Angular Introduction

Agenda

- What is a SPA?
- Angular.JS Overview and Version Comparison
- Node.js, npm, WebPack, Yarn
- Angular Command Line Interface – Angular CLI
- Bootstrapping Angular / Project Configuration using Node.js

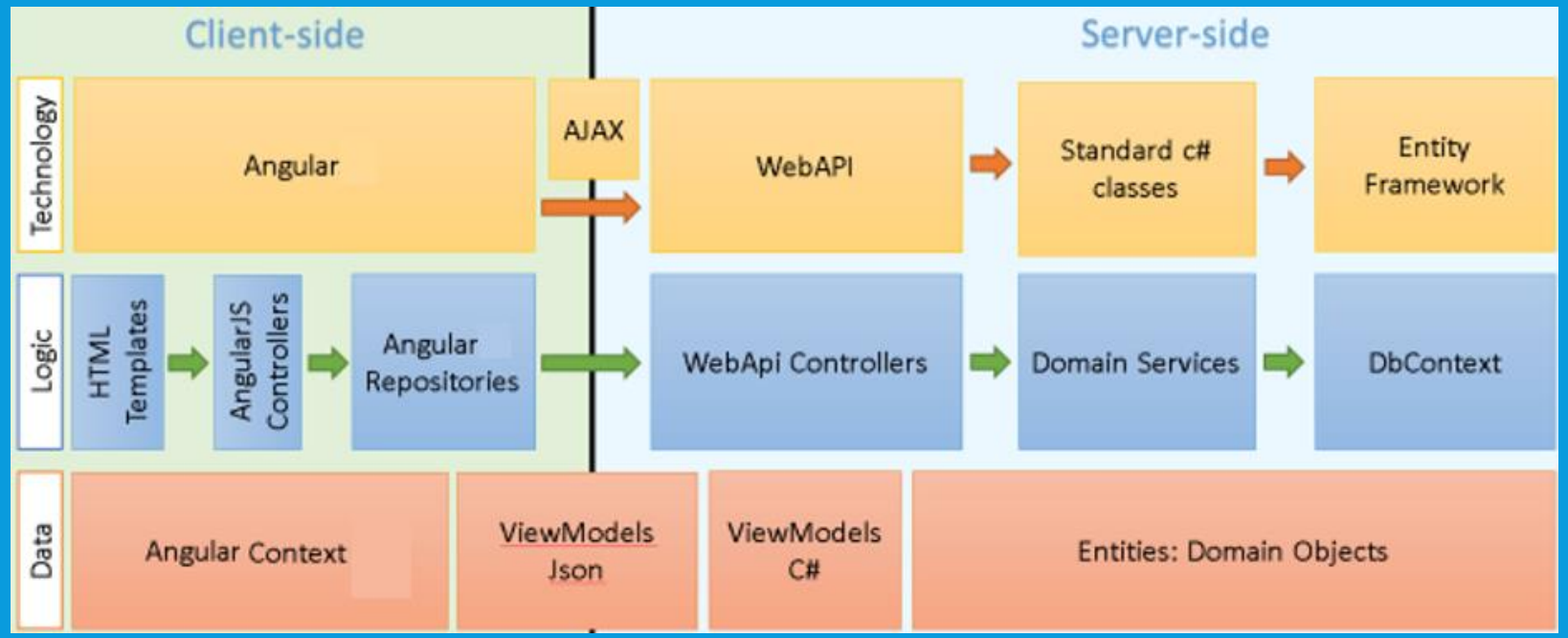
What is a SPA

What is a Single Page Application (SPA)

- A single-page application (SPA) is a web application that fits on a single page with the goal of providing a more fluent user experience similar to a desktop application
- In a SPA, either all necessary assets like HTML, JavaScript, and CSS –
  - is retrieved with a single page load, or
  - resources are dynamically loaded and added to the page, usually in response to user actions
- SPA's are often implemented using JavaScript Frameworks that use assync XMLHttpRequests like
  - Ember.js / Knockout.js
  - Angular JS
  - React

SPA Architecture

- SPA's can be implemented using a combination of client- and server side technologies
- Microsoft server side technologies often used together with SPA's are
  - Entity Framework
  - .NET Core WebAPI



Comparing SPA / Multi Page Applicaiton (MPA)

- SPA advantages over MPA:
  - Faster page loading times
  - Improved user experience because the data is loading in the background form server
  - No need to write the code to render pages on the server
  - Decoupling of front-end and back-end development
  - Simplified mobile development; you can reuse the same backend for web application and native mobile application
- SPA disadvantages to MPA:
  - Heavy client frameworks which are required to be loaded to the client
  - UI code is not compiled, so it's harder to debug and it's exposed to potential malicious user
  - SEO (search engine optimization) implications; since your pages are built in the browser, the search engine crawler will see a different version of the page than that of your users

Angular Introduction

What is ANGULAR?

