Testing using Selenium WebDriver and NUnit in C#

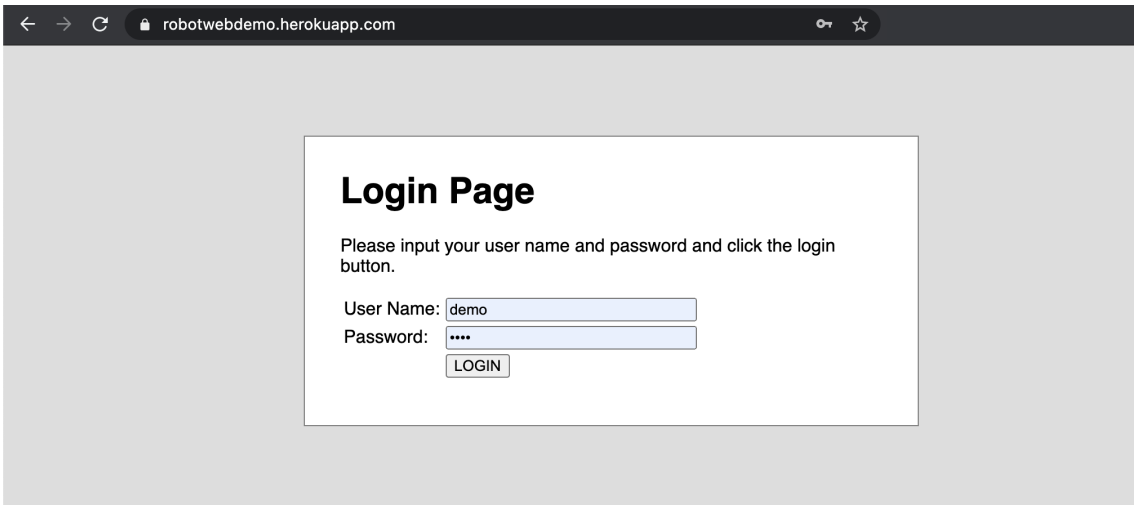
Overview

In this tutorial, we will create some UI tests using NUnit and Selenium WebDriver for browser automation.

> **Source-code for this tutorial**
>
> Code is available in GiHub; the repo contains some additional tests beyond the scope of this tutorial and some auxiliary scripts.

Description

Our target application is a simple website providing a login page that we aim to test using positive and negative test scenarios.



We start by creating a #C .NET project, with NUnit and Selenium WebDriver dependencies.

nunit_webdriver_tests.csproj

```
<Project Sdk="Microsoft.NET.Sdk">

  <PropertyGroup>
    <TargetFramework>net5.0</TargetFramework>

    <IsPackable>false</IsPackable>
  </PropertyGroup>

  <ItemGroup>
    <PackageReference Include="DotNetSeleniumExtras.PageObjects" Version="3.11.0" />
    <PackageReference Include="DotNetSeleniumExtras.PageObjects.Core" Version="3.12.0" />
    <PackageReference Include="NUnit" Version="3.13.1" />
    <PackageReference Include="NUnit.Console" Version="3.12.0" />
    <PackageReference Include="NUnit3TestAdapter" Version="3.16.1">
      <IncludeAssets>runtime; build; native; contentfiles; analyzers; buildtransitive</IncludeAssets>
      <PrivateAssets>all</PrivateAssets>
    </PackageReference>
    <PackageReference Include="Microsoft.NET.Test.Sdk" Version="16.5.0" />
    <PackageReference Include="Selenium.WebDriver" Version="3.141.0" />
  </ItemGroup>

</Project>
```

Before implementing the tests, we need to choose an approach for abstracting our website.

Interaction with the login page is abstracted using the page objects model. There's a object for the login page itself and another for the page containing the result.

Tests **may** be annotated with the "Requirement" property, if you wish to link the corresponding Test issue to an existing requirement/story issue in Jira.

The following code snippet shows two test scenarios: one for a successful login and another for an invalid login attempt due to incorrect credentials.

