Providing Protractor to Java / .Net
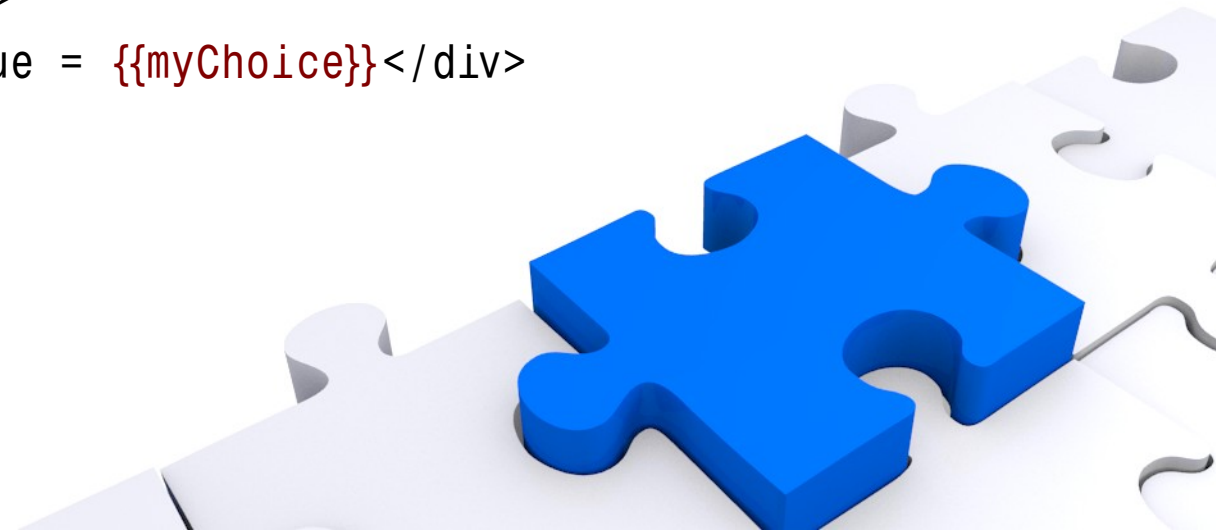
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Bare-bones Angular page

```html
<html ng-app="myApp">
<head>
<script src="angular.js"></script>
<script type="text/javascript">
var app = angular.module('myApp', []);
app.controller('myCtrl',
function($scope){
$scope.myChoice = 1;
  $scope.options = [
{ name: 'one', value: 1},
{ name: 'two', value: 2},
]});
</script>
</head>
```
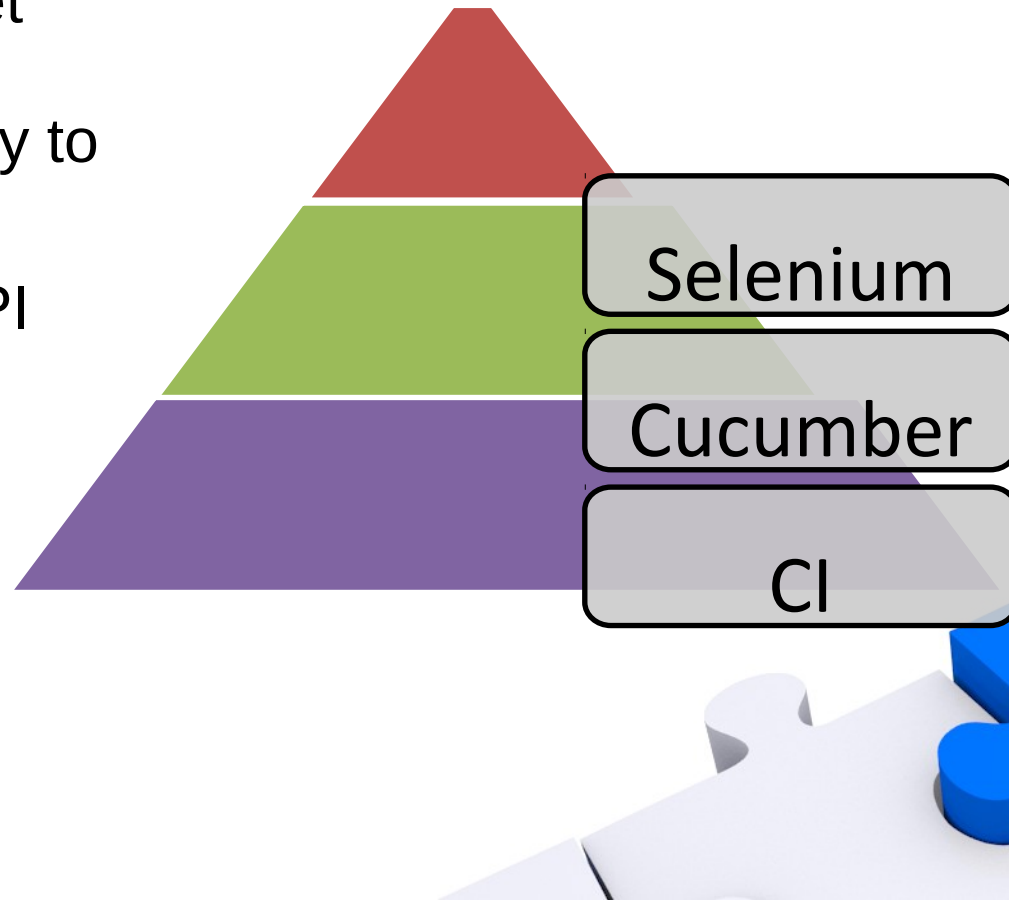
```html
<body ng-controller = "myCtrl">
 <select ng-model = "myChoice">
    <option ng-repeat = "option in
options"
              value = "{{option.value}}"
              ng-selected =
"option.value ==
myChoice">{{option.name}}</option>
  </select>
  <div>Value = {{myChoice}}</div>
</body>
</html>
```
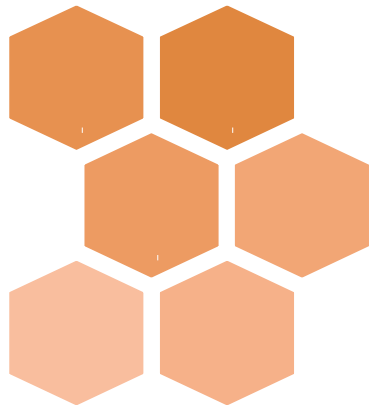
Integration with QA / CI