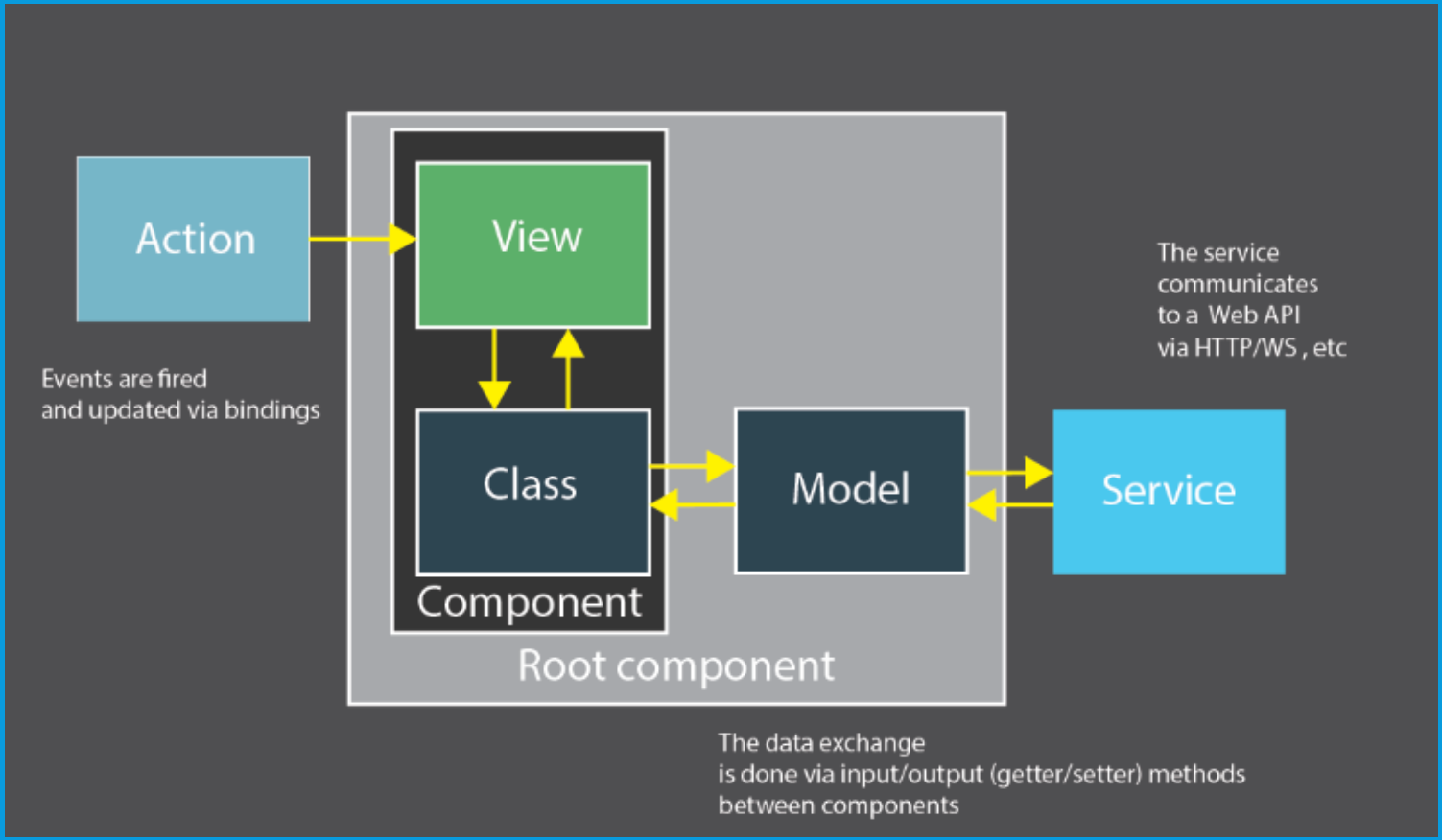
- A Single Page App (SPA) Framework maintained by Google
- Enhances HTML by attaching directives, custom tags, attributes, expressions, templates within HTML.
- Encourage TDD & Client Side MVC/MVVM design pattern
- Current version 5 released Nov 01 2017

- Schedule published @
- https://github.com/angular/angular/blob/master/docs/RELEASE_SCHEDULE.md

Versions

- Angular JS (1.0)
  - Implemented mostly in pure JavaScript
- Angular (2+)
  - Complete Rewrite
  - Drastic change between 1.x and 2.x
  - Mostly Implemented in TypeScript
  - Current Version 5.x

Components - Angulars MVC



Routing

- Routing is the process to switch from one view to another
- Routing is archieved using Angular Router
- Routing is configured in app.module.ts
- Router Links are used for navigation

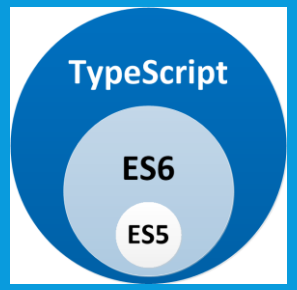
```
<nav>
<a routerLink="/" routerLinkActive="active">Home</a>
<a routerLink="/vouchers" routerLinkActive="active">Vouchers</a>
<a routerLink="/accounts" routerLinkActive="active">Accounts</a>
</nav>
<div>
<router-outlet></router-outlet>
</div>
```

```
const appRoutes: Routes = [
    { path: '',
      component: HomeComponent,
      children: [
        { path: 'inline', component: InlineStyleComponent },
        { path: 'stylebinding', component: StyleBindingComponent }
      ]
    },
    { path: 'vouchers',
      component: VouchersComponent
    },
    { path: 'vouchers/:id',
      component: VoucherComponent
    },
    { path: 'accounts',
      component: AccountsComponent,
      data: { title: 'Accounts' }
    }
  ];
```

Angular Technology Stack

- Runtime / Package Management: Node.js
- Language: TypeScript (ES 6, Dart)
- Templating / Dependencies:

