## **SELENIUM - QUICK GUIDE**

http://www.tutorialspoint.com/selenium/selenium\_quick\_guide.htm

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## SELENIUM QUICK REFERENCE

#### **Selenium - Introduction**

Selenium is an open-source and a portable automated software testing tool for testing web applications. It has capabilities to operate across different browsers and operating systems. Selenium is not just a single tool but a set of tools that helps testers to automate web-based applications more efficiently.

Let us now understand each one of the tools available in the Selenium suite and their usage.

ΤοοΙ	Description
Selenium IDE	Selenium Integrated <b>D</b> evelopment <b>E</b> nvironment <i>IDE</i> is a Firefox plugin that lets testers to record their actions as they follow the workflow that they need to test.
Selenium RC	Selenium <b>R</b> emote <b>C</b> ontrol <i>RC</i> was the flagship testing framework that allowed more than simple browser actions and linear execution. It makes use of the full power of programming languages such as Java, C#, PHP, Python, Ruby and PERL to create more complex tests.
Selenium WebDriver	Selenium WebDriver is the successor to Selenium RC which sends commands directly to the browser and retrieves results.
Selenium Grid	Selenium Grid is a tool used to run parallel tests across different machines and different browsers simultaneously which results in minimized execution time.

### **Advantages of Selenium**

QTP and Selenium are the most used tools in the market for software automation testing. Hence it makes sense to compare the pros of Selenium over QTP.

Selenium	QTP
Selenium is an open-source tool.	QTP is a commercial tool and there is a cost involved in each one of the licenses.
Can be extended for various technologies that expose DOM.	Limited add-ons and needs add-ons for each one of the technologies.
Has capabilities to execute scripts across different browsers.	Can run tests in specific versions of Firefox , IE, and Chrome.
Can execute scripts on various operating systems.	Works only with Windows.
Supports mobile devices.	Supports mobile devices with the help of third-party tools.
Executes tests within the browser, so focus is NOT required while script execution is in progress.	Needs Focus during script execution, as the tool acts on the browser <i>mimicsuseractions</i> .

QTP cannot execute tests in parallel, however integrating QTP with QC allows testers to execute in parallel. QC is also a commercial tool.

### **Disadvantages of Selenium**

Let us now discuss the pitfalls of Selenium over QTP.

Selenium	QTP
Supports only web based applications.	Can test both web and desktop applications.
No feature such as Object Repository/Recovery Scenario	QTP has built-in object repositories and recovery scenarios.
No IDE, so the script development won't be as fast as QTP.	More intuitive IDE; automation can be achieved faster.
Cannot access controls within the browser.	Can access controls within the browser such as favorites bar, backward, and forward buttons.
No default test report generation.	Default test result generation within the tool.
For parameterization, users has to rely on the programming language.	Parameterization is built-in and easy to implement.

## **SELENIUM - IDE**

#### Selenium-IDE

The Selenium-IDE IntegratedDevelopmentEnvironment is an easy-to-use Firefox plug-in to develop Selenium test cases. It provides a Graphical User Interface for recording user actions using Firefox which is used to learn and use Selenium, but it can only be used with Firefox browser as other browsers are not supported.

However, the recorded scripts can be converted into various programming languages supported by Selenium and the scripts can be executed on other browsers as well.

The following table lists the sections that we are going to cover in this chapter.

Title	Description
Download Selenium IDE	This section deals with how to download and configure Selenium IDE.
<u>Selenium IDE Features</u>	This section deals with the features available in Selenium IDE.
<u>Creating Selenium IDE</u> <u>Tests</u>	This section deals with how to create IDE tests using recording feature.
<u>Selenium IDE Script</u> Debugging	This section deals with debugging the Selenium IDE script.
Inserting Verification Points	This section describes how to insert verification points in Selenium IDE.
<u>Selenium Pattern</u> <u>Matching</u>	This section deals with how to work with regular expressions using IDE.
Selenium User Extensions	The Java script that allows users to customize or add new functionality.

## SELENIUM - ENVIRONMENT SETUP

#### **Selenium - Environment Setup**

In order to develop Selenium RC or WebDriver scripts, users have to ensure that they have the initial configuration done. Setting up the environment involves the following steps.

- Download and Install Java
- Download and Configure Eclipse
- Configure FireBug and FirePath
- Configure Selenium RC
- Configure Selenium WebDriver

### **Download and Install Java**

We need to have JDK *JavaDevelopmentKit* installed in order to work with Selenium WebDriver/Selenium. Let us see how to download and install Java.

**Step 1** : Navigate to the URL: http://www.oracle.com/technetwork/java/javase/downloads/index.html

Step 2 : Go to "Downloads" section and select "JDK Download".

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**Step 4** : Select the appropriate installation. In this case, it is 'Windows 7-64' bit. Click the appropriate link and save the .exe file to your disk.

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**Step 5** : Run the downloaded exe file to launch the Installer wizard. Click 'Next' to continue.

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**Step 6** : Select the features and click 'Next'.

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C:\Program Files\Java\jdk1.8.0_11\	Change

**Step 7** : The installer is extracted and its progress is shown in the wizard.



Step 8 : The user can choose the install location and click 'Next'.

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	2 <u>25</u> 2	
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**Step 9** : The installer installs the JDK and new files are copied across.





**Step 10** : The Installer installs successfully and displays the same to the user.

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Click Next Steps to access tutorials, API document and more to help you get started with the JDK. Next Steps	tation, developer <mark>g</mark> uides, release notes

**Step 11** : To verify if the installation was successful, go to the command prompt and just type 'java' as a command. The output of the command is shown below. If the Java installation is unsuccessful or if it had NOT been installed, it would throw an "unknown command" error.

C\\Windows\system32\cmd.exe	
C:\/java_ Usage: java [-options] class [args] (to execute a class) or java [-options] -jar jarfile [args] (to execute a jar file) where options include: -d32 use a 32-bit data model if available -d64 use a 64-bit data model if available -server to select the "server" UM The default UM is server.	
<pre>-cp <class and="" directories="" files="" jar="" of="" path="" search="" zip=""> -classpath <class and="" directories="" files="" jar="" of="" path="" search="" zip=""> A ; separated list of directories, JAR archives, and ZlP archives to search for class filesD<name>=</name></class></class></pre> -D <name>= verbose:[classigc!jni]</name>	



### **Download and Configure Eclipse**

**Step 1** : Navigate to the URL: http://www.eclipse.org/downloads/ and download the appropriate file based on your OS architecture.



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eclipse-standard-luna-R-win32-x86_64	26/07/2014 10:49	File folder		
eclipse-standard-luna-R-win32-x86_64.zip	26/07/2014 10:43	WinRAR ZIP archive	210,750 KB	

**Step 4** : Locate Eclipse.exe and double click on the file.

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) configuration	12/06/2014 4:08 AM	File folder	
🍌 dropins	12/06/2014 4:08 AM	File folder	
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artifacts.xml	12/06/2014 4:08 AM	XML Document	118 KB
🗢 eclipse.exe	12/06/2014 4:08 AM	Application	313 KB
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e notice.html	4/06/2014 8:06 PM	HTML Document	9 KB

Step 5 : To configure the workspace, select the location where the development has to take place.

Select a workspace	
Eclipse stores your projects in a folder called a workspace. Choose a workspace folder to use for this session.	
Workspace D:\PERSONAL DOCS\Selenium Trials	Browse
Use this as the default and do not ask again	
	OK Creat

Step 6 : The Eclipse window opens as shown below.





### **Configure FireBug and FirePath**

To work with Selenium RC or WebDriver, we need to locate elements based on their XPath or ID or name, etc. In order to locate an element, we need tools/plugins.

**Step 1** : Navigate to the URL : https://addons.mozilla.org/en-US/firefox/addon/firebug/ and download plugin.

		arch for add-ons
Extensio	Firebug       2.0.2       KOMELUNET         by Joe Hewatt, Jan Odvarko, robcee, FirebugWorkingGroup         Firebug integrates with Firefox to put a wealth of development tools at your fingertips while you browse. You can edit, debug, and monitor CSS, HTML, and JavaScript live in any web page         + Add to Firefox	★★★★★ 1,655 user reviews 2,589,073 users @ □ Add to collection < Share this Add-o
	Enjoy this add-on? The developer of this add on asks that you show your support by making a donation	

**Step 2** : The add-on installer is shown to the user and it is installed upon clicking the 'Install' button.





Step 3 : After installing, we can launch the plugin by navigating to "Web Developer" >> "Firebug".



**Step 4** : FirePath, a plugin that works within Firebug, helps users to grab the 'XPath' of an element. Install FirePath by navigating to "https://addons.mozilla.org/en-US/firefox/addon/firepath/"

	Register or Log in	Other Applications *	mozilla ~
	ADD-ONS CTENSIONS   THEMES   COLLECTIONS   MORE	Q search for addion	5
<ul> <li>Extensio</li> </ul>	es » FirePath	1	
24	FirePath 0.9.7 by Pierre Tholence	16 us 47,12	र स ल er reviews १७ users क्र
	FirePath is a Firebug extension that adds a development tool to edit, inspect and generate XPath 1.0 expressions, CSS 3 selectors and JQuery selectors (Sizzle selectors).	tor 🗇 Ad	ld to collection are this Add-on
	+ Add to Firefox		

**Step 5** : The add-on installer is shown to the user and it is installed upon clicking the 'Install' button.





**Step 6** : Now launch "Firebug" by navigating to "Tools" >> "Webdeveloper" >> "Firebug".

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### Example

Now let us understand how to use FireBug and FirePath with an example. For demonstration, we will use www.google.com and capture the properties of the text box of "google.com".

**Step 1** : First click on the arrow icon as highlighted in the following screenshot and drag it to the object for which we would like to capture the properties. The HTML/DOM of the object would be displayed as shown below. We are able to capture the 'ID' of the input text box with which we can interact.



**Step 2** : To fetch the XPath of the object, go to 'firepath' tab and perform the following steps.

- Click the Spy icon.
- Select the Control for which we would like to capture the XPath
- XPath of the selected control would be generated.

