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Building a Testing Framework From Scratch:
A "Choose Your Own Adventure" Game

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Building A Testing Framework From Scratch

- A Testing Framework is often talked about with little idea as to what actually goes into it or what it actually is.
- Usually, when someone says "testing framework" they actually mean a much larger system, one that "tests" their code and makes sure it's "OK".

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- If that seems vague, it's because it is.
- Many people struggle with exactly what goes into this system and all the moving parts necessary for it to be effective.
- In this workshop, we will discuss
 - what a framework *is*.
 - what *isn't* a framework.
 - why the definition matters.
 - look at items we may not often consider but definitely play into the "Framework" discussion.



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- RPG means "Role Playing Game".
- This workshop is set up to leverage the idea of a classic RPG
 - to make the ideas a little more fun
 - to emphasize how things work together.



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- To play and complete an RPG, there are three ways to do so:
 - **Gaming finesse**
 - You're just awesome at gaming and can take down anything.
 - **Grinding**
 - The term for leveling up a character so any opponent in the game is just no match due to superior firepower.
 - **Stocking up at the shop**
 - Outfitting yourself with healing items, weapons, armor, and magic... for a price, of course.

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- What can we mere mortals do to outfit ourselves to thrive in this game and what is the cost to us?
- Cost in this case does not just mean money.
- If something takes time, energy, other people, or resources to accomplish, there is a cost to it.
- We will be looking at many of those costs as part of this workshop and determining which items are essential, which are nice to have and which we can do without.

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Framework:

- “defines a set of rules or guidelines which we can follow in a systematic way to achieve a desired result”

What is and what is not a Framework?

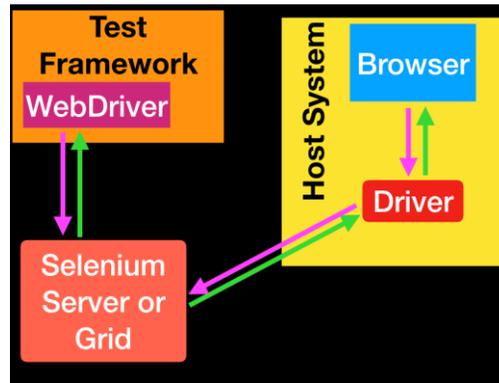
- Selenium/WebDriver is an API that communicates with a browser.
- Watir is a DSL to simplify interacting with WebDriver.
- Appium is an API that allows interaction with mobile devices.

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- What do these tools have in common?
- *They don't know a thing about testing.*
 - They don't know how to compare things
 - They don't know how to assert pass or fail.
 - They don't know a thing about reporting.

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Think of a framework like this (image courtesy seleniumhq):



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• Record and Playback

- Sometimes referred to as a “Linear Scripting” Framework.
- Selenium IDE and Katalon Recorder fit in this space, as do a number of commercial test tools (TestComplete, etc.)
- Useful for small applications.
- Very literal, can require significant editing to make reusable and useful.
- Many modern tools have come a long way with this approach so that tedious editing is not needed.

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• **Modular Testing Framework**

- Breaks down an application being tested into smaller, independent tests.
- Unit Testing in its approach towards testing the smallest item possible to qualify as a proper and complete test is an example.
- Having as little dependency or overlap with other tests as possible is a hallmark of a modular framework.
- Master test scripts can be made to call the parts as needed or in a specific order (or at random).
- Useful for end to end/integration testing scenarios.

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• **Data Driven Testing Framework:**

- Allows for tests to be iterated over a collection of data (csv file, Excel Spreadsheet, database query results, etc.)
- Tests utilize variables and a looping mechanism to “walk through” all of the listed values in the data source.
- Each test or suite of tests would be run identically with each line of data in the sourced data file.

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• Behavior Driven Development (BDD) Testing Framework:

- Allows for tests to be written to describe the desired behavior and interactions with a system.
- Allows more people (Business Analysts, Developers, Testers, Product Owners, Support, etc.) to effectively participate.
- Uses a non-technical, natural language to create specifications and scenarios.
- Ideally anyone who follows the language conventions can write scenarios and they can be immediately implemented or, if needed, supporting code created to support statements that aren't already represented.
- Cucumber is a well known tool that fits into a BDD Framework and we will be using it in this workshop.

