



Student Internship Programme (SIP)
Final Project Report

at

Visa Worldwide Pte Ltd

VISA

Reporting Period:

05 2021 to 08 2021

by

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Department of Computer Science

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Internship Title: Software Engineer Intern (Network Processing)

Internship ID: 102345

Company Supervisor: Sushil Acharya (Director - Strategic Initiatives and Long Term Architecture)

Academic Supervisor: Professor Ashish Deepak Dandekar

Summary

I was responsible for the development and support of front and backend software of the Visa Automated Test Portal (VATP) Project. Specifically, for the frontend, I was involved in the migration of the project from Angular 6 to 11. As a result, I was also required to upgrade the components used from the Visa Design System (VDS) 2 and 3 to VDS 4.0. Finally, I implemented a new feature that allowed the uploading and saving of articles using excel files, which required front and backend development.

Subject Descriptors:

•Information systems~World Wide Web~Web applications~Electronic commerce~Secure online transactions •**Software and its engineering~Software creation and management~Designing software~Software implementation planning~Software design techniques** •**Software and its engineering~Software organization and properties~Software system structures~Software architectures~n-tier architectures** •*Software and its engineering~Software organization and properties~Software functional properties~Formal methods~Software verification* •**Software and its engineering~Software organization and properties~Extra-functional properties~Software performance**

Keywords:

End-to-end web development, Software migration

Implementation Software and Hardware:

Dell Precision 5540 PC, MS-Windows 10, Angular 11, Spring, MySQL

Acknowledgement

In light of the COVID-19 global pandemic, Visa has adapted their summer internship programme to allow interns to fully work remotely. I would like to express my sincere gratitude to Visa for the summer internship opportunity, allowing me to have a fulfilling summer break. Visa has also given me the experience of working from home, which could be ubiquitous in the future, and has facilitated this by equipping me with a personal laptop.

Particularly, I would like to thank my company supervisor: Sushil Acharya and colleagues: Alexis Kristoffer Soriano Antiola, Chen Wenjia, Eric Klaesson, Hoo Yuan Yang, Diya Wu and Zhu Minhui for their continuous guidance and support during the duration of my internship.

In addition, I would like to thank my academic supervisor: Prof Dandekar for his advice which helped me to get the most out of my 12 weeks with Visa.

Table of Contents

Title	i
Summary	ii
Acknowledgement	iii
1 Introduction	
1.1 Background and Organisational Structure of Host Organisation	1
1.2 Principal Activities of Host Organisation	1
1.3 Training Programme within Host Organisation	1
1.4 Position of Host Unit within Host Organisation	1
2 Training Schedule and Assignments	
2.1 Training Schedule by Month for the Entire Training Period	2
2.2 Training Assignments Completed in 1 st Month	2
2.3 Training Assignments Completed in 2 nd Month	3
2.4 Training Assignments Completed in 3 rd Month	3
3 Knowledge and Experience Gained	
3.1 Technical Knowledge Gained from Assignments	3
3.2 Organisational/Industry Experience Gained from Assignments	3
3.3 Areas of Applicability of Knowledge and Experience Gained	4
4 Conclusions	
4.1 Summary of Work Completed and Training Received	4
4.2 Problems Faced	4
4.3 Assessment of Training Experience and Concluding Remarks	5
References	6

Introduction

1.1 Background and Organisational Structure of Host Organisation

Visa is an American multinational financial services corporation that was established on 18 September 1958 and is headquartered in Foster City, California, United States (Visa, 2015). Visa's vision is: To be the best way to pay and be paid (Visa, n.d.), which is apt considering Visa is the dominant card payment organization in the world, accounting for 50% of all credit card transactions (Milena, 2021). Since its establishment, Visa has expanded to over 200 countries and territories worldwide, connecting consumers, businesses, banks and governments (Visa, n.d.).

Visa is spearheaded by CEO Alfred F. Kelly Jr. and the Board of Directors, who set Visa's overall strategy and oversees its implementation. The Management Team executes the strategy in the 8 various business functions of Visa, namely Technology & Operations, Human Resources, Risk, Marketing and Communications, Finance, Legal, Strategy and Client (Visa, 2015).

1.2 Principal Activities of Host Organisation

Other than issuing cards, setting rates and fees for consumers, Visa provides payment services to financial institutions. These institutions utilise the services provided by visa to offer credit, debit and cash related programs to their customers.

Visa ensures the security and reliability of all its transactions worldwide through processing at one of four secure data centres (Ashburn, Virginia; Highlands Ranch, Colorado; London, England; Singapore) (Baxtel, n.d.). These data centres provide security against natural disasters, crime and operate independently of each other, ensuring the dependability of the Visa network.

1.3 Training Programme within Host Organisation

Interns were issued a work laptop to facilitate working from home. As part of the onboarding program, we participated in an interactive online orientation where we were introduced to Visa's mission and vision, organisation structure and business operations across the various regions. We were also given an overview of the security and privacy practices.

1.4 Position of Host Unit within Host Organisation

I was attached to the Network Processing division under the Technology and Operations business function. Specifically, I was part of the Clearing & Settlement team. Clearing refers to the process where the merchant receives a promise that it will be paid, and Visa sends the issuing and acquiring bank reports with total amounts they need to pay/receive at the end of the day. Settlement refers to the process where actual money is moved between issuers and acquirers using Visa's settlement bank.

