

Organizer:



Host:



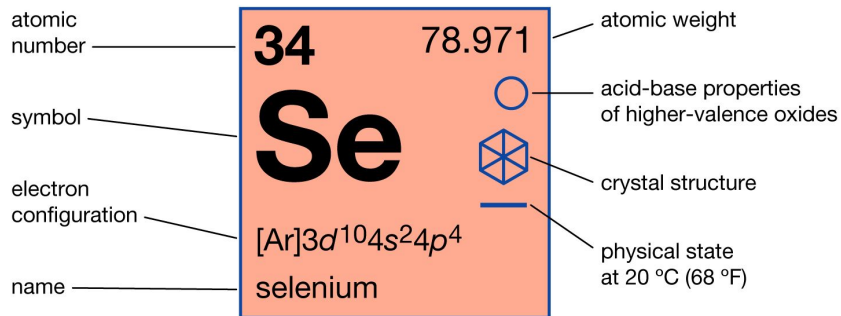
Road to Selenium 5

Boni García

Associate Professor, Universidad Carlos III de Madrid

What is Selenium?

Selenium



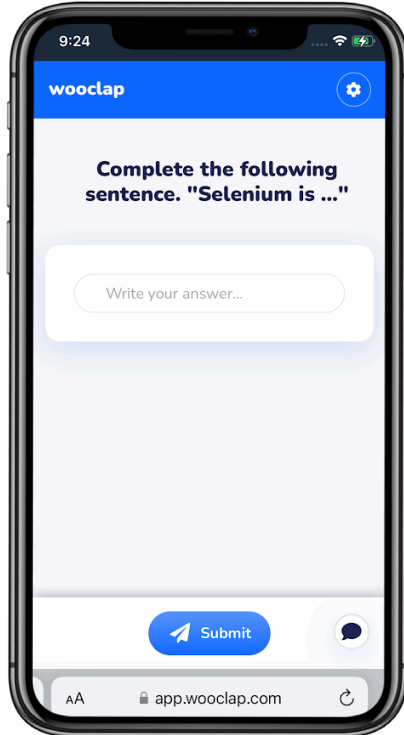
| | |
|---|---|
|  Other nonmetals |  Solid |
|  Hexagonal |  Strongly acidic |

What is Selenium?

(for software qa/devs)



What is Selenium?



<https://app.wooclap.com/IEDBHR>

What is Selenium?



- Selenium WebDriver (often known as simply **Selenium**) is a multilanguage **browser automation library**



<https://selenium.dev/>

- Maintained by the Selenium project since 2004
- Languages: officially supported in Java, JavaScript, Python, .Net, and Ruby



- Browsers: any browser with a driver compliant with the **W3C WebDriver** protocol



What is Selenium?



- Current Selenium stable version: **4.25** (released on September 23)

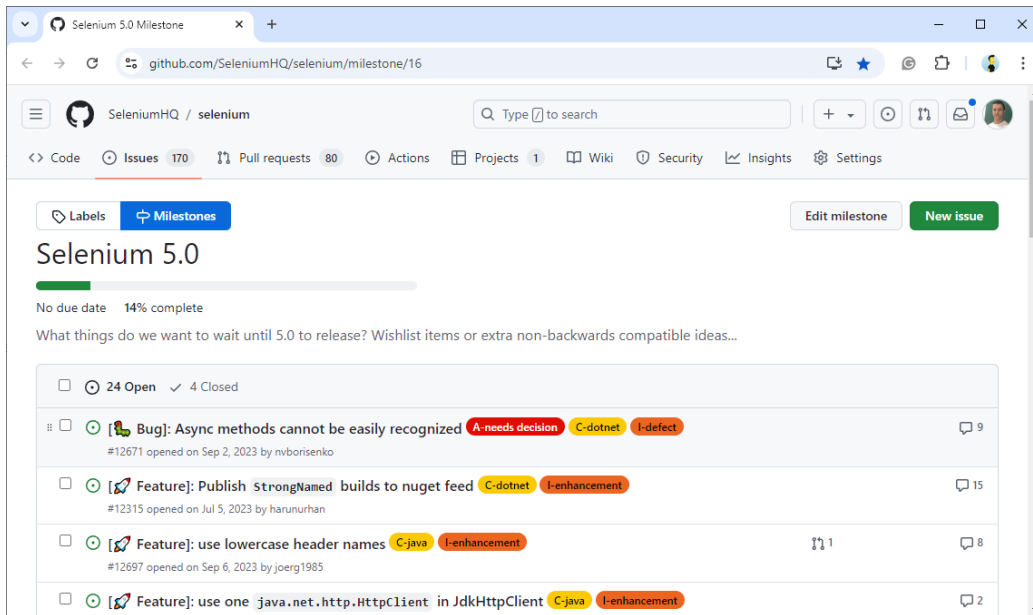


<https://www.selenium.dev/blog/2024/selenium-4-25-released/>

What is Selenium?





