Configuring Parallel Tests across Machines Using Selenium Grid Tutorial

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Introduction to Selenium Grid

Selenium Grid allows testers to run tests on multiple machines from a single central hub. This is useful for testing across platforms and browsers, or for speeding up test execution by running tests in parallel. This tutorial will take you through configuration of a simple test suite which runs parallel tests on two different PCs, and in different browsers.

Requirements

- Eclipse (We are using Neon 4.6.0)
- Eclipse Maven plugin
- Eclipse TestNG plugin
- Selenium Standalone Server 3.0.1 jar file (http://www.seleniumhq.org/download/)
- chromedriver.exe
- IEDriverServer.exe

Configuring a Grid

We will run our tests on two PCs, Machine H and Machine A. Machine H will be our hub and also run a node. Machine A will be running a single node. To install Selenium Standalone Server, simply download the .jar file and save it to some location on your computer (for this tutorial, selenium-server-standalone.jar is saved to the C:/ drive). This must be done on both Machine H and Machine A.

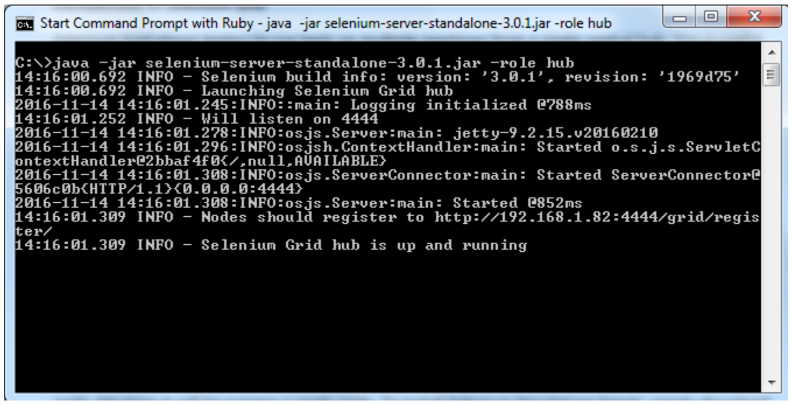
Open a Windows command prompt and navigate to the directory containing selenium-server-standalone.jar. We will now set up our hub:

On Machine H, enter the following command into the command prompt:

```
java –jar selenium-server-standalone-3.0.1.jar –role hub
```

This starts a grid on Machine H, using the default port setting of 4444. You can always change the default port using the –port option.

The command prompt should look similar to the following:



Start Command Prompt with Ruby - java -jar selenium-server-standalone-3.0.1.jar -role hub

```
C:\>java -jar selenium-server-standalone-3.0.1.jar -role hub
14:16:00.692 INFO - Selenium build info: version: '3.0.1', revision: '1969d75'
14:16:00.692 INFO - Launching Selenium Grid hub
2016-11-14 14:16:01.245:INFO::main: Logging initialized @788ms
14:16:01.252 INFO - Will listen on 4444
2016-11-14 14:16:01.278:INFO:osjs.Server:main: jetty-9.2.15.v20160210
2016-11-14 14:16:01.296:INFO:osjsh.ContextHandler:main: Started o.s.j.s.ServletC
ontextHandler@2bbaf4f0{/,null,AVAILABLE}
2016-11-14 14:16:01.308:INFO:osjs.ServerConnector:main: Started ServerConnector@
5606c0b{HTTP/1.1}{0.0.0.0:4444}
2016-11-14 14:16:01.308:INFO:osjs.Server:main: Started @852ms
14:16:01.309 INFO - Nodes should register to http://192.168.1.82:4444/grid/regis
ter/
14:16:01.309 INFO - Selenium Grid hub is up and running
```

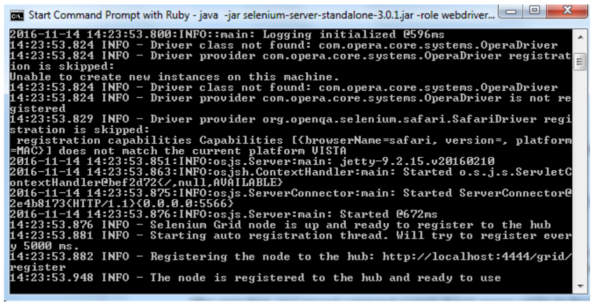
Now, we will configure a node on Machine H:

Open a separate command prompt on Machine H, navigate to the location of the selenium-server-standalone.jar, and enter the following command:

java –jar selenium-server-standalone-3.0.1.jar –role webdriver –hub http://localhost:4444/grid/register -port 5566

Feel free to use any open port, we are using 5566. Note we must specify the port of the hub on localhost; so if you did not use the default settings make sure your port numbers match.

