UTM

UNIVERSITI TEKNOLOGI MALAYSIA

Low Fidelity Prototype project: Part 2
SMART WEATHER REPORTING SYSTEM

Course/Section: SECP1513/05

Technology and Information System

Lecturer's name: Ts. Dr. Sarina Sulaiman

Group Members:

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1. Introduction

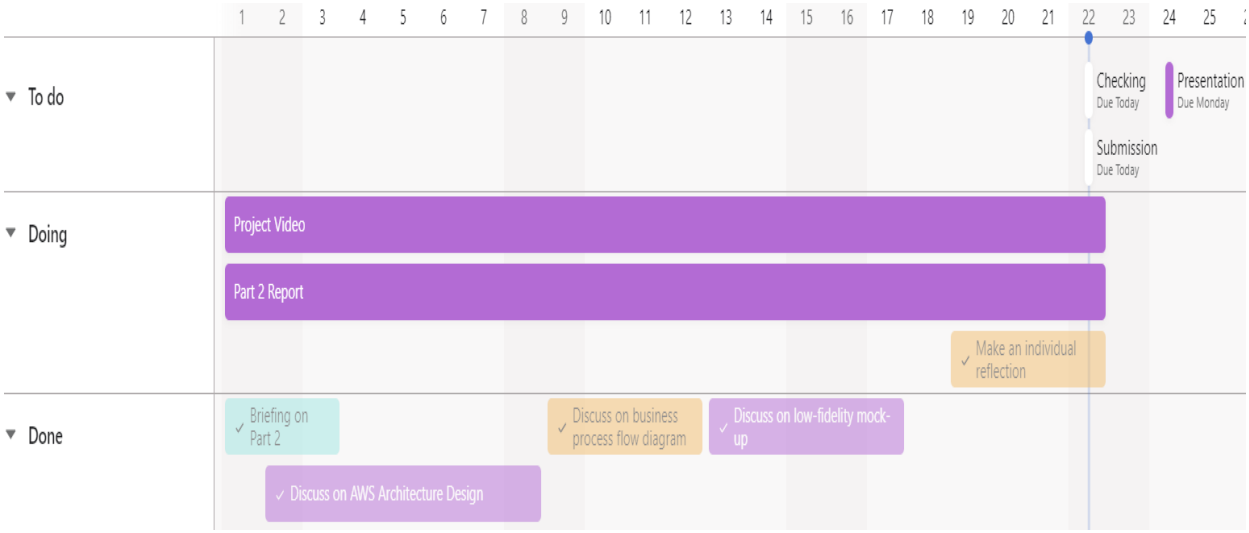
Following in the footsteps of the Internet, the Internet of Things (IoT) is viewed as an innovation and financial wave in the global data sector. The Internet of Things (IoT) is a sophisticated system that links everything to the Internet for the purpose of exchanging data and transmitting it via data-detecting devices in line with agreed-upon rules. It is capable of precisely detecting, discovering, following, watching, and supervising things. It is an improvement and expansion of an Internet-based system that connects humans to humans and things to things. Numerous articles around us will be linked into systems of various forms in the IoT worldview. It is a current correspondence paradigm that envisions a near future in which everyday items will be outfitted with microcontrollers, phones for computerized correspondence, and rational convention stacks that will enable them to communicate with one another and with clients, thus becoming an important component of the Internet. As a result, the Internet of Things concept seeks to make the Internet even more immersive and unavoidable.

Every structure is built on the foundation of a building management system. A building management system is a system that monitors and controls building services such as ventilation, lighting, power, fire, and security using sensors and artificial intelligence. While these tasks are frequently mechanized and computer-controlled, the integration of sensors and AI enables intelligent facility management with a holistic picture, enabling responsive operations. These technologies enable building occupants to monitor and control the day-to-day operations and functioning. In their early days, building management systems were revolutionary in the way they revolutionized the way building operations were carried out. A computer-based control and management system may be able to handle a building's operating components independently. This enhanced building managers' work by making it easier for them to carry out their responsibilities. Traditional building management systems, on the other hand, pose their own set of challenges, necessitating the use of IoT for building management. Building management systems can save on repair costs by permitting proactive preventative maintenance and lower utility costs by adjusting energy use to real demand. They may enhance the tenant experience by increasing security and

convenience, as well as reducing theft, food spoilage, and other losses. These systems assist buildings meet environmental standards and incentives, as well as attract and maintain tenants by reducing the facility's carbon footprint.