  Angular CLI, Yeoman, NPM, Yarn
- Bundling: Webpack



webpack
MODULE BUNDLER

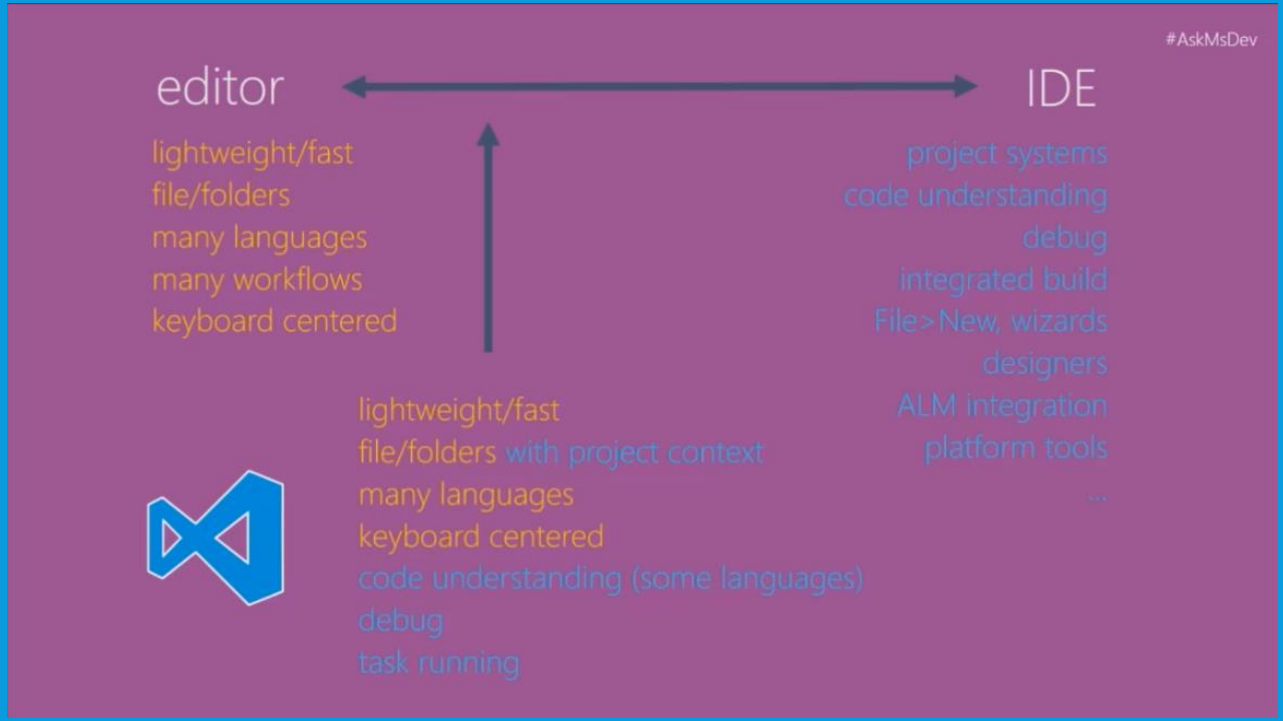
Common Editors

- Any Editor that has integrated Support for Node.js
- Editor is many times result of Plugins available
  - Visual Studio Code
  - Atom, Sublime
  - WebStorm
  - Visual Studio Professional

Visual Studio Code

- Free, Open Source, lightweight cross plattform editor built on top up GitHubs Electron platform
- Optimized to build HTML, JS, TS based applications
- Out-of-box integration of GitHub & Node.js
- Get from https://code.visualstudio.com/
- Source @ https://github.com/microsoft/vscode
- 2nd Choice Editor would be Webstorm

  https://www.jetbrains.com/webstorm



VS Code Shortcuts & Settings

- Ctrl + P — Quick open
- Ctrl + Shift + F — Find in Files
- Ctrl + K, S — Save All
- Ctrl + ö — Open Terminal Window
- Shift + # — Toggle Comment
- Alt + Shift + A — Toggle Block Comment

