Angular Bootcamp

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Agenda

- Front-end JavaScript Frameworks
- Introducing Angular
- Angular Vocabulary
- Angular Building Blocks
- Directives
- Expressions, Data Binding
- MVC / MVVM
- Module
- Controller
- Filter
- Scope
- Forms
- Dependency Injection
- Service
- Template
- SPA
- Routing
- Client Server Communication - $http, $resource
- Custom Directives
- Q & A

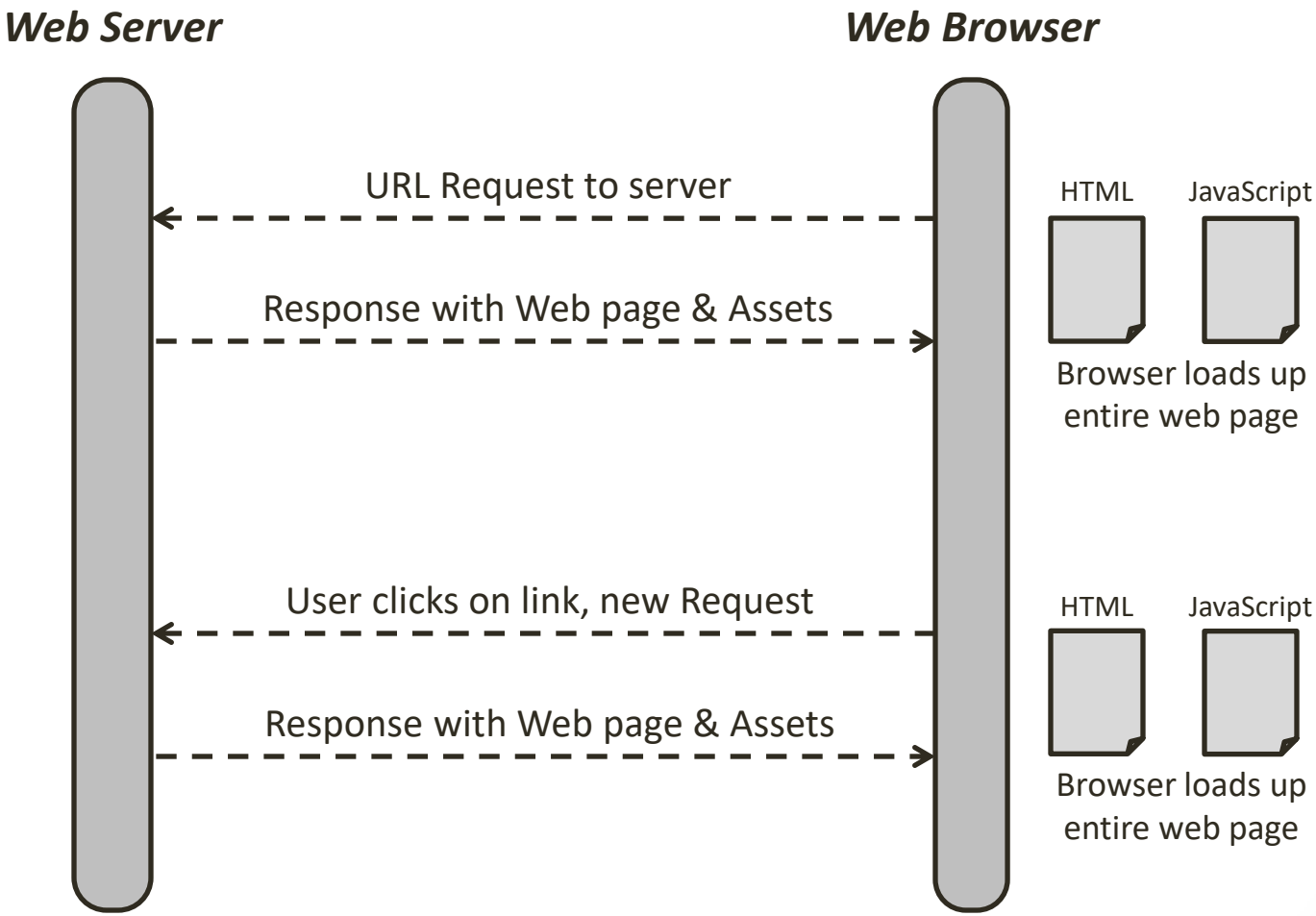
Need for JavaScript Frameworks

- HTML – good for static documents
- Dynamic Apps – DOM manipulation and data updates
- Impedance mismatch
- Library
  - A collection of reusable functions
  - Your code is in charge, calls into the library when it sees fit
  - E.g. jQuery
- Framework
  - A particular implementation of a web application
  - Provides generic functionality
  - Your code fills in details
  - Framework is in charge, it calls into your code, when it needs something
  - E.g. Backbone, Ember, Meteor