During my internship, the team was working on a client project called Visa Automated Test Portal (VATP) that generates millions of dollars in revenue each year for Visa. VATP is a web application service that Visa offers to banks to verify the accuracy and speed of their transactions within Visa's network.

Training Schedule and Assignments

2.1 Training Schedule by Month for the Entire Training Period

My company supervisor provided me with the tech stack used in their projects for me to pick up in my own time, which I did so by using online tutorials in the form of YouTube tutorial series and written articles.

Month	Technical Skills Gained
May	<ul style="list-style-type: none">• C++, Angular
June	<ul style="list-style-type: none">• Spring/Springboot, MySQL, PostgreSQL

2.2 Training Assignments Completed in 1st Month

I started my internship on 17 May and spent the first 2 weeks completing my goal setting, compliance training and picking up Angular and Springboot. This culminated in a personal project where I made a Reddit Clone app and presented it to my colleagues via a YouTube video (<https://youtu.be/UTC0yMI2RGs>).

2.3 Training Assignments Completed in 2nd Month

My first task was to support the migration of the existing project from Angular 6 to Angular 11 along with a colleague. This task is huge and has a timeline that extends until December, which my colleague will work on even after I end my internship. On top of the migration, we were also required to upgrade the components used from the Visa Design System (VDS) 2 and 3 to VDS 4.0 which is supported by Angular 11. These tasks required us to rebuild the entire app from scratch as all the components had to be replaced by new ones.

In addition, we had to work closely with the original project team during the migration as they were working on the existing old application simultaneously, so we had to constantly add in their latest changes to the code base.

2.4 Training Assignments Completed in 3rd Month

During the 3rd month, I continued to work on the migration of the project. Wanting to get my hands dirty with the backend as well, I requested for a task to allow me to do so from the project lead and was subsequently tasked to implement a new feature that allowed the uploading and saving of articles using excel files.

This required me to work across the front and backend, interacting with the MySQL database. While developing the backend in Spring, I used Postman to send HTTP requests to test them before proceeding to integrate it with the front end using the HttpClient. After developing the API, I proceeded with the writing of the documentation for the API.

For the API, I adopted the N-tier architecture to allow for separation of concerns. This made the code modular and easy for my colleagues to understand. It also made it simple to handover the code to my colleagues for them to update it if required in the future.

Towards the end of the internship, I was also involved in a mass intern sharing, where every intern had the chance to present the work they have done during the past 3 months.

Knowledge and Experience Gained

3.1 Technical Knowledge Gained from Assignments

As mentioned in the previous section, I picked up modern web development technologies Angular, Spring and MySQL. I am now confident of building a web application from scratch with the skills I have gleaned.

Additionally, I am even more familiar with using software development tools such as debuggers during development. I am also more experienced with using version control tools in a software engineering team.

3.2 Organisational/Industry Experience Gained from Assignments

Working from home was an interesting experience, which could even become the norm in the future. I learnt to stay productive using collaborative applications and setting my own schedule to ensure work is delivered on time.

I was also given the golden opportunity to serve as the team's manager for 3 weeks in July. In line with the team's belief in everyone's ability to lead regardless of seniority or experience, every member takes their turn to be the team manager. As manager, I initiated one-on-one sessions to check in on my team's well-being, on top of getting to know everyone personally. Furthermore, I organized a lunch santa where team members bought food for one another and played team bonding games. Through this experience, I was able to hone my leadership and management skills in a corporate setting, which aligns with my long-term goal of people management in the future.

3.3 Areas of Applicability of Knowledge and Experience Gained

For technical knowledge, I am confident of contributing effectively to software engineering teams regardless of frameworks and libraries used. I have gained greater insight into being a successful software engineer through this experience as well as interaction with my colleagues.

As for non-technical knowledge, I am more confident in contributing my ideas to a team and being an effective team member. I am much more comfortable in communicating and forming personal relationships with my colleagues as well.

Conclusions

4.1 Summary of Work Completed and Training Received

To summarise, I experienced end-to-end web application development during my internship. I was tasked with both front and backend development and got a taste of team and people management as well.

4.2 Problems Faced

Implementation in Angular 11 and VDS 4.0

Migrating the project from Angular 6 and VDS 2 and 3 to Angular 11 and VDS 4.0 posed many challenges. VDS is a design system managed by a team in Visa. In VDS 4.0, there were many components changed by the team and some of the features of the older components were considered obsolete and hence removed. However, my project leader challenge my colleague and I to recreate these functionalities ourselves. As a result, we had to build many custom functions and tinker around with the CSS to produce the same look and feel of the existing VATP application.

Working with Well-Developed Brownfield Project

The projects I worked on were brownfield projects that already had large code bases. In comparison to my previous internship experience at a start-up where I mostly worked on greenfield projects, this introduced the challenge of having to go through large amounts of code written by other developers, which was time consuming. To be more productive during work hours, I used my time after work to study the code base so that time during work hours can be spent on implementing new features instead.

4.3 Assessment of Training Experience and Concluding Remarks

My summer internship with Visa Worldwide Pte Ltd challenged and empowered me to make an impact. Despite the internship being fully work-from-home, I have had an incredibly enriching experience. I had the opportunity to get my hands dirty with many of the modern web development technologies in the form of Angular, Spring and MySQL.

As for non-technical takeaways, I gained more experience working in a development team. I was able to get involved during team discussions, as well as take the initiative in sourcing for and proposing alternative solutions and ideas.

I will definitely leverage on the knowledge and experience that I have gleaned for my future endeavours.

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