INTEGRATE CUCUMBER WITH SELENIUM WEBDRIVER FOR WEBSITE AUTOMATION

A PROJECT REPORT

Submitted by

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to

The APJ Abdul Kalam Technological University

In partial fulfillment of the requirements for the award of the Degree of

MASTER OF COMPUTER APPLICATIONS

Thangal Kunju Musaliar College of Engineering
Kerala

DEPARTMENT OF COMPUTER APPLICATIONS

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DECLARATION

I undersigned hereby declare that the project report INTEGRATE CUCUMBER WITH SELENIUM WEBDRIVER FOR WEBSITE AUTOMATION, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of Prof. Natheera Beevi M. This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

Place: Kollam

Date: 12-05-22

Jibin Titus K

DEPARTMENT OF COMPUTER APPLICATIONS
TKM COLLEGE OF ENGINEERING

C E R T I F I C A T E

This is to certify that, the report entitled "**INTEGRATE CUCUMBER WITH SELENIUM WEBDRIVER FOR WEBSITE AUTOMATION"** submitted by **JIBIN TITUS K(TKM19MCA014)**, to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications is a bonafide record of the project work carried out by her under our guidance and supervision.This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor | Head of the Department | External Examiner

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11th May, 2022

TO WHOM IT MAY CONCERN

This is to certify that Jibin Titus K, student of MCA, TKM College of Engineering, Kollam is pursuing the internship at Mpowered Health Infotech Private Limited from 1st Feb, 2022 which will be completed on 31st July, 2022.

During the internship program, she has got the opportunity to work on product development, quality assurance, and on various other ad hoc projects.

We have found her very punctual, hardworking, and inquisitive about learning new things. We wish him all the success in future endeavours.

Yours Truly,
For **Mpowered Health Infotech Private Limited.**,

Rajesh Kumar Ray
Authenticated through
Leegality.com (b3xL4t1)
Rajesh Kumar Ray
Date: Wed May 18 13:58:58 IST
2022

Rajesh Kumar
Ray Country
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First and foremost I thank GOD almighty and my parents for the success of this project. I owe sincere gratitude and heart full thanks to everyone who shared their precious time and knowledge for the successful completion of my project.

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I owe my thanks to our friends and all others who have directly or indirectly helped us in the successful completion of this project.

Jibin Titus K

ABSTRACT

Nowdays there is an increased demand for both web and mobile apps.Software systems are getting more and more important for organizations and individuals alike and at the same time they are growing bigger and more complex. It is thus only logical that importance of software quality is also rising. If quality does not get better as systems grow in size, complexity and importance, then software system may face more issues in future.The need for better quality means more pressure for software testing.It is very difficult to test these complex web applications.Automation testing is a need of fast and efficient software development life cycle (SDLC) for high productivity and good quality of product.The demand of all type of web applications is increasing day by day, and every organization is adopting agile SDLC model.Automation testing is a software testing technique that performs using special automated testing software tools to execute a test case suite. Automation testing uses automation tools to reduce human intervention and repeatable tasks.Automation increases the speed of test execution, helps increase Test Coverage.

The objective of this project is to design and develop a web automation framework help to run lots of test cases consistently again and again on different versions of the system under test.This automation testing framework also helps to improve test accuracy, and drastically reduces the test maintenance costs and lowers risks involved.

The project ”Integrate Cucumber With Selenium Webdriver For Website Automation” focuses on Automation Testing of Mpowered Health Web Application as a regression suite.Also automating the add partners(EAM). Mpowered Health application empowers consumers to take charge of their healthcare by providing solutions that improve transparency, choice, access and convenience.The automation testing framework has been implemented using selenium Web driver with cucumber. As we run the regression suite it will execute all the functionalities generated and TestNG is used to give a detailed Serenity report to show the pass and failure cases and Screenshots are taken automatically for the failure cases.

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Chapter 1

INTRODUCTION

With the development of each web application or software there is a very important need to verify that the developed software's functionality is as per the requirements of the stakeholders.Software testing is a process to evaluate the functionality of a software application with an intent to find whether the developed software has met the specified requirements or not and to identify the potential defects in order to produce the quality product. Automation testing uses software tools, separate from the software being tested, to control the execution of tests and the comparison of actual outcomes with predicted outcomes. Test automation process can automate repetitive but necessary tasks in a formalized testing process, or perform additional testing that would be difficult to do manually. Test automation is critical for continuous delivery and continuous testing.

The key benefit of automating the web application is it saves time and effort to test the application. Software tests have to be repeated often during development cycles to ensure quality. Every time source code is modified software tests should be repeated. For each release of the software it may be tested on all supported operating systems and hardware configurations. Manually repeating these tests is costly and time consuming. Once created, automated tests can be run over and over again at no additional cost and they are much faster than manual tests. Automated software testing can reduce the time to run repetitive tests from days to hours.
Once automation testing framework have been developed, they can be run quickly and repeatedly.

Many times, this can be a cost-effective method for regression testing of software products that have a long maintenance life. Even minor patches over the lifetime of the application can cause existing features to break which were working at an earlier point in time. Test automation reduces the effort associated with manual testing. Manual effort is needed to develop and maintain automated checks, as well as reviewing test results[3].

Automation can offer huge improvements in test efficiency and effectiveness but may require substantial investment. Software Test automation makes use of specialized tools to control the execution of tests and compares the actual results against the expected result. The test execution environment configured for testing. Test bed consists of specific hardware, Operating system, network configuration, the product under test, other system software and application software[7].

1.1 Existing System

Once we develop a software product, we have to analyze and inspect its features and also evaluate the component for potential errors and bugs so that when it gets delivered in the market, If it is bug and errors free.The test cases/scenarios are executed one by one by Testers manually without using any readymade/testing tools, and then the results are verified.Manual verification is the most primitive form of software testing. But Manual Testing of all workflows, all fields, negative scenarios is time and money consuming. It is difficult to test for multilingual sites manually.It isn't easy to find size difference and color combination of GUI objects using a manual test.Load testing and performance testing is impractical in the manual tests.When there is a large number of tests, then running tests manually is a very time-consuming job.Regression Test cases performed using manual tests are time-consuming.So there must need a change to be done to the previous system to improve efficiency, accuracy and performance.

1.2 Objective

The main aim of the project is to design and develop an automated testing framework to perform the automated testing on MPHWeb application.

- Develop an web automation framework with the help of selenium,cucumber,TestNG and Serenity report.
- Generate report of the test with all the informations regarding passed , failed and skipped test cases.Also date , started time,ended time ,execution time are available in the reports.
- Capture the screenshots of failed test cases.
- Then integrate automated functionalities into a single regression suite.

1.3 Company Profile

Mpowered Health is a consumer-driven healthcare technology company committed to creating a better healthcare experience for consumers and enterprises. The California-based company empowers consumers to take charge of their healthcare. The company provides enterprise solutions in compliance, consumer acquisition engagement to enable healthcare organizations to serve their consumers more effectively and achieve their organizational goals. Mpowered Health is building the future of healthcare by connecting consumers and healthcare enterprises. We empower consumers to take charge of their healthcare by providing solutions that improve transparency, choice,access and convenience. In recognizing that consumer empowerment cannot be a zero-sum game,we enable healthcare organizations to serve their consumers more effectively and achieve their organizational goals.Mpowered Health empowers consumers to take charge of their healthcare by providing solutions that improve transparency, choice, access and convenience.

Chapter 2

LITERATURE SURVEY

Literature review is the comprehensive study and interpretation of literature that relates to a particular topic. When one uses literature review research questions are identified, then one seek to answer this research questions by searching for and analyzing relevant literature. Some importance of literature reviews is that new insights can be developed by the re-analyzing the results of the study. A literature review is both a summary and explanation of the complete and current state of knowledge on a topic as found in academic books and journal articles. There are two kinds of literature reviews you might write at university: one that students are asked to write as a stand-alone assignment in a course, and the other that is written as part of an introduction to, or preparation for, a longer work, usually a thesis or research report. The focus and perspective of your review and the kind of hypothesis or thesis argument you make will be determined by what kind of review you are writing. One way to understand the differences between these two types is to read published literature reviews or the first chapters of theses and dissertations in your own subject area. Analyses the structure of their arguments and note the way they address the issues.

2.1 Related Works

According to Dustin et al. [4], automate software testing activities including the development and execution of test scripts, verification of testing requirements, and the use of automated testing tools. Software Test Automation aims at optimizing the speed, efficiency and quality of the application along with reducing the cost involved in the manual process thus providing better return on

investment (ROI). Several open source tools such as JMeter , Canoo WebTest, Soasta CloudTest, Selenium etc., are used to support software test automation amongst which Selenium is considered as the most popular open source functional test tool for web-based applications [5].

Software Test Automation is achieved by means of developing a Test Automation Framework. A Test Automation framework is scaffolding laid to provide an execution environment for the automation test scripts, enabling engineers to follow various guidelines, coding standards, concepts, processes, practices, project hierarchies, modularity, reporting mechanism, test data injections etc., to pillar automation testing. The most prominent advantages of a Test Automation Framework include reusability of code, maximum coverage of test cases and recovery scenario's, low cost maintenance, minimal manual intervention and ease of reporting.

According to Sivanandan et al Behavior Driven Development framework allows automation of functional validations in easily readable and understandable format to Business Analysts, Developers, Testers, etc. Such frameworks do not necessarily require the user to be acquainted with the programming language. There are different tools available for BDD like cucumber, Jbehave etc. Details of BDD framework are discussed later in Cucumber tutorial. We have also discussed details on Gherkin language to write test cases in Cucumber.

