PLAYWRIGHT

- Playwright is a powerful end-to-end testing framework that enables reliable automation for modern web applications.

❖ **Why Playwright?**

1. **Reliable End-to-end Testing:**
   - Playwrigth's Auto-wait capability ensures reliable and stable end-to-end testing for modern web applications, even in the face of dynamic and complex user interactions.
   - **Auto-waiting:**

     The playwright performs a range of actionability checks on the elements before making actions to ensure these actions behave as expected. It auto-waits for all the relevant checks to pass and only then performs the requested actions. If required checks do not pass within the given **timeout**, action fails with the **TimeoutError.**
   - Before execution for that element playwright check some conditions are eligible on that element or not like it visible, stable or enable or not

Here is the complete list of actionability checks performed for each action:

Action	Visible	Stable	Receives Events	Enabled	Editable
locator.check()	Yes	Yes	Yes	Yes	-
locator.click()	Yes	Yes	Yes	Yes	-
locator.dblclick()	Yes	Yes	Yes	Yes	-

2. **Cross-Browser Compatibility:**
   - Playwright supports all major browsers, including Chrome, Edge, Firefox, Safari and Opera, allowing you to test your web applications across a wide range of browsers and platforms
3. **Multiplatform Support:**
   - Playwright works seamlessly on Windows, macOS, and Linux, and also supports native mobile emulation for Google chrome on Android and Safari on iOS, enabling comprehensive testing across different devices and operating systems.
4. **Multilingual Flexibility:**
   - Playwright provides language binding for JavaScript, TypeScript, Java, Python and C# allowing you to choose the programming language that best fits your team's preferences and expertise.

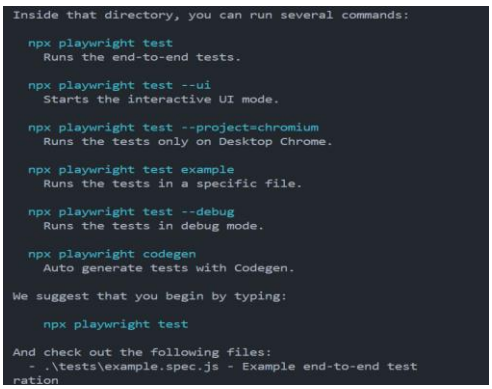
❖ **Playwright's Advanced Features:**

1. **Tracing and Debugging:**
   - Playwright has built-in tracing and debugging capabilities, including automatic screenshots, test video recording and comprehensive logging, to simplify the process of identifying and resolving issues in your test suite.
2. **Network Interception:**
   - Utilize playwright's API testing libraries to intercept and validate network calls within your web application, enabling you to test edge case scenarios and ensure the resilience of your application's network interaction.
3. **Browser Context Management:**
   - Explore playwright's browser context feature, which allows you to save and transfer browser state across your test suite, improving test efficiency and reducing the overhead of setting up the same browser state for each test case.
4. **Codegen Tool:**
   - It can generate code by recording your actions, saving your time and effort in creating initial test case and providing a starting point for further customization.

❖ **To create playwright project, we use following command**

npm init playwright

- This command is creating playwright structure project with all playwright dependencies
- **Playwright.config.json** file is important file which is also called as playwright test runner file



- **Sample test cases:**

```
//1st way
test('Browser Playwright test', async function ({ browser }) {
  //Write your playwright code.....
  //chrome - plugins/cookies
  const context = await browser.newContext(); //create fresh browser instance
  const page = await context.newPage(); //create actual page for automate

  await page.goto('https://rahulshettyacademy.com/loginpagePractise/');
});

//2nd way
test('Page Playwright test', async function ({ page }) {
  //No need to create context and page variable it comes from fixers
  await page.goto('https://google.com');
});
```

We can manually create **page** using **browser** fixture or we can directly use **page** fixture to goto URL.