Google	
Google Search // Pm Feeling Lucky	

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### **Configure Selenium RC**

Now let us look at how to configure Selenium Remote control. We will understand how to develop scripts with Selenium RC in later chapters, however for now, we will understand just the configuration part of it.

**Step 1** : Navigate to the Selenium downloads section http://www.seleniumhq.org/download/ and download Selenium Server by clicking on its version number as shown below.

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Browser Automation	~	Projects	Download	Documentation	Support	About
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roject if you'd like some public ecognition of your generous	Download version 2	.42.2				

**Step 2** : After downloading, we need to start the Selenium Server. To do so, open command prompt and navigate to the folder where the downloaded JAR file is kept as shown below.



**Step 3** : To start the server, use the command 'java -jar <<downloaded jar name >> and if java JDK is installed properly, you would get a success message as shown below. Now we can start writing Selenium RC scripts.



### **Configure Selenium WebDriver**

Now let us look at how to configure Selenium WebDriver. We will understand how to develop scripts with Selenium WebDriver in later chapters, however for now, we will understand just the configuration part of it.

**Step 1** : Navigate to the selenium downloads section http://www.seleniumhq.org/download/ and download Selenium WebDriver by clicking on its version number as shown below.

#### The Internet Explorer Driver Server

This is required if you want to make use of the latest and greatest features of the WebDriver InternetExplorerDriver. Please make sure that this is available on your \$PATH (or %PATH% on Windows) in order for the IE Driver to work as expected.

Download version 2.42.0 for (recommended) <u>32 bit Windows IE</u> or <u>64 bit Windows IE</u> CHANGELOG

#### Selenium Client & WebDriver Language Bindings

In order to create scripts that interact with the Selenium Server (Selenium RC, Selenium Remote Webdriver) or create local Selenium WebDriver script you need to make use of language-specific client drivers. These languages include both 1.x and 2.x style clients.

While language bindings for other languages exist, these are the core ones that are supported by the main project hosted on google code.

Language	guage Client Version Release Date					
Java	2,42,2	2014-06-03	Download	Change log	Javadoc	
C#	2.42.0	2014-05-27	Download	Change log	API docs	-
Ruby	2.42.0	2014-05-22	Download	Change log	API docs	
Python	2.42.1	2014-05-27	Download	Change log	API docs	
Javascript (N	ode) 2.42.0	2014-05-22	Download	Change log	API docs	
100000 10						

**Step 2** : The downloaded file is in Zipped format and one has to unzip the contents to map it to the project folder.

♥ 🎉 → Computer → DataDisk (D:) → PERSON	AL DOCS 🔸 Selenium 1	Frials → JAR →		•	49
e ▼ Include in library ▼ Share with ▼	New folder				
Name	Date modified	Туре	Size		
🕼 selenium-java-2.42.2	27/07/2014 8:18 AM	File folder			
selenium-java-2.42.2.zip	27/07/2014 8:17 AM	WinRAR ZIP archive	24,140 KB		

**Step 3** : The Unzipped contents would be displayed as shown below. How to map it to the project folder and how to start scripting would be dealt in the webDriver chapter.

Include in library	New folder		
Vame	Date modified	Туре	Size
📕 libs	3/06/2014 10:42 AM	File folder	
CHANGELOG	3/06/2014 10:42 AM	File	65 KB
selenium-java-2.42.2.jar	3/06/2014 10:42 AM	Executable Jar File	3,708 KB
selenium-java-2.42.2-srcs.jar	3/06/2014 10:42 AM	Executable Jar File	628 KB

### What is Selenium RC?

Selenium Remote Control *RC* was the main Selenium project that sustained for a long time before Selenium WebDriver*Selenium*2.0 came into existence. Now Selenium RC is hardly in use, as WebDriver offers more powerful features, however users can still continue to develop scripts using RC.

It allows us to write automated web application UI tests with the help of full power of programming languages such as Java, C#, Perl, Python and PHP to create more complex tests such as reading and writing files, querying a database, and emailing test results.

### **Selenium RC Architecture**

Selenium RC works in such a way that the client libraries can communicate with the Selenium RC Server passing each Selenium command for execution. Then the server passes the Selenium command to the browser using Selenium-Core JavaScript commands.

The browser executes the Selenium command using its JavaScript interpreter.



• The Selenium Server launches and kills browsers. In addition to that, it interprets and

executes the Selenese commands. It also acts as an HTTP proxy by intercepting and verifying HTTP messages passed between the browser and the application under test.

• Client libraries that provide an interface between each one of the programming languages Java, C#, Perl, Python and PHP and the Selenium-RC Server.

#### **RC Scripting**

Now let us write a sample script using Selenium Remote Control. Let us use http://www.calculator.net/ for understanding Selenium RC. We will perform a Percent calculation using 'Percent Calculator' that is present under the 'Math Calculators' module.

**Step 1** : Start Selenium Remote Control *withthehelpofcommandprompt*.

**Step 2** : After launching Selenium RC, open Eclipse and create a "New Project" as shown below.

C	New	Alt+Shift+N *	12	Java Project			ないりゃんの中の
	Open File		0	Project			
	Close	Ctrl+W	=	Package			
	Close All	CbT+SbiR+W	G	Class			Workbench
	Save	Ctrl+S	0	Interface Enum	-		
1.10	Seve All Revert	Ctrl+Shilt+S	8 8 10	Annotation Source Folder Java Working Set			
4	Move Rename Refuelb	F2	10,00	Folder File		Tutorials Go through tutorials	
	Convert Line Delimiters To		調査	Unitited Text File JUnit Test Case			
2	Print_	Ctrl+P	13	Other Ctr	tel+N	What's New	
	Switch Workspace Restart	,			v	FIRE OUL WILL DE HEW	
10.10	Import Export						
	Properties	Alt+Enter					

**Step 3** : Enter the project name and click 'Next' button.

reate a Java Project	n an external location.
roject name: selrcdemo	
Use default location	
ocation: D:\PERSONAL DOCS\Seleniur	m Trials\selrcdemo Browse
JRE	
Use an execution environment JRE:	JavaSE-1.8
O Use a project specific JRE:	jre8 👻
🔘 Use default JRE (currently 'jre8')	Configure JREs
Project layout	
Project layout	s and class files

**Step 4** : Verify the Source, Projects, Libraries, and Output folder and click 'Finish'.



Step 5 : Right click on 'project' container and choose 'Configure Build Path'.



**Step 6** : Properties for 'selrcdemo' opens up. Navigate to 'Libraries' tab and select 'Add External JARs'. Choose the Selenium RC jar file that we have downloaded and it would appear as shown below.



Step 7 : The referenced Libraries are shown as displayed below.

File Edit Source Refactor Navigate Search Broject Bun Window Help



**Step 8** : Create a new class file by performing a right click on 'src' folder and select 'New' >> 'class'.



Step 9 : Enter a name of the class file and enable 'public static void main' as shown below.

New Java Class

Source folder:	selrcdemo/src	Browse
Package:	selrcdemo	Browse
Enclosing type:		Browse
Name:	rcdemo	
Modifiers:	public  package  private ( private ) private private )	🗇 protected
Superclass:	java.lang.Object	Browse
Interfaces:		Add
		Remove
Which method stub	s would you like to create?	
	void main(String[] args)	
	Constructors from superclass	
_	Inherited abstract methods	
Do you want to add	Comments? (Configure templates and defau	lt value <u>here</u> )

**Step 10** : The Created Class is created under the folder structure as shown below.



**Step 11** : Now it is time for coding. The following code has comments embedded in it to make the readers understand what has been put forth.

```
package selrcdemo;
import com.thoughtworks.selenium.DefaultSelenium;
import com.thoughtworks.selenium.Selenium;
public class rcdemo
{
    public static void main(String[] args) throws InterruptedException
    {
        // Instatiate the RC Server
        Selenium selenium = new DefaultSelenium("localhost", 4444 , "firefox",
        "http://www.calculator.net");
        selenium.start(); // Start
```

```
selenium.open("/"); // Open the URL
   selenium.windowMaximize();
   // Click on Link Math Calculator
   selenium.click("xpath=.//*[@id='menu']/div[3]/a");
   Thread.sleep(2500); // Wait for page load
   // Click on Link Percent Calculator
   selenium.click("xpath=.//*[@id='menu']/div[4]/div[3]/a");
   Thread.sleep(4000); // Wait for page load
   // Focus on text Box
   selenium.focus("name=cpar1");
   // enter a value in Text box 1
   selenium.type("css=input[name=\"cpar1\"]", "10");
   // enter a value in Text box 2
   selenium.focus("name=cpar2");
   selenium.type("css=input[name=\"cpar2\"]", "50");
   // Click Calculate button
   selenium.click("xpath=.//*[@id='content']/table/tbody/tr/td[2]/input");
   // verify if the result is 5
   String result = selenium.getText(".//*[@id='content']/p[2]");
   if (result == "5")
   ł
      System.out.println("Pass");
   }
   else
   ł
      System.out.println("Fail");
   }
}
```

**Step 11** : Now, let us execute the script by clicking 'Run' Button.

}

0 1	ava - se	elrcdemo	/stc/selrcde	emo/rcdemo.j	ava - Ed	lipse								
Eile	Edit	Source	Refactor	Navigate S	earch	Project	Run	Window	Help					
103	- 12		* *	0 <b>9</b> 2	•	· ·	9 4	• 9	J u	n 🖗	- 6	- 🍫 🤇	5. • IG	217

**Step 12** : The script would start executing and user would be able to see the command history under 'Command History' Tab.