In paper [6] a set of tools that support the testing process in a variety of ways. Some tools simulate the final execution environment as a way of expediting test execution, others automate the development of test plans, and still others collect performance data during execution.In these tough economic times, software- development managers are pushing to get more and testing done faster. Most recognize the automated testing tools facilitate higher quality and more productive testing, but acquiring such tools is often complicated. The paper had given the evaluation criteria for selecting the testing tools.Automation testing covers all the problems of manual testing.Automation testing automates the steps of manual testing using automation tools such as Quick Test Pro (QTP) and Load Runner. increases the test execution speed, more reliable, repeatable, programmable, comprehensive, and reusable[19].infrastructure and automation-based approach, together with the

set of best practices. We then explain implementation details and a new test automation framework architecture that combines several control structures, which is easier to control the workflow of tests and test environments, as well as other reusable components to interface with external systems.

For successfully testing of each modules of online web application by using automation selenium testing tool without any failure. User interaction with browsers has been recorded by tester on the basis of test script. In this research, author review the test-cases design working of the web based selenium testing tool and need it to run some online web based application applications. In process to test an web based application, testing testers do not to learn the all selenium web driver tool completely. This tool is needful for a technical lead and tester; they can design their source code owing to review shot properties of framework IDE. It created the adapted test suit cases report to the testing tester. It is very well to maintain update the fail-pass test suite case for latest version of the web based application by selenium tool[7]

In paper[8] author conclude Compare many Web dependent many test generation based Tools analyzed Selenium web driver is the good feasible open-source automation tool for web based petition among all that can be freely available. Testing can be performed by using some test cases, for that test script have been written for each module and tested separately. The proposed tools are based on test cases so that the profitable connections of web based request growing the significance of managing and upgrading its grade [9]. The focal edge of using automated testing tools is that we can ignore the guidebook try need to test each suit of our web based site by generating the test scripts.

Multiple test scripts can be executed concurrently by using Behaviour driven automation. Various test cases have been proposed in conjunction with selenium test tool. In work authored summarized that manual dependency have been deduced as compared to automation. Continuous integration has been utilized to achieve the objective with respect to time, space Complexity[10].

2.2 Automation Testing Tools

Automation testing contains test cases which makes the work easy to capture different scenarios and store them. Therefore, software automation testing process plays a vital role in the software testing success.Sneha et al discuss the different types of software testing techniques and tools and to compare manual testing versus automation testing.Rafi et al. discuss the benefits and restrictions of automated software testing.Though, at the same time it is recognized that there is a gap between academic research and the benefits and problems actually encountered in applying software testing in industry [10].The survey showed that benefits of test automation were related to test reusability, repeatability, test coverage and effort saved in test executions.A study shows that automated scripts for testing are more efficient, accurate and cost effective over the manual testing.Rao et al.analyze software automation testing, definition, characteristics and functions. The study proposed method to improve the overall testing process[11].Hanna et al. make comparisons between various scripting techniques that used in automated testing.

Selenium IDE is an publicly available testing script generation tool that is used for report cases testing. Selenium tool is a set of many software modular Tools with a better mode to carry the scripts automation [1]. Selenium webdriver directly communicate with the browser, so selenium webdriver is faster than selenium RC. Selenium webdriver supports multiple web browsers and also support for Ajax applications. The main goal of the selenium webdriver is to improve support for modern web application testing problems. Selenium webdriver supports multiple languages to write the test scripts. Selenium webdriver's API is simpler than the selenium RC's [17]. However, despite all advantages of selenium web driver, it has some limitations when testing the web applications. Selenium webdriver does not have built in functionality to generate the screenshots for failure test cases. Selenium webdriver does not have built in capability to generate the test results. It depends on third party tools to generate the test reports. This limitation can be avoided by using TestNG framework. TestNG is a testing framework designed to overcome the limitations of JUnit testing framework[20].TestNG provides some new functionality that makes it more powerful than

JUnit. TestNG covers all categories of tests such as unit, functional, integration testing, end to end testing.

Behavior-driven development's approach involves the usage of shared language that enhances communication between various tech and non-tech teams. Tests are more user-focused and based on the system's behavior. In BDD, "Given-When-Then" is the proposed approach for writing test cases.Cucumber is used to execute automated acceptance tests written in the "Gherkin" language. Gherkin is a domain-specific language for behavior descriptions. Gherkin is business readable.Many organizations prefer the Selenium framework for cross browser compatibility testing. These organizations also prefer integrating Cucumber with Selenium as it makes it easier to read and understand the flow of applications among the members from different teams. Gherkin syntax involves simple and plain text, which makes it easier to understand test cases[20].

Chapter 3

METHODOLOGY

Quality Assurance(QA) is a subset of the software development life cycle (SDLC), and QA automation means using automated testing tools to run tests on the software being developed and report on the results. Automation testing handles many of the time-consuming tasks that were previously carried out by manual testers. It's especially useful for continuous integration and continuous delivery, where software is developed, tested, and deployed multiple times per day, rather than in stages.

3.1 System Architecture

In this project I created a Maven automation framework.Maven folder structure comes with pom.xml file. In pom.xml file we specify the dependencies. Here we use dependencies like selenium, poi, cucumber, TestNg etc.Then create test scripts to test each functionalities of Mpowered Health consumer website . A cucumber feature file is created along with each of the functionalities. Feature file test cases are mapped to corresponding java test script. These test scripts are then merged into a single regression suite and push that code into github shared repository. After execution we will get a Report here we use Serenity and TestNG Report. Evaluating this report anyone can understand which of the functionalities are passed and failed. For each failed test cases corresponding screenshots are present in screenshot folder.One can manually design the test cases and place it in the repository or write module for dynamically developing test cases according to the requirement.

We have designed test automation framework based on selenium web driver with cucumber,TestNG. The framework designed in this paper includes five components listed below.

- Object Repository
- Input File
- Utility Section
- Test Suite
- Customization Serenity Report

Object repository

Selenium webdriver supports various types of locator to locate the web page elements. Web page elements can be located by its id, link text, xpath or css locators. Object repository stores all the locators of web page elements. This will simplify the task of maintaining and repairing the test cases. we have implemented object repository which contains the id's, xpath and link text for all web page elements. Whenever tester writes the test case, tester will use the information to locate the web page element. This will reduce the maintenance cost of test cases. Whenever change occurs in web application elements, tester needs to change only object repository.

Input file

In Web application, end user needs to enter some information for e.g. Login credentials requires user name and password to login. Such kind of inputs stored in input file. Instead of entering same information in web application, tester may access these inputs from input file. In this file tester can store the input values required by web application.

Utilities Section

- **Reusable function:**

  Selenium webdriver doesn't support the direct functions to perform certain operations like clicking a button, selecting checkbox etc.This section contains the common functions like click button, select check-box, click link etc. This will reduce the redundancy of code in test script.

This file also contains the application specific functions for example if web application contains table and you need to verify particular column is sorted or not. To verify this kind of application specific functionality, separate functions can be created. These functions will be useful for writing different test cases.

Test Suite

A test suite is a collection of tests.TestNG enables you to run test methods, test classes and test cases in parallel in- side your project. By performing parallel execution, we can reduce the execution time as tests are started and executed simultaneously in different threads.It contains the runner file.

Customization of test report

Selenium webdriver doesn't support built in functionality to generate the report.Here we are using Cucumber testing framework to generate the test report.Both Serenity BDD with TestNG generates the report in HTML format, which is tedious to understand.Here we use serenity report.

Generate Screenshot

Selenium webdriver does not support the screenshot for failure test cases. We have implemented new function that will take the screenshot for failure test case only. Using this function tester can easily capture the error occurred in web application. This will also help to developer to analyze their failure. After execution of test suite, screenshots for failure test cases are stored in Screenshot folder.

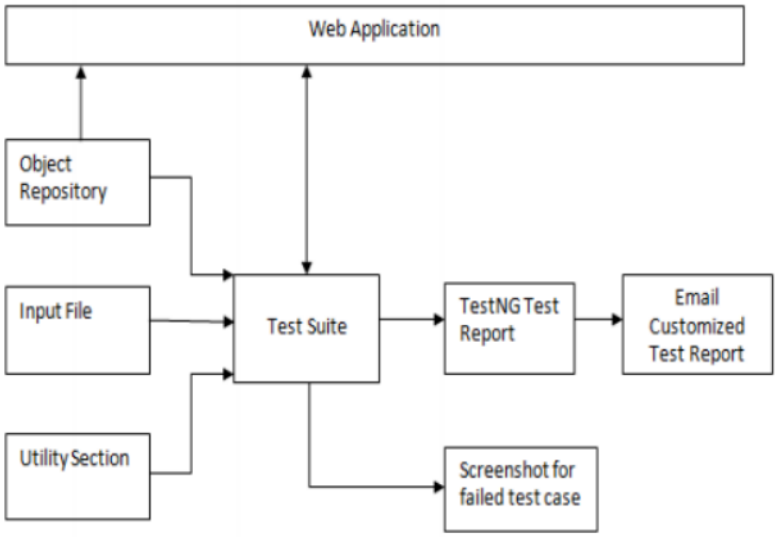

Figure 3.1: Architecture of proposed system

3.2 System Requirements

The software used for the project:

- Intellij
- Java

3.2.1 Intellij

IntelliJ IDEA IDE for Java is the most powerful Integrated Development Enterprise. It is developed and maintained by JetBrains. This IDE is loaded with rich features and functionalities.It is an intelligent, context-aware IDE for working with Java and other JVM languages like Kotlin, Scala, and Groovy on all sorts of applications. Additionally, IntelliJ IDEA Ultimate can help you develop full-stack web applications, thanks to its powerful integrated tools, support for JavaScript and related technologies, and advanced support for popular frameworks like Spring, Spring Boot, Jakarta EE, Micronaut, Quarkus, Helidon. Moreover, you can extend IntelliJ IDEA with free plugins developed by JetBrains, allowing you to work with other programming languages, including Go, Python, SQL, Ruby, and PHP.

