Practical AngularJS

Deep dive into Angular JS fundamentals, design and architecture

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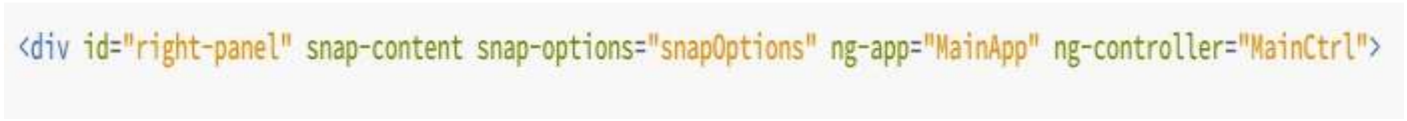
Agenda

- ❑ Introduction
- ❑ Fundamentals
- ❑ Features
- ❑ Project Setups
- ❑ Demo App
- ❑ Q & A
- ❑ Hands-on Session

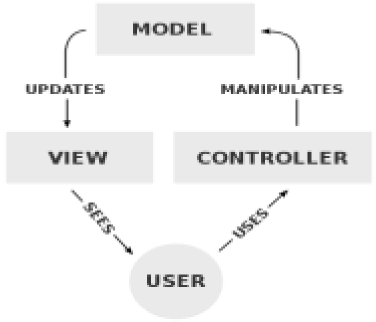
What is Angular JS?

- ❑ It is a JavaScript framework (open-source, by Google)
- ❑ It is used to build rich internet applications
- ❑ It is popular, “MEAN” stack: MongoDB, Express, AngularJS, Node.JS.
- ❑ It extends HTML tag attributes using ng-directives

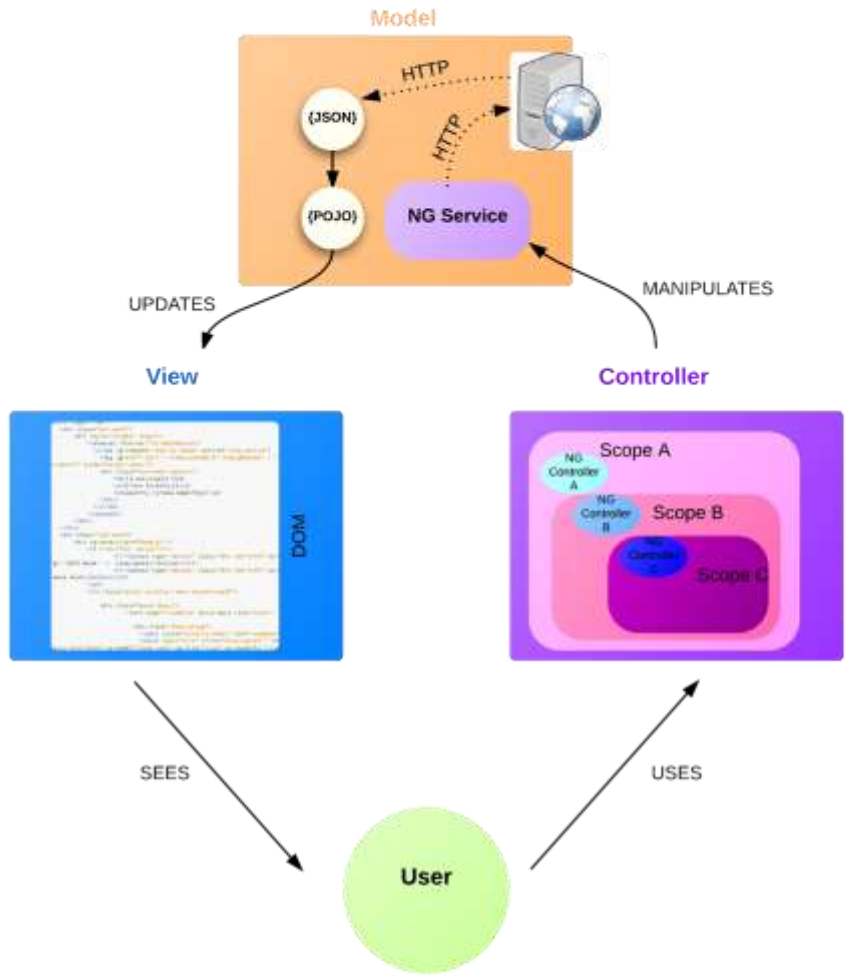


```
<div id="right-panel" snap-content snap-options="snapOptions" ng-app="MainApp" ng-controller="MainCtrl">
```

- ❑ It supports client-side MVC architecture



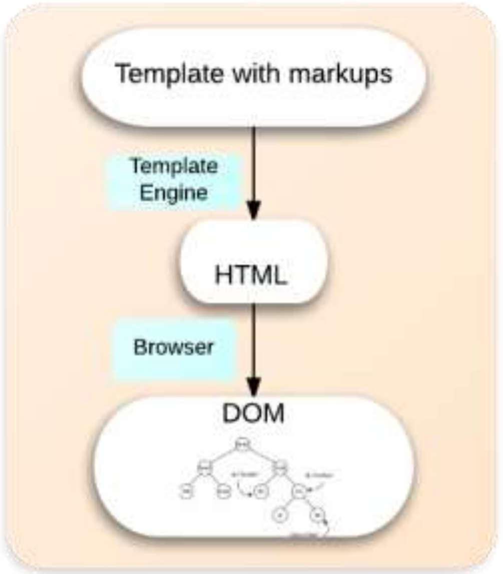
How it works?

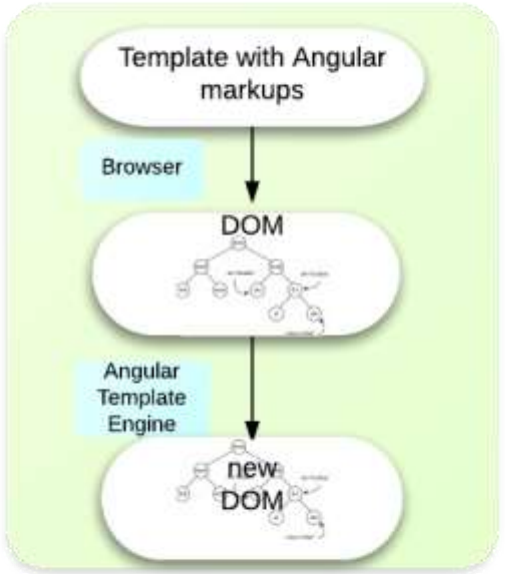

Model
HTTP
{JSON}
HTTP
{POJO}
NG Service
UPDATES
MANIPULATES
View
Controller
DOM
Scope A
NG Controller A
NG Controller B
Scope B
Scope C
SEES
USES
User

Declarative Programming

Building the structure and elements of UI programs, that expresses the logic without describing its control flow

Two-way Binding





Why AngularJS?

