Angular CLI

In this article we have a look at what Angular CLI is, what it can do for you, and how it performs some of its magic behind the scenes. Even if you already use Angular CLI, this article can serve as a reference to better understand its inner workings.

Technically you are not required to use Angular CLI to develop an Angular application, but its many features can highly improve the quality of your code and save you a lot of time along the way.

So let's get started!

What Is Angular CLI?

Angular CLI is a Command Line Interface (CLI) to automate your development workflow. It allows you to:

- create a new Angular application
- run a development server with Live-Reload support to preview your application during development
- add features to your existing Angular application
- run your application's unit tests
- run your application's end-to-end (E2E) tests
- build your application for deployment to production

Before we have a look at each of the above in detail, let's first see how you can install Angular CLI.

Prerequisites

Before you can use Angular CLI, you must have Node.js 6.9.0 and npm 3.0.0 or higher installed on your system.

You can download the latest version of Node.js for your operating system and consult the latest installation instructions on the official Node.js website.

If you already have Node.js and npm installed, you can verify their version by running:

```
$ node -v # => displays your Node.js version

$ npm -v # => displays your npm version
```

Once you have Node.js installed, you can use the npm command to install TypeScript:

```
$ npm install -g typescript
```

Note :TypeScript may install automatically after installing angular CLI.

Although TypeScript is technically not an absolute requirement, it is highly recommended by the Angular team, so I recommend you install it to make working with Angular as comfortable as possible.

Now that you have Node.js and TypeScript installed, you can install Angular CLI.

Installing Angular CLI

To install Angular CLI, run:

```
$ npm install -g @angular/cli
```

which will install the ng command globally on your system. Here −g means install command on your system globally.

To verify whether your installation completed successfully, you can run:

```
$ ng version
```

which displays the version you have installed:

```
@angular/cli: 1.0.0

node: 6.10.0

os: darwin x64
```

Now that you have Angular CLI installed, let's use it to create a new application.

Creating a New Angular Application

There are two ways to create a new application using Angular CLI:

- `ng init`: create a new application in the current directory
- `ng new`: create a new directory and run `ng init` inside the new directory

So `ng new` is similar to `ng init` except that it also creates a directory for you.

Assuming you haven't created a directory yet, let's use `ng new` to create a new project:

```
$ ng new my-app
```

Behind the scenes, the following happens:

- a new directory ***my-app*** is created
- all source files and directories for your new Angular application are created based on the name you specified (***my-app***) and best-practices from the official Angular Style Guide
- ***npm*** dependencies are installed
- TypeScript is configured for you
- the **Karma** unit test runner is configured for you
- the **Protractor** end-to-end test framework is configured for you
- environment files with default settings are created

At this point you have a working Angular application and your new directory ***my-app*** looks like this:

```
.
├── README.md
├── e2e
│   ├── app.e2e-spec.ts
│   ├── app.po.ts
│   └── tsconfig.e2e.json
├── karma.conf.js
├── package.json
├── protractor.conf.js
├── src
│   ├── app
│   │   ├── app.component.css
│   │   ├── app.component.html
│   │   ├── app.component.spec.ts
│   │   ├── app.component.ts
│   │   └── app.module.ts
│   ├── assets
│   ├── environments
│   │   ├── environment.prod.ts
│   │   └── environment.ts
│   ├── favicon.ico
│   ├── index.html
│   ├── main.ts
│   ├── polyfills.ts
│   ├── styles.css
│   ├── test.ts
│   ├── tsconfig.app.json
│   ├── tsconfig.spec.json
│   └── typings.d.ts
├── tsconfig.json
└── tslint.json
```

