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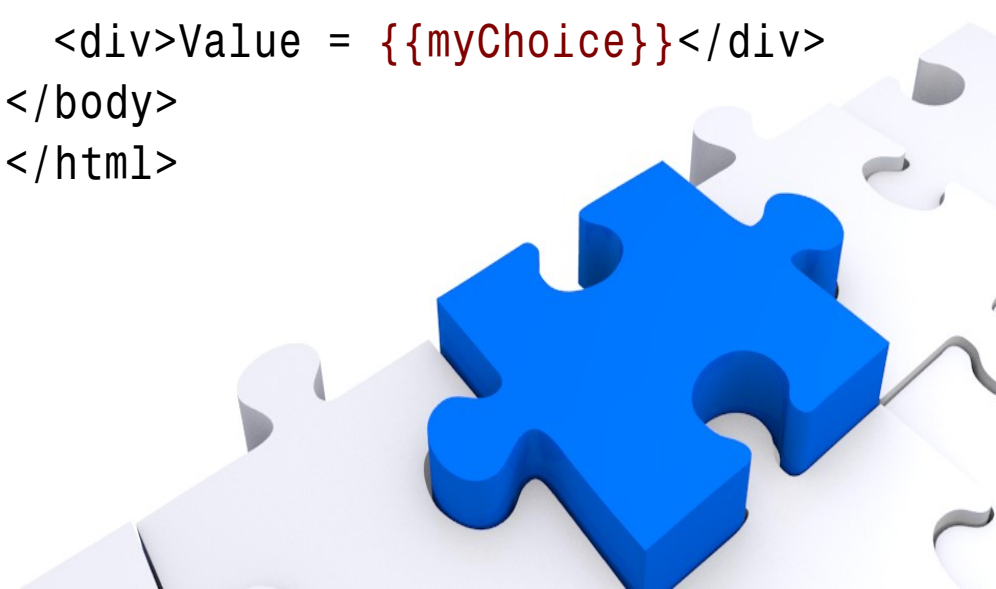
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Bare-bones Angular page

```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>
```
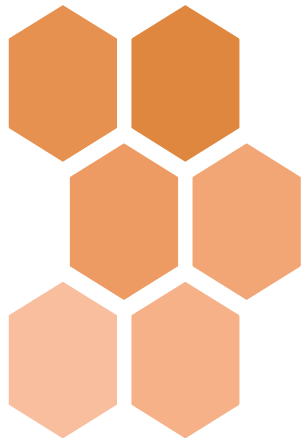
Integration with QA / CI

- 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)

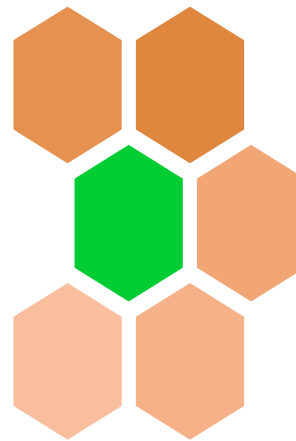- Angular MVC Clientside API were only available through Protractor

Adding Key Protractor Methods

Java

Node.js

jProractor,
Protractor-
net

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

- `

Frequently Used Selenium API

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

- ExpectedConditions

- WebElement.findElements

- Wait

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


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

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

`

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

Convenience

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

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


List<WebElement> customers = ngDriver.findElements(NgBy.repeater("cust in
Customers"));
NgWebElement cell = ngDriver.findElement(
                              NgBy.repeaterElement("row in rows", rowNum,
"cellName"));

ngDriver.findElement(ByAngular.repeater("car in Cars")
        .row(2)
        .column("item.isSelected")).click();




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

ArrayList<Long> accounts = (ArrayList<Long>)
                            new NgWebElement(ngDriver,customer)
                              .evaluate("customer.accountNo");
```

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 |
```

