Software Unit Testing, part 4
Playwright

1 Introduction
In part 1 we discussed how Software Unit Testing is different from End-to-End testing. We briefly discussed Test Coverage and why you need it. There was a discussion of how you did automated software testing in the early days using a generic test framework, and an explanation of how automated software testing would be performed using JavaScript with the modern Web testing framework Cypress. In part 2 we discussed how to do Software Unit Testing in the C# language using .NET and the modern xUnit test framework. In part 3 we discussed how to do Software Unit Testing in the C++ language using a generic test framework as well as the modern GTEST framework. In this article we will discuss how to do Software Unit Testing using Playwright.

2 What is Playwright?
Playwright is a product of Microsoft and is actively maintained. [202] Playwright can test .NET, Java, JavaScript, Python and TypeScript. It can run on Linux, macOS and Windows. Playwright supports browsers based on Chromium, Firefox and WebKit. It also supports mobile devices (Chrome for Android and Mobile Safari). [196] One advantage of Playwright is that it supports TypeScript. [202]

Playwright runs in a real browser, not an emulated browser. Everything that runs in your browser will work. It was created for end-to-end testing, but also works well for unit testing. [202] [203] [206] Unit testing has been supported since 2022. [206] Code coverage can be provided using ***nyc***, which is part of ***Istanbul*** (a code coverage tool for JavaScript). [202]

3 Setting up Playwright
You need to install Node.js® on your local machine before you install Playwright. Node.js is a free, open-source, cross-platform JavaScript runtime environment that lets you run JavaScript on the server. [96] [97] It is used by millions of developers. [98] **Make sure that you have successfully installed Node.js before you begin.**

Create a directory for the project.

mkdir playwrightTest1

Change directory to the project directory.

cd playwrightTest1

Install Playwright :

npm install -D @playwright/test@latest

Install nyc in order to obtain line coverage:

npm install nyc --save-dev

Install monocart reporter :

npm i -D monocart-reporter

Create a directory called **src** for the code we wish to test.

mkdir src

If there is no directory called tests, create a directory called **tests** where we will create our tests.

mkdir tests

Change to the tests directory.

cd tests

Create a directory called **fizzbuzz** .

mkdir fizzbuzz

Change directory back to the project directory.

cd ..

4 Test Scenario

For our testing example let's use the children's game "FizzBuzz", which is sometimes used as a coding test. FizzBuzz works like this:

Output the numbers from 1 to 100.

1. If the number is not divisible by either 3 or 5, just display the number.
2. If the number is divisible by 3, display the word "FIZZ" instead of the number.
3. If the number is divisible by 5, display the word "BUZZ" instead of the number.
4. If the number is divisible by both 3 and 5, display the word "FIZZBUZZ" instead of the number.

So, our code must meet the four requirements listed above. In order to do so, the code must make several decisions based on the input value. We would therefore need a minimum of 4 test cases to do testing based on the requirements. This function has the following code paths:

path 1 - the input IS NOT divisible by EITHER 3 or 5, return the input value
path 2 - the input IS divisible by BOTH 3 and 5, return "FIZZBUZZ"
path 3 - the input IS divisible by 3 but IS NOT divisible by 5, return "FIZZ"
path 4 - the input IS NOT divisible by 3 but IS divisible by 5, return "BUZZ"

If we test to meet the requirements, we would expect to see 100% path coverage of the main section of the code with the four test cases needed to meet the requirements. We would add a fifth test case to verify that errors are handled correctly.

5 Unit Testing - Playwright

Let's write a function called ***fizzBuzz*** that we want to use in an application. We create it in the ***src*** directory. We want to test this function using Playwright to make sure it works correctly. Our function would look like this:

```
//  src/fizzbuzz.js

export function fizzbuzz (num) {
  if (num % 3 === 0 && num % 5 === 0) {
    return 'FIZZBUZZ'
  }
  else
  if (num % 3 === 0) {
    return 'FIZZ'
  }
  else
  if (num % 5 === 0) {
    return 'BUZZ'
  }
  else {
    return num
  }

  //   end     function
}
```

Figure 1: JavaScript code for the fizzBuzz function.

