**SELENIUM**

**Selenium Introduction:**

**What is selenium?**

* Selenium is an open-source tool/framework/set of API’S/project for a range of libraries used to automate web application on different browser & platform.
* Selenium provides remote control of browser instances which emulate user’s interaction with the browser.
* It supports many languages to write automation script
* It supports many IDE (Integrated Development Environment) like eclipse, Visual studio, PyCharm etc. to write automation scripts using different languages.
* It supports only web-application automation.
* Selenium is a well-known antidote for mercury poison.

It contains following tool’s:

1. Selenium IDE (Integrated Development Environment)
2. Selenium RC (Remote Control)
3. Selenium WD (WebDriver)
4. Selenium Grid

Diagram

Description automatically generated

Selenium IDE:

* It is a Firefox extension that can automate web applications by Record & Playback feature.
* In 2006, Selenium IDE is merged with selenium project.

|  |  |
| --- | --- |
| Advantages | Dis-Advantages |
| Very easy to install | Available only for Firefox |
| No programming knowledge is required | No support for customized test operations |
| Built in test reports | Slow in execution compared with RC & WD |
| Open source | We can run the recorded scripts only in Firefox browser |

**Selenium RC :**

* It is a server written in java.
* It is the first automated web-testing tool that support all programming languages.
* Selenium RC merged with web driver in 2008 and formed selenium-2. After new updates & improvements introduced selenium-3.

|  |  |
| --- | --- |
| Advantages | Dis-Advantages |
| Faster than selenium IDE | Slower than selenium WD |
| Support for customized test operations | Need selenium RC server to execute test cases |
| Support parallel testing | Complicated in installation |
| Open source | Must have any programming skills |
| Support Data Driven framework | Internally RC used JavaScript to automate web-applications |
| Selenium RC has in-built HTML report generation features for test results | No support for Headless HTMLUnit browsers (Invisible browser) |

Diagram

Description automatically generated

**Selenium WD :**

* Founded by Simon Stewart in 2006.
* Selenium WebDriver was the first cross-platform testing framework that could control the browser from OS level.

|  |  |
| --- | --- |
| Advantages | Dis-Advantages |
| Faster than selenium RC & IDE | Installation is Complicated then selenium IDE |
| Support for customized test operations | Must have any programming skills |
| support parallel testing | It does not rely on JavaScript for automate web-applications |
| Open source | Does not provide test results directly without third party tools. |
| Interact directly with browser through Driver |  |
| Not required any server to execute testcases |  |
| Customized test results |  |
| Support for Headless HTMLUnit browsers (Invisible browser) |  |

Diagram

Description automatically generated

**Selenium Grid :**

* It is a tool used to run Testcases parallel on different machines, different browsers, and multiple versions of browsers at the same time.
* It has HUB and NODES features.
* Hub is a central source. it provides selenium commands to Nodes.
* Nodes perform actions that are initiated by Hub.

Diagram

Description automatically generated

**WebDriver interface:**it is an interface provided by selenium. It consists constant and abstract methods. These abstract methods are implemented in RemoteWebDriver class and all respective browser driver class like, ChromeDriver , FirefoxDriver, InternetExplorerDriver, AndroidDriver etc. are extended this RemoteWebDriver class.

Example :

WebDriver driver = new ChromeDriver();

WebDriver driver = new FirefoxDriver();

WebDriver driver = new InternetExplorerDriver();

WebDriver driver = new OperaDriver();

**Launching Browsers :**

**Chrome Browser :**

**Note :** check the chrome browser version first and download chrome driver which is compatibility with that version.

**Syntax:**

System.setProperty("webdriver.chrome.driver","chromedriver path");

WebDriver chrome = new ChromeDriver();

* We need to specify driver and its path in set property method so that system can identify driver at the given path.
* Second line will launch the Chrome browser.

**Firefox Browser :**

**Note1** : check the firefox browser version first and download gecko driver which is compatibility with that version.

**Note2:** It's compatible with most browsers

**Syntax:**

System.setProperty("webdriver.gecko.driver","geckodriver path");

WebDriver firefox = new FirefoxDriver();

**IE Browser :**

**Note1 :**

* First, we must check the Protection Mode of our IE browser.
* **Launch Internet Explorer → move to Tools Menu → Internet Options → Security tab.**
* **Check** the option Select **Enable Protected Mode**. Also, we must choose the Internet as the zone. We can make the level as Medium-high. The other Protection zones like **Local Intranet** and **Trusted sites** (apart from **Restricted sites**) should also have the **same configuration**. Once all the configurations are done, we have to Apply and then click OK.
* Zoom level should be 100%.
* check the ie browser version first and download ie driver which is compatibility with that version.

**Note2:** Among all browsers, Internet Explorer is slower than the other drivers.

**Syntax:**

System.setProperty("webdriver.ie.driver","iedriver path");

WebDriver ie = new InternetExplorerDriver();

**Edge Browser :**

**Note1** : check the edge browser version first and download edge driver which is compatibility with that version.

**Syntax:**

System.setProperty("webdriver.edge.driver","edgedriver path");

WebDriver firefox = new EdgeDriver();

**Opera Browser :**

**Note1** : check the opera browser version first and download opera driver which is compatibility with that version.

**Syntax:**

System.setProperty("webdriver.opera.driver","operadriver path");

WebDriver firefox = new OperaDriver();

**Headless Browser (Non-UI mode) in selenium:**

**Headless browser:**

* A headless browser is same as a real browser except it do not have a GUI.
* All modern browsers provide the capabilities to run them in a headless mode
* when Selenium tests run in headless browsers, they execute in the background.
* Selenium supports headless browser testing using HtmlUnitDriver.
* HtmlUnitDriver is based on java framework HTMLUnit and is the one of the lightweight and fastest among all headless browsers.
* In older versions of Selenium, we used the HTMLUnitDriver mainly, a headless driver providing a non-GUI implementation of Selenium WebDriver.
* But with the latest versions of Selenium WebDriver 3 and Selenium WebDriver 4, Selenium also supports headless versions of real browsers like Chrome, Firefox, and Edge.

**Running Selenium test cases using HTMLUnitDriver :**

* Fastest execution of WebDriver compared to other browsers.
* HtmlUnitDriver is platform independent.
* HtmlUnitDriver supports JavaScript.
* Also, HtmlUnitDriver allows you to choose other browser versions to run your scripts. You can mention different browser versions of Chrome or Firefox in the HtmlUnitDriver itself.
* One of the significant benefits of using headless browsers is performance. Since headless browsers don't have a GUI, they are faster than real browsers.

**Note :** Required **Selenium standalone server 3.5.3** jar file.

**Syntax:**

HtmlUnitDriver driver = new HtmlUnitDriver();

**Running tests on different browser versions using HtmlUnitDriver :**

* **Chrome syntax:**

HtmlUnitDriver chrome = new HtmlUnitDriver(BrowserVersion.***CHROME***);

* **Firefox syntax:**

HtmlUnitDriver firefox = **new** HtmlUnitDriver(BrowserVersion.***FIREFOX***);

* **IE syntax:**

HtmlUnitDriver ie = **new** HtmlUnitDriver(BrowserVersion.***INTERNET\_EXPLORER***);

* **Edge syntax:**

HtmlUnitDriver edge = **new**  HtmlUnitDriver(BrowserVersion.***EDGE***);

**PhantomJS PhantomJS** :

PhantomJS PhantomJS is a headless browser with JavaScript API. It has integrated with GhostDriver and there is no need to separately install it.

**Note** : By PhantomJs provides log file

**Syntax:**

System.setProperty("phantomjs.binary.path"," phantomjs path");

WebDriver firefox = new FirefoxDriver();

**Headless Real Browsers in selenium:**

**Running Selenium headless browser tests using the headless Real Chrome browser.**

**NOTE** : Google Chrome is available with headless execution since version 59.

* Selenium WebDriver provides a class called "**ChromeOptions**"
* ChromeOptions can specify certain configurations to change the default behavior of Chrome.
* One of those configurations is the "**headless**" mode, which launches the Chrome in headless mode.

