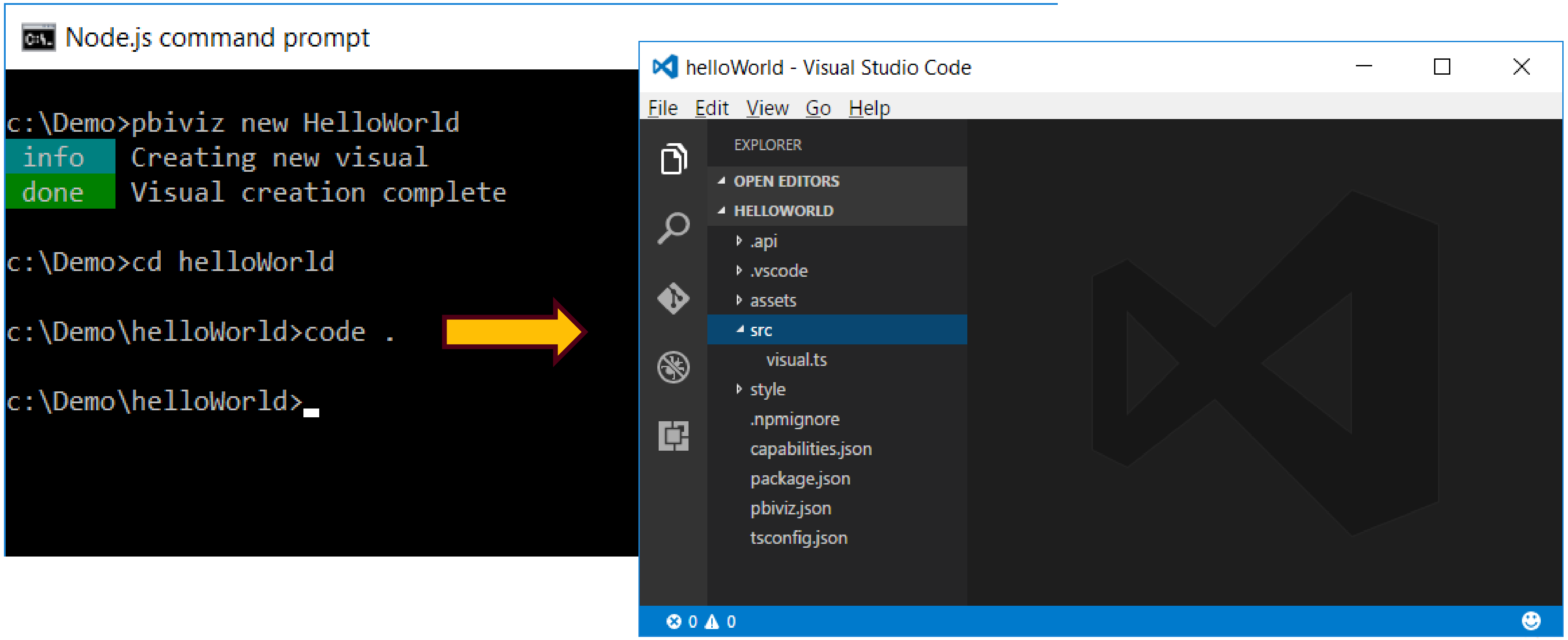
Creating a New Custom Visual Project

- Creating a new project

  `pbiviz new <ProjectName>`

- Open the Project with Visual Studio Code

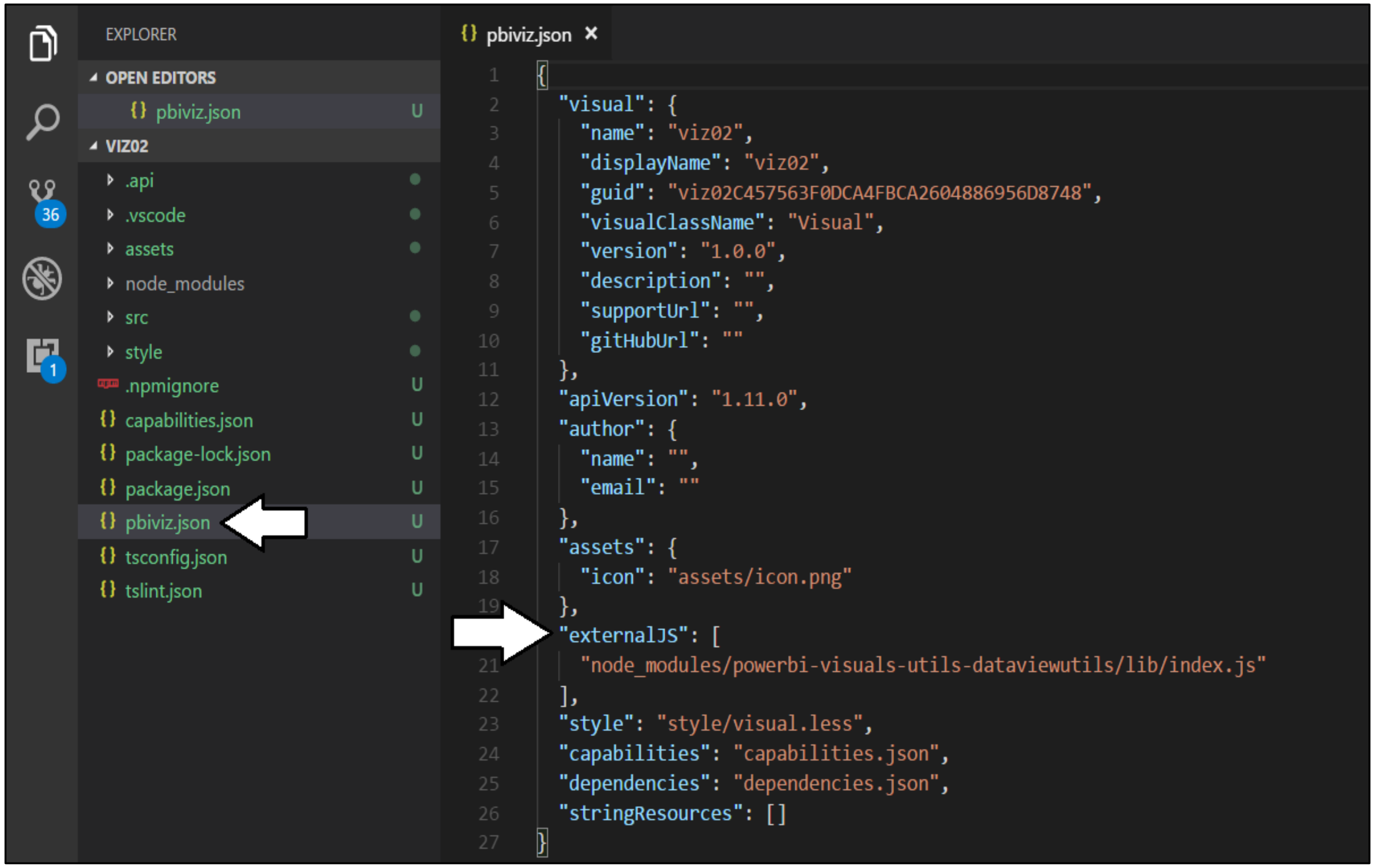
  `code .`



```
c:\Demo>pbiviz new HelloWorld
 info   Creating new visual
 done   Visual creation complete

c:\Demo>cd helloWorld

c:\Demo\helloWorld>code .

c:\Demo\helloWorld>_
```

The pbiviz.json File

- Acts as top-level manifest file for custom visual project
  - External JS library files must be referenced in **externalJS** section



```
{
  "visual": {
    "name": "viz02",
    "displayName": "viz02",
    "guid": "viz02C457563F0DCA4FBCA2604886956D8748",
    "visualClassName": "Visual",
    "version": "1.0.0",
    "description": "",
    "supportUrl": "",
    "gitHubUrl": ""
  },
  "apiVersion": "1.11.0",
  "author": {
    "name": "",
    "email": ""
  },
  "assets": {
    "icon": "assets/icon.png"
  },
  "externalJS": [
    "node_modules/powerbi-visuals-utils-dataviewutils/lib/index.js"
  ],
  "style": "style/visual.less",
  "capabilities": "capabilities.json",
  "dependencies": "dependencies.json",
  "stringResources": []
}
```

Summary

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