Available Options

- `--dry-run`: boolean, default false, perform dry-run so no changes are written to filesystem
- `--verbose`: boolean, default false
- `--link-cli`: boolean, default false, automatically link the @angular/cli package (more info)
- `--skip-install`: boolean, default false, skip npm install
- `--skip-git`: boolean, default false, don't initialize git repository
- `--skip-tests`: boolean, default false, skip creating tests
- `--skip-commit`: boolean, default false, skip committing the first git commit
- `--directory`: string, name of directory to create, by default this is the same as the application name
- `--source-dir`: string, default 'src', name of source directory
- `--style`: string, default 'css', the style language to use ('css', 'less' or 'scss')
- `--prefix`: string, default 'app', the prefix to use when generating new components
- `--mobile`: boolean, default false, generate a Progressive Web App application (see section on upcoming features)
- `--routing`: boolean, default false, add module with routing information and import it in main app module
- `--inline-style`: boolean, default false, use inline styles when generating the new application
- `--inline-template`: boolean, default false, use inline templates when generating the new application

Running Your Application

To preview your new application in your browser, navigate to its directory:

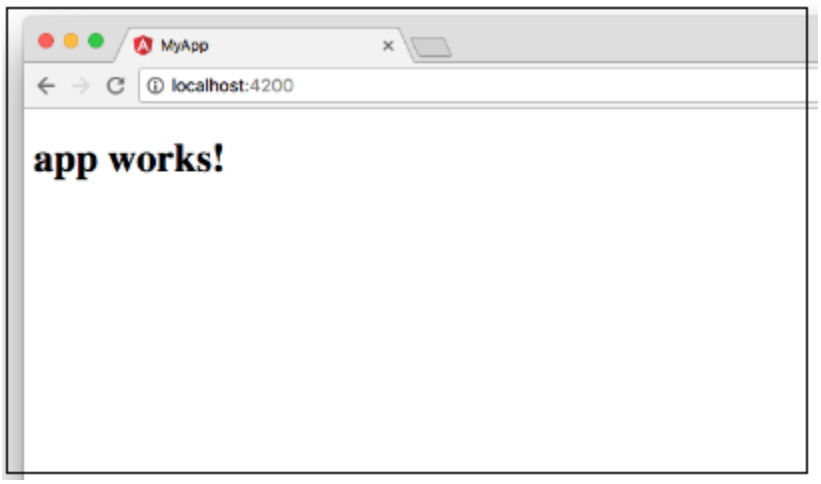
```
$ cd my-app
```

and run:

```
$ ng serve
```

to start the built-in development server on port 4200:

After the completion of you can navigate to your browser, then run the following url: http://localhost:4200/



Behind the scenes, the following happens:

1. Angular CLI loads its configuration from *.angular-cli.json*
2. Angular CLI runs ***Webpack*** to build and bundle all JavaScript and CSS code
3. Angular CLI starts ***webpack dev*** server to preview the result on localhost:4200

Notice that the ng serve command does not exit and return to your terminal prompt after **step 3**.

Instead, because it includes Live-Reload support, the process actively watches your ***src*** directory for file changes. When a file change is detected**, step 2** is repeated and a notification is sent to your browser so it can refresh automatically.

To stop the process and return to your prompt, press ***ctrl-c***.

Adding Features to Your Angular Application

You can use the ng generate command to add features to your existing application:

- `ng generate class my-new-class`: add a class to your application
- `ng generate component my-new-component`: add a component to your application
- `ng generate directive my-new-directive`: add a directive to your application
- `ng generate enum my-new-enum`: add an enum to your application
- `ng generate module my-new-module`: add a module to your application
- `ng generate pipe my-new-pipe`: add a pipe to your application
- `ng generate service my-new-service`: add a service to your application

The generate command and the different sub-commands also have shortcut notations, so the following commands are similar:

- `ng g cl my-new-class:` add a class to your application
- `ng g c my-new-component`: add a component to your application
- `ng g d my-new-directive:` add a directive to your application
- `ng g e my-new-enum`: add an enum to your application
- `ng g m my-new-module`: add a module to your application
- `ng g p my-new-pipe`: add a pipe to your application
- `ng g s my-new-service`: add a service to your application

Each of the different sub-commands performs a different task and offers different options and parameters. Let's have a look at each of them.