WebdemoTests.cs

```
using System;
using NUnit.Framework;
using OpenQA.Selenium;
using OpenQA.Selenium.Chrome;
using Webdemo.PageObjects;

namespace SeleniumWebdriver
{
    [TestFixture]
    public class WebdemoTests
    {
        private IWebDriver driver;

        [SetUp]
        public void SetupTest()
        {
            ChromeOptions options = new ChromeOptions();
            options.AddArgument("--no-sandbox"); // Bypass OS security model, to run in Docker
            options.AddArgument("--headless");
            driver = new ChromeDriver(options);
        }


        [TearDown]
        public void TeardownTest()
        {
            try
            {
                driver.Quit();
            }
            catch (Exception)
            {
                // Ignore errors if unable to close the browser
            }
        }

        [Test, Property("Requirement", "CALC-1195")]
        public void ValidLogin()
        {
            LoginPage loginPage = new LoginPage(driver).Open();
            LoginResultsPage loginResultsPage = loginPage.Login("demo", "mode");
            Assert.AreEqual(loginResultsPage.Title, "Welcome Page");
            Assert.IsTrue(loginResultsPage.Contains("Login succeeded"));
        }

        [Test, Property("Requirement", "CALC-1195")]
        public void InvalidLogin()
        {
            LoginPage loginPage = new LoginPage(driver).Open();
            LoginResultsPage loginResultsPage = loginPage.Login("demo", "invalid");
            Assert.AreEqual(loginResultsPage.Title, "Error Page");
            Assert.IsTrue(loginResultsPage.Contains("Login failed"));
        }

    }
}
```

Running the tests can be done using `dotnet` utility.

example of a Bash script to run the tests

```
dotnet test -s nunit.runsettings --filter WebdemoTests
```

We can specify a configuration file to fine-tune NUnit behaviour, such as the output directory for the automation results report.

nunit.runsettings

```
<?xml version="1.0" encoding="utf-8"?>
<RunSettings>
   <NUnit>
     <WorkDirectory>./TestResults</WorkDirectory>
     <TestOutputXml>./</TestOutputXml>
 </NUnit>
</RunSettings>
```

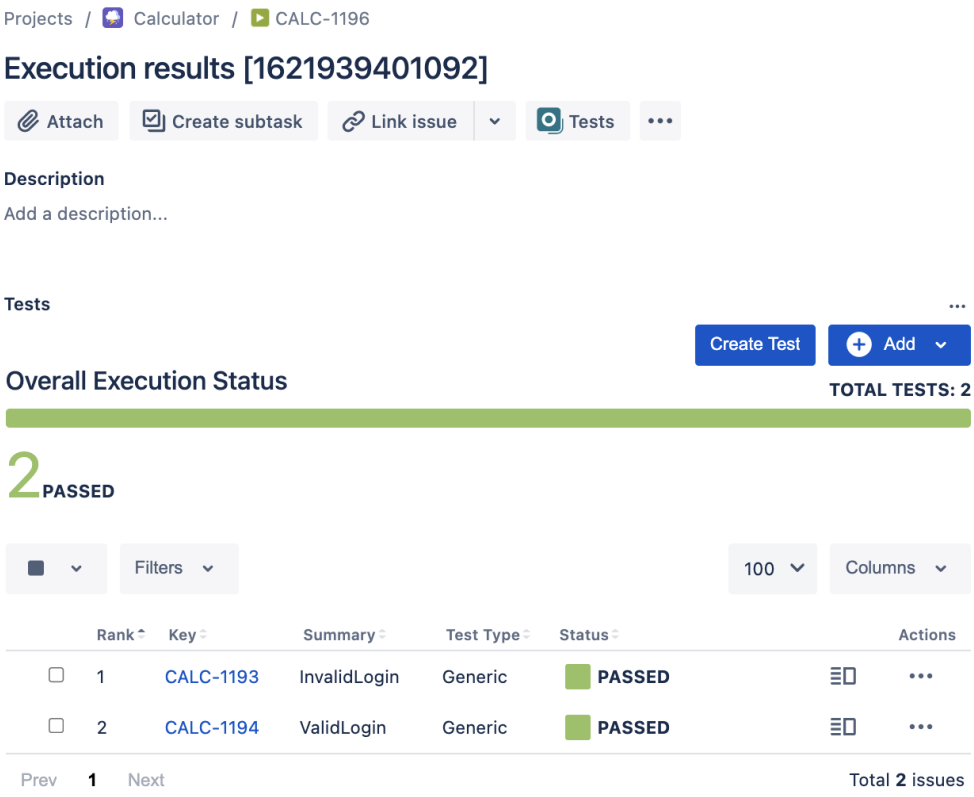
After successfully running the Test Case and generating the NUnit XML report (e.g., nunit_webdriver_tests.xml), it can be imported to Xray via a CI tool (e.g. Jenkins), or the REST API, or by using the **Xray - Import Execution Results** action within the Test Execution.

