

Developing with Node.js and Visual Studio Code



Agenda

- Introduction to Node.JS and NPM
- Installing and Updating Packages in Visual Studio Code
- Adding TypeScript Support to a Node.js Project
- Configuring Node.js with Server-side Debugging Support
- Using Gulp to Automate Running Development Tasks
- Developing Projects using Webpack



Cross-platform Toolchain

- Node.js
- Node Package Manager (npm)
- TypeScript
- Gulp
- Webpack



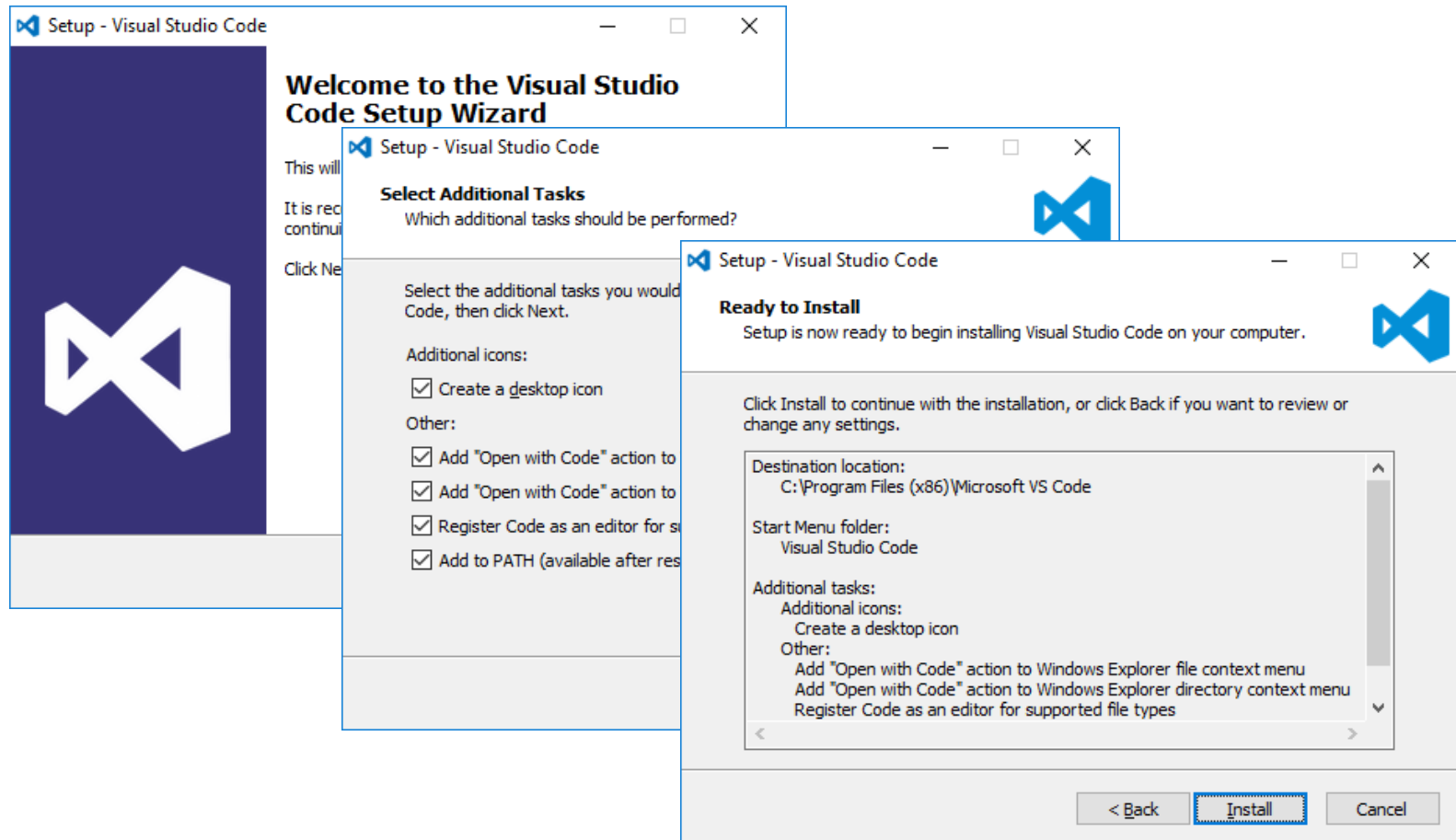
Installing node.js

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



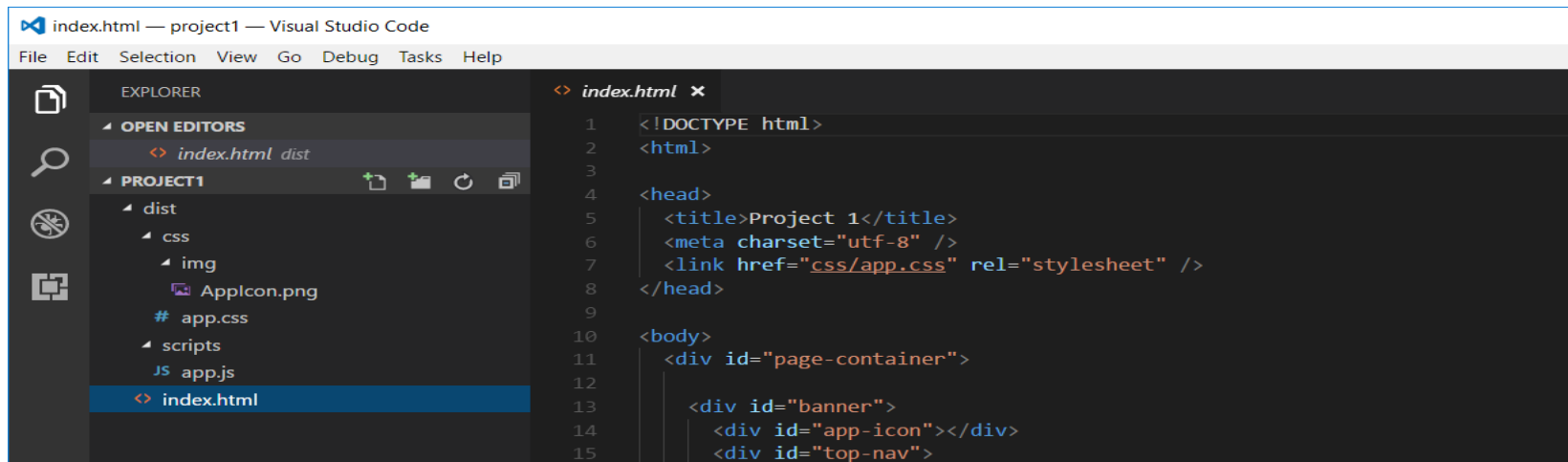
Install Visual Studio Code

- <http://code.visualstudio.com/>



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

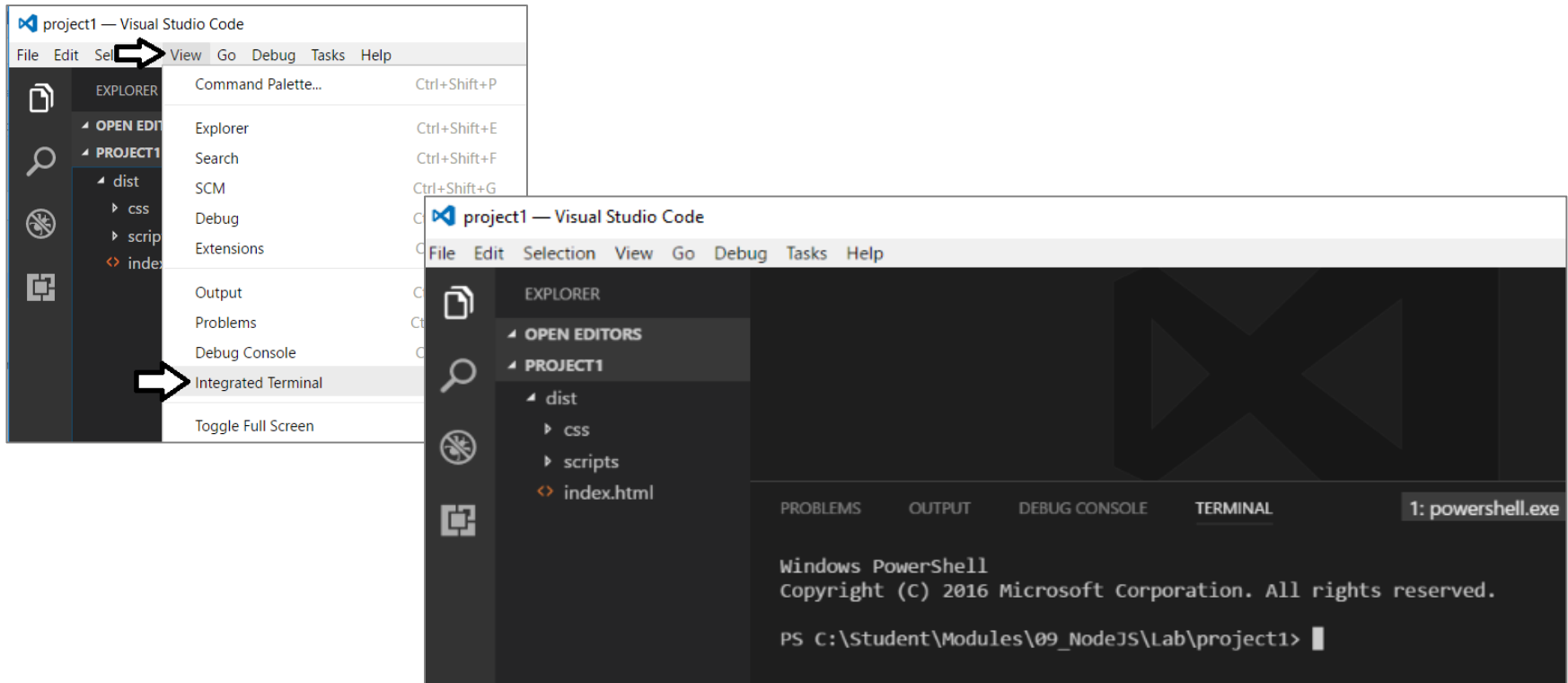


- Visual Studio is not a good fit for Node.js development
 - Visual Studio solution & project files incompatible with Node.js