Adding a new class

To add a class called *UserProfile*, run:

```
$ ng generate class user-profile
```

Angular CLI will automatically adjust the letter case of the file name and class name for you, so the following commands have the same effect:

```
# All three commands are equivalent
$ ng generate class user-profile
$ ng generate class userProfile
$ ng generate class UserProfile
```

Behind the scenes, the following happens:

- a file *src/app/user-profile.ts* is created that exports an empty class named *UserProfile*

Available options

- `--spec`: boolean, default false, generate spec file with unit test

Run `$ ng generate --help` to see all available options of your locally installed Angular CLI.

Examples:

```
# Generate class 'UserProfile'
$ ng generate class user-profile
# Generate class 'UserProfile' with unit test
$ ng generate class user-profile --s
```

Adding a new component

To add a component with a selector **app-site-header**, run:

```
$ ng generate component site-header
```

Angular CLI will automatically adjust the letter case of the file name and component name for you and apply the prefix to the component selector, so the following commands have the same effect:

```
# All three commands are equivalent
$ ng generate component site-header
$ ng generate component siteHeader
$ ng generate component SiteHeader
```

Behind the scenes, the following happens:

- a directory ***src/app/site-header*** is created
- inside that directory 4 files are generated:
  - a CSS file for the component styles
  - an HTML file for the component template
  - a TypeScript file with a component class named *SiteHeaderComponent* and selector *app-site-header*
  - a spec file with a sample unit test for your new component
- *SiteHeaderComponent* is added as a declaration in the *@NgModule* decorator of the nearest module, in this case the *AppModule* in *src/app/app.module.ts*

Available Options

- `--flat`: boolean, default false, generate component files in src/app instead of src/app/site-header
- `--inline-template`: boolean, default false, use an inline template instead of a separate HTML file
- `--inline-style`: boolean, default false, use inline styles instead of a separate CSS file
- `--prefix`: boolean, default true, use prefix specified in .angular-cli.json in component selector
- `--spec`: boolean, default true, generate spec file with unit test
- `--view-encapsulation`: string, specifies the view encapsulation strategy
- `--change-detection`: string, specifies the change detection strategy

Example

```
# Generate component 'site-header'
$ ng generate component site-header


# Generate component 'site-header' with inline template and inline styles
$ ng generate component site-header --inline-template --inline-style
```

Adding a new directive

To add a directive with a selector appAdminLink, run:

```
$ ng generate directive admin-link
```

Angular CLI will automatically adjust the letter case of the file name and directive name for you and apply the prefix to the directive selector, so the following commands have the same effect:

```
# All three commands are equivalent
$ ng generate directive admin-link
$ ng generate directive adminLink
$ ng generate directive AdminLink
```

Behind the scenes, the following happens:

- a *file src/app/admin-link.directive.ts* is created that exports a directive named *AdminLinkDirective* with a selector *appAdminLink*
- a *file src/app/admin-link.directive.spec.ts* is created with a unit test for the directive
- *AdminLinkDirective* is added as a declaration in the *@NgModule* decorator of the nearest module, in this case the *AppModule* in *src/app/app.module.ts*

Available options

- `--flat`: boolean, default true, generate directive files in *src/app* instead of *src/app/admin-link*

- `--prefix`: boolean, default true, use prefix specified in .angular-cli.json in directive selector
- `--spec`: boolean, default true, generate spec file with unit test

Example

```
# Generate directive 'adminLink'
$ ng generate directive admin-link


# Generate directive 'adminLink' without unit test
$ ng generate directive admin-link --spec=false
```

Adding a new enum

To add an enum called **Direction**, run:

```
$ ng generate enum direction
```

Angular CLI will automatically adjust the letter case of the file name and enum name for you, so the following commands have the same effect:

```
# Both commands are equivalent
$ ng generate enum direction
$ ng generate enum Direction
```

Behind the scenes, the following happens:

- a file *src/app/direction.enum.ts* is created that exports an *enum* named **Direction**

Available options

There are no command line options available for this command.

Adding a new module

To add a new module to your application, run:

```
$ ng generate module admin
```

Behind the scenes, the following happens:

- a directory *src/app/admin* is created
- an *AdminModule* module is created inside *src/app/admin/admin.module.ts*

Notice that the *AdminModule* module is not added automatically to your main module *AppModule* in *src/app/app.module.ts.* It is up to you to import the module where you need it.