- To set which browser should execute we should mention in Playwright.config.json file.

```
use: {
  browserName: 'chromium',
```

- To execute playwright project we use following command

  npx playwright test

- Playwright by default run in headless mode means we won't see anything of what is happening in the browser when our script runs. If we want to see browser execution then we should run in **headed** mode using following command

  npx playwright test –headed

  or

  add in configuration file

```
use: {
  browserName: 'chromium',
  // browserName: 'firefox',
  // browserName: 'webkit', //default playwright specific engine
  headless: false,
},
```

- To generate test report:

  npx playwright show-report

- To execute in debug mode:

  npx playwright test --debug

- To verify title of webpage we have assertion

```
  await expect(page).toHaveTitle('Google');
```

It will check and verify title of webpage if match then **passes** otherwise **failed**

Note: webkit is a default playwright specific browser engine.

➢ Fixtures: 🔗

- Playwright commonly uses with the **Page Object Model,** which is one of the approaches to structuring tests to optimize their speed and efficiency. In the framework under consideration, fixtures simplify grouping tests and are considered a way manage them as the page object method.
- Test fixtures are preliminary conditions or steps that are executed before running a test. The testing concept of fixtures is based on their use – existing fixtures create a precise environment for each test, avoiding anything unnecessary.
- In playwright, test fixtures allow you to reuse code for different test cases. In essence, a fixture is a function that wraps the inheritance of classes. It's a convenient way to encapsulate your testing functionality and its data in separate blocks and call it when needed.

```
import { test, expect } from '@playwright/test';

test('basic test', async ({ page }) => {
  await page.goto('https://playwright.dev/');

  await expect(page).toHaveTitle(/Playwright/);
});
```

In this example, the test function argument `{ page }` indicates the need to configure the page fixture.

- Below, we present a list of fixtures used when writing a base test in playwright:

Fixture	Type	Description
page fixture	Page	Instances of pages isolated between tests
context	BrowserContext	Context, isolated for a specific test run
browser	Browser	Browser instances that can be used for all tests in a worker process
browserName	String (textual data)	Mention of the browser name in which to run test files
request	APIRequestContext	APIRequestContext instance, isolated for this test run

- **Different types of methods in Playwright:**

1. **.fil():**
   - **.fill()** method is use to fill/pass data in input filled

```
//css selector
await page.locator('#username').fill('rahulshetty');
//Xpath selector
await page.locator('//input[@id="password"]').fill
('learning');
```

2. **.pressSequencially():**
   - Type into the field character by character, as if it was a user with a real keyboard with **locator.pressSequentially().**

```
// Press keys one by one
await page.locator('#area').pressSequentially('Hello World!');
```

   - This method will emit all the necessary keyboard events, with all the keydown, keyup, keypress event in place. You can even specify the optional delay between the key presses to simulate real user behavior.

3. **.click():**
   - **.click()** method is used to perform click event on elements like button.

```
await page.locator('//input[@id="signInBtn"]').click();
```

4. **.textContent():**
   - **.textContent()** method is used to extract text from element

```
console.log(await page.locator('[style*="block"]').textContent());
```

5. **. toContainsText():**
   - **.toContainsText()** check given text available in there or not

```
await expect(page.locator('[style*="block"]')).toContainText('Incorect');
```

     It will check given text available in that located element or not that's basis it will passes or failed the case

     This method is assertion method.

6. **.waitFor():**
   - **.waitFor()** method is primarily used with locators to paused the execution until a specific condition is met on a web page element.
   - It helps in synchronizing your test scripts with dynamic content changes.

```
await page.locator('.card-body b').first().waitFor();
```

- This method works on single element if multiple element is detect it won't work. If we want to work we should select only one element by using **.first() / .last()** function.

7. **.selectOption():**
   - **.selectOption()** method is used to select option in dropdown menu

```
const dropdown = page.locator('//select[@class="form-control"]');
await dropdown.selectOption('consult');
```

8. **Handling Radio button and popup:**

```
//Handling radio button selector
const userRadioButton = page.locator('.radiotextsty');
console.log('Radio button selector');
await userRadioButton.last().click();
await page.locator('#okayBtn').click(); //after selecting radio button one web-base popup is open so we click that popup
console.log(await userRadioButton.last().isChecked()); //checking radio button is checked or not
await expect(userRadioButton.last()).toBeChecked(); //this assertion will throw error and failed test case if radio button is not
checked
await page.pause();
```

   - **.toBeChecked()** assertion is passed case if radio button is checked otherwise it failed this test case.
   - **.isChecked()** method is check button is checked or not checked.