Step Definitions

```java
@Test
public void testCustomerLogin() throws
Exception {
// When I proceed to "Customer Login"
ngDriver.findElement(
NgBy.buttonText("Customer Login")).click();


// And I choose from existing customers
for (WebElement currentCustomer :
ngDriver.findElements(
NgBy.repeater("cust in Customers")))) {
  if (currentCustomer.getText().indexOf(
"Harry Potter") >= 0) {
currentCustomer.click();}
}
// And I log in
ngDriver.findElement(NgBy.buttonText("Login")
).click();
// Then I am greeted by my first and last
name
assertThat(ngDriver.findElement(NgBy.binding(
"user")).getText(), containsString("Harry"));
```
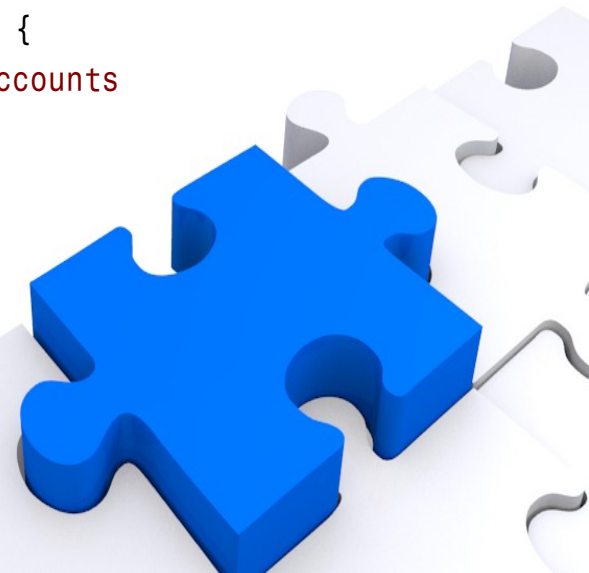
```java
// And I see one of my accounts
Matcher matcher = Pattern.compile(
"(1004|1005|1006)")
.matcher(
ngDriver.findElement(NgBy.binding("account
No")).getText());
assertTrue(matcher.find());


Enumeration<WebElement> accounts =
Collections.enumeration(ngDriver
.findElements(NgBy.options(
"account for account in Accounts")));
while (accounts.hasMoreElements()) {
  // And I can not see any other accounts
then my own
  matcher = Pattern.compile(
"^(?!1004|1005|1006).*$")
.matcher(
accounts.nextElement().getText());
  assertFalse(matcher.find());
}
```

Protractor Annotations

```
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

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;
      var matcher = new RegExp('({|\\s|^|\\|)' +
                    binding.replace(/[\-\[\]\/\{\}\(\)\*\+\?\.\\\^\$\|]/g, '\\
$&') +
                    '(}|\\s|$|\\|)');
            if (matcher.test(bindingName)) {
                matches.push(bindings[i]);
            }
    }
  return matches; /* Return the array for webdriver.findElements. */
};

var using = arguments[0] || document;
var binding = arguments[1];
var rootSelector = arguments[2];
return findBindings(binding, using, rootSelector);
```
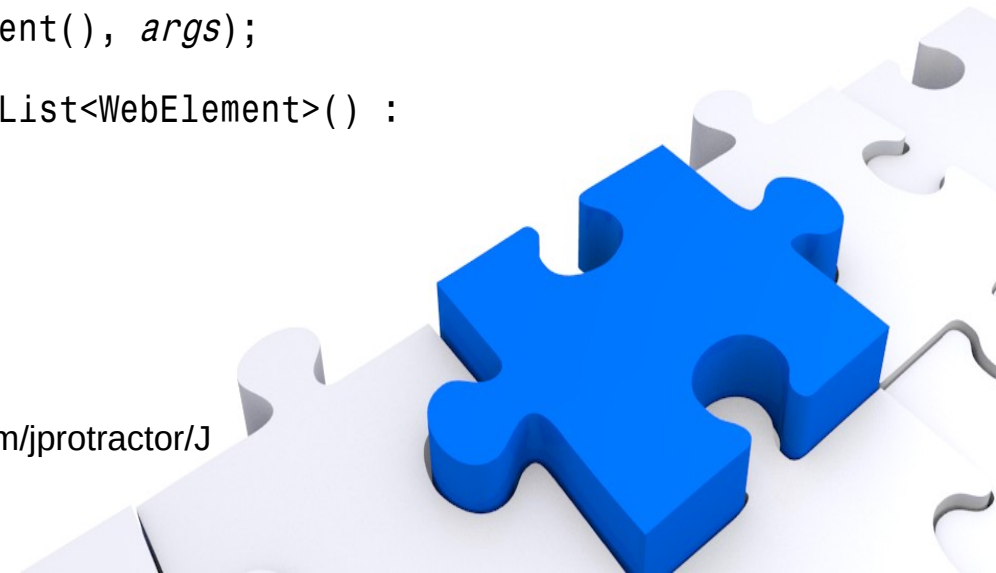
https://github.com/angular/protractor/blob/master/lib/clientsidescripts.js #L115

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;
  }
}
```

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");
}
```

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/paul-hammant/ngWebDriver

- 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