# Angular

Superheroic framework

# Training Agenda

- ❑TypeScript : Introduction
- ❑Angular : Introduction
- ❑Angular Building Blocks
  - Component
  - Modules
  - Directives
  - Services
  - Pipes
- ❑Bindings
- ❑Forms
- ❑Remote Calls
- ❑Routing
- ❑Authentication / Authorization
- ❑PWA
- ❑NGRX

# Why Angular ?

- Angular is easy
- ES2015+ features
- Corporate Care-taker
- Performance and Mobile
- Project architecture and Maintenance
- Component based architecture

# What is Angular ?

Angular is a structural framework for dynamic (SPA) web apps.

Extension of standard HTML markups.

Keeps the front-end clean; separation of concerns.

# Why Typescript ?

Microsoft extension for JS

Object oriented features

ES6+ features

Type definition

Angular itself programmed in TS

# TypeScript features

- Classes & Inheritance
- Module system
- Arrow function
- Template String
- Constants and block scope
- Destructuring
- Spread & Rest operator
- Decorator
- Additional types

# Understanding Angular Environment Setup

- Node
- TypeScript
- Webpack
- Angular Packages
- RxJS
- ZoneJS

# Components

- A component controls a patch of screen real estate that we could call a view, and declares reusable UI building blocks for an application.
- Passing data to/from components
  - Property binding
  - Event binding
  - Two way data-binding
- Nested components
  - Parent to Child
  - Child to Parent
- Data projection
- Component types :
  - Smart components
  - Dump components

| | |
|---|---|
| *ngOnChanges* | - called when an input binding value changes |
| *ngOnInit* | - after the first ngOnChanges |
| *ngDoCheck* | - after every run of change detection |
| *ngAfterContentInit* | - after component content initialized |
| *ngAfterContentChecked* | - after every check of component content |
| *ngAfterViewInit* | - after component's view(s) are initialized |
| *ngAfterViewChecked* | - after every check of a component's view(s) |
| *ngOnDestroy* | - just before the component is destroyed |

# Component Life Cycle

# Directives

- A Directive modifies the DOM to change appearance, behavior or layout of DOM elements.
- Directive Types :
  - *Component Directive* : directive with template
  - *Attribute Directive* : directives that change the behavior of a component or element but don't affect the template
  - *Structural Directives* : directives that change the behavior of a component or element by affecting how the template is rendered

# Pipes

- Pipes are used to filter/format data for template
- Built-in Pipes :
    - Currency
    - Date
    - Uppercase
    - Lowercase
    - Number
    - JSON
    - Percent
    - Async
- Custom pipes
    - Pure
    - Impure

# Forms

## Template Driven Forms

- Angular infers the Form Object from the DOM
- App logic resides inside the template

## Model Driven Forms

- Form is created programmatically and sync with the DOM
- App logic resides inside the component
- Use of FormControl, FormGroup, FormBuilder

# DI & Services

Angular's DI system is controlled through **@NgModule**.

Services implement DI concepts in an Angular App.

Services are simple ES6 classes.

Services are registered with Angular App using providers.

Services are Singleton.

# Services : Hierarchical Injector

| | |
|---|---|
| Root Module | Same instance of service is available Application-wide |
| Root Component | Same instance of service is available for all components (but not for other services) |
| Other Component | Same instance of service is available for the component and it’s own child components |

# Services : Hierarchical Injector

Use providedIn: 'root' for services which should be available in whole application as singletons