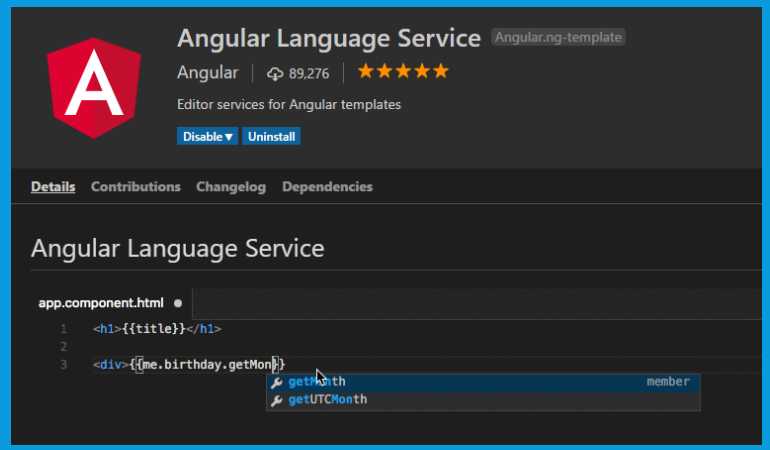
Useful Workspace Settings

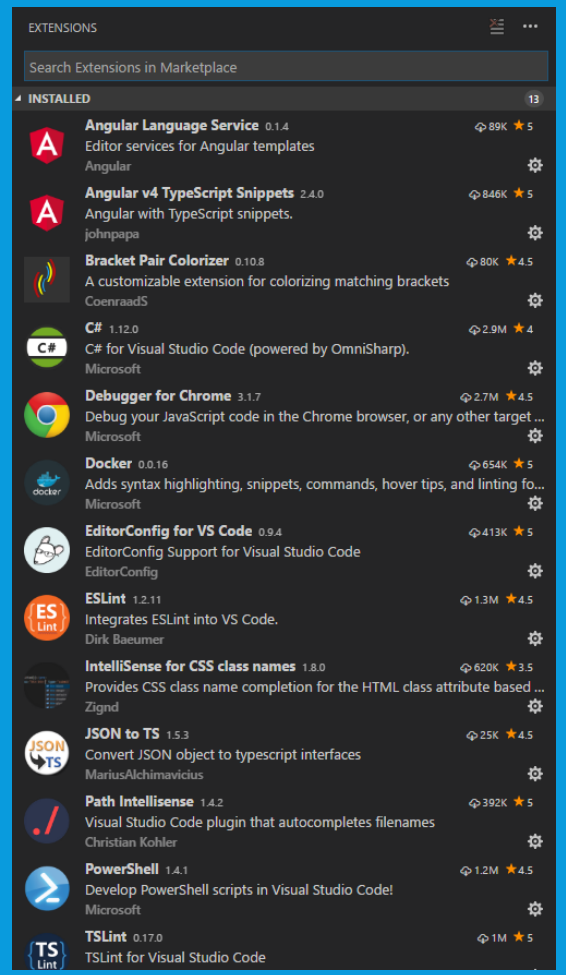
```
"editor.wordWrap": "on"
"workbench.editor.enablePreview": false
```

- Complete VS Code Shortcute Guide:
- https://github.com/Microsoft/vscode-tips-and-tricks

Usefull VS Code Extensions

- Extensions make VS Code development easier
  - Angular v5 Snippets
  - Angular Language Service
  - Debugger for Chrome
  - Bracket Pair Colorizer
  - Path Intellisense
  - JSON 2 TS





Extension Management

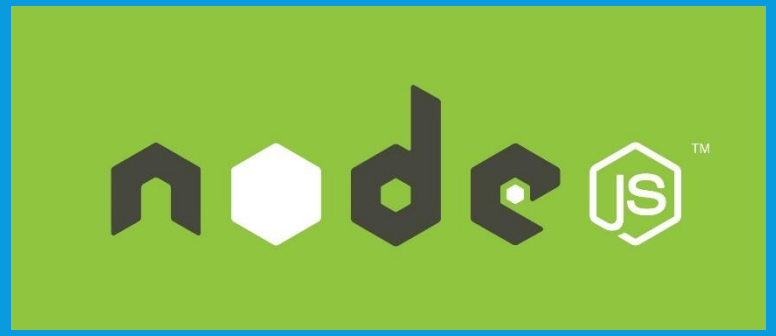
- List
  - code --list-extensions
- Install (VSIX install possible)
  - code --install-extension NAME ie: Angular.ng-template
- Uninstall
  - code --uninstall-extension NAME ie: ms-vscode.csharp

Angular.ng-template
christian-kohler.path-intellisense
clinyong.vscode-css-modules
CoenraadS.bracket-pair-colorizer
DougFinke.vscode-PSStackoverflow
eg2.vscode-npm-script
formulahendry.auto-close-tag
johnpapa.Angular2
KnisterPeter.vscode-github
MariusAlchimavicius.json-to-ts
Mikael.Angular-BeastCode
ms-vscode.csharp
ms-vscode.PowerShell
msjsdiag.debugger-for-chrome
rafaelsalguero.csharp2ts
rbbit.typescript-hero
xabikos.JavaScriptSnippets

Node.js, Yarn, Webpack

What is Node.js

- Node.js is a platform built on Chrome's JavaScript runtime for easily building fast and scalable network applications
- Uses an event-driven, non-blocking I/O model that makes it lightweight and efficient
- Used to build:
  - I/O bound, Data Streaming Applications
  - Data Streaming Applications
  - JSON APIs based Applications
  - Single Page Applications
- Current version 8.0
- Doku @ https://nodejs.org/en/



Nodes Role in Angular Dev

- Node.js accts as a Runtime Host for our Dev Toolset
- Many tasks are automated using „Watchers“

package.json

- The configuration file for node.js
- Defines libs used at runtime or devtime
- packages are saved to node_modules – name cannot be changed
- npm install xxx [–g] –save | npm install xxx [–g] –save-dev
- npm-shrinkwrap creates a npm-shringwrap.json which can used to lock down package dependency

```
"dependencies": {
  "@angular/animations": "^5.1.2",
  "@angular/common": "^5.1.2",
  "@angular/compiler": "^5.1.2",
  "@angular/compiler-cli": "^5.1.2",
  "@angular/core": "^5.1.2",
  "@angular/forms": "^5.1.2",
  "@angular/http": "^5.1.2",
  "@angular/platform-browser": "^5.1.2",
  "@angular/platform-browser-dynamic": "^5.1.2",
  "@angular/platform-server": "^5.1.2",
  "@angular/router": "^5.1.2",
  "bootstrap": "^3.3.7",
  "core-js": "^2.4.1",
  "g": "^2.0.1",
  "jquery": "3.2.1",
  "moment": "2.18.1",
  "rxjs": "^5.5.2",
  "webpack": "^3.5.5",
  "zone.js": "^0.8.14"
},
"devDependencies": {
  "@angular/cli": "^1.6.3",
  "@angular/compiler-cli": "^4.2.4",
  "@angular/language-service": "^4.2.4",
  "@types/jasmine": "~2.5.53",
  "@types/jasminewd2": "~2.0.2",
  "@types/jquery": "3.2.12",
  "@types/moment": "2.13.0",
  "@types/node": "~6.0.60",
  "codelyzer": "~3.1.1",
  "file-loader": "^0.11.2",
```

