Testing web applications using Playwright

What you'll learn

- How to define tests using Playwright-test
- Run the test and push the test report to Xray
- Validate that the test results are available in Jira

Source-code for this tutorial

- code is available in GitHub

Overview

Playwright is a recent browser automation tool that provides an alternative to Selenium.

Prerequisites

For this example we will use Playwright Test Runner, that accommodate the needs of the end-to-end testing. It does everything you would expect from the regular test runner.

Playwright Test Runner is still fairly new as you can see in the official documentation:

> Zero config cross-browser end-to-end testing for web apps. Browser automation with Playwright , Jest-like assertions and built-in support for TypeScript.
>
> Playwright test runner is available in preview and minor breaking changes could happen. We welcome your feedback to shape this towards 1.0.

If you want, you can use other runners (e.g. Jest, AVA, mocha).

What you need:

- Access to a demo site that you want to test
- Node.js environment with Playwright and Playwright Test Runner

Implementing tests

To start using the Playwright Test Runner, follow the Get Started documentation.

The test consists of validating the login feature (with valid and invalid credentials) of the demo site, for which we have created a page object that will represent the loginPage...

./models/Login.js

```
const config = require ("../config.json");

// models/Login.js
class LoginPage {

    constructor(page) {
      this.page = page;
    }

    async navigate() {
      await this.page.goto(config.endpoint);
    }

    async login(username, password) {
        await this.page.fill(config.username_field, username);
        await this.page.fill(config.password_field, password);
        await this.page.click(config.login_button);
    }

    async getInnerText(){
        return this.page.innerText("p");
    }

  }
  module.exports = { LoginPage };
```

...plus a configuration file where we have the identifiers that will match the elements in the page

config.json

```
{
    "endpoint" : "https://robotwebdemo.onrender.com/",
    "login_button" : "id=login_button",
    "password_field" :"input[id=\"password_field\"]",
    "username_field" : "input[id=\"username_field\"]"
}
```

Now we can define the test that will assert if the operation is successful or not.

login.spec.js

```
const { test, expect } = require('@playwright/test');
const { LoginPage } = require('./models/Login');

test.describe("Login validations", () => {

    test('Login with valid credentials', async({ page }) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode");
        const name = await loginPage.getInnerText();
        expect(name).toBe('Login succeeded. Now you can logout.');
    });

    test('Login with invalid credentials', async({ page }) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode1");
        const name = await loginPage.getInnerText();
        expect(name).toBe('Login failed. Invalid user name and/or
password.');
    });
})
```

The Playwright Test Runner provides a Jest like way of describing test scenarios, here you can see that it uses '*test, test.describe, expect*'.

These are simple tests that will validate the login functionality by accessing the demo site, inserting the username and password (in one test with valid credentials and in another with invalid credentials), clicking the login button and validating if the page returned is the one that matches your expectation.

For the below example we will do a small change to force a failure, so in the *`login.spec.js`* file remove "/or" from the expectation on the Test *' Login with invalid credentials'*, this is the end result:

login.spec.js

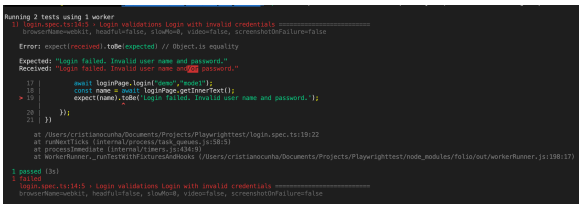
```
const { test, expect } = require('@playwright/test');
const { LoginPage } = require('./models/Login');

test.describe("Login validations", () => {

    test('Login with valid credentials', async({ page }) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode");
        const name = await loginPage.getInnerText();
        expect(name).toBe('Login succeeded. Now you can logout.');
    });

    test('Login with invalid credentials', async({ page }) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode1");
        const name = await loginPage.getInnerText();
        expect(name).toBe('Login failed. Invalid user name and password.');
    });
})
```

Once the code is implemented (and we will make it fail on purpose on the '*Login with invalid credentials*' test due to missing word, to show the failure reports), can be executed with the following command:

```
npx playwright test --browser=chromium --reporter=junit,line
```

First, define one extra parameter: "*browser*" in order to execute the tests only with the chrome browser (chromium), otherwise the default behavior is to execute the tests for the three available browsers (chromium, firefox and webkit).

