# Advanced Technology Attachment Programme (ATAP) Final Project Report

**at**

# Binance

**Reporting Period:**

**01 2023 to 06 2023**

by

Kang Wenhan

***Department of Computer Science***

***School of Computing***

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Project Title: Advanced Technology Attachment Programme

Project ID: AY2211886200

Project Supervisor: Prof Huang Zhiyong

# Summary

I am interning at Binance from Jan 2023 to June 2023 as a Junior Tech Support Engineer. My main role is to maintain and develop current software that were utilized by the Operations team in Binance. This include all of the Chatbots on Wea and the RADAR, incident reporting and monitoring website. I am also in charge of the Air Classroom project which aids the Tech Project Management Office (PMO) team in organizing internal company events. This report will detail the implementation details of the projects which I had done during those period. It will also be a reflection of the challenges I had faced when I was working on those projects.

Subject Descriptors:

D.2.7: Distribution, Maintenance, and Enhancement

D.2.1: Requirements/Specifications

D.1.5: Object-oriented Programming

K.6.1: Project and People Management

Keywords:

Software Engineering, Management of Computing and Information Systems

Implementation Software:

React, NextJS, JavaScript, Java, SpringBoot, MySQL, Google Cloud Platform, IntelliJ, Postman, Git

# Acknowledgement

I wish to express my utmost gratitude to the individuals and organizations who have supported me throughout this ATAP.

Firstly, I extend my sincere appreciation to the host company, Binance, for providing me with the necessary resources, equipment, and personnel that were crucial in my internship.

I am also deeply grateful for the invaluable support, guidance, and feedback provided by the mentors, especially Brian, Tony, Vic, Galen and Martin assigned to me by the company. Their expertise and unwavering commitment have been instrumental in the success of the many projects I undertook in my internship.

Furthermore, I would like to acknowledge the support and encouragement provided by my colleagues, throughout the duration of this project. Their collaborative efforts, constructive feedback, and teamwork have been an immense source of inspiration, motivation, and resilience.

In conclusion, I express my gratitude to all individuals and organizations who played a part in making this project a success. Their contributions have been invaluable, and I am honoured to have been part of such an exceptional team.

# Table of Contents

# 1. Introduction

## 1.1. Background and Organisational Structure of Host Organisation

Binance started as a crypto spot exchange founded in 2017 by current CEO Changpeng Zhao. It has subsequently invested its success into building a thriving blockchain and crypto ecosystem.

Being a relatively young company, they have adopted a fully remote working culture. Even though the company does have physical office in Singapore, it is completely optional to work in the office.

The company also still have a heavy Chinese culture. There has been a majority of Chinese employees in the company, and some of the documentations are exclusively written in Chinese. However, recently the company has been recruiting non Chinese from middle east and other countries as well.

There are several departments in Binance, most notably the Marketing team, Charity team, Compliance/Internal Audit team, Research team, Operations team and the product team.

## 1.2. Principle Activities of Host Organisation

Binance is the world's leading blockchain and cryptocurrency infrastructure provider with a financial product suite that includes the largest digital asset exchange by volume. Trusted by millions worldwide, the Binance platform is dedicated to increasing the freedom of money for users, and features an unmatched portfolio of crypto products and offerings, including: trading and finance, education, data and research, social good, investment and incubation, decentralization and infrastructure solutions, and more.

## 1.3. Training Programme within Host Organisation

There are a variety of non-technical training programmes provided by Binance: New Employee Orientation, Security Awareness, Privacy and Data Protection, Anti-Money Laundering and Counter-Terrorism Financing, Anti-Bribery and Corruption Training and Legal Training.

For technical training, I was assigned to work on the RADAR website, which is a website for incident management for the operations team. I also had the opportunity to create a whole new project called Air Classroom. Thanks to the help of my mentors, these projects went smoothly.

## 1.4. Position of Host Unit within Host Organisation

I am under the Tools team, which is under TechOps, which is under the Technology Department. The main focus of my team is to provide support to the incident management projects. These projects will aid the Operations team to satisfy customer service. Thus, our team is very critical to the maintenance of the infrastructure of the Binance platform.

