

Providing Protractor to Java / .Net

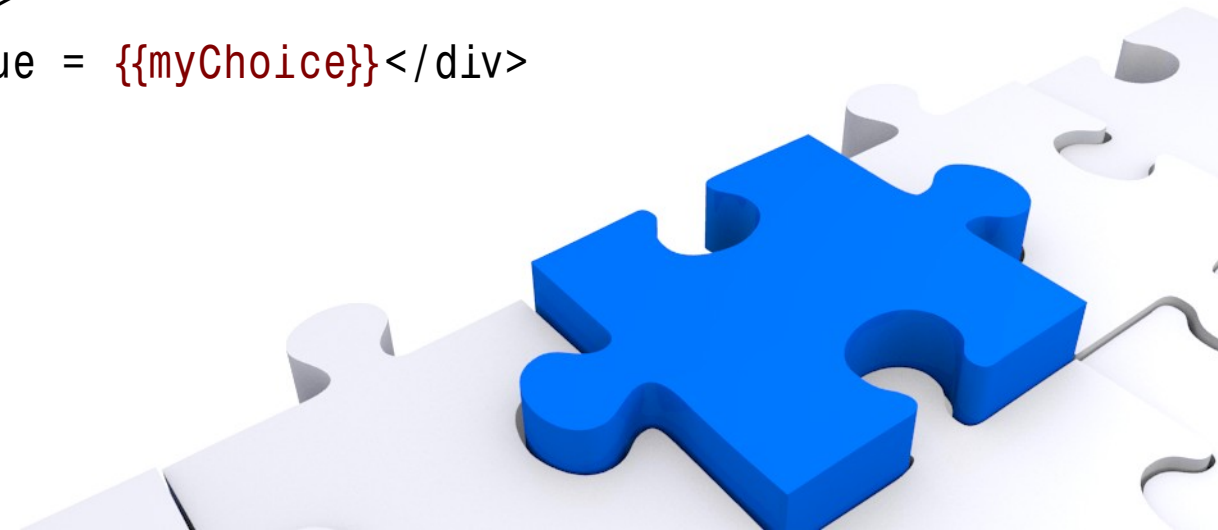
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Bare-bones Angular page

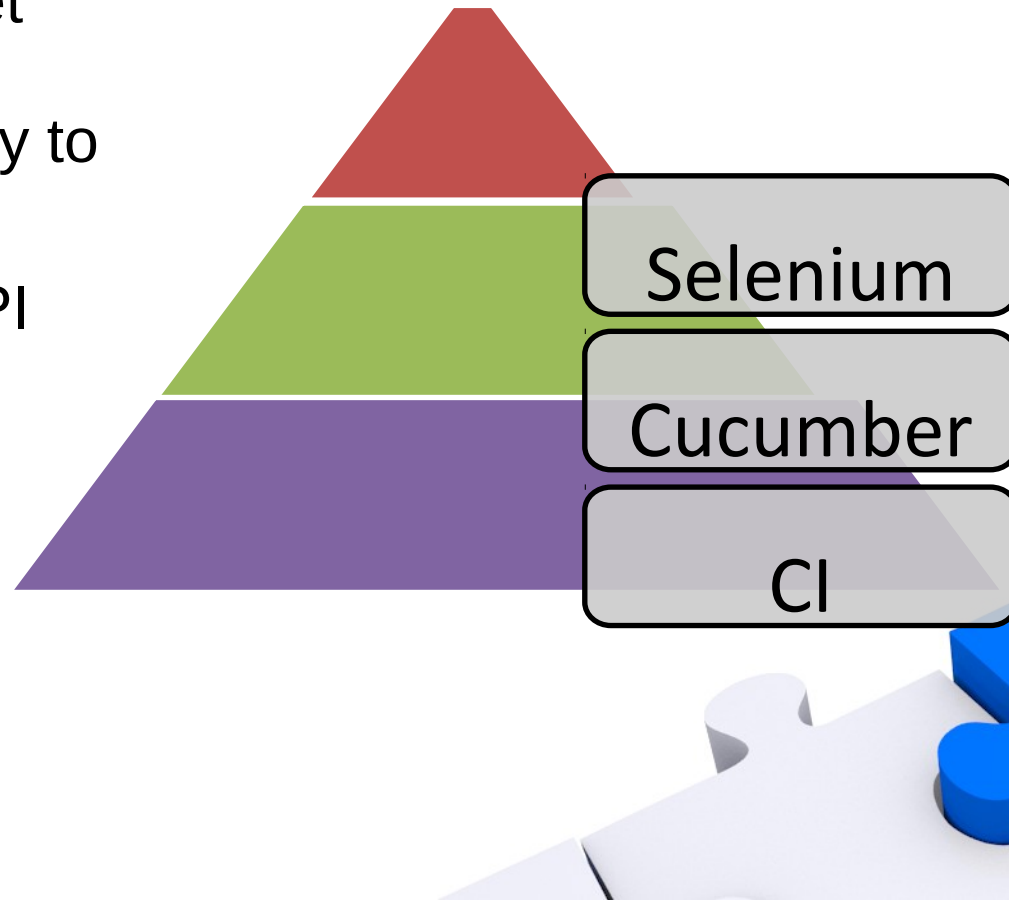
```
<html ng-app="myApp">
<head>
<script src="angular.js"></script>
<script type="text/javascript">
var app = angular.module('myApp', []);
app.controller('myCtrl',
function($scope){
$scope.myChoice = 1;
  $scope.options = [
{ name: 'one', value: 1},
{ name: 'two', value: 2},
  ]});
</script>
</head>
```

```
<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>
```

