

AngularJS



Training Agenda

JavaScript : Overview

MV* Frameworks

AngularJS : Getting started

Building Blocks

- Controller
- Directive
- Filters
- forms
- Service

Testing

Prerequisites



Sound knowledge of HTML,
CSS, JavaScript & Angular

Interest to learn

JavaScript : Overview

Browser gets the HTML text of the page, parses it into DOM structure, lays out the content of the page and style the context before it gets displayed.

JS has become one of the most popular client-side scripting language on the web used to create dynamic views in web-apps

JS plays a major role in the usage of AJAX, user experience and RWD.

Objects in JavaScript

JavaScript (ES5) is Object-based language.

Object is unordered collection of properties and methods.

Objects can be created using :

Literal Method

Constructor Method

Instance Method

Functions in JavaScript

JS treats functions as objects (first-class citizens)

In JS, functions can be instantiated, returned by other functions, stored as elements of array or assigned to variables.

A function with no name is called an *anonymous function*.

Function Borrowing
&
Currying

JS function acts as a constructor when we use it together with the *new* operator.

Closures

Returning the function from a function, complete with variables from an external scope, is called Closure.

Process of binding the variable deep inside the function factory.

Closures help in function “Construction Zones”

Closures can even modify bound variables in the background

Closures treat global variables as local for functions

Prototype

- A Prototype is like a blueprint Object for the object we create.
- All inheritance in JavaScript is made possible through the prototype property
- All of the native JS data structures inherit all of their properties and methods from their very own prototype.
- Each object has common properties & methods inherited from *Object*:
 - valueOf
 - constructor
 - toString
 - isPrototypeOf
 - propertyIsEnumerable
 - hasOwnProperty

Design Guidelines : 10 points to remember

Simple is beautiful.

Design is paramount.

Navigation should be intuitive.

Consistency is key.

Colors are crucial.

Make your website responsive.

Develop for multiple browsers.

Check your website for errors.

Write your own code.

Don't forget the content.

MV* Frameworks

Maintainability

- MV* frameworks are designed to make our code easier to maintain and to improve the user experience.

Popular Patterns

- MV* framework is nothing but the popular pattern like : MVC, MVVM, MVP

Separation of Concerns

- Idea of all pattern is to separate the Model, View and the Controller.

Some famous framework

- AngularJS, BackboneJS, KnockoutJS, EmberJS, ExtJS are some famous framework libraries.

AngularJS : An Overview

Open-source

- AngularJS is an open source JS library , sponsored and maintained by Google.

Super-heroic features

- AngularJS termed described as *structural lib for dynamic web apps* by following MV* pattern.

Own Markups

- AngularJS lets you to extend HTML vocabulary for your application.

SPA

- Helps to create SPA apps easily.

AngularJS Features

Extending Markups

Two way binding

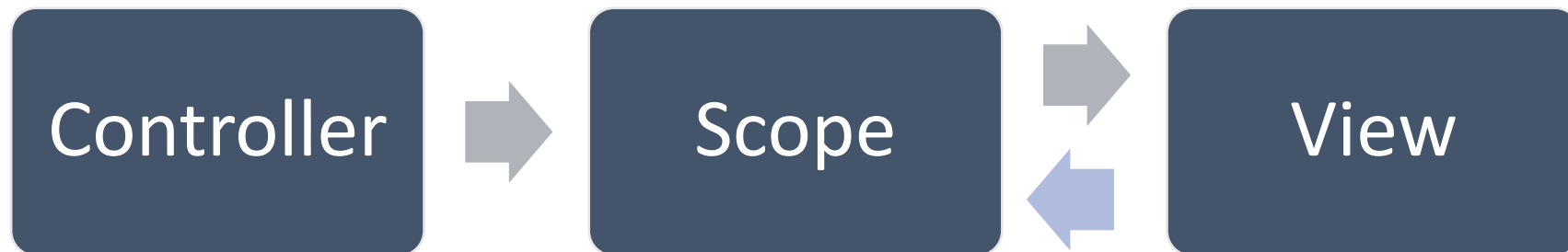
HTML Templates

Testability

Super features (filtering, XHR calls, data-binding, history DOM manipulation etc)

AngularJS Controller & Scope

- Controller primary responsibility is to create scope object (\$scope).
- Scope communicate with the view in two way communication.
- Scope expose model to view. Model is nothing but the data present in the Scope.
- View can be bind to the functions on the scope.
- We can modify the model using methods available on scope.