Need for JavaScript Frameworks

- Benefits:
  - Abstracts complexities of development
  - Increases developer productivity
  - Requires less in-depth expertise
  - Moving the application code forward in the stack
    - Reduces server load, thus reducing cost
    - Crowd-sourcing of computational power

Traditional Page Refresh



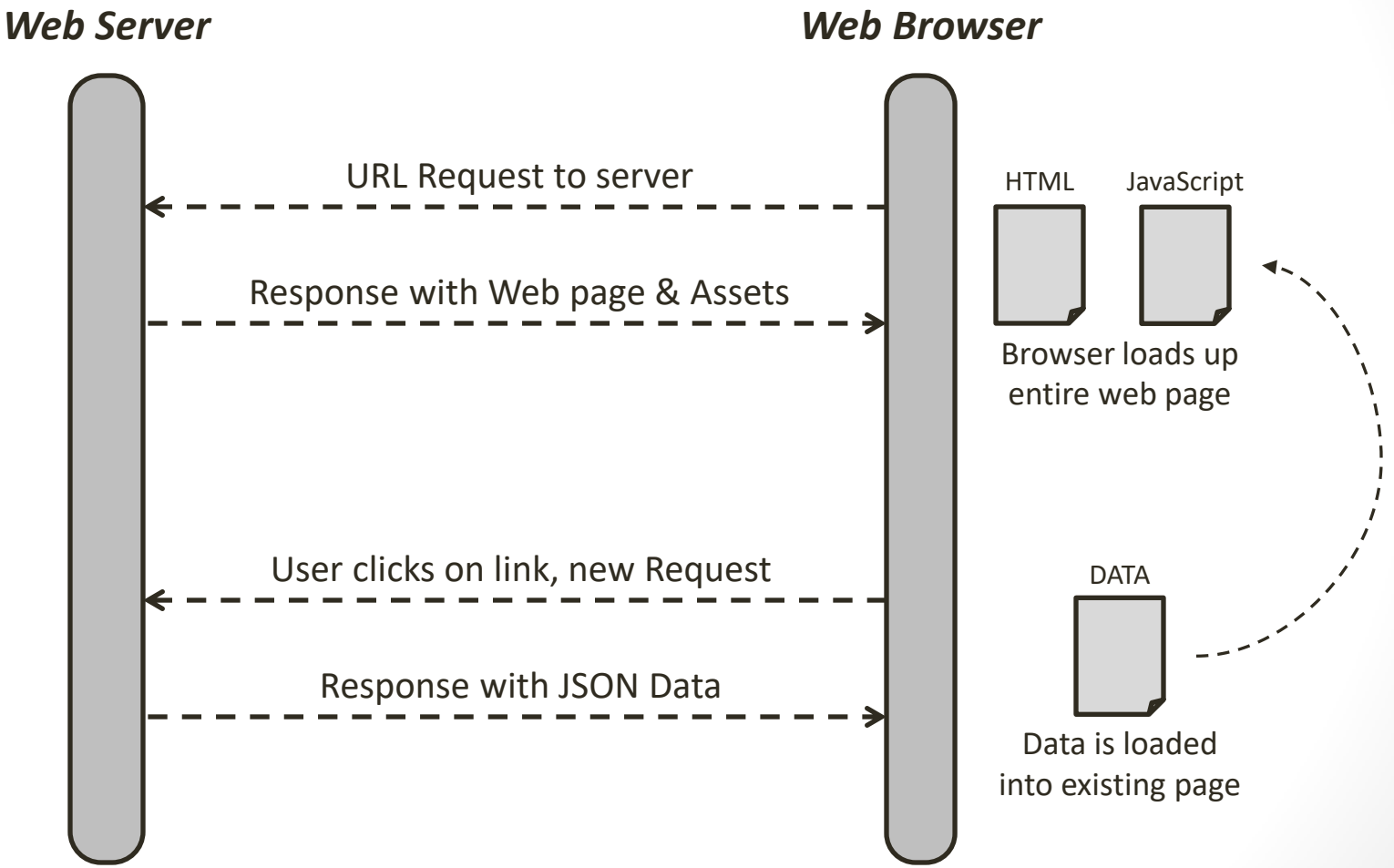
Introducing Angular

- Developed in 2009 by Misko Hevery
- Structural framework for dynamic web apps
- Front-end SPA, RIA framework
- Uses HTML as the template language
- Lets you extend HTML's syntax
- Declarative programming
- Not every app is a good fit for Angular
  - Best suited for building CRUD applications
  - Games and GUI editors – not a good fit

