INTERNSHIP REPORT

Efficient Software Testing

Pioneering strategies for self healing

Vibhav V. S. Pissurlenkar

2054

Efficient Software Testing

Pioneering strategies for self healing

Completed by
Vibhav V. S. Pissurlenkar
2054

for the partial fulfillment of
MCA Degree for Semester VI
Discipline of Computer Science and Technology,
Goa Business School,
Goa University

At
Infuse Consulting India Private Limited
B 902, Teerth Towers,
Sr. No. 28/2, Near Raj Hotel, Baner,
Pune - 411021
India Company Incorporated by Government of India, Ministry of Corporate Affairs under number
U74999PN2018PTC179748
www.infuse.it

Under the guidance of
Mr. Subodh Borkar
(Head of Product Development - useMango, Infuse Consulting)

INFUSE
consulting
Excellence through Quality Assurance

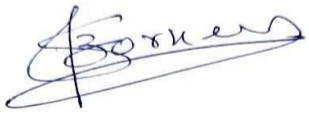
2nd June 2023

INTERNSHIP CERTIFICATE

This is to certify that Vibhav Sinai Pissurlenkar, Roll No. 2054, currently pursuing the 6th Semester of the MCA program in the Computer Science and Technology discipline at Goa Business School, Goa University, has been actively engaged as an intern with our organization since January 9th, 2023. During his internship, he has consistently displayed exemplary performance by successfully accomplishing assigned tasks and other related responsibilities.

Vibhav exhibits a strong sense of self-motivation and requires minimal supervision to effectively complete his assigned tasks. He has demonstrated remarkable aptitude for swiftly acquiring the required domain knowledge and mastering the necessary technologies. His rapid learning pace has greatly contributed to the overall productivity and successful delivery of the team.

Yours Sincerely,



Subodh Borkar,
Head of Product Development - useMango

GOA UNIVERSITY

GOA BUSINESS SCHOOL

CERTIFICATE OF EVALUATION

This is to certify that Mr./Ms. Vibhav Sinai Pissurlenkar has successfully completed her internship at **Infuse Consulting India Private Limited**, Patto-Goa, in partial fulfillment of the award of the degree in Master of Computer Application.

_____ _____

Examiner 1 Examiner 2

Place: Goa University
Date: 15/06/2023

_____

Dean, Goa Business School

Acknowledgement

The internship opportunity I had with Infuse was a great chance for learning and professional development, especially to have so many wonderful people leading me throughout this period. The internship wouldn't be complete without expressing my gratitude and appreciation to all the people who made it possible.

I would like to thank Mr. Nalin Parbhu (CEO/CTO, Infuse Consulting) for giving me the opportunity to intern at Infuse.

My sincerest gratitude to Mr. Subodh Borkar (Head of Product Development useMango, Infuse Consulting) for being my mentor and giving me necessary advice and guidance. I choose this moment to acknowledge his contribution gratefully.

My great appreciation to Ms. Priya Ravi (Test Lead, Infuse Consulting) who in-spite of being extraordinarily busy with her duties, took time out to hear, guide and keep me on the correct path and allowing me to carry out my tasks during the internship.

I thank all the faculty and staff at the MCA, Goa University for their constant encouragement and support during the entire course work.

I would like to thank my family and friends for all the love, support and encouragement they provided me during this internship which will never be forgotten.

Finally, I would like to express my gratitude towards the Infuse family, especially my seniors Imtiyaz Khan, Preshly Fernandes, Vinay Prabhu, Rochelle Martins, Minaxi Patil, Onkar Parshekar and Joyrel Vaz who were always ready to help me and guide me. Also, I would like to thank my internship colleagues for helping me to learn new things and always supporting me during this period.

I perceive this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement.

Contents

Introduction

This report serves as a comprehensive overview of my full-time on-site internship at Infuse, providing essential information about the organization, projects undertaken, and tasks accomplished during the internship period.

The subsequent sections will delve into the details of the company, its work environment, and the prevailing culture. Additionally, the report will elaborate on the projects I was involved in, providing a concise overview of each project, including the modules developed and tasks completed within those modules.

Moreover, this report aims to emphasize my learning experience and the contributions made to the organization during my tenure as an intern. It will elucidate the knowledge acquired through the successful completion of assigned tasks.