AngularJS Model

The model is simply a plain old JS Object, does not use getter/setter methods or have any special framework needs.

Changes are immediately reflected in the view via the two-way binding feature.

All model stem from Scope object.

Typically model objects are initialized in controller code.

In the HTML template, model variable would be referenced in curly braces.

AngularJS View and Templates

The View in AngularJS is the compiled DOM

View is the product of \$compile merging the HTML template with the \$scope.

In AngularJS, templates are written with HTML that contains Angular specific elements and attributes.

AngularJS combines the template with information from the model and controller to render the dynamic view that a user sees in browser.

AngularJS Modules

Group Interrelated Code

- A module is the overall container used to group AngularJS code. It consists of compiled services, directives, views controllers etc.

App Wiring

- Module is like a main method that instantiates and wires together the different part of app.

Declarative

- Module declaratively specify how an app should be bootstrapped.

Module Creation

- Angular module API allows to declare module using *angular.module()* API method.

Module Definition

- When declaring the module, we need to pass two parameters to the method. First : Module_Name; Second : Injectables

AngularJS Expressions

- Expressions `{{ expression }}` are JavaScript like code snippets.
- Expressions are evaluated against a scope object.
- AngularJS let us to execute expressions directly within our HTML pages.
- Expressions can also hold computational code but can't directly use JavaScript syntax like conditionals, loops or exceptions inside it.

e.g.

```
{{ 3*3 }}
```

```
{{ "Foo" + " " + "Bar" }}
```

```
{{ ["Foo", "Bar", "Bam", "Baz"] }}
```

\$rootScope

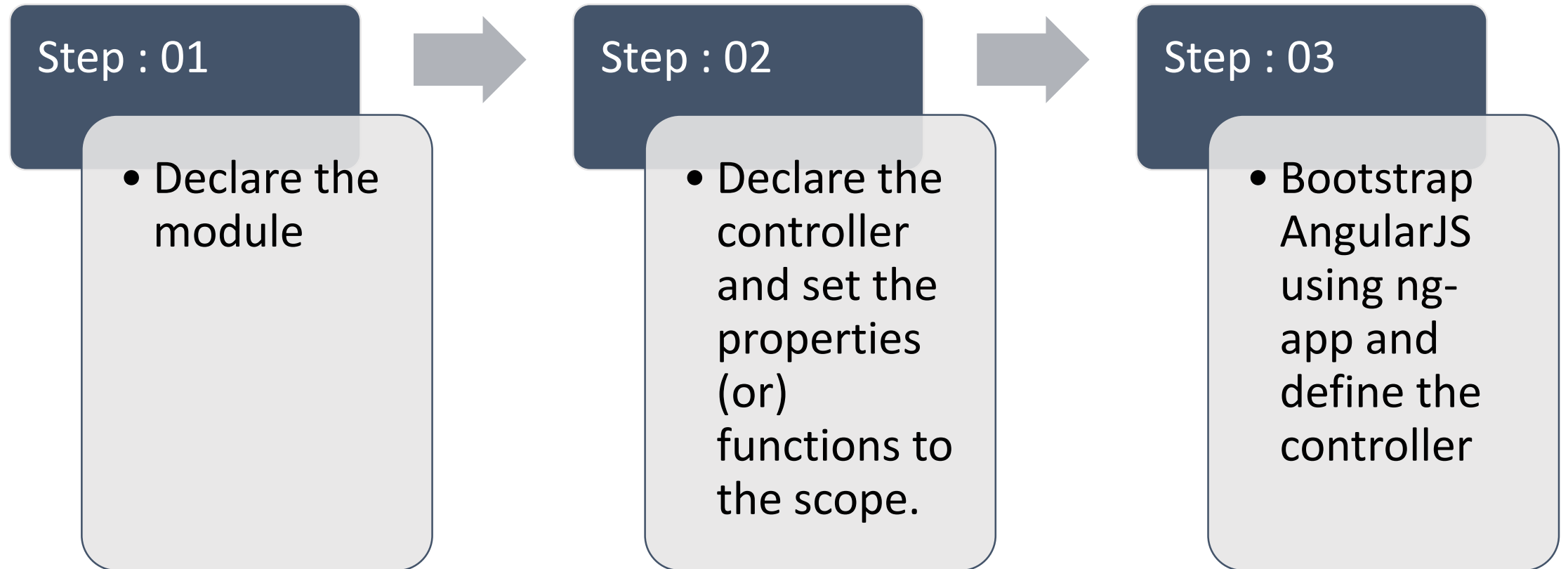
When AngularJS starts to run and generate the view, it will create a binding from the root ng-app element to the \$rootScope.