Node.js Basic Setup

- Install Node.js from https://nodejs.org/
- npm install –g xxx --> installs globally
  - i. e. npm install –g typescript
- Go to cmd of your project
- Get Angular Seeder Project or create using Angular CLI: ng new xxx
- npm install --> installs all dependencies listed in project.json

npm – Node Packet Manager

npm

- npm makes it easy for JavaScript developers to share the code
- Esentially it acts as the package manager for node.js using the “install” cmd
- Lots of other cli commands
  - version
  - build
  - bundle
  - start
- Documented @ https://docs.npmjs.com/cli/install

npmjs.com

- npmjs.com is a centralized repository form packages
- Allows to have private packages calles @scope (@microsoft/xx, @angular/xx)
- Used in vendor packages like Angular, SharePoint Framework (SPFx)

```
"dependencies": {
  "@microsoft/sp-client-base": "~1.0.0",
  "@microsoft/sp-core-library": "~1.0.0",
  "@microsoft/sp-webpart-base": "~1.0.0",
  "@types/webpack-env": ">=1.12.1 <1.14.0"
},
```

```
"dependencies": {
  "@angular/common": "2.1.0",
  "@angular/compiler": "2.1.0",
  "@angular/core": "2.1.0",
  "@angular/forms": "2.1.0",
  "@angular/http": "2.1.0",
  "@angular/platform-browser": "2.1.0",
  "@angular/platform-browser-dynamic": "2.1.0",
```

npm scripts

- npm allows scripting to automate tasks – eg. Starting dotnet cli
- Scripted cmds may be stated
  - Inline
  - External file

```
1   {
2     "name": "first-angular",
3     "version": "0.0.0",
4     "license": "MIT",
5     "scripts": {
6       "ng": "ng",
7       "start": "ng serve",
8       "build": "ng build",
9       "test": "ng test",
10      "lint": "ng lint",
11      "e2e": "ng e2e"
12    },
```

Semantic versioning - Semver

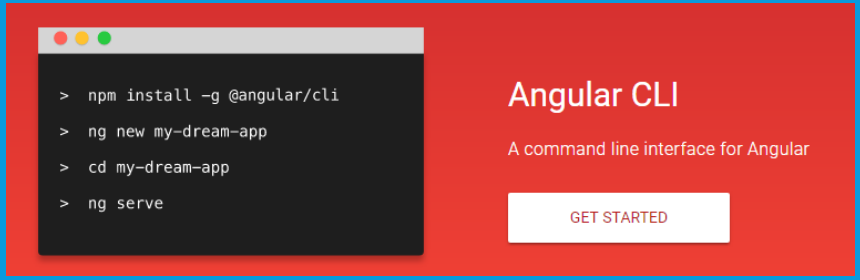
- Major release, increment the first number, e.g. **2**.0.0
- Minor release, increment the middle number, e.g. 1.**1**.0
- Patch release, increment the last number, e.g. 1.0.**1**

- >1.2.3 means greater than a specific version.
- <1.2.3 means less than a specific version.
- 1.2.3 - 2.3.4 means >=1.2.3 <=2.3.4.
- ~1.2.3 means >=1.2.3 <1.3.0.
- ~1.2 means >=1.2.0 <2.0.0.
- ~1 means >=1.0.0 <2.0.0.
- 1.2.x means >=1.2.0 <1.3.0.
- 1.x means >=1.0.0 <2.0.0.

Angular CLI

What is Angular CLI

- Command Line Interface used to manage Angular projects
- Installation
  - npm install –g @angular/cli
- Common Commands
  - ng new
  - ng generate
  - ng serve
- Documentations @ https://cli.angular.io/



.angular-cli.json

- Configuration file for Angular CLI
- Contains settings for
  - root
  - outDir
  - testing
  - linting
  - assets

ng generate

- Used to create Angular artifacts like
  - class
  - component
  - directive
  - enum
  - guard
  - interface
  - module
  - pipe
  - service

- General Syntax:
  - ng generate component [name]
  - ng g c [name]
- See Expected Output: --dry-run
- Do not create specs: --spec: false

```
PS D:\Classes\SmartAngular\05 UI\VouchersUI> ng g c demos/flexbox -m app.module.ts --dry-run --spec false
  create src/app/demos/flexbox/flexbox.component.html (26 bytes)
  create src/app/demos/flexbox/flexbox.component.ts (274 bytes)
  create src/app/demos/flexbox/flexbox.component.scss (0 bytes)
  update src/app/app.module.ts (3013 bytes)
```

Use Angular CLI with Yarn

- By default Angular CLI uses NPM
- To speed up DL time use Yarn instead
- Can be achieved using ng set cmd
  - ng set [key]=[value]
  - ng set --global packageManager=yarn

ng serve / ng build

- ng serve
  - Uses webpack-dev-server
  - Compiled output is served from memory, not from disk
  - Does NOT include all project files
  - Runs on http://localhost:4200 by default
  - Runs in watch mode
- ng build
  - Writes output to dist/ folder

Update Angular

- Customize to your needs!

```
npm install @angular/common@latest
@angular/compiler@latest
@angular/compiler-cli@latest
@angular/core@latest
@angular/forms@latest
@angular/http@latest
@angular/platform-browser@latest
@angular/platform-browser-dynamic@latest
@angular/platform-server@latest
@angular/router@latest
@angular/animations@latest
"@angular/cli"@latest
typescript@latest
--save
```

Yarn

Yarn

- Replacement for npm that Speeds up Node based dev by downloading and caching packages more efficient than npm
- Installation: npm install -g yarn
- Npm install -> yarn
- Npm install xxx –save -> yarn add xxx –save
- Yarn can be set as global Package Manager for Angular
  - ng set --global packageManager=yarn
- Documentation @ https://yarnpkg.com/en/docs