Furthermore, the report will shed light on the tools and technologies employed throughout the internship, and outline the specific timeframe during which the internship was conducted. Lastly, a reflection on personal and professional growth resulting from this experience will be discussed.

This report encompasses a holistic view of my internship at Infuse, showcasing the valuable insights gained, the tangible contributions made, and the overall impact it has had on my personal and professional development.

Company Profile

Infuse Consulting

- Infuse Consulting is an international company and leverages strategic consulting partners as well as its technology partners to deliver the best solution for you. Our team's joint skillsets rarely exist within one supplier. Infuse is a Gold Partner of Micro Focus and Oracle, and has a partner network including CA, Microsoft, AWS and SAP. Since 2002, Infuse Consulting has successfully helped over 500 customers globally to get the most out of their software.

- Since 2002, Infuse Consulting has been helping leading companies deliver their software projects more successfully. We are early adopters and industry leaders of Test Automation, DevOps, Agile & CI/CD Services.

- Recognised as the leading provider of Test Automation and Lifecycle Transformation Services for both public and private organizations, Infuse Consulting is headquartered in the UK and since 2002 has helped more than 500 businesses get the most out of their Software Delivery Teams.

- Infuse Consulting is a UK headquartered IT Software and Services business, enabling modern software delivery that provides a distinct alternative to its competitors, by helping organizations get the most out of their software.

- Recognised as the leading provider of Test Automation and Lifecycle Transformation for the most successful and ambitious organizations. Infuse prides itself on its ability to provide innovative solutions, especially in test automation. We have been automating mobile testing since 2003 and developed a functional scriptless test automation tool, useMango™

Roles Performed

Currently I'm a Team Intern in Infuse Consulting and have performed the following duties under the following projects as a part of my internship.

SELF HEALING TESTS (Research, Team - 02)

- Finding solutions and alternatives
- Discovering compatibility issues and limitations

SOLENT SITS (Consultancy Project, Team - 05)

- Analysis of test basis documentation
- Creation of test cases
- Creation of test scripts (ie detailed steps)
- Completion of provided traceability matrix
- Provide test data requirements for created tests
- Execution of tests
- Updating tests with execution results
- Gathering / storing of relevant test evidence
- Creation of defect records
- Retesting of defect fixes and updating defect records

Overview

SELF HEALING TESTS

Self-healing test automation is an innovative approach that aims to enhance the reliability and efficiency of test automation processes. It involves the implementation of intelligent algorithms and techniques to autonomously detect and address failures or issues encountered during test execution. As a member of a research team focused on self-healing test automation, your role is to explore, develop, and evaluate new methodologies, tools, and frameworks in this domain. Your objective is to enhance the resilience of automated tests, minimize manual intervention, and improve overall test efficiency. By leveraging advanced techniques such as machine learning and adaptive algorithms, you strive to create self-healing test automation solutions that can automatically identify, diagnose, and recover from test failures, ultimately optimizing the software testing process and delivering high-quality software products.

SOLENT SITS

The Tribal SITS application is a comprehensive student information management system widely used by universities in the UK. It serves as a centralized platform to manage various aspects of student data, including admissions, enrollment, academic records, and student support services. Universities in the UK choose to utilize the Tribal SITS application due to its robust features, scalability, and ability to streamline administrative processes. It offers efficient data management, facilitates reporting and analytics, supports regulatory compliance, and enhances the overall student experience. By using Tribal SITS, universities can effectively manage their student population, improve operational efficiency, and make data-driven decisions to support student success and institutional goals.

As a tester responsible for testing the Tribal SITS client and Evision portal, I played a crucial role in ensuring the quality and reliability of these software applications. My main objective is to thoroughly test the functionalities, features, and user interfaces of both systems to identify any defects, inconsistencies, or usability issues. By executing test cases, conducting exploratory testing, and utilizing various testing techniques, I verify that the applications meet the specified requirements and deliver a seamless user experience.

Problem Statements

Research - SELF HEALING

- Software testing plays a crucial role in ensuring the quality and reliability of software applications. However, the process of test case creation and maintenance can be laborious and time-consuming, particularly in scenarios where projects are often dynamic and subject to frequent updates. Additionally, manual identification and resolution of test failures can be a daunting task, leading to delays in the testing process and decreased productivity.

- One approach to address these challenges is the integration of self-healing capabilities into the testing framework. Self-healing tests refer to the ability of test cases to autonomously identify and resolve issues encountered during the testing process. By incorporating self-healing mechanisms, such as automated error detection and remediation, the testing process can become more efficient, robust, and adaptive.

