# BASIC SELENIUM

## Disadvantages of Manual Testing

- It is time consuming process.
- It requires more man power (Resources).
- It is tedious job, monotonous job (Hectic job).
- It is susceptible to human errors (Less accurate).

## What is Automation Testing?

Testing the application with the help of tool is called as automation Testing.
**Or**
Converting Manual test cases into Automation test scripts with the help of tools such as QTP, Selenium, etc... is known as Automation Testing.

## Advantages of Automation Testing

- It is fast.
- It is less time consuming.
- It requires less man power.
- Comparatively more accurate (as it done by tools).
- We can do non-functional testing like performance testing, compatibility testing etc.
- We can do the cross-browser testing.
- We will get better quality product.

## Disadvantages of Automation Testing

- Initial investment is High
- Required skilled manpower
- 100% Automation is not possible.

## Tools used for Automation Testing

- QTP (Quick Test Professional)
    1. It is named as UFT (Unified Functional Testing).
    2. It is used to automate web application
    3. It is licensed version.
    4. It provides customer support.
    5. It supports only one programming language (VB script).
- Test Complete

1. It is licensed version.
2. It supports 7+ programming languages (JS, C#, python…)
3. It provides customer support.
4. It supports automation for web, desktop and mobile applications.
5. It support only windows Operating System.

- Appium
  1. It is open source and free tool.
  2. It supports multiple languages like java, python, JS, Ruby, and C#...)
  3. It mostly used for mobile application.
  4. It supports third party integration.
  5. Restricted Support for desktop application.
  6. Slower execution compared to other automation Testing tools.
- Cypress
  1. It is free.
  2. It supports automation for all types of applications.
  3. It supports only one programming language (JavaScript).
  4. It supports only one browser.

## SELENIUM

Selenium is an automation tool, which is used to automate web-based applications.
It is a collection of libraries which consists of inbuilt classes and methods.
Selenium was developed by Jason Huggins in the year of 2004 at Thought works. First it was named as "**JavaScript Test Runner**" as he developed first script with the help of JavaScript. Later they named it as Selenium.

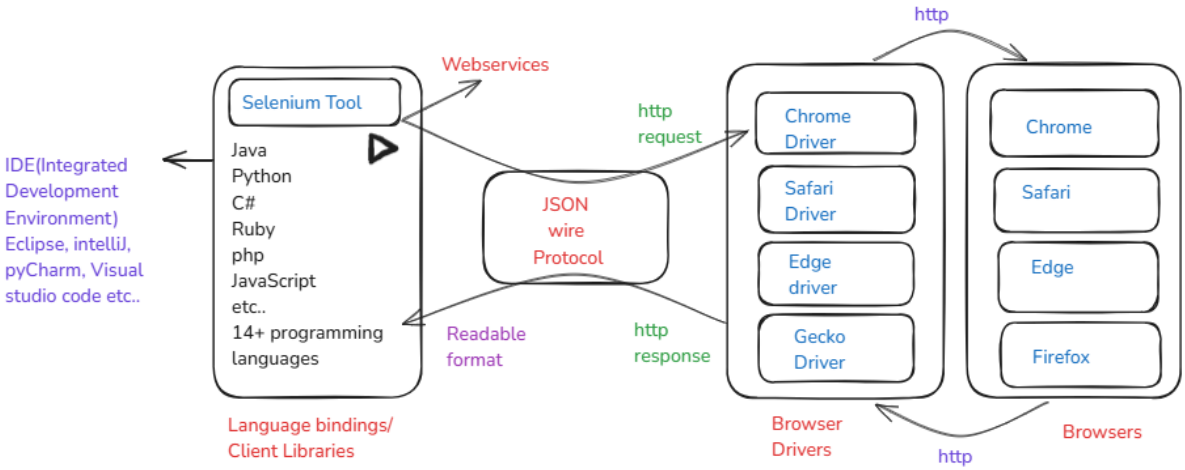
**Advantages of Selenium**

- It is Open Source and free tool.
- It supports 14+ programming Languages.
- It supports all major browsers (e.g: Chrome, Firefox, Edge, IE, Opera…)
- It Supports all major Operating Systems (e.g Windows, Linux, mac)
- It allows 3rd party integration (e.g. TestNG, AutoIT, Cucumber…)