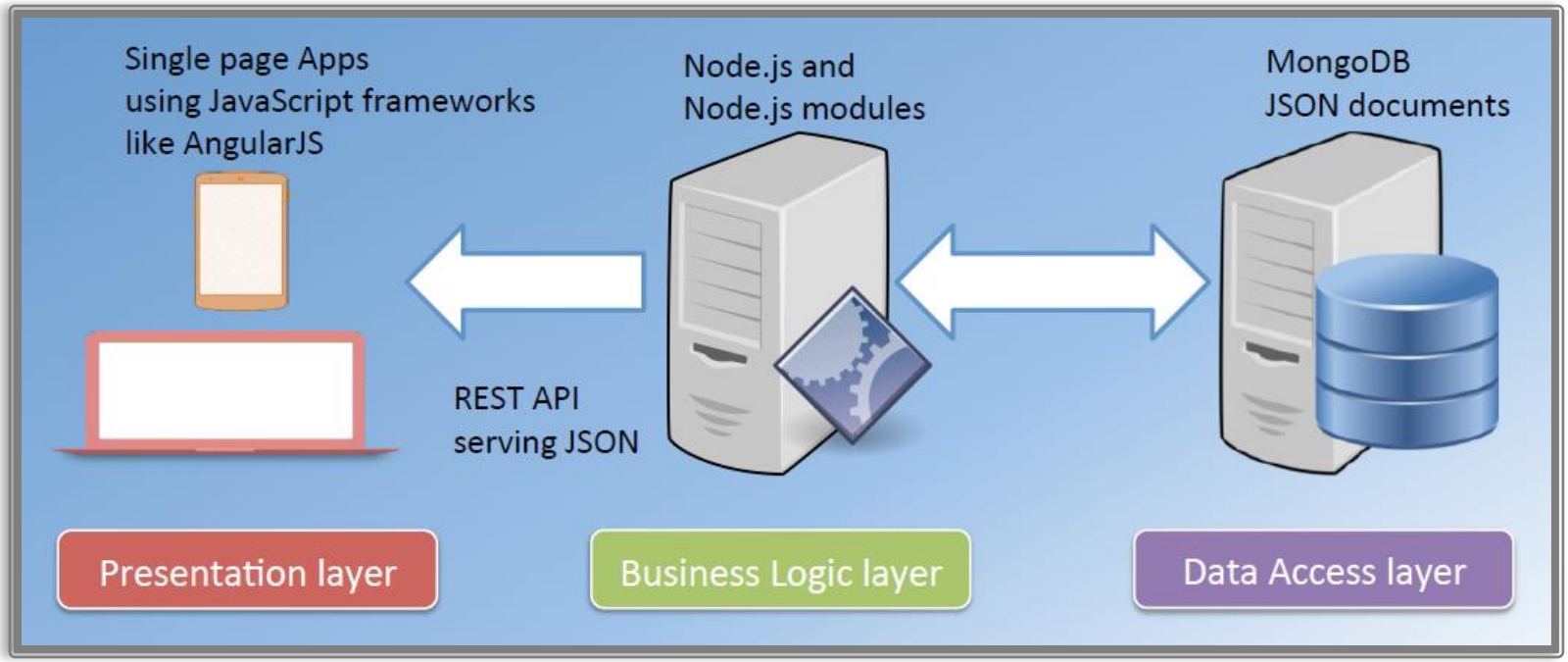
Angular - Advantages

- Helps you organize your JavaScript code
- Helps create responsive web apps
- Data Binding and Dependency Injection eliminates much of the manual code
- Decouple DOM manipulation from app logic
  - Improves testability
- Decouple client side of an app from the server side
  - Allows reuse
  - Allows parallel development