Consulting Project - SOLENT SITS

- Solent University has recently adopted the Tribal SITS Software for their data maintenance and usage. The Software includes SITS-Client which serves as an accessibility point for the data stored in the database. Alternatively e-vision portal, serves as frontend to end users, can be customized as per the requirements and is used by different end users for their tasks in accordance with the university environment.

- It is thus crucial to test the same before it goes live and is used by the university users. Inorder to address the challenges of defects in the system, testing is performed extensively to discover any faults and failures in the system so that the university can take appropriate actions and addresses them before the system goes live.

My Contributions

Self - healing Research - Part of the R&D Team

Our project kicked off with an enlightening knowledge transfer session dedicated to Self Healing Research. The session served as an opportunity for the team to exchange valuable insights and information regarding self-healing testing. We actively engaged in absorbing the knowledge shared and delved into prior research conducted in the field to expand our understanding.

Our focus then shifted to gaining a comprehensive grasp of the USEMANGO architecture, an essential framework. We carefully examined the integration of Healenium, a self-healing testing tool, with USEMANGO, aiming to identify any potential limitations or challenges that could arise.

Once equipped with this knowledge, we eagerly embraced the practical implementation of Healenium in our testing endeavors. Through experimentation with Docker, we explored its functionalities and used it on various automation websites. However, this journey was not without obstacles. We encountered limitations and challenges along the way. Nevertheless, we maintained a proactive mindset, relentlessly seeking viable solutions and workarounds to overcome these hurdles.

To deepen our understanding of Healenium's capabilities, we took the initiative to create a dedicated website. Our aim was to harness its self-healing properties and evaluate its effectiveness. The website, hosted on GitHub.io, became our testing ground for comprehensive assessment and analysis.

In parallel, we ventured into researching alternatives to Healenium, determined to broaden our perspectives on self-healing testing. We actively scoured resources related to self-healing research and extensively explored alternative implementations available within the field.

Throughout the project, we have demonstrated a disciplined and proactive approach, constantly advancing our knowledge and implementation of self-healing testing methodologies. By actively participating in knowledge transfer sessions, conducting in-depth research, experimenting with Healenium, and investigating alternative approaches, we have nurtured our expertise in this dynamic domain.

SOLENT SITS - Part of the testing team on a client project

In the initial phase, the focus was on understanding the epics, including the user stories, test cases, and problem statements. Thorough analysis was conducted to gain a clear comprehension of the project's requirements and scope.

Following that, test cases were created based on the acceptance criteria and test templates. This involved carefully crafting test step actions, test descriptions, and test step expectations to ensure comprehensive coverage of the testing scenarios.

The next phase involved preparing the necessary test data, ensuring its availability for executing the planned tests. Test executions were carried out, following defined procedures, and detailed documentation of the results was maintained.

During the test defect raising phase, any deviations, anomalies, or issues encountered during testing were actively identified and reported. These defects were meticulously tracked, and communication with relevant stakeholders, such as the client, was established to provide updates and seek resolutions. Additionally, regular test reviews were conducted, ensuring the quality of the test cases, and necessary revisions were made to align with the project's requirements.

Continuing into the subsequent phase, test data creation remained a priority, ensuring the availability of relevant and representative data for effective test scenario execution. Test cases were executed, and comprehensive documentation of the results was maintained. Any defects or issues identified during this phase were promptly raised and recorded for further investigation and resolution.

Throughout this solo work, a systematic and meticulous approach was followed, encompassing understanding the project requirements, creating test cases, preparing test data, executing tests, and raising defects. Comprehensive documentation was maintained to ensure accuracy and facilitate efficient collaboration with stakeholders.

Tools and Technologies

Use Mango

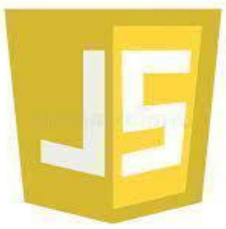
useMango™ is a functional automation tool and test automation framework that offers the benefits of test automation at a lower risk compared to traditional automation approaches, allowing you to automate testing without the need to write scripts.

Ruby

Ruby is an interpreted, high-level, general-purpose programming language. It was designed and developed in the mid-1990s by Yukihiro "Matz" Matsumoto in Japan.