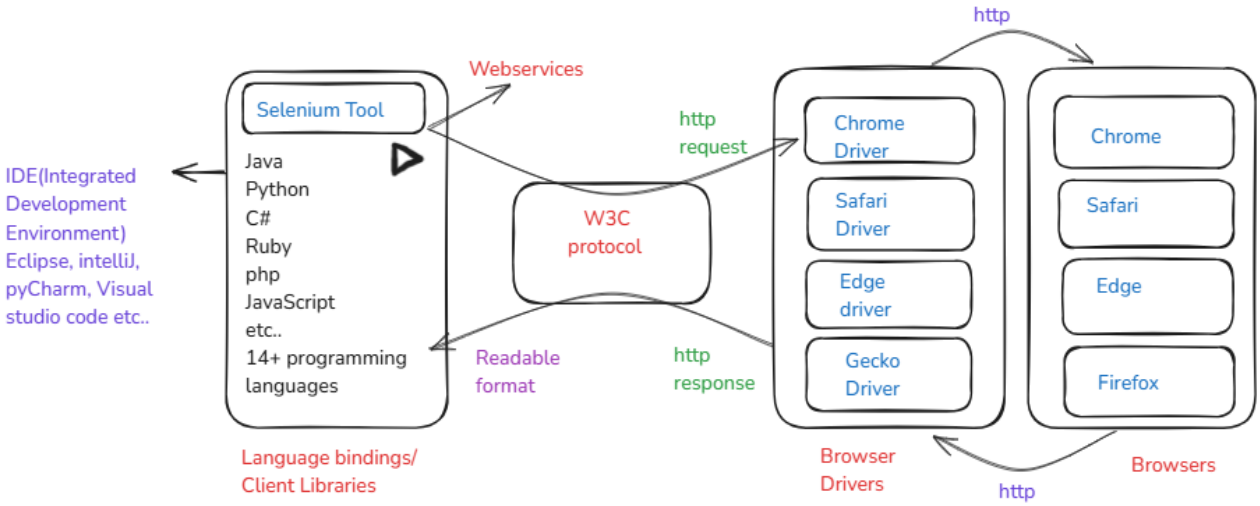
**Disadvantages of Selenium**

- It supports only web-based applications.
- No customer Support.
- We cannot automate Captcha, OTP and animations.

# SELENIUM ARCHITECTURE




Till Selenium 3.8 version




Selenium 4 and above version

It is a client and Server Architecture. Client server architecture is all about sending the request and receiving the response. Selenium architecture has divided into 2 parts.

1. **Client side**
2. **Server side**

In the client side, we have a component called client libraries/Language bindings (nothing but programming languages). In the server side, we have browser drivers and browsers and in between we have protocol (Translating medium).

1. **Selenium Client Library:** This component provides language-specific bindings or APIs (java, Python, Ruby, etc. ) that allow users to write test scripts and interact with the WebDriver.
2. **JSON Wire Protocol over HTTP:** The JSON Wire Protocol is a standardized protocol used for communication between the Selenium Client Library and the Browser Drivers. It defines a set of commands and responses in JSON format exchanged over HTTP requests.
3. **Browser Drivers:** These are executable files that establish a communication channel between the WebDriver and the actual web browsers such as Chrome, Firefox, Safari, etc. Each browser requires its specific driver (e.g., ChromeDriver, GeckoDriver, etc.) to enable WebDriver to control and automate browser actions.
4. **Real Browsers:** These are web browsers like Google Chrome, Mozilla Firefox, Microsoft Edge, etc., where the actual testing and automation take place. The WebDriver interacts with these browsers through their respective browser drivers to perform actions like clicking elements, filling forms, navigating pages, and validating content.

At the client side, we have our Selenium tool which is used to covert manual test cases into automation Test Scripts. Selenium tool supports 14+ programming languages to write automation scripts on the IDE (Integrated Development Environment) such as Eclipse, IntelliJ, PyCharm, Visual studio code etc. After writing the scripts we should run the scripts. As soon as we run the scripts all the methods, variables and interfaces used to write the selenium commands will mapped to particular webservices and for that implementation is present in browser drivers. But the programming language which we used to write the selenium commands cannot be understood by the Browser drivers. So, we will send the selenium commands through a translating medium called JSON Wire Protocol.

JSON wire protocol converts selenium commands into https request because browsers can understand only http and request will be sent to browser drivers.