After executing, your second command prompt should appear similar to the following:



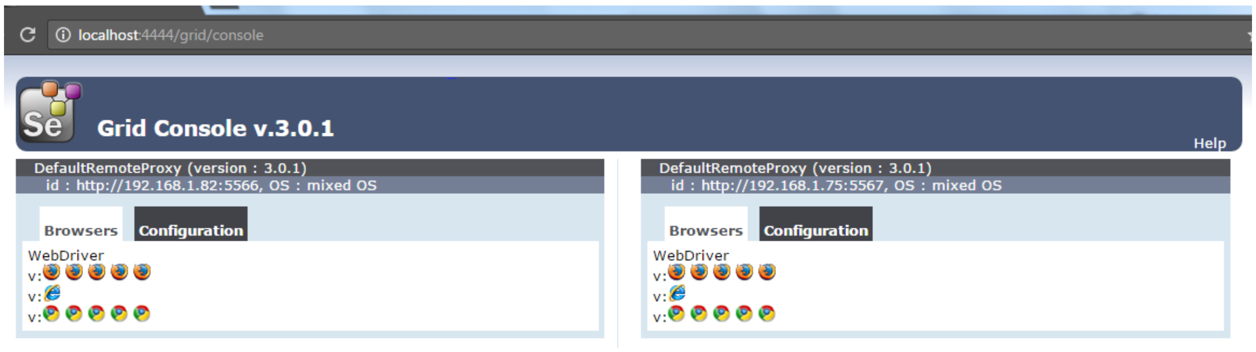
```
Start Command Prompt with Ruby - java  -jar selenium-server-standalone-3.0.1.jar -role webdriver...
2016-11-14 14:23:53.800:INFO::main: Logging initialized @596ms
14:23:53.824 INFO - Driver class not found: com.opera.core.systems.OperaDriver
14:23:53.824 INFO - Driver provider com.opera.core.systems.OperaDriver registrat
ion is skipped:
Unable to create new instances on this machine.
14:23:53.824 INFO - Driver class not found: com.opera.core.systems.OperaDriver
14:23:53.824 INFO - Driver provider com.opera.core.systems.OperaDriver is not re
gistered
14:23:53.829 INFO - Driver provider org.openqa.selenium.safari.SafariDriver regi
stration is skipped:
 registration capabilities Capabilities [{browserName=safari, version=, platform
=MAC}] does not match the current platform VISTA
2016-11-14 14:23:53.851:INFO:osjs.Server:main: jetty-9.2.15.v20160210
2016-11-14 14:23:53.863:INFO:osjsh.ContextHandler:main: Started o.s.j.s.ServletC
ontextHandler@bef2d72{/,null,AVAILABLE}
2016-11-14 14:23:53.875:INFO:osjs.ServerConnector:main: Started ServerConnector@
2e4b8173{HTTP/1.1}{0.0.0.0:5566}
2016-11-14 14:23:53.876:INFO:osjs.Server:main: Started @672ms
14:23:53.876 INFO - Selenium Grid node is up and ready to register to the hub
14:23:53.881 INFO - Starting auto registration thread. Will try to register ever
y 5000 ms.
14:23:53.882 INFO - Registering the node to the hub: http://localhost:4444/grid/
register
14:23:53.948 INFO - The node is registered to the hub and ready to use
```

Now, on the remote machine (Machine A) navigate to C:/ drive via command prompt and enter following command:

java –jar selenium-server-standalone-3.0.1.jar –role webdriver –hub http://192.168.1.82:4444/grid/register -port 5567

Note that you must know the domain name of Machine H, which in our case it is 192.168.1.82. You can also specify any open port you wish, here we use 5567 for clarity in comparison with the node on Machine H.