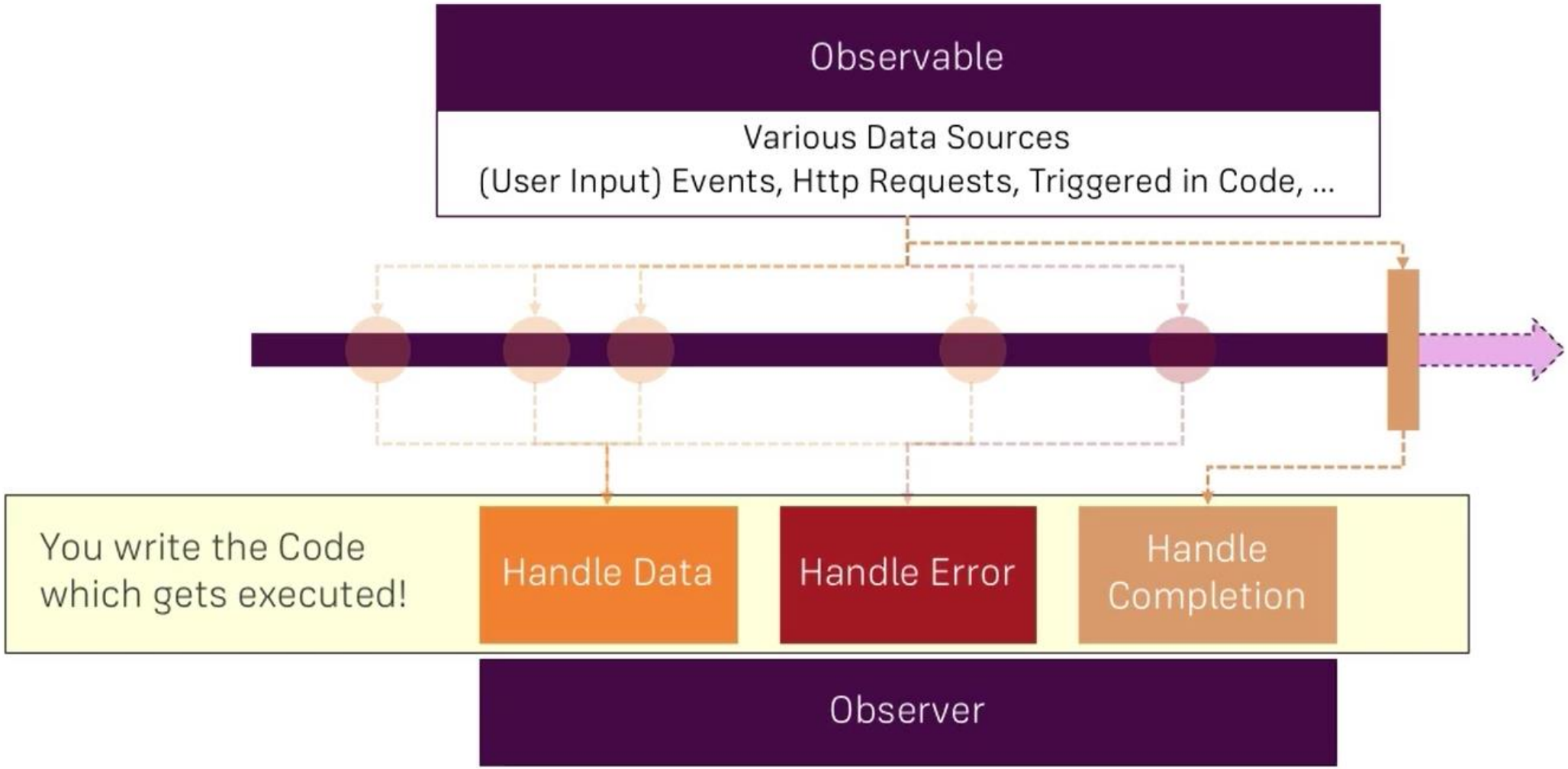
Never use `providedIn: EagerlyImportedModule`, you don’t need it and if there is some super exceptional use case then go with the providers: [] instead

Use `providedIn: LazyServiceModule` to prevent service injection in the eagerly imported part of the application or even better use `providers: [LazyService]` in the LazyModule.

If we want to use LazyServiceModule then we have to import it in LazyModule to prevent circular dependency warning. LazyModule will then be lazy loaded using Angular Router for some route in a standard fashion.

Use `providers: []` inside of @Component or @Directive to scope service only for the particular component sub-tree which will also lead to creation of multiple service instances (one service instance per one component usage)

