

Lab 5: Working with Selenium Grid

In this lab, We will describe how to use Selenium Grid. You will learn how to install a selenium grid and how to configure it.

Lab Solution

Lab solution is present in `C:\Users\fenago\Desktop\advanced-selenium-java\Lab05` folder.

Go to <http://www.seleniumhq.org/download/> and download **Selenium Standalone Server**. Selenium team constantly updating the versions. You may see a different version, pls do not panic, just download it. :)

Selenium Standalone Server

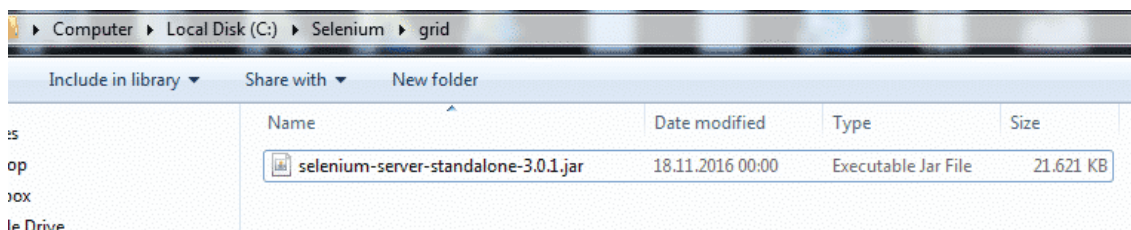
The Selenium Server is needed in order to run Remote Selenium WebDriver. Selenium 3.X is no longer capable of running Selenium RC directly, rather it does it through emulation and the WebDriverBackedSelenium interface.

Download version [3.141.59](#) 

To run Selenium tests exported from the legacy IDE, use the [Selenium Html Runner](#).

To use the Selenium Server in a Grid configuration [see the wiki page](#).

Then, **copy the .jar** file to `*C:\Selenium\grid*` folder.



What are Hub and Nodes?

Basically, we have a **Hub** which is a server that we connect from our tests and we have ****Nodes,**** they can be on different machines and they register with the hub. ***Simply, we have a hub and several nodes, nodes are registered in our hub and the hub knows which browsers are available. Hub sends requests to the nodes based on desired capabilities and executes the tests.***

How to Start and Configure Hub and Nodes

The best way to start hub and node with .bat files for Windows also it is easier and tidier to configure them with **.json files**.

First, let's start the hub by command window.

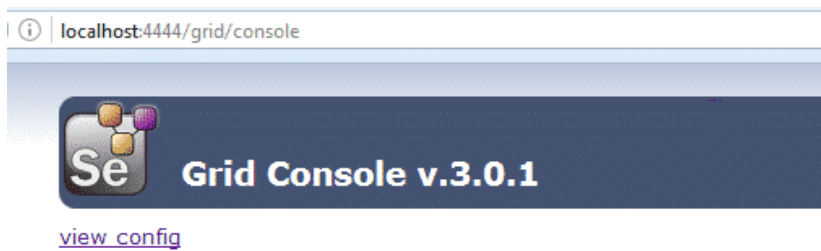
Hub Start Command:

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

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

```
C:\Selenium\grid>java -jar selenium-server-standalone-3.0.1.jar -role hub
22:35:23.756 INFO - Selenium build info: version: '3.0.1', revision: '1969d79'
22:35:23.758 INFO - Launching Selenium Grid hub
2016-11-19 22:35:25.074:INFO:osjs.main: Logging initialized @1776ms
22:35:25.088 INFO - Will listen on 4444
2016-11-19 22:35:25.152:INFO:osjs.Server.main: jetty-9.2.15.v20160210
2016-11-19 22:35:25.200:INFO:osjs.ContextHandler.main: Started o.s.j.s.ServletContextHandler@701fc37a{/,null,AVAILABLE}
2016-11-19 22:35:25.223:INFO:osjs.ServerConnector.main: Started ServerConnector@13407b5d{HTTP/1.1}{0.0.0.0:4444}
2016-11-19 22:35:25.224:INFO:osjs.Server.main: Started @1925ms
22:35:25.225 INFO - Nodes should register to http://192.168.1.101:4444/grid/register/
22:35:25.226 INFO - Selenium Grid hub is up and running
```

and you can see the hub panel on your browser as follows.



Let's start the node

We can start the node with the command window as below command.