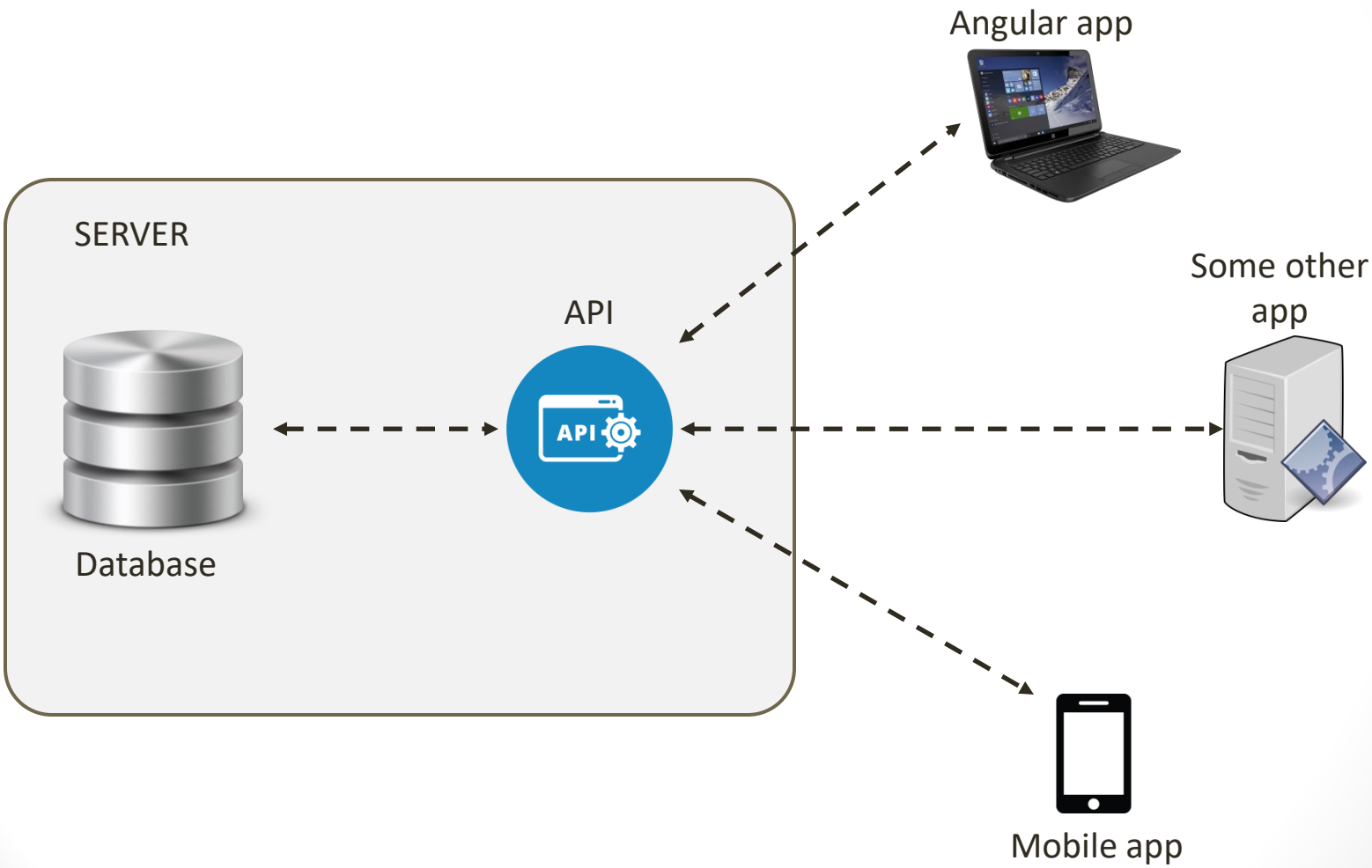
Responsive Page using Angular



Where does Angular fit?