# 2. Training Schedule and Assignments

## 2.1. Training Schedule by Month for Entire Training Period

| Month | Assignment Title | Description |
|---|---|---|
| 1 | Frontend: Operation Logs Improvement | Create a separate page for the Operation Logs on the RADAR website |
| | Frontend: Manually Add Ticket Numbers | Create a separate button to enable the manual adding of the Jira ticket number on the RADAR website. |
| | Frontend: Locales, Labels & Translation | Create locales for all the hard coded Strings on the RADAR website and complete the Chinese language translation for those Strings. |
| 2 | Backend: Alert Ack/Silence & Alert Lock API | Modify the current Alert ackSilence API logic such that ACK and Silence can happen separately.<br>Create a new API that locks the ability to close an alert issue. |
| | Chat Bot: Fiat TS Bot Optimization | The Fiat Customer Service team requested some new features for their Chat Bot – including the ability to automatically add yourself as the reporter in the Jira issue and if a staff has replied to the Jira issue, automatically change the Jira issue to 'In Progress'. |
| 3 | Air Classroom | The PMO team has a new suggestion, they wanted an app to track all the internal company events. Thus, my manager has delegated this task to me. |
| 4 | Air Classroom Security Vulnerabilities | In order to push the product into production, we need to go through security audit for the product, thus fix related vulnerabilities. |

| | | |
|---|---|---|
| 4 | Frontend:<br>Radar Homepage Alarm Dashboard | The old homepage for the Radar website was barebones, so the operations team decided to display analytics for the alarms at the homepage in order to have an overview of how many alarms are there. |
| 5 | Frontend:<br>Business Monitor Dashboard Redesign | The operations team requested a redesign of the business monitor dashboard. |
| 6 | Air Classroom Release | After the security audit, the product is pushed into production for user testing, however there are a lot of bugs encountered on the production server. |
| | Frontend:<br>Radar Homepage Postmortem Dashboard | Add an improvement to the homepage by displaying the Postmortem Dashboard as well. |
| | Frontend:<br>Feedback Statistic Page Redesign | Another massive overhaul for the feedback statistic page, this is to display the dashboard for the alarms and alerts. |

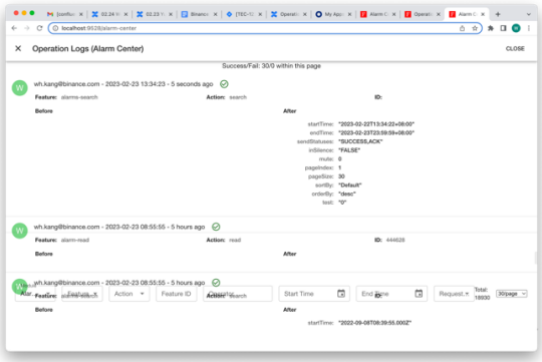
## 2.2. Training Assignments Completed in 1st Month

### 2.2.1. Frontend: Operation Logs Improvement

Mentor: Brian

The original way to access Operation Logs was through the Alarm Center drop down menu. This feature, although it was handy, was hard to find. So Brian had come up with the suggestion to move the Operation Logs page to the Main Menu on the left side of the webpage. Major UI changes were necessary as the original Operation Logs "dialog" page had a lot of overlapping components.

It was an difficult journey for me to complete this first task. Although my mentor was very helpful, he patiently went through with me the task requirements and expectations, but I have no experience in frontend development. Therefore, I had to seek independent self-study for how to use the React and NextJS frameworks. This proved to be fruitful for the subsequent tasks as I dived into frontend development. Although I was spending hours on research, I feel that it has enriched my knowledge on frontend development.



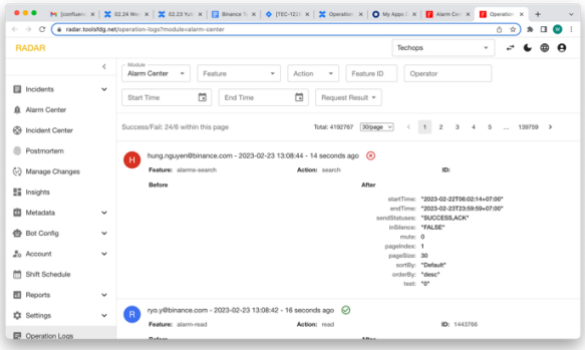




*Figure 1&2: Before and After page for Operation Logs.*

### 2.2.2. Frontend: Manually Add Ticket Numbers

Mentor: Brian

This is my first production level issue that I had to handle. Apparently, there is a loophole on Creating Action Items under Postmortem. Usually, the action items are added there, and RADAR will automatically create a Jira issue. However, when the Jira is already created by another team, there is previously no way to use that Jira issue number as a tracker. Because of this, the Operations team requested to be able to manually add the Jira issue number in the Postmortem.