🔄 🕲 chrome://src/content/RemoteRunner.html?session	id⇒a0d9fd20d4d34cf88df60e1888962e2e5tmultiWindow⇒true8 🗵 C	🚼 = Google
Selenium Functional Testing for Web Apps Open Source From ThoughtWorks and Friends	Command History: click(xpath=.//*[@id='menu']/div[3]/a)	3
Show Log Slow Mode	<pre>click(xpath=.//*[8id='menu']/div[4]/div[3]/a focus(name=cpar1) type(css=input[name="cpar1"], 10)</pre>	.)
a0d9fd20d4d34cf88df60e1888962e2e	<pre>tocus(name=cpar2) type(css=input[name="cpar2"], 50) click(xpath=.//*[@id='content']/table/tbody/ astText(//*(@id='content')/n[2])</pre>	tr/td[2]/input)

**Step 13** : The final state of the application is shown as below. The percentage is calculated and it displayed the result on screen as shown below.

🗧 📾 👌 🐨 www.calculator.net/percenti-calculator.html?epar1=108/epar2=508/epar3=8/a=02	Sy=0 * C	🔁 • Google	P	合自	4	<b>†</b>
--	----------	------------	---	----	---	----------



**Step 14** : The output of the test is printed on the Eclipse console as shown below as we have printed the output to the console. In real time the output is written to an HTML file or in a simple Text file.

Problems @ Avadoc (@ Declaration (D) Console St	·····································
-terminated-+ receimo (Java Application) L'Orogram Files (Java grecibin gavaw exe (29 ) Pass	ur 2014 12:20:44 am)
40	

### **Selenium - Selenese Commands**

A command refers to what Selenium has to do and commands in selenium are of three types. Click on each one of them to know more about the commands.

- Actions
- Accessors
- Assertions

#### Locators

Element Locators help Selenium to identify the HTML element the command refers to. All these locators can be identified with the help of FirePath and FireBug plugin of Mozilla. Please refer the Environment Setup chapter for details.

- **identifier=id** Select the element with the specified "id" attribute and if there is no match, select the first element whose @name attribute is id.
- **id=id** Select the element with the specified "id" attribute.
- name=name Select the first element with the specified "name" attribute
- **dom=javascriptExpression** Selenium finds an element by evaluating the specified string that allows us to traverse through the HTML Document Object Model using JavaScript. Users cannot return a value but can evaluate as an expression in the block.
- **xpath=xpathExpression** Locate an element using an XPath expression.
- **link=textPattern** Select the link element *withinanchortags* which contains text matching the specified pattern.
- css=cssSelectorSyntax Select the element using css selector.

## SELENIUM - WEBDRIVER

### **Selenium Webdriver**

WebDriver is a tool for automating testing web applications. It is popularly known as Selenium 2.0. WebDriver uses a different underlying framework, while Selenium RC uses JavaScript Selenium-Core embedded within the browser which has got some limitations. WebDriver interacts directly with the browser without any intermediary, unlike Selenium RC that depends on a server. It is used in the following context:

- Multi-browser testing including improved functionality for browsers which is not wellsupported by Selenium RC *Selenium*1.0.
- Handling multiple frames, multiple browser windows, popups, and alerts.
- Complex page navigation.
- Advanced user navigation such as drag-and-drop.
- AJAX-based UI elements.

### Architecture

WebDriver is best explained with a simple architecture diagram as shown below.



### Selenium RC Vs WebDriver

Selenium RC	Selenium WebDriver
The architecture of Selenium RC is complicated, as the server needs to be up and running before starting a test.	WebDriver's architecture is simpler than Selenium RC, as it controls the browser from the OS level.
Selenium server acts as a middleman between	WebDriver interacts directly with the

the browser and Selenese commands.	browser and uses the browser's engine to control it.
Selenium RC script execution is slower, since it uses a Javascript to interact with RC.	WebDriver is faster, as it interacts directly with the browser.
Selenium RC cannot support headless execution as it needs a real browser to work with.	WebDriver can support the headless execution.
It's a simple and small API.	Complex and a bit large API as compared to RC.
Less object-oriented API.	Purely object oriented API.
Cannot test mobile Applications.	Can test iPhone/Android applications.

### Scripting using WebDriver

Let us understand how to work with WebDriver. For demonstration, we would use http://www.calculator.net/. We will perform a "Percent Calculator" which is located under "Math Calculator". We have already downloaded the required WebDriver JAR's. Refer the chapter "Environmental Setup" for details.

**Step 1** : Launch "Eclipse" from the Extracted Eclipse folder.



**Step 2** : Select the Workspace by clicking the 'Browse' button.

Select a wo	rkspace	
Eclipse store Choose a we	es your projects in a folder called a workspace. orkspace folder to use for this session.	

Use this as the default and	do not ask again	
ose and as the deladit and	ao not use again	

**Step 3** : Now create a 'New Project' from 'File' menu.

C	New	Alt+Shift+N*	Java Project			教育会社大学国際の
	Open File		Project			-
	Close Close All	Ctrl+W Ctrl+Shift+W	Package Class			Workbench
0 H 0	Save Save As Save All Revert	Ctrl+S Ctrl+Shift+S	Interface     Enum     Annotation     Source Folder     Iava Working Set			
2	Move Rename Refresh Convert Line Delimiters To	F2 F5	Folder File Untitled Text File File File File File File File File		Go through tutorials	
à	Print_	Ctrl+P	C Other	Ctrl+N	What's New	
	Switch Workspace Restart	,			V ring out what is new	
	Import Export					
	Properties	Alt+Enter				

**Step 4** : Enter the Project Name and Click 'Next'.

New Java Project		
reate a Java Project		
Create a Java project in the workspace or i	n an external locatior	
Project name: WebDriverDemo		
Vse default location		
Location: D:\PERSONAL DOCS\Selenium	m Trials\WebDriverDe	emo Browse
JRE		
Our Sean execution environment JRE:	JavaSE-1.8	•
O Use a project specific JRE:	jre8	*
🔘 Use default JRE (currently 'jre8')		Configure JREs
Project layout		
O Use project folder as root for source	s and class files	
Oreate separate folders for sources a	ind class files	Configure default
Working sets		
Working sets		

**Step 5** : Go to Libraries Tab and select all the JAR's that we have downloaded. Add reference to all the JAR's of Selenium WebDriver Library folder and also selenium-java-2.42.2.jar and selenium-java-2.42.2-srcs.jar.

efine the Java build settings.	P
Bource Projects Libraries の Control Control Projects	rt
apache-mime4j-0.6.jar - D:\PERSONAL DOCS\Selenium	Add JARs
bsh-1.3.0.jar - D:\PERSONAL DOCS\Selenium Trials\JAR\ cglib-nodep-2.1_3.jar - D:\PERSONAL DOCS\Selenium Tr	Add External JARs
commons-codec-1.9.jar - D:\PERSONAL DOCS\Selenium commons-collections-3.2.1.jar - D:\PERSONAL DOCS\Se	Add Variable
commons-exec-1.1.jar - D:\PERSONAL DOCS\Selenium 1	Add Library
commons-io-2.4.jar - D:\PERSONAL DOCS\Selenium Tria commons-jxpath-1.3.jar - D:\PERSONAL DOCS\Selenium	Add Class Folder
commons-lang3-3.2.1.jar - D:\PERSONAL DOCS\Seleniur commons-logging-1.1.3.jar - D:\PERSONAL DOCS\Selen	Add External Class Folder
cssparser-0.9.11.jar - D:\PERSONAL DOCS\Selenium Trial guava-15.0.jar - D:\PERSONAL DOCS\Selenium Trials\JAF	Edit
hamcrest-core-1.3.jar - D:\PERSONAL DOCS\Selenium T	Remove
hamcrest-library-1.3.jar - D:\PERSONAL DOCS\Selenium	
htmlunit-2.14.jar - D:\PERSONAL DOCS\Selenium Trials\. htmlunit-core-js-2.14.jar - D:\PERSONAL DOCS\Selenium httpclient-4.3.2.jar - D:\PERSONAL DOCS\Selenium Trials httpcore-4.3.1.jar - D:\PERSONAL DOCS\Selenium Trials\	Migrate JAR File
httpmime-4.3.2.jar - D:\PERSONAL DOCS\Selenium Trial ini4j-0.5.2.jar - D:\PERSONAL DOCS\Selenium Trials\JAR\ jcommander-1.29.jar - D:\PERSONAL DOCS\Selenium Tr jetty-websocket-8.1.8.jar - D:\PERSONAL DOCS\Selenium	
INA-3.4.0.1ar - D:\PERSONAL DOCS\Selenium Trials\JAR\s *	

増 Package Explorer 😒	Ē	
⊳ 🖾 selrcdemo		



**Step 7** : Now right-click on the package and select 'New' >> 'Class' to create a 'class'.

# C	New		110	Java Project	
	Go Into			Project	
	Open in New Window		<b>⊞</b> Ŷ	Package	
nn - ₽∖ F	Open Type Hierarchy	F4 🌔	G	Class	
	Show In	Alt+Shift+W 🕨	G	Interface	
	Сору	Ctrl+C	G	Enum	
	Copy Qualified Name		ø	Annotation	
Ê	Paste	Ctrl+V	æ	Source Folder	
×	Delete	Delete	ß	Java Working Set	
	Build Path	*		Folder	
	Source	Alt+Shift+S ►		File	
	Refactor	Alt+Shift+T ►		Untitled Text File	
~	Times			John Test Case	
	Import			Other	Ctrl+1
	Export				
Co	Refresh	F5	ι.		
	Close Project		ι.		
	Close Unrelated Projects		ι.		
	Assign working sets		1.		
	Debug As	•			
	Run As	*			
	Team	*			
	Compare with	,			
	Configure				
	coningure				
	Properties	Alt+Enter			

**Step 8** : Now name the class and make it the main function.

Java Class		0
🐴 The use of the	e default package is discouraged.	G
Source folder:	WebDriverDemo/src	Browse

Superclass	abstract final static	Browse
Interfaces:	Jordinargio oject	Add
		Remove
Which method	stubs would you like to create?	
	with the static void main(String[] args)	$\supset$
	Constructors from superclass	
Do you want to	Inherited abstract methods add comments? (Configure templates and defa Generate comments	ault value <u>here</u> )

Step 9 : The class outline is shown as below.