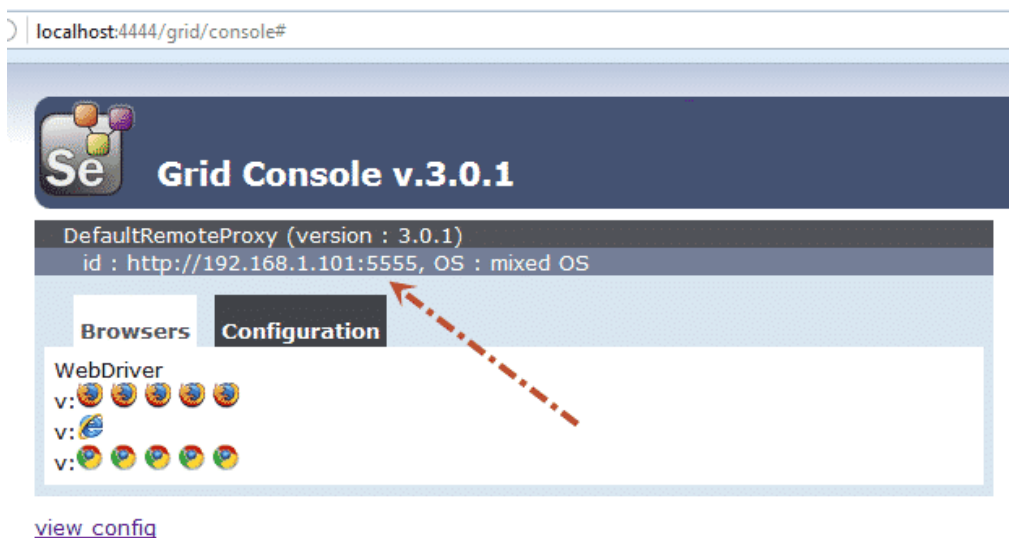
Node Start Command:

java -jar selenium-server-standalone-3.0.1.jar -role node -hub <http://localhost:4444/grid/register>

```
java -jar selenium-server-standalone-3.0.1.jar -role node -hub http://localhost:4444/grid/register
```

```
C:\Selenium\grid>java -jar selenium-server-standalone-3.0.1.jar -role node -hub http://localhost:4444/grid/register
22:54:43.123 INFO - Selenium build info: version: '3.0.1', revision: '1969d75'
22:54:43.124 INFO - Launching a Selenium Grid node
2016-11-19 22:54:44.355:INFO:main: Logging initialized @1629ms
22:54:44.426 INFO - Driver class not found: com.opera.core.systems.OperaDriver
22:54:44.426 INFO - Driver provider com.opera.core.systems.OperaDriver registration is skipped:
Unable to create new instances on this machine.
22:54:44.426 INFO - Driver class not found: com.opera.core.systems.OperaDriver
22:54:44.427 INFO - Driver provider com.opera.core.systems.OperaDriver is not registered
22:54:44.434 INFO - Driver provider org.openqa.selenium.safari.SafariDriver registration is skipped:
registration capabilities Capabilities [{browserName=safari, version=, platform=MAC}] does not match the current platfo
rm VISTA
2016-11-19 22:54:44.480:INFO:osjs.Server:main: jetty-9.2.15.v20160210
2016-11-19 22:54:44.505:INFO:osjs.ContextHandler:main: Started o.s.j.s.ServletContextHandler@2473d930{/,null,AVAILABLE}
2016-11-19 22:54:44.527:INFO:osjs.ServerConnector:main: Started ServerConnector@34b7ac2f{HTTP/1.1}{0.0.0.0:5555}
2016-11-19 22:54:44.529:INFO:osjs.Server:main: Started @1803ms
22:54:44.529 INFO - Selenium Grid node is up and ready to register to the hub
22:54:44.542 INFO - Starting auto registration thread. Will try to register every 5000 ms.
22:54:44.543 INFO - Registering the node to the hub: http://localhost:4444/grid/register
22:54:44.884 INFO - The node is registered to the hub and ready to use
```

and when you open the grid console you can see that the node registered with the hub.



When we wanted to use a selenium grid in our tests we need to tell our grid where the required browser executable is located. Thus, we should start to the node as below command before writing our tests. **We added the blue part.**

Node Start Command with Chrome Driver Location:

```
java -jar -Dwebdriver.chrome.driver=C:\Selenium\drivers\chrome\chromedriver.exe selenium-server-standalone-3.0.1.jar -role node -hub http://localhost:4444/grid/register
```