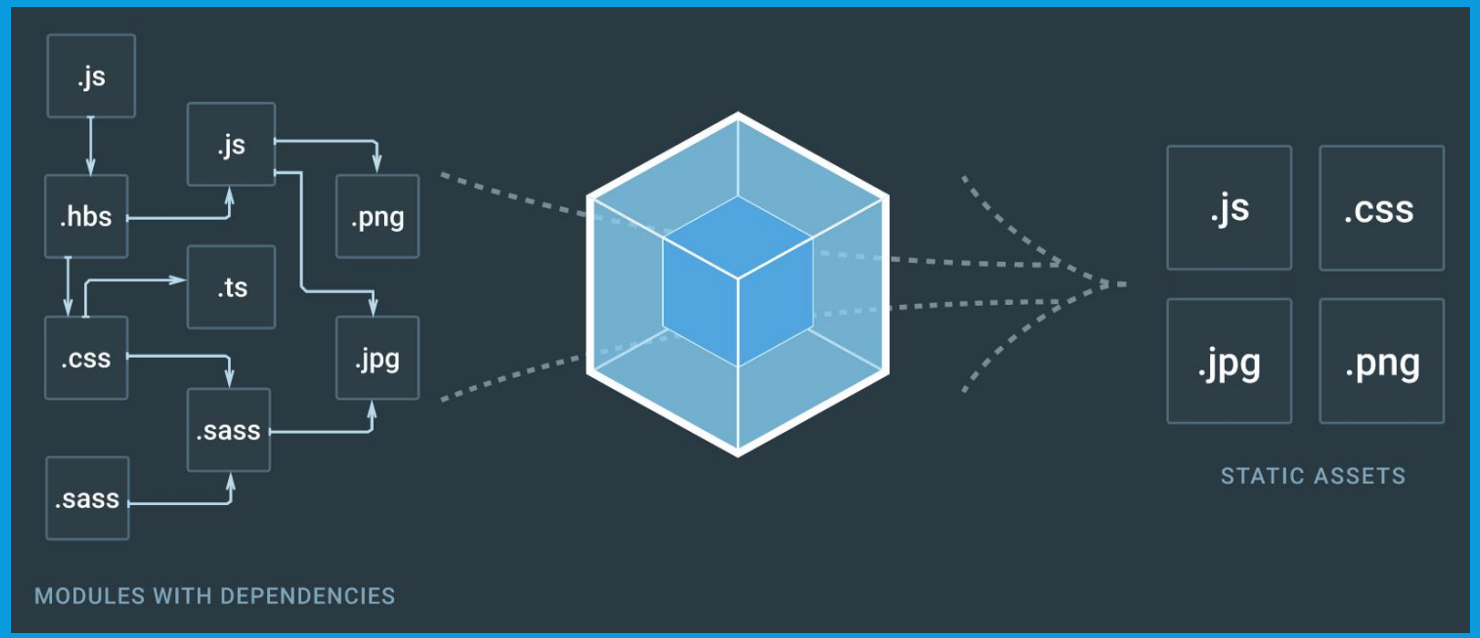
Managing Yarn Cache

- Yarn stores every package in a global cache in your user directory on the file system.
- Speeds up creation / loading of Angular projects
- print out every cached package
  - yarn cache ls
- print out the path where yarn's global cache is currently stored
  - yarn cache dir
- will clear the global cache
  - yarn cache clean
- Set cache-folder – will be created if it does not exist
  - yarn config set cache-folder <path>

Understanding Webpack

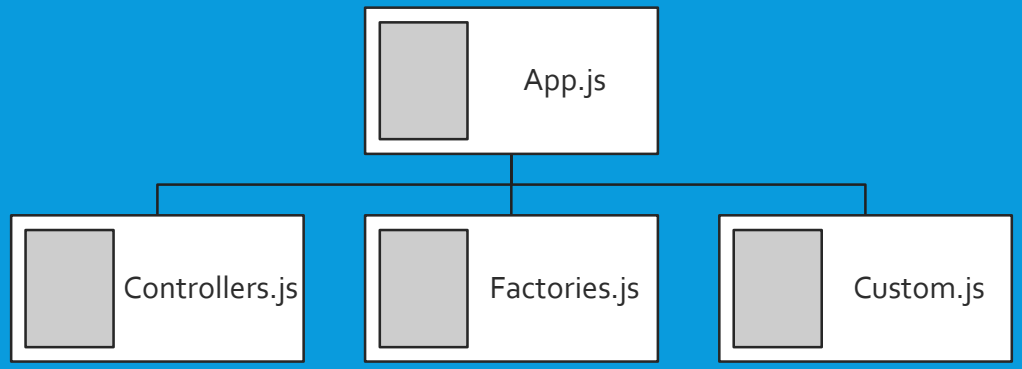
Webpack

- A module bundler for the static assets in your Angular application
- Transforms & creates bundles provided to the browser
- Works on:
  - JavaScript,
  - Typescript,
  - CSS,
  - …



Dependency Graphs

- require keyword is used to build dependency graphs
- Example: require(' ./wwwroot/app.js ');