- Framework (module) layers offered for integrating Selenium Testing with CI by Java, .Net and Node.js offer similar functionality but are not easy to combine (examples exist)

- Angular MVC Clientside API were only available through Protractor
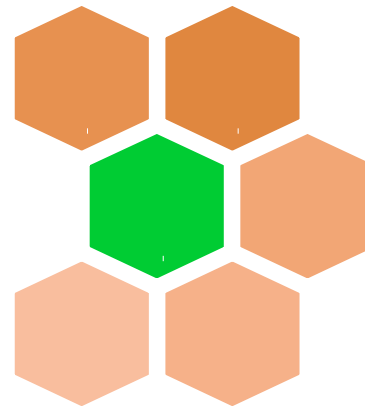
Selenium

Cucumber

CI

Adding Key Protractor Methods

Java

Node.js

jProractor,
Protractor-net

Tool Chain

- Cucumber, TestNg/Junit
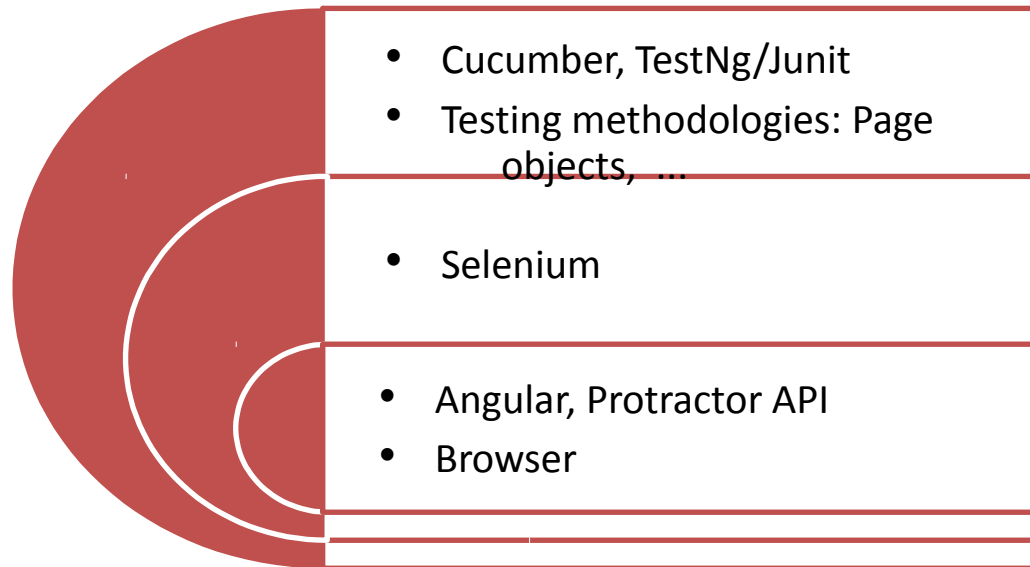- Testing methodologies: Page objects, ...