To import your new module in another module, you can specify is as an import in an *@NgModule* definition. For example:

```
import { AdminModule } from './admin/admin.module';


@NgModule({
  // ...
  imports: [
    AdminModule
  ]
})
export class AppModule { }
```

Available options

- `--routing:` boolean, default false, generate an additional module *AdminRoutingModule* with just the routing information and add it as an import to your new module
- `--spec`: boolean, default false, add *src/app/admin/admin.module.spec.ts* with a unit test that checks whether the module exists

Examples

```
# Add module 'admin'

$ ng generate module admin


# Add module 'admin' with additional module containing routing
information

$ ng generate module admin --routing
```

Adding a new pipe

A pipe is the Angular equivalent of a filter in AngularJS 1.x and allows you to transform a displayed value within a template

To add a pipe with a name **convertToEuro**, run:

```
$ ng generate pipe convert-to-euro
```

Angular CLI will automatically adjust the letter case of the file name and pipe name for you, so the following commands have the same effect:

```
# All three commands are equivalent

$ ng generate pipe convert-to-euro

$ ng generate pipe convertToEuro

$ ng generate pipe ConvertToEuro
```

Behind the scenes, the following happens:

- a file *src/app/convert-to-euro.pipe.ts* is created that exports a pipe class named **ConvertToEuroPipe**
- a file *src/app/convert-to-euro.pipe.spec.ts* is created with a unit test for the pipe

- **ConvertToEuroPipe** is added as a declaration in the **@NgModule** decorator of the nearest module, in this case the **AppModule** in *src/app/app.module.ts*

Available options

- `--flat`: boolean, default true, generate component files in ***src/app*** instead of ***src/app/site-header***
- `--spec`: boolean, default true, generate spec file with unit test

Example

```
# Generate pipe 'convertToEuro' with spec and in /src/app directory
$ ng generate pipe convert-to-euro


# Generate pipe 'convertToEuro' without spec and in
# /src/app/convert- to-euro directory
$ ng generate pipe convert-to-euro --spec=false --flat=false
```

Adding a new service

To add a service with a dependency injection token **BackendApiService**, run:

```
$ ng generate service backend-api
```

Angular CLI will automatically adjust the letter case of the file name and pipe name for you, so the following commands have the same effect:

```
# All three commands are equivalent
$ ng generate service backend-api
$ ng generate service backendApi
$ ng generate service BackendApi
```

Behind the scenes, the following happens:

- a file src/app/backend-api.service.ts is created that exports a service class named BackendApiService
- a file src/app/backend-api.service.spec.ts is created with a unit test for your new service

Notice how Angular CLI warns that the service is generated but not provided anywhere yet. It is up to you to register the service as a provider by adding it to the providers: [] array where you need it (e.g. in a module or component). For example:

```
import { BackendApiService } from './backend-api.service';


@NgModule({
  // ...
  providers: [BackendApiService],
  bootstrap: [AppComponent]
})
```

Available options

- `--flat`: boolean, default true, generate service file in src/app instead of src/app/backend-api
- `--spec`: boolean, default true, generate spec file with unit test

Examples:

```
# Generate service with DI token 'BackendApiService' in /src/app
# directory
$ ng generate service backend-api


# Generate service with DI token 'BackendApiService' in
# /src/app/backend-api directory
$ ng generate service backend-api --flat=false
```

Special note

Angular CLI does not just blindly generate code for you. It uses static analysis to better understand the semantics of your application.

For example, when adding a new component using `ng generate component`, Angular CLI finds the closest module in the module tree of your application and integrates the new feature in that module.

So if you have an application with multiple modules, Angular CLI will automatically integrate the new feature in the correct module, depending on the directory where you run the command from.

Running Your Unit Tests

Angular CLI automatically configures the Karma test runner for you when your application is initially created.

When adding a feature to your application, you can use the `--spec` option to specify whether you want Angular CLI to also create a corresponding *.spec.ts* file with a sample unit test for your new feature.