**Step 10** : Now it is time to code. The following script is easier to understand, as it has comments embedded in it to explain the steps clearly. Please take a look at the chapter "Locators" to understand how to capture object properties.

```
import java.util.concurrent.TimeUnit;
import org.openqa.selenium.*;
import org.openqa.selenium.firefox.FirefoxDriver;
public class webdriverdemo
Ł
   public static void main(String[] args)
   Ł
      WebDriver driver = new FirefoxDriver();
      //Puts an Implicit wait, Will wait for 10 seconds before throwing exception
      driver.manage().timeouts().implicitlyWait(10, TimeUnit.SECONDS);
      //Launch website
      driver.navigate().to("http://www.calculator.net/");
      //Maximize the browser
      driver.manage().window().maximize();
      // Click on Math Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[3]/a")).click();
```

```
// Click on Percent Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[4]/div[3]/a")).click();
      // Enter value 10 in the first number of the percent Calculator
      driver.findElement(By.id("cpar1")).sendKeys("10");
      // Enter value 50 in the second number of the percent Calculator
      driver.findElement(By.id("cpar2")).sendKeys("50");
      // Click Calculate Button
driver.findElement(By.xpath(".//*[@id='content']/table/tbody/tr/td[2]/input")).click();
      // Get the Result Text based on its xpath
      String result =
driver.findElement(By.xpath(".//*[@id='content']/p[2]/span/font/b")).getText();
      // Print a Log In message to the screen
      System.out.println(" The Result is " + result);
      //Close the Browser.
      driver.close();
   }
}
```

**Step 11** : The output of the above script would be printed in Console.

🔮 Problems 🕫 Javadoc ô Declaration 🖾 Console 23	
stementede-webdiwenderno (Leva Application) COProgram Files/Java/pet/this/yeaw.exe (29 Jul 2014 752:29 pm)	
the Emult is 5	

### **Most Used Commands**

The following table lists some of the most frequently used commands in WebDriver along with their syntax.

Command	Description
driver.get " URL "	To navigate to an application.
element.sendKeys " inputtext "	Enter some text into an input box.
element.clear	Clear the contents from the input box.
select.deselectAll	Deselect all OPTIONs from the first SELECT on the page.
<pre>select.selectByVisibleText " sometext "</pre>	Select the OPTION with the input specified by the user.
driver.switchTo.window " windowName "	Move the focus from one window to another.
driver.switchTo.frame " frameName "	Swing from frame to frame.
driver.switchTo.alert	Helps in handling alerts.
driver.navigate.to " URL "	Navigate to the URL.
driver.navigate.forward	To navigate forward.

driver.navigate.back	To navigate back.
driver.close	Closes the current browser associated with the driver.
driver.quit	Quits the driver and closes all the associated window of that driver.
driver.refresh	Refreshes the current page.

# **SELENIUM - LOCATORS**

### **Selenium - Locators**

Locating elements in Selenium WebDriver is performed with the help of findElement and findElements methods provided by WebDriver and WebElement class.

- findElement returns a WebElement object based on a specified search criteria or ends up throwing an exception if it does not find any element matching the search criteria.
- findElements returns a list of WebElements matching the search criteria. If no elements are found, it returns an empty list.

The following table lists all the Java syntax for locating elements in Selenium WebDriver.

Method	Syntax	Description
By ID	<pre>driver.findElementBy. id( &lt; elementID &gt; )</pre>	Locates an element using the ID attribute
By name	driver.findElement By. name( < elementname > )	Locates an element using the Name attribute
By class name	driver.findElement By. className( < elementclass > )	Locates an element using the Class attribute
By tag name	driver.findElement By. tagName( < htmltagname > )	Locates an element using the HTML tag
By link text	driver.findElement By. linkText( < linktext > )	Locates a link using link text
By partial link text	driver.findElement By. partialLinkText( < linktext > )	Locates a link using the link's partial text
By CSS	driver.findElement By. cssSelector( < cssselector > )	Locates an element using the CSS selector
By XPath	<pre>driver.findElementBy. xpath( &lt; xpath &gt; )</pre>	Locates an element using XPath query

### **Locators Usage**

Now let us understand the practical usage of each of the locator methods with the help of http://www.calculator.net

### By ID

Here an object is accessed with the help of IDs. In this case, it is the ID of the text box. Values are entered into the text box using the sendkeys method with the help of ID*cdensity*.

	Calculator	ner
	Financial Calculators	Home / Math Calculators / Mass Calculator Mass Calculator
	Weight Loss Calculators	This is a basic mass calculator based on density and volume. This calculato
	<ul> <li>Math Calculators.</li> </ul>	results of many common units.
	> Scientific Calculator	Modify the values and click the Calculate butt
	> Fraction Calculator	
	> Percent Calculator	Density 8900 kilogram/cubic meter •
	> Time Calculator	Volum 1 cubic meter •
	> Triangle Calculator	Calculate
	> Volume Calculator	
	Number Sequence Calculator	
	Pregnancy Calculators	
	Other Calculators	
	<ul> <li>Calculators for Your Site</li> </ul>	
	10	
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	<pre># fid align="sight"&gt;</pre>	e"tess" style="test-align:
	right; " value="2500" size	***6" mase="cdensity">
	<td></td>	

## By Name

Here an object is accessed with the help of names. In this case, it is the name of the text box. Values are entered into the text box using the sendkeys method with the help of ID*cdensity*.

<ul> <li>Financial Calculators</li> <li>Weight Loss Calculators</li> <li>Math Calculators</li> <li>Scenthic Calculator</li> <li>Scenthic Calculator</li> <li>Fraction Calculator</li> <li>Percent Calculator</li> <li>Trange Calculator</li> <li>Yolume Calculator</li> <li>Yolume Calculator</li> <li>Number Eleguence Calculator</li> <li>Colculators for Your Shis</li> </ul>	ing generates USO
# 🐨 K > 3⊞ Conside HTML+ CSS Script DOM Net Cookies FirePath	(PSee
Edit inputFcdensity 1 d + tr + tbody + table#standard.panel + form + dv#content + to + tr + tbody + table + body + time     change to the standard panel + to + tr + tbody + table + body + table + body + time	tyle • Computed



### **By Class Name**

Here an object is accessed with the help of Class Names. In this case, it is the Class name of the WebElement. The Value can be accessed with the help of the gettext method.



### By Tag Name

The DOM Tag Name of an element can be used to locate that particular element in the WebDriver. It is very easy to handle tables with the help of this method. Take a look at the following code.

```
WebElement table = driver.findElement(By.id("calctable"));
List<WebElement> row = table.findElements(By.tagName("tr"));
int rowcount = row.size();
```

### **By Link Text**

This method helps to locate a link element with matching visible text.

Reconstruction and a second second second		
Most Visited Getting Started	Suggested Sites 🔝 Web Slice Gallery 🔝 New Tab	
	Calculator.	net 💷 💿
	Financial Calculators	Hone / Math Calculators / Half Life Calculator Half Life Calculator
	Weight Loss Calculators	The following tools can generate any one of the values from the other three in the half-life formula
	Thath Colculators	a substance undergoing decay to decrease by half.
	3 Scientific Calculator	Half Life Calculator
	> Fraction Calculator	Please provide any three of the following to calculate the fourth value.
	> Percent Calculator	quantity remains initial quantity sime half-life
	2. Jime Calculator	N <sub>t</sub> N <sub>0</sub> t t <sub>10</sub>
	> Volume Calculator	
	> Number Sequence & soulator	Calculate 🕥
	Pregnancy Calculators	
	> Other Calculators	Half Life, Mean Lifetime, and Decay Constant Conversion
	A CALLER AND A COM	that any mean another and a court content of the



### By partial link text

This methods helps locate a link element with partial matching visible text.

	tor.html		7 C 🔡 - G
🗸 Most Visited 🛄 Getting Started 🛄 Sugg	ested Sites 🛄 Web Slice Gallery 🛄 New Tab		
	Calculator.	net	E Like (16
	<ul> <li>Financial Calculators</li> <li>Weight Loss Calculators</li> <li>Math Calculators</li> <li>Scientific Calculator</li> <li>Fraction Calculator</li> <li>Fraction Calculator</li> <li>Transper Calculator</li> <li>Number Calculator</li> <li>Number Sequence calculator</li> <li>Pregnancy Calculators</li> <li>Other Calculators</li> <li>Calculators for You Site</li> </ul>	Henre I Name Calculators I Half Life Calculate Half Life Calculator The following tools can generate any one of the values from the other three in a subtance undergoing decay to decrease by hait. Half Life Calculator Quantity remains initial quantity time that file N <sub>1</sub> N <sub>0</sub> to t <sub>1</sub> Colculate Half Life, Mean Lifetime, and Decay Constant C Please provide anyone of the following to get the other two: N <sub>1</sub> to t <sub>1</sub> Colculate Half Life, Mean Lifetime, and Decay Constant C	the haf-life formula 5
🕫 💱 🕻 🗲 X Console HTML	CSS Script DOM Net Cookies	FirePath	
the state of the s	diverselu < diversell < td < e < tbody -	table * body * ntml	* .nh = ( herkgrout

## By CSS

The CSS is used as a method to identify the webobject, however NOT all browsers support CSS identification.

WebElement loginButton = driver.findElement(By.cssSelector("input.login"));

### **By XPath**

XPath stands for XML path language. It is a query language for selecting nodes from an XML document. XPath is based on the tree representation of XML documents and provides the ability to navigate around the tree by selecting nodes using a variety of criteria.





# **SELENIUM - INTERACTIONS**

#### **User Interactions**

Selenium WebDriver is the most frequently used tool among all the tools available in the Selenium tool set. Therefore it is important to understand how to use Selenium to interact with web apps. In this module, let us understand how to interact with GUI objects using Selenium webDriver.

We need to interact with the application using some basic actions or even some advanced user action by developing user-defined functions for which there are no predefined commands.

