public static ThreadLocal<WebDriver> *threadDriver* = new ThreadLocal<WebDriver>();

explaination –

ThreadLocal is a Java class that provides thread-local variables.

Each thread accessing such a variable has its own, independently initialized copy of the variable. This is particularly useful in multi-threaded environments where you want to avoid shared state between threads.

In this context, threadDriver ensures that each thread has its own instance of WebDriver, which is essential for running parallel tests in a web automation framework.

By using ThreadLocal, the code avoids potential issues with concurrent access to a shared WebDriver instance, which could lead to unpredictable behavior and test failures.

The threadDriver variable is declared as static, meaning it is associated with the class LocalDriverManager itself rather than any particular instance of the class. This allows it to be accessed globally within the application, ensuring that the WebDriver instance is available to any thread that needs it.

Can you explain how to properly initialize and use the `WebDriver` instance in a multi-threaded test setup?

To properly initialize and use the WebDriver instance in a multi-threaded test setup, you can use the ThreadLocal class to ensure that each thread has its own instance of WebDriver. This avoids issues with concurrent access to a shared WebDriver instance. Here is a step-by-step explanation and code example:

1. Define a ThreadLocal variable for WebDriver: This ensures that each thread has its own instance of WebDriver.

```
public class LocalDriverManager {
  public static ThreadLocal<WebDriver> threadDriver = new ThreadLocal<WebDriver>();

  public static WebDriver getDriver() {
    return threadDriver.get();
  }

  public static void setWebDriver(final WebDriver driver) {
    threadDriver.set(driver);
  }
}
```

2. Initialize the WebDriver instance in each thread: In your test setup, initialize the WebDriver instance and set it using the LocalDriverManager.

```
public class TestSetup {
  public void initializeDriver() {
    WebDriver driver = new ChromeDriver(); // or any other WebDriver implementation
    LocalDriverManager.setWebDriver(driver);
  }
}
```

3. Use the WebDriver instance in your tests: Retrieve the WebDriver instance from LocalDriverManager in your test methods.

```
public class SampleTest {
  @Test
  public void testMethod() {
    WebDriver driver = LocalDriverManager.getDriver();
    driver.get("https://example.com");
    // Perform test actions
  }
}
```

4. Clean up the WebDriver instance after tests: Ensure that the WebDriver instance is properly closed after the test execution to avoid resource leaks.

```
public class TestTeardown {
  public void cleanupDriver() {
    WebDriver driver = LocalDriverManager.getDriver();
    if (driver != null) {
      driver.quit();
      LocalDriverManager.setWebDriver(null);
    }
  }
}
```

By following these steps, you can ensure that each thread in your multi-threaded test setup has its own WebDriver instance, avoiding issues with shared state and ensuring thread safety.

How can I implement parallel test execution using this setup?

Explaination-

To implement parallel test execution using the provided setup, you need to ensure that each test thread has its own instance of WebDriver.

This can be achieved using the ThreadLocal variable threadDriver in the LocalDriverManager class.

Additionally, you need to configure your test framework (e.g., TestNG) to run tests in parallel. Here are the steps to implement parallel test execution:

- Ensure ThreadLocal WebDriver Setup: The LocalDriverManager class already uses ThreadLocal to manage WebDriver instances for each thread.
- Configure TestNG for Parallel Execution: Update your testng.xml file to specify parallel execution. You can set the parallel attribute to methods, tests, or classes depending on your requirement, and specify the thread-count.
- Initialize and Clean Up WebDriver Instances: Ensure that each test initializes and cleans up its own WebDriver instance.

Here is an example configuration and code setup:

LocalDriverManager.java

Ensure the LocalDriverManager class is correctly managing WebDriver instances using ThreadLocal.

```
package com.chevron.config;


import org.openqa.selenium.WebDriver;

import org.openqa.selenium.remote.RemoteWebDriver;

import com.relevantcodes.extentreports.ExtentTest;


public class LocalDriverManager {


    public static ThreadLocal<WebDriver> threadDriver = new ThreadLocal<WebDriver>();
```

```
    public static ThreadLocal<RemoteWebDriver> dr = new
ThreadLocal<RemoteWebDriver>();


    public static WebDriver getDriver() {
        return threadDriver.get();
    }


    public static void setWebDriver(final RemoteWebDriver driver) {
        dr.set(driver);
        threadDriver.set(dr.get());
    }


    public static void setLocalDriver(final WebDriver driver) {
        threadDriver.set(driver);
    }


    private static ThreadLocal<ExtentTest> logger = new ThreadLocal<ExtentTest>();


    public static ExtentTest getLogger() {
        return logger.get();
    }


    public static void setLogger(final ExtentTest test) {
        logger.set(test);
    }
}
```