Integrated Terminal

- Use the Integrated Terminal to execute `npm` command



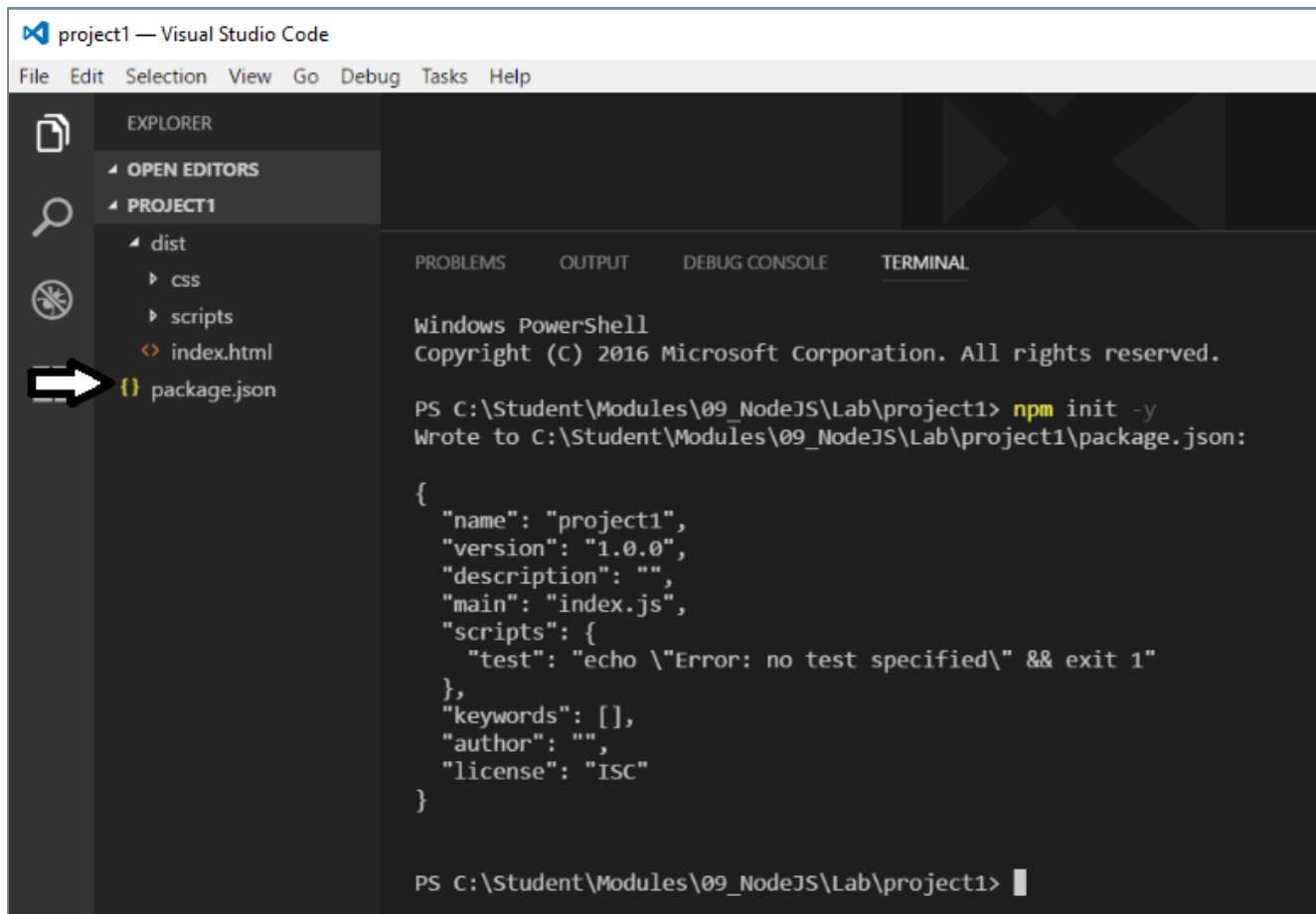
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npm init