9. **Handling checkbox:**

```
//Handle checkbox selector
const checkbox = page.locator('#terms');
await checkbox.click();
await expect(checkbox).toBeChecked();
await checkbox.uncheck();
expect(await checkbox.isChecked()).toBeFalsy();
await page.pause();
```

   - **.toBeFalsy()** check given condition return falsy value or not. It failed test case when condition return **true**
   - **.toBeTruthy()** method failed test case if condition return **false.**
   - **.uncheck()** method is used to uncheck a button/checkbox

10. Handle child window:

```
test('@Child window Handling', async ({ browser }) => {
  const context = await browser.newContext();
  const page = await context.newPage();
  const userName = page.locator('#username');
  await page.goto('https://rahulshettyacademy.com/loginpagePractise/');

  const documentLink = page.locator('//*[contains(@href,"documents-request")]');
  const [newPage] = await Promise.all([
    context.waitForEvent('page'), //listen for any new page pending , rejected , fulfilled
    documentLink.click(),
  ]); //new page is opened
  const text = await newPage.locator('.red').textContent();
  console.log(text);
```

- **Promise.all([])** create array of new pages by executing conditions written inside it
- **.waitForEvent()** this is browser context method which can be used to wait for a specific event to occur on a page. You can use this method to wait for an event, such as a DOM element being clicked, a form being submitted, a page is loaded, or a network request being made.

11. Generate code use Codegen tool:

npx playwright codegen url

- This command is used to open link in recording mode.

12. To generate screenshot and trace report:

```
screenshot: 'on', //To take screenshot of all action which will perform
// trace: 'on', //Trace all action
trace: 'retain-on-failure', //Trace only on failure
```

- Add this two properties in **playwright.config.json** file in use object

13. To go back to previous page or go to next web page:

```
await page.goto(`https://rahulshettyacademy.com/AutomationPractice/`);
await page.goto(`http://google.com`);
await page.goBack(); //--> it is use to go back to previous web page
await page.goForward(); //--> it is used to go to next web page
```

14. To handle popup/alert/dialog in playwright”

```
page.on('dialog', dialog => dialog.accept()); //accept-> ok / dismiss -> reject

await page.locator(`//input[@id="confirmbtn"]`).click();
```

- There is **page.on()** method which activated when anywhere popup/dialog box is generated in web page.
- It get two parameters which **event** and **callback function** which has **accept and dismiss** method

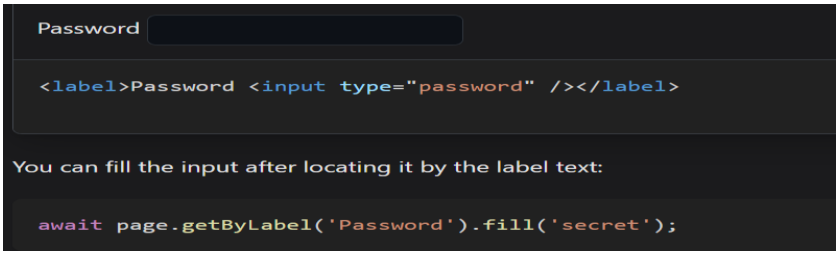
15. **To handle hover:**

```
await page.locator(`#mousehover`).hover();
```

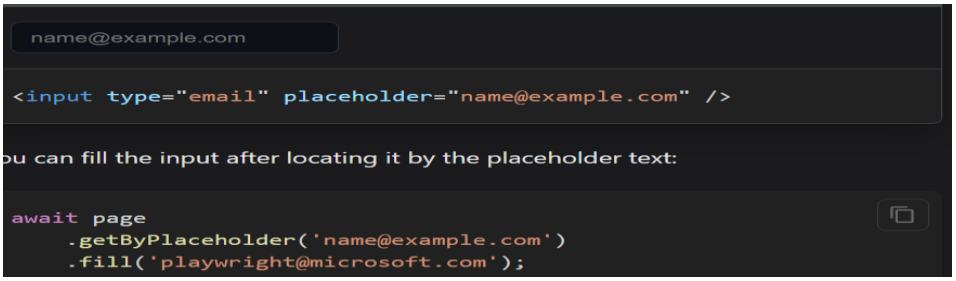
- There is separate **hover()** method to handle hover in playwright