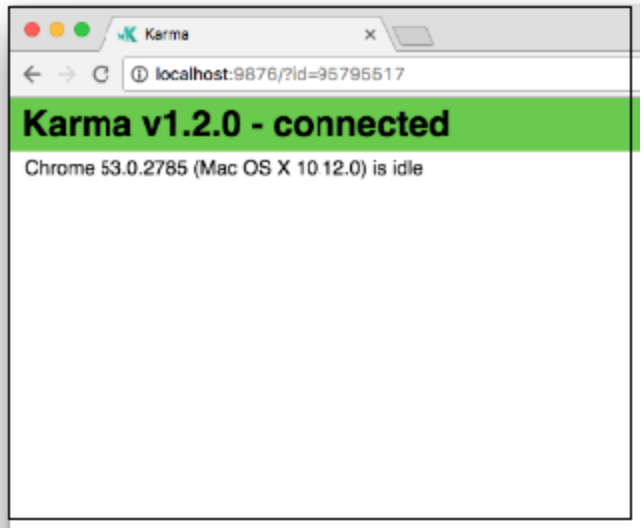
Spec files are created in the same directory of their corresponding feature in the *src* directory. This allows you to easily locate them when working on a feature.

Running all unit tests of your application thus implies running all unit tests specified in all files ending in *.spec.ts* in all directories inside your *src* directory.

To run all unit tests, run:

```
$ ng test
```

and a special browser instance will be launched:



Here is what happens behind the scenes:

1. Angular CLI loads ***.angular-cli.json.***
2. Angular CLI runs Karma with the configuration specified in ***.angular-cli.json.*** By default this ***is karma.conf.js*** located in the root directory of your application.
3. Karma opens the browser specified in the Karma configuration. By default the browser is set to Google Chrome.
4. Karma then instructs the browser (Chrome) to run ***src/test.ts*** using the testing framework specified in the Karma config. By default this is the Jasmine framework. The file ***src/test.ts*** is automatically created when your application is created. It is pre-configured to load and configure the code that is needed to test your Angular application and run all spec files ending in *.spec.ts* in your ***src*** directory.
5. Karma reports the result of the test run to the console.
6. Karma watches the ***src*** file for changes and repeats step 4 and 5 when a file change is detected.

To end the process, you can press **ctrl-c.**

If you want to learn more about testing your Angular code, you can check out the Official Angular Testing Guide.

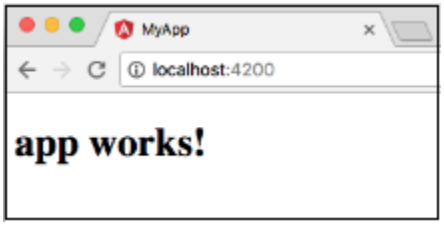
Running Your End-to-end (E2E) Tests

Angular CLI automatically configures Protractor for you when your application is initially created.

To run your E2E tests, run:

```
$ ng e2e
```

and a special browser instance will be launched:



Here is what happens behind the scenes:

1. Angular CLI loads ***.angular-cli.json***.
2. Angular CLI runs Protractor with the configuration specified in ***.angular-cli.json***. By default this is the ***protractor.conf.js*** file located in the root directory of your application.
3. Protractor opens the browser specified in the Protractor configuration. By default the browser is set to Google Chrome.
4. Protractor then instructs the browser (Chrome) to run all spec files ending in ***.e2e-spec.ts*** in your ***e2e*** directory.
5. Protractor reports the result of the test run to the console.

If you want to learn more about E2E testing your Angular code, you can check out the Official Angular Testing Guide and the Protractor documentation.

Building Your Application for Production

Running `ng serve` builds and bundles your Angular application automatically to a virtual filesystem during development.

However, when your application is ready for production, you will need real files that you can deploy to your server or to the cloud.

To build and bundle your application for deployment, run:

```
$ ng build
```

What happens behind the scenes is:

1. Angular CLI loads its configuration from ***.angular-cli.json***
2. Angular CLI runs Webpack to build and bundle all JavaScript and CSS code
3. The result is written to the ***outDir*** directory specified in your Angular CLI configuration. By default, this is the ***dist*** directory.