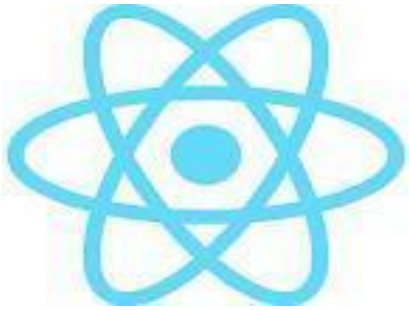
Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting language.



JavaScript

JavaScript is a lightweight, interpreted, object-oriented language with first-class functions, and is best known as the scripting language for Web pages, but it's used in many non-browser environments as well.



React JS

React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. It is maintained by Meta (formerly Facebook). React makes it painless to create interactive UIs.

AWS

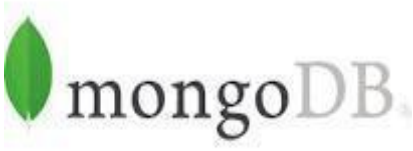
Amazon Web Services is a subsidiary of Amazon providing on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered pay-as-you-go basis.

Postman

Postman is an API platform for building and using APIs. Postman simplifies each step of the API lifecycle and streamlines collaboration so you can create better APIs—faster

Git

Git is a distributed version-control system for tracking changes in source code during software development. It is designed for coordinating work among programmers, but it can be used to track changes in any set of files.



MongoDB

MongoDB is a non-relational document database that provides support for JSON-like storage. The MongoDB database has a flexible data model that enables you to store unstructured data.

FastAPI

FastAPI is a modern, fast, and highly efficient web framework for building APIs with Python. FastAPI offers exceptional performance through the use of asynchronous programming and integrates seamlessly with other libraries and frameworks.

Tailwind CSS

Tailwind CSS is a highly customizable, utility-first CSS framework that allows developers to rapidly build user interfaces. It provides a comprehensive set of pre-defined utility classes, enabling developers to design responsive and visually appealing UI components without writing custom CSS.

Ant Design

Ant Design is a popular UI component library for React applications. It offers a comprehensive collection of reusable and customizable UI components, ranging from basic elements to complex data visualization components. Ant Design follows the principles of modern design and provides a consistent and user-friendly interface.

Tribal SITS

Tribal SITS (Student Information and Tracking System) is a comprehensive software solution designed specifically for higher education institutions. It offers a range of features and functionalities to manage student data, academic records, course registration, assessments, and other administrative tasks.

Certification

The ISTQB® Certified Tester Foundation Level (CTFL) certification is the cornerstone of essential testing knowledge that can be applied to real-world scenarios. The syllabus provides a comprehensive understanding of the terminology and concepts used in the testing domain worldwide, making it relevant for all software delivery approaches and practices, including Waterfall, Agile, DevOps, and Continuous Delivery. CTFL certification is recognized as a prerequisite to all other ISTQB® certifications where Foundation Level is required.


Certificate of Profession

This Certifies That

Vibhav Virendra Sinai Pissurlenkar

having satisfied the requirements of the International Software Testing Qualifications Board has been awarded the