Thanks to the previous research I did on those frontend frameworks, I have some idea on how to solve them. I was able to used what I had learned and implemented the solutions. Although it took longer than expected, I was satisfied with the end result. The reason why I was taking a long time was

because I was having trouble with debugging. Thankfully, Brian introduced some new frontend, React specific debugging tools for the browser. After learning about the tool, my debugging efficiency has improved dramatically.

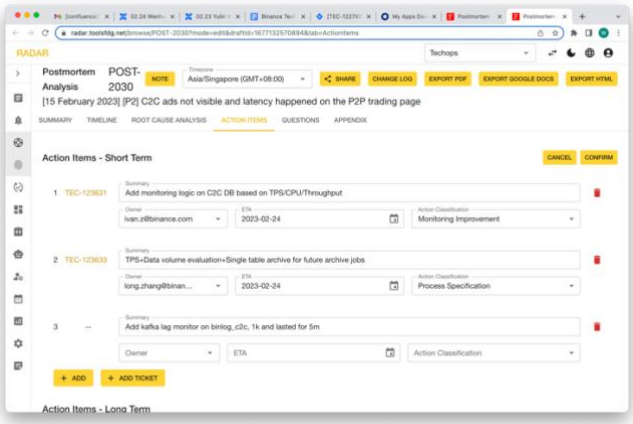



*Figure 3: The end product after the completion of the task*

### 2.2.3. Frontend: Locales, Labels & Translation

Mentor: Brian

Most of the labels on the RADAR website are hardcoded. This means that it is impossible to do a translation when one changes the language. In order to change the language, we need to make the labels dynamic - that is to use the useTranslation() React hook.

At first, I didn't know how much hardcoded labels were there, so I gave myself an underestimate of the amount of time needed to complete the feature. The requirements were simple: Check and correct English labels and grammar & translate the labels to Chinese by writing to locale files. However, they require a lot of time to complete. In the end, I wrote and edited more than 2500 lines of code.

I feel that even though this is a menial task, where I had to manually search and translate all the hardcoded labels, I feel that I learned about how localization works on websites. It was also very satisfying to see an entire webpage being translated with the click of a button:

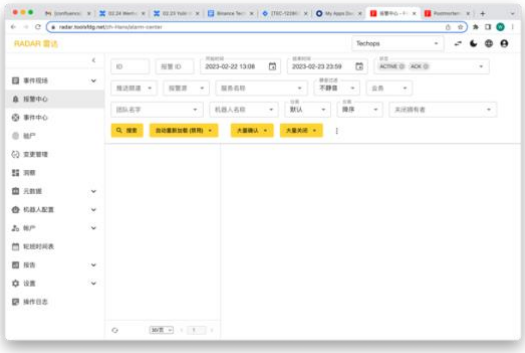


*Figure 4: Translated Webpage*

## 2.3. Training Assignments Completed in 2nd Month

### 2.3.1. Backend: Alert Ack/Silence & Alert Lock API

Mentor: Brian/Tony

Brian has told me that there are some urgent backend API that needed to be set up. Although I had not done RADAR backend before, this feature implementation has relatively simple logic, but I had to pick up skills on MySQL database and Postman querying.

I had to create a new API ***/api/monitor-api/log/alertAckSilence*** based on ***/api/monitor-api/log/alertAck*** that could handle the following POST data:

```
[
    {
        "id": 379967,
        "ack": true,
        "silence": 0,
    }
]
```

"id": Number;
"ack"?: Boolean; (do nothing if not provided)
"silence"?: number; (do nothing if not provided)

*Figure 5: POST data for /api/monitor-api/log/alertAck*

Similar to the Alert Ack/Silence API, Brian has tasked me to do the Alert Lock API as well both APIs are related to the RADAR frontend feature he is doing.

First of all, I had to modify the current API: ***/api/monitor-api/log/findAlertLog*** where I need to Add a new column "lock" as Boolean in each AlertLog and "lock" defaults to false. This means that I had to modify the database to add a “lock” column to the table.

Secondly, I had to create a new API: ***/api/monitor-api/log/alertLock*** that could handle a POST request to “lock” the Alert.

Lastly, I had to modify another current API**:** ***/api/monitor-api/log/closeAlert*** such that if the Alert's "lock" is true: do not close the Alert.