# Observables : An Overview

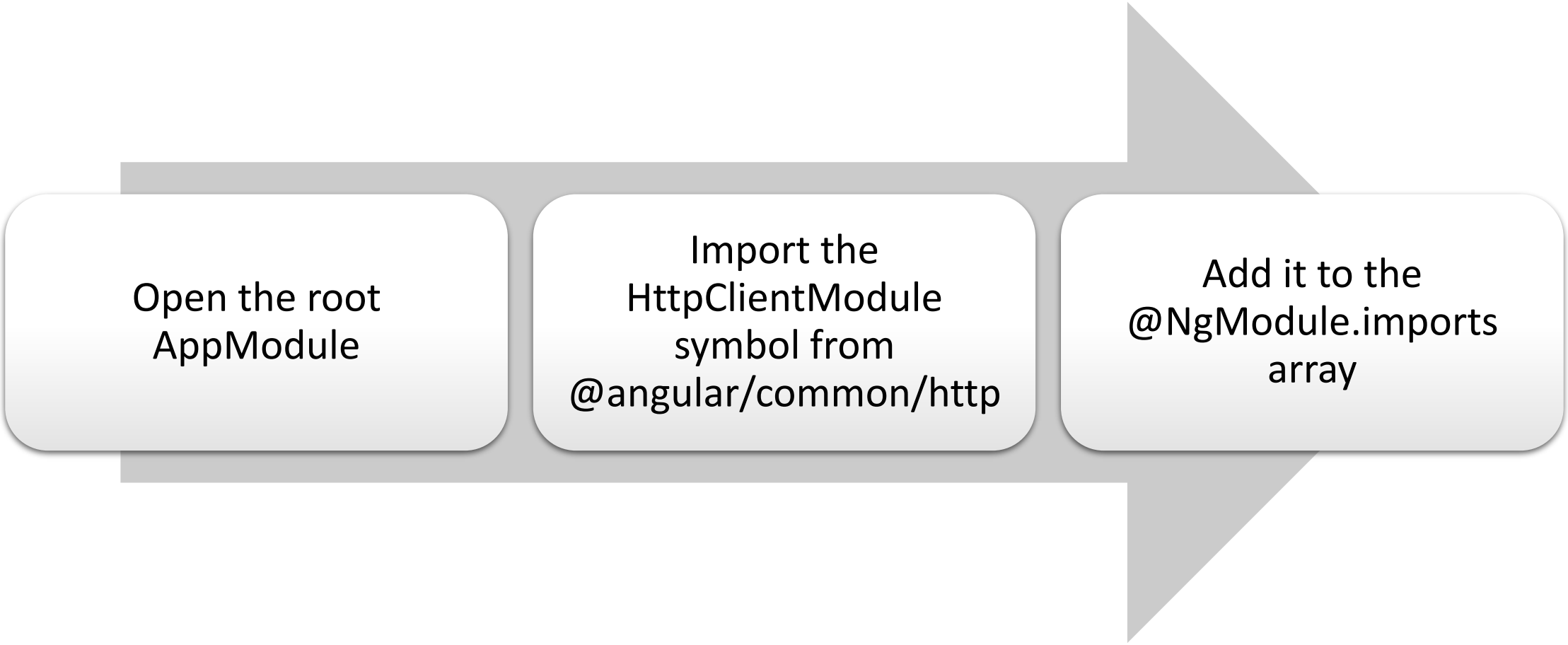


# HttpClient

The HttpClient in @angular/common/http offers a simplified client HTTP API for Angular applications that rests on the XMLHttpRequest interface exposed by browsers.

| Benefits of HttpClient: | |
|---|---|
| | Typed request and response objects |
| | Request and response interception |
| | Observable APIs |
| | Streamlined error handling. |

# HttpClient : Unlocking



Routing allows to:

- Maintain the state of the application
- Implement modular applications
- Implement the application based on the roles (certain roles have access to certain URLs)

5 steps routing:

- Checking the base href tag in index file
- Configuring routes with components
- Tell angular about routing app
- Setting up the routing links
- Provide space on template to load the component

# Routing

# Routing (Cntd..)

- Programmatic navigation
- Child routing
- Routes with parameters
- Route guard (Authentication)
- Query Parameters

# Modules

- A module is a mechanism to group components, directives, pipes and services that are related
- Module Types -
  - Root Module : one per application
  - Feature Module : depends on application features
- Modules can be instantiate lazily

# Debugging Angular Apps

- Prevent Bugs with TypeScript
- Using Debugger Statements to Stop JavaScript Execution
- Inspect Data with the JSON pipe
- Console Debugging
- Augury Chrome Plugin
- Debugging RxJS Observables using ‘tap’ operator

# PWA : Progressive Web Apps

| |
|---|
| Service worker is a script that runs in the web browser and manages caching for an application. |
| Can completely satisfy the loading of the application, without the need for the network. |
| Deliver a user experience with the reliability and performance on par with natively-installed code. |
| Reducing dependency on the network can significantly improve the user experience. |

```
ng add @angular/pwa
```


A predictable state container for JavaScript apps.

# Should I Use Redux?

| | |
|---|---|
| Some suggestions: | You have reasonable amounts of data changing over time |
| | You need a single source of truth for your state |
| | You find that keeping all your state in a top-level component is no longer sufficient |

# Redux

Redux is a predictable state container for JavaScript apps.