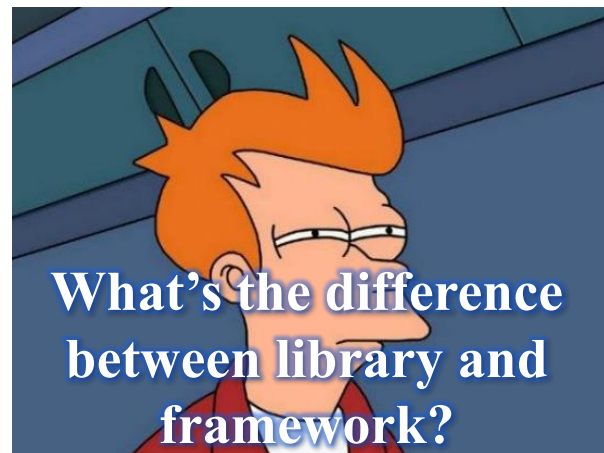
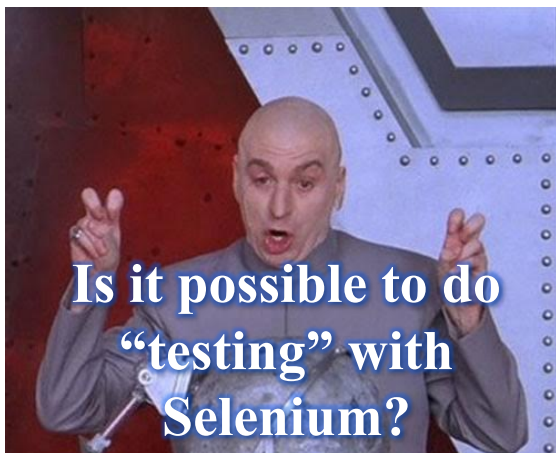
- Next major release (**Selenium 5**) is currently in development



<https://github.com/SeleniumHQ/selenium/milestone/16>

What is NOT Selenium?