Advantages

- It supports many other languages other than JAVA.
- Framework integration like Junit and TestNG and other plugins can be done easily.
- It supports the most popular version control systems, like Git, Subversion, Mercurial, and Perforce, out of the box.
- It includes fully functional integration with the Maven, Gradle, Ant, and Gant build tools, which help automate the build process.

3.2.2 Java

Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. It is a general-purpose programming language intended to let application developers write once, run anywhere (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM)

regardless of the underlying computer architecture. The syntax of Java is similar to C and C++, but has fewer low-level facilities than either of them. The Java runtime provides dynamic capabilities (such as reflection and runtime code modification) that are typically not available in traditional compiled languages. As of 2019, Java was one of the most popular programming languages in use according to GitHub, particularly for client-server web applications, with a reported 9 million developers.

3.3 Tools and Frameworks

The tools used for the project

- Maven
- Cucumber
- Selenium
- TestNG
- Serenity Report
- ChroPath

3.3.1 Maven

The Maven project is developed by Apache Software Foundation where it was formerly a part of the Jakarta project. Maven is a powerful build automation tool that is primarily used for Java-based projects.
Maven helps you tackle two critical aspects of building software:

- It describes how software is built.
- It describes the dependencies.

Maven prefers convention over configuration. Maven dynamically downloads Java libraries and Maven plug-ins from one or more repositories such as the Maven Central Repository and stores them in a local cache. The artifacts of the local projects can also be updated with this local cache. Maven can also help you build and manage projects written in C, Ruby, Scala, and other languages. Project Object Model(POM) file is an XML file that contains information related to the project and configuration information such as dependencies, source directory, plugin, goals, etc. used by Maven to build the project. When you execute a maven command you give maven a POM file to execute the commands. Maven reads the pom.xml file to accomplish its configuration and operations. **Maven Repository**:

A repository is simply a directory on your machine. The project jars, plugins or any other project-related materials are stored here.

1. Local Repository
2. Central Repository
3. Remote Repository

Whenever any dependency has to be searched, it is done in repositories. Maven initializes its search from Local repository, then Central repository and finally in Remote repository.

1. **Local Repository**

   The local repository of Maven is a folder location on your machine, where all the project related elements are stored. As soon as the Maven build is executed, Maven automatically downloads all the dependency jars into the local repository.By default, maven local repository is userhome/m2 directory.

2. **Central Repository**

   If any dependency is not found in the local repository, then Maven traverses the central repository. Maven then downloads these dependencies in your local repository.

3. **Remote Repository**

   When Maven wants to download dependency, it goes to a remote repository. A remote

repository is a repository present on a web server and is widely used to host the internal projects of an organization.

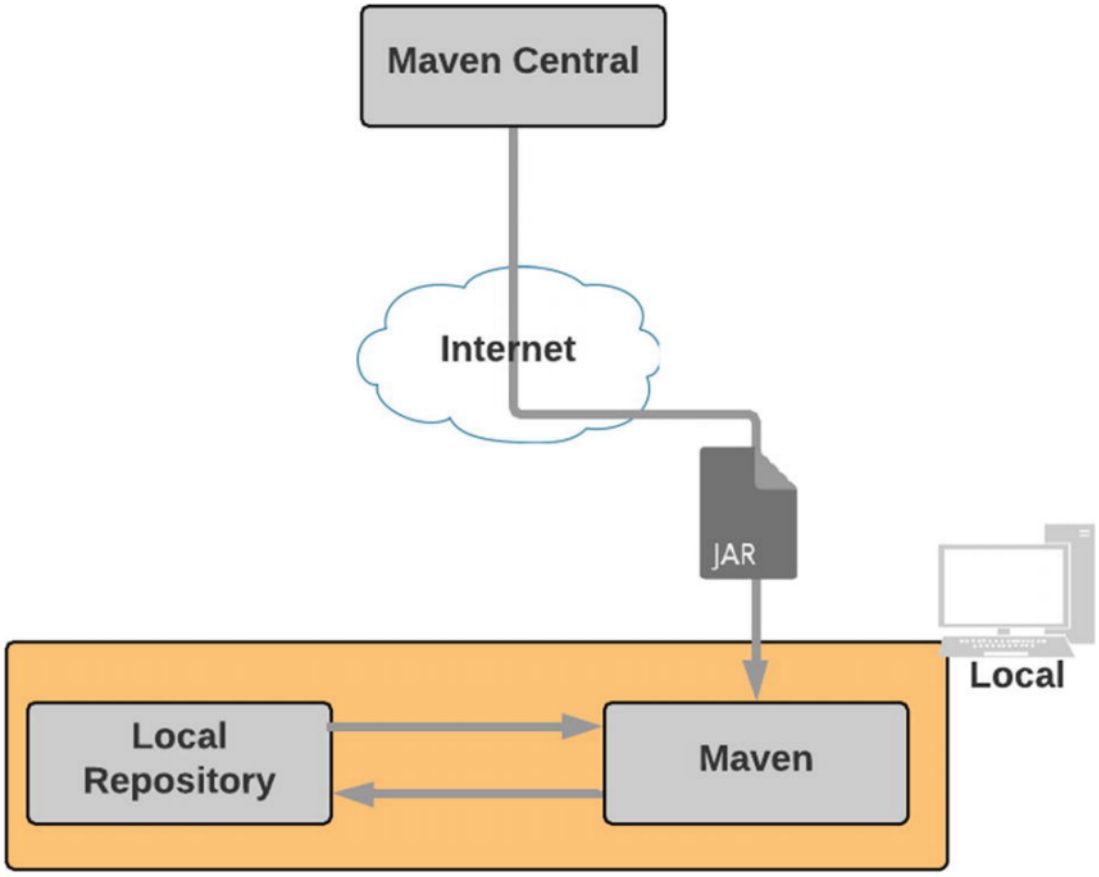

Figure 3.2: Maven fetching dependencies from central repository

Advantage

- Maven gives an easy start to the project in different environments.
- You can easily add new dependencies by writing the dependency code in the pom file.
- If the maven code for an existing dependency is not available, then one cannot add that dependency.

Disadvantage

- Maven requires the maven installation in the system for working and a maven plugin for the ide.
- If the maven code for an existing dependency is not available, then one cannot add that dependency.

Steps to create a Maven project in Intellij:

In order to create a Maven project on Intellij IDEA , the following steps are to be done:

1. Open Intellij and Go to File -New -Click on Project.
2. Click on Maven -In panel left side of the screen.
3. Click the drop-down next to ”Project SDK” to choose which JDK you want to use with your project.
4. Click Next in the bottom right corner.
5. Name your project and select a location to save it to.
6. Click on Finish button.

3.3.2 Cucumber

Cucumber is a testing tool that supports Behavior Driven Development (BDD). It offers a way to write tests that anybody can understand, regardless of their technical knowledge. Behavior-driven development's approach involves the usage of shared language that enhances communication between various tech and non-tech teams.Tests are more user-focused and based on the system's behavior. In BDD, “Given-When-Then” is the proposed approach for writing test cases.Gherkin is a set of grammar rules that makes plain text structured enough for Cucumber to understand.Cucumber reads executable specifications written in plain text and validates that the software does what those specifications say. The specifications consists of multiple examples, or scenarios.

Cucumber test automation makes use of two important files:

- Feature file: Contains Gherkin code(plain English text).
- Step definition file: Contains the actual java code written by the developer/tester.

```
Feature: Validation on refer a friend functionality

  Background: Open the browser and land on login page
    Given Mpowered website
    When Login to mph Web

      #User must click on the refer a friend and navigated to refer a friend page
  Scenario: Verify refer a friend Page UI
    When Click on Refer a Friend button in home page
    Then Verify referral code text
    And Verify How it work text is displayed below the share link button
    And  Verify invite your friends to Mpowered text and logo is displayed
    And  Verify More information & FAQ link is displayed
    And  Click More information & FAQ link
    And  Verify navigation to FAQ or Help page
    And  logout
    And  close the browser
```

Figure 3.3: Cucumber feature file.For Referral friend test cases are written in Gherkin language

Benefits of using Cucumber Testing Tools

- Testers can write Test scripts without having in-depth knowledge of programming.
- Supports various programming languages.Such as Java,Python JavaScript etc.
- Code can be reused.
- Simple and quick setup.
- Flexible with different software platforms like Selenium,Watir,Capybara etc.

Steps to implement BDD testing using Cucumber:

- To proceed with Cucumber implementation, we need to create packages to store the feature files, step definition code and testrunner code.
- To create a new package in src/test/java, right click on the folder → New → Package.
- Create the feature file in the package. Right click → New → File → Enter name test.feature.
- Create a class test.java to write the step definition for the features written. Right click Package → New → Class → enter name as test and save.
- To execute the feature files and their respective step-definition code, we need to write a TestNG runner class. Right click Package → New → Class → enter name as testrunner.