Available options

- `--aot:` enable ahead-of-time compilation
- `--base-href`: string, the base href to use in the index file
- `--environment`: string, default dev, environment to use
- `--output-path`: string, directory to write the output to
- `--target`: string, default development, environment to use
- `--watch`: boolean, default false, watch files for changes and rebuild when a change is detected

Targets

Specifying a target impacts the way the build process operates. Its value can be one of the following:

- ***development***: default mode, do not minify or uglify code
- ***production***: minify and uglify code

Building your application in production mode:

```
$ ng build --target=production
```

results in bundles that are minified, uglified and have hashes in their names.

Environments

Environments let you specify settings to customize your application behavior.

You can define your own environments in the ***.angular-cli.json*** file. The default ones are:

- *source*: use settings defined in ***environments/environment.ts***
- *dev*: use settings defined in ***environments/environment.ts***
- *prod*: use settings defined in ***environments/environment.prod.ts***

where ***environments/environment.ts*** equals:

```
export const environment = {
  production: false
};
```

and ***environments/environment.prod.ts*** equals:

```
export const environment = {
  production: true
};
```

The build process will use the **dev** environment by default.

If you specify a different environment, the build process will use the corresponding environment:

```
# Uses environments/environment.ts
$ ng build


# Also uses environments/environment.ts
$ ng build --environment=dev


# Uses environments/environment.prod.ts
$ ng build --environment=prod
```

As you can see ***in src/main.ts***, you can access the environment settings from your code by importing ***environments/environment***:

```
import { enableProdMode } from '@angular/core';

import { platformBrowserDynamic } from '@angular/platform-browser-
dynamic';


import { AppModule } from './app/app.module';

import { environment } from './environments/environment';


if (environment.production) {

  enableProdMode();

}


platformBrowserDynamic().bootstrapModule(AppModule);
```

The build process will make sure the right environment is provided when you import it.

Deploying Your Application

As of February 9, 2017, the ng deploy command has been removed from the core of Angular CLI. Read more here (https://github.com/angular/angular-cli/pull/4385).

Ejecting your application

As of v1.0, Angular CLI provides a command to decouple your application from Angular CLI.

By default, Angular CLI manages the underlying webpack configuration for you so you don't have to deal with its complexity.

If, at any given time, you wish to manually configure webpack and you no longer want to use Angular CLI with your Angular application, you can run:

```
$ ng eject
```

which will generate the following output in your console:

```
================================================================================
Ejection was successful.


To run your builds, you now need to do the following commands:
   - "npm run build" to build.
   - "npm run test" to run unit tests.
   - "npm start" to serve the app using webpack-dev-server.
   - "npm run e2e" to run protractor.


Running the equivalent CLI commands will result in an error.


================================================================================
Some packages were added. Please run "npm install".
```

What happens behind the scenes is:

1. A property **ejected: true** is added to the ***.angular-cli.json*** file
2. A **webpack.config.js** file is generated in the root of your application with a standalone webpack configuration so you can build your project without Angular CLI
3. The **build** script in your **package.json** is updated so you can run **npm run build** to build your project
4. The **test** script in your **package.json** is updated so you can run **npm run test** or **npm test** to run your unit tests
5. The **start** script in **your package.json** is updated so you can run **npm run start** or **npm start** to start a development server

6. The **e2e** script in your **package.json** is updated so you can run **npm run e2e** to run your end-to-end tests

After ejecting your application, you can manually update the webpack configuration to your liking and the Angular CLI commands will no longer work.

So if, for some reason, you want to move away from Angular CLI, the eject command has you covered.

Summary

Today, you can already use Angular CLI to:

- create a new Angular application
- run a development server with LiveReload support to preview your application during development
- add features to your existing Angular application
- run your application's unit tests
- run your application's end-to-end (E2E) tests
- build your application for deployment to production
- deploy your application to a server

Although it is technically not required to use Angular CLI to develop an Angular application, it can definitely improve the quality of your code and save you a lot of time and effort.

Because of the many exciting features that will be added over time, Angular CLI will probably become an indispensable tool for developing Angular applications.

Bibliography

- *http://sitepoint.com/*