However, there were many mishaps in the development of these APIs. I found out that apparently we cannot use "lock" because it is a protected keyword in MySQL. Therefore, I had to add a new column called "locked" to the alert_log table on the database. I also accidently pushed the code to the production server without modifying the alert_log table on the production database, thankfully the problem was resolved very quickly as modifying the production database was relatively quick.

### 2.3.2. Chatbot: Fiat TS Bot Optimization

Mentor: Galen

This is the first assignment I had for the Chatbots, Galen has patiently went through with me the backend code and how the logic works. There was a lot to take in as the codebase was enormous and the code for the Chatbots encompassed many files. I had to learn about Spring Boot, which I was rather unfamiliar with and how it communicates with the MySQL database.

This task is requested from the Fiat Team, they wanted to add some new features to their Wea bot (Wea is a messaging app developed for and by Binance). The first requirement is that they want to automatically add the case reporter on Wea to become the Jira issue reporter so as to ensure that whenever there is a reply or change in the Jira issue, and the reporter can be notified in time.

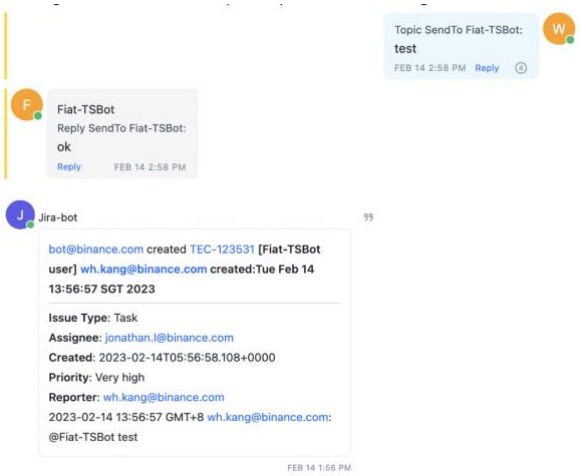



*Figure 6: Jira issue reporter was automatically changed.*

The second requirement is that if someone replied to the case issue on Wea, that person will be automatically assigned as the assignee and the issue with change to “In Progress” from “To-Do”.

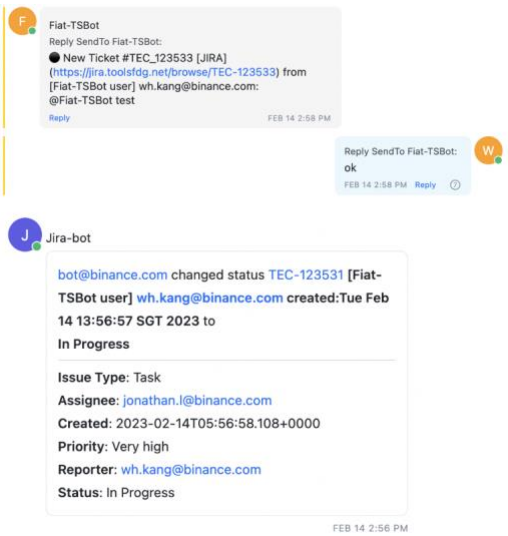



*Figure 7: Status automatically changed to In Progress.*

## 2.4. Training Assignments Completed in 3rd Month

### 2.4.1. Air Classroom

Mentor: Brian/Vic/Martin

This project is an idea from the PMO department. The PMO department wants a new interface, a virtual classroom to give transparency to all tech sharing across the Tech group and visibility on calendar of upcoming talks & depository of past recordings.

Requirements:

Output: A frontend interface (ideally on Wea) with:

i. Shared Calendar

1. Able to see at one glance what are the upcoming events and its information
2. Able to manage recurring invites (ideally sync to the original invite)
3. Able to in one click add the event to your own Google calendar
4. Able to push notifications via Wea Chatbot weekly tech talk list (automated)

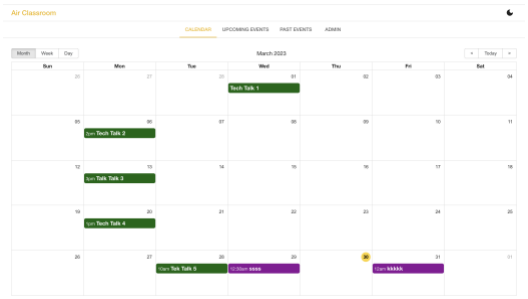


*Figure 8: Webpage for Air Classroom*

ii. Past events recordings (ideally on Wea, and record via Wea)

1. Able to access past events recordings - Showing Title and Speaker of event.
2. Recordings are recorded, and will be stored on Wea.