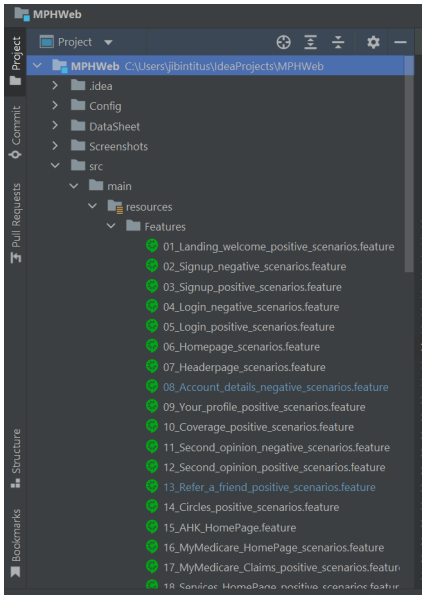

Figure 3.4: Cucumber feature files.

3.3.3 Selenium

Selenium is an open-source tool that automates web browsers. It provides a single interface that lets you write test scripts in programming languages like Ruby, Java, NodeJS, PHP, Perl, Python, and C, among others. A browser-driver then executes these scripts on a browser-instance on your device.Selenium webdriver,selenium IDE and selenium Grid are Key components of selenium .It is also known as selenium suite. Selenium Webdriver also known as Selenium 2.0, WebDriver executes test scripts through browser specific drivers.Selenium can be integrated with cucumber or TestNG framework.

Selenium WebDriver Architecture

Selenium WebDriver is not a standalone testing tool. It comprises various components that are required to run tests. These are the architectural components of Selenium.

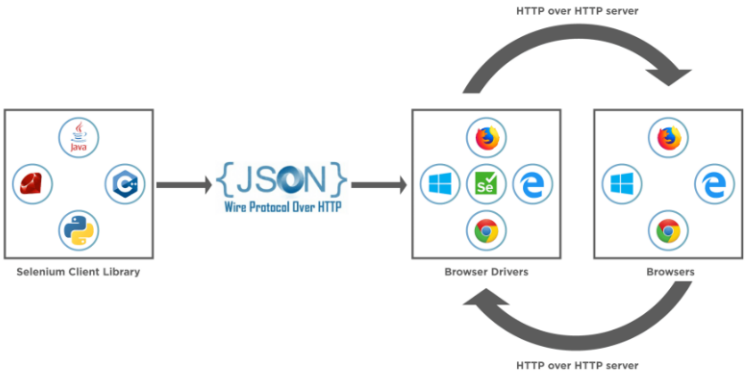

Figure 3.5: Selenium Webdriver architecture.

This image tells us about the core selenium webdriver architecture and the major selenium components which comprise WebDriver.

- **Selenium WebDriver Client Libraries / Language Bindings:**Software Testers want to select languages that they are comfortable with. Since WebDriver Architecture supports different languages, so there are bindings available for a range of languages like Java, C, Python, Ruby, PHP, etc. Anyone who has a basic knowledge of working with any programming language can get specific language bindings and can start off. This is how Selenium Achitecture provides flexibility to testers to do automation in their comfort zone.

- **JSON WIRE PROTOCOL:**As per the Selenium Architecture above, the JSON Wire Protocol facilitates all the communication that is happening in Selenium between the browser and the code. This is the heart of Selenium. JSON Wire Protocol provides a medium for data transfer using a RESTful (Representational State Transfer) API which provides a transport mechanism and defines a RESTful web service using JSON over HTTP.

- **Browser Drivers:**Since there are various browsers that are supported by Selenium, each browser has its own implementation of the W3C standard that Selenium provides. As such browser-specific binaries are available that are specific to the browser and hides the implementation logic from the end-user. JSONWire protocol establishes a connection between the browser binaries and the client libraries.

- **Browsers:**Selenium will be only able to run tests on the browsers if they are locally installed, either on the local machine or on the server machines. So browser installation is necessary.

Advantages

- Selenium is open-source, there is no licensing cost involved.

- Test scripts can be written in any of these programming languages: Java, Python, C, PHP, Ruby, Perl .Net

- Selenium support any of the Operating system: Windows,Linux or Mac.

- It support multiple browser such as Chrome,Firefox or Edge
- Selenium support parallel testing.
- Selenium can integrate third party tools.Such as Cucumber,TestNG etc.

Disadvantages

- Only for web based application.
- No report generating facility availiable.

3.3.4 TestNG

TestNG is a testing framework for the Java programming language created by Cedric Beust and ´ inspired by JUnit and NUnit. The design goal of TestNG is to cover a wider range of test categories: unit, functional, end-to-end, integration, etc., with more powerful and easy-to-use functionalities. NG in TestNG stands for "Next Generation". TestNG is inspired from JUnit which uses the annotations (@). TestNG overcomes the disadvantages of JUnit and is designed to make end-to-end testing easy. Using TestNG, we can generate a proper report, and you can easily come to know how many test cases are passed, failed, and skipped. We can execute the failed test cases separately.
Key features of Selenium TestNG:

- Annotations of TestNG are easier to understand compared to JUnit.
- TestNG does not require you to mandatorily declare @BeforeClass and @AfterClass, compared to JUnit.
- Features like prioritization and grouping of tests provided by TestNG makes it more realistic and adaptable as compared to JUnit.
- Generate the report in a proper format including a number of test cases runs, the number of test cases passed, the number of test cases failed, and the number of test cases skipped.
- The TestNG framework can be easily integrated with tools like TestNG Maven, Jenkins, etc.

3.3.5 Serenity Report

Serenity BDD is a library that makes it easier to write high quality automated acceptance tests, with powerful reporting and living documentation features. It has strong support for both web testing with Selenium, and API testing using RestAssured. Serenity strongly encourages good test automation design, and supports several design patterns, including classic Page Objects, the newer Lean Page Objects/ Action Classes approach, and the more sophisticated and flexible Screenplay pattern.

Benefits of using Serenity BDD

- Makes it easy to write, execute, and report on automated acceptance tests in terms like this, that BAs and testers as well as developers can relate to.
- Structure your automated acceptance tests into steps and sub-steps like the ones illustrated above. This tends to make the tests clearer, more flexible and easier to maintain.
- When the tests are executed, Serenity produces illustrated, narrative-style reports.

3.3.6 ChroPath

For automation testers, identifying web elements and performing actions is an important task. To make it easier, the concept called Locators was introduced in Selenium. But manually locating elements is a cumbersome task due to the complexity of the DOM structure of a webpage. This is where ChroPath comes into the picture and eases the task of locating elements in Selenium.
ChroPath is considered as a development tool to edit, inspect and generate XPath and CSS Selectors. On using ChroPath, it makes us easy to write, edit, extract and evaluate XPath and CSS queries on any webpage and saves at least 40–50 manual effort in automation script writing. ChroPath is the highest rated (4.6+) XPath tool.ChroPath is one of the extensions of Google chrome, which

helps in debugging on UI elements. Most of the Software testing companies utilize this extension from Google for bringing up issues related to layers and UI/UX testing.

Features of ChroPath

- ChroPath opens as a sidebar tab in the dev tools panel.
- It is helpful to get the absolute XPath and CSS Selector of the element or selected node.
- ChroPath generates unique relative XPath and CSS Selector for the elements selected.
- In case, the matching element is not in the visible area of a web page, it will automatically scroll to the area on mouse hovering over the matching node.
- When verifying XPath, if you enter the XPath expression pattern incorrectly or incompletely it gets highlighted in red.

Working of ChroPath

It mainly involves four pointers:

1. Add ChroPath extension to Google Chrome/Mozilla Firefox.
2. Inspect element and choose ChroPath.
3. Copy the required XPath and CSS Selector from ChroPath menu.
4. Execute the program.

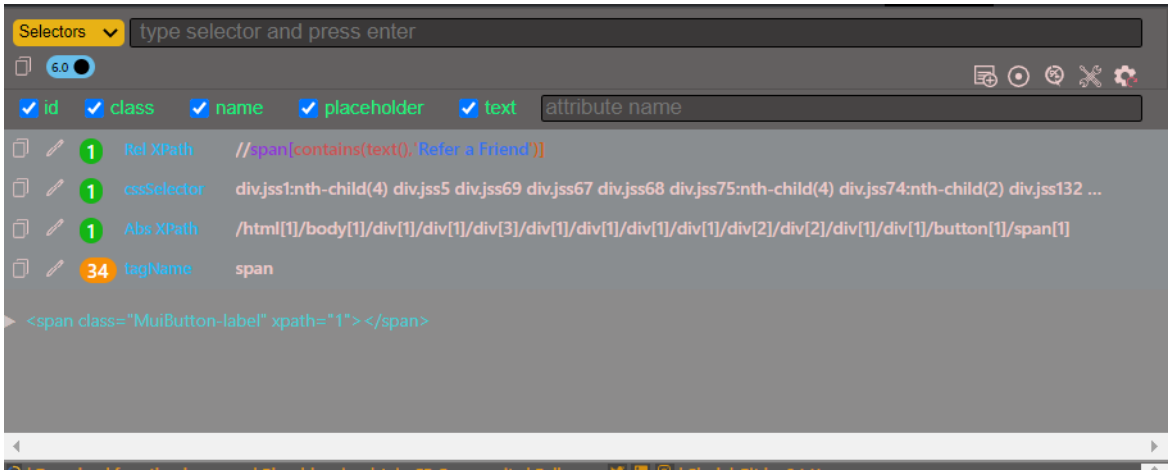

Figure 3.6: Capature xpath of Web element using ChroPath.