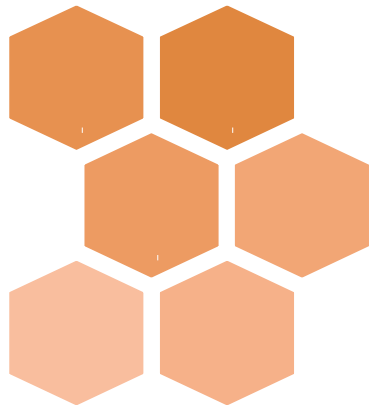


Integration with QA / CI

- 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



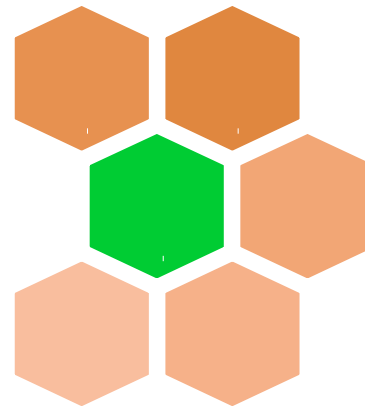
Adding Key Protractor Methods



Java



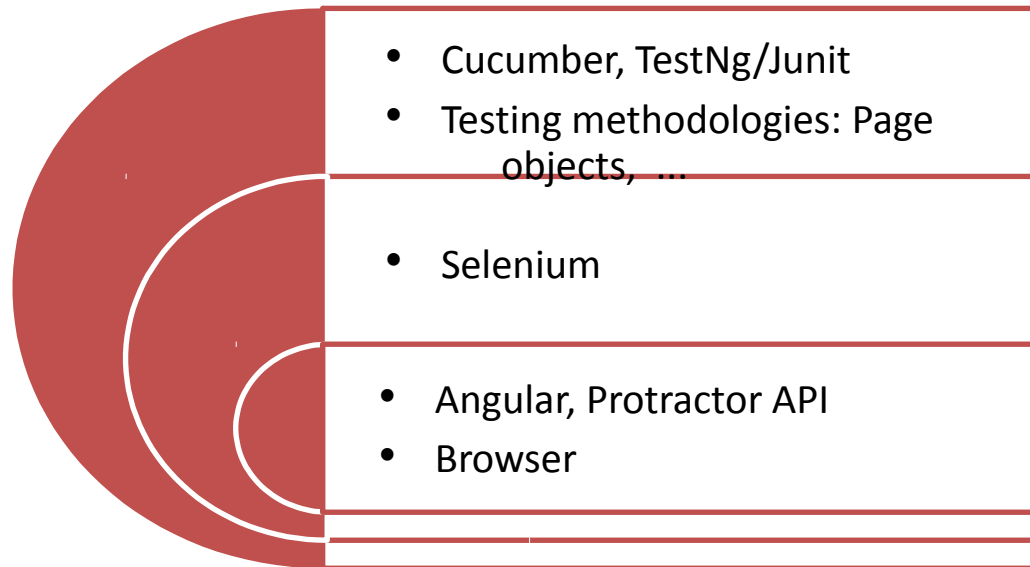
Node.js



jProtractor,
Protractor-net



Tool Chain



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/{ <i>session id</i> }/element
Find Element from Another	POST	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/element
Get Element Attribute	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/attribute/{ <i>name</i> }
Get Element Property	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/property/{ <i>name</i> }
Get Element CSS Value	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/css/{ <i>property name</i> }
Get Element Text	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/text
Get Element Tag Name	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/name
Get Element Rectangle position	GET	/session/{ <i>session id</i> }/element/{ <i>element id</i> }/rect