Let's write a very simple test that clicks the Facebook login button. Before running the below test, start the hub and the node with the above command then run the test.

```
import org.junit.AfterClass;
import org.junit.BeforeClass;
import org.junit.Test;
import org.openqa.selenium.By;
import org.openqa.selenium.Platform;
import org.openqa.selenium.WebDriver;
import org.openqa.selenium.WebElement;
import org.openqa.selenium.remote.DesiredCapabilities;
import org.openqa.selenium.remote.RemoteWebDriver;

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

/**
 * Created by fenago
 */
public class GridExampleTest {

    static WebDriver driver;

    //Setup Driver
    @BeforeClass
    public static void setupTest() throws MalformedURLException {
        DesiredCapabilities caps = DesiredCapabilities.chrome();
        //For Firefox use below capabilities
        //DesiredCapabilities caps = DesiredCapabilities.firefox();
        caps.setPlatform(Platform.WINDOWS);
        driver = new RemoteWebDriver(new URL("http://localhost:4444/wd/hub"), caps);
    }

    @Test
    public void T01_FacebookLogin() {
        //Navigate to facebook.com
        driver.navigate().to("https://www.facebook.com/");
        driver.manage().window().maximize();

        //Login Button
        WebElement loginButton = driver.findElement(By.id("loginbutton"));

        //Actions example
        loginButton.click();
    }

    //Close Driver
    @AfterClass
    public static void quitDriver() {
        driver.quit();
    }
}
```

Selenium Grid Nodes and Hub Configurations by JSON

It is also described at <https://github.com/SeleniumHQ/selenium/wiki/Grid2> page as shown below.

Configuring the nodes by JSON

```
java -jar selenium-server-standalone.jar -role node -nodeConfig nodeconfig.json
```

A sample nodeconfig file for server version 3.x.x (>= beta4) can be seen at <https://github.com/SeleniumHQ/selenium/blob/master/java/server/src/org/openqa/grid/common/defaults/DefaultNodeWebDriver.json>

A sample nodeconfig file for server version 2.x.x can be seen at <https://github.com/SeleniumHQ/selenium/blob/selenium-2.53.0/java/server/src/org/openqa/grid/common/defaults/DefaultNode.json>

Note: the `configuration { ... }` object in version 2.x.x has been flattened in version 3.x.x (>= beta4)

Configuring the hub by JSON

```
java -jar selenium-server-standalone.jar -role hub -hubConfig hubconfig.json
```

A sample hubconfig.json file can be seen at <https://github.com/SeleniumHQ/selenium/blob/master/java/server/src/org/openqa/grid/common/defaults/DefaultHub.json>

Hub Config:

<https://github.com/SeleniumGridRefactor/grid/blob/master/src/main/resources/org/openqa/grid/common/defaults/DefaultHub.json>

Node Config:

<https://github.com/SeleniumGridRefactor/grid/blob/master/src/main/resources/org/openqa/grid/common/defaults/DefaultNodeWebDriver.json>

We will use the same config which is located at the above link. By using these configurations, let's create "**starthub.bat**" and "**startnode.bat**" files.

starthub.bat

```
REM start a hub with the defaults on port 4444
REM visit http://localhost:4444/grid/console to see status
REM java -jar selenium-server-standalone-3.0.1.jar -role hub

REM Start a hub with params configured in JSON file
REM
https://github.com/SeleniumGridRefactor/grid/blob/master/src/main/resources/org/openqa/grid/common/defaults/DefaultHub.json

java -jar selenium-server-standalone-3.0.1.jar -role hub -hubConfig hub.json
```

startnode.bat

```
REM start a node configured by the node.json
REM
```

<https://github.com/SeleniumHQ/selenium/blob/master/java/server/src/org/openqa/grid/common/defaults/DefaultNodeWebDriver.json>

```
java -jar -Dwebdriver.gecko.driver=C:\Selenium\drivers\firefox\geckodriver.exe -
Dwebdriver.chrome.driver=C:\Selenium\drivers\chrome\chromedriver.exe selenium-server-standalone-3.0.1.jar -
role node -nodeConfig node.json
```

Start the HUB

```

C:\Selenium\grid>starthub.bat
C:\Selenium\grid>REM start a hub with the defaults on port 4444
C:\Selenium\grid>REM visit http://localhost:4444/grid/console to see status
C:\Selenium\grid>REM java -jar selenium-server-standalone-3.0.1.jar -role hub
C:\Selenium\grid>REM Start a hub with params configured in JSON file
C:\Selenium\grid>REM https://github.com/SeleniumHQ/selenium/blob/master/java/server/src/org/openqa/grid/common/defaults/DefaultHub.json
C:\Selenium\grid>java -jar selenium-server-standalone-3.0.1.jar -role hub -hubConfig hub.json
01:56:23.746 INFO - Selenium build info: version: '3.0.1', revision: '1969d75'
01:56:23.748 INFO - Launching Selenium Grid hub
2016-11-20 01:56:25.157:INFO::main: Logging initialized @1854ms
01:56:25.172 INFO - Will listen on 4444
2016-11-20 01:56:25.219:INFO:osjs.Server:main: jetty-9.2.15.v20160210
2016-11-20 01:56:25.269:INFO:osjs.ContextHandler:main: Started o.s.j.s.ServletContextHandler@701fc37a[/,null,AVAILABLE]
2016-11-20 01:56:25.291:INFO:osjs.ServerConnector:main: Started ServerConnector@10b48321{HTTP/1.1}{0.0.0.0:4444}
2016-11-20 01:56:25.292:INFO:osjs.Server:main: Started @1989ms
01:56:25.295 INFO - Nodes should register to http://192.168.1.101:4444/grid/register/
01:56:25.295 INFO - Selenium Grid hub is up and running

