Advanced Technology Attachment Programme (ATAP)

Interim Project Report

at

Intra Technologies Private Limited

Reporting Period

6 Jan 2020 to 19 June 2020

by

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Project Title: Web Dashboard Designing
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Summary

My internship focuses on Full-Stack Software Development to build interactive Web Dashboards. The purpose of these Dashboard's is to serve as administrative systems that administrators can use to interact with the Database and perform complex operations with ease. This involves me following the Requirements/Specifications for the software and implementing it using Software Design Patterns. I am also gaining a deeper undertanding of Software Architectures of Web Applications, by working on all layers of the application from Database modelling using firebase, backend using Node and the User interface using VueJS.

Subject Descriptors:

D.2.1 Requirements/Specifications

D.2.10 Design

D.2.11 Software Architectures

Keywords:

Web Dashboard, Web Applications, Database, Testing and Debugging

Implementation Software and Hardware:

VueJS, Node.JS, Javascript, Firebase

Contents

1 Introduction

1.1 Background and Organizational Structure of Host Organization

I am doing my ATAP at Intra Technologies Private Limited, a software development house start-up that has a few self-initiated projects. The CEO, COO and CTO work together to manage the timelines, business development of these projects. The projects the company has initiated include Lemon and Rest. I am currently focused on developing software for Lemon, with the CTO as my supervisor.

1.2 Principal Activities of Host Organization

Intra Technologies is a start up that has projects that capitalize on opportunities in various markets.

Lemon serves to offer additional services to customers who hail ride sharing services such as Grab or Gojek. In their pilot trial, customers can buy various items from within the vehicle. Lemon is the main focus of the company now.

Rest is a service that allows customers to book Hotel Rooms in advance or with short notice from its platform to maximize convenience. Additionally customers can pay by the hour for said rooms, and can choose from many established Hotel partners that Rest has.

1.3 Training Programme within Host Organization

As the company is a start-up, the structure of the organization is not fixed and we are asked to be open to changes in said structure. Nevertheless, I am considered to be part of the software development team supervised by the CTO. Intra Technologies provided various Udemy courses on Software Development for interns to learn using.[1] These courses aim to help us familiarize with the tools that will be used to build the platforms for Lemon and Rest.

2 Training Schedule And Assignments

2.1 Training Schedule By Month For The Entire Training Period

The training schedule is depicted in the Table below 1. This schedule was developed by my supervisor, and is a rough guideline at best as the objectives of the company are evolving. As such there may be important tasks that crop up that I may need to work on.

Table 1: Training Schedule

Task	Metric	Month
Familiarise with VueJS and Firebase, Start developing Inventory Management System (IMS) in the Lemon Dashboard	Integrate User Interface with backend	Jan
Continue Development of IMS and conduct developer testing	Accuracy of Lemon IMS flow based on given Requirements	Feb
Working on backend to track earnings of drivers involved in Lemon earnings	Accuracy of payment flow	Mar
Integration Testing of Lemon Dashboard with other Lemon platforms	Robustness and latency	Apr
Collect user feedback from pre-pilot trial and work on improving the dashboard	Speed and responsiveness	May
Deploy using Docker and open-source CI/CD system	Robustness	Jun

2.2 Training Assignments Completed in 1st Month

My first for the month was to familiarise with VueJS and Firebase. This was a manageable task as I had previous experience in Javascript and Backend-as-a-service (BaaS) tools such as Firebase. The main takeaways from the Udemy course was routing, authentication, state management and design patterns in VueJS. It also introduced me to the Model-View-ViewModel (MVVM) architechture that that the framework uses. With the help of the course, I built a simple video browsing application that uses YouTube API, as shown in Figure 1.

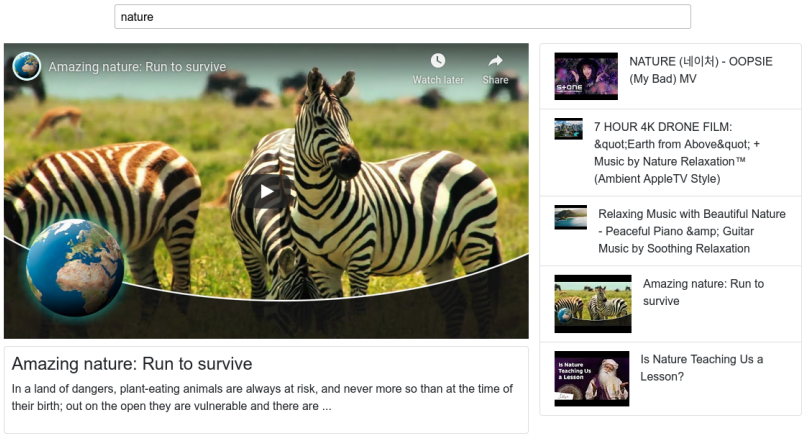

Figure 1: Video browsing application

After which, I started work on the Inventory Management System (IMS) for the Lemon Project. This constituted developing the user interface to help administrators perform create, read, update and delete (CRUD) operations for inventory items as shown in Figure 2. As such I also began interacting with the Database to perform the CRUD operations.