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



The screenshot shows the Visual Studio Code interface for a project named 'project1'. The Explorer sidebar on the left displays the file structure: 'dist' (containing 'css' and 'scripts'), 'index.html', and 'package.json'. A white arrow points to the 'package.json' file. The TERMINAL panel on the right shows the output of the 'npm init -y' command, which has created a 'package.json' file with the following content:

```
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

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

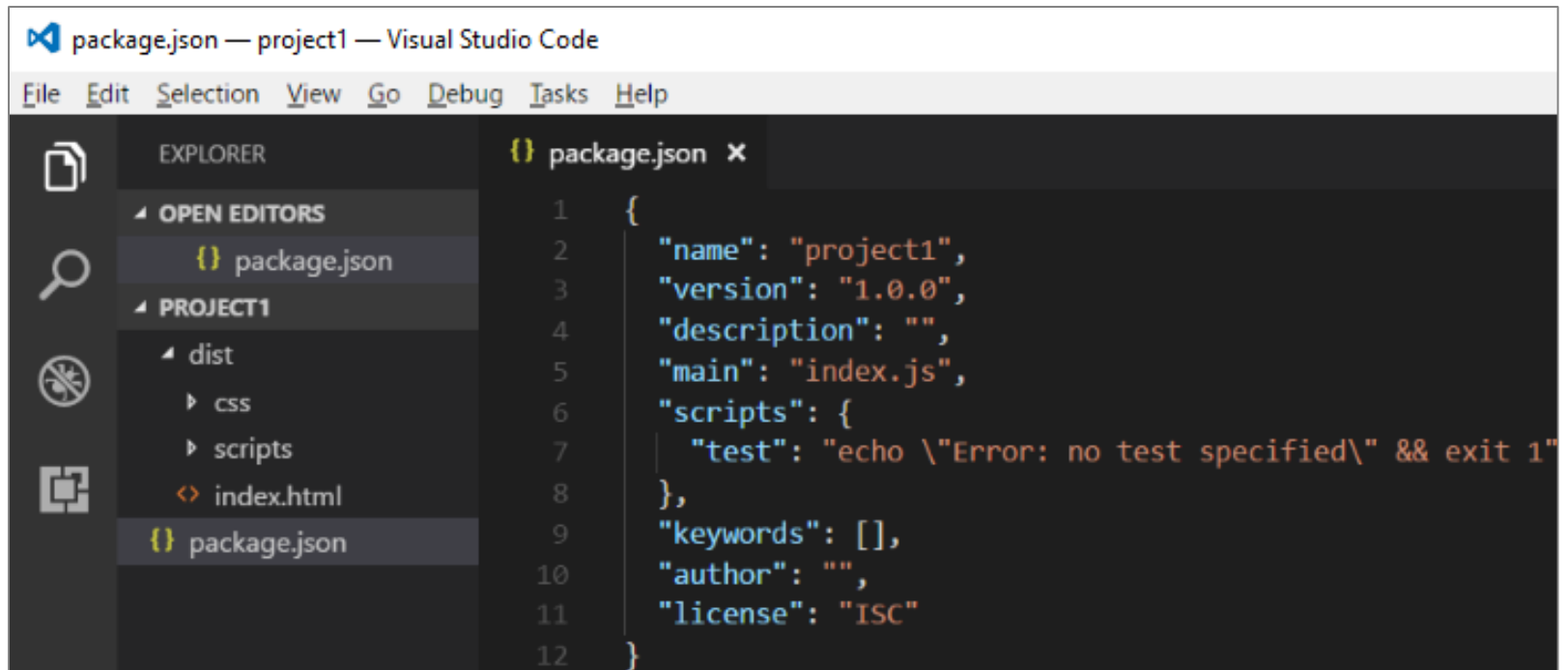
{
  "name": "project1",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC"
}
```

The terminal prompt is currently at '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



The screenshot shows the Visual Studio Code interface with the `package.json` file open in the Editor. The Explorer on the left shows the project structure with `package.json` selected. The Editor displays the following JSON content:

```
1 {  
2   "name": "project1",  
3   "version": "1.0.0",  
4   "description": "",  
5   "main": "index.js",  
6   "scripts": {  
7     "test": "echo \"Error: no test specified\" && exit 1"  
8   },  
9   "keywords": [],  
10  "author": "",  
11  "license": "ISC"  
12 }
```



Installing Packages

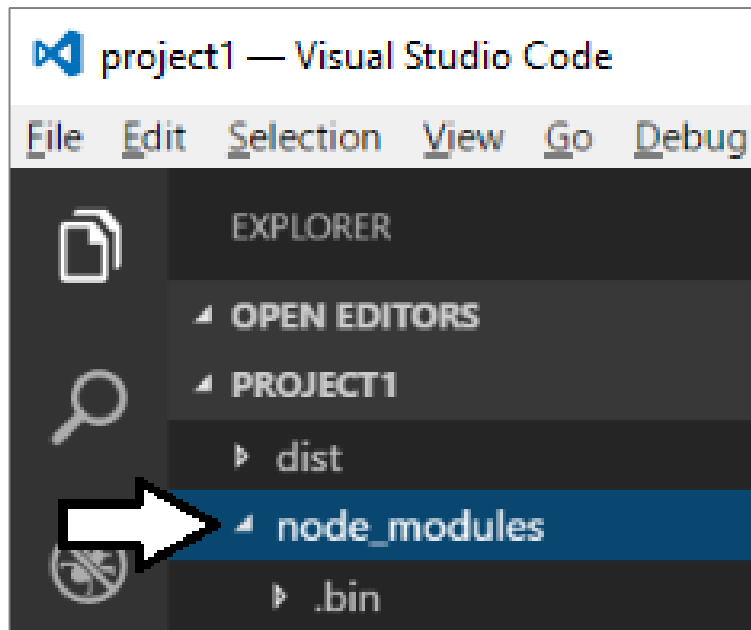
```
npm install browser-sync --save-dev
```

