

# Epiphan WUI test automation

## [1] Table of Contents

In this document, the following sections should be present.

- [1] Table of Contents
- [2] About
- [2.1] Building Blocks
- [2.2] Grid
- [2.3] Tests
- [3] Setup
- [3.1] Using Git with Jenkins
  - [3.1.1] Steps
  - [3.1.2] Notes
- [3.2] Using Git with Maven
  - [3.2.1] Steps
- [3.3] Setting up the Grid
  - [3.3.1] Steps

## [2] About

This repository contains the building blocks of a basic web UI test automation framework for use by Epiphan QA.

This framework is meant to provide a simple base upon which to build automated tests for the WUI shared by the VGA Grid, Recorder Pro, and Pearl. Additionally, this framework is meant to overcome some problems with the default Selenium Grid2 system.

This is **not** a framework for testing **anything other than WUI**.

### [2.1] Building Blocks

The Cornerstones of the UI automation framework are:

- [Selenium](#) - A *Web User Interface* (WUI) automation framework which allows Java programs to mimic the interactions of a human with a web page. Selenium implements the W3C [WebDriver](#) spec as it's API. Selenium also provides functionality called Selenium Grid2, which allows multiple machines to be networked together in order to run tests on multiple OS/browser combinations.

- [TestNG](#) - A Java framework for unit and integration testing similar to JUnit. TestNG allows the configuration of tests into ‘suites’ and ‘groups’ which provides a great deal of flexibility with regards to which tests to run, and when. TestNG also supports the the passing of parameters to tests at runtime through an xml configuration file.
- [Apache Maven](#) - A flexible Java build system with configurable dependency management.
- [Jenkins CI](#) - A popular *Continuous Integration* (CI) system used to schedule automatic builds and to aggregate build and test reports.

Other components include:

- [ReportNG](#) - Improves on TestNG’s default HTML and XML reports.
- [Apache Commons Exec](#) - An Apache Commons library for process execution from within Java programs. Commons Exec allows Java programs to spawn processes, and to continuously monitor the output of those processes while performing other tasks.
- [GitHub](#) - A popular Git repository host.

## [2.2] Grid

The actual automated test system (**grid**) is made up of a ‘hub’ and some number of ‘nodes’.

Nodes can be distributed over many machines on the network. This allows the testing of many OS/browser combinations simultaneously. Each node is capable of controlling a configurable number of browser instances. For example, one node could be in control of 10 Firefox browsers, 6 instances of Chrome, and 1 of Internet Explorer. Each of these browser instances is a ‘test slot’ which can accommodate 1 test at a time. The hub is the central point to which the tests and the nodes connect. All data within the grid flows through the hub. When a test program connects to the hub, it is assigned to a node with an open test slot matching it’s requirements.

Unfortunately, vanilla Selenium nodes are prone to getting stuck under some circumstances. Whenever some event causes a Selenium-controlled browser instance to spawn a new OS-level window (e.g. a Firefox download menu), the WebDriver controlling that browser is unable to close or otherwise eliminate the window. This results in the browser hanging indefinitely (becoming dead).

In order to prevent all test slots from eventually filling with dead browsers, each node can be injected with a custom servlet, and made to communicate with the hub via a custom proxy. The proxy counts the number of tests sent to each node, and once a node has been sent as many tests as it has test slots, the proxy sends a message to the servlet causing the node to terminate.

Every node (including the hub) can also be run through a watchdog process.

This watchdog simply checks the node every few seconds, and starts a fresh node if it finds that the node has terminated. The watchdog does not care if the node was terminated by a crash or by deliberate action.

## [2.3] Tests

The tests to be automated are found in the `tests` module.

Unlike `grid` this module does not produce any permanent artifacts when built. This means that the module must be built from scratch each time tests are run.

## [3] Setup

### [3.1] Using Git with Jenkins

Using Jenkins CI as a build manager allows us to run the latest version of the entire test system against (a) target(s) at specified times. Depending on the configuration of Jenkins, the tests can be run periodically (for example, every day at midnight), or when triggered by certain events (for example, on every commit to a Git repository containing the test code). This setup is ideal if you want to run tests on a separate computer in order to keep your development machine free for other tasks while tests are running.