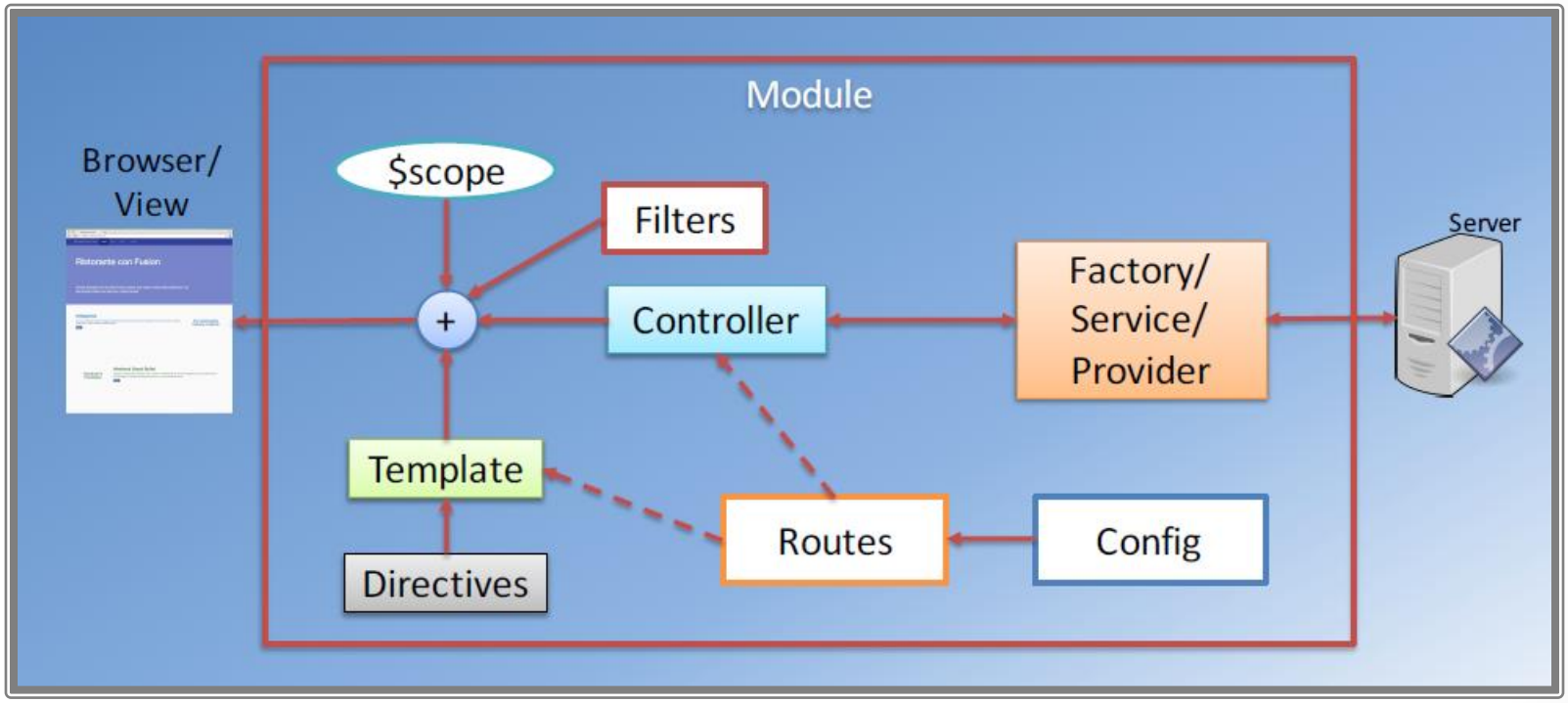
API Driven Approach



Angular Vocabulary

- Data binding
- Scope
- Directives
- Templates
- Routing
- Testing
- Modules
- Controllers
- Filters
- Services
- Views
- Form Validation
- MVC, ViewModel
- Dependency Injection

Angular Building Blocks



Getting Started

- Download Angular
  - http://angularjs.org/
  - angular.min.js
- Download Twitter Bootstrap
  - http://getbootstrap.com/
  - Bootstrap.min.css

Directives

- A marker on a HTML tag that tells Angular to run or reference some JavaScript code
- Binds behavior to HTML
- Custom attribute / element
- Helps you to extend HTML to support dynamic behavior
- Syntax: ng-<directive>
- Examples: ng-app, ng-bind, ng-model, ng-init, ng-repeat, etc.
- Declarative programming in action
  - Specifying what Angular needs to do