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



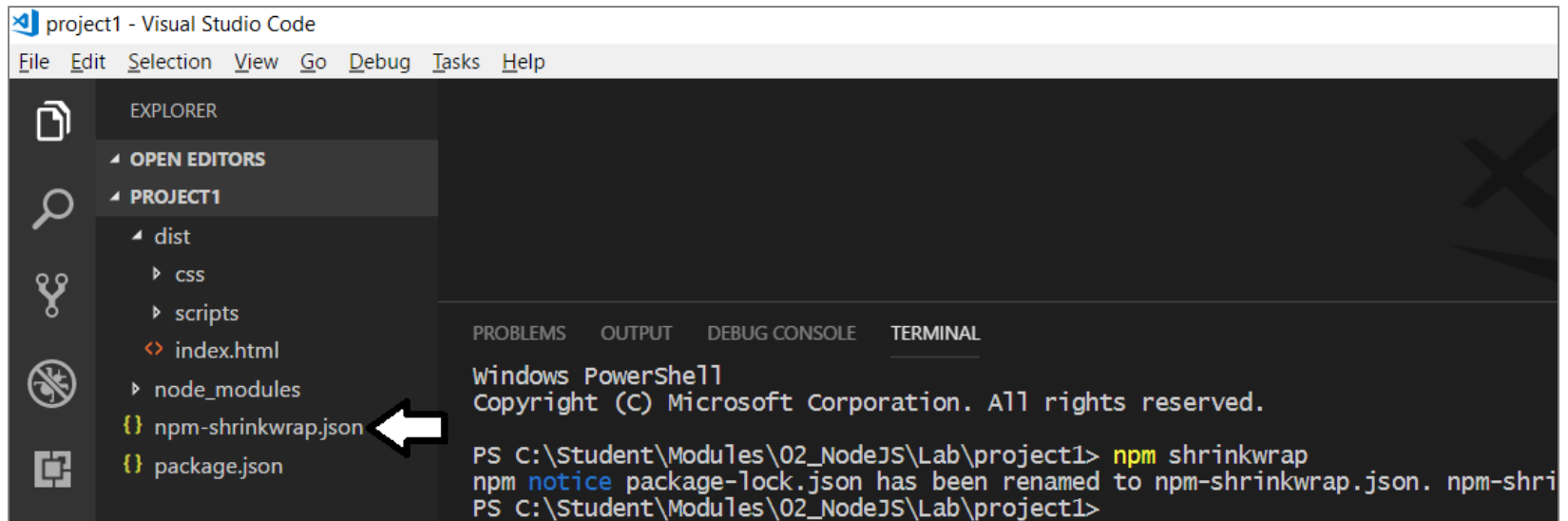
node_modules folder

- 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



package.lock.json vs npm.shrinkwrap.json

- **npm** generates files to track changes to **node-modules**
 - **package.lock.json** file initially created when installing packages.
 - **package.lock.json** file should not be checked into source control
- Running **npm shrinkwrap** generates **npm.shrinkwrap.json**
 - **npm.shrinkwrap.json** file can be checked into source control



The screenshot shows the Visual Studio Code interface for a project named 'project1'. The Explorer sidebar on the left displays the file structure under 'PROJECT1', including 'dist' (with 'css', 'scripts', and 'index.html'), 'node_modules', 'npm-shrinkwrap.json' (highlighted with a white arrow), and 'package.json'. The bottom panel shows the 'TERMINAL' tab with a Windows PowerShell prompt. The terminal output shows the command 'npm shrinkwrap' being executed, with a message indicating that 'package-lock.json' has been renamed to 'npm-shrinkwrap.json'.

```
project1 - Visual Studio Code
File Edit Selection View Go Debug Tasks Help

EXPLORER
├─ OPEN EDITORS
├─ PROJECT1
│  ├─ dist
│  │  ├── css
│  │  ├── scripts
│  │  └─ index.html
│  ├── node_modules
│  ├── npm-shrinkwrap.json
│  └─ package.json
└─ ...

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Student\Modules\02_NodeJS\Lab\project1> npm shrinkwrap
npm notice package-lock.json has been renamed to npm-shrinkwrap.json. npm-shri
PS C:\Student\Modules\02_NodeJS\Lab\project1>
```

Project Install vs Global Install

- Project installation adds package into project folder
 - Packages installed without -g parameter
`npm install [package_name] --save-dev`
 - **npx** command used to run CLIs from local **node_modules** folder
`npx package_cli`
- Global installation adds into shared package cache
 - Packages installed with -g parameter
`npm install -g [package_name]`
 - Package CLIs can be called directly from command line
`package_cli`



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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":"darwin","arch"
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4: wanted {"os":"darwin","arch"
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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

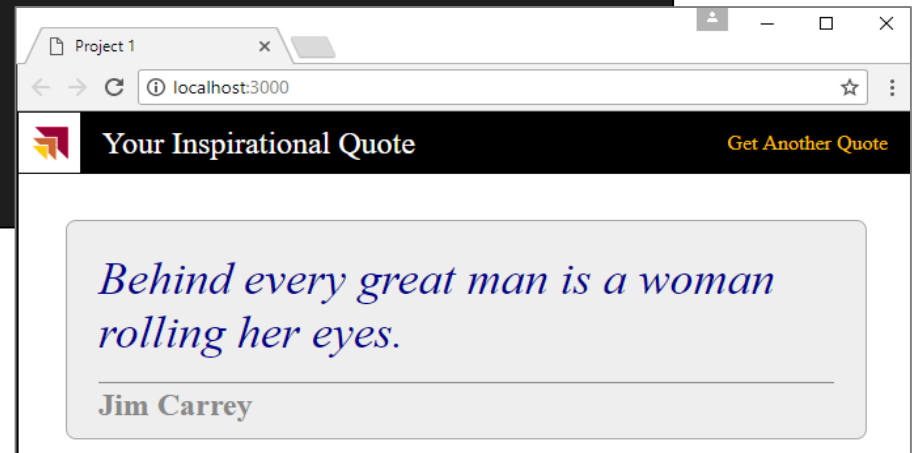
- **browser-sync start** command used to start web server
 - **--server** parameters references root folder with **index.html**

```
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
```