- Selenium is NOT a testing framework 
- Selenium is NOT a testing library 

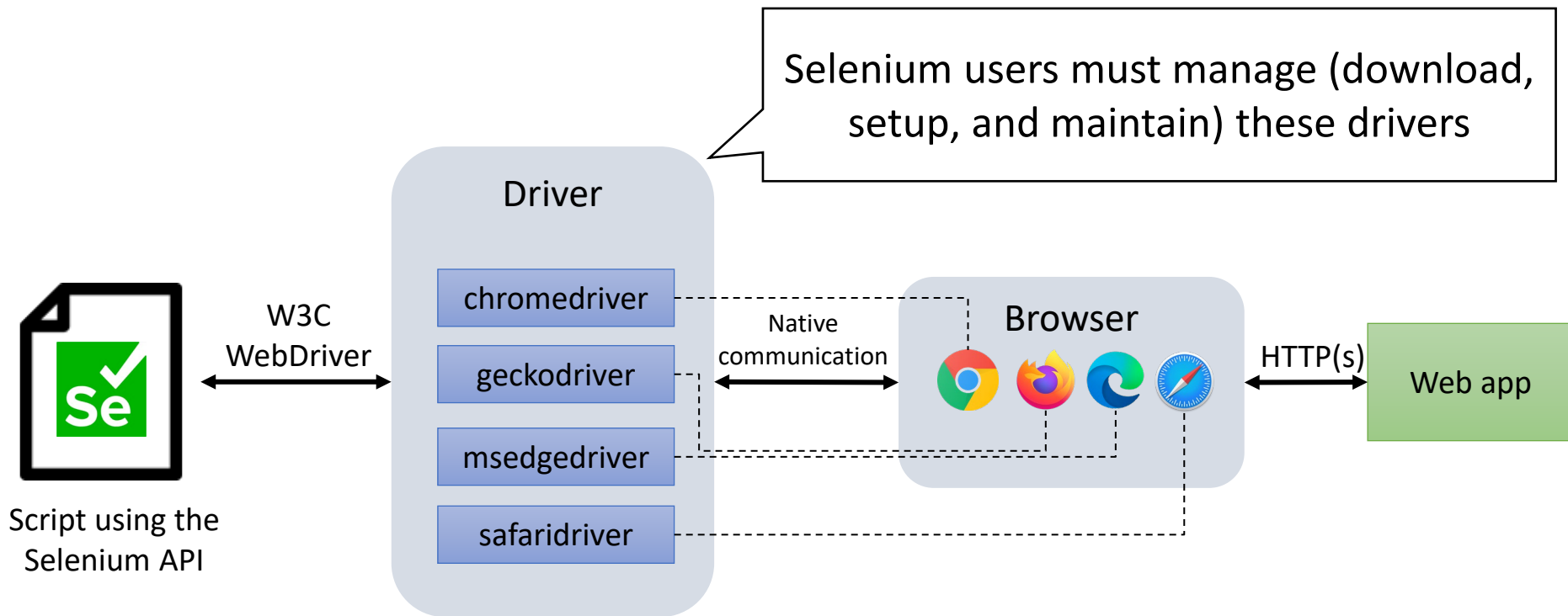


Library vs. Framework

- A **library** is a collection of code that developers can call using an API to solve a given problem
- A **framework** is a library that provides a foundational structure for developing software applications



Selenium Architecture



Hello World (Selenium 3)



```
class ChromeManualTest {  
  
    WebDriver driver;  
  
    @BeforeAll  
    static void setupClass() {  
        System.setProperty("webdriver.chrome.driver", "/path/to/chromedriver");  
    }  
  
    @BeforeEach  
    void setup() {  
        driver = new ChromeDriver();  
    }  
  
    @Test  
    void test() {  
        driver.get("https://bonigarcia.dev/selenium-webdriver-java/");  
        String title = driver.getTitle();  
        assertThat(title).contains("Selenium WebDriver");  
    }  
  
    @AfterEach  
    void teardown() {  
        driver.quit();  
    }  
  
}
```

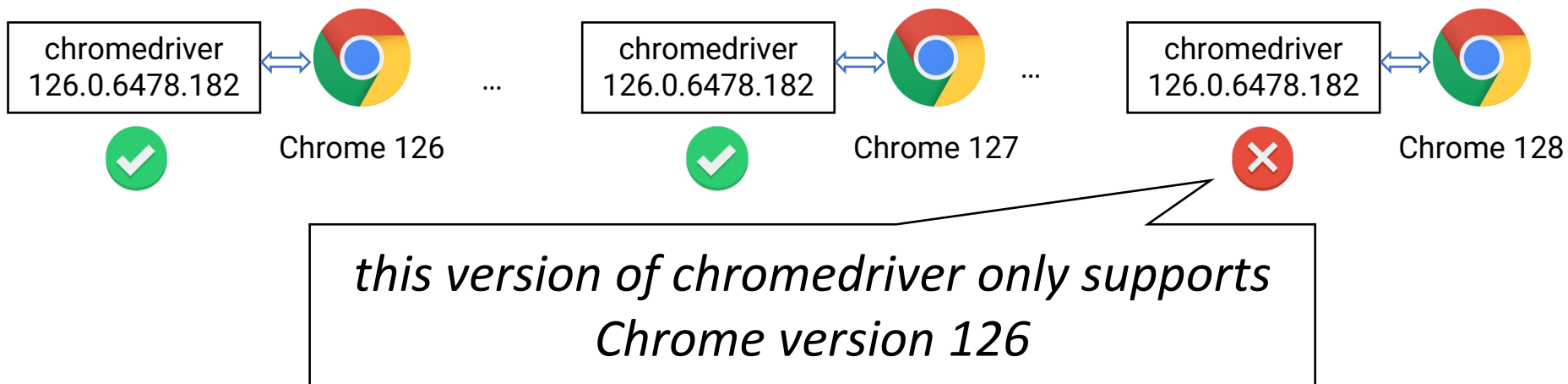
<https://github.com/bonigarcia/selenium-examples>



AssertJ

Driver Management

- Modern web browsers are ***evergreen***



Automated Driver Management



WebDriverManager 

<https://bonigarcia.dev/webdrivermanager/>

“ *Automated driver management and other helper features for Selenium WebDriver in Java* ”