\$rootScope is the eventual parent of all \$scope objects and it is set when the module initialize via run method.

The \$rootScope object is the closest object we have in global context in Angular app.

Attaching too much logic here is a bad idea.

Steps for coding Hello World in AngularJS



Config and Run Method

angular.module type has config () and run () method

config
(configFn)

We can use this method to register the work which needs to be performed on the module loading

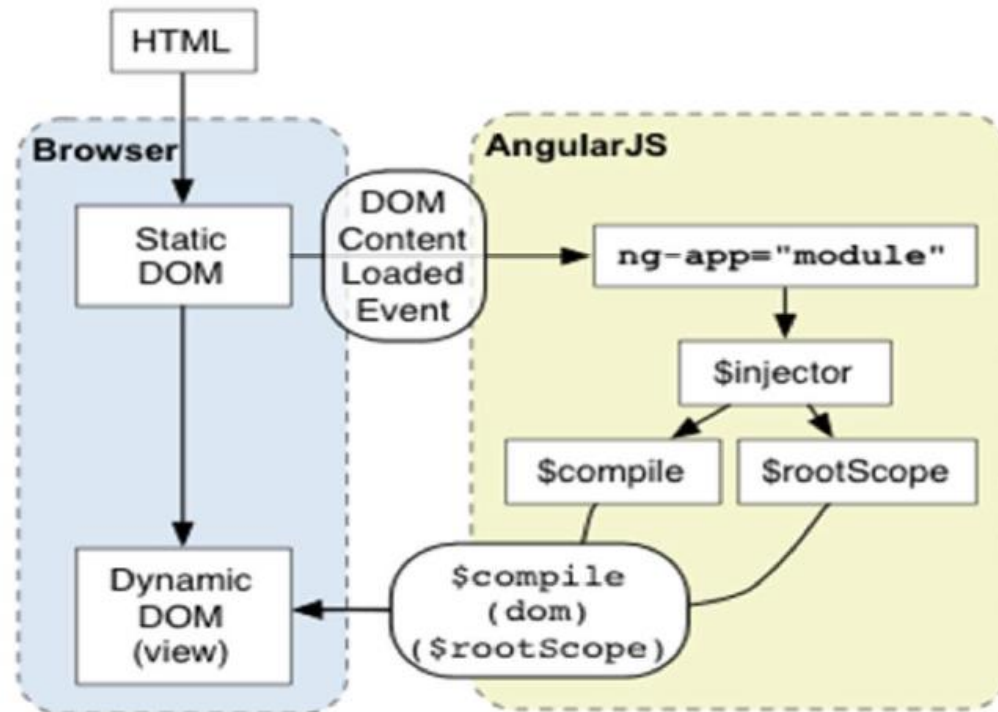
It will be very useful for configuring the service.

run
(initializationFn)

We can use this method to register the work which needs to be performed when the injector is done loading all modules.