**Syntax:**

ChromeOptions options = **new** ChromeOptions();

options.addArgument("--headless"); **or** options.setHeadless(**true**);

WebDriver driver = **new** ChromeDriver(options);

**Running Selenium headless browser tests using the headless Real Firefox browser.**

* Selenium WebDriver provides a class called " **FirefoxOptions**"
* FirefoxOptions can specify certain configurations to change the default behavior of Firefox.

**Syntax**:

FirefoxOptions options = new FirefoxOptions();

options.addArgument("--headless"); **or** options.setHeadless(**true**);

WebDriver driver = **new** FirefoxDriver(options);

**Note :** IE does not have support for a headless mode

**WebDriverManager in selenium:**

WebDriverManager allows to automate the path declaration required in Selenium WebDriver.

Using WebDriverManager its not required to write system setproperty in script always.

**Note :** Required WebDriverManager 3.2.0 jar file.

**Syntax:**

* **Chrome syntax:**

WebDriverManager.chromedriver().setup();

WebDriver chrome = new ChromeDriver();

* **Firefox syntax:**

WebDriverManager.firefoxdriver().setup();

WebDriver ff = new FirefoxDriver();

* **IE syntax:**

WebDriverManager.iedriver().setup();

WebDriver ie = new InternetExplorerDriver();

* **Edge syntax:**

WebDriverManager.edgedriver().setup();

WebDriver edge = new EdgeDriver();

* **Opera syntax:**

WebDriverManager.operadriver().setup();

WebDriver edge = new OperaDriver();

**Selenium RemoteWebDriver Methods :**

1. **get**()

This method used to navigate the url passed as parameter. It waits until page load completely.

**Syntax:**

WebDriver driver = new ChromeDriver();

driver.get(“http://google.co.in”);

1. **getTitle**()

This method is used to get the title of the current tab or webpage.

**Syntax:**

WebDriver driver = new ChromeDriver();

String title = driver.getTitle();

System.out.println(title);

1. **getCurrentUrl**()

This method is used to get the URL of the current tab or webpage.

**Syntax:**

WebDriver driver = new ChromeDriver();

String url = driver.getCurrentUrl();

System.out.println(url);

1. **getPageSource**()

This method is used to get the page source code of the current tab or webpage.

**Syntax:**

WebDriver driver = new ChromeDriver();

String pagesource = driver.getPageSource();

System.out.println(pagesource);

1. **close()**:

This method is used to close the current tab or current window.

**Syntax:**

WebDriver driver = new ChromeDriver();

driver.close();

1. **quit()**:

This method is used to close the current tab or current window.

**Syntax:**

WebDriver driver = new ChromeDriver();

driver.quit();

1. **getSessionID**():

This method used to get session-id of webpage.

Syntax:

WebDriver driver = new ChromeDriver();

String sessionid = ((RemoteWebDriver)driver).getSessionID();

System.out.println(sessionid);

1. **getCapabilities**():

The capabilities property is a dictionary containing information about the configuration**.**

1. **getBrowserName():**

This method used to get name of the browser.

Syntax:

ChromeDriver driver = new ChromeDriver();

String browsername = driver.getCapabilities().getBrowserName();

System.out.println(browsername);

**Or**

WebDriver driver = new ChromeDriver();

String browsername = ((RemoteWebDriver)driver).getCapabilities().getBrowserName();

System.out.println(browsername);

1. **getPlatform**()

This method used to get the name of the platform.

**Syntax:**

WebDriver driver = new ChromeDriver();

String platformname = ((RemoteWebDriver)driver).getCapabilities().getPlatform();

System.out.println(platformname);

1. **getVersion**()

This method used to get the version of the browser.

**Syntax:**

WebDriver driver = new ChromeDriver();

String version = ((RemoteWebDriver)driver).getCapabilities().getVersion);

System.out.println(version);

1. **getCapability**()

This method used to get the capability value based on capability name passed parameter.

**Syntax:**

WebDriver driver = new ChromeDriver();

String version = ((RemoteWebDriver)driver).getCapabilities().getCapability(“browserVersion”);

System.out.println(version);

1. **getCapabilityNames**()

This method used to get all capabilities names.

**Syntax:**

WebDriver driver = new ChromeDriver();

Set<String> caps = ((RemoteWebDriver)driver).getCapabilities().getCapabilityNames();

for(String cap: caps)

{

System.out.println(cap);

}

**Selenium RemoteNavigation class methods:**

1. **back()**

This method used to go back page from the current page.

**Syntax**:

WebDriver driver = new ChromeDriver();

driver.navigate().back();

1. **forward()**

This method used to go forward page from the current page.

**Syntax**:

WebDriver driver = new ChromeDriver();

driver.navigate().forward();

1. **refresh()**

This method used to refresh the current page.

**Syntax**:

WebDriver driver = new ChromeDriver();

Driver.navigate().refresh();

1. **to()**

This method used to navigate the url or string passed as parameter.

**Syntax**:

WebDriver driver = new ChromeDriver();

driver.navigate().to(“https://www.google.co.in/”);

OR

URL google = new URL(“https://www.google.co.in/”)

WebDriver driver = new ChromeDriver();

driver.navigate().to(google);

**Selenium RemoteWindow class methods:**

1. **maximize()**

This method used to maximize the browser window.

Syntax:

driver.manage().window().maximize();

1. **fullScreen()**

This method used to set the screen as full screen.

**Syntax**:

driver.manage().window().fullScreen();

1. **newWindow(WindowType)**

This method used to open new tab or new window of the browser.

Note : Selenium-4 new Feature

For new tab:

Syntax:

driver.switchTo().newWindow(WindowType.TAB);

For new window:

Syntax:

driver.switchTo().newWindow(WindowType.WINDOW);

1. **getSize()**

This method used to get the size of the browser window.

Return type : Dimension

**Syntax**:

Dimension dimension = driver.manage().window().getSize();

System.out.println(dimension.getHeight());

System.out.println(dimension.getWidth());

1. **setSize()**

This method used to set the size of the browser window.

Parameter type : Dimension

**Syntax**:

Dimension dimension = new Dimension(500,600);

driver.manage().window().setSize(dimension);

1. **getPosition()**

This method used to get the co-ordinates of browser window.

Return type : Point

**Syntax**:

Point point = driver.manage().window().getPosition();

System.out.println(point.getX());

System.out.println(point.getY());

1. **setPosition()**

This method used to set the co-ordinates of browser window.

Parameter type : Point

**Syntax**:

Point point = new Point (500,500);

driver.manage().window().setPosition(point);

**Selenium RemoteWebDriverOptions class methods:**

**Selenium cookie commands:**

**Cookie : Cookie Is a temporary file which can store user information.**

1. **getCookies()**

This method used to get all cookies present in a webpage.

Return type : Set <Cookie>

**Syntax**:

Set<Cookie> cookies = driver.manage().getCookies();

for(Cookie cookie: cookies)

{

System.out.println(cookie.getName());

System.out.println(cookie.getValue());

System.out.println(cookie.getPath());

}

1. **getCookieNamed()**

This method used to get a cookie by its name passed as a parameter.

Parameter Type : String

**Syntax**:

Cookie cookie = driver.manage().getCookieNamed(“cookiename”);

System.out.println(cookie);

1. **addCookie()**

This method used to add a cookie on webpage.

Parameter Type : Cookie

**Syntax**:

driver.manage().addCookie(“key”,”value”);

or

Cookie k = new Cookie(“key” ,”value”);

driver.manage().addCookie(k);

1. **deleteAllCookies()**

This method used to delete all cookies present on a webpage.