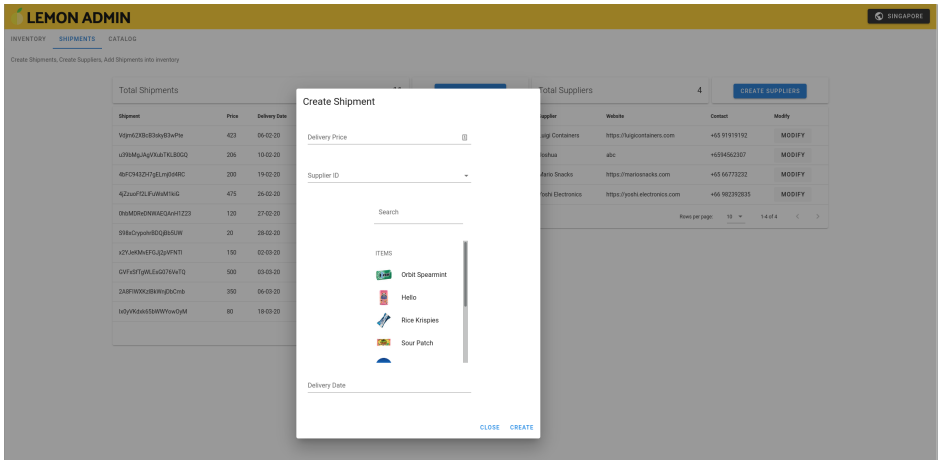

Figure 2: Inventory Management System: Shipments and Suppliers

2.3 Training Assignments Completed in 2nd Month

In this month, I continued my main task of developing the IMS. I completed work on integrating Suppliers, Shipments and Inventory to the IMS as shown in Figure 3. The increasing complexity of the code base helped me improve important web development techniques such as introducing asynchronous programming and a more advanced state management pattern.[2]

My second main task was to perform developer testing for the IMS. Through developer testing of the IMS my supervisor and I discovered errors in the code where the behavior did not match the specifications in the requirements. As such I performed bug fixes and deployed them as well. This process also helped me improve the efficiency in which the front-end code manipulated the Domain Object Model (DOM).

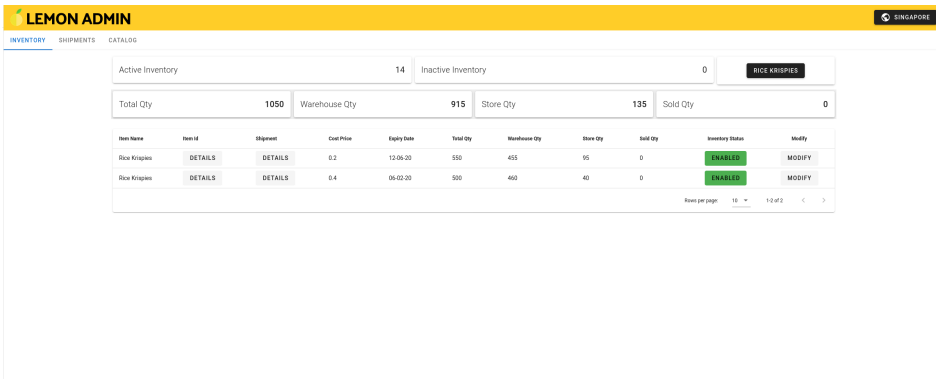

Figure 3: Inventory Management System: Inventory

2.4 Training Assignments Completed in 3rd Month

One task I completed was working on the backend code in Node.JS for the payment flow. Drivers enrolled in Lemon's pilot programme are to be paid by customers. In the case of credit card payments, Lemon uses Stripe [3] as its payment gateway to facilitate payments. Stripe's Software Development Kit (SDK) uses Webhooks to perform actions once payments are successful. I was expected to test these webhooks and ensured they behaved as expected in various situations users may encounter. My supervisor also tasked me with optimising the payment flow, such as improving error handling with the client side, and updating driver earnings, as shown in Figure 4, after each successful cash or credit payment. Subsequently the backend code was deployed to Firebase.