- Selenium

- Angular, Protractor API
- Browser

Frequently Used Selenium API

- ByClassName, ByCssSelector, ById, ByLinkText, ByName, ByPartialLinkText, ByTagName, ByXPath (nested classes of By)

- ExpectedConditions

- WebElement.findElements

- Wait

- SendKeys

- Actions

WebDriver Wire Protocol

Command	Method	URI Template
Find Element	POST	/session/{*session id*}/element
Find Element fron Another	POST	/session/{*session id*}/element/{element id}/element
Get Element Attribute	GET	/session/{*session id*}/element/{*element id*}/attribute/{*name*}
Get Element Property	GET	/session/{*session id*}/element/{*element id*}/property/{*name*}
Get Element CSS Value	GET	/session/{*session id*}/element/{*element id*}/css/{*property name*}
Get Element Text	GET	/session/{*session id*}/element/{*element id*}/text
Get Element Tag Nate	GET	/session/{*session id*}/element/{*element id*}/name
Get Element Rectangle position	GET	/session/{*session id*}/element/{*element id*}/rect
Execute Script	POST	/session/{*session id*}/execute/sync
Execute Async script	POST	/session/{*session id*}/execute/async

https://w3c.github.io/webdriver/webdriver-spec.html#dfn-command
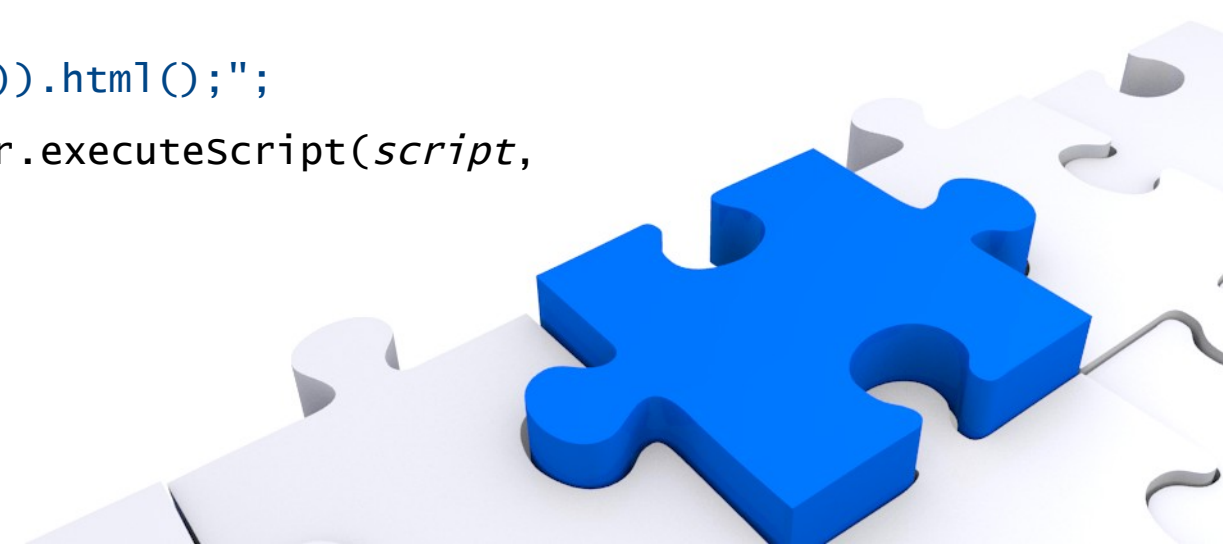
WebDriver with Protractor API

- ByClassName, ByCssSelector, ById, ByLinkText, ByName, ByPartialLinkText, ByTagName, ByXPath (nested classes of By)

- NgBy (JavaScriptBy): binding, buttonText,cssContainingText, model, options, repeater, repeaterRows, repeaterElement, selectedOption, selectedRepeaterOption

- ExpectedConditions

- WebElement.findElements

- WebElement.evaluate

- Wait

- WebDriver.waitForAngular

- SendKeys

- Actions

  `

Convenience

```
WebElement element =
driver.findElement(By.xpath("html/body/div[13]/ul/li[4]/select"));

WebElement element = driver.findElement(By.cssSelector(
    "div#ud-root div#outer div.panel div.slogan div.kid"));



(JavascriptExecutor) seleniumDriver.executeScript(
    "arguments[0].style.border='3px solid yellow'", element);



String script = "return
    angular.identity(angular.element(arguments[0])).html();";

Object result = (JavascriptExecutor)seleniumDriver.executeScript(script,
element);
`
```

https://docs.angularjs.org/api/ng/function/angular.identity

Convenience

```java
NgWebElement selectedCar = ngDriver.findElement(NgBy.model("selectedCar"));

WebElement customerName = customer.findElement(NgBy.binding("Name"));


List<WebElement> customers = ngDriver.findElements(NgBy.repeater(
"cust in Customers"));


Object customerCountry = customer.evaluate(
"customer.Country");

ArrayList<Long> accounts = (ArrayList<Long>) new

NgWebElement(ngDriver,customer).evaluate(

"customer.accountNo");


NgWebElement cell = ngDriver.findElement(NgBy.repeaterElement(
"row in rows", rowNum, "cellName"));
```