➢ **Playwright Inbuilt Locators:**

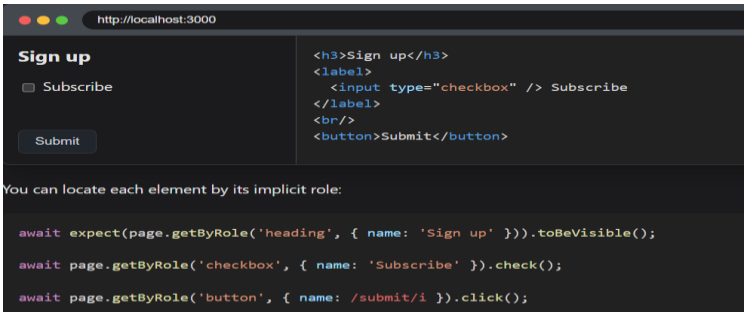
1. **.getByLabel():**
   - It is used to locate the control by its associated label using **page.getByLabel()**



   - Use this locators when locating form field.
2. **.getByPlaceholder():**
   - Input may have a placeholder attribute to hint to the user what value should be entered. You can locate such an input using **page.getByPlaceholder().**

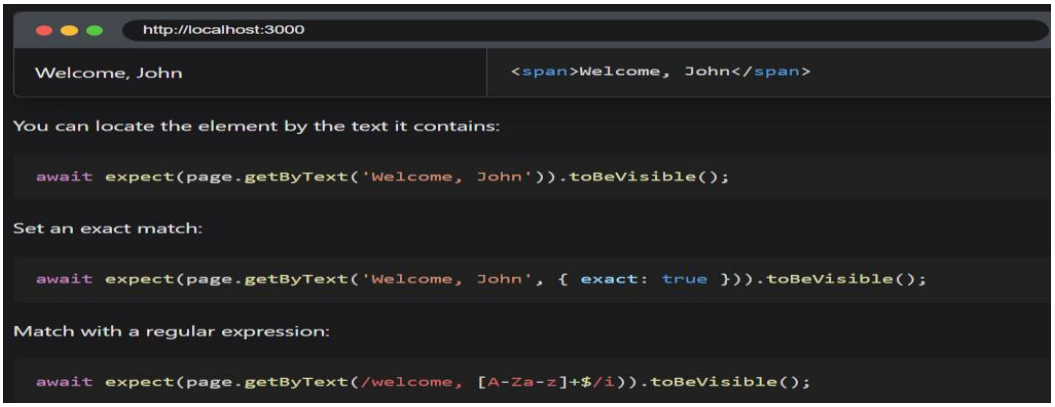


   - Use this locator when locating form elements that do not have labels but have placeholder texts.
3. **.getByRole():**
   - The **page.getByRole()** locator reflects how users and assistive technology perceive the page, for example whether some element is a button or a checkbox. When locating by role, you should usually pass the accessible name as well, so that the locator pinpoints the exact element.



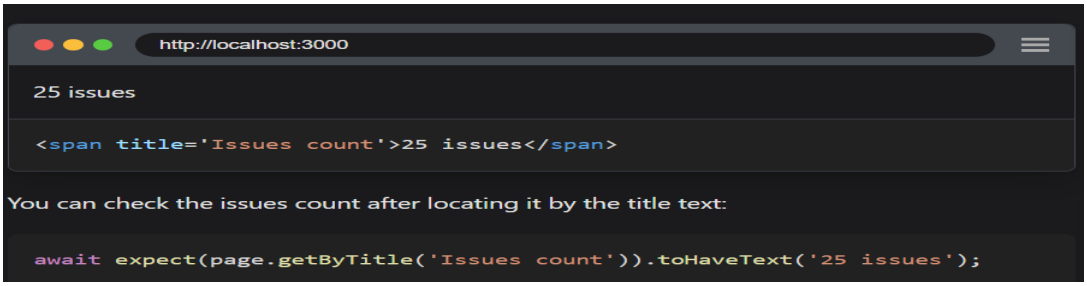
- Role locators include buttons, checkboxes, headings, links, lists, tables and may more elements.
- Note that many html elements have an implicitly defined role that is recognized by the role locator.