- Simple but powerful (declarative, 2-way binding)
- Rich and extensible (custom directives)
- POJO data model (no rich model, automatic rendering)
- Modularity & DI (logic contained, testability)
- Community Support

What is the SPA hype?

“A **single-page application** (**SPA**), is a web application or web site that fits on a single web page with the goal of providing a more fluid user experience akin to a desktop application.” (http://en.wikipedia.org/wiki/Single-page_application)

“Single page apps are distinguished by their ability to redraw any part of the UI **without requiring a server roundtrip** to retrieve HTML.” (http://singlepageappbook.com)

“The main reason is that they allow us to offer a **more-native-app-like experience** to the user." (http://singlepageappbook.com)

What opponents say

- ❑ Code Lock-In (Angular way, Angular 2.x)
- ❑ Dogmatic Architecture (controller -> service, no rich domain)
- ❑ Steep learning curve (sometime “magic work”)
- ❑ Poor Testability (difficult to test HTML rendering)

What we think

👍 Powerful & Rich

👍 Flexibility & Extensibility

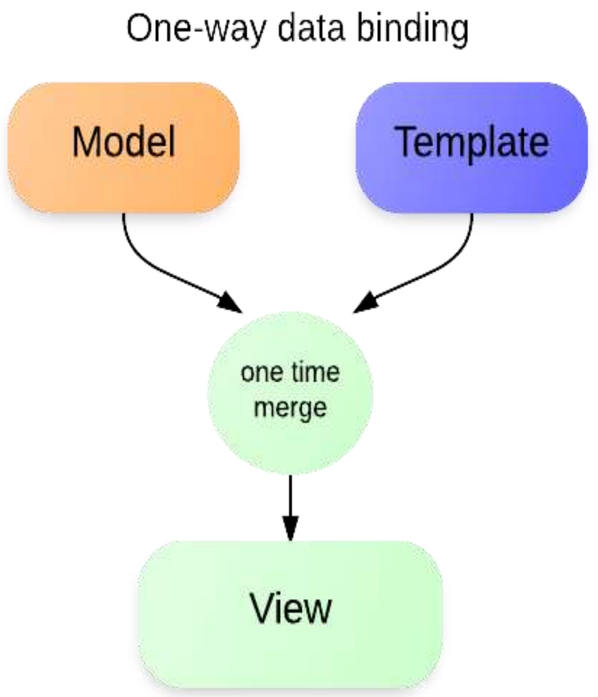
👍 Shorter Code

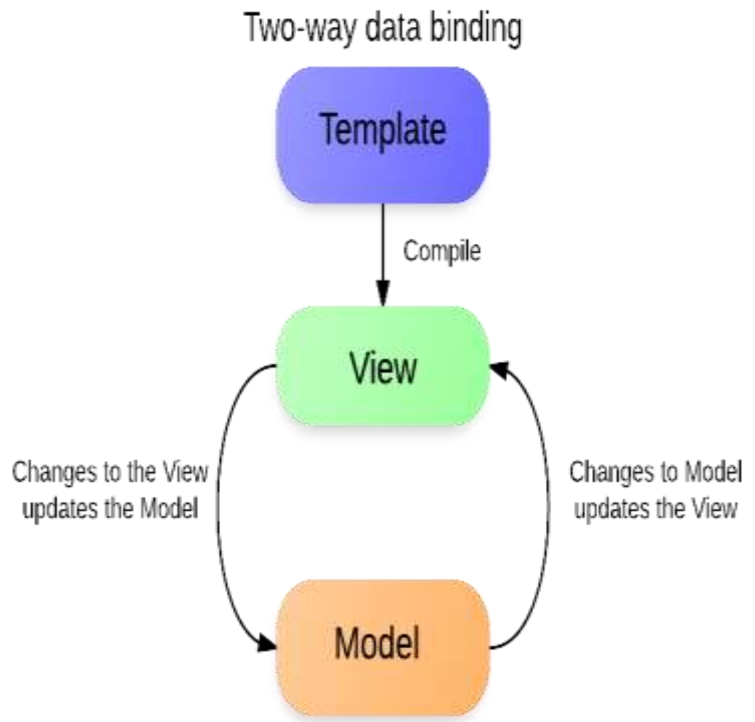
👍 Design similar to standard Java Web application (DI, Controller, Dao, TOs and modularity)

👍 Good development tool support

👎 Angular 2.x requires app rewrite

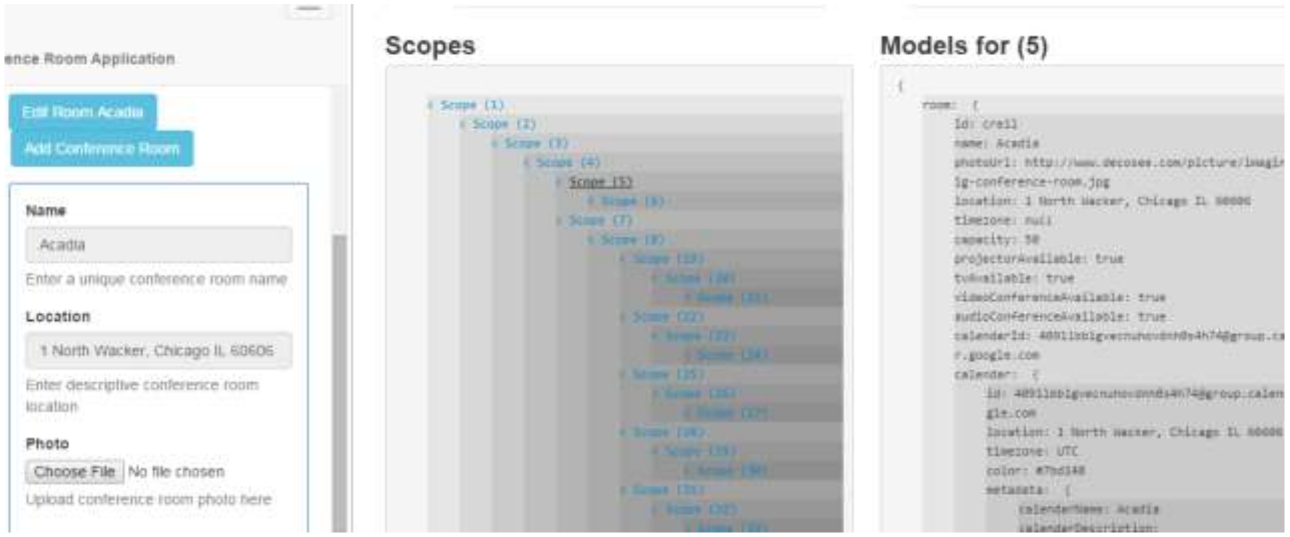
Two-way Data Binding




Two-way data binding
Template
Compile
View
Changes to the View updates the Model
Changes to Model updates the View
Model