How AngularJS Works

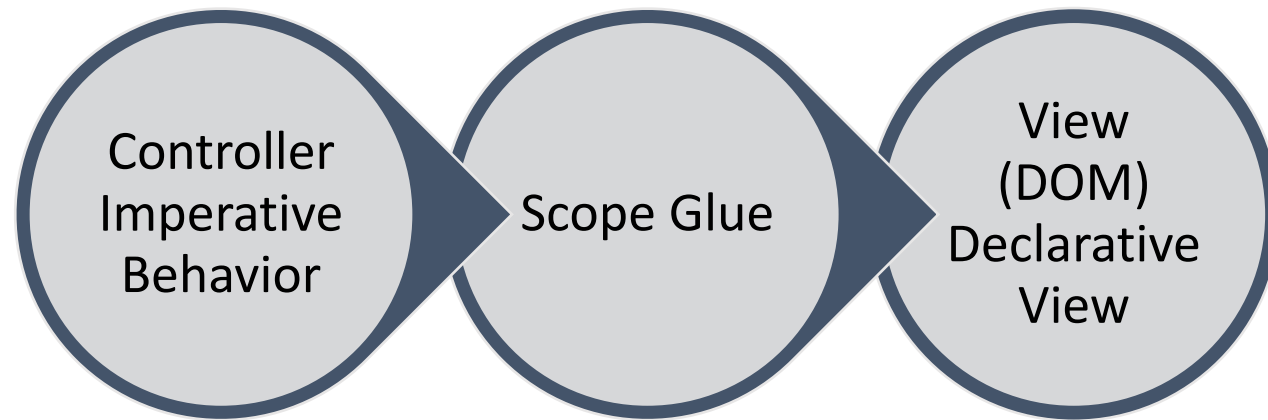
- \$compile compiles DOM into a template function that can be used to link scope and the view together



Source : Angularjs.org

Controllers

- Controller is used to provide the business logic behind the view and construct and value the model
- The goal is to not manipulate the DOM at all in the controller, which we have done using other frameworks.



Controller – Best Practices

Controllers should not know anything about the view they control.

Controllers should be small and focused.

Controllers should not talk to other controller.

Controllers should not own the domain model.

AngularJS Directives

Directives are ways to transform the DOM through extending HTML and provides new functionality.

Directive attaches a specified behaviour to that DOM element.

Directives are actual defined with camelCase in the JavaScript, but applied with a dash to the HTML.

Angular comes with a set of built-in directives along with that we can create our own directives.

As a good practice DOM manipulation need to be done in directive.

Directives

- Angular directive can be specified in 03 ways :
 - As a tag –
 - `<ng-form />`
 - As an attribute –
 - `<div ng-form> </div>`
 - As a class –
 - `<div class="ng-form"> </div>`
- All the built-in directives in angular cant be specified with all the 03 ways. Some of them can be specified in 1 or 2 ways only.

Built-in Directives

AngularJS provides a suite of built-in directives.

ngApp

- Placing ngApp on any DOM element marks that element as the beginning of the \$rootScope
- \$rootScope is the beginning of the scope chain, and all directives nested under the ng-app in your HTML inherit from it.
- \$rootScope can be accessed via the run method
- Using \$rootScope is like using global scope hence it is not a best practice
- We can use ng-app once per document

ngController

- This directive is used to place a controller on a DOM element
- Instead of defining actions and models on \$rootScope, use ng-controller

Built-in Directives

ngBind

- This attribute tells Angular to replace the text content of the specified HTML element with the value of a given expression and to update the text content when the value of that expression changes.
- It is preferable to use ngBind instead of `{{ expression }}`.

ngShow

- Shows or hide the given HTML element based in the expression provided to the ngShow attribute.

ngHide

- Shows or hide the given HTML element based in the expression provided to the ngHide attribute.

ngCloak

- Used to prevent the Angular HTML template from being briefly displayed by the browser in its raw form while your application is loading.

Built-in Directives

ngSrc

- AngularJS will tell the browser not to fetch the image via the given URL until all the expressions provided to ng-src have been interpolated

ngHref

- Angular waits for the interpolation to take place and then activates the link's behaviour

ngDisabled, ngChecked, ngReadonly & ngSelected

- Directives work with HTML Boolean attributes

ngIf

- Used to completely remove or re-create an element in the DOM based on an expression.
- Using ng-if when an element is removed from the DOM, its associated scope is destroyed. When it comes back into being, a new scope is created.