```

Start the Node

```

C:\Selenium\grid>startnode.bat
C:\Selenium\grid>REM start a node configured by the node.json
C:\Selenium\grid>REM https://github.com/SeleniumHQ/selenium/blob/master/java/server/src/org/openqa/grid/common/defaults/DefaultNodeWebDriver.json
C:\Selenium\grid>java -jar -Dwebdriver.gecko.driver=C:\Selenium\drivers\firefox\geckodriver.exe -Dwebdriver.chrome.driver=C:\Selenium\drivers\chrome\chromedriver.exe selenium-server-standalone-3.0.1.jar -role node -nodeConfig node.json
01:57:40.918 INFO - Selenium build info: version: '3.0.1', revision: '1969d75'
01:57:40.920 INFO - Launching a Selenium Grid node
2016-11-20 01:57:42.449:INFO::main: Logging initialized @2030ms
01:57:42.493 INFO - Driver class not found: com.opera.core.systems.OperaDriver
01:57:42.493 INFO - Driver provider com.opera.core.systems.OperaDriver registration is skipped:
Unable to create new instances on this machine.
01:57:42.494 INFO - Driver class not found: com.opera.core.systems.OperaDriver
01:57:42.494 INFO - Driver provider com.opera.core.systems.OperaDriver is not registered
01:57:42.496 INFO - Driver provider org.openqa.selenium.safari.SafariDriver registration is skipped:
registration capabilities Capabilities [{browserName=safari, version=, platform=MAC}] does not match the current platform VISTA
2016-11-20 01:57:42.541:INFO:osjs.Server:main: jetty-9.2.15.v20160210
2016-11-20 01:57:42.566:INFO:osjs.ContextHandler:main: Started o.s.j.s.ServletContextHandler@35047d03[/,null,AVAILABLE]
2016-11-20 01:57:42.587:INFO:osjs.ServerConnector:main: Started ServerConnector@7d2900e9{HTTP/1.1}{0.0.0.0:5555}
2016-11-20 01:57:42.588:INFO:osjs.Server:main: Started @2169ms
01:57:42.588 INFO - Selenium Grid node is up and ready to register to the hub
01:57:42.599 INFO - Starting auto registration thread. Will try to register every 5000 ms.
01:57:42.599 INFO - Registering the node to the hub: http://localhost:4444/grid/register
01:57:42.950 INFO - The node is registered to the hub and ready to use

```

Run the test again! When you run the test you will see that it will pass.

The screenshot displays an IDE with a project structure on the left, Java source code in the center, and a test runner output at the bottom.

Project Structure (Left):

- src
 - main
 - test
 - java
 - grid
 - GridExampleTest
 - Test
 - target
 - tools
 - pom.xml
 - Selenium3Project.iml
 - External Libraries

Source Code (Center):

```
23 //Setup Driver
24 @BeforeClass
25 public static void setupTest() throws MalformedURLException {
26     /*String chromeDriverLocation = System.getProperty("user.dir") + "\\tools\\di
27     System.out.println("Chrome Driver: " + chromeDriverLocation );
28     System.setProperty("webdriver.chrome.driver", chromeDriverLocation);
29     driver = new ChromeDriver();*/
30     DesiredCapabilities caps = DesiredCapabilities.chrome();
31     caps.setPlatform(Platform.WINDOWS);
32
33     driver = new RemoteWebDriver(new URL("http://localhost:4444/wd/hub"), caps);
34 }
35
36 @Test
37 public void T01_FacebookLogin() {
38     //Navigate to facebook.com
39     driver.navigate().to("https://www.facebook.com/");
40     driver.manage().window().maximize();
41 }
```

Test Runner Output (Bottom):

GridExampleTest

1 test passed - 2s 996ms

Test Case	Duration	Log Output
GridExampleTest (grid)	2s 996ms	"C:\Program Files\Java\jdk1.8.0_101\bin\java" ...
T01_FacebookLogin	2s 996ms	Kas 20, 2016 1:58:45 AM org.openqa.selenium.remote.ProtocolHandshake createSession INFO: Attempting bi-dialect session, assuming Postel's Law holds true on the remote end Kas 20, 2016 1:58:49 AM org.openqa.selenium.remote.ProtocolHandshake createSession INFO: Detected dialect: OSS

A red dashed arrow points from the **Test** folder in the project structure to the **T01_FacebookLogin** test case in the runner output.