Scope hierarchy and inheritance

- New Scope is created by each scope-creating directives (ng-controller) in DOM
- Rooted at $rootScope
- Properties are visible to all child scopes
- Referencing a parent scope ($parent.name)
- Avoid name conflict by binding a property to an object (myScope.name)



Name
Acadia
Enter a unique conference room name
Location
1 North Wacker, Chicago IL 60606
Enter descriptive conference room location
Photo
No file chosen
Upload conference room photo here

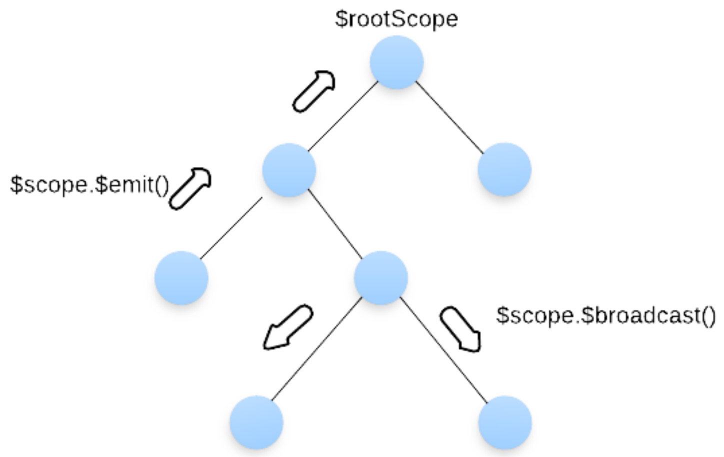
Scopes

```
< Scope (1)
  < Scope (2)
    < Scope (3)
      < Scope (4)
        < Scope (5)
          < Scope (6)
        < Scope (7)
          < Scope (8)
            < Scope (19)
              < Scope (20)
                < Scope (21)
            < Scope (22)
              < Scope (23)
                < Scope (24)
            < Scope (25)
              < Scope (26)
                < Scope (27)
            < Scope (28)
              < Scope (29)
                < Scope (30)
            < Scope (31)
              < Scope (32)
                < Scope (33)
```

Models for (5)

```
{
  room:  {
    id: creil
    name: Acadia
    photoUrl: http://www.decoses.com/picture/imagin
    ig-conference-room.jpg
    location: 1 North Wacker, Chicago IL 60606
    timezone: null
    capacity: 50
    projectorAvailable: true
    tvAvailable: true
    videoConferenceAvailable: true
    audioConferenceAvailable: true
    calendarId: 4091lsblgvecnuhovdnh0s4h74@group.ca
    r.google.com
    calender:  {
      id: 4091lsblgvecnuhovdnh0s4h74@group.calen
      gle.com
      location: 1 North Wacker, Chicago IL 60606
      timezone: UTC
      color: #7bd148
      metadata:  {
        calendarName: Acadia
        calendarDescription:
```

Eventing in Scope



- $emit() and $broadcast() methods to fire events
- $on method to register a scope-event handler

Modules & DI

- ❑ Modules are containers for related objects (controllers, services, constants etc.)
- ❑ Modules can be injected to another Module as dependencies
- ❑ Main module registered with HTML by *ng-app* attribute
- ❑ Other modules are injected through main module (only one “ng-app” registration)
- ❑ Implicit objects can be injected in components directly ($scope, $http, $window, $q, $timeout etc.)

Controllers

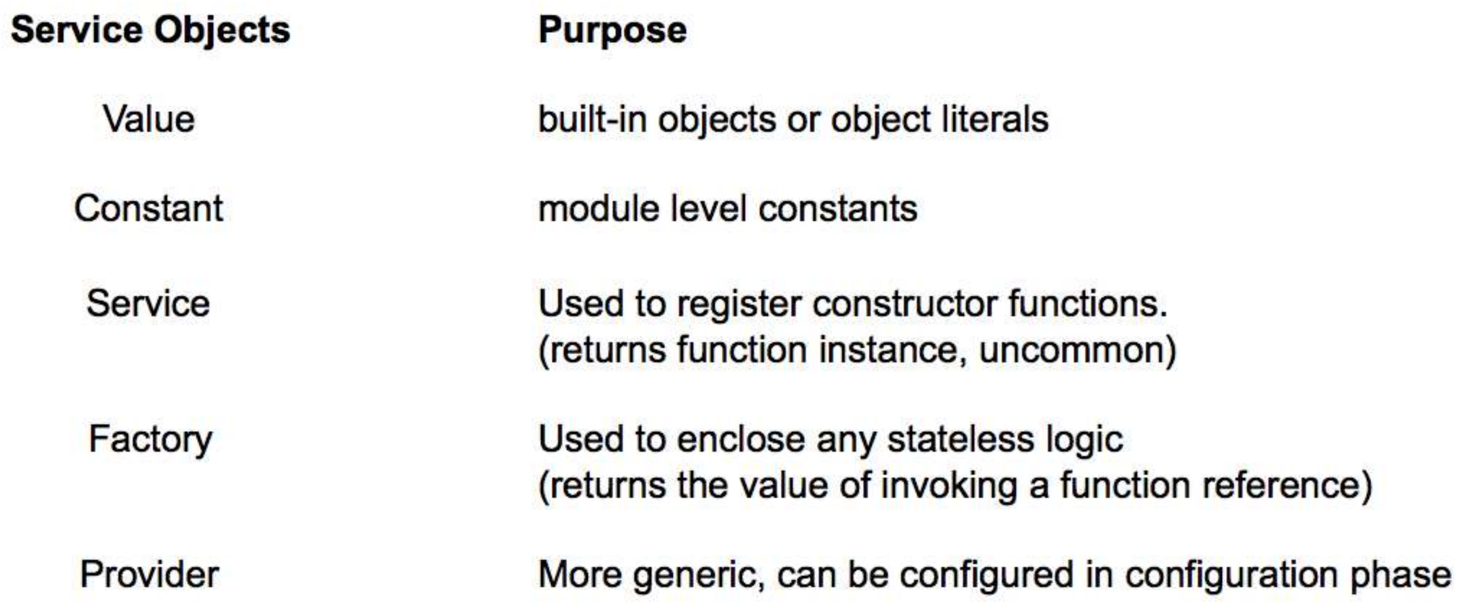
- ❑ Business logic for a single view (user list, room form, datepicker)
  - $scope.property - data model
  - $scope.method - behavior to update data model
  - Angular expression - display properties {{model.property}}
  - *ng-* event handler directives - invoke methods (ngClick=”save()”)