Hello World (Selenium 4)



```
class ChromeWdmTest {  
  
    WebDriver driver;  
  
    @BeforeAll  
    static void setupClass() {  
        WebDriverManager.chromedriver().setup();  
    }  
  
    @BeforeEach  
    void setup() {  
        driver = new ChromeDriver();  
    }  
  
    @Test  
    void test() {  
        driver.get("https://bonigarcia.dev/selenium-webdriver-java/");  
        String title = driver.getTitle();  
        assertThat(title).contains("Selenium WebDriver");  
    }  
  
    @AfterEach  
    void teardown() {  
        driver.quit();  
    }  
  
}
```

<https://github.com/bonigarcia/selenium-examples>



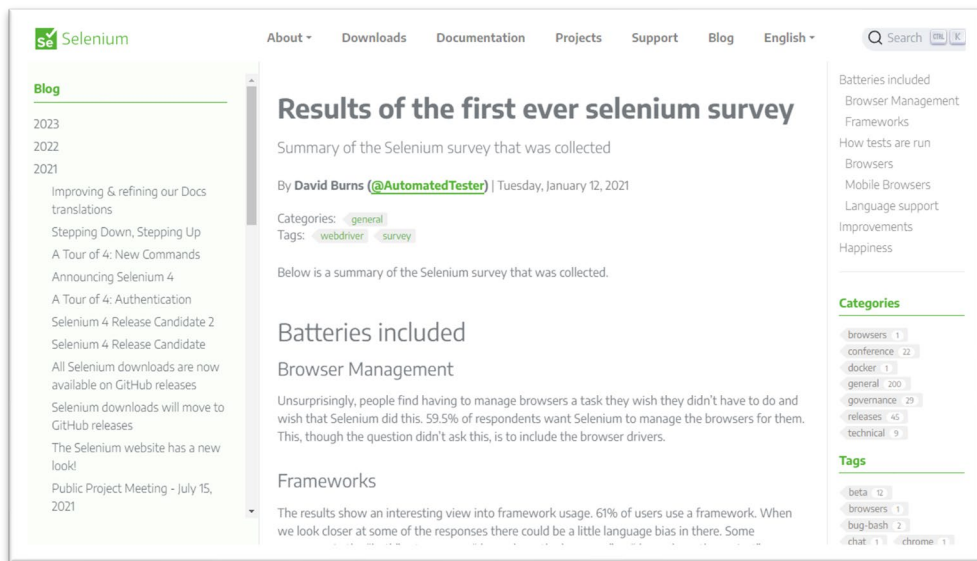
AssertJ

WebDriverManager 

Automated Driver Management



- In 2021, the Selenium project surveyed its users:



Selenium users
wanted *batteries*
included

<https://www.selenium.dev/blog/2021/selenium-survey-results/>

Selenium Manager

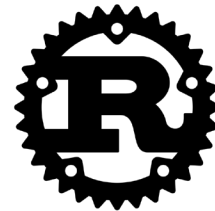


- I become a Selenium committer on August 2022



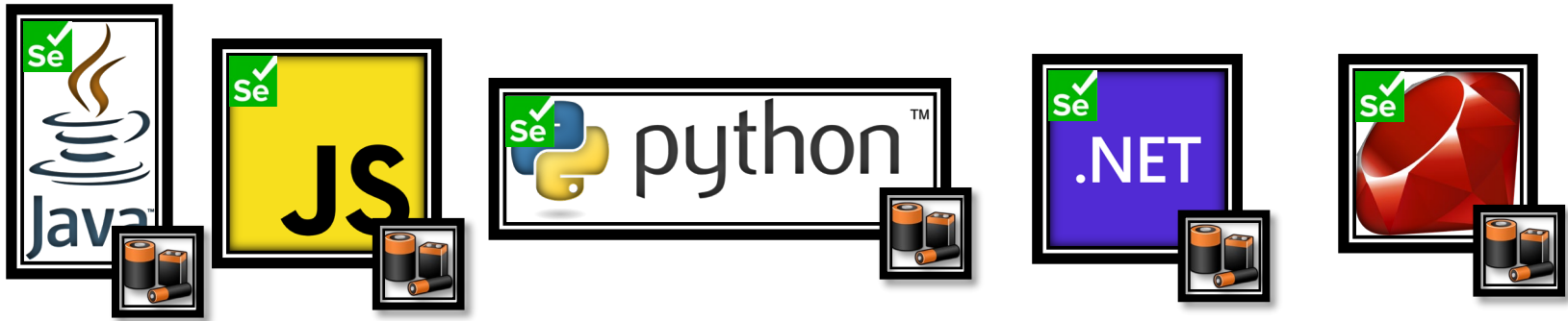
Selenium Manager

Selenium Manager is
a **CLI tool**
implemented in Rust



Selenium Manager

- Currently, each Selenium release is shipped with Selenium Manager



Hello World (Selenium 5)



```
class ChromeBasicTest {  
  
    WebDriver driver;  
  
    @BeforeEach  
    void setup() {  
        driver = new ChromeDriver();  
    }  
  
    @Test  
    void test() {  
        driver.get("https://bonigarcia.dev/selenium-webdriver-java/");  
        String title = driver.getTitle();  
        assertThat(title).contains("Selenium WebDriver");  
    }  
  
    @AfterEach  
    void teardown() {  
        driver.quit();  
    }  
  
}
```



AssertJ

<https://github.com/bonigarcia/selenium-examples>

Automated Browser Management



```
class FirefoxBasicTest {  
  
    WebDriver driver;  
  
    @BeforeEach  
    void setup() {  
        driver = new FirefoxDriver();  
    }  
  
    @Test  
    void test() {  
        driver.get("https://bonigarcia.dev/selenium-webdriver-java/");  
        String title = driver.getTitle();  
        assertThat(title).contains("Selenium WebDriver");  
    }  
  
    @AfterEach  
    void teardown() {  
        driver.quit();  
    }  
  
}
```

What happens if
the local browser is
not available?

<https://github.com/bonigarcia/selenium-examples>

Automated Browser Management

```
class ChromeVersionTest {  
  
    WebDriver driver;  
  
    @BeforeEach  
    void setup() {  
        ChromeOptions options = new ChromeOptions();  
        options.setBrowserVersion("beta");  
        driver = new ChromeDriver(options);  
    }  
  
    @Test  
    void test() {  
        driver.get("https://bonigarcia.dev/selenium-webdriver-java/");  
        String title = driver.getTitle();  
        assertThat(title).contains("Selenium WebDriver");  
    }  
  
    @AfterEach  
    void teardown() {  
        driver.quit();  
    }  
  
}
```

Specific browser versions
(including "beta", "dev",
"canary", "stable", or "esr")

<https://github.com/bonigarcia/selenium-examples>

Selenium Manager



- Another uses of Selenium Manager include:
 - Advanced configuration (with envs or global configuration file)
 - As a standalone CLI tool