The results are immediately available in the terminal.



In this example, one test has failed and the other one has succeed, the output generated to the terminal is the above one and the corresponding Junit report is below:

Junit Report

```
<testsuites id="" name="" tests="2" failures="1" skipped="0" errors="0"
time="3.024">
<testsuite name="login.spec.js" timestamp="1623863508251" hostname=""
tests="2" failures="1" skipped="0" time="2.667" errors="0">
<testcase name="Login validations Login with valid credentials" classname="
login.spec.js:6:5 › [chromium] Login validations Login with valid
credentials" time="1.754">
</testcase>
<testcase name="Login validations Login with invalid credentials"
classname="login.spec.js:14:5 › [chromium] Login validations Login with
invalid credentials" time="0.913">
<failure message="login.spec.js:14:5 Login with invalid credentials" type="
FAILURE">
  login.spec.js:14:5 › [chromium] Login validations Login with invalid
credentials ==================

    Error: expect(received).toBe(expected) // Object.is equality

    Expected: "Login failed. Invalid user name and/or password"
    Received: "Login failed. Invalid user name and/or password."

      17 |         await loginPage.login("demo","mode1");
      18 |         const name = await loginPage.getInnerText();
    > 19 |         expect(name).toBe('Login failed. Invalid user name and
/or password');
         |                      ^
      20 |     });
      21 | })

        at /Users/cristianocunha/Documents/Projects/Playwrighttests
/tutorial-js-playwright-selenium/login.spec.js:19:22
        at WorkerRunner._runTestWithBeforeHooks (/Users/cristianocunha
/Documents/Projects/Playwrighttests/tutorial-js-playwright-selenium
/node_modules/@playwright/test/lib/test/workerRunner.js:290:13)

</failure>
</testcase>
</testsuite>
</testsuites>
```

Repeat this process for each browser type in order to have the reports generated for each browser.

Notes:

- By default it will execute tests for the 3 browser types available (that is why we are forcing it to execute for only one browser)
- By default all the tests will be executed in headless mode
- Folio command line will search and execute all tests in the format: *"**/?(*.)+(spec|test).[jt]s"*
- In order to get the Junit test report please follow this section.

Integrating with Xray

As we saw in the above example, where we are producing Junit reports with the result of the tests, it is now a matter of importing those results to your Jira instance. You can do this by simply submitting automation results to Xray through the REST API, by using one of the available CI/CD plugins (e.g. for Jenkins) or using the Jira interface to do so.

API

API

Once you have the report file available you can upload it to Xray through a request to the REST API endpoint for JUnit. To do that, follow the first step in the instructions in v1 or v2 (depending on your usage) to obtain the token we will be using in the subsequent requests.

Authentication

The request made will look like:

```
curl -H "Content-Type: application/json" -X POST --data '{ "client_id":
"CLIENTID","client_secret": "CLIENTSECRET" }'  https://xray.cloud.getxray.
app/api/v1/authenticate
```