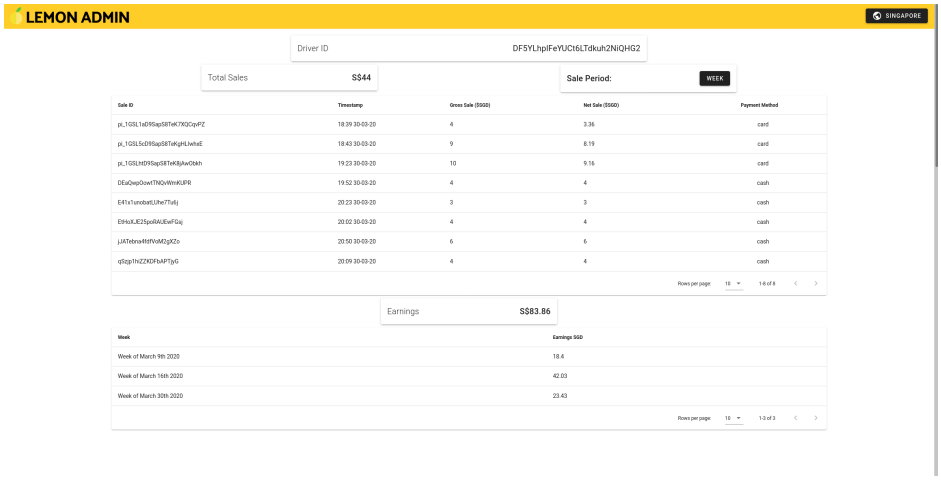

Figure 4: Driver earnings UI

Another task I completed was securing the Database. I wrote Firebase security rules to ensure that certain collections in the NoSQL Database collections tree are protected from unauthenticated users. This was imperative for the pilot trial of the system.

3 Knowledge And Experience Gained

3.1 Technical Knowledge Gained From Assignments

Firstly, I learnt about creating web-based platforms that are efficient. Through the assignment I was exposed to advanced web development concepts such as centralised state-management and DOM manipualtion. As the company was paying Google for use of tools such as Firebase, it was important that CRUD opertations were optimised and re-rendering of components was minimised so as to reduce reads. Such financial considerations helped me gain exposure to important web architecture concepts which I would have otherwise not come accross. This included improvements in my functional and asynchronous Javascript programming skills.

Secondly, I gained a deeper understanding of Software Design Patterns and best practices. Having taken CS2103 in the previous semester, I was able to apply Software Engineering principles such as Seperation of Concerns and Architectures such as Model View Controller in a more advanced setting.

3.2 Organizational/Industry Experience Gained From Assignments

Firstly, I learnt more about the inner workings of a start-up and the way they are managed. Due to the size of start-ups such as Intra Technologies, employees are expected to understand all facets of the company and be flexible to change in reporting structure. Nevertheless, it is much easier to approach high-level management such as the CEO to clarify issues or gain more knowledge. For example, I was able to learn more about the branches of a company other than the Technological side. I was exposed to how business development strategies such as marketing, roadmaps and product plans are created and the considerations that are taken into producing them.

Next, I was exposed to the Planning, Defining, Designing and Building stages of the Software Development Lifecycle. Also, for the building of the software the company decided to adopt Scrum techniques that improved my productivity and quality of code I wrote.

3.3 Areas of Applicability of Knowledge And Experienced Gained

On the technical side, Full-Stack Software Development is a skillset that is increasingly vital to industries that are digitalizing. Learning the Software Architecture and how the different layers interact helps me understand how to design each layer and the overall Architecture easily for any use case I may encounter in my career.

On the non-technical side, I hope that working in a start-up will help give me a edge in understanding businesses strategies in my future workplace. Furthermore, I am more knowledgable about branding and product development. Such knowledge may help me if I decide to expand my career to include product management and development strategies.

4 Conclusion

4.1 Summary Of Work Completed And Training Received

The bulk of the training I received was in understanding the requirements of the project and coding skills in VueJS. This helped me design and build the Web components more efficiently. My first major contribution was building the IMS system, which integrated with the Database. My second contribution was that of optimising the payment flow in the backend. This involved updating a few of the endpoints to add side effects based on the requirements. Other notable contributions include developer testing of the entire system and helping with Database modelling.

4.2 Problems Faced

A problem I am facing is writing and automating tests for the Web Application. The project is complex as it uses many frameworks, SDK, libraries and such tools whose ecosystems are evolving constantly. As such, it is difficult to automate integration tests for important components such as payment. I am currently looking to add CI/CD tools to update the dependencies regularly, as well as find testing suites that are suitable for our technological stack.

The second problem I faced was helping with Database Modelling. As the project deals with significantly more data than I am used to, I found it difficult to provide solutions to design considerations for working with the Database model used. I had to research and implement strategies such as Database Normalisation in a relatively short period of time.

4.3 Assessment Of Training Experience And Concluding Remarks

I find the Software Development Process to be enriching and challenging at times. Although Firebase's BaaS model is optimal for the requirements of the company's projects, I believe I am unable to learn about Full-Stack Architecture in greater detail as BaaS is constrictive and less robust. Nevertheless, I am looking forward to improving the Lemon's system using CI/CD, testing and possibly Dockerization in the coming months.

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