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• Hybrid Framework:

- Utilizes elements of all of the previous examples.
- Most frameworks developed end up being hybrid frameworks as there's really no "one ring to rule them all", at least not yet.

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- **Potch is a made up money system**
 - (it comes from the Suikoden series of RPG games)



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- Every participant in this workshop will receive a budget of 100,000 Potch.
- The goal of the game is to build out our “Framework” without going over budget.

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- In the real world, there are external factors that can also be part of the cost consideration.
 - amount of testing required
 - release dates
 - customer requirements
 - number of qualified team members
 - etc.
- Those costs are outside the scope of this workshop, but make no mistake they are very real.
- They can have a significant impact on the framework you create and the supporting tools you will use to implement it.

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- Everything is negotiable.
- Members of the workshop are all part of the “party”. Each member will have special skills and talents.
- In the RPG world, there are warriors, archers, mages, healers, etc.
- In our world, there are people who have certain knowledge and specialties, such as programming languages, containerization technologies, automation tools, CI/CD experience, etc.
- Talking to these individuals and getting a better picture of the lay of the land can help us all spend wisely, or even get discounts because of a better/different way to play the game.
- Use your party!

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- Platform (10,000 Potch)
 - Do we want to deploy on actual hardware?
 - What is the cost to maintain it?
 - Do we want to have that hardware interact in some meaningful way with our production environment?
 - On premise vs. in the cloud (AWS, Azure, etc.)

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- Deployment four-layer cake:
 - Dev Machine(s)
 - Demo
 - Staging
 - Production
- What is the cost of implementing these multiple paths?
- Are they necessary?
- Can we collapse any of these?
- Why would/should we?

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- Development Environment
 - Eclipse Photon
 - Natural 0.76 Plugin
 - Maven: Quickstart Template
 - POM.xml document with JAR's
 - Cucumber-java
 - Cucumber-junit
 - JUnit 4.12 (our test runner)



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- Testing Tools/API's
 - Selenium
 - Appium
 - Watir
- Application code and helper libraries
- Databases and helper libraries
- Continuous integration components and helper libraries



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- Containers (10,000 potch)
 - Does it make sense to break up some of these pieces into their own containers?
 - What does a container buy us?
 - What container technology should we use?
 - Why would/should we consider this?

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- Dedicated IDEs
 - Often paid for licenses, some have community editions
 - Typically with support behind them
 - Potentially easier to start working with
 - Examples: RubyMine, PyCharm, Eclipse, Visual Studio
- Cost: 8,000 Potch**

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•Using Vim as an IDE (6,000 Potch)

- Lots of plug-ins and modules to download and load via the .vimrc file
- No real support outside of digging on the internet and discussion forums or knowledgeable friends
- Requires the user to stay on top of and really understand their environment.
- Can usually be run on the host system easily.

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•Freelancers

- Can run vim bare bones
- Still have to know enough vim to be effective
- Call all of the pieces to be able to make our test framework run effectively from the command line.

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- Programming Languages
 - Tools and frameworks
 - Pick a language and let's see what is available
 - Ruby (4,000 potch)
 - Java (4,000 potch)
 - Python (4,000 potch)
 - Maverick (plug in your own favorite)
 - (4,000+ potch)
 - some languages have a rich ecosystem of helper libraries, while others are more limited, so pricing will vary.



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- What goes into choosing a language?
- Should you use what your team is using?
- Should you choose something that's separate from the developers language?



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- Other Testing Considerations
 - Writing tests in real time
 - Automating while designing
 - Exploration and Codifying
 - Eliminating waste and busywork

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- <https://github.com/mkltesthead/flamechamp>

```

11 <!-- https://mvnrepository.com/artifact/org.seleniumhq.selenium/selenium-java -->
12 <dependency>
13 <groupId>org.seleniumhq.selenium</groupId>
14 <artifactId>selenium-java</artifactId>
15 <version>3.141.59</version>
16 </dependency>
17 <!-- https://mvnrepository.com/artifact/info.cukes/cucumber-junit -->
18 <dependency>
19 <groupId>info.cukes</groupId>
20 <artifactId>cucumber-junit</artifactId>
21 <version>2.3.1</version>
22 </dependency>
23 <!-- https://mvnrepository.com/artifact/org.mockito/mockito-core -->
24 <dependency>
25 <groupId>org.mockito</groupId>
26 <artifactId>mockito-core</artifactId>
27 <version>2.23.0</version>
28 </dependency>
29 <!-- https://mvnrepository.com/artifact/junit/junit -->
30 <dependency>
31 <groupId>junit</groupId>
32 <artifactId>junit</artifactId>
33 <version>4.12</version>
34 </dependency>
35 <!-- https://mvnrepository.com/artifact/org.hamcrest/hamcrest -->
36 <dependency>
37 <groupId>org.hamcrest</groupId>
38 <artifactId>hamcrest</artifactId>
39 <version>1.3</version>
40 </dependency>
41 </dependencies>
  