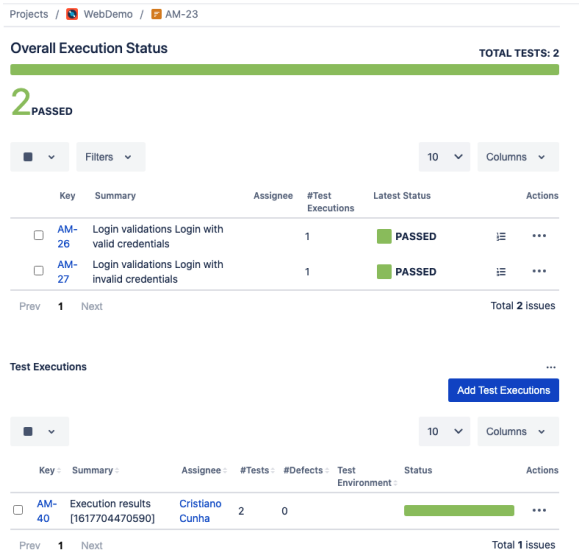
The response of this request will return the token to be used in the subsequent requests for authentication purposes.

JUnit XML results

Once you have the token we will use it in the API request with the definition of some common fields on the Test Execution, such as the target project, project version, etc.

```
curl -H "Content-Type: text/xml" -X POST -H "Authorization: Bearer
$token"  --data @"junit.xml" https://xray.cloud.getxray.app/api/v2/import
/execution/junit?projectKey=AM&testPlanKey=AM-23
```

With this command, you will create a new Test Execution in the referred Test Plan with a generic summary and two tests with a summary based on the test name.



JUnit XML results Multipart

However, there's another endpoint that is more flexible and allows the customization of any field on the target Test Execution; this is the specific JUnit multipart endpoint.

This endpoint follows a JSON-based syntax based on Jira's REST API for updating issues. As an example of uploading the results to a Test Execution with a given Summary, associating with a Test Environment (previously created as "Chromium", "Webkit" and "Firefox" to distinguish the different executions) we have created these two additional files: *issueFields.json* and *testIssueFields.json*, where we are doing the above associations.

issueFields.json

```
{
    "fields": {
        "project": {
            "id": "10000"
        },
        "summary": "Login validation [Firefox]",
        "issuetype": {
            "id": "10011"
        },
        "components" : [
            {
            "name":"Interface"
            },
            {
            "name":"Login"
            }
        ]
    },
    "xrayFields": {
        "testPlanKey": "AM-23",
        "environments": ["firefox"]
    }
}
```

testIssueFields.json

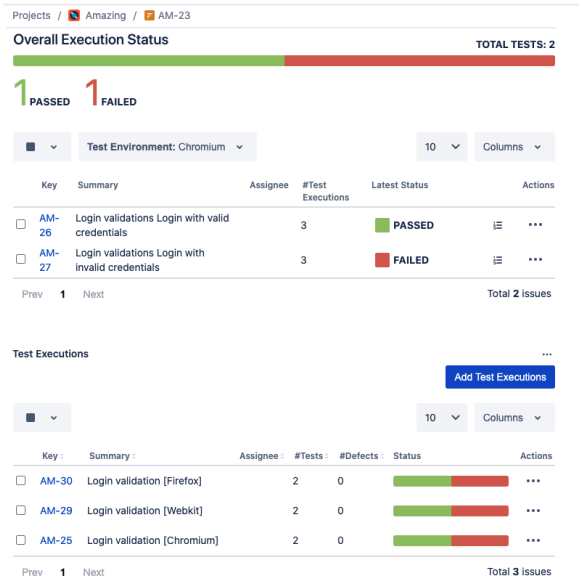
```
{
    "fields": {
        "project": {
            "id": "10000"
        },
        "labels" : ["firefox","junit"]
    }
}
```

To upload the reports through Junit multipart endpoint, use the following command:

```
curl -H "Content-Type: multipart/form-data" -X POST -F info=@.
/importResults/issueFields.json -F results=@junit_ff.xml -F testInfo=@.
/importResults/testIssueFields.json -H "Authorization: Bearer $token"
https://xray.cloud.getxray.app/api/v1/import/execution/junit/multipart
```

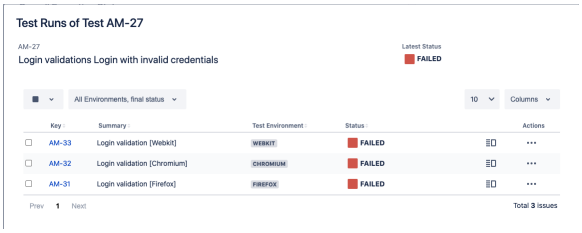
This way, you generate one Junit report per browser (considering each one as Test Environment in Xray). As such we have 3 of the above files, one per each browser type: Chromium, Webkit and Firefox (the ones you see above are for Firefox).