Chapter 4

RESULTS AND DISCUSSIONS

Testing framework is an essential part of any successful automated testing process. They can reduce maintenance costs and testing efforts and will provide a higher return on investment (ROI) for QA teams looking to optimize their agile processes.The test helps to identify errors,gaps or missing requirements in contrary to the actual requirements. It can be either done manually or using automated tools.Manual testing is the process of testing the software manually to find the defects. Automation testing is the process of testing the software using an automation tool to find the defects. Each test gave the appropriate results such as accuracy, better performance of the system etc.If the software production happens without testing it, it could be useless or sometimes dangerous for loss customers.

4.1 Test Plan

A test plan is a systematic approach to test a system. The plan typically contains a detailed understanding of what the eventual workflow will be. Normally testing of any large system will be in two parts.

- The functional verification and validation against the requirement specification.
- Performance evaluation against the indicated requirements.

Testing activity is involved right from the beginning of the project. At the very first stage of testing, the goals and objectives are set. This simplifies the limits or boarders of testing process.

Before testing, the tester should plan what kind of data he/she is giving for test. Give data inputs as functional, boundary, stress,performance, usability values etc.

Characteristics of a Good Test:

- Tests are likely to catch bugs
- No redundancy
- Not too simple or too complex

4.2 Test Cases

A specific set of steps and data along with expected results of a particular test objective. A test case should only test one limited subset of a feature or functionality. Test case documents for each functionality/testing area will be written, reviewed and maintained separately in excel sheets. In system testing, test data should cover the possible values of each parameter based on the requirements. Since testing every value is impractical, a few values should be chosen from each equivalence class. An equivalence class is a set of values that should all be treated the same. Ideally, test cases that check our error conditions are written separately from the functional test cases and should have steps to verify the error messages and logs. Realistically, if error test cases are not yet written, it is OK for testers to check for error conditions when performing normal functional test cases.

- **Positive Test Cases**

  A testing method performed on a software application by providing the valid data sets as an input. It checks whether the software application behaves as expected with positive inputs or not. Positive testing is performed in order to check whether the software application does exactly what it is expected to do.do.The positive test cases for Mpowered Health demo web sites.

  - Landing page positive scenarios
  - Login positive scenarios
  - Sign Up positive scenarios
  - Home page positive scenarios
  - Header page positive scenarios
  - Help positive scenarios
  - Circles positive scenarios
  - Award points positive scenarios
  - Account details positive scenarios
  - Second opinion positive scenarios
  - Refer a friend positive scenarios
  - Utilities positive scenarios
  - Wallet positive scenarios
  - Services positive scenarios
  - Coverage positive scenarios
  - Forgot password positive scenarios

- **Negative Test Cases**

  A testing method performed on the software application by providing invalid or improper data sets as input. It checks whether the software application behaves as expected with the negative or unwanted user inputs. The purpose of negative testing is to ensure that the software application does not crash and remains stable with invalid data inputs.inputs.The negative test cases for Mpowered Health demo web sites.

  - Login negative scenarios
  - Sign Up negative scenarios

- Circles negative scenarios
- Account details negative scenarios
- Award points negative scenarios
- Second opinion negative scenarios
- Utilities negative scenarios
- Forgot password negative scenarios

Implementation

Implementation is the process of having the system personnel check out and put new equipment to use, train the users to use the new system and construct any file that are needed to see it. The final and impartment phases in the system life cycle are the implementation of the new system. System implementation refers to the steps necessary to install a new system to put into operation. The implementation has different meaning, ranging from the conversion of a basic application to complete replacement of computer system. Implementation includes all these activities that take place to convert from old system to new one. The new system may be totally new replacing an existing manual or automated system or it may be major modification to an existing system. The methods of implementation and time scale adopted are found out initially. The system is tested properly and at the same time the users are trained in the new procedure. Proper implementation is essential to provide a reliable system to meet organizational requirements. Successful implementations may not guarantee improvement in the organization involves the following things:

- Careful planning.
- Investigation of the system and constraint.
- Design the methods to achieve the change over.
- Train the staff in the changed phase.
- Evaluation of change over method Implementation methods.

There are several methods for handling the implementation and consequent conversion from the old to new automated system. The most secure for this conversion is to run the old and new system in parallel. This method offers high security but the cost for maintaining the two systems in parallel is very high. Another method is direct cut over the existing system to automated system. The chance may take place within a week or within a day.

Implementation Phase

It includes a description of all activities that most occur to implement the new system and put into operation. It consists of the following steps:

- List all files required for the implementation.
- Identify all data required to build new files during the implementation.
- List all new document and procedure that go to the new system.

4.3 Testing Methods

There are at least three levels of testing: unit testing, integration testing, and system testing.However, a fourth level, acceptance testing, may be included by developers. This may be in the form of operational acceptance testing or be simple end-user (beta) testing, testing to ensure the software meets functional expectations.

Unit Testing

Unit testing is a level of software testing where individual units/ components of application are tested. The purpose is to validate that each unit of the application performs as designed. A unit is the smallest testable part of any software. It usually has one or a few input and usually a single output. The framework implemented by unit test supports test suites, and a test runner to enable automated testing for your code. For this framework we are using TestNG for unit testing. For testing modules, first specify dependency ”testng” in pom.xml file. And extend ”AbstractTestNGCucumberTests” class in the testrunner file. The TestNG will produce inbuilt report of the testing. The possible outcomes of the unit test are given below.

- OK – The test passes.
- FAIL - The test got failed and raises an Assertion Error Exception.
- ERROR - The test raises an exception other than Assertion Error.

Integration Testing

Integration testing tests the interface between modules of the software application. The different modules are first testing individually and then combined to make a system. Testing the interface between the small units or modules is integration testing. It is usually conducted by software integration tester and in continuation to the development. There is a standard for developing system and all developers follows this standard. During integration testing, checks naming conventions, repetition of modules etc.

System Testing is testing of the software application as a whole to check if the system is complaint with the user requirements. It is an end to end user perspective testing intended to find defects in the software system. The system testing is using in this project to measuring performance and functions.

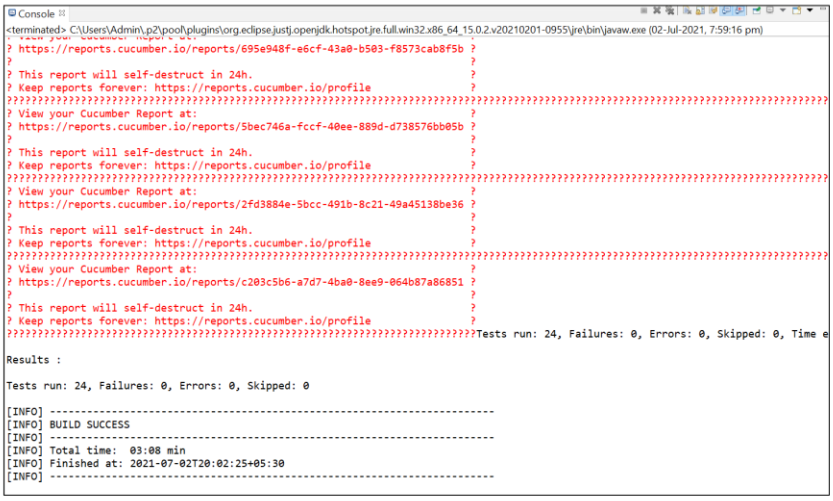

Figure 4.1: Console output of the integration test execution by Maven

Regression Testing

Regression Testing is defined as a type of software testing to confirm that a recent program or code change has not adversely affected existing features.Regression Testing is nothing but a full or partial selection of already executed test cases which are re-executed to ensure existing functionalities work fine. This testing is done to make sure that new code changes should not have side effects on the existing functionalities. It ensures that the old code still works once the latest code changes are done.Below figure serenity report of the regression test execution of 39 functionalities.

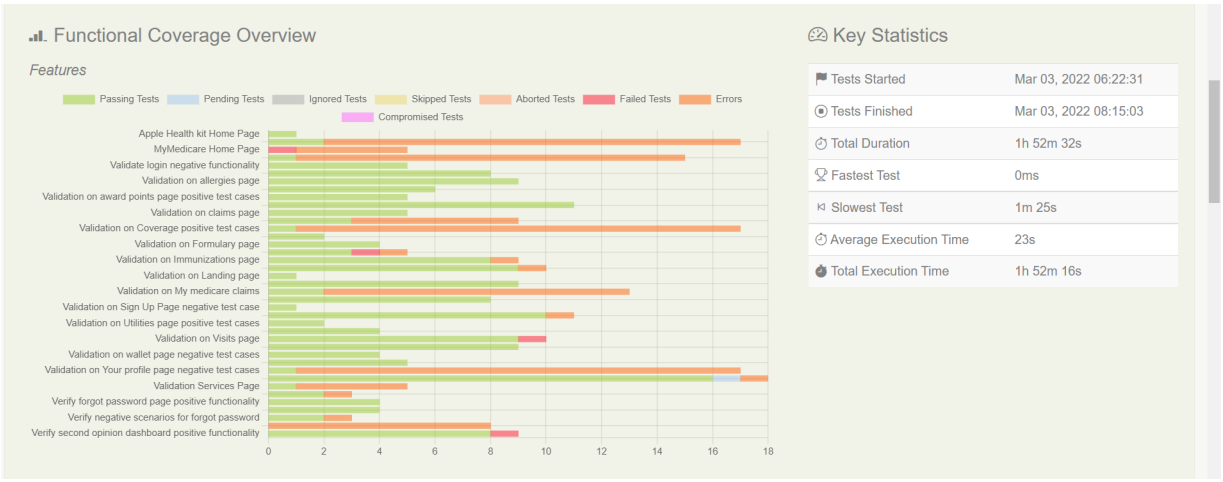

Figure 4.2: Serenity report of the regression suit testing execution by Maven.