```

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- Cucumber Uses a Domain Specific Language called Gherkin
 - Feature, Scenario, Scenario Outline
 - Given, When, Then, And, But
- We construct our Gherkin statements using phrases that begin with these words

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Feature: Log In

Scenario: Verify that the user has logged into the system

Given that I am on the home page

When I click on the Login button

And I enter my username

And I enter my password

And I click on the Submit Button

Then I should see the Welcome message

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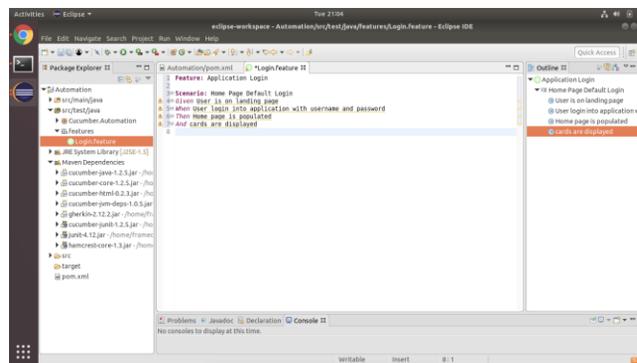
- FEATURE:

- resides in a "feature" file.
- We can set up our tools to allow these feature files to be run and their contents interpreted.
- Feature statements are easy to read and explain what we want to see the system do.
- Feature statements by themselves **do not mean or do anything**.

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- FEATURE



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- STEP DEFINITIONS:

- Each statement in a Feature needs to have a “step definition” associated with it.
- Step definitions are specific lines of code that can be executed based on the statement line in the feature file.
- Step Definitions allow for variable substitution and making calls to specific tools.
- If you need to interact with Selenium, Watir, Appium or some other application to perform an operation, those calls would be part of the step definition.

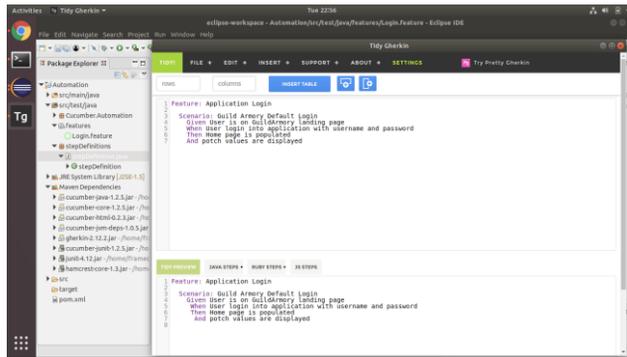
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- STEP DEFINITIONS:

- There is a utility called “Tidy” that can help you create step definitions Java, Ruby and JavaScript. It’s available as a Chrome plug-in.
- There is one AND ONLY ONE step definition for any given Feature statement.
- Using Regular Expressions will allow us to make the needed step definitions to a minimum.

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- STEP DEFINITIONS:
Tidy with Gherkin Statements



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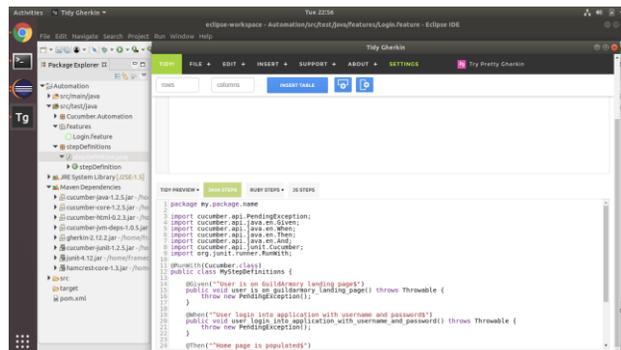
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- STEP DEFINITIONS:
Tidy with Java Step Definition Examples