example of a Bash script to import results

```
#!/bin/bash
FILE="TestResults/nunit_webdriver_tests.xml"
PROJECT=CALC
TESTPLAN=""
BROWSER=""
token=$(curl -H "Content-Type: application/json" -X POST --data @"cloud_auth.json" https://xray.cloud.getxray.
app/api/v2/authenticate| tr -d '"')
curl -H "Content-Type: application/xml" -X POST -H "Authorization: Bearer $token"  --data @"$FILE"
"https://xray.cloud.getxray.app/api/v2/import/execution/nunit?
projectKey=$PROJECT&testPlanKey=$TESTPLAN&testEnvironments=$BROWSER"
```

example of cloud_auth.json used in this tutorial

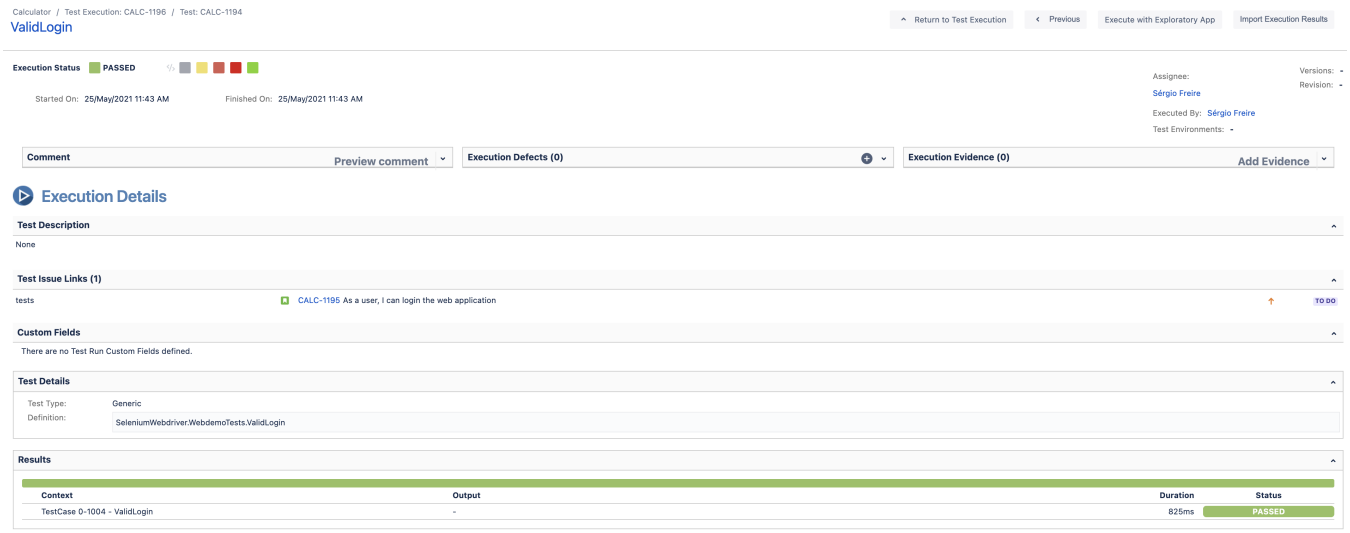
```
{ "client_id": "0000215FFD69FE4644728C72182E0000","client_secret":
"0000f8f22f500006a8684d7c18cd600002787d95e4da9f3bfb0af8f02ec0000" }
```



A Test Execution issue will be created in this case. The first time results are imported, Test issues are autoprovisioned; one per each NUnit test; in subsequent imports, results (i.e. Test Runs) are created for the already existing Tests so that these are reused and not duplicated.