4. **.getByText():**
   - Find an element by the text it contains. You can match by a substring, exact string, or a regular expression when using **page.getByText().**



   - Matching by text always normalizes whitespace

5. **.getByTitle():**
   - Locate an element with a matching title attribute using **page.getByTitle();**



➢ **Assertions:** 🔗

- Playwright includes test assertions in the form of **expect()** function. To make an assertion, call **expect(value)** and choose a matcher that reflects the expectation. There are many generic matchers like **toEqual, toContain, toBeTrutht** that can be used to assert any condition

1. **.toBeAttached():**
   - Ensure that locator points to an element that is connected to a Document or a shadowRoot

     Eg: **await expect(page.getByText('Hidden text')).toBeAttached();**

2. **.toBeChecked():**
   - Ensure the locator points to checked input

```
const locator = page.getByLabel('Subscribe to newsletter');
await expect(locator).toBeChecked();
```

3. **.toBeDisable():**
   - Ensure the locator point to a disable element. Element is disabled if it has "**disabled**" attribute or is disabled via **'aria-disabled'.**
   - Note that only native control element such as HTML button, input, select, textarea, option, optgroup can be disabled by setting **'disabled'** attribute.
   - **Disabled** attribute on other elements is ignored by the browser.

```
const locator = page.locator('button.submit');
await expect(locator).toBeDisabled();
```

4. **.toBeEditable():**
   - Ensure the Locator points to an editable element.

```
const locator = page.getByRole('textbox');
await expect(locator).toBeEditable();
```

5. **.toBeVisible():**
   - Ensure that locator points to an **attached** and **visible** Dom node.
   - To check that at least one element from the list is visible, use **locator.first()**

```
// A specific element is visible.
await expect(page.getByText('Welcome')).toBeVisible();

// At least one item in the list is visible.
await expect(page.getByTestId('todo-item').first()).toBeVisible();

// At least one of the two elements is visible, possibly both.
await expect(
    page.getByRole('button', { name: 'Sign in' })
        .or(page.getByRole('button', { name: 'Sign up' }))
        .first()
).toBeVisible();
```

6. **.toContainText():** 🔗
   - Ensure the Locators points to an element that contains the given text. All nested elements will be considered when computing the text content of the element.
   - You can use regular expression for the value as well.

```
const locator = page.locator('.title');
await expect(locator).toContainText('substring');
await expect(locator).toContainText(/\d messages/);
```

7. **.toHaveAttribute(name,value):**
   - Ensure the locator points to an element with given attributes.

```
const locator = page.locator('input');
await expect(locator).toHaveAttribute('type', 'text');
```

   - **name:** attribute name
   - **value:** Expected attribute value

8. **.toHaveAttribute(name):**
   - Ensure the locator points to an element with given attribute.
   - The method will assert attribute presence.

```
const locator = page.locator('input');
// Assert attribute existence.
await expect(locator).toHaveAttribute('disabled');
await expect(locator).not.toHaveAttribute('open');
```

Usage

```
await expect(locator).toHaveAttribute(name);
await expect(locator).toHaveAttribute(name, options);
```

9. **.toBe():**
   - Compares value with expected by calling **object.is.**
   - This method compares objects by reference instead of their content, similarly to the strict equality operator **===.**

```
const value = { prop: 1 };
expect(value).toBe(value);
expect(value).not.toBe({});
expect(value.prop).toBe(1);
```

10. **.toBeFalsy():**
    - Ensure that value is false in Boolean context, one of **false, 0, '', null, undefined and NaN.**
    - Use this method when you don't care about the specific value

```
const value = null;
expect(value).toBeFalsy();
```