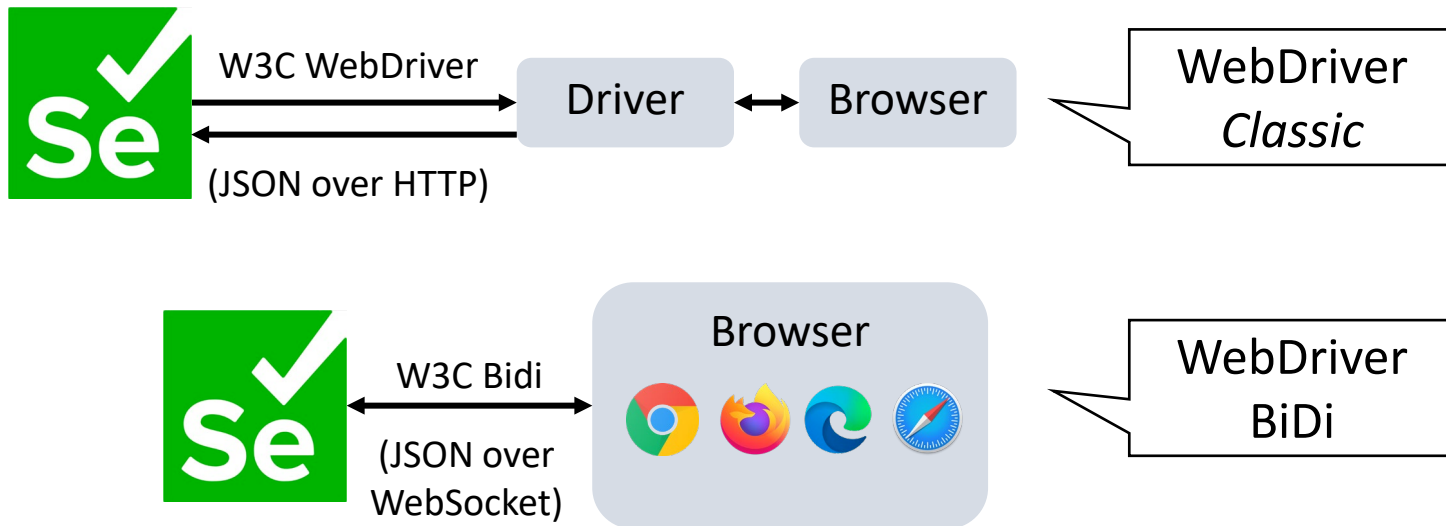


Selenium Manager

https://www.selenium.dev/documentation/selenium_manager/

WebDriver BiDi

- W3C WebDriver is evolving to a new specification called **W3C BiDi** (*BiDirectional*)



<https://w3c.github.io/webdriver-bidi/>

- WebDriver BiDi features:
 - Bidirectional communication using a WebSocket
 - Event-driven architecture (e.g., for log gathering)
 - Support for modern web features (e.g., network interception)
- WebDriver BiDi modules:
 - Browsing context
 - Actions
 - Scripting
 - Logging
 - Network

<https://www.selenium.dev/documentation/webdriver/bidi/w3c/>

WebDriver BiDi

- Some of the WebDriver BiDi features are already available in Selenium 4

```
@BeforeEach
void setup() {
    ChromeOptions options = new ChromeOptions();
    options.enableBiDi();
    driver = new ChromeDriver(options);
}
```



```
@BeforeEach
void setup() {
    FirefoxOptions options = new FirefoxOptions();
    options.enableBiDi();
    driver = new FirefoxDriver(options);
}
```



```
@BeforeEach
void setup() {
    EdgeOptions options = new EdgeOptions();
    options.enableBiDi();
    driver = new EdgeDriver(options);
}
```



To use WebDriver BiDi in Selenium, first we need to enable it using browser options

WebDriver BiDi

Hands-On Selenium
WebDriver with Java

Practice site

Console logs

This page makes call to JavaScript's console (log, info, warn, error).

Copyright © 2021-2024 [Boni García](#)

7 messages

- 4 user messages
- 4 errors
- 1 warning
- 2 info
- No verbose

This a call to 'console.log' console-logs.html:54

This a call to 'console.info' console-logs.html:55

▶ This a call to 'console.warn' console-logs.html:56

▶ This a call to 'console.error' console-logs.html:57

Uncaught Error: This a forced error at console-logs.html:58:11

<https://bonigarcia.dev/selenium-webdriver-java/console-logs.html>

WebDriver BiDi



```
@Test
void test() {
    List<GenericLogEntry> logs = new ArrayList<>();
    try (LogInspector logInspector = new LogInspector(driver)) {
        logInspector.onGenericLog(logs::add);
        logInspector.onConsoleEntry(logs::add);
        logInspector.onJavaScriptException(logs::add);
    }

    driver.get(
        "https://bonigarcia.dev/selenium-webdriver-java/console-logs.html");

    new WebDriverWait(driver, Duration.ofSeconds(5))
        .until(_d -> logs.size() > 3);

    for (GenericLogEntry log : logs) {
        System.out.println(log.getText());
    }
}
```

<https://github.com/bonigarcia/selenium-examples>

WebDriver BiDi



```
class ChromeBidiNetworkTest {

    WebDriver driver;

    @BeforeEach
    void setup() {
        ChromeOptions options = new ChromeOptions();
        options.enableBiDi();
        driver = new ChromeDriver(options);
    }

    @Test
    void test() throws Exception {
        try (Network network = new Network(driver)) {
            CompletableFuture<ResponseDetails> future = new CompletableFuture<>();
            network.onResponseCompleted(future::complete);
            driver.get("https://bonigarcia.dev/selenium-webdriver-java/");
            ResponseDetails response = future.get(5, TimeUnit.SECONDS);
            assertThat(response.getRequest().getMethod()).isEqualTo("GET");
            assertThat(response.getResponseData().getStatus()).isEqualTo(200);
        }
    }

    @AfterEach
    void teardown() {
        driver.quit();
    }
}
```

Work in progress

<https://github.com/SeleniumHQ/selenium/issues/13993>

Selenium Ecosystem



- Tools (e.g., testing frameworks) based on Selenium:



- WebDriver ecosystem:



- WebDriver BiDi ecosystem:



<https://www.selenium.dev/ecosystem/>

Thank You!

Any questions?

boni.garcia@uc3m.es