- ❑ Register to DOM via *ng-controller*

- ❑ Each controller is associated with a new scope ($scope injected in constructor function)

- ❑ Don’ts
  - Manipulate DOM
  - Format input (custom directives)
  - Filter output (angular filters)
  - Fat controller (service objects)

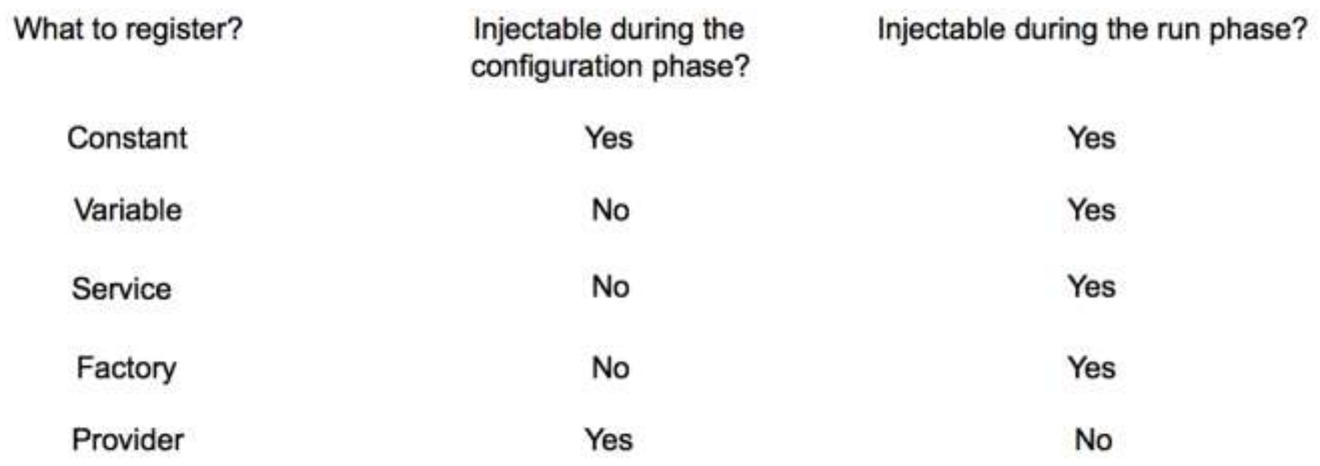
Angular Service Flavors



Service Objects	**Purpose**
Value	built-in objects or object literals
Constant	module level constants
Service	Used to register constructor functions. (returns function instance, uncommon)
Factory	Used to enclose any stateless logic (returns the value of invoking a function reference)
Provider	More generic, can be configured in configuration phase

Modules Lifecycle

- **The configuration phase**: components are collected and configured
- **The run phase:** post-instantiation logic execution



What to register?	Injectable during the configuration phase?	Injectable during the run phase?
Constant	Yes	Yes
Variable	No	Yes
Service	No	Yes
Factory	No	Yes
Provider	Yes	No

Calling back-end service

- **$http** - all-purpose API for XHR
  (GET, POST, PUT, DELETE, HEAD, JSONP)
  e.g. *$http.post(url, data, config)*
- Data conversion JS object ⇔ JSON occurs automatically for request and response
- *success* and *error* callback functions can be registered through $promise
- Function can be registered as Interceptors for $http service (security mechanism: CSRF token, Basic Auth)

Async is a “promise”

$q - Angular implementation of Promise API

```
var promise =
$http.get('http://host:80/servi
ce/users');

promise.then(
  function(payload) {
    $scope.mydata =
payload.data;
  },
  function(payload) {
    $scope.errorMsg =
payload.message;
  }$$
);
```

```
.factory('myService', function($http,
$log, $q) {
  return {
   asyncGet: function(movie) {
     var deferred = $q.defer();

$http.get('http://host:80/service/users)
       .success(function(data) {
          deferred.resolve({
             name: data.roomName,
             location: data.location});
       }).error(function(msg, code) {
          deferred.reject(msg);
          $log.error(msg, code);
       });
     return deferred.promise;
   }
  }
 });
```

API

$q(resolver);
defer();
reject(reason);
when(value);
all(promises);

jQuery and AngularJS

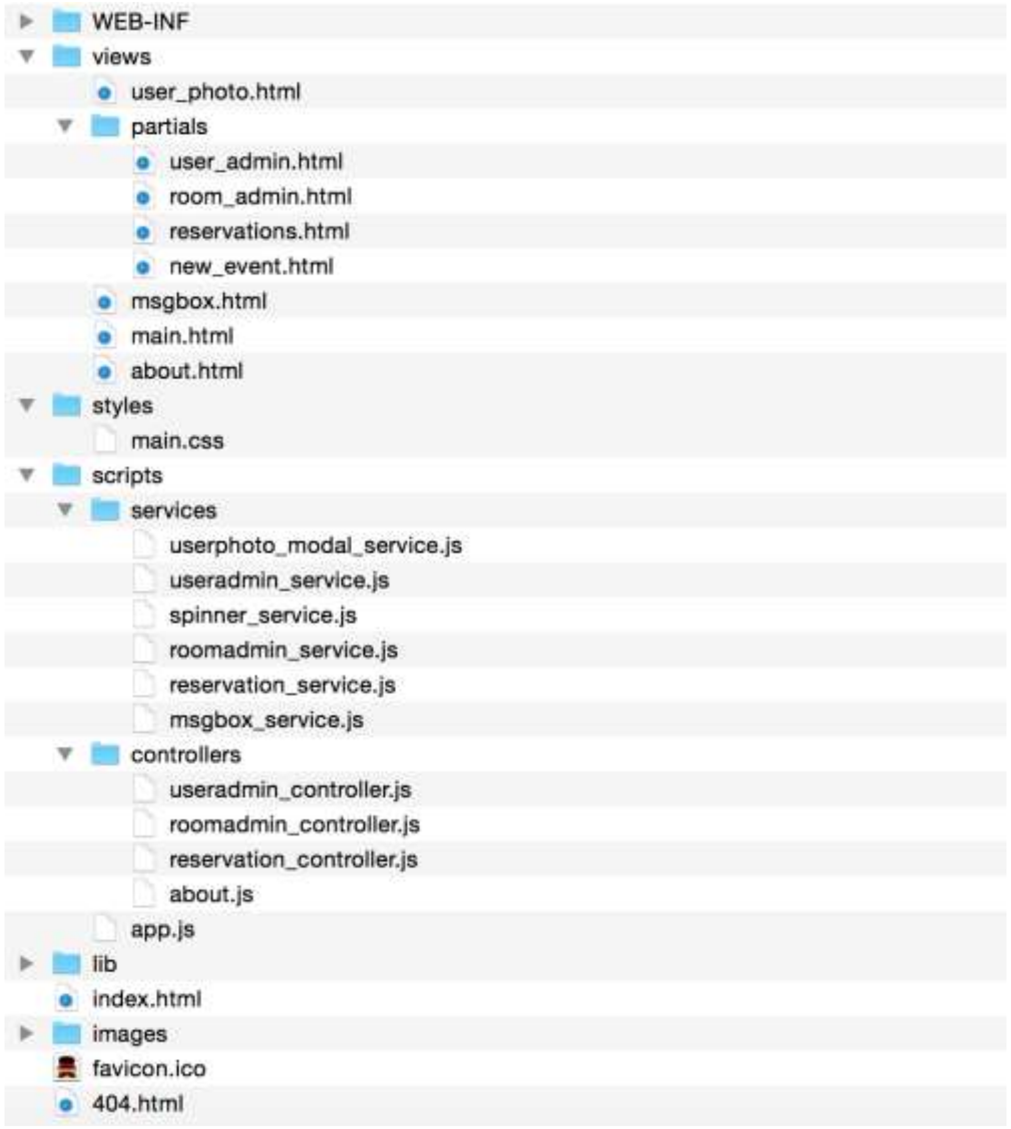
- jqLite - embedded & simplified jQuery in AngularJS
- Can cooperate, but not recommended