Installation

- Webpack is installed by default in Angular CLI projects
- Core elements installed using Node.js
  - WebPack:

    npm install webpack –g

  - WebPack Dev Server:

    npm install webpack-dev-server –g

webpack.config.js

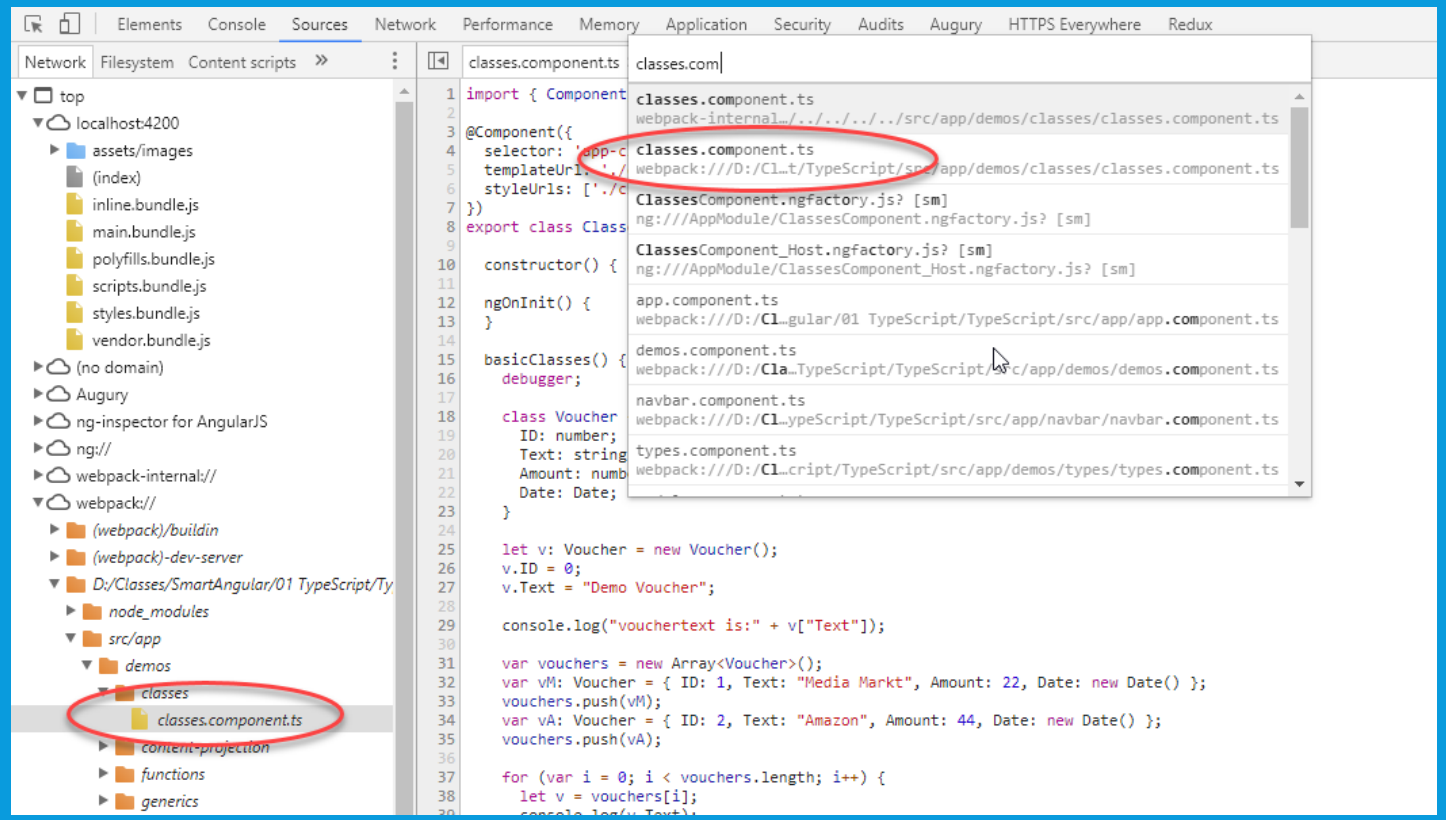
- Used to automate build
  - __dirname refers to the directory where this webpack.config.js lives
  - Entry: entry file of the app
  - Output: file to generate
  - Watch: use watcher

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

module.exports = {
    entry: {
        app: './wwwroot/app.js'
    },
    resolve: {
        extensions: ['.js']
    },
    output: {
        path: './wwwroot',
        filename: 'js/bundle.js'
    }
};
```

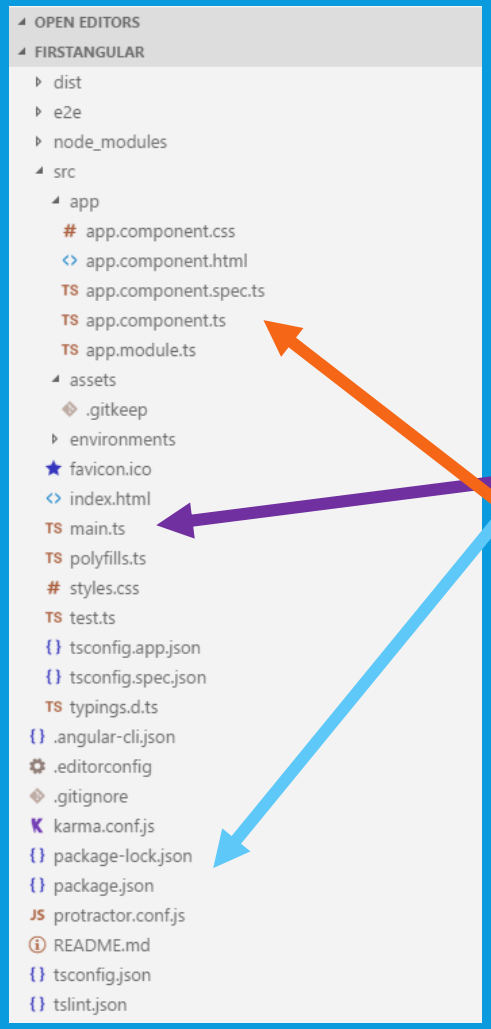
Angular Debugging into bundles

- Use „Ctrl + P“ in Chrome Dev tools to directly navigate to a file you want to debug



Bootstrapping Angular / Project Configuration

Project Structure



- Configuration:
  - package.json, tsconfig.json
- Boostraping:
  - main.ts
- App:
  - app.module.ts
  - app.component.ts

package.json

- package.json is the configuration file for node.js
- Packages are downloaded automatically, when file is saved
- Consists of:
  - Metadata
  - Dependencies
  - DevDependencies

    … not installed using: npm install –production
  - Scripts

package.json