Foundation Level Certificate in Software Testing

Awarded on 10th Day of March, 2023

Certificate Number ITB - CTFL-121772 India

itb INDIAN TESTING BOARD

ITB President

ISTQB Syllabus Foundation Level 2018 Version v3.1.1

ISTQB Certified Tester Foundation Level

Workshop Project

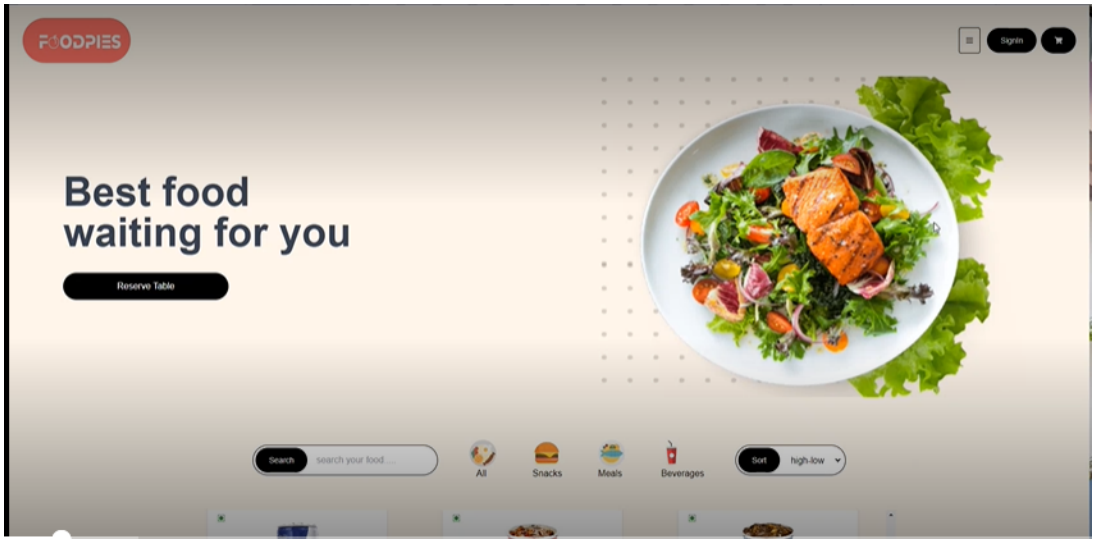
Restaurant Management System -

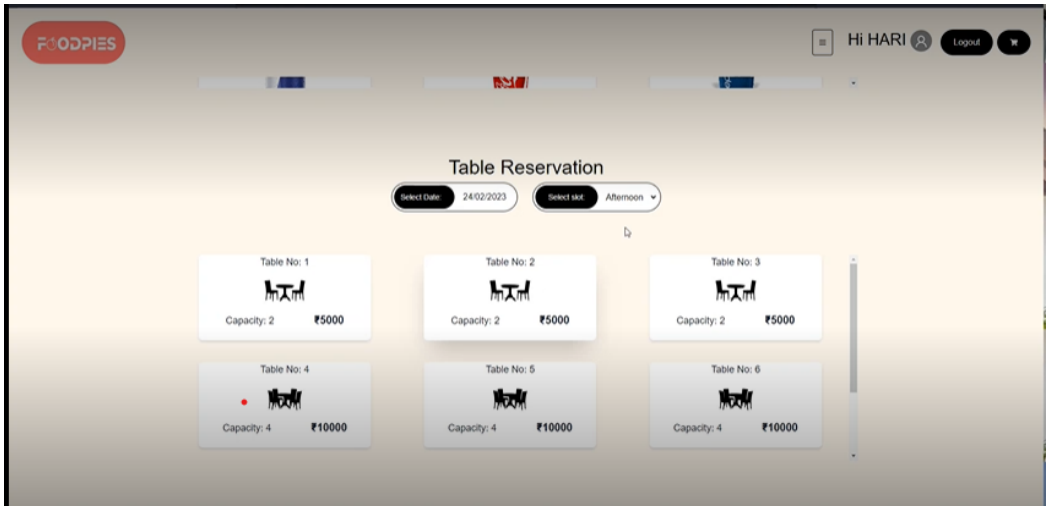
- Workshop Team Project (04 Members)

  Created a website that allows users to order a wide range of food and drinks, users can make reservations for dine-in

  - Technologies used : Fast API, MongoDB, React Vite + Javascript & Tailwind/ANTD

  - Blockers : Learning new technologies in short amount of time, Actual implementation of the newly learned tech in our workshop & Merging the code with team and resolving the conflicts.