AngularJS	:	declarative view logic, model-centric
jQuery	:	DOM manipulation, traversing, event handling, Ajax

“thinking in Angular”

- Custom Directives - wraps underlying jQuery enabled components (example : angular-ui-calendar/fullcalendar)

Project Structure



```
▶ WEB-INF
▼ views
      user_photo.html
    ▼ partials
          user_admin.html
          room_admin.html
          reservations.html
          new_event.html
      msgbox.html
      main.html
      about.html
▼ styles
      main.css
▼ scripts
    ▼ services
          userphoto_modal_service.js
          useradmin_service.js
          spinner_service.js
          roomadmin_service.js
          reservation_service.js
          msgbox_service.js
    ▼ controllers
          useradmin_controller.js
          roomadmin_controller.js
          reservation_controller.js
          about.js
      app.js
▶ lib
  index.html
▶ images
  favicon.ico
  404.html
```

Core Directives

- Markers on a DOM element with specified behavior
- ngApp - auto-bootstrap an AngularJS app
- ngModel - binds an input,select, textarea to a property on the scope

Core Directives

- ngShow - shows or hides the given HTML element based on the expression provided

- ngDisabled - sets the disabled attribute on the element based on the expression provided

Core Directives

- ngController - attaches a controller class to the view
- ngRepeat - instantiates a template once per item from a collection
- ngNonBindable - tells Angular not to compile or bind the contents of the current DOM element

Core Filters (formatters)

- currency - formats a number as a currency (ie $1,234.56)
- date - formats date to a string based on the requested format
- uppercase
- lowercase

Core Filters

- “filter” - selects a subset of items from an array
- orderBy - orders an array

AngularJS UI Bootstrap

- Bootstrap components written in pure AngularJS: Accordion, Alert, Buttons, Carousel, Collapse, Datepicker, Dropdown, Modal, Pagination, Popover, Progressbar, Rating, Tabs, Timepicker, Tooltip, Typeahead
- https://angular-ui.github.io/bootstrap/
- Tabs sample
- Buttons sample
- Accordion sample

Custom Event Listener

- Events among controllers

  $emit(), **$broadcast()** and **$on()**

- Monitors any change and triggers callback

  $watch(watchExpression, listener);

  $watchCollection(obj, listener);

- **$watch() -> $broadcast() -> $on() -> update**

Timer Services

- **$timeout** - Call another function after a time delay

```
myapp.controller("MyCtrl", function($scope, $timeout) {

        $timeout(function(){ $scope.delayedFuntion(); }, 3000);

});
```

- **$interval** - Schedules repeated calls at a time interval

```
myapp.controller("MyCtrl", function($scope, $interval) {


                $interval( function(){ $scope.intervalFunction(); },
3000);



});
```

Custom Directives

Why Custom Directives?

- ❑ Simplify code, create reusable view logic in a new HTML mark-up
- ❑ Encapsulate view specific business logic (custom validation)
- ❑ Integrate with 3rd-party DOM manipulation API (jQueryUI)

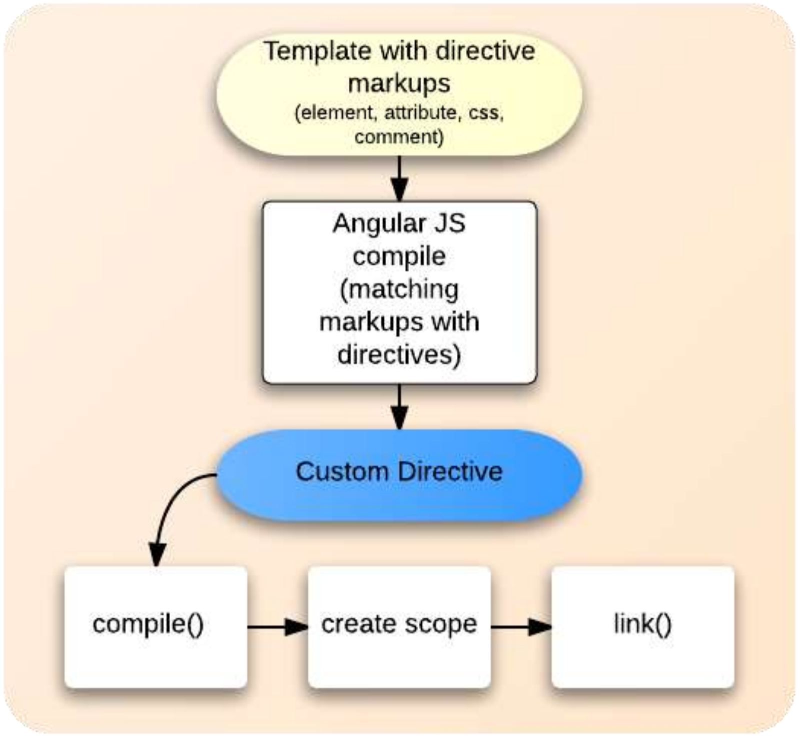
Defining a Directive

```
angular.module('myapp')
    .directive('myDirective', function () {
    return {
                  restrict: 'EA',
                  scope: {  name: '@'  },
                  template: '<div>{{ employeeName
}}</div>',
                  templateUrl:
'employ_detail_template.html',
                  controller: customController,
         compile: function(element, attributes) { },
         replace: true,
         transclude: true,
         require: 'ngModel',
         link: function ($scope, element, attrs) { }
             }
});
```

restrict

E = element, A = attribute, C = class, M = comment

Directive Lifecycle


Template with directive markups
(element, attribute, css, comment)
Angular JS compile (matching markups with directives)
Custom Directive
compile()
create scope
link()