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)? █
```



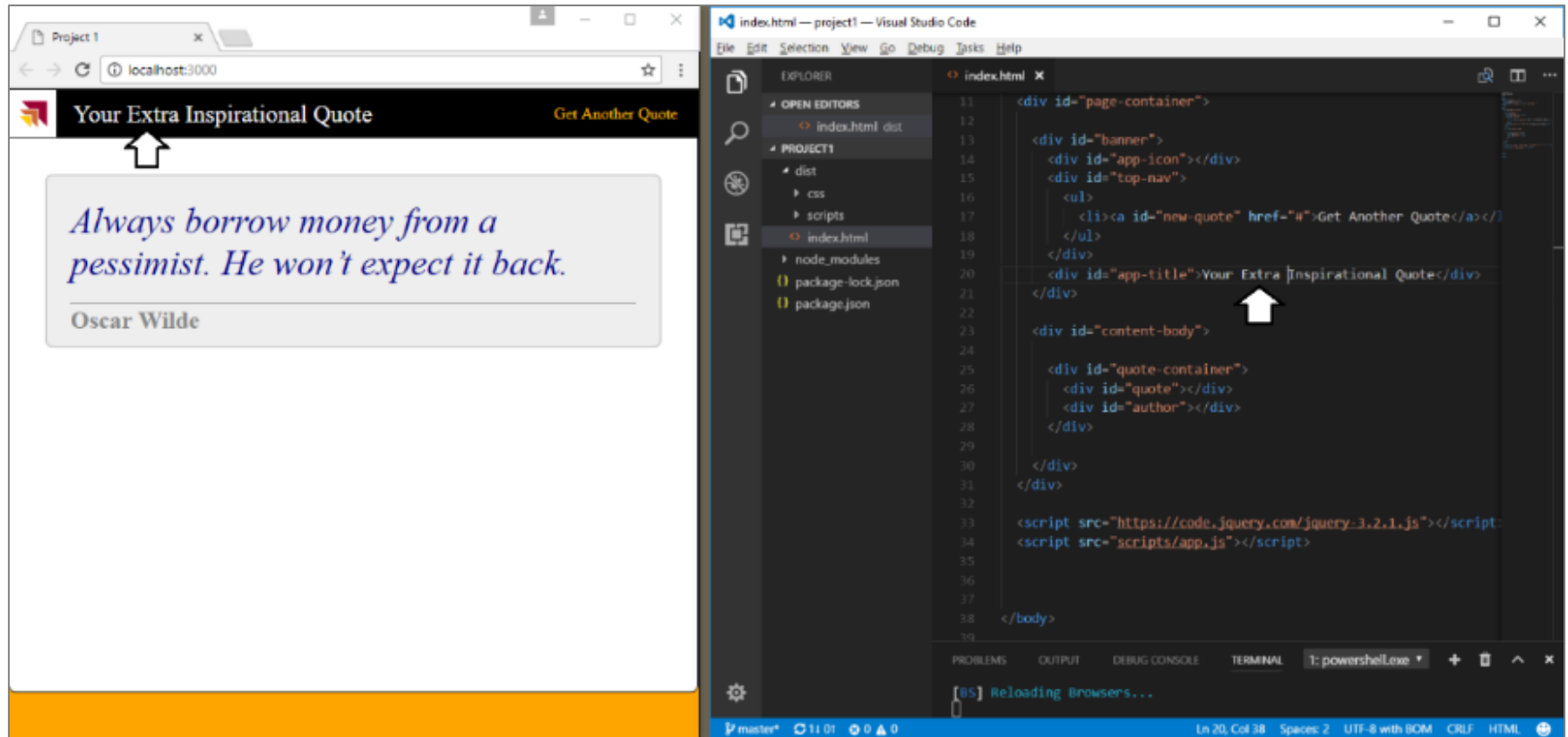
Starting Browser-sync with File Watching

- Browser-sync support `--files` parameter
 - `browser-sync start --server dist --files dist`

```
PS C:\Student\Modules\02_NodeJS\Lab\project1> browser-sync start --server dist --files 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
[Browsersync] Watching files... 
```



Automatic Updates



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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\fsevents)
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.4
+ typescript@3.0.1
added 1 package in 8.156s
PS C:\Student\Modules\02_NodeJS\Lab\project1>
```