**Syntax**:

driver.manage().deleteAllCookies();

1. **deleteCookie()**

This method used to delete a cookie present on a webpage.

Parameter Type : Cookie

**Syntax**:

Cookie k = new Cookie(“key” ,”value”);

driver.manage().deleteCookie(k);

1. **deleteCookieNamed()**

This method used to delete a cookie present on a webpage.

Parameter Type : String

**Syntax**:

driver.manage().deleteCookieNamed(“cookieName”);

**HTML Web page components & tags.**

**Browser Inspectors.**

**Selenium RemoteWebDriver class methods:**

1. **findElement():**

This method used to locate a WebElement on a webpage.

Parameter Type : By

Return type : WebElement

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.id(“loginbtn”));

1. **findElements():**

This method used to locate multiple WebElement’s on a webpage.

Parameter Type : By

Return type : List<WebElement>

**Syntax**:

WebDriver driver = new ChromeDriver();

List<WebElement> btns = driver.findElements(By.id(“loginbtn”));

**Types of locators in selenium or By class attributes.**

In selenium we have 8 types of locators.

Note: locator value should not have any space

1. Id

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.id(“xxxxxx”));

1. name

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.name(“xxxxxxx”));

1. className

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.className(“xxxxxxx”));

1. tagname

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.tagName(“xxxxx”));

1. linkText

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.linkText(“xxxxxx”));

1. partialLinkText

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.partialLinkText(“xxxxxx”));

1. xpath

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginBtn = driver.findElement(By.xpath(“xxxxx”));

**Xpath in selenium:**

if we are unable to find any locator i.e., id , name, class, text etc. in any tag, then use xpath to locate that tag.

Xpath is categorized into two types

1. **Absolute xpath :**

It starts from the first “/” root tag of the html source code and ends at required tag.it is direct way of finding the WebElement.

Ex: /html/body/div[2]/div/div/div[2]/div[2]/div[1]/form/div[7]/div[2]/div[1]/input

The major dis-advantage of absolute xpath is, if there is any change in elements of the webpage then absolute xpath will not work.

We can get absolute xpath directly by using any tool like Selenium IDE, firebug, chrome inspector etc.

1. **Relative xpath:**

it starts with double forward slash ( // ) and at any tag inside the html source.

Syntax :

//tagname[@attribute= ‘attribute value’]

Ex: //button[@id="hobbies"]

The major advantage of relative xpath is, if there is any change in WebElement of a webpage relative xpath will not affected.

**Different characters in xpath syntax:**

1. Single forward slash ( / ) :

it selects all child tags inside a parent tag.

**Syntax** : //tagname[@attribute=’attributeValue’]/tag

**Example** : //form[@id="userForm"]**/**div

1. Double forward slash( // ) :

it selects all selective tags inside a parent tag.

**Syntax** : //tagname[@attribute=’attributeValue’]//tag

**Example** **: //**form[@id="userForm"]//div

1. Address sigh ( @ ) :

it is used to select a tag based on attribute of a selective tag.

**Syntax** : //tagname[@attribute=’attributeValue’]/tag

**Example** : //form[**@**id="userForm"]

1. Dot ( . ) :

it selects current tag.

**Syntax** : //tagname[@attribute=’attributeValue’]/.

**Example** : //form[@id="userForm"]/**.**

1. Double dot (..) :

it selects parent tag of current tag.

**Syntax** : //tagname[@attribute=’attributeValue’]/..

**Example** : //form[@id="userForm"]/**..**

1. Asterisk ( \* ) :

it selects any tag of html source code.

**Syntax** : //\*[@attribute=’attributeValue’]

**Example** : //**\***[@id="userForm"]

1. Address and Asterisk ( @\* ) :

it selects any attribute of a given tag.

**Syntax** : //tagname[@\*]

**Example** : //form[**@\***]

1. or ( | ) :

it used to select any matched path. Its

**Syntax** : //tagname[@attribute=’attributeValue’] | //tagname[@attribute=’attributeValue’]

**Example** : //form[@id="userForm"] **|** //\*[@id="userNumber"]

**Note: xpath and CSS selector use 1-based index.**

**Predicates in xpath** :

Predicates are used to find specific element by its index.

1. index ( [ ] ) :

it selects WebElement based on index from grope of matched WebElement.

**Syntax** : //tagname[@attribute=’attributeValue’]/tag**[index]**

**Example** : //form[@id="userForm"]/div[2]

1. last() :

it selects last WebElement from grope of matched WebElement.

**Syntax** : //tagname[@attribute=’attributeValue’]/tag**[last()]**

**Example** : //form[@id="userForm"]/div[last()]

1. position() :

it selects specific positioned WebElement from grope of matched WebElement.

**Syntax** : //tagname[@attribute=’attributeValue’]/tag**[position()=x]**

**Example** : //form[@id="userForm"]/div[position()=1]

**Functions in xpath** :

1. Contains():

It is used to select WebElement based on partial value of an attribute or text.

**Syntax** : //tagname[contains(@attribute,’partialAttributeValue’)]

( or )

**Syntax** : //tagname[contains(text() , ’partialtext’)]

**Example** : //input[contains(@id,'first')]

**Example** : //label[contains(text(),'Sport')]

1. Starts-with():

It is used to select WebElement based on starting value of an attribute or text.

**Syntax** : //tagname[starts-with(@attribute,’partialAttributeValue’)]

( or )

**Syntax** : //tagname[starts-with(text() , ’partialtext’)]

**Example** : //input[starts-with(@id,'first')]

**Example** : //label[starts-with(text(),'Spo')]

1. text():

It is used to select WebElement based on starting value of an attribute or text.

**Syntax** : //tagname[text() = ’text’]

**Or**

**Syntax** : //tagname[. = ’text’]

**Example** : //label[text()='Sports']

**Example** : //label[.='Sports']

**Operators in xpath** :

1. and :

It is used to combined two different conditions to select WebElement.

**Syntax** : //tagname[@attribute=’AttributeValue’ and @attribute=’AttributeValue’]

( or )

**Syntax** : //tagname[@attribute=’AttributeValue’ and text() =’text’]

**Example** : //input[@placeholder='First Name' and @id='firstName']

**Example** : //input[@placeholder='First Name' and text()='firstName']

1. or :

It is used any one condition to select WebElement.

**Syntax** : //tagname[@attribute=’AttributeValue’ or @attribute=’AttributeValue’]

( or )

**Syntax** : //tagname[@attribute=’AttributeValue’ or text() =’text’]

**Example** : //input[@placeholder='First Name' or @id='firstName']

**Example** : //input[@placeholder='First Name' or text()='firstName']

**Special Attributes in xpath:**

1. child:

It selects all child tags of the current node.

**Syntax** : //tagname[@attribute=’AttributeValue’]/child::tag

( or )

**Syntax** : //tagname[@attribute=’AttributeValue’]/tag

**Example** : //\*[@id='userEmail-wrapper']/child::input

**Example** : //\*[@id='userEmail-wrapper']/input

1. descendant:

it selects all descendant (children, grandchildren, etc.) of the current node.

**Syntax** : //tagname[@attribute=’AttributeValue’]/descendant::tag

( or )

**Syntax** : //tagname[@attribute=’AttributeValue’]//tag

**Example** : //\*[@id='userEmail-wrapper']/ descendant::input

**Example** : //\*[@id='userEmail-wrapper']//input

1. parent:

It selects parent tag or selective tag of the current tag.

**Syntax** : //tagname[@attribute=’AttributeValue’]/parent::tag

( or )

**Syntax** : //tagname[@attribute=’AttributeValue’]/..

**Example** : //\*[@id='userEmail-wrapper']/parent::input

**Example** : //\*[@id='userEmail-wrapper']/..

1. Ancestor:

It selects all ancestors (parent, grandparent, etc.) of the current node.