- ❑ compilation called only once, linking called every iterations
- ❑ linking deal with data models in scope

Scope in a Directive

- ❑ Read the value from an attribute with @

```
scope: { employeeName: '@name' },

<div my-directive name="{{ employee.name }}"></div>
```

- ❑ Two-way data binding to the attribute with **=**

```
scope: { employee: '=' },

<div my-directive employee="employee"></div>
```

- ❑ Pass external function to directive using **&**

```
scope: { action: '&' },

<div my-directive action="getExmloyeeAddress()"></div>
```

Wrapping 3rd-party widget

```
myapp.directive('myWidget', function () {
    return {
            restrict: 'E',
            require:'ngModel',
            link:function (scope, element, attrs, ngModel) {
                element.jQueryWidget({   // option configuration
                            width : 10,
            color : 'red',
                            ….
        });
                ngModel.$render = function() {
                            element.jQueryWidget("set",
ngModel.$viewValue);
                };
            }
        ….
    };
});
```

Environment Setup

Node.js

Grunt

Bower

Karma

Batarang

Yeoman

Protractor

Node.js and NPM

- **Node.js** - run the JavaScript code outside the browser
- **NPM** - package manager for Node.js
- **package.json**

```
{ "name": "Conference-Room-UI",
  "version": "1.0.0",
  "repository": "https://github.com/coder-weiru/Conference-Room-UI",
  "dependencies": {
    "archiver": "^0.12.0",
  }
  "devDependencies": {
    "grunt": "~0.4.5",
    "grunt-bower-task": "^0.4.0",
    "grunt-karma": "~0.8.3",
    "grunt-war": "^0.4.5",
    "http-server": "^0.6.1",   ...
  },
  "scripts": {
    "start": "http-server -a 0.0.0.0 -p 8000",
    "test": "node node_modules/karma/bin/karma start test/karma.conf.js", ...
 }
}
```

Build with Grunt

- **Grunt.js** - A task runner for JavaScript
  (Maven/Java, Gradle/Groovy, Rake/Ruby)
- **Grunt Plugins** - Available tasks (jshint, karma, war, uglify ...)
- **Gruntfile.js** - Configuration

```
grunt.initConfig({
        pkg: grunt.file.readJSON('package.json'),
        bower: {
                    options: {...},
                }
        concat: { .. },
        clean: {...},
                war: {
                                target: {
                    options: {
                                },
                files: [ ... ]
                }});

grunt.loadNpmTasks('grunt-karma');
grunt.registerTask('default', ['karma','jshint','concat','uglify']);
```

Manage libs with Bower

- Manage client side dependencies
- **bower install <package>**
- **grunt bower**
- **.bowerrc** - Bower configuration
- **bower.json** - Project dependencies configuration

```
{ "name": "Conference Room UI",
  "version": "1.0.0",
  "private": true,
  "ignore": [
    "**/.*",
    "node_modules",
    "bower_components" ],
  "dependencies": {
    "angular": "^1.3.0",
  },
  "devDependencies": {
    "jasmine": "^2.0.0"
  },
  "appPath": "webapp",
  }
```

Test with Karma

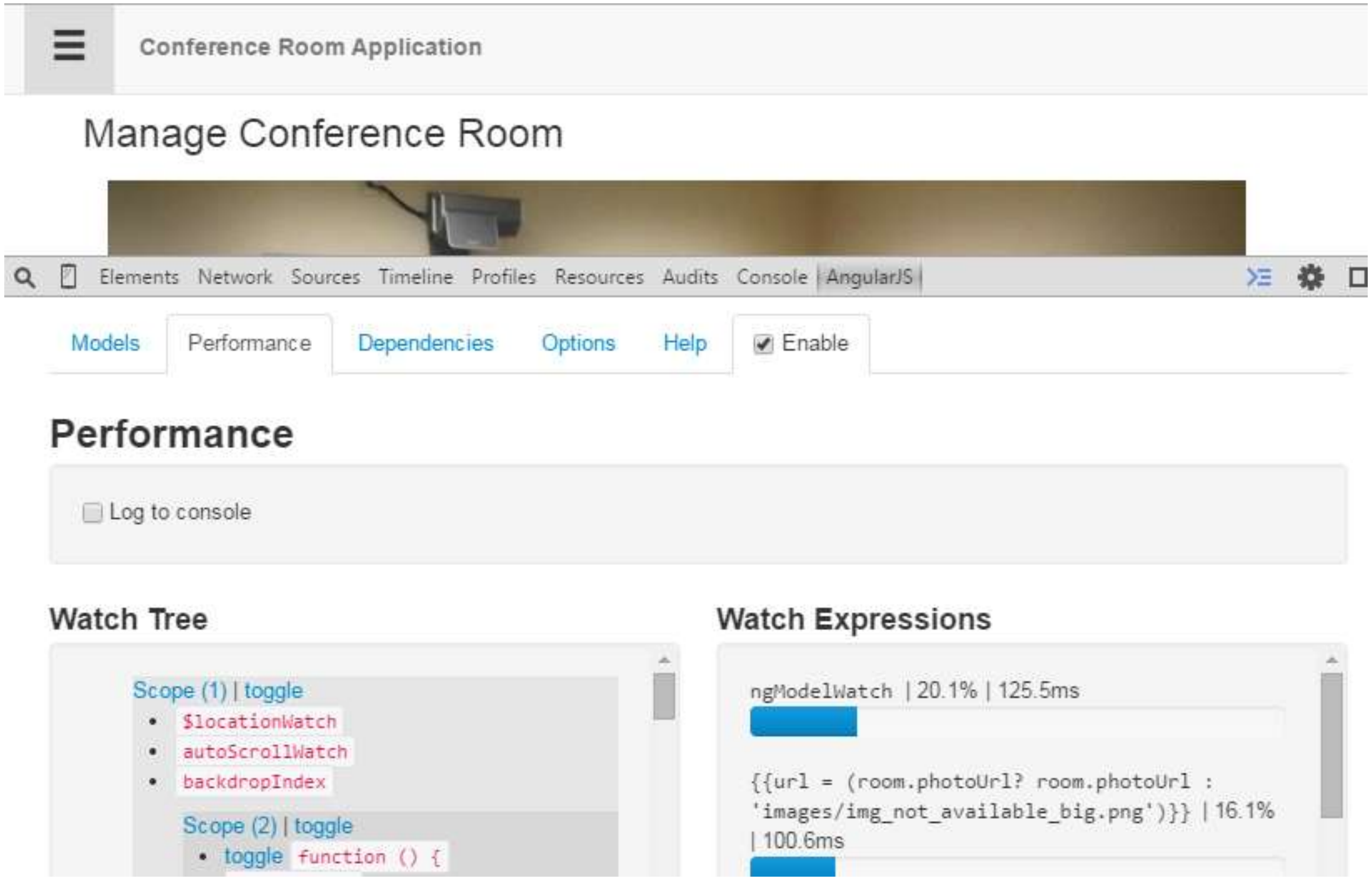
- **Karma** - Automated test runner (Jasmine, Mocha, QUnit)
- Installed as node modules (karma, karma-chrome-launcher, karma-jasmin)
- Configuration (karma.conf.js)

```
module.exports = function(config) {
  config.set({
    autoWatch: true,
    basePath: '../',
    frameworks: ['jasmine'],
    files: [
      'webapp/lib/angular/angular.js',
      'webapp/lib/angular-mocks/angular-mocks.js',
      'webapp/scripts/**/*.js',
      'test/unit/**/*.js'
    ],
    exclude: [   ...    ],
    port: 8989,
    browsers: [ 'Chrome’ ],
    plugins: [
      'karma-chrome-launcher',
      'karma-jasmine' ],
        ...
```

```
// Continuous Integration mode
singleRun: false

     …
     ...
```