Our function has a single numeric input value, and we return a single result in a string. Since we have not placed any restrictions on the input, we could have thousands of possible input values. FizzBuzz only requires that we use the values from 1 to 100, so we would need at least 100 test cases to test every input value that we would expect to encounter. What happens if we input a zero? What happens if we input a value higher than 100? Would they cause an undesired result? Do we need to add code to handle inputs that are out of range? If we were to define the input as a byte, we would still have 256 possible input values (0 to 255). Assuming that we only tested the values 1 to 100, it might be a good idea to test 0 and the values greater than 100, just to be thorough. This would require at least 256 test cases.

6 Playwright Unit Test

We create our Unit Test for fizzbuzz in the ***tests/fizzbuzz*** directory. It is called ***fizzbuzz.spec.js*** . Our Unit test of fizzBuzz using Playwright would look like this:

```
//  tests/fizzbuzz/fizzbuzz.spec.js

import { test, expect } from '@playwright/test';
import { fizzbuzz } from '../../src/fizzbuzz.js';

test.describe('fizzbuzz.js', () => {

        test('fizzbuzz()', async ({ page, browserName }) => {
                console.log('Running on browser: ' + browserName );

                page.on( 'console', msg => {
                   console.log('[Browser Console]: ${msg.text()} ' );
                });


                if ( browserName == "chromium" ) {
                    console.log('*** chromium browser, turn ON coverage ***');

                    if (!page.coverage) throw new
                           Error('Could not collect coverage with browser ' + browserName );

                    console.log("*** collecting coverage ... ***");

                    await page.coverage.startJSCoverage({ resetOnNavigation: false });

                    //   end     if chromium
                }


                    console.log('*** test case 1 ***');

                // test case 1 - fizzBuzz with input of 1 returns "1"
                expect(fizzbuzz(1)).toEqual(1);


                    console.log('*** test case 2 ***');

                // test case 2 - fizzBuzz with input of 2 returns "2"
                expect(fizzbuzz(2)).toEqual(2);
```

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Figure 2a: Unit test of JavaScript function fizzBuzz written using Playwright.

```
                console.log('*** test case 3 ***');

            // test case 3 - fizzBuzz with input of 3 returns "FIZZ"
            expect(fizzbuzz(3)).toEqual('FIZZ');


                console.log('*** test case 4 ***');

            // test case 4 - fizzBuzz with input of 4 returns "4"
            expect(fizzbuzz(4)).toEqual(4);


                console.log('*** test case 5 ***');

            // test case 5 - fizzBuzz with input of 5 returns "BUZZ"
            expect(fizzbuzz(5)).toEqual('BUZZ');


                console.log('*** test case 6 ***');

            // test case 6 - fizzBuzz with input of 15 returns "FIZZBUZZ"
            expect(fizzbuzz(15)).toEqual('FIZZBUZZ');


                console.log('*** test case 7 ***');

            // test case 7 - fizzBuzz with input of 16 returns "16"
            expect(fizzbuzz(16)).toEqual(16);



        //        console.log('*** test case 8 ***');

            // test case 8 - fizzBuzz with input of 16 returns "17"
             //  expect(fizzbuzz(16)).toEqual(17);

            //  dont evaluate since this is a repeat of input value 16


            // *********************************************************

            if ( browserName == "chromium" ) {
                console.log('*** chromium browser, turn OFF coverage ***');

                const [jsCoverage] = await page.coverage.stopJSCoverage();

                //   end     if chromium
            }



            console.log('*** END OF TEST ***');


//              await browser.close();

        });

});
```

Figure 2b: Unit test of JavaScript function fizzBuzz written using Playwright.

We create 7 tests. We have an additional test case (test case 8) to verify that everything works correctly when we get an unexpected result. For now, we will leave that test case commented out.