Built-in Directives

ngModel

- ngModel directive provides two way data-binding by synchronizing the model to the view, as well as view to the model.
- ngModel will try to bind the property given by evaluating the expression on the current scope. If the property does not already exist on this scope, it will be created implicitly and added to the scope.
- ngModel is responsible for :
 - Binding the view into the model.
 - Providing validation behaviour.
 - Keeping the state of the control.
 - Setting related CSS classes on the element
 - Registering the control with it's parent form

Built-in Directives

ngInit

- Used to setup the state inside the scope of a directive when that directive is invoked

ngInclude

- Used to fetch compile and include an external HTML fragment into your current application.
- By default, the template URL is restricted to the same domain and protocol as the application document, unless white-listed or wrapped as a trusted-values.

ngRepeat

- Instantiates a template once per item from a collection. Each template instance gets its own scope, where the given loop variable is set to the current collection item, and \$index is set to the item index or key.

Built-in Directives

ngStyle

- Allows you to set CSS style on an HTML element
- CSS class name and values must be quoted

ngClass

- Allows you to dynamically set CSS classes on an HTML element by databinding an expression that represent all classes to be added.

ngClassEven

- Works in conjunction with ngRepeat and take effect only on even row elements i.e 0,2,4,6 ...

ngClassOdd

- Works in conjunction with ngRepeat and take effect only on odd row elements i.e 1,3,5,7 ...

Built-in Event Directives

When AngularJS parses the HTML, it look for directive and take action based on that, when it looks for event directives it register the event on the DOM object.

ngClick

ngDbclick

ngMouseup

ngMousedown

ngMouseleave

ngMouseenter

ngMousemove

ngMouseover

ngChange

Custom Directive

Custom directive is defined using the `.directive()` method on app Angular module.

Directives can be implemented on the following ways:

Element

Class

Attribute

Comment

AngularJS recommends to use element and attribute directive and leave the CSS class and comment directive (unless absolutely necessary).

Custom Directive

Directive consist of three (or less) important things :

Link function is where DOM manipulation occurs

Controller is constructed during the pre-linking phase and receives the \$scope for the element.

DDO tells the compiler how the directive to be assembled. Common properties include the link function, controller function, restrict, template and templateUrl etc.

Applying restrictions to directives

Custom directive is restricted to attribute by default.

In order to create directive that are triggered by element, class name & comment, we need to use the *restrict* option.

The restrict option is typically set to :

A

E

C

M

These restrictions can also be combined

'AEC' – matches either attribute or element or class name

Custom Directives - template

Template is an inline template specified using HTML as a string /function gets appended / replaced within the element where the directive was invoked.

Template has a scope that can be accessed using double curly markup, like `{{ expression }}`. Backslashes is used at the end of the each line to denote multi-line string.

When a template string must be wrapped in a parent element i.e a root DOM element must exist.

Custom Directives - templateUrl

templateUrl comes in handy when template becomes too big to inline.

We can specify the path of an HTML file / a function which return the path of an HTML file.

By default, the HTML file will be requested on demand via Ajax when the directive is invoked.

Custom Directives – compile() & link()

The compile() and link() function define how the directive is to modify the HTML that matched the directive.

When the directive is first compiled by AngularJS, the compile() function is called. The compile() function can do any one time configuration of the element needed.

The compile() function finishes by returning the link() function. The link() function is called everytime the element is to be bound to data in the \$scope object.

We can even set only a link() function for the custom directive.

Custom Directives – compile() & link()

The template produced by a directive is meaningless unless it's compiled against the right scope.

By default, a directive does not get a new child scope. Rather, it gets the parent's scope. This means that if the controller is present inside a controller it will use that controller's scope. To utilize the scope, we can make use of a function called *link*.

Link takes a function with the following signatures :

Scope

Element

Attributes

The link function is mainly used for attaching event listeners to DOM elements, watching model properties for changes, and updating the DOM.

Custom Directive – Directive's Scope

By default, a directive get the parent's scope, so that they are free to modify the parent's controller scope properties.

If directive need to add properties and functions for internal use there is no need to add it to the parent's scope.

The scope can be configured with the scope property of the directive definition object.

A child scope – this scope prototypically inherits the parent's scope.

An isolated scope – a new scope does not inherit from the parent and exists on its own. These bindings are specified by the attributes defined in HTML and the definition of the scope property in the directive definition object.