Debug with Batarang


Conference Room Application
Manage Conference Room
Elements Network Sources Timeline Profiles Resources Audits Console AngularJS
Models Performance Dependencies Options Help Enable

Performance

Log to console

Watch Tree

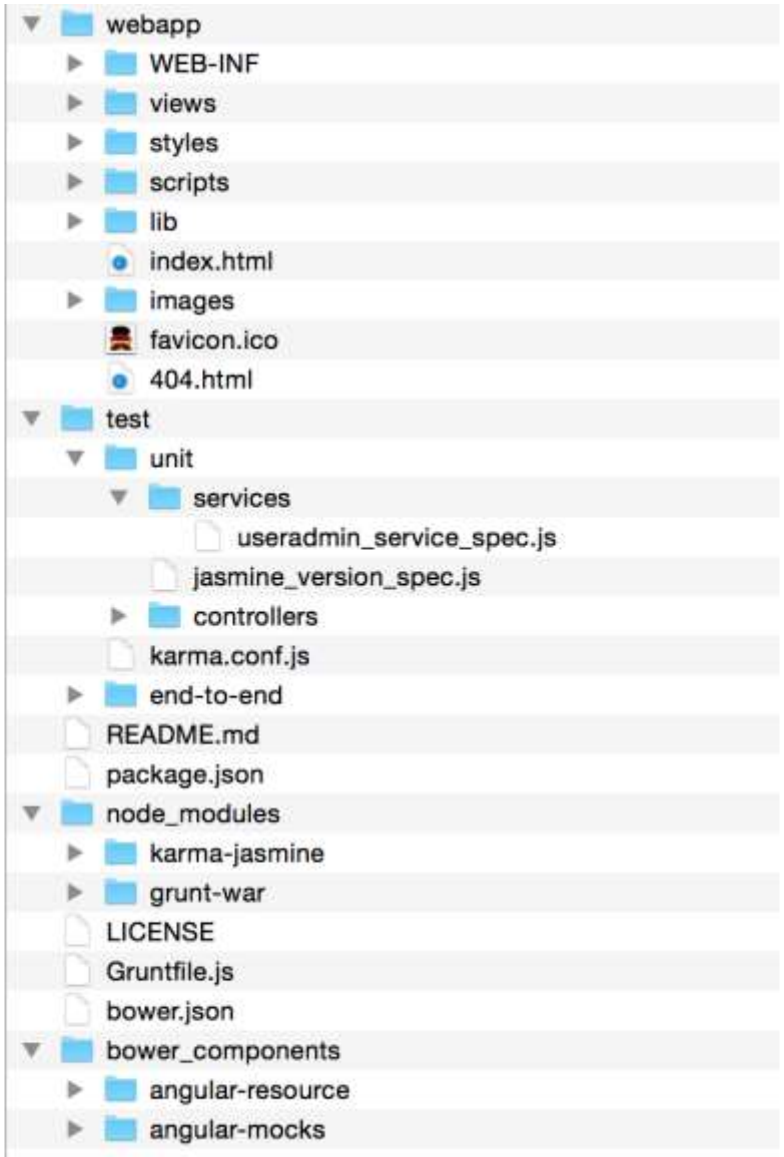
```
Scope (1) | toggle
  • $locationWatch
  • autoScrollWatch
  • backdropIndex
    Scope (2) | toggle
      • toggle function () {
```

Watch Expressions

```
ngModelWatch | 20.1% | 125.5ms

{{url = (room.photoUrl? room.photoUrl :
'images/img_not_available_big.png')}} | 16.1%
| 100.6ms
```

Files and folders



```
▼ webapp
    ▶ WEB-INF
    ▶ views
    ▶ styles
    ▶ scripts
    ▶ lib
      index.html
    ▶ images
      favicon.ico
      404.html
▼ test
    ▼ unit
        ▼ services
              useradmin_service_spec.js
          jasmine_version_spec.js
        ▶ controllers
      karma.conf.js
    ▶ end-to-end
  README.md
  package.json
▼ node_modules
    ▶ karma-jasmine
    ▶ grunt-war
  LICENSE
  Gruntfile.js
  bower.json
▼ bower_components
    ▶ angular-resource
    ▶ angular-mocks
```

Unit Tests

- **Jasmine** - behavior-driven test framework

- **module()** - loads the module (and all the dependent modules) through $injector (*ng-app*)

- **inject()** - injects services into tests

- **$new()** - creating a new $scope instance (*ng-controller*)

  $scope = $rootScope.$new();

- **$controller** - instantiating a new controller (*ng-controller*)

- **ngMock** - $exceptionHandler, $log, $httpBackend, $timeout

Service Test Example

```
describe('service.user Tests', function() {
    beforeEach(module('service.user'));
    describe('UserService returns a list of users', function() {
        var $httpBackend, userService;
        beforeEach(inject(function(UserService, $injector) {
                    $httpBackend = $injector.get('$httpBackend');
                    userService = UserService;
                    var mockData = [...];
                    $httpBackend.when("GET",url).respond(mockData);
      }));
     it("Async listUsers() return 2 items", function() {
                    var promise = userService.listUsers();
                                    promise.then(function(data) {
                                    result = data.data.length;
                                    });
                    $httpBackend.expect('GET', '/user/list');
                    $httpBackend.flush();
                                    expect(result).toEqual(2);
     });
});
```