After configuring the node on Machine A, open up a browser on Machine H and navigate to http://localhost:4444/grid/console. You should see something similar to the following:


localhost:4444/grid/console
Grid Console v.3.0.1
Help
DefaultRemoteProxy (version : 3.0.1)
id : http://192.168.1.82:5566, OS : mixed OS
Browsers
Configuration
WebDriver
v:
v:
v:
DefaultRemoteProxy (version : 3.0.1)
id : http://192.168.1.75:5567, OS : mixed OS
Browsers
Configuration
WebDriver
v:
v:
v:

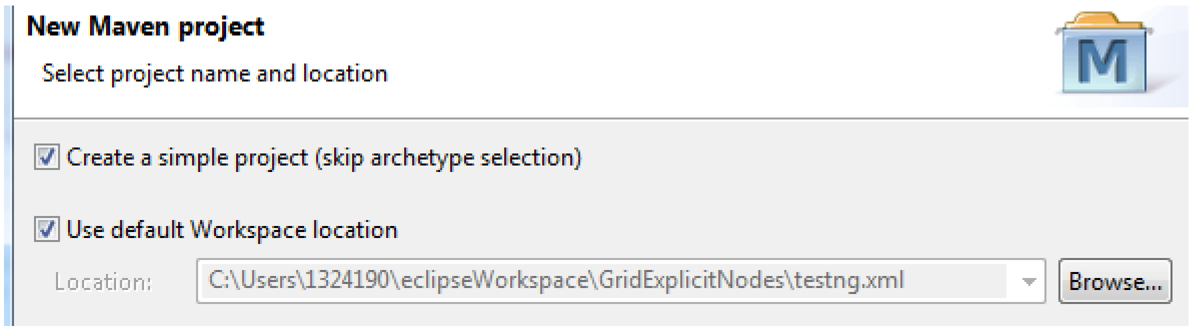
Note the two nodes and their ip addresses, we have successfully set up our grid! You will notice the browser symbols in each node, this tells us the maximum number of webdrivers that each node can run at one time. Hovering your mouse over one of these will also tell you the platform that they will be running on.

Creating a Maven Project in Eclipse

Launch Eclipse and select File->New->Project

Select 'Maven Project' and click 'Next'.

Select the 'Create a simple project' checkbox as shown below and select 'Next'



New Maven project

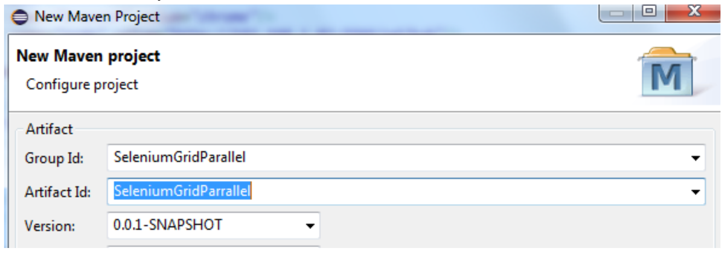
Select project name and location

[✓] Create a simple project (skip archetype selection)

[✓] Use default Workspace location

Location: C:\Users\1324190\eclipseWorkspace\GridExplicitNodes\testng.xml

Enter a Group ID and Artifact ID, we will use SeleniumGridParallel.



New Maven Project

New Maven project

Configure project

Artifact

Group Id: SeleniumGridParallel

Artifact Id: SeleniumGridParralel

Version: 0.0.1-SNAPSHOT

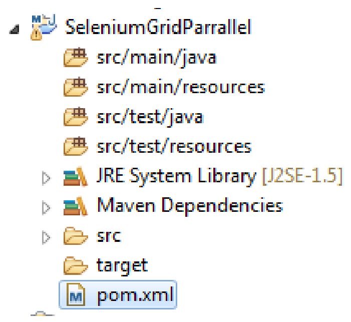
Click 'Finish'.

Maven Dependencies

We must add two Maven Dependencies to our pom.xml file, testng and selenium-java. We have supplied the code for these dependencies to copy into your pom.xml below:

```
<dependencies>
        <dependency>
         <groupId>org.testng</groupId>
         <artifactId>testng</artifactId>
         <version>6.9.10</version>
         <scope>test</scope>
      </dependency>
      <dependency>
       <groupId>org.seleniumhq.selenium</groupId>
             <artifactId>selenium-java</artifactId>
        <version>3.0.1</version>
      </dependency>
</dependencies>
```

Click on the 'save' button to build the project. You will see the necessary jar files added to 'Maven Dependencies' in the project architecture.



```
SeleniumGridParrallel
    src/main/java
    src/main/resources
    src/test/java
    src/test/resources
  ▷ JRE System Library [J2SE-1.5]
  ▷ Maven Dependencies
  ▷ src
    target
    pom.xml
```

Now we will convert our project into a TestNG project. Right click on the project in the package explorer and select TestNG->Convert to TestNG. Click 'Finish' and you will see testng.xml added to your project.