**Syntax** : //tagname[@attribute=’AttributeValue’]/ancestor::tag

**Example** : //\*[.='Label']/ancestor::table

1. following:

Selects every tag in the source after the current node.

**Syntax** : //tagname[@attribute=’AttributeValue’]/following::tag

**Example** : //\*[.='Label']/following::table

1. preceding:

it selects every tag in the source before the current node.

**Syntax** : //tagname[@attribute=’AttributeValue’]/preceding::tag

**Example** : //\*[.='Label']/preceding::table

1. following-sibling:

It selects all selective below sibling tags from the current tag.

**Syntax** : //tagname[@attribute=’AttributeValue’]/following-sibling::tag

**Example** : //\*[.='Label']/following-sibling::table

1. preceding-sibling:

It selects all selective above sibling tags from the current tag.

**Syntax** : //tagname[@attribute=’AttributeValue’]/preceding-sibling::tag

**Example** : //\*[.='Label']/preceding-sibling::table

1. CSS Selector

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement loginbtn = driver.findElement(By.cssSelector(“xxxxx”));

**CSS selector in selenium** : Cascading style sheets

CSS has better performance and speed than xpath because

* Xpath allows bidirectional flow which means the traversal can be both ways from parent to child and child to parent as well
* CSS allows only one directional flow which means the traversal is from parent to child only
* Xpath engines are different in each browser, hence make them inconsistent.
* IE does not have a native xpath engine, therefore selenium injects its own xpath engine for compatibility of its API.
* Every webpage has its CSS at the top in the <head> section and JavaScript at the bottom. This allows the browser to load your CSS first.

**Note: xpath and CSS selector use 1-based index.**

1. **Id**

**Syntax** : tag[id=’idvalue’]

**Example** : input[id=’firstname’] or input**#**firstname

**Note** : **#** symbol indicates ‘ID’ in CSS selector.

1. **Class**

**Syntax** : tag[class=’classvalue’]

**Example** : input[class=’firstname’] or input**.**firstname

**Note** : **.** symbol indicates ‘ID’ in CSS selector.

1. **Any attribute**

**Syntax** : tag[attribute=’attributevalue’]

**Example** : button[placeholder=’acceptcookies’]

**Multiple attribute:**

* **Id & attribute:**

**Syntax** : tag[id=’idvalue’][attribute=’attributevalue’] or tag#idvalue[attribute=’attributevalue’]

**Example** : input[id='firstName'][placeholder='First Name']

or

input#firstName[placeholder='First Name']

* **class & attribute:**

**Syntax** : tag[class=’classvalue’][attribute=’attributevalue’] or tag.classvalue[attribute=’attributevalue’]

**Example** : input[class=’firstname’][placeholder='First Name']

or

input.firstName+[placeholder='First Name']

**Using parent – child hierarchy**

**Syntax** : parenttag>childtag>childtag>…>…>…>

**Example** : form[id='userForm']>div>div>input[id='firstName']

or

form#userForm>div>div>input[id='firstName']

**Note** : **>** symbol indicates child tags in CSS selector.

**Index or nth-of-value()**

**Syntax** : parenttag>childtag : nth-of-type(index)

**Example** : form[id='userForm']>div:nth-of-type(1)>div:nth-of-type(2)>input[id='firstName']

or

form#userForm>div:nth-of-type(1)>div:nth-of-type(2)>input[id='firstName']

**Note** : nth-of-type(index) symbol indicate tags based on index in CSS selector.

**With text**

* Starting text

**Syntax** : tag[attribute^=’attributeStartingValue’]

**Example** : input[id^='firstNa']

**Note** : **^** symbol indicates Start-with text in CSS selector.

* Contains-text

**Syntax** : tag[attribute$=’attributeSomeTextValue’]

**Example** : input[id$='rstNa']

**Note** : **$** symbol indicates Contains-with text in CSS selector.

* Ending text

**Syntax** : tag[attribute\*=’attributeEndTextValue’]

**Example** : input[id\*='tName']

**Note** : **\*** symbol indicates Contains-with text in CSS selector.

**Selenium RemoteWebElement class methods:**

1. **click();**

This method used to perform click on WebElement.

Syntax:

WebDriver driver = new ChromeDriver();

WebElement loginbutton = driver.findElement(By.id(“loginbtn”));

loginbutton.click();

or

WebDriver driver = new ChromeDriver();

driver.findElement(By.id(“loginbtn”)).click();

1. **submit();**

This method used to perform click or enter action on a WebElement.

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement button = driver.findElement(By.id(“btn”));

button.submit();

Or

WebDriver driver = new ChromeDriver();

driver.findElement(By.id(“btn”)).submit();

Note: We can use submit method only on WebElement’s which are having form tag or under form tag and its attribute **type** value must be **submit i.e.**

Text

Description automatically generated

1. **sendKeys();**

This method used to pass input keys to a WebElement.

Parameter Type : String

Syntax:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

username.sendKeys(“siddhi”);

or

WebDriver driver = new ChromeDriver();

driver.findElement(By.id(“uname”)).sendKeys(“siddhi”);

1. **clear();**

This method used to clear the text from the input field of a webpage.

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

username.clear();

or

WebDriver driver = new ChromeDriver();

driver.findElement(By.id(“uname”)).clear();

1. **getAttribute();**

This method used to get value of an attribute of a WebElement.

Parameter Type : String

Return Type : String

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

String attvalue = username.getAttribute(“type”);

or

WebDriver driver = new ChromeDriver();

String attvalue = driver.findElement(By.id(“uname”)).getAttribute();

1. **getCssValue();**

This method used to get cssvalue of a WebElement.

Parameter Type : String

Return Type : String

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

String color = username.getCssValue(“color”);

or

WebDriver driver = new ChromeDriver();

String color = driver.findElement(By.id(“uname”)).getCssValue(“color”);

1. **getTagName();**

This method used to get tagname of a WebElement.

Return Type : String

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

String tagname = username.getTagName();

or

WebDriver driver = new ChromeDriver();

String tagname = driver.findElement(By.id(“uname”)).getTagName();

1. **getText();**

This method used to get text of a WebElement.

Return Type : String

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

String tagname = username.getText();

or

WebDriver driver = new ChromeDriver();

String tagname = driver.findElement(By.id(“uname”)).getText();

1. **isDisplayed();**

This method used to conform a WebElement is displayed or not on a webpage.

Return Type : Boolean

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement username = driver.findElement(By.id(“uname”));

Boolean user = username.isDisplayed();

or

WebDriver driver = new ChromeDriver();

Boolean user = driver.findElement(By.id(“uname”)).isDisplayed();

1. **isEnabled();**

This method used to conform a WebElement is enable or not on a webpage.

Return Type : Boolean

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement checkbox = driver.findElement(By.id(“checkbox”));

Boolean enable = checkbox.isEnabled();

Or

WebDriver driver = new ChromeDriver();

Boolean enable = driver.findElement(By.id(“checkbox”)).isEnabled();

1. **isSelected();**

This method used to conform a WebElement is selected or not on a webpage.

Return Type : Boolean

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement checkbox = driver.findElement(By.id(“checkbox”));

Boolean select = checkbox.isSelected();

Or

WebDriver driver = new ChromeDriver();

Boolean select = driver.findElement(By.id(“checkbox”)).isSelected();

1. **getLocation();**

This method used to get co-ordinates of a WebElement on a webpage.

Return Type : Point

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement button = driver.findElement(By.id(“btn”));

Point p = button.getLocation();

System.out.println(p.getX());

System.out.println(p.getY());

Or

WebDriver driver = new ChromeDriver();

System.out.println(driver.findElement(By.id(“btn”)).getLocation().getX());

System.out.println(driver.findElement(By.id(“btn”)).getLocation().getY());

1. **getSize()**

This method used to get the size of a WebElement.