On Xray, you can see that the tests are associated to a Test Plan and you can identify which tests are failing or passing per browser type. Below you can see two tests (for valid and invalid credentials) but executed in 3 different browsers:



You can also notice that the summary is now defined based on the files we used for uploading the test results.

This will provide the team with another dimension to analyze the test results as you have the ability to check the results per Test Environment:



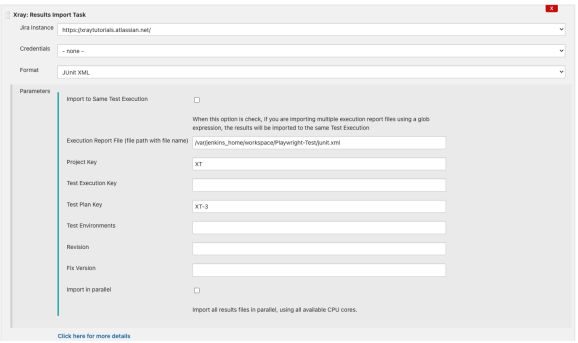
Jenkins

Jenkins

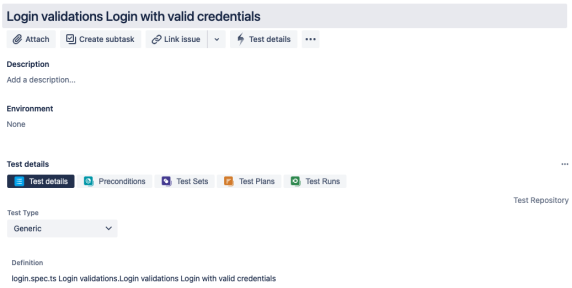
As you can see below we are adding a post-build action using the "*Xray: Results Import Task*" (from the Xray plugin available), where we have some options. For now, we will focus in two of those, one called "*Junit XML*" (simpler) and another called "*Junit XML multipart*" (both are explained below and will require two extra files).

Junit XML

- the Jira instance (where you have your Xray instance installed)
- the format as "*JUnit XML*"
- the test results file we want to import
- the Project key corresponding of the project in Jira where the results will be imported

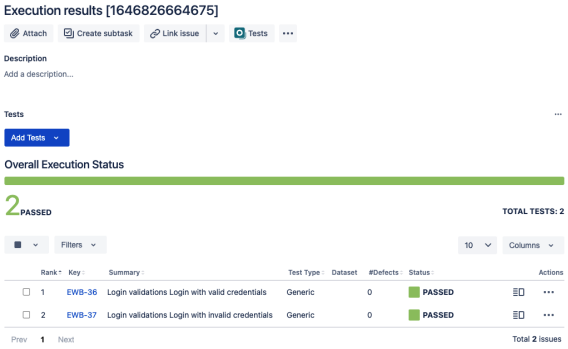


Tests implemented using Jest will have a corresponding Test entity in Xray. Once results are uploaded, Test issues corresponding to the Jest tests are auto-provisioned, unless they already exist.