Since we want to see the line coverage for the fizzbuzz function, we need to use ***nyc*** to run Playwright. We tell nyc to generate the line coverage information in ***lcov*** format. When we run the tests using nyc, we get the following results:

```
npx nyc --reporter=lcov --reporter=text-summary npx playwright test fizzbuzz/fizzbuzz
[MR] clean output dir ...

Running 3 tests using 1 worker

  ok 1 [chromium] › tests\fizzbuzz\fizzbuzz.spec.js:8:6 › fizzbuzz.js › fizzbuzz() (368ms)
Running on browser: chromium
*** chromium browser, turn ON coverage ***
*** collecting coverage ... ***
*** test case 1 ***
*** test case 2 ***
*** test case 3 ***
*** test case 4 ***
*** test case 5 ***
*** test case 6 ***
*** test case 7 ***
*** chromium browser, turn OFF coverage ***
*** END OF TEST ***
  ok 2 [firefox] › tests\fizzbuzz\fizzbuzz.spec.js:8:6 › fizzbuzz.js › fizzbuzz() (2.4s)
Running on browser: firefox
*** test case 1 ***
*** test case 2 ***
*** test case 3 ***
*** test case 4 ***
*** test case 5 ***
*** test case 6 ***
*** test case 7 ***
*** END OF TEST ***
  ok 3 [webkit] › tests\fizzbuzz\fizzbuzz.spec.js:8:6 › fizzbuzz.js › fizzbuzz() (553ms)
Running on browser: webkit
*** test case 1 ***
*** test case 2 ***
*** test case 3 ***
*** test case 4 ***
*** test case 5 ***
*** test case 6 ***
*** test case 7 ***
*** END OF TEST ***

  3 passed (17.8s)
[MR] generating report data ...
[MR] generating test report ...
[MR] MCR Playwright Report
```

Continued on the next page.

Figure 3a: Unit Test results for the fizzBuzz function.

```
┌──────────────────┬──────────────────────────────────────────┐
│ Tests            │ 3                                        │
│  ├ Failed        │ 0 (0.0%)                                 │
│  ├ Flaky         │ 0 (0.0%)                                 │
│  ├ Skipped       │ 0 (0.0%)                                 │
│  └ Passed        │ 3 (100.0%)                               │
│ Steps            │ 54                                       │
│ Suites           │ 3                                        │
│  ├ Projects      │ 3                                        │
│  ├ Files         │ 1                                        │
│  ├ Describes     │ 3                                        │
│  └ Shards        │ 0                                        │
│ Errors           │ 0                                        │
│ Retries          │ 0                                        │
│ Logs             │ 30                                       │
│ Attachments      │ 0                                        │
│ Artifacts        │ 0                                        │
│ Playwright       │ v1.56.1                                  │
│ Date             │ 11/22/2025, 12:05:46 PM                  │
│ Duration         │ 17.9s                                    │
└──────────────────┴──────────────────────────────────────────┘
[MR] json: test-results/mcr-report/index.json
[MR] view report: npx monocart show-report test-results/mcr-report/index.html

To open last HTML report run:

  npx playwright show-report


=============================== Coverage summary ===============================
Statements   : 100% ( 9/9 )
Branches     : 83.33% ( 10/12 )
Functions    : 100% ( 1/1 )
Lines        : 100% ( 9/9 )
================================================================================
```

Figure 3b: Unit Test results for the fizzBuzz function.

After you run the tests, there will be a directory called ***coverage*** in the project.

Change to the coverage directory.

cd coverage

You will see a directory called ***lcov-report*** .

Change to the lcov-report directory.

cd lcov-report

You will see a directory called ***playwrightTest1_22nov2025*** . The date will reflect the date when you ran the test.

Change to the playwrightTest1_22nov2025 directory.

cd playwrightTest1_22nov2025

You will see a directory called ***src*** .