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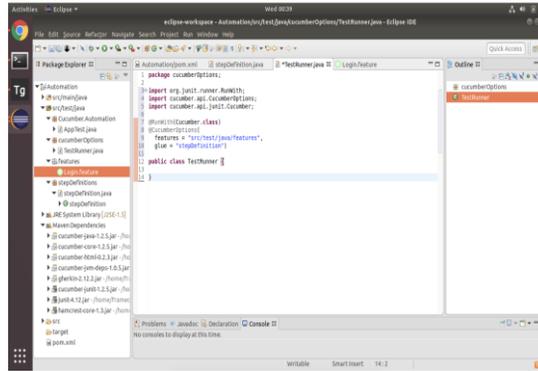
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- TEST RUNNER:
- The Test Runner executes the test cases.



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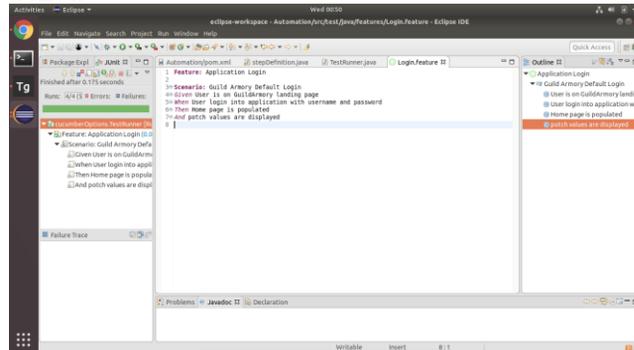
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- TEST RUNNER:
- Create a class that can identify the feature file(s) location. You can call the entire grouping or a single feature file if you wish.
- Use the “glue” option to tie feature statements to their respective step definitions.
- From there, click on the TestRunner.java file, run as a jUnit test, and if everything is pointing to the right things, our test will run and complete successfully.

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•TEST RUNNER:



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- Source Control
 - Not just how will code be version controlled but where?
 - On premises and local servers
 - Revisioning service provider (think Github, Bitbucket, etc.)
 - Test code and production code NEED to be stored together and need to function well together.
 - This saves us the trouble of versioning our tests along with the application code. It all goes together.
 - Cost for any implementation is **15,000 potch**

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- Source Control
 - Git
 - Mercurial
 - svn
 - Microsoft environment: Team Foundation Server
- Who chooses?
- Does it ultimately matter?
- What considerations have to be made?

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- Building the Software
 - Local build options - 20,000 patch
 - Continuous Integration Options - 15,000 patch
 - Jenkins/Hudson
 - Concourse
 - Circle
 - Travis
 - AWS Codebuild
 - Microsoft MS Build in Team Foundation Server.

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- Why choose?
- What else do we need to be aware of with these solution?
- What plugins are essential?
- What are nice to have?
- Why do we need to consider them in the first place?
- How does each compare to other options?

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- Load Testing/Performance? **15,000 potch**
 - To make sure that we are running tests that can give us feedback on how many connections it can handle
 - To get a baseline as to how the application performs over time.
- Security? **20,000 potch**
 - Integrate with toolsets such as Kali Linux or Metasploit.
- Reporting? **5,000 potch**
 - For readable results, and exporting results in a common format
- Proxies? **5,000 potch**
 - For inspecting HTTP calls, shaping network traffic, setting geolocation for location based tests
- Usability testing? **6,000 potch**
- Accessibility? **6,000 potch**

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- There's a lot of moving parts and pieces when it comes to a testing framework.
- This workshop has been to help you get a little familiar with what those items are.
- This is more of a decision making exercise, not a full blown project.
- If this were an actual project, we would need a couple of days just to get started.
- This is something that teams usually refine over years.

Building A Testing Framework From Scratch

- There are many more options out there and how you choose to “build out your party” will depend on a lot of things that you can control and several that you can't.
- The toolchain can be massive or it can be much more simple depending on your goals.
- If you go back to your team and should a discussion of building a testing framework come up and you say “oh, wow, we are missing a bunch of stuff from this conversation”, then we have been successful in our quest :).

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Reviewers

- Jim Holmes
- Josh Gibbs
- Paul Grizzaffi
- Kim Knup
- Perze Ababa



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