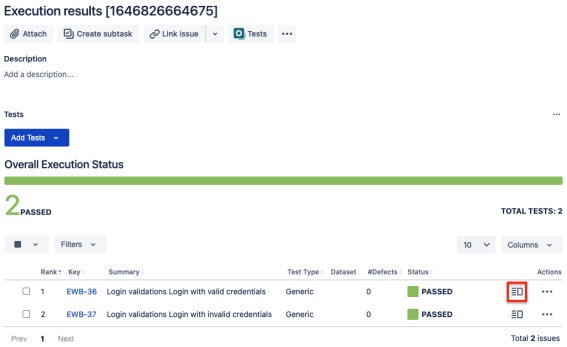


Xray uses a concatenation of the suite name and the test name as the the unique identifier for the test.

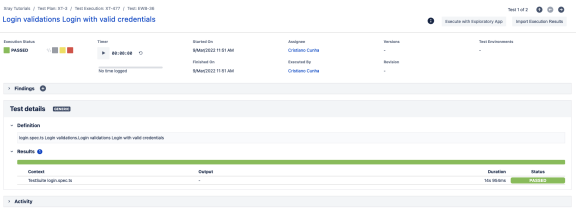
In Xray, results are stored in a Test Execution, usually a new one. The Test Execution contains a Test Run per each test that was executed using playwright-test runner.



Detailed results, including logs and exceptions reported during the execution of the test, can be seen on the execution screen details of each Test Run, accessible through the *Execution details*:

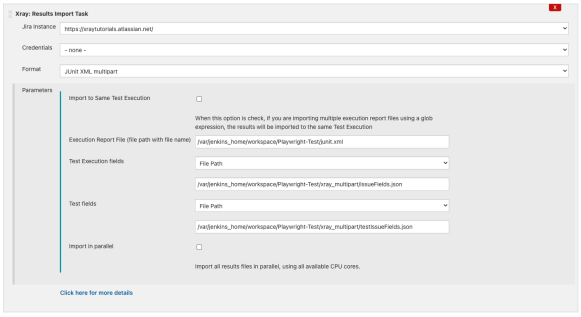


As you can see here:

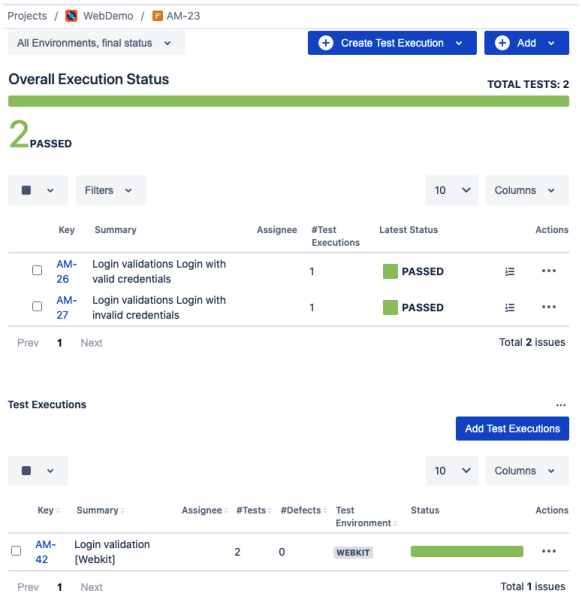


Junit XML multipart

- the Jira instance (where you have your Xray instance installed)
- the format as "*Junit XML Multipart*"
- the two files already added to the repo: "issueFields.json" and "testIssueFields.json" (in the **xray _multipart** directory, note that you must update the inner values to have the correct labels, projectid, testPlanKey, issueType and environments)
- The results file, in our case "*junit.xml*"



In this integration we have more control over the import to Jira. In this particular case, you can see that we will import these results to the Project with the id:10000, with a specific summary and associate this with a particular Test Plan and with a specific Test Environment, all of this is specified in the files (issueFields.json and testIssuesFields.json).