4.4 Result Analysis

Fig.4.3 depicts on entering incorrect email format in sign up page user will get a validation message that ”Invalid Email id”. This message is validated during the execution of test scripts.

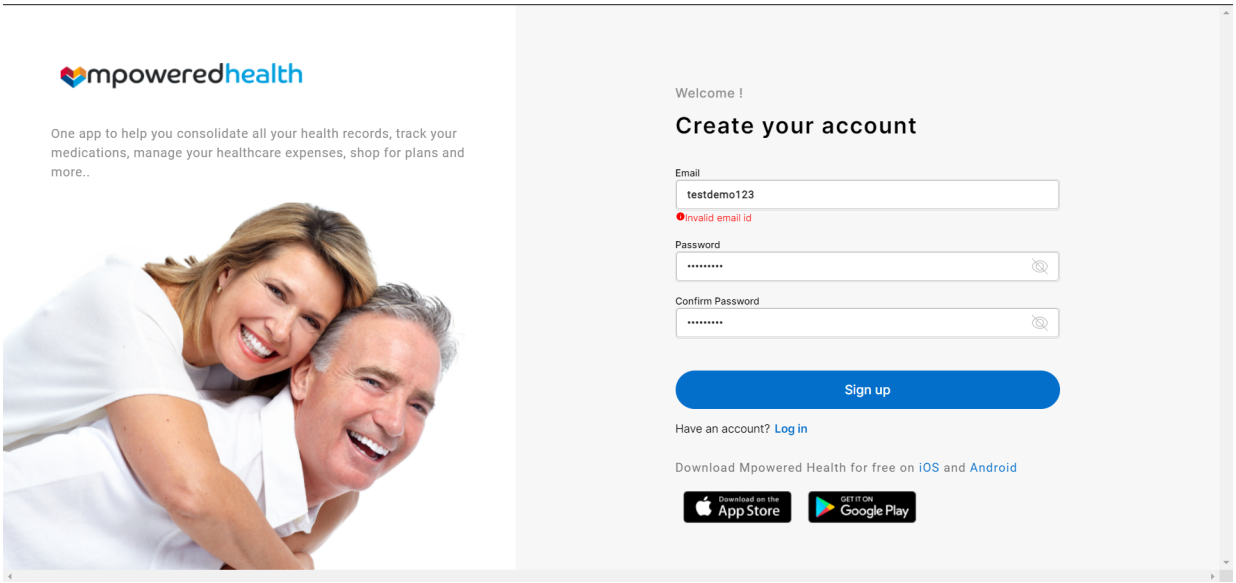

Figure 4.3: Sign up page showing validation message on entering invalid email id

Serenity Report

Serenity report is the other source of information about the testing framework. The reports will be generated and stored under the ”Reports” folder. Inside reports folder each reports will be saved within a folder named with the date and time of execution. So it will enable the testers to keep track of execution history. And from the report we can analyze the rate of failures, passes and skipped cases. Also date , started time,ended time ,execution time are available in the reports.

Figure 4.4 shows a failed test cases screenshot which showing referral friend more information link not loaded for testing.So that corresponding test case will be failed.

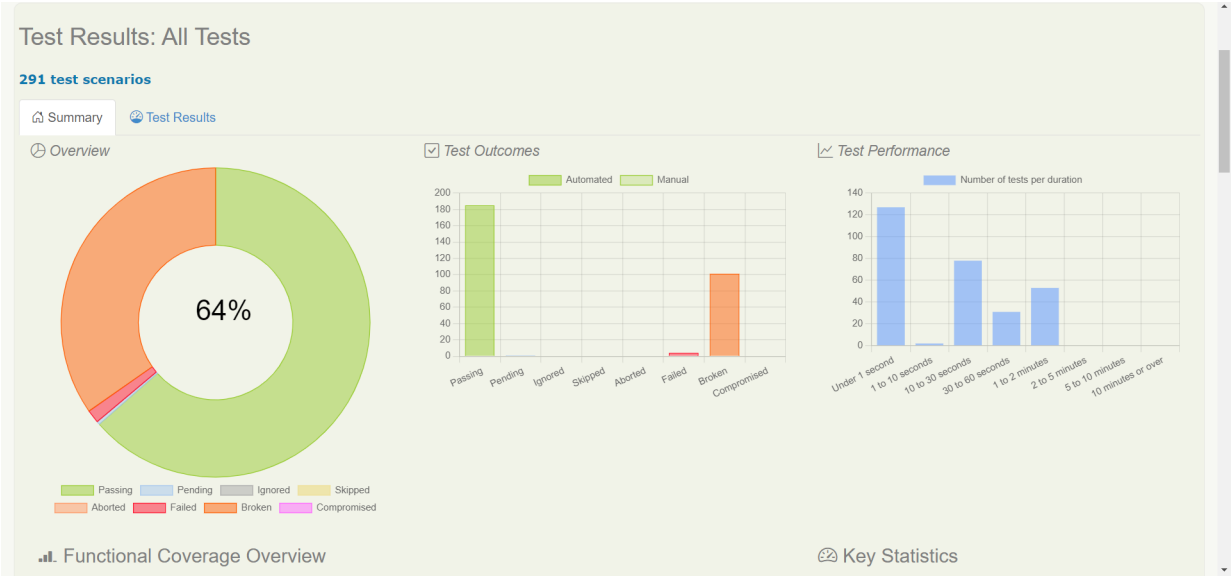

Figure 4.4: Serenity Report of test execution

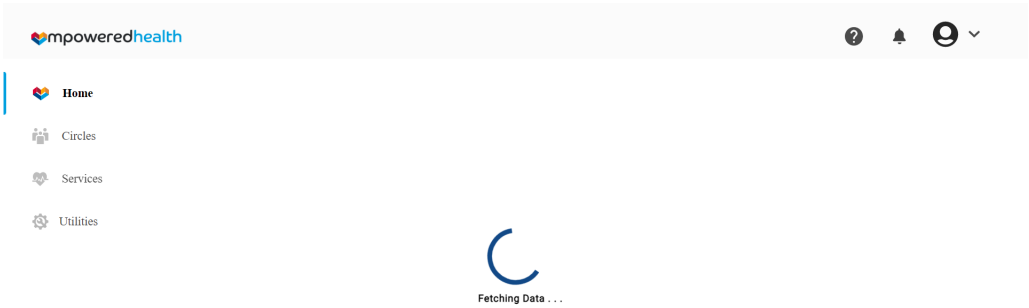

Figure 4.5: Failed test case screenshot

Chapter 5

CONCLUSION

Quality Assurance testing methodology should ideally combine both automated testing and manual testing. Testing and quality assurance is always important for the development of successful web based application. Automated software testing is a new trend that is taken up by the developer to deliver high performance applications in short periods of time. The key is to determine which type of testing is most relevant for each aspect and stage of the product.

This project propose a automation testing framework to test the web based application of Mpowered Health based on selenium webdriver with cucumber framework for Quality Assurance of the Web application.In order to test the web application proposed automation framework surely reduces the time required to write the test cases and increases the pass percentage of test cases.It also reduces workload of tester. By using this framework one can generate the customized serenity report and also analyze the failures using screenshots of failed test cases. This framework is very useful for dynamically changing web applications. The automation test scripts are easy to understand using this framework. In this way automation framework helps organization to test web applications efficiently.

5.1 Advantages

The key Features are:

- Test data are stored in excel sheet and reading all the data from Excel sheet
- Screenshots will be captured if any failure of test cases.
- Serenity report generate living documentation that contains meaningful report for each Test.

5.2 Future Enhancement

In the future, the proposed method can be used to test the further functionalities that will be added in the Mpowered Health Web application.This method will also be used for automating the mobile application of Mpowered Health.With the help of Smile CDR automate the database of MPH.