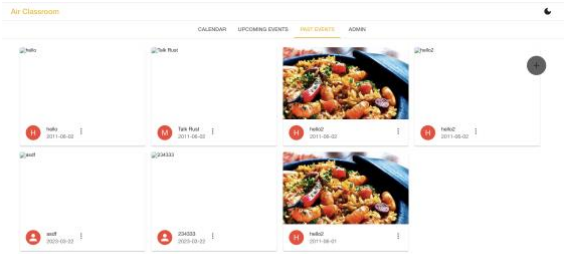


*Figure 9: Past event recordings page*

Input:

1. An interface for people to upload: Event name, Event speaker, Target audience, When, Calendar invite
2. Recurring event synced -> capture from invites -> calendar should reflect cancellations
3. Input for past event

For this project, I was tasked with managing the project itself as well as developing the backend. The backend definitely took a long time to development. I not only had to come up with the APIs design by collaborating with the frontend developer – Brian,  I also have to procure the Google Cloud Project. The procurement of the GCP requires a lot of communication effort as I had to liaise not only the Security team, but Devops team as well.

This is because, currently, our plan is to host the Air Classroom on RADAR's environment, however this causes a lot of problem as RADAR hosted a lot of sensitive data which should be isolated in its own environment instead. Thus, the security team wanted us to create a separate environment for the Air Classroom.

Despite that, the progress of frontend was relatively smooth, and a prototype was released on the week of 6 - 10 Mar. The app was also accessible on Wea (I had to liaise with Wea developers as well):

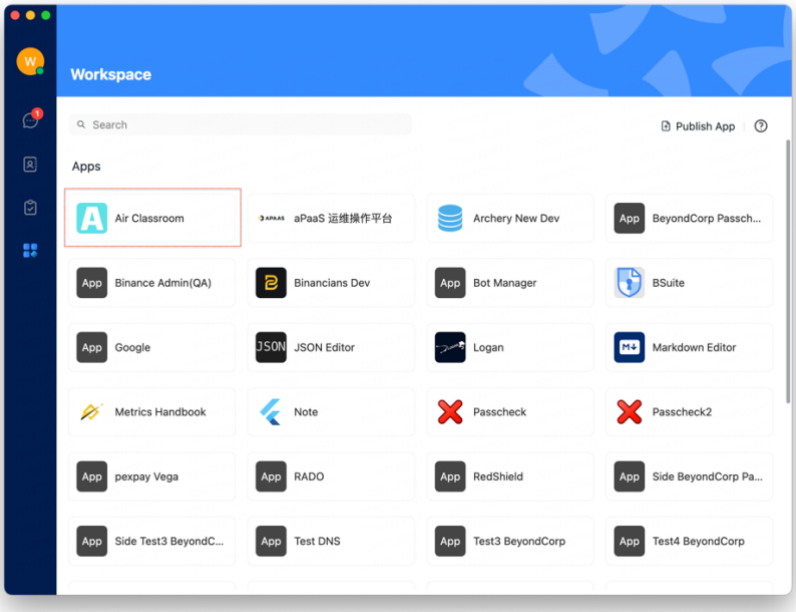



*Figure 10: Air Classroom on Wea*

## 2.5. Training Assignments Completed in 4th Month

### 2.5.1. Air Classroom Security Vulnerabilities

Mentor: Brian/Vic/Martin

After the completion of the backend and frontend of Air Classroom, we have to prepare it for release by going through a security audit with the SEC team.

They have found several vulnerabilities, including:

i. Malicious XSS script injection into Rich Text Editor.
ii. APIs that should require administrator access could be accessed by anyone.

In order to prevent XSS script injection, I filtered out the permissible html tags for the text editor.

For the admin-only access, I modified the backend to check for administrator privileges of the wea account used to access our wea app. This checked results is then stored under the cookies, using JSession, which will expire/be removed once the user account is no longer administrator.

### 2.5.2. Frontend: Radar Homepage Alarm Dashboard

Mentor: Brian

This project is to redesign the homepage and to add analytics for the alarms that were being reported to the operations team.