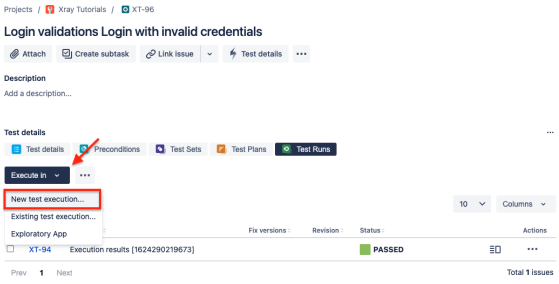


Jira UI

Jira UI

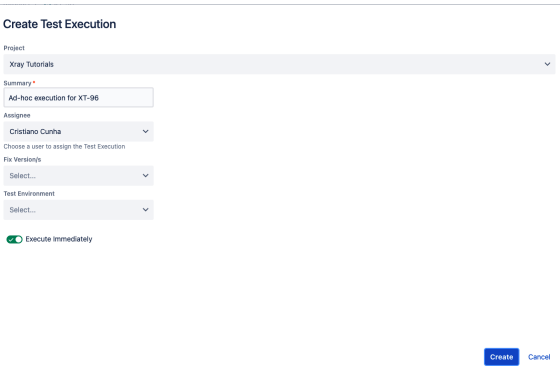
1

Create a Test Execution for the test that you have



2

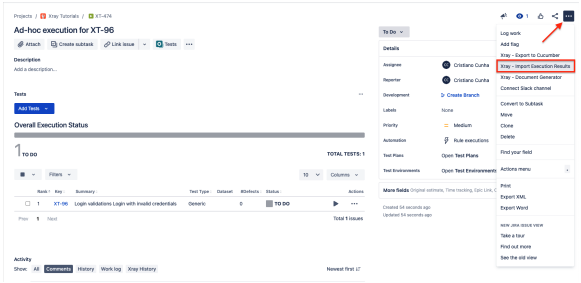
Fill in the necessary fields and press "*Create*."



3

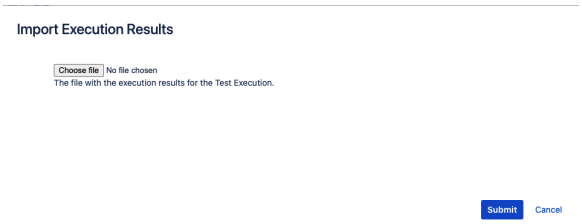
3

Open the Test Execution and import the JUnit report.



4

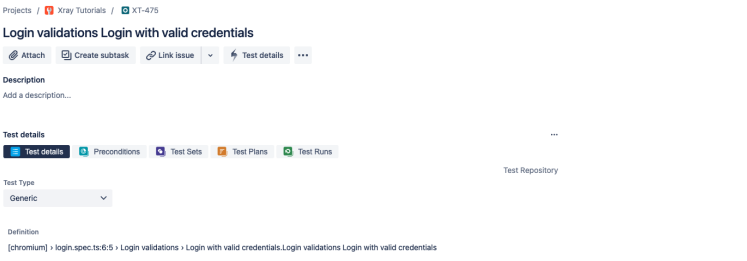
Choose the results file and press *"Import."*



5

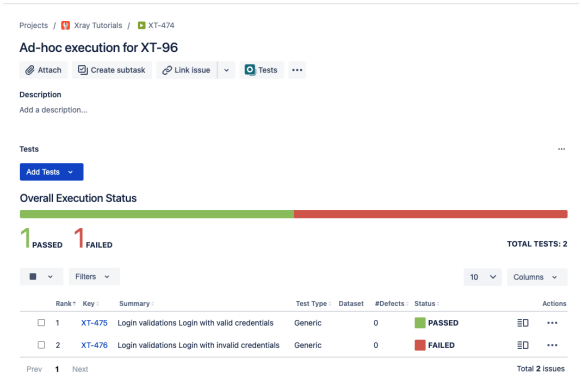
The Test Execution is now updated with the test results imported.

Tests implemented using Jest will have a corresponding Test entity in Xray. Once results are uploaded, Test issues corresponding to the Jest tests are auto-provisioned, unless they already exist.