FOODPIES
Hi HARI
Logout
Table Reservation
Select Date
24/02/2023
Select slot
Afternoon
Table No: 1
Capacity: 2
₹5000
Table No: 2
Capacity: 2
₹5000
Table No: 3
Capacity: 2
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Capacity: 4
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Table No: 5
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Capacity: 4
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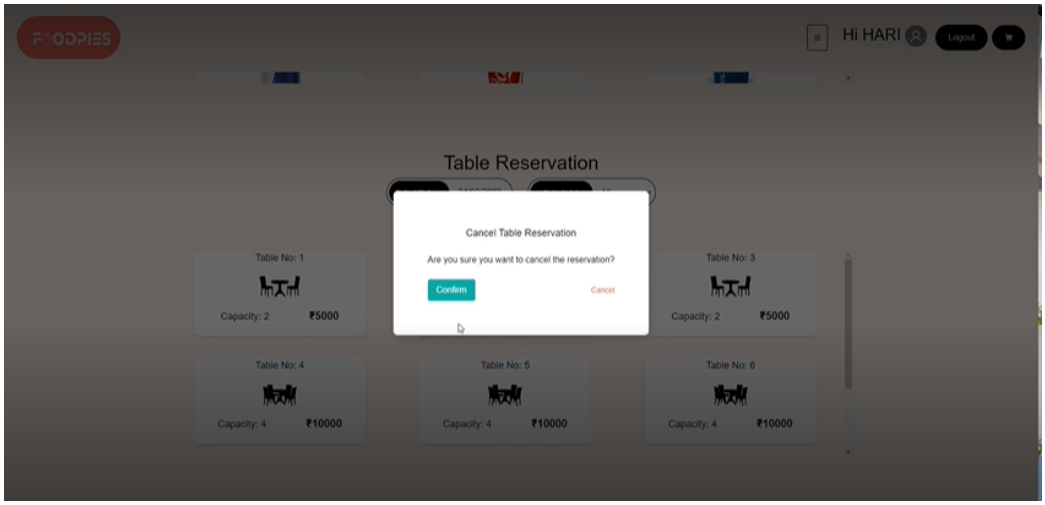
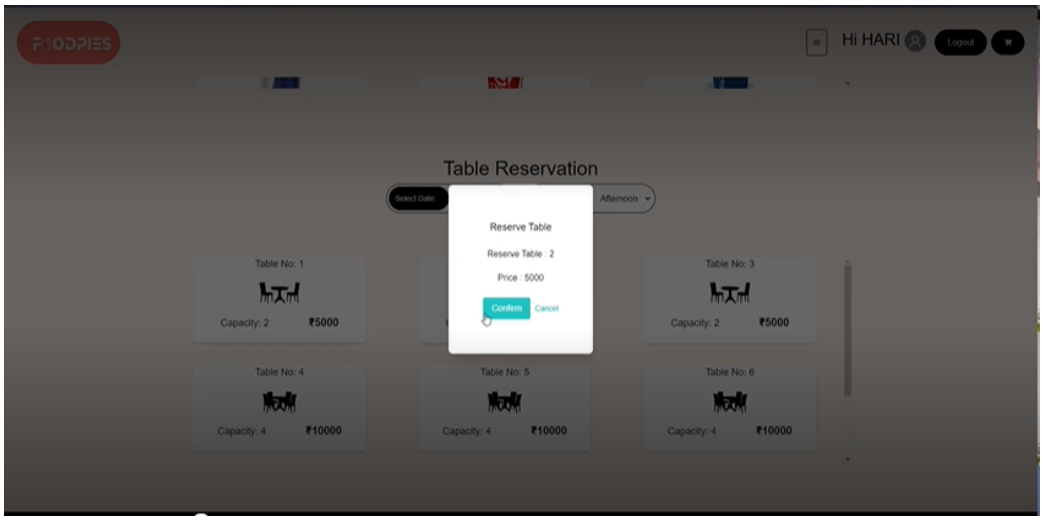

FOODPIES
Hi HARI
Logout
Table Reservation
Cancel Table Reservation
Are you sure you want to cancel the reservation?
Confirm
Cancel
Table No: 1
Capacity: 2
₹5000
Table No: 3
Capacity: 2
₹5000
Table No: 4
Capacity: 4
₹10000
Table No: 5
Capacity: 4
₹10000
Table No: 6
Capacity: 4
₹10000


FOODPIES
Hi HARI
Logout
Table Reservation
Reserve Table
Reserve Table : 2
Price : 5000
Confirm
Cancel
Table No: 1
Capacity: 2
₹5000
Table No: 3
Capacity: 2
₹5000
Table No: 4
Capacity: 4
₹10000
Table No: 5
Capacity: 4
₹10000
Table No: 6
Capacity: 4
₹10000

My Reflections / Experiences of Internship

My internship at Infuse Consulting has been an enriching and transformative experience. Infuse consistently presented me with dynamic challenges that propelled my growth. The company culture fosters an insatiable appetite for knowledge and continuous learning, instilling these values in its employees. Immersed in an industry setting and working on a real product, I gained invaluable practical experience.

Throughout my internship at Infuse, I never felt isolated as I had the freedom to engage with colleagues, seek advice, and receive guidance. This collaborative environment allowed me to expand my knowledge in areas such as software development, clean code architecture, and writing high-quality code. Embracing innovation, I was encouraged to explore new technologies and implement them seamlessly into the product, even when initially unfamiliar with them. This enabled me to engage in a daily cycle of learning and experimentation.