11. **.toBeTruthy():**
    - Ensure that value is true in a Boolean context, **anything but false, 0, '', null, undefined or NaN.**
    - Use this method when you don't care about the specific value

```
const value = { example: 'value' };
expect(value).toBeTruthy();
```

12. **.toEqual():**
    - Compares content of the value with contents of **expected,** performing **'deep equality'** check.
    - For objects, this method recursively checks quality of all fields, rather than comparing objects by reference as performed by **expect(value).toBe().**
    - For primitive values, this method is equivalent to **expect(value).toBe().**

```
const value = { prop: 1 };
expect(value).toEqual({ prop: 1 });
```

➢ **Playwright Test:**
    - Playwright Test provides a **test** function to declare tests and **expect** function to write assertions

```
import { test, expect } from '@playwright/test';

test('basic test', async ({ page }) => {
  await page.goto('https://playwright.dev/');
  const name = await page.innerText('.navbar__title');
  expect(name).toBe('Playwright');
});
```

    - There are different hooks on test function.

1. **test.afterAll():**
    - Declare an **afterAll** hook that is executed once per worker after all tests.
    - When called in the scope of a test file, runs after all tests in the file,
    - When called inside a **test.describe()** group, runs after all tests in the group.

```
test.afterAll(async () => {
  console.log('Done with tests');
  // ...
});
```

Alternatively, you can declare a hook **with a title**.

```
test.afterAll('Teardown', async () => {
  console.log('Done with tests');
  // ...
});
```

2. **test.afterEach():**
   - Declares an **afterEach** hook that is executed after each test.
   - When called in the scope of a test file, runs after each test in the file.
   - When called inside a **test.describe()** group, runs after each test in the group.

```
import { test, expect } from '@playwright/test';

test.afterEach(async ({ page }) => {
  console.log(`Finished ${test.info().title} with status ${test.info().status}`);

  if (test.info().status !== test.info().expectedStatus)
    console.log(`Did not run as expected, ended up at ${page.url()}`);
});

test('my test', async ({ page }) => {
  // ...
});
```

3. **test.beforeAll():**
   - Declares a **beforeAll** hook that is executed once per worker process before all tests.
   - When called in scope of a test file, runs before all tests in the file
   - When called inside a **test.describe()** group, runs before all tests in the group.

```
import { test, expect } from '@playwright/test';

test.beforeAll(async () => {
  console.log('Before tests');
});
```

   - We can use this for login, session creation

4. **test.beforeEach():**
   - Declares an **beforeEach** hook that is executed after each test.
   - When called in the scope of a test file, runs before each test in the file.
   - When called inside a **test.describe()** group, runs before each test in the group.

- You can access al the same **fixtures** as the test body itself, and also the **TestInfo** object that gives a lot of useful information.
- Eg. You can navigate the page before starting the test.

```
import { test, expect } from '@playwright/test';

test.beforeEach(async ({ page }) => {
  console.log(`Running ${test.info().title}`);
  await page.goto('https://my.start.url/');
});

test('my test', async ({ page }) => {
  expect(page.url()).toBe('https://my.start.url/');
});
```

5. **test.describe():**
   - Declare a group of tests.
   - Syntax:

```
• test.describe(title, callback)
• test.describe(callback)
• test.describe(title, details, callback)
```

   - You can declare a group of tests with a title. The title will be visible in the test report as a part of each test's title.

```
test.describe('two tests', () => {
  test('one', async ({ page }) => {
    // ...
  });

  test('two', async ({ page }) => {
    // ...
  });
});
```

➢ **Page.addInitScript():**
   - Add a Script which would be evaluated in one of the following scenarios:
     - Whenever the page is navigated.
     - Whenever the child frame is attached or navigated. In this case the script is evaluated in the context of the newly attached frame.