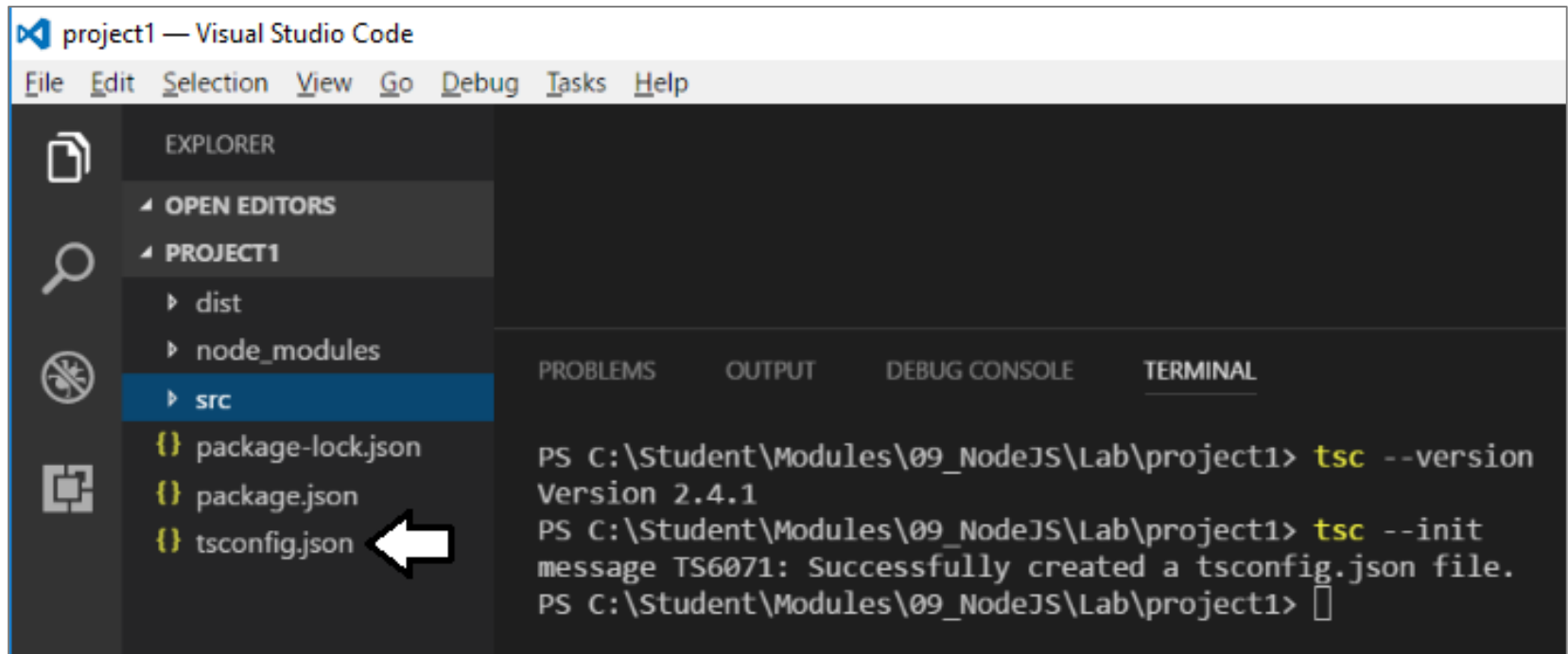
- Take note of version number of typescript package
 - typescript version may vary from one project to another
 - Determine project-specific version using **npx tsc --version**

```
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



The screenshot shows the Visual Studio Code interface for a project named 'project1'. The Explorer sidebar on the left displays the file structure: 'PROJECT1' contains 'dist', 'node_modules', and 'src' folders, and three files: 'package-lock.json', 'package.json', and 'tsconfig.json'. A white arrow points to 'tsconfig.json'. The bottom panel shows the 'TERMINAL' tab with the following commands and output:

```
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

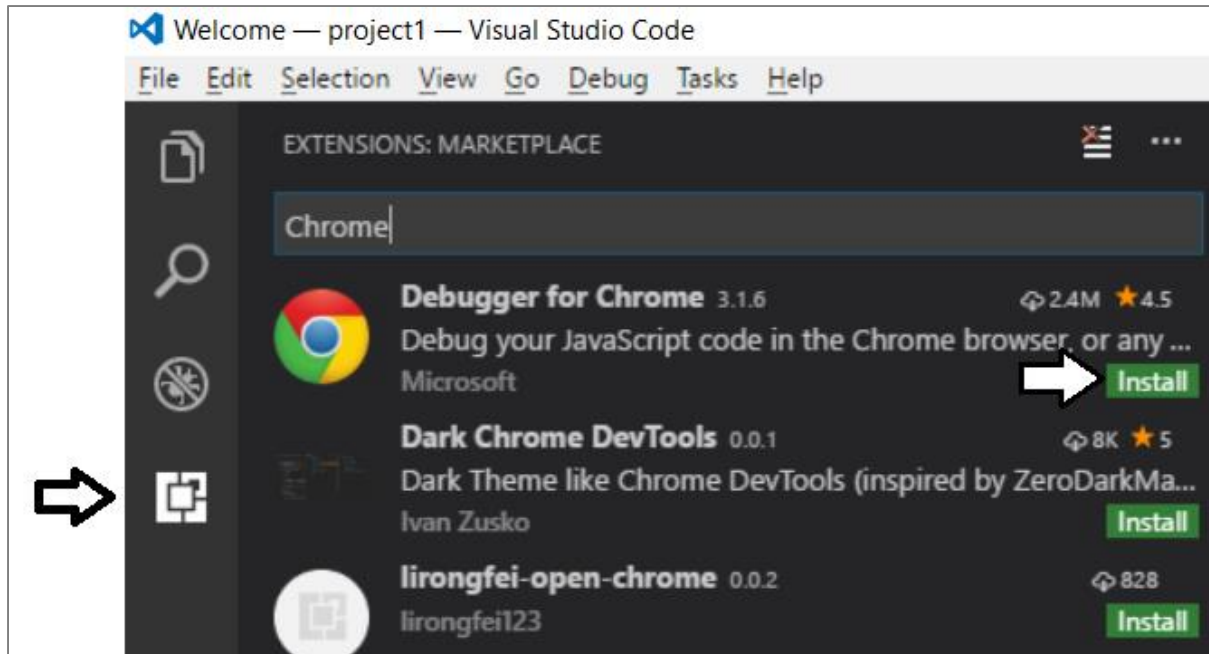
- Example of a **tsconfig.json** file

```
{  
  "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"  
  ]  
}
```



Chrome Debugging Support

- Visual Studio Code provides Chrome debugger extension
 - Provides ability to debug client-side Typescript code