In summary, I am immensely grateful to be part of the Infuse team and for the multitude of new skills and insights I have acquired. I extend my sincerest well-wishes to all my colleagues at Infuse.

Internship Timeline

January 2023

- Week 1
    - Using the inhouse Product **UseMango**
        - Introduction & Training on usage
        - Finding & Reporting Bugs
        - Exploring features
        - Creating composites, scripted components and test flow controls
        - Writing automated test scripts in useMango
        - Understanding the environment and tools set up for development

- Week 2
    - Programming with Ruby
    - Introduction to Web Automation
        - Programming in Js
        - HTML, Css and DOM
        - Element Identification
        - Introduction to Automation
        - Programming using selenium
        - Creation of automated test scripts on different websites and workflows using Gecko driver
    - Git & source code management
        - Test Plan Creation
        - Getting the work done peer reviewed
        - Fixing defects and resolving comments
        - Implementing suggestions given
    - Containerisation
        - Introduction to docker
        - Creating containers, adding and using images
        - Running static web pages in docker

- Week 3
    - Containerisation + Automation framework
        - Workshop Introduction
        - Building a basic containerised testing framework for a practice website
        - Demo of workshop
    - CI & CD pipelines with Jenkins
        - Performed exercises using Jenkins
        - Workshop on CI & CD
        - Demo of workshop

February 2023

- Week 1
    - Programming in Python
        - Completion of exercises in python
    - Web Services
        - Introduction to web service architecture
        - Python web service framework
        - Workshop on building a web service
    - Agile Processes
        - Workshop on Webservice Unit Testing + API Testing
        - Creating Unit test cases using python on the exercises covered in python and ruby
        - Creating API test cases

- Week 2
    - Workshop Project
        - Involves the use of the entire set of skills learned so far. We were divided into teams and were given a problem statement. Where we were expected to entirely design, develop and test their solution. This was done under the guidance of team mentors.

- Week 3
    - Deployment on AWS
        - Introduction to AWS Services
        - Workshop project manual deployment to AWS
        - Infrastructure as Code
        - Workshop project automated deployment on AWS

- Week 4
    - Demo of the workshop project to the project owner - Restaurant Management Website
    - Work on the suggestions and check out different solutions

March 2023

- Week 1
    - Knowledge transfer session on Self Healing Research
        - Gathering knowledge on prior research conducted on self-healing testing
        - Going through architecture of USEMANGO
        - Finding out limitations if healenium integrated with usemango
- Week 2
    - Using Healenium
        - Trying Healenium with docker
        - Trying Healenium on different automation websites
        - Finding solutions/workarounds for the limitations discovered
- Week 3
    - Understanding Healenium
        - Creating website and hosting on github.io for testing healenium self-healing properties - https://vibhav19.github.io/Test-Healenium/
        - Testing the demo website created using Healenium
- Week 4
    - Alternatives to healenium
        - Finding Resources of Self-healing Research
        - Finding alternatives and other available implementations for self healing

April 2023

- Week 1
    - Understanding the implementation of healenium
        - Writing POC for self healing (Own implementation)
        - Brainstorm sessions on different approaches for self-healing
- Week 2
    - Generating resources
        - Creating workflow diagrams, documentations on the brainstorm sessions held
    - Demo to the product owner on the work done so far
        - Working on the suggestions/feedback
- Week 3
    - Updating the trackers
    - Knowledge transfer session to the new team involved in self healing

- Week 4
    - Transfer to a new client project - **SOLENT SITS**
        - Going through material (documentations of previous similar projects)
        - Going through the guidebooks/ references on the Tribal SITS client application

May 2023

- Week 1
    - Sessions on usage of Tribal SITS e-vision application
    - Demo of Tribal SITS Client application
    - Sessions with the client and other project members in-order to familiarize with the work

- Week 2
    - Understanding the epics
        - Understanding the epics/user stories/test case titles/ problem statements

    - Creating test case
        - Creating the required test cases from the user stories based on the acceptance criteria and test templates
        - Writing test step actions/ test description/ test step expectations
- Week 3
    - Test data preparation
    - Test executions and documentation

- Week 4
    - Test defect raising
        - Defect tracking with the client
    - Test reviews and re-written test cases as per the requirements

- Week 5
    - Test data creation
    - Test executions
        - Test documentation
    - Test defect raising

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