Return type : Dimension

**Syntax**:

Dimension dimension = driver.findElement(By.id(“xx”)).getSize();

System.out.println(dimension.getHeight());

System.out.println(dimension.getWidth());

1. **getRect();**

This method used to get rectangle dimensions of a WebElement on a webpage.

Return Type : Rectangle

**Syntax**:

WebDriver driver = new ChromeDriver();

WebElement button = driver.findElement(By.id(“btn”));

Rectangle rec = button.getRect();

System.out.println(rec.getHeight());

System.out.println(rec.getWidth());

Or

WebDriver driver = new ChromeDriver();

System.out.println(driver.findElement(By.id(“btn”)).getRect().getHeight());

System.out.println(driver.findElement(By.id(“btn”)).getRect().getWidth());

1. **getScreenShotAs**()

This method used to get screen shot of a WebElement.

Parameter type : OutputType

**Syntax**:

File source = chrome.findElement(By.*name*("q")).getScreenshotAs(OutputType.***FILE***);

File dest = **new** File("D:\\xxxx\\test.png");

FileUtils.*copyFile*(source, dest);

**Secreenshot of a section in a page:**

**Example : table , grid or group of matched web elements**

File source = chrome.findElement(By.*name*("tablename")).getScreenshotAs(OutputType.*FILE*);

File dest = new File("D:\\xxxx\\test.png");

FileUtils.*copyFile*(source, dest);

**Window-handles in selenium:**

**Parent window** : The main window on which the user has currently landed or webpage on which the user is landed after hitting a link/URL. Such a webpage in Selenium is referred as the parent window also known as the main window.

**Child Window** : All the windows which will open inside your main window will be called as child windows.

**Window Handle**: A window handle stores the unique address of the browser windows. It is just like window navigator , whose return type is alphanumeric(**String**). The window handle in Selenium helps in handling multiple windows and child windows. Each browser/tab will have a unique window handle value with which we can uniquely identify it.

1. **getWindowHandle**() : This method will handle the **current window** that uniquely identifies it within this driver instance. Its return type is **String**.

**Syntax** :

String windowHandle = chrome.getWindowHandle();

System.out.println("Parent window Handle : "+windowHandle);

1. **getWindowHandles**() : To handle all **opened windows** by web driver, we can use “getWindowHandles()” method and then we can **switch** window from one window to another in a web application. Its return type is Set<String>

**Syntax**:

Set<String> windowsHandles = chrome.getWindowHandles();

for(String window:windowsHandles)

{

driver.switchTo().window(window).close();

}

**Selenium RemoteTargetLocator class methods:**

1. activeElement()

This method used to switch the web driver focus on active WebElement.

Return Type : WebElement

Syntax:

driver.switchTo().activeElement().click();

1. window()

This method used to switch the web driver focus on given windowHandle passed as parameter.

Return Type : WebDriver

Syntax:

driver.switchTo().window(“windowHandle”);

**Alerts in selenium:**

**What is an alert?**

Alerts are small popup boxes/desktop-windows which display the messages/notifications and notify the user with some information seeking some permission on certain kinds of operations. Additionally, we can also use them for warning purposes. Sometimes, the user can enter a few details in the alert box as well.

**Types of alerts provided by Web Applications:**

**1.Simple alert**: These alerts are just informational alerts and have an OK button on them. Users can click on the OK button after reading the message displayed on the alert box. A simple alert box looks like below.

Graphical user interface, text, application, email

Description automatically generated

**2.Prompt Alert**: In Prompt alerts, some input requirement is there from the user in the form of text needs to enter in the alert box. A prompt alert box is displayed like below, where the user can enter his/her username and press the OK button or cancel the alert box without entering any details.

Graphical user interface, application, website, Teams

Description automatically generated

**3.Confirmation Alert**: These alerts get some confirmation from the user in the form of accepting or dismissing the message box. They are different from prompt alerts in a way that the user cannot enter anything as there is no text-box available. Users can only read the message and provide the inputs by pressing the OK/Cancel button.

Graphical user interface, application

Description automatically generated

1. **accept**() : This method is used to click on accept/ok/yes button on an alert.

* **dismiss**() : This method is used to click on cancel/no/reject button on an alert.
* **getText**() : This method is used to return the text present on an alert.
* **sendKeys**() : This method is used to send some commands to an alert.

**Syntax:**

WebDriver chrome = new ChromeDriver();

chrome.switchTo().alert().accept();

chrome.switchTo().alert().dismiss();

chrome.switchTo().alert().sendKeys("Hello Siddhi");

String alertText = chrome.switchTo().alert().getText();

System.out.println(alertText);

**IFrames in selenium:**

**What is iframe ?**

* + Iframe is webpage which is embedded in another web page

**(or)**

* + It is a HTML document embedded inside another HTML document
  + These frames are used in a webpage to add content from other source like advertisements in a webpage.
  + These iframe are defined with **<iframe>** tag.

**How to identity iframe on a web page?**

* We cannot detect the frames by just seeing the page or by inspecting on webpage.
* But when we try to inspect on web page, on context click options it will display

**View frame source**  or **Reload frame** in chrome browserand **This Frame** in Firefox bowser by these options we can confirm that webpage consists of frames.

Graphical user interface, text, application, email

Description automatically generated 

1. **frame(int )** : This method is used to switch the frame by its index.
2. **frame(String)** : This method is used to switch the frame by its name or id.
3. **frame(WebElement)** : This method is used to switch the frame by its webelement.
4. **parentFrame()** : This method is used to switch parent frame from child frame.
5. **defaultContent()** : This method is used to switch parent page from any frame.

**Single Frame:**

Graphical user interface, application, Word

Description automatically generated

**Html code:**

<html>

<head> </head>

<body class=" darktheme">

<iframe frameborder="20" id="frame1" name="frame1" allowfullscreen="true">

<button type="submit1" id="loginbutton” form="nameform1" value="Submit">Submit1</button>

</iframe>

</body>

</html>

**Selenium code :**

**With index:**

chrome.switchTo().frame(0);

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

or

**With id or name:**

chrome.switchTo().frame("frame1");

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

or

**With web-element:**

chrome.switchTo().frame(chrome.findElement(By.id("iframe1")).);

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

**Multiple frame:**

Diagram

Description automatically generated

**Html code:**

<html>

<head> </head>

<body class=" darktheme">

<iframe frameborder="0" id="frame1" name="frame1" allowfullscreen="true">

<button type="submit" form="nameform" value="Submit">Submit1</button>

</iframe>

<iframe frameborder="0" id="frame2" name="frame2" allowfullscreen="true">

<button type="submit" form="nameform" value="Submit">Submit2</button>

</iframe>

<iframe frameborder="0" id="frame3" name="frame3" allowfullscreen="true">

<button type="submit" form="nameform" value="Submit">Submit3</button>

</iframe>

</body>

</html>

**Selenium code :**

chrome.switchTo().frame("iframe1");

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

chrome.switchTo().frame("iframe2");

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

chrome.switchTo().frame("iframe3");

chrome.findElement(By.id("loginbutton")).click();

chrome.switchTo().defaultContent();

**Nested Frames:**



<html>

<head> </head>

<body class=" darktheme">

<iframe frameborder="0" id="iframe2" name=" iframe2" allowfullscreen="true">

<button type="submit" form="nameform" id=" element2" value="Submit">element2</button>

<iframe frameborder="0" id="iframe1" name=" iframe1" allowfullscreen="true">

<button type="submit" form="nameform" " id=" element1" value="Submit">element1</button>

</iframe>

</iframe>

</body>

</html>

**Selenium syntax :**

chrome.switchTo().frame("iframe2");

chrome.findElement(By.id("element2")).click();

chrome.switchTo().frame("iframe1");

chrome.findElement(By.id("element1")).click();

chrome.switchTo().parentFrame();

chrome.switchTo().defaultContent();

**Select Class in selenium**:

Select is used to automate dropdown which are developed by using <select> HTML tag.