TestSetup.java

Initialize the WebDriver instance for each test.

package com.chevron.config;

```
import org.openqa.selenium.WebDriver;
import org.openqa.selenium.chrome.ChromeDriver;

public class TestSetup {

    public void initializeDriver() {
        WebDriver driver = new ChromeDriver(); // or any other WebDriver implementation
        LocalDriverManager.setLocalDriver(driver);
    }
}
```

TestTeardown.java

Clean up the WebDriver instance after each test.

```
package com.chevron.config;

import org.openqa.selenium.WebDriver;

public class TestTeardown {

    public void cleanupDriver() {
        WebDriver driver = LocalDriverManager.getDriver();
        if (driver != null) {
            driver.quit();
            LocalDriverManager.setLocalDriver(null);
        }
    }
}
```

testng.xml

Configure TestNG to run tests in parallel.

```
<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">
<suite name="ParallelTestSuite" parallel="methods" thread-count="5">
  <test name="Test1">
    <classes>
      <class name="com.chevron.tests.SampleTest"/>
    </classes>
  </test>
</suite>
```

SampleTest.java

Example test class using the WebDriver instance.

```
package com.chevron.tests;

import org.openqa.selenium.WebDriver;
import org.testng.annotations.AfterMethod;
import org.testng.annotations.BeforeMethod;
import org.testng.annotations.Test;
import com.chevron.config.LocalDriverManager;
import com.chevron.config.TestSetup;
import com.chevron.config.TestTeardown;

public class SampleTest {

  TestSetup setup = new TestSetup();
  TestTeardown teardown = new TestTeardown();

  @BeforeMethod
  public void setUp() {
    setup.initializeDriver();
```

```
    }

    @Test
    public void testMethod() {
        WebDriver driver = LocalDriverManager.getDriver();
        driver.get("https://example.com");
        // Perform test actions
    }

    @AfterMethod
    public void tearDown() {
        teardown.cleanupDriver();
    }
}
```

By following these steps, you can implement parallel test execution using the provided setup. Each test thread will have its own WebDriver instance, ensuring thread safety and avoiding shared state issues.

What are some best practices for managing WebDriver instances in a large test suite?

Managing `WebDriver` instances in a large test suite can be challenging, especially when dealing with parallel execution and ensuring thread safety. Here are some best practices to follow:

1. **Use `ThreadLocal` for WebDriver Instances:**

   Ensure each thread has its own instance of `WebDriver` to avoid concurrency issues.

   ```java
   public class LocalDriverManager {
       private static ThreadLocal<WebDriver> threadDriver = new ThreadLocal<>();
```

```
    public static WebDriver getDriver() {
        return threadDriver.get();
    }

    public static void setWebDriver(WebDriver driver) {
        threadDriver.set(driver);
    }

    public static void removeDriver() {
        threadDriver.remove();
    }
}
```

2. **Initialize WebDriver in a Thread-Safe Manner:**

   Initialize the `WebDriver` instance in each test setup method.

```java
public class TestSetup {
    public void initializeDriver() {
        WebDriver driver = new ChromeDriver(); // or any other WebDriver implementation
        LocalDriverManager.setWebDriver(driver);
    }
}
```

3. **Clean Up WebDriver Instances:**

   Ensure that the `WebDriver` instance is properly closed and removed after test execution to avoid memory leaks.

```java
```

```
public class TestTeardown {
    public void cleanupDriver() {
        WebDriver driver = LocalDriverManager.getDriver();
        if (driver != null) {
            driver.quit();
            LocalDriverManager.removeDriver();
        }
    }
}
```

4. **Configure Parallel Execution in Test Framework:**

   Configure your test framework (e.g., TestNG) to run tests in parallel.

   ```xml
   <!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">
   <suite name="ParallelTestSuite" parallel="methods" thread-count="5">
       <test name="Test1">
           <classes>
               <class name="com.example.tests.SampleTest"/>
           </classes>
       </test>
   </suite>
   ```

5. **Use a Base Test Class:**

   Create a base test class to handle common setup and teardown logic.