Custom directives – Isolated Scope using '@ = &'

There are three types of binding options which are defined as prefixes in the scope property. The prefix is followed by the attribute name of HTML element

One way text binding (prefix : @)

Two-way binding (prefix : =)

Execute function in the parent scope (prefix : &)

Text binding are prefixed with @, and they are always strings. Whatever we write as attribute value, it will be parsed and return as strings. If the parent scope changes, the isolated scope will reflect those changes, but not the other way around.

Two way bindings are prefixed by = and can be of any type. Whenever the parent scope property changes, the corresponding isolated scope property also changes and vice-versa.

Form Validation

ngForm directive can be used, when we need to nest a form within another form which is not allowed in normal HTML.

The outer form is valid when all the child forms are valid.

The following CSS classes are set automatically, depending on the validity of form :

ngValid

ngInvalid

ngPristine

ngDirty

Filters

A filter formats the value of an expression for display to the user.

Filters can be invoked in HTML with the | (pipe) character inside the template.

We can also use filters from within JavaScript by using `$filter` Service.

To pass an argument to a filter in the HTML form, we pass it with a colon after the filter name (for multiple arguments, we can simply append a colon after each argument)

AngularJS gives us several built-in filters as well as an easy way to create our own.

Built-in Filters

☐ Uppercase

☐ Lowercase

☐ Number

☐ Currency

☐ Json

☐ Date

☐ Filter

☐ limitTo

☐ orderBy

Service

Service is just a simple JavaScript object that does some sort of work.

It is typically stateless and encapsulates some sort of functionality.

As a best practice, we need to place business logic inside service instead of placing it in the controller.

It help us to adhere to the Single Responsibility Principle (SRP) and Dependency Injection Principle (DIP) as well make the service reusable.

Services provide a method for us to keep data around for the lifetime of the app and communicate across controllers in a consistent manner.

Services are singleton objects that are instantiated only once per app and lazy loaded.

Creating and Registering a Service

AngularJS comes with several built-in services along with that we can create our own services.

Angular compiler can reference service and load it as a dependency for runtime once it is registered.

We can create service using five different ways –

Factory()

Service()

Provider()

Constant()

Value()

Registering Service using factory() function

The most common method for registering a service with our app is through the factory() method.

The factory() function takes two arguments :

- Name of the service which we want to register.
- Function which runs when Angular creates the service. It will be invoked once for the duration of the app lifecycle, as the service is a singleton object. It can return anything from a primitive value to a function to an object.

Registering Service using service() function

The service() function is used to register an instance of a service using a constructor function.

The service() function will instantiate the instance using the new keyword when creating the instance.

The service() function takes two arguments -

- Name of the service which we want to register
- The constructor function that we'll call to instantiate the instance

Registering Service using provider() function

A provider is an object with a `$get()` method. The `$injector` calls the `$get()` method to create a new instance of the service. The `provider()` method is responsible for registering the service in the `$providerCache`.

`factory()` function is shorthand for creating a service through the `provider()` method wherein we assume that the `$get()` function is the function passed.

`$provide service` is responsible for instantiating these providers at runtime.

We can also register service via the `$provide service` inside of a module's config function.

The `provide()` function takes two arguments.

- Name
- Object / Function / Array

Registering Service using constant() function

Constant() function is used to register an existing value as a service so that we can inject it into a module configuration function.

The constant() function returns a registered service instance.

The constant() function takes two arguments –

- The name with which to register the constant.
- The value to register as a constant

Registering Service using value() function

Value function is used to register the service, when the return value is just a constant.

The value () function returns a registered service instance.

We can't inject a value into a config function.

The value() function takes two arguments –

- The name with which to register the value
- The injectable instance

Use value() to register a service object or function and use constant() for configuration data.