Browser.java

Create a new package inside of /src/test/java. We will name ours testSuite. Right click on this package in the Project Explorer and create a new Java Class named 'Browser'. This class will instantiate the RemoteWebDriver object that executes a given test class on a given node. We do this to be able to specify the node that our test should be run on, and specify which browser we will run the test in. The browser and node URL will be passed as parameters in our testng.xml file, but let's first consider the Browser.java code:

```
package testSuite;

import java.net.MalformedURLException;
import java.net.URL;

import org.openqa.selenium.remote.DesiredCapabilities;
import org.openqa.selenium.remote.RemoteWebDriver;

public class Browser {
	public static RemoteWebDriver getDriver(String browser, String nodeURL) throws
MalformedURLException {
		return new RemoteWebDriver(new URL(nodeURL), getBrowserCapabilities(browser));
	}

	private static DesiredCapabilities getBrowserCapabilities(String browserType) {
		switch (browserType.toLowerCase()) {
		case "firefox":
			System.out.println("Opening firefox driver");
			return DesiredCapabilities.firefox();
		case "chrome":
			System.out.println("Opening chrome driver");
			return DesiredCapabilities.chrome();
		case "ie":
			System.out.println("Opening IE driver");
			return DesiredCapabilities.internetExplorer();
		default:
			System.out.println("browser : " + browserType + " is invalid, Launching
Firefox as browser of choice..");
			return DesiredCapabilities.firefox();
		}
	}
}
```

Now create another java class named GoogleTestRunner.java inside of the testSuite package. The code is given below:

```java
package testSuite;

import java.net.MalformedURLException;

import org.openqa.selenium.remote.RemoteWebDriver;
import org.testng.annotations.AfterClass;
import org.testng.annotations.BeforeClass;
import org.testng.annotations.Parameters;
import org.testng.annotations.Test;

public class GoogleTestRunner {
	public static RemoteWebDriver driver;
	public static String appURL = "https://www.google.com";

	@BeforeClass
	@Parameters({ "browser", "node" })
	public void setUp(String browser, String node) throws MalformedURLException {
		System.out.println("*******************");
		driver = Browser.getDriver(browser, node);
		driver.manage().window().maximize();
	}

	@AfterClass
	public void tearDown() {
		if(driver!=null) {
			System.out.println("Closing browser");
			driver.quit();
		}
	}

	@Test
	public void testNavigationToPenFed() {
		driver.navigate().to(appURL);
		String pageTitle = driver.getTitle();
		System.out.println("The page title is: " + pageTitle);
	}
}
```