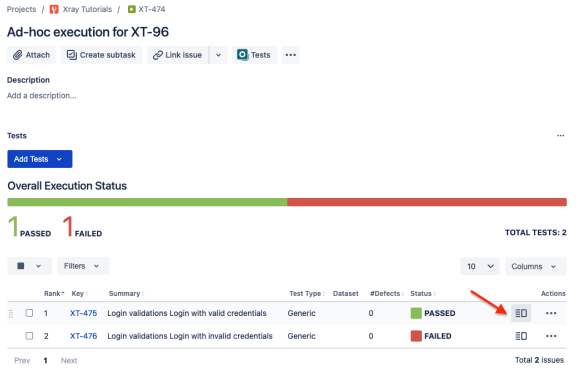


Xray uses a concatenation of the suite name and the test name as the the unique identifier for the test.

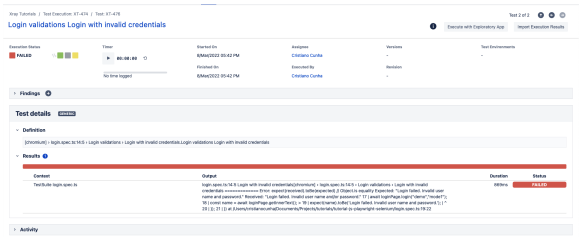
In Xray, results are stored in a Test Execution, usually a new one. The Test Execution contains a Test Run per each test that was executed using playwright-test runner.



Detailed results, including logs and exceptions reported during execution of the test, can be seen on the execution screen details of each Test Run, accessible through the *Execution details*:



As we can see here:



Passing additional test related information to Xray

We manage to have our contribution to Playwright approved and the end result is that you can use the native Junit reporter to enrich the Junit report with information that will be treated by Xray natively.

Now you can use the *testInfo* object to add properties in the Junit report, adding information that is natively supported by Xray.

Configurating the test reporter

To use it start by including a configuration file '*playwright.config.js*' with the following content:

playwright.config.js

```
// JUnit reporter config for Xray
const xrayOptions = {
  // Whether to add <properties> with all annotations; default is false
  embedAnnotationsAsProperties: true,

  // By default, annotation is reported as <property name='' value=''>.
  // These annotations are reported as <property name=''>value</property>.
  textContentAnnotations: ['test_description'],

  // This will create a "testrun_evidence" property that contains all
attachments. Each attachment is added as an inner <item> element.
  // Disables [[ATTACHMENT|path]] in the <system-out>.
  embedAttachmentsAsProperty: 'testrun_evidence',

  // Where to put the report.
  outputFile: './xray-report.xml'
};

const config: PlaywrightTestConfig = {
  reporter: [ ['junit', xrayOptions] ]
};

module.exports = config;
```

This configuration setup properties with particular annotations that are natively interpreted by Xray.

On the tests we can now add information using the testInfo object available:

login.spec.js

```
const { test, expect } = require('@playwright/test');
const { LoginPage } = require('./models/Login');

test.describe("Login validations", () => {

    test('Login with valid credentials', async({ page }, testInfo) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode");
        const name = await loginPage.getInnerText();

        //Adding Xray properties
        testInfo.annotations.push({ type: 'test_key', description: 'XT-92'
});
        testInfo.annotations.push({ type: 'test_summary', description:
'Successful login.' });
        testInfo.annotations.push({ type: 'requirements', description: 'XT-
41' });
        testInfo.annotations.push({ type: 'test_description', description:
'Validate that the login is successful.' });

        expect(name).toBe('Login succeeded. Now you can logout.');
    });

    test('Login with invalid credentials', async({ page }, testInfo) => {
        const loginPage = new LoginPage(page);
        await loginPage.navigate();
        await loginPage.login("demo","mode1");
        const name = await loginPage.getInnerText();

        //Adding Xray properties
        testInfo.annotations.push({ type: 'test_key', description: 'XT-93'
});
        testInfo.annotations.push({ type: 'test_summary', description:
'Unsuccessful login.' });
        testInfo.annotations.push({ type: 'requirements', description: 'XT-
41' });
        testInfo.annotations.push({ type: 'test_description', description:
'Validate that the login is unsuccessful.' });

                // Capture a screenshot and attach it.
        const path = testInfo.outputPath('tmp_screenshot.png');
        await page.screenshot({ path });
        testInfo.attachments.push({ name: 'screenshot.png', path,
contentType: 'image/png' });

        expect(name).toBe('Login failed. Invalid user name and password.');
    });
})
```