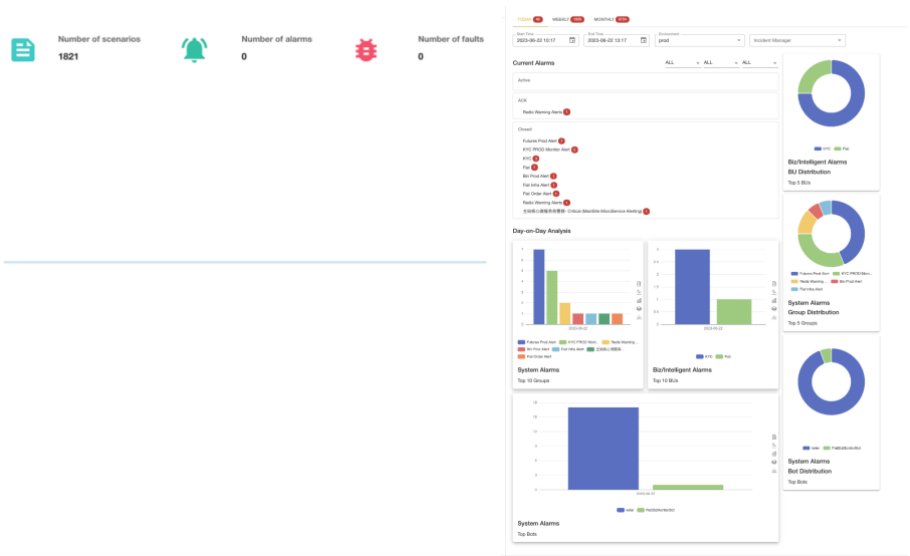



*Figure 11 & 12: Homepage before (left) and after (right)*

It was a major overhaul and requires me to learn React-E-Charts for the pie and bar charts. I also learned a lot about how to integrate backend APIs with the frontend data display. This took me a long time to get it right as I need to learn about the React's async-await feature and how it renders the HTML on the webpage.

## 2.6. Training Assignments Completed in 5th Month

### 2.6.1. Frontend: Business Monitor Dashboard Redesign

Mentor: Brian

There were several things to implement:

1. Create 3 separate tabs for the Public, Private & Biz-Monitor dashboards.
2. Create a autofill search bar to search for a particular dashboard.
3. Modify the dashboard panels such that they can show a live view of the dashboard.
4. For each of the Biz-Monitor Dashboards, we need to create another page that shows the charts, along with filter options.

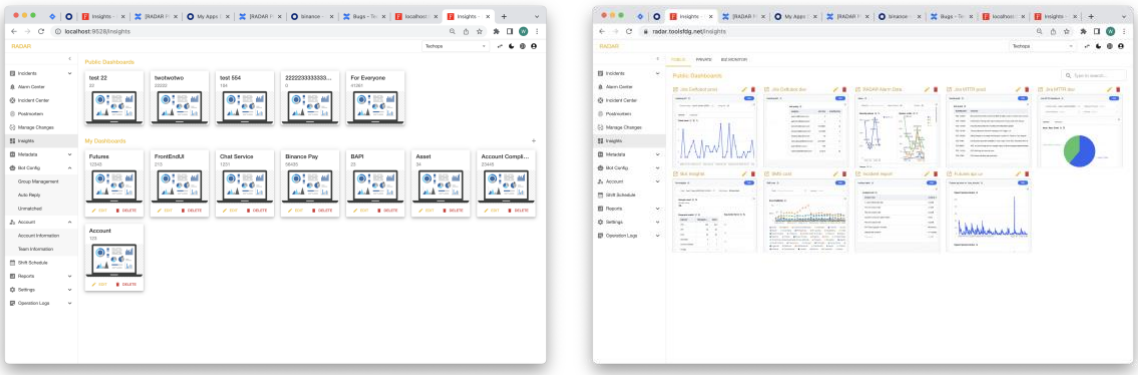


*Figure 13 & 14: Dashboard before (left) and after (right)*

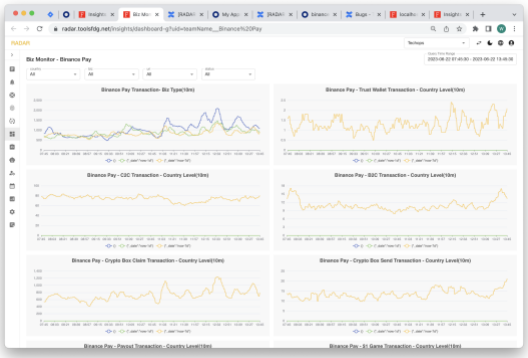


*Figure 15: Biz-Monitor Dashboard charts*

This took a while to implement as the Grafana Chart APIs are very difficult to learn. The major overhaul means I need to create a lot of new classes especially for the panels that contains the live-view of the charts.