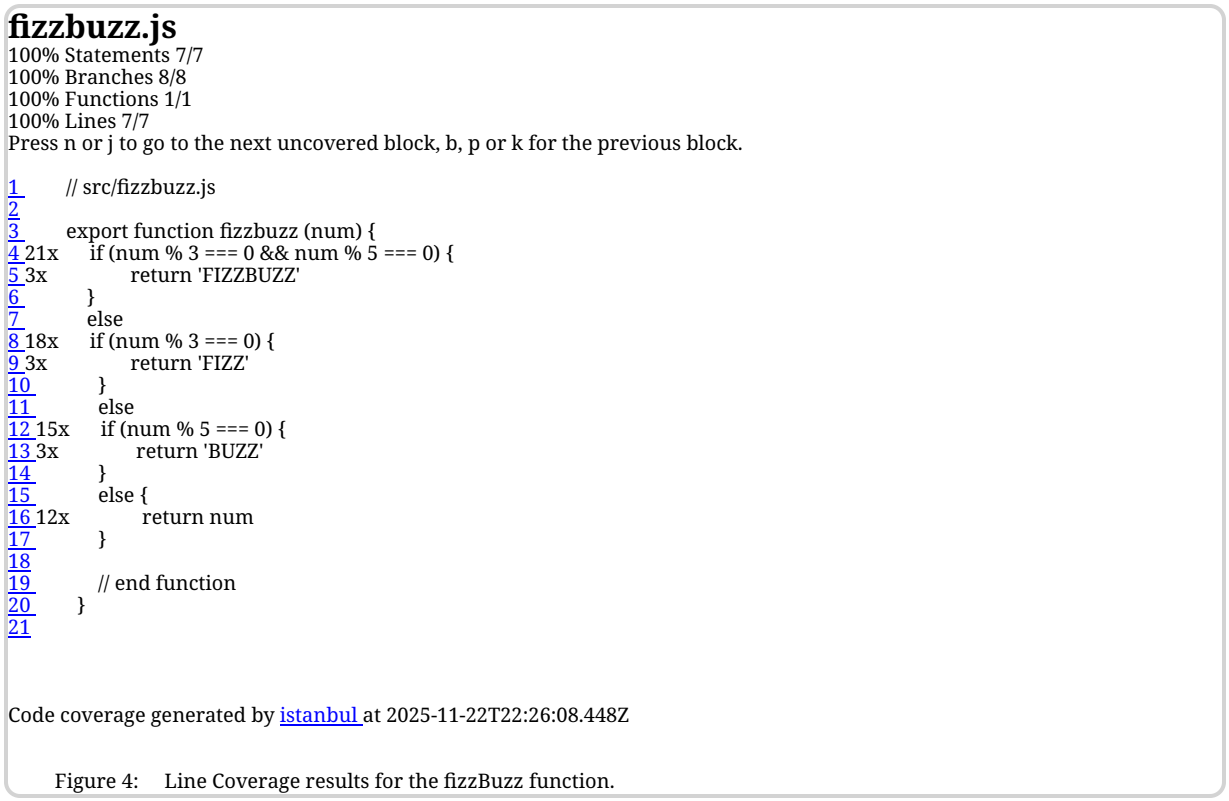
Change to the src directory.

cd src

You will see a file called ***fizzbuzz.js.html*** .

Open the file fizzbuzz.js.html with your browser.

You will see a ***Line Coverage*** report similar to the following:



fizzbuzz.js

100% Statements 7/7
100% Branches 8/8
100% Functions 1/1
100% Lines 7/7
Press n or j to go to the next uncovered block, b, p or k for the previous block.

```
1       // src/fizzbuzz.js
2
3       export function fizzbuzz (num) {
4 21x     if (num % 3 === 0 && num % 5 === 0) {
5 3x            return 'FIZZBUZZ'
6         }
7         else
8 18x     if (num % 3 === 0) {
9 3x            return 'FIZZ'
10        }
11        else
12 15x    if (num % 5 === 0) {
13 3x           return 'BUZZ'
14        }
15        else {
16 12x          return num
17        }
18
19        // end function
20      }
21
```

Code coverage generated by istanbul at 2025-11-22T22:26:08.448Z

Figure 4: Line Coverage results for the fizzBuzz function.