Graphical user interface, text, application

Description automatically generated

**Types of dropdowns**:

1.single selection dropdown

Example :



2. Multiple selection dropdown

Example :



**Select-Methods:**

**How to check whether dropdown is multi-Select?**

The Select class provides the "**isMultiple()** " method, which determines whether the web element is supports for multiple selections or not. It returns a boolean value, i.e., True/False, without taking any argument. It checks the attribute 'multiple' in the HTML code for the web element.

1. **isMultiple**

Syntax :

Select country = new Select(driver.findElement(By.name("xxxxxx")));

Boolean selection = country.isMultiple();

System.out.println(selection);

1. **selectByIndex()** :

This method selects the dropdown option by its index number. We provide an integer value as the index number as an argument.

The index starts at 0

**syntax**:

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.selectByIndex(3);

**2.** **selectByValue() :**

This method selects the dropdown option by its value. We provide a string value as the value as an argument.

**syntax**:

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.selectByValue("india");

3. **selectByVisibleText() :**

This method selects the dropdown option based on the dropdown text. We provide the dropdown text as a string as an argument.

**Syntax**:

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.selectByVisibleText("INDIA");

4. **getOptions()** :

This method is used to get all the options in a dropdown or multi-select box.

Using this method, we can retrieve all the options of a dropdown (be it single-select or multi-select ).

This method returns all the options of the dropdown as a list of WebElement (List<WebElement>).

**syntax**:

Select country = new Select(driver.findElement(By.name("xxxxxx")));

List<WebElement>options = country.getOptions();

for(WebElement option:options)

{

System.out.println(option.getText());

}

5. **getFirstSelectedOption() :**

This method returns the first selected option of the dropdown. If it is a single-select dropdown, this method will return the selected value of the dropdown, and if it is a multi-select dropdown, this method will return the first selected value of the dropdown.

This method returns a WebElement.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

System.out.println(country.getFirstSelectedOption());

6. **getAllSelectedOptions() :**

This method returns all the selected options of the dropdown. If it is a single-select dropdown, this method will return the only selected value of the dropdown, and if it is a multi-select dropdown, this method will return all the selected values of the dropdown.

Using this method, we can retrieve all the selected options of a dropdown (be it single-select or multi-select ).

This method returns a WebElement’s.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

List<WebElement>options = country. getAllSelectedOptions ();

for(WebElement option:options)

{

System.out.println(option.getText());

}

7. **deselectAll():**

It will deselect all the options from the dropdown.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.deselectAll()

8. **deselectByIndex ():**

This method is used to deselect an option from the dropdown by using its index.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country. deselectByIndex(index);

9. **deselectByValue ():**

This method is used to deselect an option from the dropdown by using its value.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.deselectByValue(“Value”);

10. **deselectByVisibleText():**

This method is used to deselect an option from the dropdown by using its Text.

**Syntax:**

Select country = new Select(driver.findElement(By.name("xxxxxx")));

country.deselectByVisibleText(“Text”);

**Actions Class in selenium:**

**Actions Class:**

* Actions class is provided by selenium to perform mouse events and handling keyboard operations.
* Actions classes are used to perform multiple actions at a time sequentially.
* **build()** method is always the final method, so that all the listed actions will be compiled into a single step
* **perform()** method is used to perform all compiled/stored actions.

**Different Methods in Actions class to perform Keyboard Events:**

1. **keyDown(Keys):**

This method used to perform a key press(Keyboard).

1. **keyDown(WebElement** , **Keys):**

This method performs, cursor focus on given webelement and key press(Keyboard).

1. **keyUp(Keys):**

This method used to perform a key release(Keyboard).

1. **keyUp(WebElement** , **Keys):**

This method performs, cursor focus on given webelement and key release(Keyboard).

1. **sendKeys(keys):**

This method used to perform Sendkeys to the active web element.

1. **sendKeys(WebElement** , **keys):**

This method performs, cursor focus on given webelement and Sendkeys.

Example for keyDown, KeyUp & sendKeys :

**Syntax:**

Actions action = new Actions(chrome);

WebElement firstname = chrome.findElement(By.name("firstName"));

action.click(firstname).keyDown(firstname,Keys.SHIFT)

.sendKeys(firstname, "siddhiInstitute")

.keyUp(firstname,Keys.SHIFT).build().perform();

**Different Methods in Actions class to perform Mouse Events:**

1. **moveToElement(WebElement):** This method used to move the mouse pointer to the middle of the given WebElement.

**Syntax:**

Actions action = new Actions(chrome);

WebElement nextbutton = chrome.findElement(By.name("xxxxxx"));

action.moveToElement(nextbutton).build().perform();

1. **click():** This method used to click at the **current** mouse pointer.

**Syntax:**

Actions action = new Actions(chrome);

action.click().build().perform();

1. **click(WebElement):** This method used to perform click on the WebElement, which is passed an argument.

**Syntax:**

Actions action = new Actions(chrome);

WebElement nextbutton = chrome.findElement(By.name("xxxxxx"));

action.click(nextbutton).build().perform();

1. **doubleClick():** This method used to double-click at the current mouse pointer.

**Syntax:**

Actions action = new Actions(chrome);

action.doubleClick().build().perform();

1. **doubleClick(WebElement):** This method used to perform double-click on the WebElement, which is passed an argument.

**Syntax:**

Actions action = new Actions(chrome);

WebElement nextbutton = chrome.findElement(By.name("xxxxxx"));

action.doubleClick(nextbutton).build().perform();

1. **contextClick()** : This method used to perform a context-click(mouse right click) at current mouse pointer.

**Syntax:**

Actions action = new Actions(chrome);

action.contextClick().build().perform();

1. **contextClick(WebElement)** : This method used to perform a context-click(mouse right click) at middle of the given WebElement.

**Syntax:**

Actions action = new Actions(chrome);

WebElement menu = chrome.findElement(By.name("xxxxxx"));

action.contextClick(menu).build().perform();

1. **clickAndHold():** This method used to perform mouse left click (without releasing) at current mouse pointer.

**Syntax:**

Actions action = new Actions(chrome);

action.clickAndHold().build().perform();

1. **clickAndHold(WebElement):** This method used to perform mouse left click (without releasing) at the middle of the given WebElement.

**Syntax:**

Actions action = new Actions(chrome);

WebElement imagetohold = chrome.findElement(By.name("xxxxxx"));

action.clickAndHold(imagetohold).build().perform();

1. **release():** This method used to release the depressed left mouse button at the current mouse location.

**Syntax:**

Actions action = new Actions(chrome);

action.release().build().perform();

1. **release(WebElement):** This method used to release the depressed left mouse button on the given webelement.

**Syntax:**

Actions action = new Actions(chrome);

WebElement imagetohold = chrome.findElement(By.name("xxxxxx"));

action.clickAndHold(imagetohold).build().perform();

action.release(imagetohold).build().perform();

1. **dragAndDrop(source we, target we):** This method used to perform click-and-hold at the location of the source webelement, moves and release at the location of the target webelement.

**Syntax**:

WebElement source = chrome.findElement(By.xpath(“xxx"));

WebElement target = chrome.findElement(By.xpath(“xxx"));

action.dragAndDrop(source, target).build().perform();

1. **dragAndDropBy(source, xOffset, yOffset):** This method used to perform click-and-hold the mouse at the location of the source webelement, moves and release at given offset.