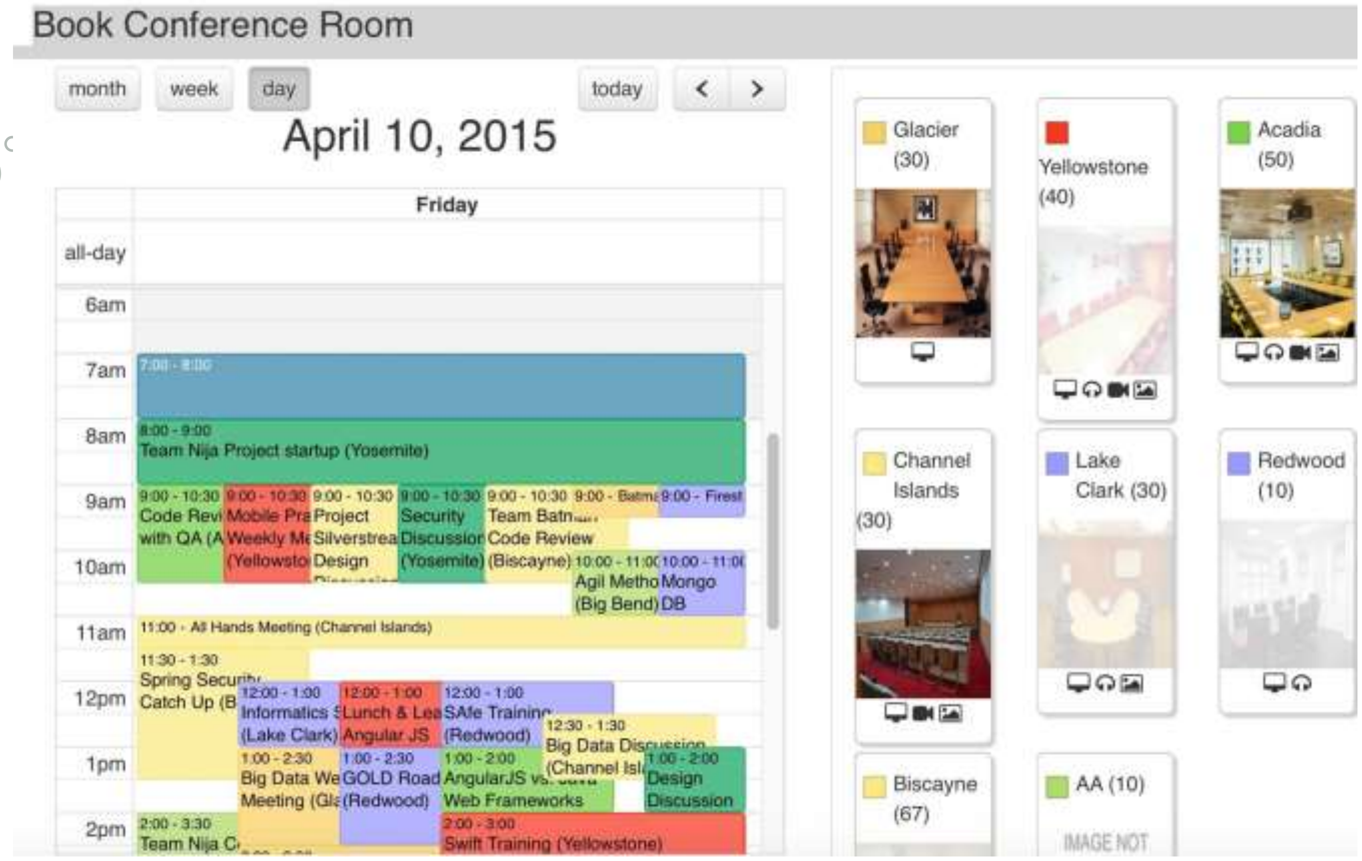
Controller Test Example

```
describe('controller.user Test', function () {
            var $scope;
            beforeEach(module('controller.user'));
            beforeEach(inject(function ($rootScope) {
                        $scope = $rootScope.$new();
    }));
it('should remove the user', inject(function($controller) {
      var mockUser = { … };
            $controller('UserListCtrl', {
                                    $scope: $scope,
                                    users: [mockUser]
      });
      expect($scope.users).toEqual([mockUser]);

      $scope.removeUser(mockUser);

      expect($scope.users).toEqual([]);
}));
```

Demo App



Book Conference Room

April 10, 2015

Friday

all-day

6am

7am 7:00 - 8:00

8am 8:00 - 9:00 Team Nija Project startup (Yosemite)

9am 9:00 - 10:30 Code Revi with QA (A | 9:00 - 10:30 Mobile Pra Weekly Me (Yellowsto | 9:00 - 10:30 Project Silverstrea Design Discussion | 9:00 - 10:30 Security Discussior (Yosemite) | 9:00 - 10:30 Team Batm Code Review (Biscayne) | 9:00 - Batma | 9:00 - Firest

10am 10:00 - 11:00 Agil Metho (Big Bend) | 10:00 - 11:00 Mongo DB

11am 11:00 - All Hands Meeting (Channel Islands)

11:30 - 1:30 Spring Security Catch Up (B

12pm 12:00 - 1:00 Informatics (Lake Clark) | 12:00 - 1:00 Lunch & Lea Angular JS | 12:00 - 1:00 SAfe Training (Redwood) | 12:30 - 1:30 Big Data Discussion (Channel Isl

1pm 1:00 - 2:30 Big Data We Meeting (Gla | 1:00 - 2:30 GOLD Road (Redwood) | 1:00 - 2:00 AngularJS vs. Java Web Frameworks | 1:00 - 2:00 Design Discussion

2pm 2:00 - 3:30 Team Nija C | 2:00 - 3:00 Swift Training (Yellowstone)

Glacier (30)

Yellowstone (40)

Acadia (50)

Channel Islands (30)

Lake Clark (30)

Redwood (10)

Biscayne (67)

AA (10)

IMAGE NOT

Hands-on Session

- ❑ Ex-1 **Display a user list using a controller**
- ❑ Ex-2 **Add a service object to retrieve user data from remote REST service**
- ❑ Ex-3 **Add detail views to the user list**
- ❑ Ex-4 **Add the capability to update user information via remote REST service**
- ❑ Ex-5 **Add pagination to the user list by a custom directive**
- ❑ Ex-6 **Use UI Grid to display the user list**

Exercises Source Location (https://github.com/coder-weiru/CoderConf-2015/)