12 Generate the report using reportgenerator

If we have the **.NET SDK** installed on our system, we can also use the report generator tool for .NET to generate the report.

13 .NET CLI

The .NET framework includes a command line interface (CLI). The .NET command-line interface (CLI) is a cross-platform toolchain for developing, building, running, and publishing .NET applications. The .NET CLI is included with the .NET SDK. [123] After installing the SDK, CLI commands are run by opening a Command Prompt window and entering the commands at the command prompt. [122] [124] [134] Once the .NET SDK is installed, further help on using the CLI may be obtained by typing

dotnet --help or dotnet -h

To determine the version of the .NET SDK which is installed, type

dotnet --info

If we are using a **.NET SDK earlier than version 8** , we may need to add some software in order to generate coverage reports. [145] [146] [151]

dotnet new tool-manifest

dotnet add package coverlet.collector

dotnet add package coverlet.msbuild

dotnet tool install coverlet.console

dotnet tool install -g dotnet-reportgenerator-globaltool

If we are using **.NET SDK 8** , we may need to install the following software: [146] [147]

dotnet tool install --global dotnet-coverage

The report generator converts coverage reports generated by coverlet, OpenCover, dotCover, Visual Studio, NCover, Cobertura, JaCoCo, Clover, gcov or lcov into human readable reports in various formats. The reports show which lines of your source code have been covered. ReportGenerator is available under the Apache [136] License. [148]

Some of the many report types available include: [157]

Html	**A summary (index.html) and detailed reports for each class.**
Html_Light	**Html with a light theme.**
Html_Dark	**Html with a dark theme.**
HtmlSummary	**A single HTML file (summary.html) without links.**
TextSummary	**A single TXT file containing coverage information per class.**
SvgChart	**A single SVG file containing a chart with historic coverage information.**
Badges	**SVG files that show line and/or branch coverage information.**

14 Using the Reportgenerator Installed Under the Dotnet CLI

Use the dotnet reportgenerator tool to create the coverage report for fizzbuzz.js.

reportgenerator -reports:coverage/lcov.info -targetdir:coverage-report1 -reporttypes:"Html_Dark"

```
2025-11-30T13:47:53: Arguments
2025-11-30T13:47:53:  -reports:coverage/lcov.info
2025-11-30T13:47:53:  -targetdir:coverage-report1
2025-11-30T13:47:53:  -reporttypes:Html_Dark
2025-11-30T13:47:53: Writing report file 'coverage-report1\index.html'
2025-11-30T13:47:53: Report generation took 0.3 seconds
```

We wrote a coverage report for fizzbuzz.js to **coverage-report1\index.html** . We can open the file in a browser.

15 Coverage Report

The coverage report created by reportgenerator show that we have the following coverage:

File(s): fizzbuzz.js

Covered lines:	**7**
Uncovered lines:	**0**
Coverable lines:	**7**
Total lines:	**20**
Line coverage:	**100%**

The line coverage report would be similar to the following:

File(s)

src\fizzbuzz.js

#	Line	Line coverage
	1	// src/fizzbuzz.js
	2	
	3	export function fizzbuzz (num) {
21	4	if (num % 3 === 0 && num % 5 === 0) {
3	5	return 'FIZZBUZZ'
	6	}
	7	else
18	8	if (num % 3 === 0) {
3	9	return 'FIZZ'
	10	}
	11	else
15	12	if (num % 5 === 0) {
3	13	return 'BUZZ'
	14	}
	15	else {
12	16	return num
	17	}
	18	
	19	// end function
	20	}

Generated by: ReportGenerator 5.3.8.0
11/30/2025 - 1:47:53 PM
GitHub | reportgenerator.io

Figure 5: Line Coverage results for the fizzBuzz function.

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