(Here directly we are not sending request to browsers because according to browsers, Selenium is 3rd party tool. Browsers don't want to expose all its services to Selenium). Browser drivers tries to understand the request as soon as the request comes. Then it takes the control over actual browsers and performs the actions. Here browser drivers contains only implementation but actions will be performed on the actual browsers. Once the actions are done, Browsers will send the http response to browser drivers and browser drivers send the response to JSON wire protocol. JSON wire protocol converts the http response into readable format and send it to Console. So, users can understand the response.

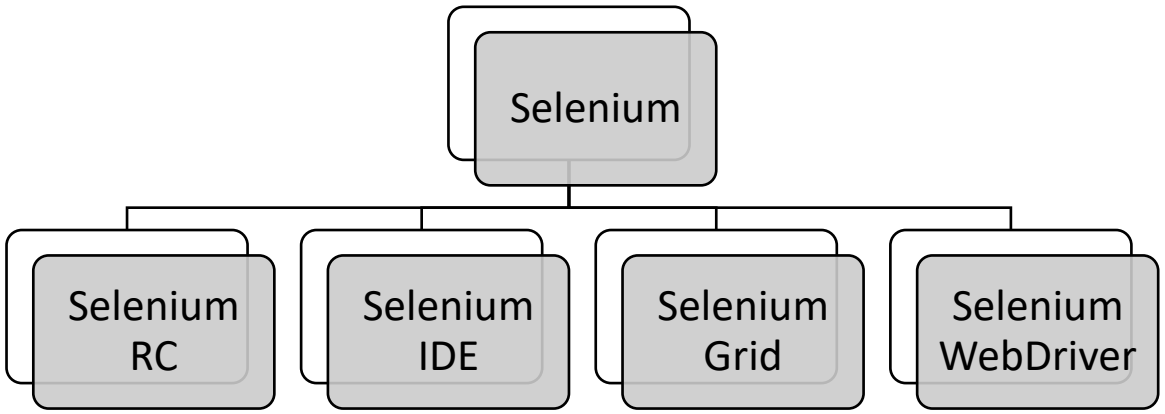
All the requests and responses are in the form of http.

This is all about the selenium architecture till selenium 3.8 and below version but from selenium 4 onwards JSON wire protocol is replaced with W3C protocol.

**Advantages of using W3C protocol:**

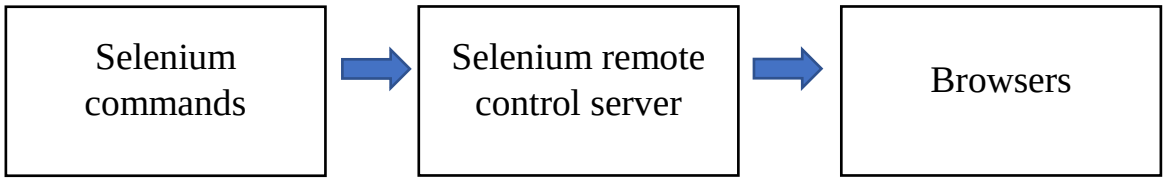
1. It provides inter web operability.
2. More secure.
3. Quick response.
4. More Efficient.

## SELENIUM COMPONENTS




1. **Selenium RC (Remote Control)-2004:**

- Used to write test automation scripts in various programming languages (Java, Python, c#, ..) to automate web applications.
- One needs to install a separate server called as Selenium Remote control server.




- This Server acts like a mediator between the selenium scripts and the browser.
- RC sever injects JavaScript program into the browser and then all the selenium commands are translated to JavaScript commands and then executes on Browser.

### Disadvantages

- Need to install a server separately.
- Selenium RC consumes more time.
- Performance is slow as RC injects JavaScript code into the server.

### NOTE

- Selenium RC is no longer in use and it is not supported.
- It has been deprecated in favour of Selenium WebDriver, which is more efficient and stable compared to RC.

**2. Selenium IDE (Integrated Development Environment):**

- Selenium IDE allows you to record interactions with a web page and then automatically generate test scripts based on those interactions.
- This makes it accessible for users who are not familiar with programming, as it can generate test scripts in various languages (e.g., Java, Python, JavaScript, etc.)
- It supports Chrome Browser, Firefox browser and Edge as well.