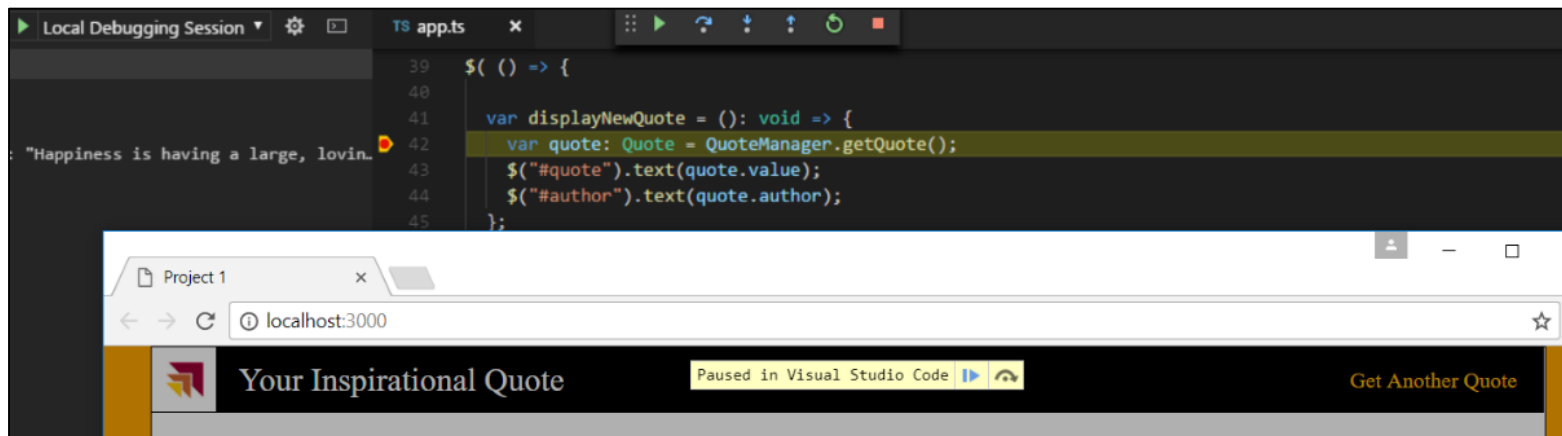
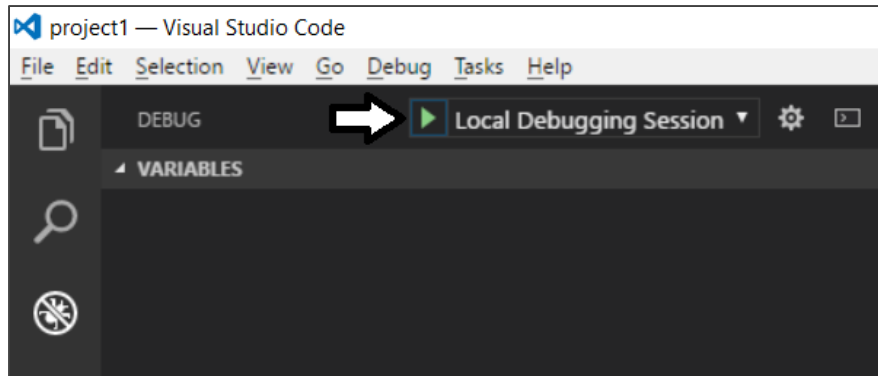
Visual Studio Debugging Support

- Debugging configurations tracked in launch.json

```
{ } launch.json ●
1  {
2      "version": "0.2.0",
3      "configurations": [
4          {
5              "name": "Local Debugging Session",
6              "type": "chrome",
7              "request": "launch",
8              "url": "http://localhost:3000/",
9              "webRoot": "${workspaceRoot}/dist",
10             "sourceMaps": true,
11             "runtimeArgs": [
12                 "--remote-debugging-port=9222"
13             ]
14         }
15     ]
16 }
```



Running the Debugger



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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 for
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

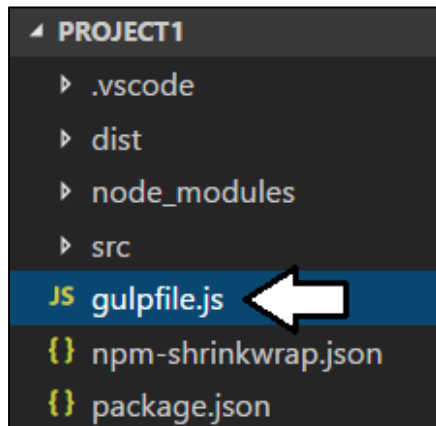
npm WARN project1@1.0.0 No description
npm WARN project1@1.0.0 No repository field.

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



gulpfile.js

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



```
JS gulpfile.js x
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("."));
});
```

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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

```
TS app.ts x
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);
  }
});
```

```
TS quote.ts •
1 export class Quote {
2   value: string;
3   author: string;
4   constructor(value: string, author: string){
5     this.value = value;
6     this.author = author;
7   }
8 }
```

```
TS quote-manager.ts x
1 import { Quote } from './quote';
2
3 export class QuoteManager {
4
5   private static quotes: Quote[] = [
6     new Quote("Always borrow money from a pal", "John D. MacDonald"),
7     new Quote("Behind every great man is a great woman", "Robert A. Heinlein"),
8     new Quote("In Hollywood a marriage is a business", "Marilyn Monroe")
9   ];
10 }
```



Webpack Loaders

- Loaders do two things
 - Identify which file or files should be transformed
 - Transform files and add 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`



Summary

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