Additionally, Jenkins offers a convenient web based interface for use on headless machines, and has a wide range of plugins available for such things as test reporting, and integration with Confluence / JIRA.

#### [3.1.1] Steps

1. Install the latest version of Maven [version 3.3.3 at 2015-05-12]
2. Install the latest version of Git for your OS [version 1.9.1 at 2015-05-12]
3. Install the latest version of Jenkins [version 1.613 at 2015-05-12]
4. In Jenkins, under **Manage Jenkins>Manage Plugins>Available** select **Git Client Plugin** and click **Download now and install after restart**
5. Create a **New Item** and give it a suitable name, select **Maven Project** as the project type and press **OK**
6. By default, Jenkins keeps all build artifacts until the end of time. I recommend that you select **Discard Old Builds** (unless you have a very good reason for doing otherwise), setting an appropriate time to live, or number of builds to keep.
7. Under **Source Code Management** select **Git**  
The repository location is `git://github.com/epiharvey/fuzzy-shame`  
See Ian Harvey in QA to get the repository credentials. Bring a USB drive.
8. Run a build to ensure that everything is set up correctly.

### [3.1.2] Notes

- When first setting up a Jenkins project, it may be necessary to point Jenkins to the local Maven installation you want to use.
- Feel free to play around with additional plugins for test reporting, Confluence/JIRA integration, etc... Jenkins can't push to Git, so you can't break anything important.
- If you don't want to compile the grid module on every build, point Jenkins to `/fuzzy-shame/tests/pom.xml` instead of `/fuzzy-shame/pom.xml`

### [3.2] Using Git with Maven

To be able to write tests, or to make changes to the test system, it is necessary to set up git and maven. Both the build system, as well as the tests rely on maven to run. Git allows the system to be kept in a consistent state even with multiple parties contributing new code, or alterations.

#### [3.2.1] Steps

1. Install the latest version of Maven [version 3.3.3 at 2015-05-13]
2. Install the latest version of Git [version 1.9.1 at 2015-05-13]
3. checkout a copy of the [repository](#).
4. The repository contains a ready-to-go maven project with everything you need to begin writing and executing tests.
5. If you do not already have a copy of `grid.jar` or `spawn.jar`, build the `grid` module to obtain both.

### [3.3] Setting up the Grid

Before using the automated test system, it is necessary to provide an infrastructure upon which tests can be run. This entails setting up a modified Selenium grid as described in [2.2]

#### [3.3.1] Steps

1. Obtain working copies of both `grid.jar` and `spawn.jar`. these can be created by running `mvn clean install` on the `grid` module. The files `grid.jar`, `spawn.jar`, and `grid-<version>.jar` will be created in `/fuzzy-shame/grid/target/`. Pay no attention to `grid-<version>.jar`. It contains all the classes in the `grid` module ,and will be installed to your local Maven repository for use in other projects. You may leave `grid.jar` and `spawn.jar` in place, or move them to a convenient location on your local filesystem.

2. ensure that a file called `grid.properties` exists in the same directory as `grid.jar` and `spawn.jar`. Enusre that `grid.properties` contains the lines `defaultInterval=10000` and `uniqueSessionCount=10`
3. Create a Selenium hub. To do this, run `java -jar spawn.jar grid.jar -role hub`. You may optionally specify the `-port <port>` parameter to set the port on which the hub will listen for incoming connections from nodes (default 4444)and/or the `-hubConfig <file.json>` parameter. to specify a configuration file for the hub.
4. Create Selenium nodes. The hub cannot run tests on its own, it simply delegates work to nodes which control browser instances. To create a node, run `java -jar spawn.jar grid.jar -role node -hub http://<hub IP address>/grid/register` You may set the `-nodeConfig <file.json>` parameter to specify a configuration file for the node.

### [3.3.2] Notes

- The reason we run `grid.jar` through `spawn.jar` rather than through `java -jar` is that `spawn.jar` acts as a watchdog, restarting dead nodes as described in [2.2]
- When running through `spawn.jar`, provide program arguments just as you normally would. The full list of command line arguments for `grid.jar` can be found by running `java -jar grid.jar -h`

### [4] Use

Before running tests, it is necessary to provide the infrastructure upon which tests will be run. In order to do this you must have working copies of both `grid.jar` and `spawn.jar`.