Execute Script	POST	/session/{ <i>session id</i> }/execute/sync
Execute Async script	POST	/session/{ <i>session id</i> }/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) 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");
```



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

```
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>

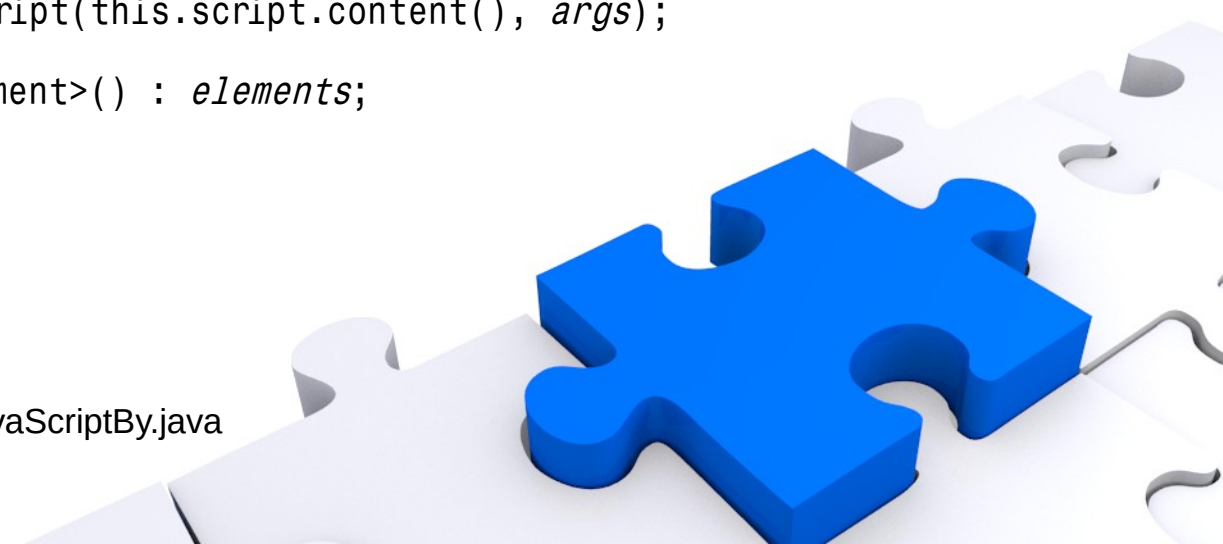


Java Plumbing

```
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.

```
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");  
    }  
}
```



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

```
@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"));
    }
}
```

```
// And I see one of my accounts
Matcher matcher = Pattern.compile(
    "(1004|1005|1006)")
    .matcher(
        ngDriver.findElement(NgBy.binding("accountNo")).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 FindBy 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>



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>