Directives

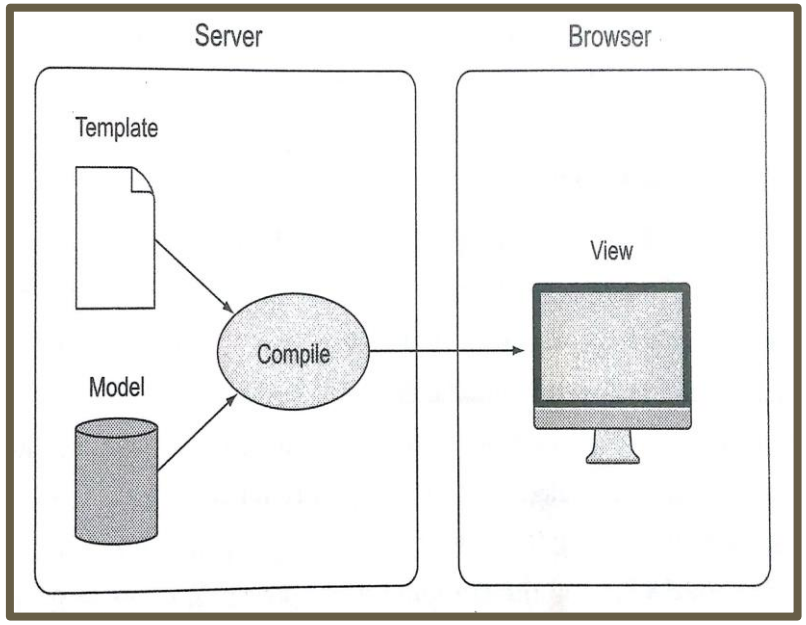
- ng-app
  - Runs the module when the document loads
  - Applied to specify the root of the application
  - Can be applied to any tag, typically applied to <html> tag
- ng-init
  - Used to evaluate an expression
  - Used to initialize a JavaScript variable
- ng-model
  - Binds an input value to a variable within the scope
- ng-repeat
  - Is a looping construct
  - Loops over items in a collection
  - Instantiates a template for each item

Expressions, Data Binding

- Expressions
  - Simple JavaScript expressions
  - Allow you to insert dynamic values into your HTML
  - No conditionals, loops or exceptions
  - Syntax: {{ <expression> }}

- Data Binding
  - Binding an HTML or CSS property to a JavaScript variable
  - Automatic synchronization of data between the model and view components

Data Binding

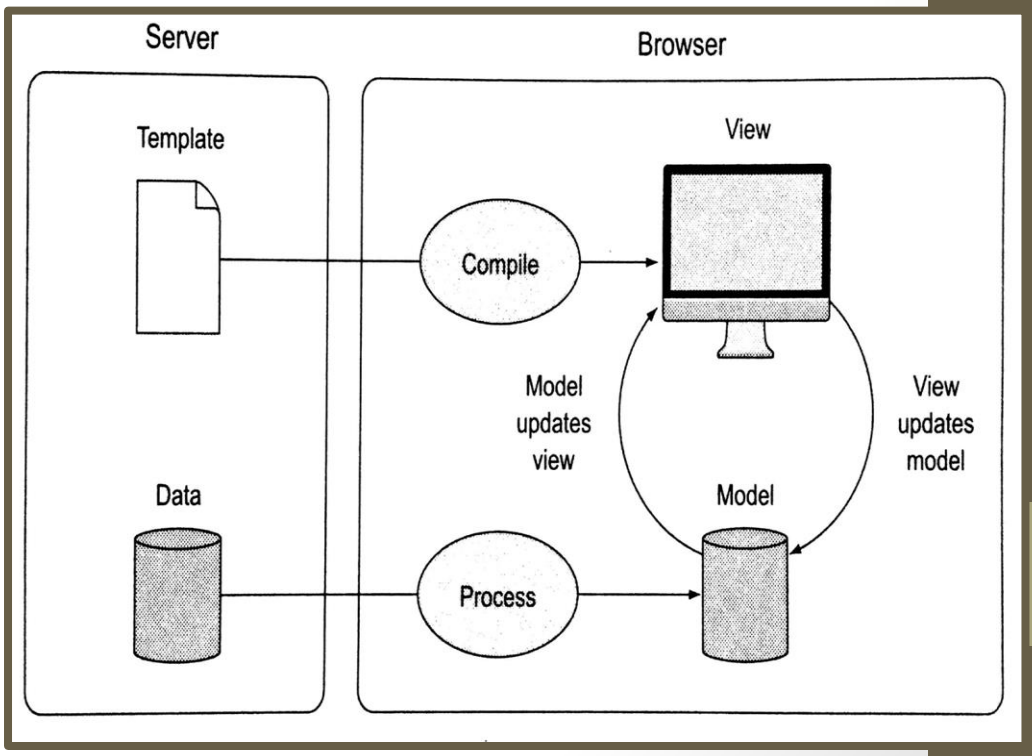


One-way data binding

The template and model are compiled on the server before being sent to the browser