Clientsidescripts.js

18 methods
3 to > 100 lines of JavaScript / method

```
var element = arguments[0];

var expression = arguments[1];

return angular.element(element).scope().$eval(expression);
```

https://github.com/angular/protractor/blob/master/lib/clientsidescripts.js#L623

Clientsidescripts.js

```javascript
var findBindings = function(binding, exactMatch, using, rootSelector) {

    var root = document.querySelector(rootSelector || 'body');

    using = using || document;

    ...

    var bindings = using.getElementsByClassName('ng-binding');

    var matches = [];

    for (var i = 0; i < bindings.length; ++i) {

        var dataBinding = angular.element(bindings[i]).data('$binding');
...

            var bindingName = dataBinding.exp || dataBinding[0].exp || dataBinding;

matches.push(bindings[i]);

...

return matches; /* Return the whole array for webdriver.findElements. */

};
```

https://github.com/angular/protractor/blob/master/lib/clientsidescripts.js#L115

Java Plumbing

```java
public final class JavaScriptBy extends By {
  public List<WebElement> findElements(final SearchContext context) {
    final Object[] scriptargs = new Object[this.args.length + 1];
    scriptargs[0] = this.root;
    System.arraycopy(this.args, 0, scriptargs, 1, this.args.length);
    return this.elements(context, scriptargs);
  }
private List<WebElement> elements( final SearchContext context,final Object[] args) {
    List<WebElement> elements = (List<WebElement>) this.executor(context)
       .executeScript(this.script.content(), args);
    return (elements == null) ? new ArrayList<WebElement>() : elements;
  }
}
```

https://github.com/serguelk/jProtractor/blob/master/src/main/java/com/jprotractor/JavaScriptBy.java

Java Plumbing , contd.

```java
public static By model(final String model) {

  return new JavaScriptBy(new FindModel(), model);

}

public final class FindModel implements Script {

    public String content() {

        return new Loader("model").content();

    }

}

final class Loader {

    Loader(final String file) {

        this.filename = file + ".js";

    }

    String content() {

      final InputStream stream = Loader.class.getClassLoader().getResourceAsStream(this.filename);

      Final byte[] bytes = new byte[stream.available()];

      Stream.read(bytes);

      return new String(bytes, "UTF-8");
```

https://github.com/sergueik/jProtractor/tree/master/src/main/java/com/jprotractor

```
}
```

Protractor and Cucumber

```
@test Scenario Outline: Existing Customer Login

    Given I am at the Home Page

    When I continue as "Customer Login"

    And I am existing customer "<FirstName>", "<LastName>"

    Then I am greeted by "<FirstName>", "<LastName>"

    And I see balance on one of my accounts "<AccountNumbers>"

    And I can switch to any of accounts "<AccountNumbers>" I have

    And I can not see any other accounts...

    Examples:

    | AccountNumbers | FirstName | LastName |

    | 1004,1005,1006 | Harry | Potter |
```

Latest development

```java
NgWebElement firstNumber = ngDriver.findElement(NgBy.model("first"));


NgWebElement operator= ngDriver.findElement(NgBy.options("value for
(key, value) in operators"));



@FindBy(how = How.MODEL, using = "first")
 private WebElement firstNumber;

@FindBy(how = How.OPTIONS, using = "value for (key, value) in
operators")
 private WebElement operatorSelect;

 new Select(operatorSelect).selectByValue("MULTIPLICATION");
```

https://github.com/henrrich/jpagefactory

Questions, Demos

Resources

- https://github.com/angular/protractor

- https://github.com/caarlos0/jProtractor

- https://github.com/F1tZ81/Protractor-jvm

- https://github.com/henrrich/jpagefactory

- https://github.com/bbaia/protractor-net

- https://github.com/sergueik/protractor-net

- https://github.com/greengerong/maven-ng-protractor

Resources

- http://www.java2s.com/Tutorials/AngularJS/

- http://juliemr.github.io/protractor-demo/

- http://qualityshepherd.com/angular/friends/

- http://www.way2automation.com/angularjs-protractor/banking

- https://htmlpreview.github.io/?https://github.com/angular-ui/

- http://amitava82.github.io/angular-multiselect/

- http://www.codeproject.com/Articles/1066968/Developing-Protractor-tests-in-Csharp-or-Java