Listed below are the different kinds of actions against those GUI objects:

- Text Box Interaction
- Radio Button Selection
- <u>Check Box Selection</u>
- Drop Down Item Selection
- Synchronization
- Drag & Drop
- <u>Keyboard Actions</u>
- Mouse Actions
- Multi Select
- Find All Links

## SELENIUM - TEST DESIGN TECHNIQUES

### **Selenium Test Design Techniques**

There are various components involved in designing the tests. Let us understand some of the important components involved in designing a framework as well. We will learn the following topics in this chapter:

- Page Object Model
- Parameterizing using Excel
- Log4j Logging
- Exception Handling
- <u>Multi Browser Testing</u>
- <u>Capture Screenshots</u>
- <u>Capture Videos</u>

## **SELENIUM - TESTNG**

#### What is TestNG?

TestNG is a powerful testing framework, an enhanced version of JUnit which was in use for a long time before TestNG came into existence. NG stands for 'Next Generation'.

TestNG framework provides the following features:

- Annotations help us organize the tests easily.
- Flexible test configuration.
- Test cases can be grouped more easily.
- Parallelization of tests can be achieved using TestNG.
- Support for data-driven testing.
- Inbuilt reporting

#### Installing TestNG for Eclipse

Step 1 : Launch Eclipse and select 'Install New Software'.

3	Welcome	
0	Help Contents	
27	Search	
	Dynamic Help	
	Key Assist	Ctrl+Shift+L
	Tips and Tricks	
	Cheat Sheets	
â	Check for Updates	
(	Install New Software	
۲	Installation Details	
mp	Eclipse Marketplace	
•	About Eclipse	



🗢 Instali		
Available Software Select a site or enter the location of a site.		
Work with: <sup>0</sup> http://acusticom/eclipse	Find more software by working with the	• Add
type filter text		
Name	Version	
Select All Deselect All		
Details		13
Show only the latest versions of available software	I Hide items that are already installed	
Group items by category	What is <u>already installed</u> ?	
Show only software applicable to target environment		
Contact all update sites during install to find required software		

Step 3 : The dialog box 'Add Repository' opens. Enter the name as 'TestNG' and click 'OK'

ocation: http://beust.com/eclipse	
cocuron nuply beastconi compse	Archive.
cocatoni mepi/ocustconi copic	Arch

**Step 4** : Click 'Select All' and 'TestNG' would be selected as shown in the figure.

D Install		0.0
Available Software Check the items that you wish to install.		(B)=
Work with: TestNG - http://beust.com/eclipse	Find more software by working	Add
type filter test		
F WIII TestNG	Version	

**Step 5** : Click 'Next' to continue.

🖉 Install			
Available Software			
Check the items that you wish to install.			() <b>_</b>
Work with: TestNG - http://beust.com/eclipse		S.	<u>A</u> dd
	Find more software by working with the	"Available Software	<u>e Sites</u> preference
type filter text			
Name	Version		
▷ [V] BUB TestNG			
Select All Deselect All 1 item selected			
Select All Deselect All 1 item selected			
Select All Deselect All 1 item selected Details			
Select All Deselect All 1 item selected Details 7 Show only the latest versions of available software			
Select All Deselect All 1 item selected Details  Show only the Jatest versions of available software Group items by category	Elide items that are already installed What is <u>already installed</u> ?		
Select All Deselect All 1 item selected Details  Show only the latest versions of available software Group items by category Show only software applicable to target environment	図Hide items that are already installed What is <u>already installed</u> ?		
Select All       1 item selected         Details       2         Show only the latest versions of available software       2         Group items by category       3         Show only software applicable to target environment       2         Contact all update sites during install to find required software	☑ Hide items that are already installed What is <u>already installed</u> ?		

**Step 6** : Review the items that are selected and click 'Next'.

Install Details		
Review the items to be	installed.	e
Name	Version	Id
TestNG	6.8.6.20141201_2240	org.testng.eclipse.feature.gro
Details		
~		



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License' shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.	License' shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.	
accept the terms of the license agreement	Laccept the terms of the license agreement	
Community Statement of Statemen	I do not accent the terms of the license agreement	
) I do not accept the terms of the license agreement	Jigo not accept the terms of the license agreement	

**Step 8** : TestNG starts installing and the progress would be shown follows.

Installing Software		

**Step 9** : Security Warning pops up as the validity of the software cannot be established. Click 'Ok'.



**Step 10** : The Installer prompts to restart Eclipse for the changes to take effect. Click 'Yes'.



### Annotations in TestNG

Annotations were formally added to the Java language in JDK 5 and TestNG made the choice to use annotations to annotate test classes. Following are some of the benefits of using annotations. More about TestNG can be found <u>here</u>

- TestNG identifies the methods it is interested in by looking up annotations. Hence, method names are not restricted to any pattern or format.
- We can pass additional parameters to annotations.
- Annotations are strongly typed, so the compiler will flag any mistakes right away.
- Test classes no longer need to extend anything *suchasTestCase*, *forJUnit*3.

Annotation	Description
@BeforeSuite	The annotated method will be run only once before all the tests in this suite have run.
@AfterSuite	The annotated method will be run only once after all the tests in this suite have run.
@BeforeClass	The annotated method will be run only once before the first test method in the current class is invoked.
@AfterClass	The annotated method will be run only once after all the test methods in the current class have run.
<pre>@BeforeTest</pre>	The annotated method will be run before any test method belonging to the classes inside the <test> tag is run.</test>
@AfterTest	The annotated method will be run after all the test methods belonging to the classes inside the <test> tag have run.</test>
@BeforeGroups	The list of groups that this configuration method will run before. This method is guaranteed to run shortly before the first test method that belongs to any of these groups is invoked.
@AfterGroups	The list of groups that this configuration method will run after. This method is guaranteed to run shortly after the last test method that belongs to any of these groups is invoked.
<pre>@BeforeMethod</pre>	The annotated method will be run before each test method.
@AfterMethod	The annotated method will be run after each test method.
@DataProvider	Marks a method as supplying data for a test method. The annotated method must return an Object[ ][ ] where each Object[ ] can be assigned the parameter list of the test method. The @Test method that wants to receive data from this DataProvider needs to use a dataProvider name equals to the name of this annotation.
@Factory	Marks a method as a factory that returns objects that will be used by TestNG as Test classes. The method must return Object[ ].
@Listeners	Defines listeners on a test class.
@Parameters	Describes how to pass parameters to a @Test method.
@Test	Marks a class or a method as part of the test.

### **TestNG-Eclipse Setup**

**Step 1** : Launch Eclipse and create a 'New Java Project' as shown below.



C	New	Alt+Shift+N *	當	Java Project	
	Open File		0	Project	<b>2</b> 4
	Close	Ctrl+W	#	Package	
	Close All	Cbi+Shift+W	G	Class	workbeiten
	Save	Ctrl+S	0	Interface	
	Save As		0	Enum	
	Seve All	Ctrl+Shift+S	C	Annotation	
	Revert		40	Source Folder	
	Move_		12	Java Working Set	Tutorials
1	Rename	F2	9	Folder	Go through tutorials
	Refresh	E5		File Hotblad Test Ella	
	Convert Line Delimiters To	5		Whit Test Case	
	Print_	Ctrl+P	19	Other Ctrl+N	What's New
	Switch Workspace	,	1		Find out what is new
	Restart				
	Import				
2	Export				
	Properties	Alt+Enter			

Step 2 : Enter the project name and click 'Next'.

New Java Project		
<b>reate a Java Project</b> Create a Java project in the workspace or i	n an external location.	P
Project name: TestNGDemo		
☑ Use default location		
Location: D:\PERSONAL DOCS\Seleniu	m Trials\TestNGDemo	Browse
JRE		
Use an execution environment JRE:	JavaSE-1.8	•
Use a project specific JRE:	jre8	*
O Use def <u>a</u> ult JRE (currently 'jre8')		Configure JREs
Project layout		
Use project folder as root for source	s and class files	
<u>©</u> reate separate folders for sources a	and class files	Configure default
Working sets		
Add project to working sets		
W <u>o</u> rking sets:		*] Select

**Step 3** : Navigate to "Libraries" Tab and Add the Selenium Remote Control Server JAR file by clicking on "Add External JAR's" as shown below.

The construction of the state of the second of the second s		Add JA	Rs
		Add Externa	al JARs
JAR Selection		X:	
) - 🕌 « Selenium Trials + JAR +	+ + Search	JAR	Q
Organize 👻 New folder		≅ • 🗊	0
Name	Date modified	Туре	Size
📕 🤰 selenium-java-2.42.2	27/07/2014 8:18 AM	File folder	
📔 📰 🔊 selenium-java-2.42.2.zin	27/07/2014 8:17 AM	WinRAR ZIP archive	24,
Selenium-server-standalone-2.42.2.ja	27/07/2014 7:42 AM	Executable Jar File	34,
8			
E			
8			
E	III		,
File name:	m ▼*jar;*.zi	p	•
File name:	m ▼ [*.jar;*.zi	p Cancel	•

**Step 4** : The added JAR file is shown here. Click 'Add Library'.

Settings ine the Java build settings.	P
Source 😂 Projects 🛋 Libraries 🍫 Order and Export	
Rs and class folders on the build path:	
🧧 selenium-server-standalone-2.42.2.jar - D:\PERSONAL DOCS\Selenium Trials\/A	Add JARs
JRE System Library [JavaSE-1.8]	Add External JARs
	Add <u>V</u> ariable
	Add Library
	Add Class Folder
	Add External Class Folder.
	Edit
	[ <u>R</u> emove
	Migrate JAR File

e	.111		*	

**Step 5** : The 'Add Library' dialog opens. Select 'TestNG' and click 'Next' in the 'Add Library' dialog box.

Source	🗁 Projects 🛋 Libraries 🌭 Order and Export	
Rs and clas	is folders on the build path:	
🛛 🐻 selen	ium-server-standalone-2.42.2.jar - D:\PERSONAL DOCS\Selenium Trials\JAR	Add JARs
JRE S	ystem Library [JavaSE-1.8]	Add External JARs
		Add <u>V</u> ariable
	C Add Library	dd Library
	Add Library	Add <u>C</u> lass Folder
	Select the library type to add.	Add External Class Folder
	JRE System Library	<u>E</u> dit
	Plug-in Dependencies	Remove
	User Library	Migrate JAR File
	< Back Next >	
ē [		