Two-way data binding

The model and the view are processed in the browser and bound together, each instantly updating the other



MVC / MVVM

- Refer to my blog – MVC, MVVM and Angular
- URL – https://naveenpete.wordpress.com/2016/09/07/mvc-mvvm-and-angular/

Module

- Where we write pieces of our Angular app
- Makes our code more maintainable, testable and readable
- Where we define dependencies for our app
- A collection of:
  - Controllers
  - Directives
  - Filters
  - Services
  - Other config information
- Usage
  - angular.module('store', []);
  - <html ng-app='store'></html>

Controller

- JavaScript object containing properties and methods
- Defines app's behavior by defining functions and values

- Usage:

```
var app = angular.module('store');
app.controller('StoreController', function() {
    …
})

<div ng-controller="StoreController as storeCtrl">
    …
</div>
```

Filter

- Format the value of an expression for display
- Does not modify underlying data
- Angular comes with many built-in filters
  - uppercase
  - lowercase
  - currency
  - date
  - filter
  - orderBy
  - limitTo
- Custom filters

Scope

- An object that refers to the application model
- Core of two-way data binding
- Glue between the view and the controller
  - Controller sets properties on the scope
  - View binds to the properties set by the controller
  - Angular keeps the two in sync
- $rootScope – topmost scope
  - Created by Angular when your app starts
- As Angular traverses the DOM, new scopes are created when it encounters some directives
  - ng-controller, ng-repeat
  - Scope tree similar to DOM tree
- A new scope is created as a child of a parent scope
  - Child has access to properties in the parent scope

Forms

- Two-way data binding
  - Define a JavaScript object on the $scope
  - Use ng-model directive on form fields
- Binding <SELECT>: ng-options directive
- Form validation
  - Turn off HTML5 validation: novalidate
  - Make sure to give the form a name
  - Form submit: ng-submit
  - Field Properties
    - $pristine – true if form / field has not been changed
    - $dirty – reverse of $pristine
    - $valid – true if form / field is valid
    - $invalid – reverse of $valid
- Bootstrap classes
  - has-error, has-warning, has-success
  - help-block

Dependency Injection (DI)

- Software design pattern that implements Inversion of Control (IoC) for resolving dependencies
- Coined by Martin Fowler in 2004
- Dependency: An object that can be used (a service)
- Injection: Passing of a dependency to a dependent object so that it can use it. The client does not need to build the object
- Three ways
  - Create dependency using new operator
  - Look up dependency using a global variable
  - Have dependency passed to it where needed
- Third approach is most flexible
- Four Roles
  - The Service
  - The Client
  - The Interfaces
  - The Injector

Angular and DI

- Separation of business logic and dependency construction
- Dependency is passed to consuming object where needed
- Angular injector subsystem
- DI is extensively used in Angular
  - Services, Factories
  - Filters
  - Controllers
- Dependency Annotations
  - Inline Array
  - $inject property
  - Implicit

Service

- Substitutable object wired together using DI
- Allows organizing and sharing code across an app
- Lazily instantiated
- Singleton
- Angular includes several built-in services
  - $http, $timeout, $window, $location, $rootScope, $log, $filter
- Five ways
  - service()
  - factory()
  - provider()
  - value()
  - constant()

- AJAX calls
- Business rules
- Calculations
- Share data between controllers

Angular Template

- Written in HTML
- Contains Angular specific elements and attributes
- Dynamic View = Template + Controller + Model
- Angular elements and attributes
  - Directives
  - Markup
  - Filters
  - Form Controls
- ng-include directive
  - Used to fetch, compile and include an Angular template
  - Creates a new scope

SPA

- Web application that fits in a single web page
- No need to reload entire page, redraw parts of the page when needed
- UX like a desktop / native application
- Most assets / resources are retrieved during the initial page load

- Challenges
  - Search engine optimization
  - Analytics
  - Initial page load
  - History

SPA

- Role of Server
  - Serves data using REST API
  - Supplies static HTML pages, Angular templates and other assets
- Role of Client
  - Rendering of view - Templating
  - Routing
- Deep linking
  - The use of a hyperlink that links to a specific, generally searchable or indexed, piece of web content on a website
  - E.g. http://example.com/path/page.html