```
1  {
2    "name": "angular2-seed",
3    "version": "1.0.0",
4    "description": "A simple starter Angular2 project",
5    "scripts": {
6      "build": "webpack --progress",
7      "watch": "npm run build -- --watch",
8      "server": "webpack-dev-server --inline --progress --port 3000
9      "start": "npm run server"
10   },
11   "contributors": [
12     "Rob Wormald <robwormald@gmail.com>",
13     "PatrickJS <github@gdi2290.com>"
14   ],
15   "license": "MIT",
16   "dependencies": {
17     "@angular/common": "~2.2.1",
18     "@angular/compiler": "~2.2.1",
19     "@angular/compiler-cli": "~2.2.1",
20     "@angular/core": "~2.2.1",
21     "@angular/forms": "~2.2.1",
22     "@angular/http": "~2.2.1",
23     "@angular/platform-browser": "~2.2.1",
24     "@angular/platform-browser-dynamic": "~2.2.1",
25     "@angular/platform-server": "~2.2.1",
26     "@angular/router": "~3.2.1",
27     "@angular/upgrade": "~2.2.1",
28     "angular2-in-memory-web-api": "0.0.21",
29     "bootstrap": "^3.3.7",
30     "core-js": "^2.4.1",
31     "ie-shim": "^0.1.0",
32     "reflect-metadata": "^0.1.3",
33     "rxjs": "5.0.0-beta.12",
34     "zone.js": "~0.6.26"
35   },
36   "devDependencies": {…
48   },
49   "keywords": [
50     "Angular2",
51     "angular2-seed",
52     "official angular 2 seed",
53     "official angular2 seed"
```

Angular Dependencies

- Angular has the following depedencies
  - systemjs – Module Loading
  - es6-promise – Promises to ES5
  - es6-shim – Other missing ES6 functionality for ES5
  - reflect-metadata – ES7 Decorators to ES5/ES6
  - rxjs – Reactive extensions – Use observables insted of Promises
  - zone.js – Event handling outside Angular

tsconfig.json

- Indicates the root of a typescript project
- Specifies the compiler options
- Most common used settings
  - sourceMap
  - moduleResolution
  - target

tsconfig.json

```
1  {
2    "compileOnSave": false,
3    "compilerOptions": {
4      "outDir": "./dist/out-tsc",
5      "baseUrl": "src",
6      "sourceMap": true,
7      "declaration": false,
8      "moduleResolution": "node",
9      "emitDecoratorMetadata": true,
10     "experimentalDecorators": true,
11     "target": "es5",
12     "typeRoots": [
13       "node_modules/@types"
14     ],
15     "lib": [
16       "es2016",
17       "dom"
18     ]
19   }
20 }
21
```

main.ts

- Bootstraps the Angular Applicaiton
- Load the AppModule

main.ts

```
1  import { enableProdMode } from '@angular/core';
2  import { platformBrowserDynamic } from '@angular/platform-browser-dynamic';
3
4  import { AppModule } from './app/app.module';
5  import { environment } from './environments/environment';
6
7  if (environment.production) {
8    enableProdMode();
9  }
10
11 platformBrowserDynamic().bootstrapModule(AppModule);
12
```

app.module.ts

- The @NgModule decorator identifies AppModule as an Angular module class which is the root of an Angular app
- All artifacts must be registered in the module so that they can be used
- Consists of sections:
  - Imports
  - Declarations
  - Bootstrap
  - Providers

src/app/app.module.ts

```
import { NgModule }      from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { AppComponent }  from './app.component';

@NgModule({
  imports:      [ BrowserModule ],
  declarations: [ AppComponent ],
  bootstrap:    [ AppComponent ]
})
export class AppModule { }
```

app.component.ts

- Is the root component of an angular app used in your start page (index.html)
- All other components are nested in this one

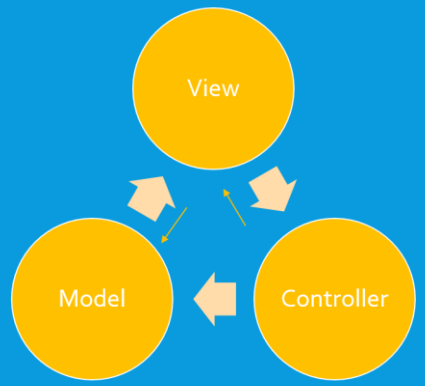
app.component.ts

```
1  import { Component } from '@angular/core';
2
3  @Component({
4    selector: 'app-root',
5    templateUrl: './app.component.html'
6    styleUrls: ['./app.component.css']
7  })
8  export class AppComponent {
9    title = 'app works!';
10 }
```

```
11 <body>
12   <app-root>Loading...</app-root>
13 </body>
14 </html>
```

Components

- An Angular App consists of a set of one or more [nested] component
- @Input | @Output are used to exchange data
- It defines:
  - A selector
  - View: HTML | Inline
  - Directives
  - CSS
  - …



home.component.ts

```
1  import {Component} from '@angular/core';
2
3  @Component({
4    selector: 'home',
5    styleUrls: ['./home.component.css'],
6    templateUrl: './home.component.html'
7  })
8  export class HomeComponent {
9  }
10
```