**Step 6** : The added 'TestNG' Library is added and it is displayed as shown below.



Native library location: (None)	AGG Valiable
승규는 야구 같은 것 같은	
b testing.jar - D:\PERSONAL DOCS\Eclipse\eclipse-standard-luna-R-win32-x80	5 Add Library
	Add <u>C</u> lass Folder
	Add External Class Folder.
	[
	ßemove
	Migrate JAR File
111	F

**Step 7** : Upon creating the project, the structure of the project would be as shown below.

4	E	TestNGDemo
	-	🕮 src
	⊳	➡ JRE System Library [JavaSE-1.8]
	Þ	🛋 Referenced Libraries
	Þ	🛋 TestNG

**Step 8** : Right-click on 'src' folder and select New >> Other.



e×a	Build Path Source Refactor Import	Alt+Shift+S		Folder File Untitled Text File JUnit Test Case	
	Export	C	9	Other	Ctrl+
B	Refresh	F5	-		
	Assign Working Sets				
	Debug As	×.			
	Run As	÷.			
	Team	¥.,			
	Compare With	•			
	Restore from Local History				
	TestNG	•			
	Properties	Alt+Enter			

**Step 9** : Select 'TestNG' and click 'Next'.

New		
Sele <mark>ct a w</mark> izard		
Wizards:		
type filter text		
🞯 Interface		
/ Java Projec	ct	
🖹 Java Projec	ct from Existing Ant Buildfile	
🃸 Plug-in Pr	oject	
👂 🗁 General		
CVS		
👂 🗁 Git		=
👂 🗁 Java		
👂 😂 Plug-in De	evelopment	
🔺 🗁 TestNG		
N TestNO	G class	
👂 🗁 User Assist	tance	-

**Step 10** : Select the 'Source Folder' name and click 'Ok'.

0		C Folder Selection	
New TestNG class The source folder of an existing project must be specified.		Select new file container	
Source folden	Browse	<ul> <li>Image: Construction of the selecter of the selec</li></ul>	

	> SIC > WebDriverDerno
Annotations	
Oberoremethod      Overtermethod      Overtermethod     Overtermethod	
OBeforeTest     OAfterTest	
@@BeforeSuite @AfterSuite	
The second second second	
XML suite file:	

**Step 11** : Select the 'Package name', the 'class name', and click 'Finish'.

Source folder:	/TestNGDemo/src			
<u>P</u> ackage name:	TestNG			
<u>C</u> lass name:	TestNGClass			
🔲 @BeforeSuit	e 🕅 @AfterSuite			
XML suite file:				

**Step 12** : The Package explorer and the created class would be displayed.

増 Package Explorer 🔀	- 8	🗊 *TestNGClass.java 🔀
<ul> <li>Selrcdemo</li> <li>TestNGDemo</li> <li>TestNGDemo</li> <li>TestNG src</li> <li>ARE System Library [</li> <li>Referenced Libraries</li> <li>TestNG</li> <li>WebDriverDemo</li> </ul>	IavaSE-1.8]	<pre>1 package TestNG; 2 3 import org.testng.annotations.Test; 4 5 public class TestNGClass 6 { 7 @ @Test 8 public void f() 9 { 10 11 } 12 } 13</pre>

### **First Test in TestNG**

@AfterTest

Now let us start scripting using TestNG. Let us script for the same example that we used for understanding the WebDriver. We will use the demo application, www.calculator.net, and perform percent calculator.

In the following test, you will notice that there is NO main method, as testNG will drive the program execution flow. After initializing the driver, it will execute the '@BeforeTest' method followed by '@Test' and then '@AfterTest'. Please note that there can be any number of '@Test' annotation in a class but '@BeforeTest' and '@AfterTest' can appear only once.

```
package TestNG;
import java.util.concurrent.TimeUnit;
import org.openqa.selenium.*;
import org.openqa.selenium.firefox.FirefoxDriver;
import org.testng.annotations.AfterTest;
import org.testng.annotations.BeforeTest;
import org.testng.annotations.Test;
public class TestNGClass
ł
   WebDriver driver = new FirefoxDriver();
   @BeforeTest
   public void launchapp()
   Ł
      // Puts an Implicit wait, Will wait for 10 seconds before throwing exception
      driver.manage().timeouts().implicitlyWait(10, TimeUnit.SECONDS);
      // Launch website
      driver.navigate().to("http://www.calculator.net");
      driver.manage().window().maximize();
   }
   @Test
   public void calculatepercent()
   Ł
      // Click on Math Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[3]/a")).click();
      // Click on Percent Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[4]/div[3]/a")).click();
      // Enter value 10 in the first number of the percent Calculator
      driver.findElement(By.id("cpar1")).sendKeys("10");
      // Enter value 50 in the second number of the percent Calculator
      driver.findElement(By.id("cpar2")).sendKeys("50");
      // Click Calculate Button
driver.findElement(By.xpath(".//*[@id='content']/table/tbody/tr/td[2]/input")).click();
      // Get the Result Text based on its xpath
      String result =
driver.findElement(By.xpath(".//*[@id='content']/p[2]/span/font/b")).getText();
      // Print a Log In message to the screen
      System.out.println(" The Result is " + result);
      if(result.equals("5"))
      {
         System.out.println(" The Result is Pass");
      }
      else
      {
         System.out.println(" The Result is Fail");
      }
```

```
public void terminatetest()
{
    driver.close();
}
}
```

### Execution

To execute, right click on the created XML and select "Run As" >> "TestNG Suite"

Package Explo	rer 8 mo tem l	ibrary (JavaSE-1.8)				
<ul> <li>D A TestNO</li> <li>D A Reference</li> <li>D E test-ou</li> </ul>	i nced l itput	Libraries				
iestng.		New	•	Ì.		
		Open Open With Show In A	F3 , lt+Shift+W •			
		Copy Copy Qualified Name Paste Delete	Ctrl+C Ctrl+V Delete			
		Build Path Refactor	، Alt+Shift+T ک	6	Javadoc 🔯 Declarati	on 👫 Results of runnin
		Import Export		> dis	play at this time.	
	00	Refresh Assign Working Sets	F5			
	-	Debug As	•			
	C	Run As		Ħ	1 TestNG Suite	Alt+Shift+X, G
		Team Compare With Replace With	•	-	Run Configurations	
		TestNG	٠			
tectors yml - TectNi		Properties	Alt+Enter			

### **Result Analysis**

The output is thrown to the console and it would appear as shown below. The console output also has an execution summary.



Deta	uit tes	st	
Test	s run:	1, Fa:	llures: 0, Skips: 0
******		I NAME OF BRIDE	
Default	SUITE		
ee.ee.e	JUALL		
Total te	sts rur	n: 1, I	Failures: 0, Skips: 0
Total te	sts rur	n: 1, I	Failures: 0, Skips: 0
Total te	sts rur	n: 1, I	Failures: 0, Skips: 0
Total te	sts rur Time t	n: 1,   taken	Failures: 0, Skips: 0 
Total te [TestNG] [TestNG]	Time t	taken l	Failures: 0, Skips: 0 
Total te [TestNG] [TestNG] [TestNG]	Time t Time t	taken l taken l	Failures: 0, Skips: 0 by org.testng.reporters.JUnitReportReporter@626b2d4a: 9 ms by org.testng.reporters.SuiteHTMLReporter@73a8dfcc: 66 ms by org.testng.reporters.EmailableReporter2@6f2b958e: 4 ms
Total te [TestNG] [TestNG] [TestNG] [TestNG]	Time t Time t Time t Time t	taken   taken   taken   taken	Failures: 0, Skips: 0 by org.testng.reporters.JUnitReportReporter@626b2d4a: 9 ms by org.testng.reporters.SuiteHTMLReporter@73a8dfcc: 66 ms by org.testng.reporters.EmailableReporter2@6f2b958e: 4 ms by [FailedReporter passed=0 failed=0 skipped=0]: 1 ms
Total te [TestNG] [TestNG] [TestNG] [TestNG] [TestNG]	Time t Time t Time t Time t Time t	taken   taken   taken   taken   taken	Failures: 0, Skips: 0 by org.testng.reporters.JUnitReportReporter@626b2d4a: 9 ms by org.testng.reporters.SuiteHTMLReporter@73a8dfcc: 66 ms by org.testng.reporters.EmailableReporter2@6f2b958e: 4 ms by [FailedReporter passed=0 failed=0 skipped=0]: 1 ms by org.testng.reporters.jq.Main@aec6354: 34 ms

The result of TestNG can also be seen in a different tab. Click on 'HTML Report View' button as shown below.

	Tests 5.5 Methods 1 (1638) enit	<u> </u>
ants		8 Paund 1 8 Failed 2 8 Support 9
N Al Terri (D Falio) Terri Sammary • (E) Oxfact subs (1050.0   0.302 c)	Failure Euroption	e.
By Default and Local Co     By TestMicTest     By calculateger(set \$5.302.6)		

The HTML result would be displayed as shown below.

	Test results	
All suites	C TestN0.TestN0Class	
Default suite	anangecon	
Info C:Constrat/appCont.cod/Texptome_edges_UTUTWERTHE terms_contensions - Define - Texpt - Texpt		
I setted, I pend     Pained setteds (babe)     Buddelinesetest		

### **Selenium Grid**

Selenium Grid is a tool that distributes the tests across multiple physical or virtual machines so that we can execute scripts in parallel *simultaneously*. It dramatically accelerates the testing process across browsers and across platforms by giving us quick and accurate feedback.

Selenium Grid allows us to execute multiple instances of WebDriver or Selenium Remote Control tests in parallel which uses the same code base, hence the code need NOT be present on the system they execute. The selenium-server-standalone package includes Hub, WebDriver, and Selenium RC to execute the scripts in grid.

Selenium Grid has a Hub and a Node.