SPA

- The $location service
  - Exposes the current URL in the browser address bar
    - Watch and observe the URL
    - Change the URL
  - Maintains synchronization between itself and the browser's URL when the user
    - Changes the address in the browser's address bar
    - Clicks the back or forward button in the browser
    - Clicks on a link in the page

Routing - ngRoute

- Associate a template and a controller with a specific URL
- In SPA, hash portion of the URL is used
- ngRoute module
  - Separate module: angular-route.js
  - Dependency Injection
    - angular.module(‘app-name', ['ngRoute']);
  - $routeProvider
    - Used for configuring routes
    - Wires together controller, view template and the current URL
  - $routeParams
    - Allows you to retrieve the current set of route parameters
  - ngView directive
    - Complements route service by including the rendered template of the current route into the main layout file (index.html)

Routing – UI Router

- Limitations
  - Only one view is allowed per page
  - Views are tied to URL
- Introducing UI Router
  - View are based on states instead of URL
    - Can change parts of the application even if the URL does not change
  - Multiple views
  - Nested views
  - Download: https://github.com/angular-ui/ui-router
  - Separate module: angular-ui-router.js
  - Dependency Injection
    - angular.module('app-name', ['ui.router']);

Routing – UI Router

- $stateProvider
  - Manages state definitions
- $stateParams
  - Object that will have one key per URL parameter
  - A perfect way to provide your controller with the individual parts of the navigated URL
- ui-sref directive
  - Equivalent to href or ng-href in <a /> elements except the target value is a state name
- ui-view directive
  - Renders views defined in the current state

Client Server Communication

- Web applications are not stand-alone
- Network operations cause unexpected delays
- Data is not instantly available
- HTTP – A client-server communication protocol
- HTTP response format
  - XML
  - JSON
- JSON
  - Lightweight data interchange format
  - Language independent
  - Self-describing, easy to understand
  - Data is structured as a collection of name-value pairs

$http

- Core Angular service to communicate with remote servers using HTTP protocol
- Uses browser's XmlHttpRequest object
- Asynchronous in nature
- Based on promise API exposed by $q service
- Returns a promise

```
$http( { method: 'GET', url: 'http://server/api' } )
   .then(
         function(response) {   // success   },
         function(error) {   // error   }
   );
```

$http

- Shortcut methods
  - $http.get()
  - $http.post()
  - $http.put()
  - $http.delete()
- Response
  - response.data – string / object containing the body of the message
  - response.status – HTTP status code
  - response.headers – HTTP response header information
  - response.statusText – HTTP status text of the response

$resource

- Provides a higher level abstraction than $http
- Useful for interacting with a RESTful API server
- Wrapper around a REST API to perform CRUD operations
- Not part of Angular core
- Separate module: angular-resource.js
- Dependency Injection
  - angular.module('app-name', ['ngResource']);
- Usage

```
$resource('http://localhost:3000/movies/:id',
    { id: '@id' },
    { update: { method: 'PUT' } }
);
```

$resource

- $resource Methods
  - .query()
  - .get()
  - .save()
  - .remove()
  - .delete()

Custom Directives

- What is a Directive?
  - Markers on a DOM element that tell Angular's HTML compiler to attach a specified behavior to that DOM element
  - Teaches HTML new tricks
  - Makes HTML more expressive
- What can a directive do? Some examples
  - Manipulate the DOM
  - Iterate through data
  - Handle Events
  - Modify CSS
  - Validate data
  - Data binding

Custom Directives

- 3rd Party Directives
  - UI Bootstrap
  - AngularStrap
  - Angular UI Grid
  - Angular Translate
- Directive Types
  - Attribute directives
    -
  - Element directives
    - <my-dir></my-dir>
  - CSS class directives
    -
  - Comment directives
    - <!-- directive: my-dir value -->

Custom Directives

- Directive Building Blocks
  - $compile
  - Directive Definition Object (DDO)
  - Template
  - Scope
- Features of DDO
  - Defines the template for the directive
  - Can include DOM manipulation code
  - Can define a controller for the directive
  - Controls the directive's scope
  - Defines how the directive can be used

Custom Directives

Key DDO Properties	
restrict	scope
template	controller
templateUrl	link

```
angular.module('myApp')
    .directive('myDirective', function() {
        return {
            restrict: 'EA',
            scope: {},
            template: '<div>{{ myVal }}</div>',
            controller: MyController,
            link: function(scope, element, attrs) { }
        };
    });
```

Custom Directives

- Shared Scope
- Isolate Scope

Q & A

- Thank you