Built-in Services

- AngularJS services are substitutable object that we wired together using Dependency Injection (DI). We can use those services to organize and share code across the application.
- AngularJS ships with lot of built-in services. Important services below:

\$http

\$q

\$compile

\$filter

\$log

\$window

\$timeout

\$locale

Testing : Let's sleep without worry

Karma

- The test runner

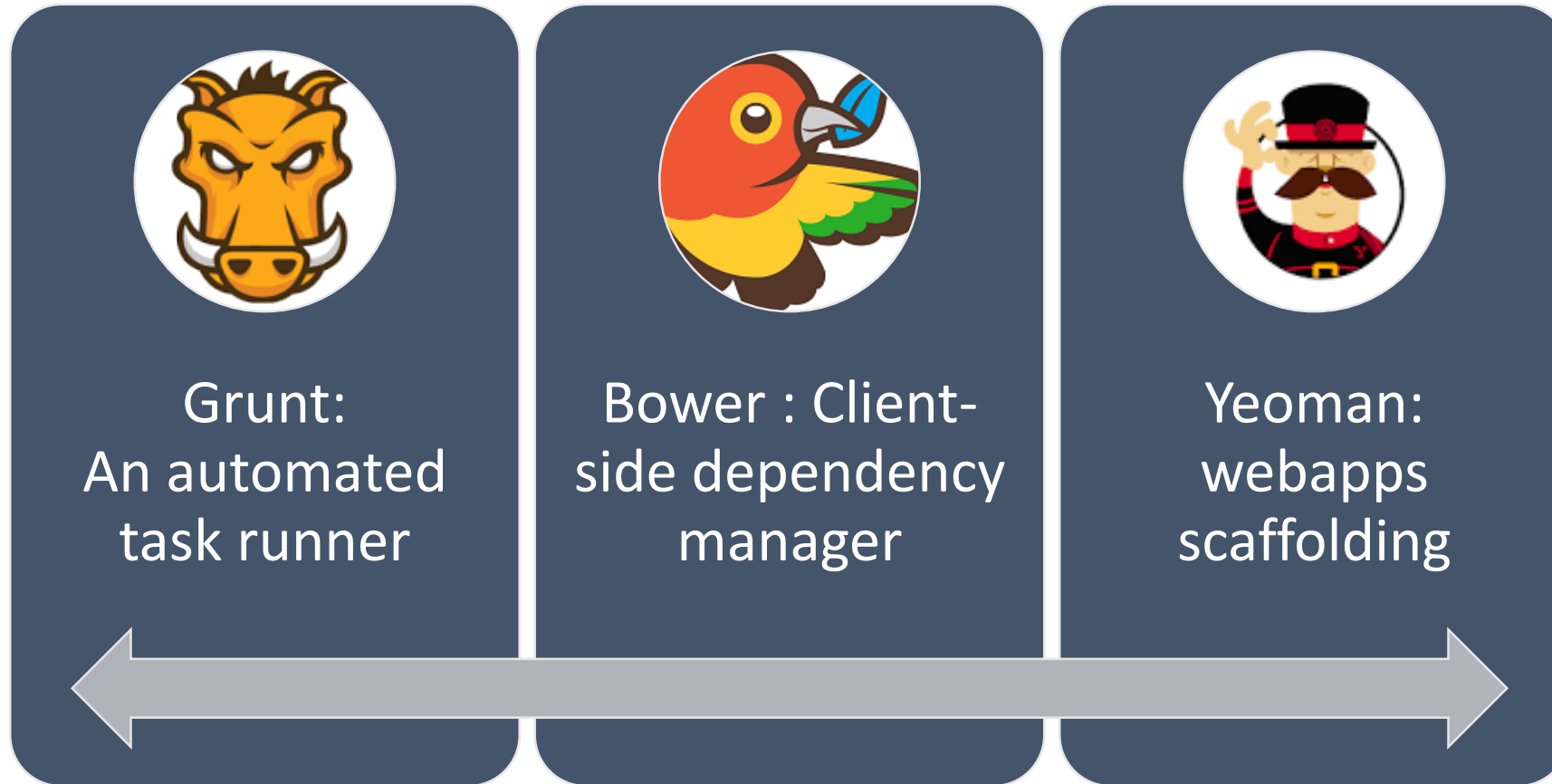
Jasmine

- Testing Framework

Protractor

- End-to end testing

JavaScript Development Workflow



References

Web

- <https://angularjs.org/>
- <https://www.javatpoint.com/angularjs-tutorial>
- <http://tutorials.jenkov.com/angularjs/index.html>

Books

- Ng-book by Ari Lerner