- **Hub** The hub can also be understood as a server which acts as the central point where the tests would be triggered. A Selenium Grid has only one Hub and it is launched on a single machine once.
- **Node** Nodes are the Selenium instances that are attached to the Hub which execute the tests. There can be one or more nodes in a grid which can be of any OS and can contain any of the Selenium supported browsers.

### Architecture

The following diagram shows the architecture of Selenium Grid.



### Working with Grid

In order to work with the Grid, we need to follow certain protocols. Listen below are the major steps involved in this process:

- Configuring the Hub
- Configuring the Nodes
- Develop the Script and Prepare the XML File
- Test Execution
- Result Analysis

Let us discuss each of these steps in detail.

### **Configuring the Hub**

**Step 1** : Download the latest Selenium Server standalone JAR file from http://docs.seleniumhq.org/download/. Download it by clicking on the version as shown below.

Seleniun	💥 SeleniumHQ		search s	search selenium:		Go
Browser Automatic	on	Projects	Download	Documentation	Support	About
Colonium Downloade	Downloads					
Selenium Downloads	Below is where	you can find the latest release	s of all the S	elenium components	s. You can a	lso find a
Latest Releases	list of previous	releases, source code, and ad	ditional inform	sation for <u>Maven use</u>	ers (Maven i	s a popula
Previous Releases	Java build tool	2-				
Source Code	Selenium IDE	B				
Maven Information	Selenium IDE is this to either o	s a Firefox plugin which records reate simple scripts or assist in	and plays ba exploratory	ck user interactions testing. It can also	with the br export Remo	owser. Use te Control
onate to Selenium	sort of Page O	bject-y structure for any kind o	of resiliency.	iroe and should be r	Meruanien i	nto some
with PayPal	Download late: install some ph	st released version 2.5.0 release ugins.	ad on 01/Jan/	2014 or view the Re	lease Notes	and then
	the second s					



**Step 2** : Start the Hub by launching the Selenium Server using the following command. Now we will use the port '4444' to start the hub.

Note : Ensure that there are no other applications that are running on port# 4444.

C122 C1Window(wytern C2) and every C122 Java _jar **D12PERSONAL Mug 60; 2024 r.20100 MI 032 1NF01 Lawebing a selenium 2014-08-02 07222:06; 1975 1NI 2014-08-02 07222:06; 2075 1NI 2014-08-02 07222:06; 2075 1NI 2014-08-02 0722:06; 2075 1NI 2014-08-02 0722:06; 2075 1NI 2014-08-02 0722:06; 2075 1NI 2014 001 02; 2014 7121:00 MI or WI 041 02: Max instance not	a jer "D.VERSONAL DOCNSelenum Inch UARselenum-server standalone 2.42.2 pr - port 4444 -role hub -nodeTimeout 1000	
Aug 82, 2814 7:22147 AH org UNBATHS' Max instance not Aug 82, 2814 7:27188 AM org UNBATHNC: Max instance not	.openga.grid.internal.BasaRemoteProxy (init) pecifiad. Heing default = 1 instance .openga.grid.internal.BaseRemoteProxy (init) pecified. Being default = 1 instance	

**Step 3** : Now open the browser and navigate to the URL http//localhost:4444 from the Hub The system where you have executed Step#2.



**Step 4** : Now click on the 'console' link and click 'view config'. The config of the hub would be displayed as follows. As of now, we haven't got any nodes, hence we will not be able to see the details.

🐷 Grid Console	× 🖸
- ⇒ C fí	localhost/4444/grid/console?config=true&configDebug=true
-	
Se	Grid Console v.2.42.2
Config f	or the hub :
host : n	ull 144
cleanUp(	Cycle : 5000
timeout	1 300000 Timaout - D
newSess	sionWaitTimeout : -1
grid1Map	pping : {}
capabilit	yMatcher : org.openga.gnd.internal.utils.DefaultCapabilityMatcher
prioritize	r : null
serviets	
all paran	<u>16 1</u>

browserTimeout : 0 capabilityMatcher : org.openqa.grid.internal.utils.DefaultCapabilityMatcher cleanUpCycle : 5000 host : null jettyMaxThreads : -1 maxSession : 5 newSessionWaitTimeout : -1 nodePolling : 5000 nodeTimeout : 1000 port : 4444 prioritzer : null role : hub serviets : [] throwOnCapabilityNotPresent : true timeout : 300000

### **Configuring the Nodes**

**Step 1** : Logon to the node *whereyouwouldliketoexecutethescripts* and place the 'selenium-server-standalone-2.42.2' in a folder. We need to point to the selenium-server-standalone JAR while launching the nodes.

**Step 2** : Launch FireFox Node using the following below command.



**Step 3** : After executing the command, come back to the Hub. Navigate to the URL - http://10.30.217.157:4444 and the Hub would now display the node attached to it.

Se Grid	Console v.2.42.2	2	
DefaultRemotePro id : http://10.1	oxy (version : 2.42.2) 112.66.52:5555, OS : VIST	A	
Browsers Co	onfiguration	1	
WebDriver v:		C	Connected in Port 5555
Config for the hub	ŧ.		
port: 4444 cleanlinCycle: 5000	1		

**Step 4** : Now let us launch the Internet Explorer Node. For launching the IE Node, we need to have the Internet Explorer driver downloaded on the node machine.

#### **Step 5** : To download the Internet Explorer driver, navigate to

http://docs.seleniumhq.org/download/ and download the appropriate file based on the architecture of your OS. After you have downloaded, unzip the exe file and place in it a folder which has to be referred while launching IE nodes.



#### **Step 6** : Launch IE using the following command.

```
C:\>java -Dwebdriver.ie.driver=D:\IEDriverServer.exe -jar
D:\JAR\selenium-server-standalone-2.42.2.jar -role webdriver -hub
http://10.30.217.157:4444/grid/register -browser browserName=ie,platform=WINDOWS -port
5558
Where,
D:\IEDriverServer.exe = The location of the downloaded the IE Driver(on the Node
Machine)
D:\JAR\selenium-server-standalone-2.42.2.jar = Location of the Selenium Server Standalone
Jar File(on the Node Machine)
http://10.30.217.157:4444 = IP Address of the Hub and 4444 is the port of the Hub
browserName = ie (Parameter to specify the Browser name on Nodes)
5558 = Port on which IE Node would be up and running.
```





**Step 7** : After executing the command, come back to the Hub. Navigate to the URL - http://10.30.217.157:4444 and the Hub would now display the IE node attached to it.

**		
Grid Console v.2.42.2	and the second	-
Defaultilanoistivary (version 1 2.42.2) at : http://10.112.64.52-5555.06 / VETA	Defaulthemoloficary (version : 2.42.2) ed : http://10.112.66.52.5558.05 : whethere	
The second se	E Node is	

**Step 8** : Let us now launch Chrome Node. For launching the Chrome Node, we need to have the Chrome driver downloaded on the node machine.

**Step 9** : To download the Chrome Driver, navigate to http://docs.seleniumhq.org/download/ and then navigate to Third Party Browser Drivers area and click on the version number '2.10' as shown below.

Third Party Drivers, E	Bindings, and	Plugins			
Selenium can be extend maintained by third part consult the docs.	led through the ties. For more in	use of plugin formation on	s. Here are how to cre	a number of plugin ate your own plugir	s created and n or have it listed,
Please note that these project. In addition, be Apache License v.2.0. S icense; others are only icense of distribution n	plugins are not advised that th Some of the plug available under eed to be raised	supported, m e plugins liste gins are avail a proprietary I with their re	aintained, h ed below an able under a / license. Ar spective de	nosted, or endorsed e not necessarily lic another free and op ny questions about eveloper(s).	I by the Selenium censed under the en source software plugins and their
Third Party Browser Driv Browser	ers NOT DEVELO	PED by seleni	umhq		
Chrome	2.10	<u>change</u> log	<u>issue</u> <u>tracker</u>	<u>selenium wiki</u> page	Released 2014- 05-01
Opera	1.5	change log	<u>issue</u> tracker	selenium wiki page	Released 2013- 08-13
GhostDriver	(Phantom)	JS)	<u>issue</u> <u>tracker</u>	SeConf talk	
Windows Phone	4.14.028.	10	<u>issue</u> <u>tracker</u>		Released 2013- 11-23
<u>Selendroid</u> - Selenium f Android	for		issue tracker		
ios-driver			<u>issue</u> <u>tracker</u>		
BlackBerry 10			<u>issue</u> tracker	Released 2014- 01-28	
Appium			<u>issue</u> <u>tracker</u>		
Crosswalk			issue	Released 2014-	

**Step 10** : Download the driver based on the type of your OS. We will execute it on Windows environment, hence we will download the Windows Chrome Driver. After you have downloaded, unzip the exe file and place it in a folder which has to be referred while launching chrome nodes.

# Index of /2.10/

	Name	Last modified	Size	ETag
2	Parent Directory			
10 01 10	chromedriver_linux32.zip	2014-05-01 20:46:22	2.33MB	4fecc99b066cb1a346035bf022607104
10 01 10	chromedriver_linux64.zip	2014-05-01 22:40:58	2.20MB	058cd8b7b4b9688507701b5e648fd821
10-1	chromadriver mar 32 zin	2014.05.01 22-36-30	3 Q3MR	fd0dafc3ada3619adda7961f2haadc5c
104	abromadaine min22 sin	2014 05 01 22-50-29	0.71MD	002-01-5-20004-7070710-5-0009-3-10-5000



**Step 11** : Launch Chrome using the following command.



**Step 12** : After executing the command, come back to the Hub. Navigate to the URL - http://10.30.217.157:4444 and the Hub would now display the chrome node attached to it.

Default/sensibleary (version ( 2.42.2) el http://10.112.06.52.5556, OS   wtwbow	19	Defailtfeeotofrony (venion : 2.42.3) ki : http://16.132.66.82.5358, OS : V95TA	= =
Browsers Configuration		Browners Configuration	
WetChiver Vig		WebCriver	
DefaulthemolePresy (version ( 2.42.3)			
M   http://16.112.46.52.5557, 05   WINDOW			

### **Develop the Script and Prepare the XML File**

**Step 1** : We will develop a test using TestNG. In the following example, we will launch each one of those browsers using remote webDriver. It can pass on their capabilities to the driver so that the driver has all information to execute on Nodes.