   ```java
   public class BaseTest {
       @BeforeMethod
```

```
    public void setUp() {
        new TestSetup().initializeDriver();
    }

    @AfterMethod
    public void tearDown() {
        new TestTeardown().cleanupDriver();
    }
}
```

6. **Implement Logging and Reporting:**

   Use logging and reporting tools (e.g., ExtentReports) to capture test execution details.

```java
public class LocalDriverManager {
    private static ThreadLocal<ExtentTest> logger = new ThreadLocal<>();

    public static ExtentTest getLogger() {
        return logger.get();
    }

    public static void setLogger(ExtentTest test) {
        logger.set(test);
    }

    public static void removeLogger() {
        logger.remove();
    }
}
```

By following these best practices, you can manage `WebDriver` instances effectively in a large test suite, ensuring thread safety, proper resource management, and efficient parallel execution.

What tools can I use to manage WebDriver instances more effectively in my tests?

To manage `WebDriver` instances more effectively in your tests, you can use the following tools and libraries:

1. **Selenium Grid**: Allows you to run tests on different machines and browsers in parallel, improving test execution time and resource utilization.

2. **WebDriverManager**: A library that automates the management of WebDriver binaries, ensuring that you always have the correct version for your browser.

3. **TestNG**: A testing framework that supports parallel test execution and provides various annotations to manage test setup and teardown.

4. **ExtentReports**: A reporting library that provides detailed and visually appealing test reports, helping you track test execution and results.

5. **ThreadLocal**: A Java class that provides thread-local variables, ensuring that each thread has its own instance of `WebDriver`.

Here is an example of how to use some of these tools in your project:

WebDriverManager

```java
import io.github.bonigarcia.wdm.WebDriverManager;
import org.openqa.selenium.WebDriver;
import org.openqa.selenium.chrome.ChromeDriver;

public class TestSetup {
```

```
    public void initializeDriver() {
        WebDriverManager.chromedriver().setup();
        WebDriver driver = new ChromeDriver();
        LocalDriverManager.setLocalDriver(driver);
    }
}
```

TestNG Configuration

```xml
<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd">
<suite name="ParallelTestSuite" parallel="methods" thread-count="5">
    <test name="Test1">
        <classes>
            <class name="com.example.tests.SampleTest"/>
        </classes>
    </test>
</suite>
```

ExtentReports Integration

```java
import com.relevantcodes.extentreports.ExtentReports;
import com.relevantcodes.extentreports.ExtentTest;

public class LocalDriverManager {
    private static ThreadLocal<ExtentTest> logger = new ThreadLocal<>();
    private static ExtentReports extent = new ExtentReports("path/to/report.html");

    public static ExtentTest getLogger() {
        return logger.get();
```

```
    }

    public static void setLogger(ExtentTest test) {
        logger.set(test);
    }

    public static void removeLogger() {
        logger.remove();
    }

    public static void flushReports() {
        extent.flush();
    }
}
```

By using these tools, you can manage `WebDriver` instances more effectively, ensuring proper resource management, parallel execution, and detailed reporting.

JD

Chevron invites applications for an experienced Agile Scrum Master. As a Scrum Master for Compute and storage, you will facilitate and coordinate Agile Scrum processes including Kanban and SAFe, ensuring the team works collaboratively and efficiently to deliver high-quality solutions in a predictable cadence.

You will work closely with the product development team to ensure that the work progresses on schedule, within budget, and to the desired level of quality. Your primary role is to facilitate the Scrum process, maintain project timelines, remove obstacles, manage risks, and monitor progress of deliverables. Additionally, you will coach and mentor the team helping to create a culture of continuous improvement.

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Key Responsibilities

Responsibilities for this position may include but are not limited to:

• Facilitates Agile ceremonies and ensure the team is utilizing Scrum/SAFe ceremonies effectively to maximize value delivery.

• Manage and organize the team's Azure Dev Ops (ADO) kanban board and track the team backlog of features and epics.

• Communicate timelines, risks, mitigations and progress to stakeholders.

• Facilitate the identification and removal of impediments to the team’s progress and focus on eliminating waste and delays.

• Represent the team at broader planning and coordination sessions (e.g., Scrum of Scrums ceremony).

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