

Lecture 16 - Testing the Web with JUnit, Selenium (and maybe Cucumber)

The Story So Far...

We know:
1. Test
2. XUnit
3. Selenium

Now what? We have tests and code. What can we do with them?

This is not OK!

I am scared and of stock frameworks. If you don't think I'm being paranoid, then you're probably right. I have to be the maintainer of the code. It's like being the captain of a ship. You have to be responsible for the safety of everyone on board. That's a lot of responsibility. I'm not sure if I'm up to it.

Please use the right level of abstraction.

All that said, let's do some programming!

Using Selenium



Testing



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I am scared and of stock frameworks. If you don't think I'm being dramatic, then you're probably not reading this. I am not alone. Many others share my fears. I am not alone. Many others share my fears. I am not alone. Many others share my fears. I am not alone. Many others share my fears.

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All that said: let's do some programming!

Using Selenium



Testing



JUnit, Selenium (and maybe more)

The Story So Far...

We know..
1. BDD
2. JUnit
3. Selenium

Time to put them all together.

Remember, the same basic concepts of testing apply.
We're just going to be working with their fake
HTML, and associated code at a higher level of
abstraction.

This is not OK!

```
class Test {
    public void testLoginPage() {
        String expectedHTML = "<html><head><title>Fluffy Birds</title><meta name='keywords' content='pretty birds'></head><body>Welcome to Fluffy Birds</body></html>";
        String pageHTML = getFrom("http://www.example.com");
        assertEquals(expectedHTML, pageHTML);
    }
}
```

Use some sort of web framework. If you don't like Selenium, that's fine.

But don't check HTML directly. I view it as the equivalent of this code:

```
public int addTwoNums(int a, int b) {
    int toReturn = 0;
    for (int i=0; i < a; i++) {
        toReturn++;
    }
    for (int j = 0; j < b; j++) {
        toReturn++;
    }
    return toReturn;
}
```



Please use the right level of abstraction.

All that said, let's do some programming!

We know..

- 1. BDD**
- 2. JUnit**
- 3. Selenium**

Time to put them all together.



Prezi

Remember, the same basic concepts of testing apply.

We're just going to be working with text (aka HTML and associated code) at a higher level of abstraction.

This is not OK!

```
@Test  
public void testLoginPage() {  
    String expectedHtml = "<html><head><title>Fluffy Birds,  
Inc."</title><META NAME="keywords" content="pretty  
birds, good birds, fluffy birds, birds">  
</head><body>Welcome to Fluffy Birds!</body></html>";  
    String pageHtml = getPage("http://www.example.com");  
    assertEquals(expectedHtml, pageHtml);  
}
```

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```



PROBLEM?

Please use the right level of abstraction.

**All that said, let's do some
programming!**

Using Selenium

1. Install JUnit
2. Install Selenium WebDriver
3. Add appropriate jars to path
4. Away you go!

Same Concepts as other JUnit tests:

1. Write tests
2. Run tests
3. Green is good, red is bad

We're just adding some functionality

First thing to do - set up a driver!

```
WebDriver driver = new HtmlUnitDriver();  
WebDriver driver = new FirefoxDriver();
```

* Note - there are also drivers for Chrome, IE, and Opera. Testing in Safari is not officially supported.

Firefox is the "core" of Selenium and so I recommend you test with it. HtmlUnitDriver is a lightweight and fast driver, but it is a bit idiosyncratic;

By commands

But there are lots of different ways to get them. You can use various "By" commands to get them, e.g.,

```
e = driver.findElement(By.name("input_1"));  
  
<input name="input_1" type="text"/>
```

The most common way is probably by ID. Remember you can find IDs either by looking at the HTML code directly or using the Selenium ID to "select" something.

```
e = driver.findElement(By.id("goku"));
```

How it works...

```
JUnit test -->  
Selenium library -->  
Translates to Selenese -->  
Sends to WebDriver -->  
Executes on web browser -->  
Returns results (if any)
```

We're just adding some functionality

In your JUnit class file, import all the Selenium classes...

```
import org.openqa.selenium.*;
```



(OK, you can only import the ones you need. But this is probably easier. And the only real reason not to import whatever.* is to avoid namespace collisions. Also, slightly reduce compilation times. But ninety lines of import statements at the top of each class is just ugly.)



Most of the Java commands are going to line up with Selenium commands, which means that if you were here last lecture, the only really new thing should be the syntax and some name changes.

Now let's get a webpage with our driver.

```
driver.get("http://www.google.com");
```

**NOTE THIS DOES NOT RETURN A PAGE
driver is STATEFUL.**

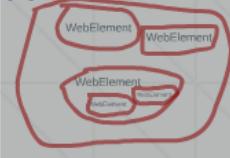
Side note:

"Mutable shared state is the root of all evil."
-Josh Vallin,
Rails Core Contributor,
creator of Elixir programming language

Back on track...

```
driver now contains a reference to google.com  
  
Internally, all of the elements of google.com's homepage have been stored as WebElements
```

google.com These correspond to DOM elements.



You can get references to these elements by using driver.findElement()

```
element = driver.findElement(***)
```

You can have multiple windows/frames...

```
driver.switchTo().window("other_window");  
driver.switchTo().frame("other frame");
```

You can also go back and forward in history if need be...

```
driver.navigate().forward();  
driver.navigate().back();
```

Or set cookies...

```
Cookie cookie = new Cookie("bill", "yw");  
driver.manage().addCookie(cookie);  
if (do stuff)  
driver.deleteAllCookies();
```

... and don't forget our old friend 'wait'

```
WebDriverWait wait = new WebDriverWait(driver, 30);
```

... but we can just set an implicit wait time instead of doing this all the time.

```
driver.manage().timeouts().implicitlyWait(30, TimeUnit.SECONDS);
```

Finally, you should quit the driver before ending.

```
driver.quit();
```

Testing

1. Install JUnit
2. Install Selenium WebDriver
3. Add appropriate jars to path
4. Away you go!

Same Concepts as other JUnit tests:

- 1. Write tests**
- 2. Run tests**
- 3. Green is good, red is bad**

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How it works...