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[21] Online Resource:https://mvnrepository.com/

APPENDIX

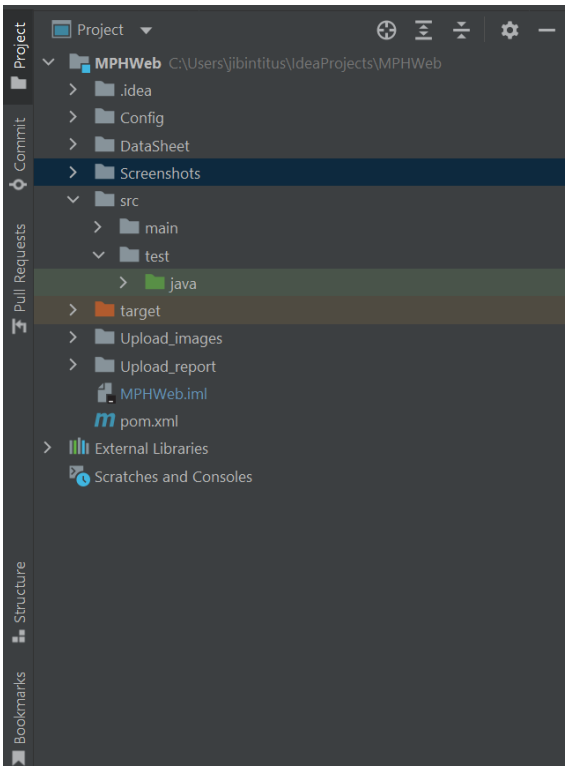

Figure 5.1: Framework folder structure

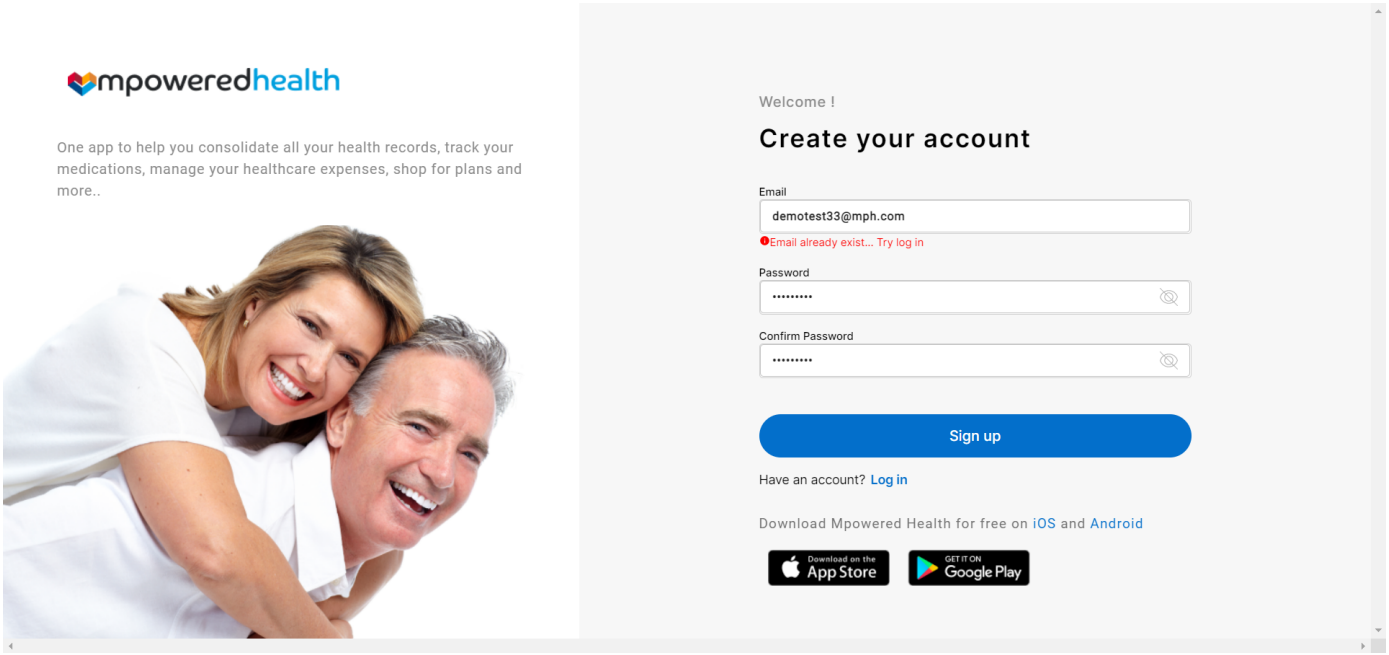

Figure 5.2: Signup negative scenarios testing - User enters existing email id.

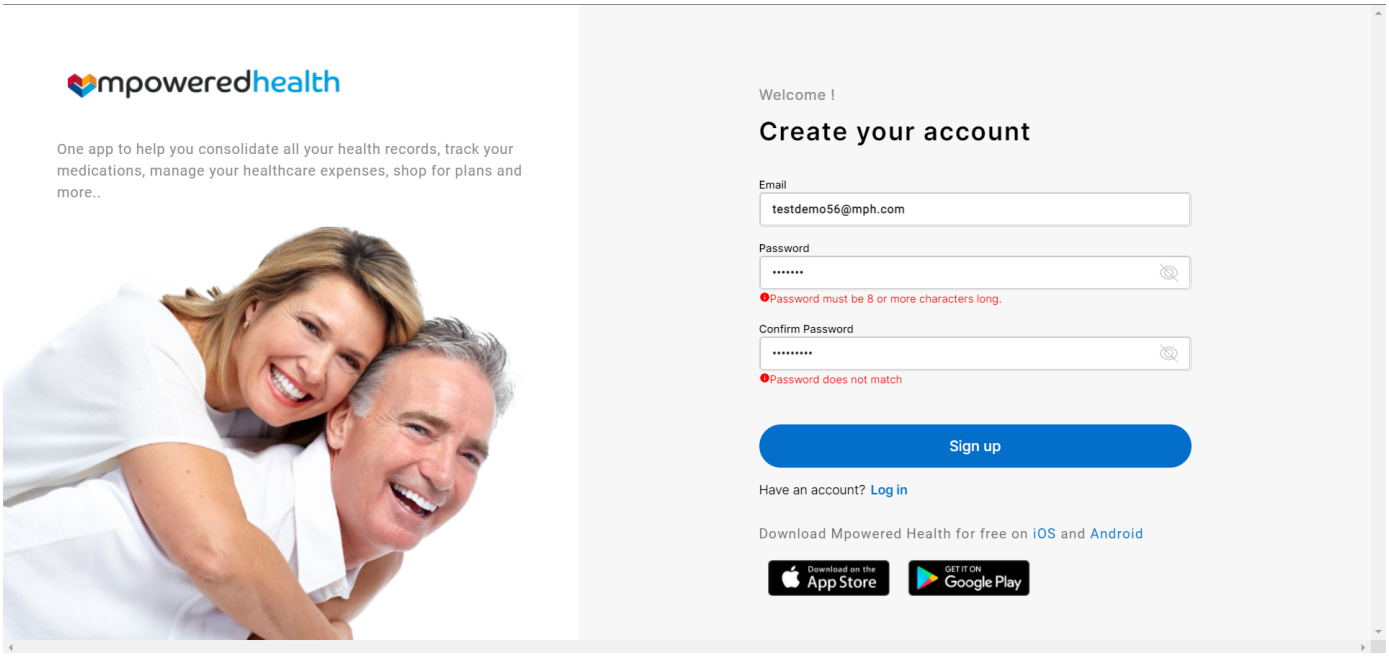

Figure 5.3: Signup negative scenarios testing - User entered password less than 8.