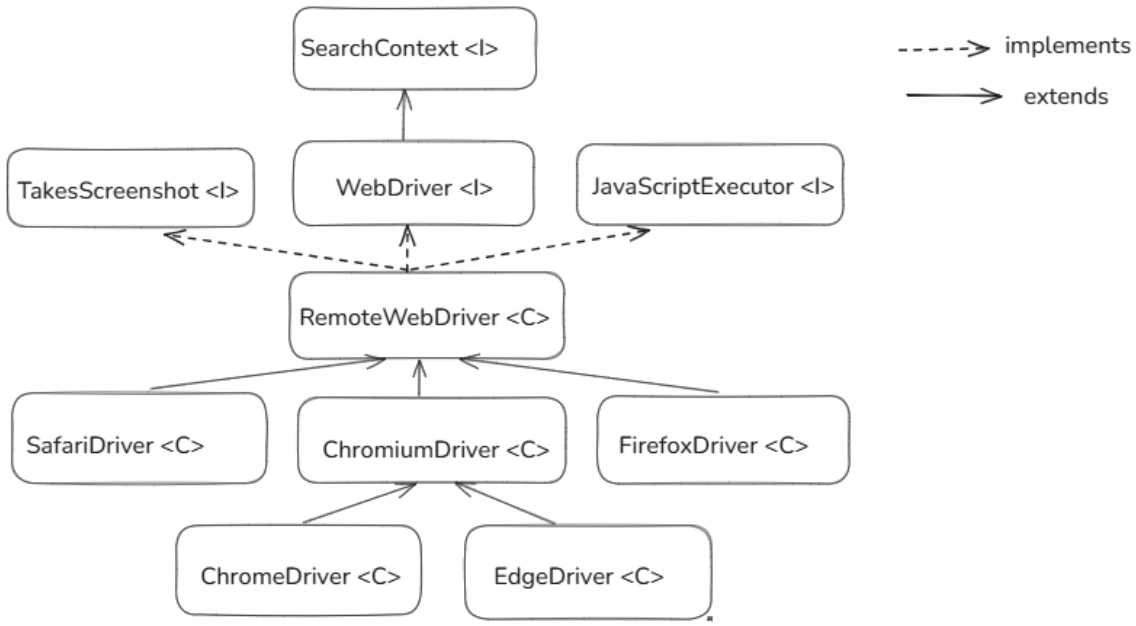
### Disadvantages

- Cannot automate complex scenarios.
- Cannot perform Data-driven Testing.
- Supports only few browsers.

3. **Selenium Grid**
   - It is used to run test scripts on multiple machines from a central point.
   - Selenium Grid is a powerful tool for parallel test execution, enabling you to test your application across multiple browsers, operating systems, and configurations simultaneously.
   - It is designed to speed up the testing process by distributing the execution of tests across different environments.
4. **Selenium WebDriver**
   - This is the most important component of Selenium Tool's Suite.
   - This is simple and robust.
   - This drives the browser effectively.
   - Test Scripts can be developed in any of the programming language and can be executed directly in different browsers.

## SELENIUM WEBDRIVER ARCHITECTURE (with respect to Java)

It is also known as Coding-Level Architecture.




**SearchContext <I>:**

It provides some mechanism to search element in the webpages

It provides 2 abstract methods

1. findElement()  2. findElements()

**WebDriver <I>:**

It provides some mechanism to perform browser related actions.

[Opening, closing, maximizing, minimizing, navigating to browser etc]

It provides 11 abstract methods+2 inherited methods.

**TakesScreenshot <I>:**

It is an interface which provides some mechanism to take screenshot of an entire webpage.

It provides 1 abstract method

1. getScreenshotAs()

**JavascriptExecutor <I>:**

It is an interface which provides the mechanism to write the code in browser

understandable language.

It provides 2 abstract methods

1. executeScript()

2. executeAsyncScript()

**NOTE**

All these methods implementation is given in RemoteWebDriver class. Respective browser specific classes will extend RemoteWebDriver class.

[Respective browsers means ChromeDriver, EdgeDriver, FirefoxDriver, SafariDriver classes, etc will extends RemoteWebDriver class].

## INSTALLATION OF SELENIUM

1. In eclipse, create a new project named “Basic_Selenium”.
2. Open the browser, search for “seleniumdev” in the page, click on “downloads” in top navigation bar.
3. Scroll down to “Previous releases” and click on 4.25.0 version.
4. Click on 4.25.0 jar file.
5. Once after it is downloaded, open eclipse, right click on “selenium” project.

6. Click on “build path”→configure build path.
7. Click on libraries→add external jar file button→search for selenium 4.25.0 is downloads→click on “open”.
8. Click on “apply”, “apply and close”. Now, selenium is installed properly.
9. Now, we can write selenium code of the project.