## 2.7. Training Assignments Completed in 6th Month

### 2.7.1. Air Classroom Release

Mentor: Brian/Vic

There were several bugs upon pushing Air Classroom to production:

1. Duplicate events
    i. There were a lot of duplicated events due to the synchronising issue. This was due to there being multiple servers, each running the synchronization at the same time, causing massive duplicates.
    ii. Hence I implemented a Redis lock to the synchronization function such that only one server can run it at any point in time.
    iii. I also implement an active remove duplicate method under the synchronization function so as to remove the previous duplicates left on the server.
2. Recurring events not displaying properly
    i. Google recurring events do not display as expected, hence I have to exclude recurring events from the database, instead using the recurring event instances.
    ii. I also specified a time range of 6 months from current date to load the data so that the server would synchronise faster.

After these 2 issues were fixed, Air Classroom was able to be released for use by internal employees.

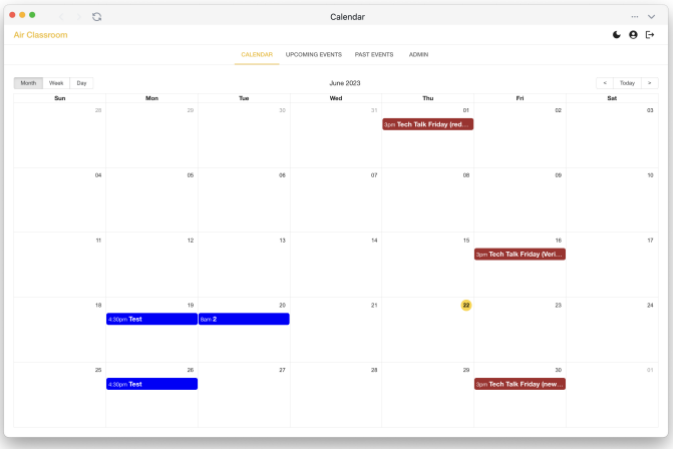



*Figure 16: Final released version of Air Classroom*

### 2.7.2. Frontend: Radar Homepage Postmortem Dashboard

Mentor: Brian

This is an extension to the homepage feature. It shows the Postmortem incident analytics overview.

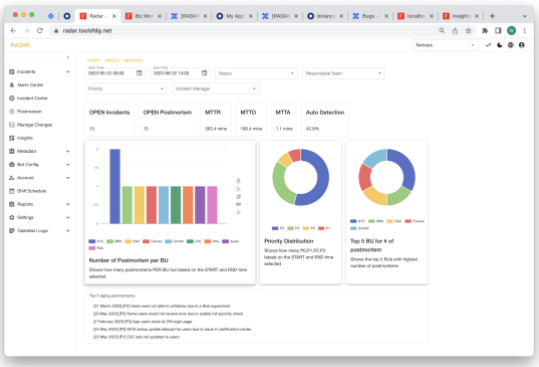


*Figure 17: Radar Homepage Postmortem Dashboard*

Thanks to the previous classes I created for the filters, the pie charts and the bar charts when I did the homepage, I was able to quickly link the APIs together with the pie & bar charts. This shows the effectiveness of OOP. On top of that, I also have to create a table-list to list out the top 5 aging postmortems, which was fairly easy thanks to Material UI's amazing documentation.

### 2.7.3. Frontend: Feedback Statistic Page Redesign

Mentor: Brian

Similar to the previous project, this one is to redesign the feedback statistics page. I have reused the pie and bar charts classes from the previous projects and created a new data table using MUI. This took me much shorter compared to creating the classes from scratch. As you can see from the diagram below, I had to modify the classes to include an inner table that tracks the names and counts. This therefore shows the applicability of inheritance in a practical way.