**Syntax**:

WebElement source = chrome.findElement(By.xpath(“xxx"));

action.dragAndDrop(source, x, y).build().perform();

1. **moveByOffset(x-offset, y-offset):** This method used to move the mouse from its current position (or 0,0) to the given offset.

**Syntax**:

WebElement source = chrome.findElement(By.xpath(“xxx"));

action.moveByOffset(x, y).build().perform();

1. **pause(long):** This method is used to pause/delay the execution between actions for a specified duration in milli seconds.

**Syntax**:

Actions action = new Actions(chrome);

action.click().pause(2000).click().build().perform();

1. **pause(Duration ):** This method is used to pause/delay the execution between actions for a specified duration.

**Syntax**:

Actions action = new Actions(chrome);

action.click(firstname).pause(Duration.ofSeconds(2)).sendKeys("xx”).build().perform();

**JavaScriptExecuter in selenium:**

**What is JavaScriptExecuter ?**

* Javascriptexecutor is an interface which is used to execute JavaScript with selenium webdriver.
* Javascriptexecutor allows you to run pure JavaScript code irrespective of the Selenium language binding(Java, C#, Python etc.) you are using.

**Why JavaScriptExecuter?**

* JavaScript is extremely efficient and accurate when comparing with scripts written with Selenium-Java/c#/python etc.
* some features we can’t handle using Java-selenium so we need scripting language also which can control server side or client-side scripting so we will use JavaScript in our Selenium

It consists of two methods used to run JavaScript

1. executeScript : This method is used to execute JavaScript in sequential order.
2. executeAsyncScript : This method is used to execute asynchronous script in random order.(Time constants)

**Note** : Both methods will block the WebDriver execution until they complete execution

**JavaScriptExecuter Actions:**

1. **Navigating URL :**

JavascriptExecutor js = (JavascriptExecutor) driver; js.executeScript("window.location=’url’");

1. **Title of a Webpage :**

JavascriptExecutor js = (JavascriptExecutor) driver;

String title = js.executeScript("return document.title").toString();

System.***out***.println(title);

1. **Domain of a Webpage :**

JavascriptExecutor js = (JavascriptExecutor) driver;

String domain = js.executeScript("return document.domain").toString();

System.***out***.println(domain);

1. **URL of a Webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

String url = js.executeScript("return document.URL").toString();

System.***out***.println(url);

1. **Inner Text of a WebElement :**

JavascriptExecutor js = (JavascriptExecutor) driver;

String text = js.executeScript("return arguments[0].innerText",WebElement).toString();

System.***out***.println(text);

(or)

String text1 = js.executeScript("return document.getElementById('xx').innerText").toString();

System.***out***.println(text1);

1. **Attribute of a WebElement:**

JavascriptExecutor js = (JavascriptExecutor) driver;

String arg = js.executeScript("return arguments[0].getAttribute('xxx')",WebElement).toString();

System.***out***.println(arg);

(or)

String arg1 = js.executeScript("return document.getElementById('xxx').getAttribute('xxx')").toString();

System.***out***.println(arg1);

1. **click on WebElement**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("arguments[0].click()",WebElement);

(or)

js.executeScript("document.getElementById('xxx').click();");

1. **sendkeys on WebElement**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("arguments[0].value='xxxx'", WebElement);

(or)

js.executeScript("document.getElementById('xx').value='xxx'");

1. **vertical scroll**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("window.scrollTo(0,300)");

1. **horizontal scroll**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("window.scrollTo(300,0)");

1. **scroll bottom of the webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

driver;js.executeScript("window.scrollTo(0,document.body.scrollHeight)");

1. **scroll top of the webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

driver;js.executeScript("window.scrollTo(document.body.scrollHeight,0)");

1. **Height of a webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

String height = js.executeScript("return window.innerHeight").toString();

System.***out***.println(height);

1. **Width of a webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

String width = js.executeScript("return window.innerWidth").toString();

System.***out***.println(width);

1. **changing the border color**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("arguments[0].style.borderColor='yellow'", WebElement);

1. **scroll Into View**

JavascriptExecutor js = (JavascriptExecutor) driver; js.executeScript("document.getElementById('xx').scrollIntoView(true)"); (or)

js.executeScript("arguments[0].scrollIntoView(true);", WebElement);

1. **multiple actions**

JavascriptExecutor js = (JavascriptExecutor) driver; js.executeScript("arguments[0].click();arguments[1].click();",

WebElement1, WebElement2);

1. **Example for asyncscript**

JavascriptExecutor js = (JavascriptExecutor) driver; js.executeAsyncScript("window.setTimeout(arguments[arguments.length-1],5000);alert('Hello');");

1. **alert creation**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("alert('Hello');");

1. **Refresh webpage**

JavascriptExecutor js = (JavascriptExecutor) driver;

js.executeScript("history.go(0)");

**Screenshot in Selenium Webdriver :**

**TakesScreenshot** is an interface which is used to take screenshot of a web page during the execution for debugging the failures.

To take screen shot first we need to convert webdriver instance into TakesScreenshot.

Jar files required to add project : **Apache Commons IO**

**TakesScreenshot Methods :**

1. **getScreehshotAs(OutputType) :** This method used to take screen shot and convert into image file.

**Syntax :**

TakesScreenshot screenshot = (TakesScreenshot) chrome;

File source = screenshot.getScreenshot(OutputType.***FILE***);

File dest = **new** File("path where to store");

FileUtils.*copyFile*(source, dest);

**FileUpload in selenium:**

We can use webdriver sendKeys method to upload file in file upload option. But that file upload WebElement must have **<input> tag** and attribute **type=’file’**.

Example of file upload html :

Text

Description automatically generated

**Syntax :**

chrome.findElement(By.*id*("xxxx")).sendKeys("path");

**FileUpload with Robot Class:**

Robot class used to operate all keyboard event.

chrome.findElement(By.*id*("uploadbutton")).click();

StringSelection path = **new** StringSelection("C:\\xxxxx\\xxxx.png");

Toolkit.*getDefaultToolkit*().getSystemClipboard().setContents(path,**null**);

Robot robot = **new** Robot();

robot.keyPress(KeyEvent.***VK\_ENTER***);

robot.keyRelease(KeyEvent.***VK\_ENTER***);

robot.keyPress(KeyEvent.***VK\_CONTROL***);

robot.keyPress(KeyEvent.***VK\_V***);

robot.keyRelease(KeyEvent.***VK\_V***);

robot.keyRelease(KeyEvent.***VK\_CONTROL***);

robot.keyPress(KeyEvent.***VK\_ENTER***);

robot.keyRelease(KeyEvent.***VK\_ENTER***);

**FileUpload with Auto IT:**

**Software required to download :**

1. **Autoit :** To read window information.
2. **Script Editor :** To write autoit script.

**Syntax:**

chrome.findElement(By.*id*("uploadbutton")).click();

ControlFocus("Open","","Edit1")

ControlSetText("Open","","Edit1","path of file to upload.png")

ControlClick("Open","","Button1")

Runtime.*getRuntime*().exec("path of compiled autoit script.exe");

**Keys class in selenium:**

Keys class used to perform keyboard actions.

Syntax:

chrome.findElement(By.*xpath*("xx")).sendKeys(Keys.***CONTROL***);

**Selenium Exceptions:**

An exception is a runtime error that happens at the time of execution of a program.

The Exception Handling in selenium is used to handle the runtime errors so that the normal flow of the execution can be maintained.