- The script is evaluated after the document was created but before any of its scripts were run. This is useful to amend the JavaScript environment, Eg. To seed Math.random

➢ **To take screenshot:**

- **Locator level screenshot:**

```
//Locator level Screenshot
await page
  .locator(`//input[@id="displayed-text"]`)
  .screenshot({ path: './Playwright-First-project/locatorSS.png' });
```

- **Complete page screenshot:**

```
//Complete page screenshot
await page.screenshot({ path: 'Playwright-First-project/screenshot.png' }); //--> create
screenshot
```

➢ **Perform Visual test by matching/comparing screenshots of ui:**

```
//screenshot - store -> screenshot ->
test('visual', async function ({ page }) {
  await page.goto(`https://www.flightaware.com/`);
  expect(await page.screenshot()).toMatchSnapshot('landing.png');
});
```

- **.toMatchSnapshot()** assertion is first create a snapshot if not present
- If snapshot already present it match that snapshot and compare each element are present in same position with previous snapshot.
- If any changes occurs then it will failed the test case and throws a error.

➢ **To upload file using playwright:**

```
await page.locator("#fileinput").click();
await page.locator("#fileinput").setInputFiles("/Users/rahulshetty/downloads/download.xlsx");
```

- **.setInputFiles()** method is use to upload files using playwright.
- But there is a condition, for applying this method our html element should have **input type=”file”.**

➢ **Playwright Framework Features:**

- Implement Page Object Pattern for web automation tests
- Create API utilities for Data setup and clean up.
- How to drive test data from external files for playwright tests
- How to parameterize the test with different data sets in playwright.
- Create project configuration with playwright config file
- Tests retry feature in playwright and how it works
- How to record the video of test execution within playwright framework
- Understand how tests run in parallel mode in playwright framework

- Test automation on run, skip, serial run and parallel run
- Playwright command line arguments options to run tests
- Detailed view of HTML reporting with trace viewer logs
- Generating all your reporting for playwright execution results
- How to create custom scripts in package.json to trigger tests
- Integrate the playwright framework with Jenkins CI/CD jobs and schedule runs.

➢ **Page Object Model Pattern:**

- Page Object Model is a design pattern that creates a repository for storing all web elements.
- It is useful in reducing code duplication and improving test script maintenance.
- In POM, consider each web page of an application as a separate class file. Each class file will contain only corresponding web page elements. Using these elements, testers can perform operations on the website under test.
- Large test suites can be structured to optimized ease of authoring and maintenance. POM is one such approach to structure your test suite
- Page objects simplify authoring by creating a higher-level API which suits your application and simplify maintenance by capturing element selectors in one place and creating reusable code to avoid repetition.
- It is an important tool for test automation that can help improve code quality, maintainability and readability, and make code reusable and scalable.
- **Advantages of Page Object Model:**

  1. **Easy Maintenance:**
     - POM makes maintenance easier even if there is a change in the DOM tree and selectors we don't have to modify everywhere.
  2. **Increased Reusability:**
     - Using POM, we can reuse the code which can be written for another test.
     - Also, we can create helper methods to achieve this.
     - Code reusability reduce the code, thus saving time and effort

3. **Readability:**
    - As the tests are independent, it increases the readability.

- **Disadvantages of Page Object Model:**
    - Initial design and building framework take some time.
    - Good coding skills are required to set the POM framework
    - Elements are stored in a shared file, so even a tiny mistake in the page object file can lead to breaking the whole test suite.

➢ **Some more test configuration in Playwright.config file:** 🔗

```
export default defineConfig({
  testDir: './tests',
  retries: 1,
  timeout: 30 * 1000, // 30 sec for whole test
  expect: {
    timeout: 5000, //5 sec for assertion
  },
  workers: 3, //By default 5 worker executed by playwright
  fullyParallel: true, //Run test in parallel Mode
  forbidOnly: true, //it is avoid test.only
  reporter: 'html',
```

- **testDir:** In this property mention the path of folder where all tests are present.
- **retries:** It retry the file execution if any problem occurs
- **timeout:** Time out for whole test execution
- **expect:** mention conditions for all expects.
- **workers:** worker thread will execute in parallel mode. By default playwright execute **5** worker thread in Parallel mode where 5 test case executed simultaneously . And for serial mode 1 thread is executed all test case one by one
- **fullyParallel:** Run test cases in parallel mode
- **forbidOnly:** it forbidden **test.only()** feature
- **reporter:** this is indicate generate report in particular given format like '**html**'

➢ **To execute tagged test case:**

```
npx playwright test --grep '@TS'
```