JUnit test -->

Selenium library -->

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Returns results (if any)

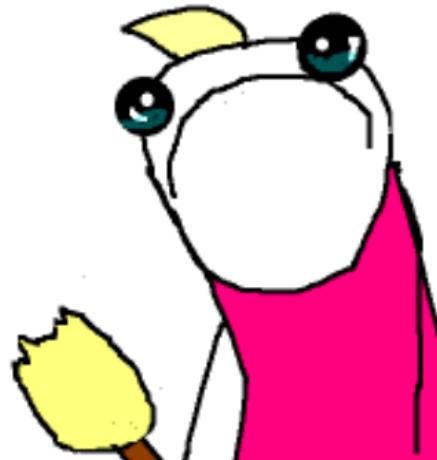
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(OK, you can only import the ones you need. But this is probably easier. And the only real reason not to import whatever.* is to avoid namespace collisions. Also, slightly reduce compilation times. But ninety lines of import statements at the top of each class is just ugly.)

Clean all the things?



Most of the Java commands are going to line up with Selenese commands, which means that if you were here last lecture, the only really new thing should be the syntax and some name changes.

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Now let's get a webpage with our driver.

```
driver.get("http://www.google.com");
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Side note:

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Internally, all of the elements of google.com's homepage have been stored as WebElements

google.com

These correspond to DOM elements.

WebElement

WebElement

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WebElement

You can get references to these elements by using `driver.findElement()`

`element = driver.findElement(***)`

By commands

But there are lots of different ways to get them. You can use various "By" commands to get them, e.g.,

```
e = driver.findElement(By.name("input_1"));
```

```
<input name="input_1" type="text"/>
```

The most common way is probably by ID. Remember you can find IDs either by looking at the HTML code directly or using the Selenium ID to "select" something.

```
e = driver.findElement(By.id("gbqfq"));
```

There are all kinds of ways to get these WebElements..

By.cssSelector

By.linkText

By.partialLinkText

By.tagName

By.xpath

With a reference to that element, you can do things like type something in it..

```
element.sendKeys("wocka wocka");
```

or click on a checkbox..

WebElement checkbox

```
driver.findElement(By.tagName("option"));  
checkbox.click();
```

... or even look for the main submit button and click it.

```
element.submit();
```

You can have multiple windows/frames..

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driver.switchTo().window("other_window");
```

```
driver.switchTo().frame("other frame");
```

You can also go back and forward in history if need be...

```
driver.navigate().forward();  
driver.navigate().back();
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Or set cookies...

```
Cookie cookie = new Cookie("Bill", "yay");
driver.manage().addCookie(cookie);
// Do stuff...
driver.deleteAllCookies();
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... and don't forget our old friend 'wait'

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Finally, you should quit the driver before ending.

```
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```

Testing

So we can now navigate around, but how do we test?

We can just use our old pals, the asserts!
assertTrue(), assertEquals(), etc.

The Simplest Thing to Do

```
WebElement fooElement = driver.findElement(By.id("foo"));
assertEquals(fooElement.getText(), "foo");
```

Or, say, check that the page does have a title...

```
assertNotNull(driver.getTitle());
```

A little bit of trickiness...

If a WebElement is not found, instead of returning null, a NoSuchElementException is thrown. Simple workaround: fail the test if the exception is thrown.

Alternatively, you can do a check before each access, but it's often easier to just catch an exception if you're accessing numerous WebElements.

```
For Debugging  
  
System.out.println(driver.getPageSource());
```

Once again, please, please, please, pretty please with a cherry on top.. DO NOT DO THIS FOR YOUR ACTUAL TESTS.

```
String expectedText = "<html><head>...</head></html>";
String actualText = driver.getPageSource();
assertEquals(expectedText, actualText);
```

The driver API is here

<http://selenium.googlecode.com/svn/trunk/driver/doc/api/org/openqa/selenium/WebDriver.html>

Selenium provides a good way of checking for things. Use in combination with JUnit assertions.

```
selenium.isTextPresent()  
selenium.getAlert()  
selenium.getSelectedLabel()  
selenium.isSelected("locator")  
selenium.isEnabled("locator")  
selenium.isElementPresent("locator")  
selenium.isVisible() – To verify whether the object is visible
```

```
try {
    WebElement e = driver.findElement(By.name("foo"));
    assertEquals(e.getAttribute("name"), "mew");
} catch (NoSuchElementException ex) {
    fail();
}
```

I get by with a little help from my IDE...

**So we can now navigate around, but
how do we test?**



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`assertTrue()`, `assertEquals()`, etc.

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```
try {  
    WebElement e = driver.findElement(By.name("foo"));  
    assertEquals(e.getText(), "meow");  
} catch (NoSuchElementException ex) {  
    fail();  
}
```

For Debugging

```
System.out.println(driver.getPageSource());
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org/openqa/selenium/WebDriver.html](http://selenium.googlecode.com/git/docs/api/java/org/openqa/selenium/WebDriver.html)

Web Element API here:

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I am scared and of stock frameworks. If you don't think I'm being paranoid, then you're probably not. I have to be the maintainer of the code. It's like being the captain of a ship. You have to make sure it's safe, it's strong, it's fast, it's reliable. But if you're not careful, you can end up with a ship that's too heavy, too slow, and too unreliable.

Please use the right level of abstraction.

All that said, let's do some programming!

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Testing



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help from my IDE...**