**Exceptions in Selenium WebDriver :**

1. **ElementNotVisibleException** : In spite of the element being present in the DOM, it is not visible (can not be interactive). For example, elements defined in HTML with type =”hidden”
2. **ElementNotSelectableException**: An element is disabled (can not be clicked/selected) in spite of being present in the DOM.
3. **NoSuchElementException**: Webdriver is not able to determine the elements during runtime, i.e., the FindBy method cannot find a particular component.
4. **NoSuchFrameException**: Webdriver attempts to switch to an invalid frame, which is unavailable.
5. **NoAlertPresentException**: Webdriver is trying to switch to an invalid alert, which is unavailable.
6. **NoSuchWindowException**: Webdriver is trying to switch to an invalid window, which is unavailable.
7. **StaleElementReferenceException**: The referenced element is no longer present on the DOM page (a reference to a component is now Stale). For example, the item belongs to a different frame than the current one or the user has navigated away to another page.
8. **SessionNotFoundException**: Webdriver is acting immediately after ‘quitting’ the browser.
9. **TimeoutException**: The command did not complete in the specified time. For example, the element didn’t display at the specified time. This is especially encountered when working with waits.
10. **WebDriverException**: Webdriver is acting immediately after ‘closing’ the browser
11. **ConnectionClosedException** : This type of Exception takes place when there is a disconnection in the driver.
12. **ElementClickInterceptedException** : The command may not be completed as the element receiving the events is concealing the element which was requested clicked.
13. **ElementNotInteractableException** : This Selenium exception is thrown when any element is presented in the DOM. However, it is impossible to interact with such an element.
14. **ErrorHandler.UnknownServerException** : Exception is used as a placeholder in case if the server returns an error without a stack trace.
15. **ImeActivationFailedException :** This expectation will occur when IME engine activation has failed.
16. **ImeNotAvailableException :** It takes place when IME support is unavailable.
17. **InsecureCertificateException :** Navigation made the user agent to hit a certificate warning. This can cause by an invalid or expired TLS certificate.
18. **InvalidArgumentException :** It occurs when an argument does not belong to the expected type.
19. **InvalidCookieDomainException :** This happens when you try to add a cookie under a different domain instead of current URL.
20. **InvalidCoordinatesException :** This type of Exception matches an interacting operation that is not valid.
21. **InvalidElementStateExceptio :** It occurs when command can’t be finished when the element is invalid.
22. **InvalidSessionIdException :** This Exception took place when the given session ID is not included in the list of active sessions. It means the session does not exist or is inactive either.
23. **InvalidSwitchToTargetException :** This occurs when the frame or window target to be switched does not exist.
24. **JavascriptException :** This issue occurs while executing JavaScript given by the user.
25. **JsonException :** It occurs when you afford to get the session when the session is not created.
26. **NoSuchAttributeException :** This kind of Exception occurs when the attribute of an element could not be found.
27. **MoveTargetOutOfBoundsException :** It takes place if the target provided to the ActionChains move() methodology is not valid. For Example, out of the document.
28. **NoSuchCookieException :** This Exception occurs when no cookie matching with the given pathname found for all the associated cookies of the currently browsing document.
29. **NotFoundException :** This Exception is a subclass of WebDriverException. This will occur when an element on the DOM does not exist.
30. **RemoteDriverServerException :** This Selenium exception is thrown when the server is not responding because of the problem that the capabilities described are not proper.
31. **ScreenshotException :** It is not possible to capture a screen.
32. **SessionNotCreatedException :** It happens when a new session could not be successfully created.
33. **UnableToSetCookieException :** This occurs if a driver is unable to set a cookie.
34. **UnexpectedTagNameException**  **:** Happens if a support class did not get a web element as expected.
35. **UnhandledAlertException :** This expectation occurs when there is an alert, but WebDriver is not able to perform Alert operation.
36. **UnexpectedAlertPresentException :** It occurs when there is the appearance of an unexpected alert.
37. **UnreachableBrowserException :** This Exception occurs only when the browser is not able to be opened or crashed because of some reason.

**ChromeOptions class in selenium:**

Ref : **https://peter.sh/experiments/chromium-command-line-switches/**

This class used for customizing the ChromeDriver session. It helps to perform various operations like opening Chrome in maximized mode, disable existing extensions, disable pop-ups, etc.

**List of arguments :**

1. disable-extensions : Disable extensions
2. headless : Run in headless mode, i.e., without a UI.
3. no-sandbox : Sandbox removes unnecessary privileges from the processes that don't need them in Chrome, for security purposes.
4. window-size=1200x600 : Sets the initial window size. Provided as string in the format "800,600".
5. verbose : WebView will log additional debugging information.
6. disable-web-security : Don't enforce the same-origin policy
7. ignore-certificate-errors : ignore all certification issue raised will browsing.
8. allow-running-insecure-content : allow all sights
9. incognito : open browser in incognito mode
10. start-maximized : Opens Chrome in maximize mode
11. disable-popup-blocking : Disables pop-up blocking.
12. disable-notifications : Disables the Web Notification and the Push APIs
13. make-default-browser : Makes Chrome default browser
14. disable-infobars : Prevents Chrome from displaying the notification ‘Chrome is being controlled by automated software
15. make-default-browser : Makes Chrome default browser
16. version : Prints chrome browser version

**Broken Links & Images on webpages:**

**What are Links?**

Hyperlinks, usually called as links and these are the HTML tags which enables users to redirection from one web page to another when they click on it.

**What are Broken Links?**

A broken link, also called as dead link, i.e it does not work, does not redirect to the webpage. This usually occurs because

* The destination web page is down, moved, or no longer exists.
* A web page moved without adding a redirect link.
* The user entered an improper/misspell URL.
* The web page link removed from the website.
* With activated firewall settings, also the browser cannot access the destination web page at times.

When someone clicks on a broken link, an error message is displayed.

Broken links may exist due to some kind of server error. A valid URL will have a 2xx HTTP status code.

Broken links, which are contain invalid HTTP requests have 4xx and 5xx status codes. The 4xx status code refers to a client-side error, while the 5xx status code usually points to a server response error.

**What are Broken images?**

A broken image on a web page is a link that is associated with the image, and the link is not working.

* Firstly, the image file is not located in the same path specified in your <img src " "> tag.
* Secondly, the image does not have the same path or filename.
* Thirdly, the image file at the location is either corrupt or undergoes damage, or maybe it's not compatible with a specific browser, and rendering fails in that browser only.

**Note:** Images can be broken on a web page, even if the link is valid on the page. In such a case, the issue is with either the image file itself or the browser's image rendering.

**What are HTTP Status Codes?**

A server generates HTTP Status codes in response to the request submitted by the client to the server.

There are different HTTP status codes, and a few of them are as below:

* 200 – Valid Link/success
* 301/302 - Page redirection temporary/permanent
* 404 – Page not found
* 400 – Bad request
* 401 – Unauthorized
* 500 – Internal Server Error

**Sytax:**

**public** **class** BrokenLinks {

**public** **static** **void** main(String[] args) **throws** InterruptedException, IOException

{

System.*setProperty*("webdriver.chrome.driver","driverpath");

WebDriver chrome = **new** ChromeDriver();

chrome.get("https://www.zensar.com/");

Thread.*sleep*(15000);

List<WebElement> links = chrome.findElements(By.*tagName*("a"));

**for**(WebElement link : links)

{

String linkurl = link.getAttribute("href");

URL url = **new** URL(linkurl);

HttpURLConnection huc = (HttpURLConnection) url.openConnection();

huc.setConnectTimeout(5000);

huc.connect();

**if**(huc.getResponseCode()>=400) {

System.***out***.println("link broken " + linkurl);

}**else** {

System.***out***.println("Valid link");

}

}

chrome.close();

chrome.quit();

}

}

**Types of Web Tables** :

Depending on the data in the table, web tables can be classified as Static web tables and Dynamic web tables.

1. **Static Web Tables :**

These tables have fixed data that remains unchanged throughout. Due to the static nature of their content, they are called Static web tables.

1. **Dynamic Web Tables :**

These tables have data that changes over time, and hence the number of rows and columns might also change depending upon the data shifts. Due to the dynamic nature of their content, they are called Dynamic web tables.