We added several properties in the test to showcase the capabilities of these annotations but you can use only the ones that are useful in your case.

All annotations will be added as <property> elements on the JUnit XML report. The annotation type is mapped to the name attribute of the <property>, and the annotation description will be added as a value attribute.

Resuming the annotations we are using:

- **test_key**: Link to the test in Xray with the specified key.
- **test_summary:** Redefine the summary of the test.
- **test_description:** Redefine the test description.
- **requirements:** Link to one or several requirements in Xray.

There's a special way to add attachments, using the `testInfo` object; as an example, in the following test we are adding the screenshot to the test:

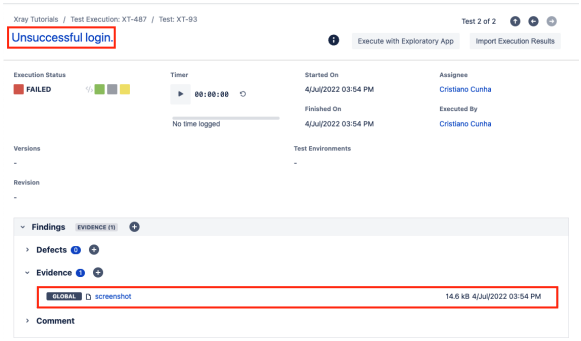
```
test('Login with invalid credentials', async({ page }, testInfo) => {
  ...
  const path = testInfo.outputPath('tmp_screenshot.png');
  await page.screenshot({ path });

  testInfo.attachments.push({ name: 'screenshot.png', path, contentType:
'image/png' });\
  ...
```

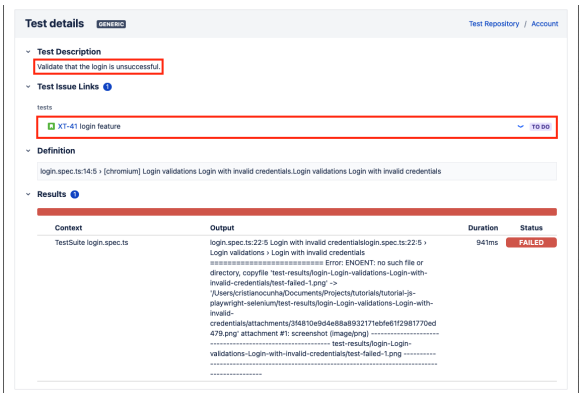
Seeing additional test information in Xray

If you are using the Junit reporter defined above the results uploaded to Xray have now the information provided within the test.

To import these results you should use exactly the same approach as described here because the report generated will be a valid Junit report with extra information.

Once imported we can see the redefinition of the summary, the screenshot added, the redefinition of the test description and the link added to the requirement.





Tips

- after results are imported in Jira, Tests can be linked to existing requirements/user stories, so you can track the impact of their coverage.
- results from multiple builds can be linked to an existing Test Plan in order to facilitate the analysis of test result trends across builds.
- results can be associated with a Test Environment, in case you want to analyze coverage and test results by that environment later on. A Test Environment can be a testing stage (e.g. dev, staging, prepod, prod) or an identifier of the device/application used to interact with the system (e.g. browser, mobile OS).

References

- https://playwright.dev/docs/test-intro/
- https://playwright.dev/