It helps you write applications that behave consistently, run in different environments (client, server, and native), and are easy to test.

It provides a great developer experience, such as live code editing combined with a time traveling debugger.

```
npm install --save redux
npm install --save @ngrx/store
```

# Redux : Three Principles

## Single source of truth

- The *state* of your whole application is stored in an object tree within a single *store*.

## State is read-only

- The only way to change the state is to emit an *action*, an object describing what happened.

## Changes are made with pure functions

- To specify how the state tree is transformed by actions, you write pure *reducers*.

# Actions

- *Actions* are payloads of information that send data from your application to your *store*.
- They are the only source of information for the store.
- You send them to the store using `store.dispatch()`.

```
{
    type: ADD_TODO,
    text: 'Build my first Redux app’
}
```

# Reducers

- The *reducer* is a pure function that takes the previous *state* and an *action*, and returns the next state.
- *Actions* only describe *what happened*, but don't describe how the application's state changes.
- **Reducers** specify how the application's state changes in response to *actions* sent to the *store*.

```
(previousState, action) => newState
```

# Reducers : Don’ts

**Things you should never do inside a reducer:**

- Mutate its arguments.
- Perform side effects like API calls and routing transitions.
- Call non-pure functions, e.g. `Date.now()` or `Math.random()`.

# Store

The Store is the single *object* that has the following responsibilities:

- Holds application state.
- Allows access to state.
- Allows state to be updated via `dispatch(action)`.
- Registers listeners via `subscribe(listener)`.
- Handles unregistering of listeners via the function returned by `subscribe(listener)`.

# Creating Store with Root Reducer

```
import { StoreModule } from '@ngrx/store' ;

@NgModule({
        …
        imports :     [StoreModule.forRoot({prop : reducer})]
})
export class AppModule{}
```

# Data Flow

Redux architecture revolves around a **strict unidirectional data flow**.

The data lifecycle in any Redux app follows these 4 steps:

- You call `store.dispatch(action)`.
- The Redux store calls the reducer function you gave it.
- The root reducer may combine the output of multiple reducers into a single state tree.
- The Redux store saves the complete state tree returned by the root reducer.

# Angular : Creating Libraries

A library typically includes *reusable code* that defines components, services, and other Angular artifacts

Libraries extend existing Angular functionality.

Libraries by default, built with the AoT compiler.

Export functionality for library is maintained in *public-api.ts* file

# Creating Angular Library : Steps

## Create Workspace

- `ng new my-workspace --creatApplication=false`

## Create Lib

- `ng generate library <libname> --prefix=incedo-lib`

## Make modification in library and PUBLIC API

- `ng build <libname>`

## Install lib in project/application

- `npm install <libname>`

## Import the Lib Module in App Module

## Use the lib functionalities

# Securing Angular Apps

- Best Practices :
  - Keep current with the latest Angular library releases
  - Don't modify your copy of Angular.
  - Avoid Angular APIs marked in the documentation as “*Security Risk*.”
- Preventing cross-site scripting (XSS)
  - Angular treats all values as untrusted by default.
  - Angular sanitizes and escapes untrusted values.
    - Interpolated content is always escaped
    - Angular recognizes the *binded value* as unsafe and automatically sanitizes it
  - Never generate template source code by concatenating user input and templates, instead use the offline template compiler (template injection)

# Securing Angular Apps

| | |
|---|---|
| **Trusting Safe Values** : To mark a value as trusted, inject *DomSanitizer* and call one of the following methods - | bypassSecurityTrustHtml |
| | bypassSecurityTrustScript |
| | bypassSecurityTrustStyle |
| | bypassSecurityTrustUrl |
| | bypassSecurityTrustResourceUrl |
| **HTTP-level vulnerabilities** : Angular has built-in support to help prevent two common HTTP vulnerabilities - | Cross-Site Request Forgery (CSRF or XSRF) |
| | Cross-Site Script Inclusion (XSSI) / JSON vulnerability |

# Optimizing Angular App Performance

- Using onPush change detection strategy
- Using trackBy function
- Avoid computing values in templates
- Using lazy loading
- Disable change detection (if required)

# Deployment Steps :

## Build the App

- Consider AOT Compilation

## Set the correct <base>

- Domain name with App Directory

## Server should return index file

- Server would not know the routes

# References

## Books

- Rangle's Angular Training Book
- Ngbook

## Web

- http://angular.io
- http://rangle.io
- http://reactivex.io
- http://learnrxjs.io
- https://redux.js.org