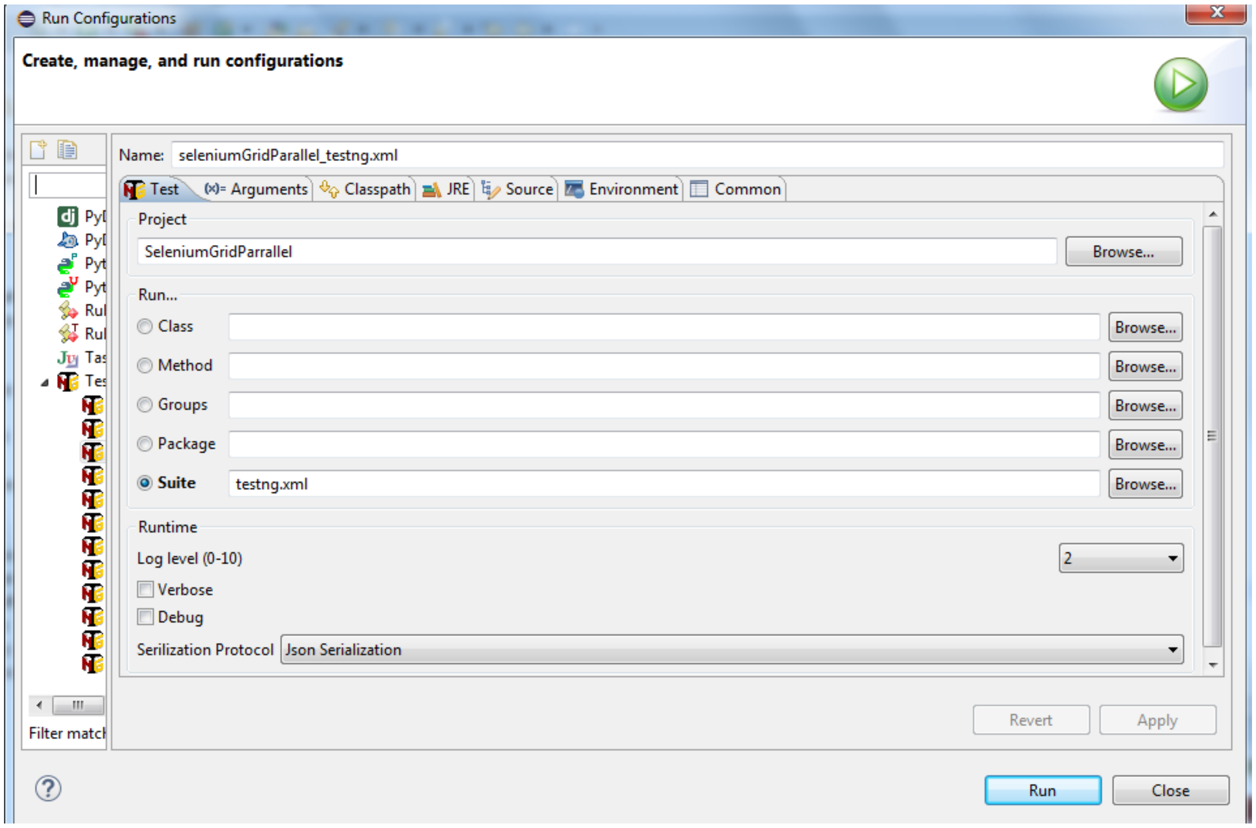
Now create a second test class, GoogleSearchTestRunner.java within suiteRunner.

```java
package testSuite;

import java.net.MalformedURLException;

import org.openqa.selenium.By;
import org.openqa.selenium.WebElement;
import org.openqa.selenium.remote.RemoteWebDriver;
import org.testng.annotations.AfterClass;
import org.testng.annotations.BeforeClass;
import org.testng.annotations.Parameters;
import org.testng.annotations.Test;

public class GoogleSearchTestRunner {
	public static RemoteWebDriver driver;
	public static String appURL = "https://www.google.com";

	@BeforeClass
	@Parameters({ "browser", "node" })
	public void setUp(String browser, String node) throws MalformedURLException {
		System.out.println("*******************");
		driver = Browser.getDriver(browser, node);
		driver.manage().window().maximize();
	}

	@AfterClass
	public void tearDown() {
		if(driver!=null) {
			System.out.println("Closing browser");
			driver.quit();
		}
	}

	@Test(priority=0)
	public void testNavigationToGoogle() {
		driver.navigate().to(appURL);
		String pageTitle = driver.getTitle();
		System.out.println("The page title is: " + pageTitle);
	}

	@Test(priority=1)
	public void viewProducts() {
		WebElement searchButton = driver.findElement(By.name("q"));
		searchButton.sendKeys("selenium server");
		searchButton.submit();
	}
}
```

Now we will edit our testng.xml file in order to run our project as a testNG Suite. The code is below. Pay attention to how we are executing tests in parallel, and passing in the browser type and node ip address as parameters for each test.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">
<suite name="Suite" parallel="tests">
  <test name="Test">
    <parameter name="browser" value="chrome"/>
    <parameter name="node" value="http://192.168.1.82:5566/wd/hub"/>
    <classes>
      <class name="testSuite.GoogleTestRunner"/>
    </classes>
  </test> <!-- Test -->
  <test name="Test2">
    <parameter name="browser" value="chrome"/>
    <parameter name="node" value="http://192.168.1.82:5566/wd/hub"/>
    <classes>
        <class name="testSuite.GoogleSearchTestRunner"/>
    </classes>
  </test>
    <test name="Test3">
    <parameter name="browser" value="ie"/>
    <parameter name="node" value="http://192.168.1.75:5567/wd/hub"/>
    <classes>
        <class name="testSuite.GoogleTestRunner"/>
    </classes>
  </test>
</suite> <!-- Suite -->
```

To execute the test right click inside of testng.xml and select Run->Run Configurations. Specify the proper Project and Suite, it should look as follows. Click Run.


Run Configurations

Create, manage, and run configurations

Name: seleniumGridParallel_testng.xml

Project: SeleniumGridParralel

Run...
- Class
- Method
- Groups
- Package
- [✓ Suite] testng.xml

Runtime

Log level (0-10): 2

Verbose

Debug

Serilization Protocol: Json Serialization

If you have been careful in keeping track of your ip addresses and port numbers, and the chromedriver.exe and IEDriverServer.exe are both in the same directory as selenium-server-standalone.jar, then each test should execute in parallel and pass.