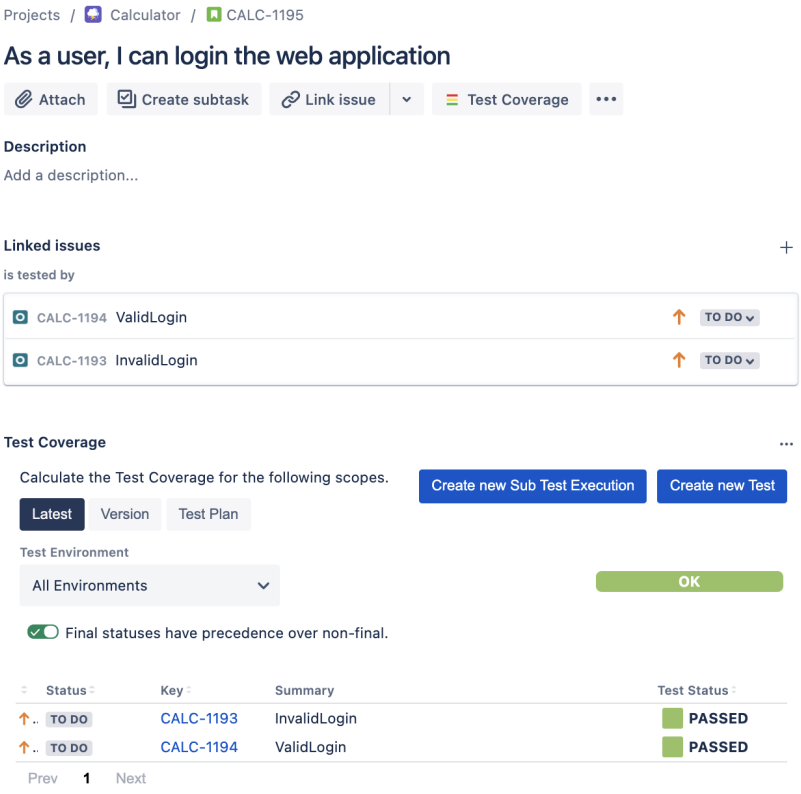
Each NUnit's test is mapped to a Generic Test in Jira, and the **Generic Test Definition** field contains the name of the namespace, class, and the method name that implements the test.

In the details of execution screen, we can see the Test Run, showing the overall result and also the duration of the Test.



In this case, we can also see that the Test was linked automatically to the existing user story (i.e. CALC-1195).

Therefore, in the Story issue screen we can track the impacts of the test results on the calculated coverage, which in this case shows our Story as being "OK" due to the passing tests.

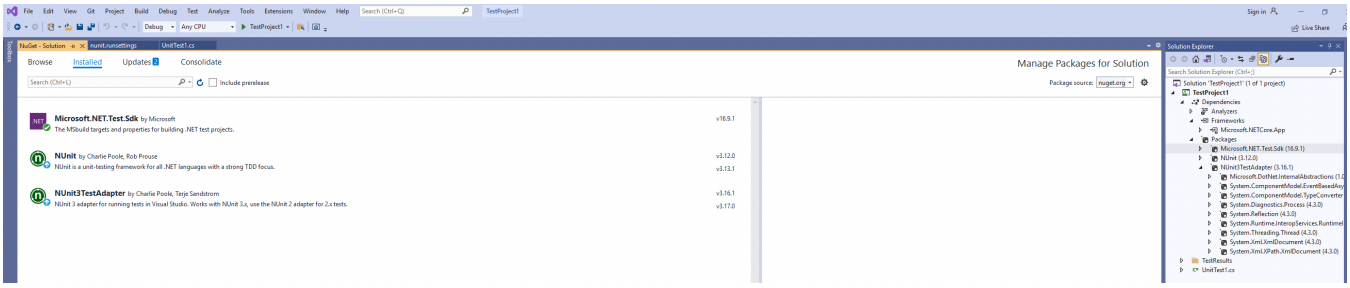


Tips

If you're using Visual Studio as your IDE, you need to have some dependencies/packages installed.