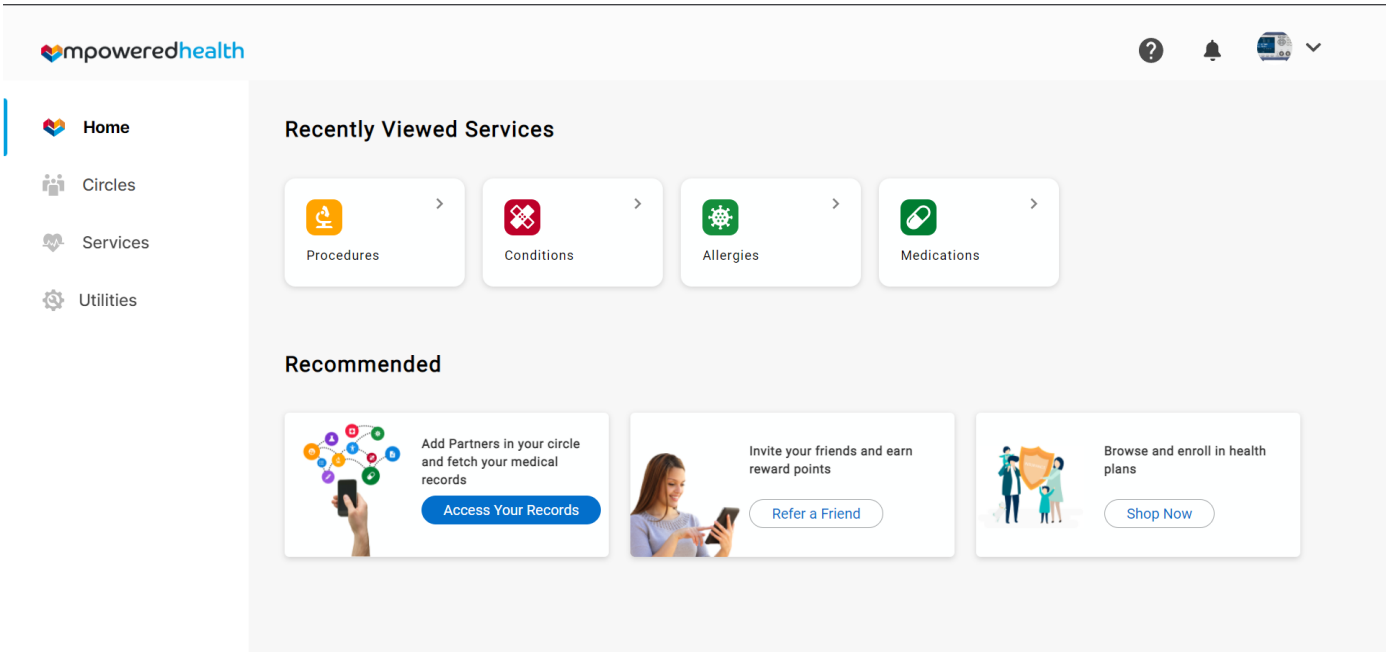

Figure 5.4: Home positive scenarios testing - User navigated to home page

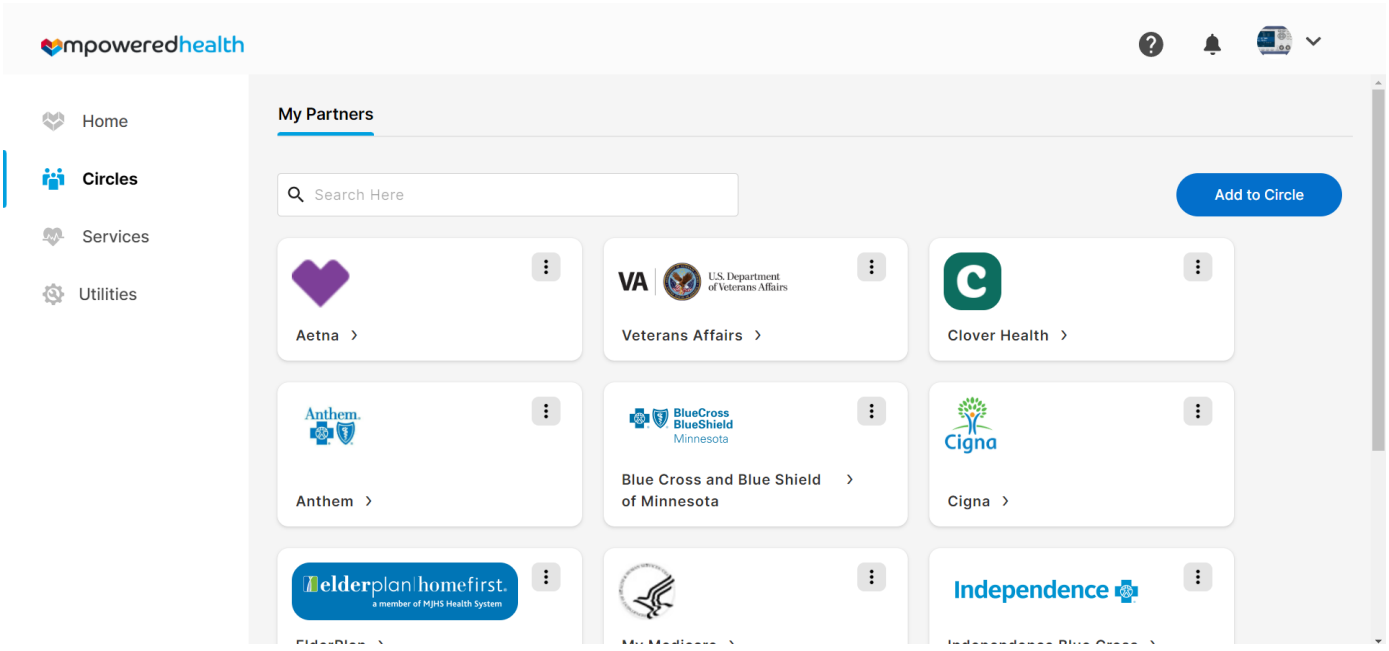

Figure 5.5: Circles positive scenarios testing - User on circles

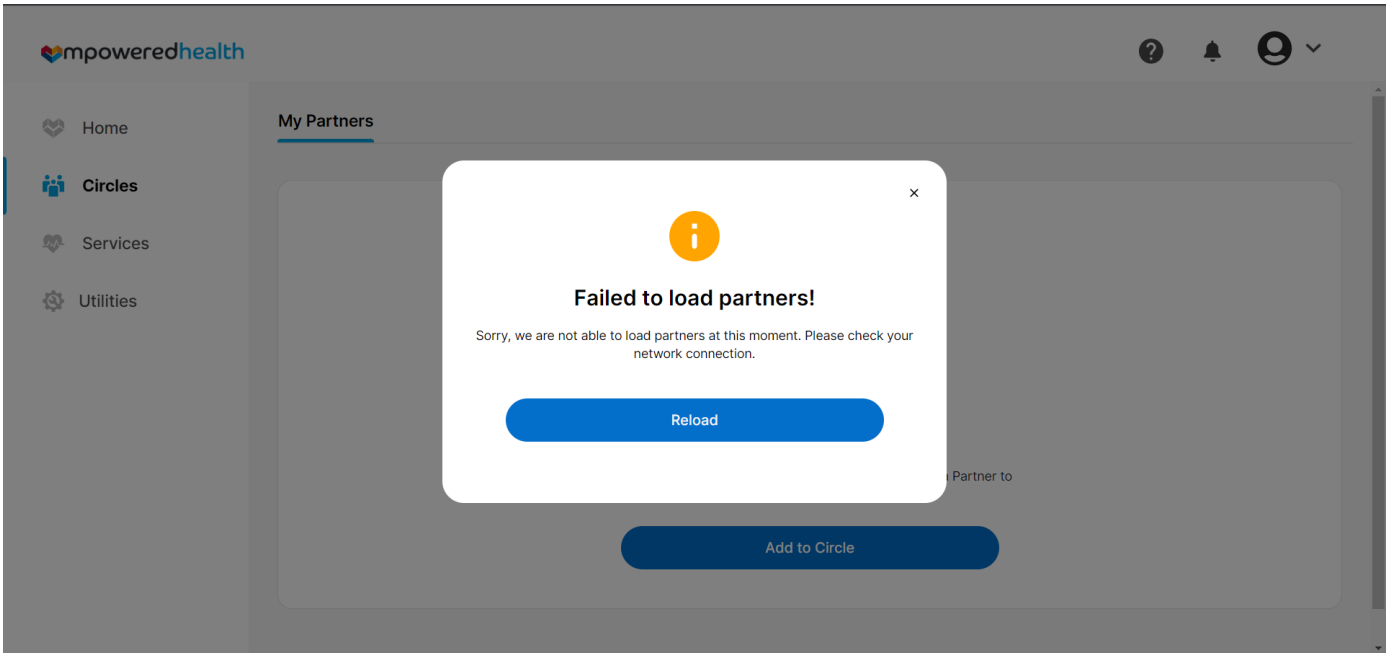

Figure 5.6: Circles negative scenarios testing - Failed to load partner

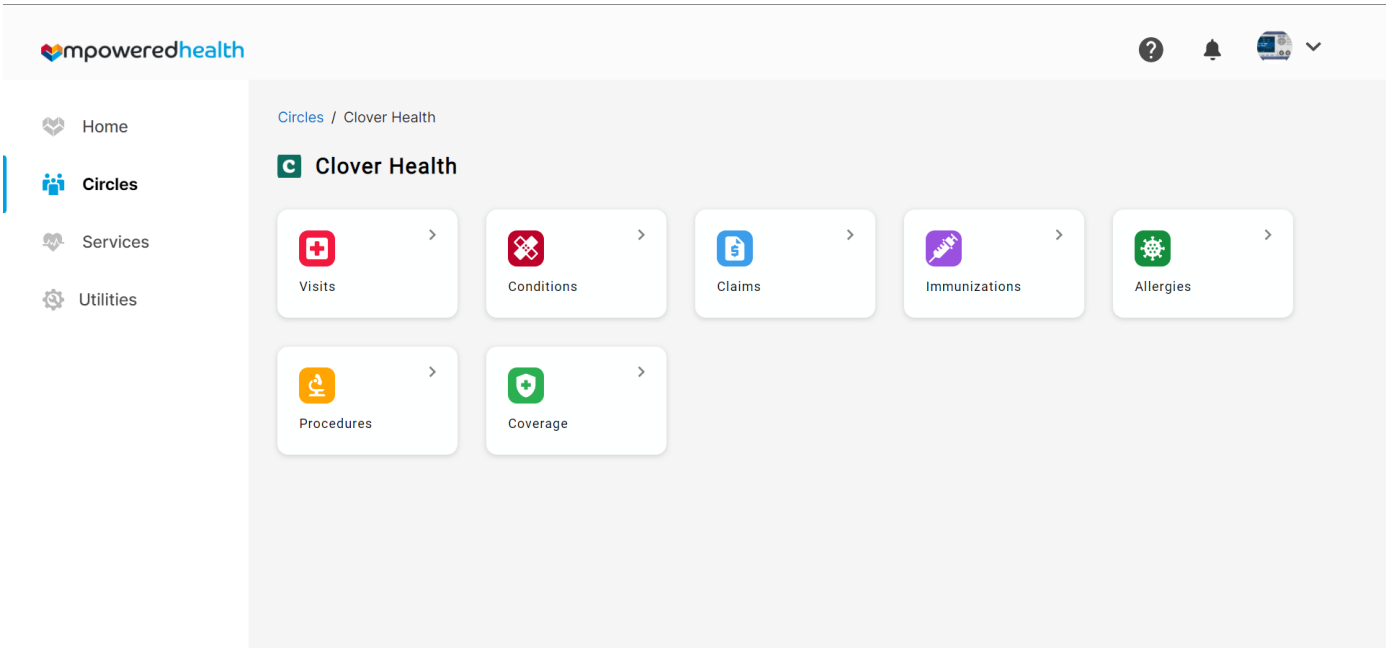

Figure 5.7: Circles postive scenarios testing - navigation to clover health