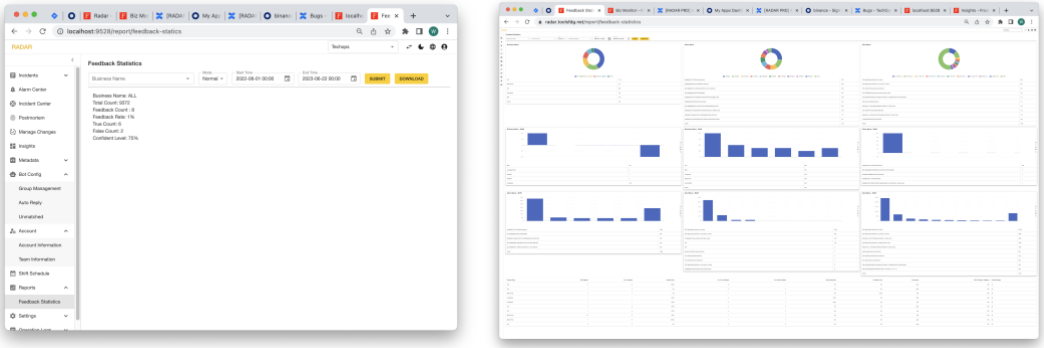


*Figure 18 & 19: Feedback Statistic page before (left) and after (right)*

# 3. Knowledge and Experience Gained

## 3.1. Technical Knowledge Gained from Assignments

I actually never used the React & NextJS framework before, so starting with React and NextJS frontend development means I had to take some time to learn the basics, and then more advanced terminologies and tips on using the framework. I had to consult various tutorials and documentations to understand what was going on. I also had to understand what was going on in the code base, which is very complex.

As with frontend development, I am not familiar with how to debug frontend websites as they are not started on IDE, but on terminal. Brian has introduced me some useful extensions for google chrome: React Developer Tools & Redux DevTools. These are able to pause the code from running through the setting up of break points and provided me with a more detailed understanding of the code.

I have learned about database, MySQL and how it integrates with SpringBoot. This is the first time I have experienced a real enterprise-level database.

## 3.2. Organisational/Industrial Experience Gained from Assignments

At first, I was very confused at everything, even the code base. Thankfully, given sufficient time, I was able to absorb and understand most of what was going on. However, this is very inefficient, as a simple question to Brian can get me the answer I need. Therefore, I realised that asking my mentors is the best way to progress than to dissect something that is so complicated on your own.

I also learned a lot on how to formulate my messages to achieve the desired outcomes. I am delighted that Binance has a Chinese medium where I get to practice and hone my Chinese language skills.

On collaboration, the fact that I need to work with multiple teams to come up with a product is quite eye-opening. I realised that meetings are the best way to get your points across rather than for me to keep relaying the messages across different teams.

## 3.3. Areas of Applicability of Knowledge and Experience Gained

Both the hard technical skills and the soft personal skills is very applicable to my future work and career in Software Engineering. In cases of future projects, having experience in these practical skills would speed up my efficiency in implementing the features. This is especially important in teams which primarily deals with operational issues, which would directly impact the business if not fixed promptly. For the soft skills side, these projects would require collaboration between multiple teams. I would need to ensure that my features implemented are suitable for the teams that are using them. Hence in the future, I should engage in more open communication with the teams that requested the features.

# 4. Conclusion

## 4.1. Summary of Work Completed and Training Received

I have engaged in both frontend and backend development for the RADAR website, I also started my own independent project. For the frontend and backend project, I had extensive help from my mentors, this means that I was able to learn a lot while doing the projects. I was also tasked with creating a new project, Air Classroom. This project required me to collaborate with various international teams online.

## 4.2. Problems Faced

There were a lot of challenges at the start, namely with learning new technology stack such as React and NextJS. The codebase for both the RADAR website and the Chatbots are huge, it took me almost one whole week to understand what was going on, but even then I still do not fully understand. There were simply too many files and not much documentation for internal company's project.

However, I overcame these challenges by either seeking help and clarification from mentors or researching online for the task that I was dealing with. Each challenge helped me to grow as a developer and problem solver, and I am grateful for the opportunity to have faced them.

## 4.3. Assessment of Training Experience and Concluding Remarks

During my training experience, I had the opportunity to work with a team of international professionals in the software engineering field, which has provided me with valuable insights into working with different cultures. The experience has been very fruitful for me, as it has enriched my understanding of software engineering, incident management, and working in a global team.

Overall, the internship has been an invaluable learning experience, and I am grateful for the opportunity to have been a part of it. I feel confident that the skills and knowledge I have gained will serve me well in my future endeavours, and I look forward to applying them in my future work.