The Browser Parameter would be passed from the "XML" file.

```
package TestNG;
import org.openqa.selenium.remote.DesiredCapabilities;
import java.util.concurrent.TimeUnit;
import org.openqa.selenium.*;
import org.testng.annotations.AfterTest;
import org.testng.annotations.BeforeTest;
import org.testng.annotations.Parameters;
import org.testng.annotations.Test;
```

```
import java.net.URL;
import java.net.MalformedURLException;
import org.openqa.selenium.remote.RemoteWebDriver;
public class TestNGClass
{
   public WebDriver driver;
   public String URL, Node;
   protected ThreadLocal<RemoteWebDriver> threadDriver = null;
   @Parameters("browser")
   @BeforeTest
   public void launchapp(String browser) throws MalformedURLException
   Ł
      String URL = "http://www.calculator.net";
      if (browser.equalsIgnoreCase("firefox"))
      Ł
         System.out.println(" Executing on FireFox");
         String Node = "http://10.112.66.52:5555/wd/hub";
         DesiredCapabilities cap = DesiredCapabilities.firefox();
         cap.setBrowserName("firefox");
         driver = new RemoteWebDriver(new URL(Node), cap);
         // Puts an Implicit wait, Will wait for 10 seconds before throwing exception
         driver.manage().timeouts().implicitlyWait(10, TimeUnit.SECONDS);
         // Launch website
         driver.navigate().to(URL);
         driver.manage().window().maximize();
      else if (browser.equalsIgnoreCase("chrome"))
      Ł
         System.out.println(" Executing on CHROME");
         DesiredCapabilities cap = DesiredCapabilities.chrome();
         cap.setBrowserName("chrome");
         String Node = "http://10.112.66.52:5557/wd/hub";
         driver = new RemoteWebDriver(new URL(Node), cap);
         driver.manage().timeouts().implicitlyWait(10, TimeUnit.SECONDS);
         // Launch website
         driver.navigate().to(URL);
         driver.manage().window().maximize();
      }
      else if (browser.equalsIgnoreCase("ie"))
      {
         System.out.println(" Executing on IE");
         DesiredCapabilities cap = DesiredCapabilities.chrome();
         cap.setBrowserName("ie");
         String Node = "http://10.112.66.52:5558/wd/hub";
         driver = new RemoteWebDriver(new URL(Node), cap);
         driver.manage().timeouts().implicitlyWait(10, TimeUnit.SECONDS);
         // Launch website
         driver.navigate().to(URL);
         driver.manage().window().maximize();
      }
      else
      ł
         throw new IllegalArgumentException("The Browser Type is Undefined");
      }
   @Test
   public void calculatepercent()
   Ł
      // Click on Math Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[3]/a")).click();
      // Click on Percent Calculators
      driver.findElement(By.xpath(".//*[@id='menu']/div[4]/div[3]/a")).click();
      // Enter value 10 in the first number of the percent Calculator
```

```
driver.findElement(By.id("cpar1")).sendKeys("10");
     // Enter value 50 in the second number of the percent Calculator
     driver.findElement(By.id("cpar2")).sendKeys("50");
     // Click Calculate Button
String result =
driver.findElement(By.xpath(".//*[@id='content']/p[2]/span/font/b")).getText();
     // Print a Log In message to the screen
     System.out.println(" The Result is " + result);
     if(result.equals("5"))
     {
        System.out.println(" The Result is Pass");
     }
     else
     {
        System.out.println(" The Result is Fail");
     }
  @AfterTest
  public void closeBrowser()
  ł
     driver.quit();
  }
}
```

Step 2 : The Browser parameter will be passed using XML. Create an XML under the project folder.

New	Alt+Shift+N	19	Java Project	
Open File	Part Shirt 11	B	Project	
Close	Ctrl+W	-	Package	
Close All	Ctrl+Shift+W	0	Class	
Save	Ctrl+S	G	Interface	
Save As		G	Enum	
Save All	Ctrl+Shift+S	ø	Annotation	
Revert		63	Source Folder	
		13	Java Working Set	
Move		C	Folder	
Rename	F2	Ľ	File	
Refresh	F5		Untitled Text File	
Convert Line Delimiters To		E?	JUnit Test Case	
Print	Ctrl+P	-	Other	Ctrl+N
Switch Workspace				
Restart				
Import				
Export				
Properties	Alt+Enter			
1 testng.xml [TestNGDemo]				
2 TestNGClass.java [TestNGDemo/src/]				
3 index.html [TestNGDemo/test-output]				

Step 3 : Select 'File' from 'General' and click 'Next'.

elect a wizard		
Create a new file resour	ce	
Wizards:		
type filter text		
<ul> <li>Class</li> <li>Interface</li> <li>Java Project</li> <li>Java Project from</li> <li>Plug-in Project</li> <li>General</li> <li>General</li> <li>File</li> <li>Project</li> <li>Project</li> <li>Untitled Text</li> <li>CVS</li> </ul>	m Existing Ant Buildfile t File	

**Step 4** : Enter the name of the file and click 'Finish'.




**Step 5** : TestNg.XML is created under the project folder as shown below.



**Step 6** : The contents of the XML file are shown below. We create 3 tests and put them in a suite and mention parallel="tests" so that all the tests would be executed in parallel.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">
<suite name="Suite" parallel="tests">
   <test name="FirefoxTest">
      <parameter name="browser" value="firefox" />
      <classes>
             <class name="TestNG.TestNGClass" />
      </classes>
   </test>
   <test name="ChromeTest">
      <parameter name="browser" value="chrome" />
      <classes>
             <class name="TestNG.TestNGClass" />
      </classes>
   </test>
   <test name="IETest">
      <parameter name="browser" value="ie" />
      <classes>
             <class name="TestNG.TestNGClass" />
      </classes>
   </test>
</suite>
```

### **Test Execution**

**Step 1** : Select the created XML; right-click and choose 'Run As' >> 'TestNG Suite'.

Java - TestNGDemo/testng.xml - Eclipse File Edit Source Refactor Navigate Search Pro	ject <u>Bun W</u> indow <u>H</u> elp
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😫 Package Explorer 🙁 📄 😫 😇 🗖 🗖	testing.aml 23
<ul> <li>selrcdemo</li> <li>TestNGDemo</li> <li># src</li> <li># JRE System Library [JavaSE-1.8]</li> <li># TestNG</li> <li># Referenced Libraries</li> <li>test-output</li> <li>testng.xml</li> </ul>	<pre>1<?xml version="1.0" encoding="UTF-8"?> 2<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">     3<suite name="Suite" parallel="tests"> 4</suite></pre>
WebDrive New	<ul> <li>A second s</li></ul>

	Open	F3	name	"ChromeTest">	ar" unluas"chroma"	15
	Open With	•	asse	s>	er varne- curone	
	Show In	Alt+Shift+W 🕨	lace	<class <="" name="Te:&lt;/th&gt;&lt;th&gt;stNG.TestNGClass" th=""><th>5</th></class>	5	
Th.	Сору	Ctrl+C	>	cor.		
ED	Copy Qualified Name					
m	Paste	Ctrl+V	name	="IETest">		
×	Delete	Delete	asse	ter name= browse s>	er value= ie />	
1.100	Rould Dath		1	<class <="" name="Te:&lt;/th&gt;&lt;th&gt;stNG.TestNGClass" th=""><th>/&gt;</th></class>	/>	
	Refactor	Alt+Shift+T >	2055	ess		
	-		-			
2.00	import					
2-2	Export					
3	Refresh	F5				
	Assign Working Sets					
-	Debug As	,				
C	Run As	•	f	1 TestNG Suite	Alt+Shift+X, G	$\mathbf{D}$
	Team	,		Run Configurations		
	Compare With	•	-			_
	Replace With	,				
	TestNG	•				

**Step 2** : Now open the Node, where we have launched all the browser nodes. You will see all the three browsers in execution simultaneously.

E Calabarat For Detail (a)		r d B-ten	2004 #	010 (C)	Testa	Executing on IE	includes and these belows .	0000
Calculator.	Tests Executing on	e Calculators	-	Calcul	ator.n	et Free Or	line Calculators	
Presected Catalogue     Proprietal Lase Catalogue     Wate Catalogue     Programmy Catalogue     Programmy Catalogue     Other Catalogue     Catalogue     Programmy Catalogue     Programmy     Catalogue	FireFox	No         No         No         No           No         No         No         No         No	A     A	Promited Catalog     Weight Long Catalog     Weight Long Catalog     Must Catalog     Programmy Catalog     Order Catalogue     Catalogue	ana salaton mer ble Deseth	Wei         Yee         Yee           Wei         Yee         Yee         Yee           Yee         Yee         Yee         Yee <th>An Angel     Angel</th> <th>Construction of the second sec</th>	An Angel     Angel	Construction of the second sec
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### **Result Analysis**

**Step 1** : Upon completing the execution, we can analyze the result like any other execution. The result summary is printed in the console as shown in the following snapshot.

👫 Problems 🛛 @ Javadoc 🔟 Declaration 👫 Results of running suite	🔄 Console 🔀	
<terminated> testng.xml [TestNG] C:\Program Files\Java\jre8\bin\javaw.e</terminated>	exe (2 Aug 2014 8:2	5:04 am)
[TestNG] Running:		
D:\PERSONAL DOCS\Selenium Trials\TestNGDemo\testng.xm	1	
Executing on FireFox		
Executing on IE		
Executing on CHROME		
The Result is 5		
The Result is Pass		
The Recult is 5		

```
The Result is Pass
The Result is 5
The Result is Pass
Suite
Total tests run: 3, Failures: 0, Skips: 0
```

**Step 2** : Navigate to the 'Results of Running Suite' Tab and TestNG would display the result summary as shown below.



Step 3 : Upon generating the HTML, we will be able to see the test results in HTML format.