- NUnit
- NUnit3TestAdapter

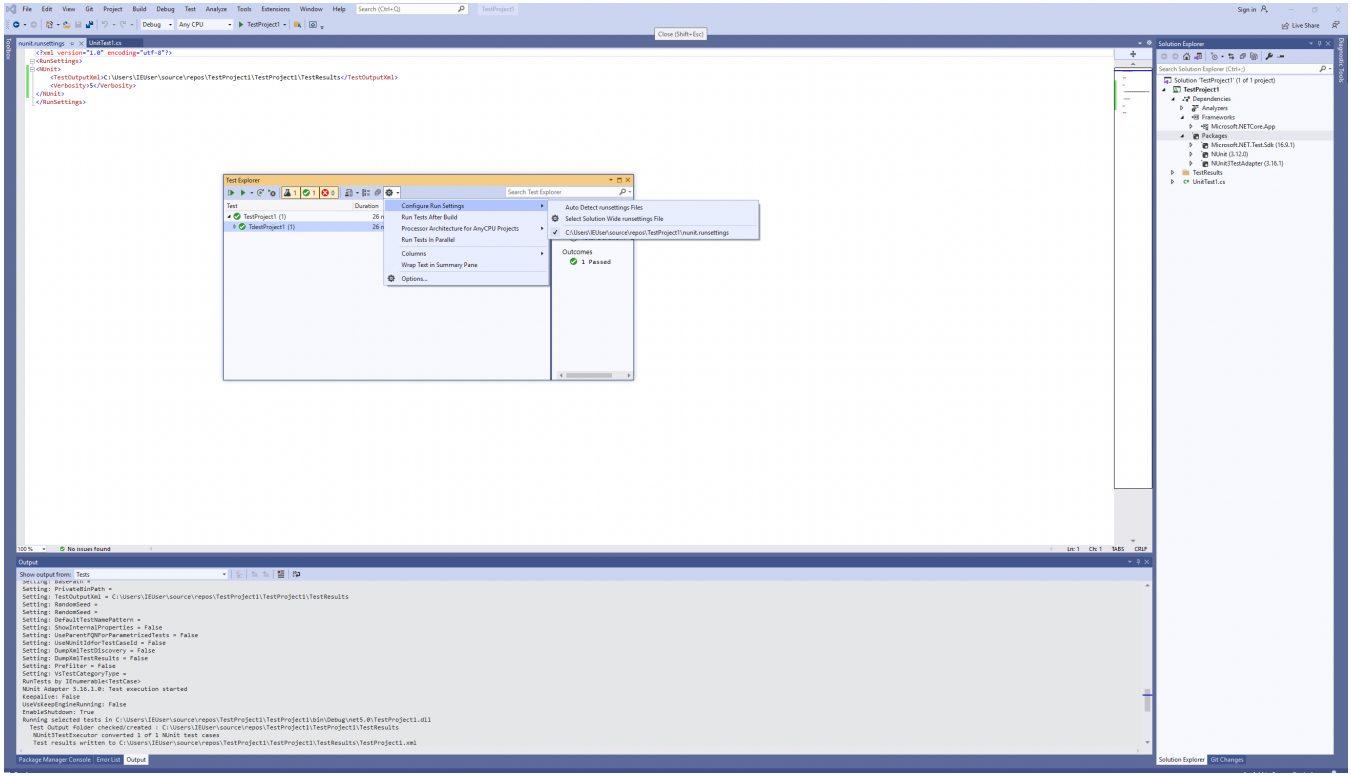
These can be installed from **Tools>NuGet Package Manager** (using the console or the manager's UI).



Then you can configure the Test Explorer to run the NUnit tests while at the same time producing a NUnit XML report.

nunit.runsettings

```
<?xml version="1.0" encoding="utf-8"?>
<RunSettings>
   <NUnit>
     <TestOutputXml>C:\TestResults</TestOutputXml>
 </NUnit>
</RunSettings>
```



References

- GitHub repository for this tutorial
- https://github.com/nunit/docs/wiki
- http://www.seleniumhq.org/docs/03_webdriver.jsp
- http://www.dotnetcatch.com/2016/11/23/selenium-with-net-core/
- http://toolsqa.wpengine.com/selenium-webdriver/c-sharp/iwebdriver-browser-commands-in-c-sharp/
- Configure unit tests by using a .runsettings file