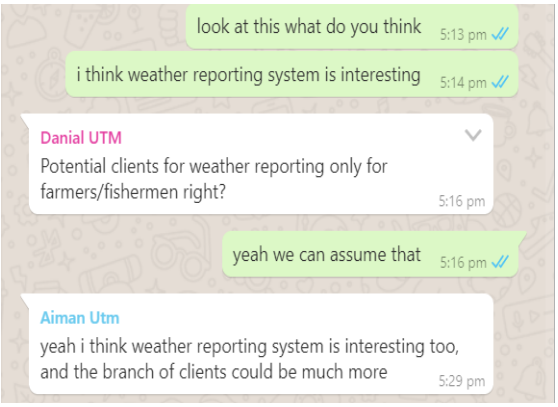
For this project, we created a mock-up of a building management system application that we are confident will assist the building manager in collecting data, understanding what is currently going on in the building, and providing suggestions for improvement by analyzing historical data and the building's current situation. Weather is one of the factors they must consider when determining if the job can be completed safely or whether it would endanger their staff. For example, over 6,500 construction workers have perished in Qatar, with one of the major causes being the country's extreme summer heat. This application will assist by offering a weather prediction and reminding workers if it is unsafe for them to work or if there is an issue with their project. So, we believe that by implementing this application, we may significantly reduce the number of deaths in this specific working environment and reassure building employees about their safety, allowing them to work without fear.

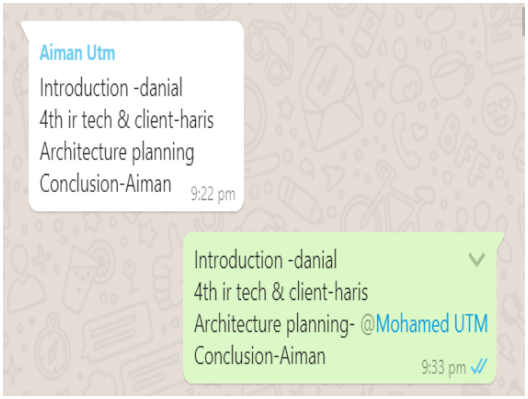
2. Detail step of team journey

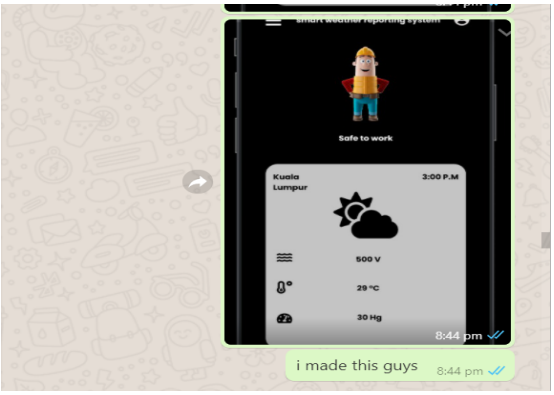


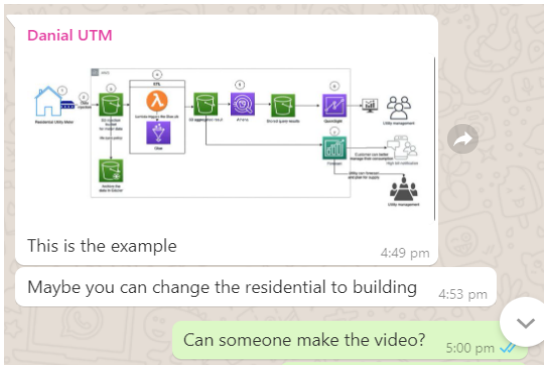
For project part 1 we started working on it by distributing tasks among ourselves, Aiman as a team leader was the one who gave the tasks in the first part of the project. The project was divided into 4 tasks. Introduction, 4th IR tech & clients, Architecture planning and conclusion. The introduction was done by Muhammad Danial Wajdi Bin Safiay, The 4th IR tech and clients part was done by Haris Izudin Bin Hairul Azhar, The Architecture planning was done by Mohamed Ali Mohamed Ali and the conclusion was written by Aiman Haikal Bin Zainuddin. We have a whatsapp group where we share the details together and ask any questions If needed. Also everyone who finishes his part would send it to the whatsapp group so the other members can Evaluate his work and get the approval of the whole group. We finished our work by the 31st of December 2021 and submitted the first part of the project.

For project part 2. Aiman again as the group leader divided the work into smaller tasks and every member would choose the task he thinks he can do the best. For this time, we had a timetable with tasks and their due dates. Also when a task is done it is labeled as done in the table. This method is for better work organization and more efficiency. For part 2 Muhammad Danial Wajdi Bin Safiay took the Job to do the Video for the project and the Introduction of the report. Mohamed Ali Mohamed Ali Took the task 2 and 3 which are both writing the details and work progress of the team in this project, Also discussing the problem that is being faced and its solution. Aiman Haikal Bin Zainuddin's task was to design the AWS Architecture that showcases the entire system. And Haris Izudin Bin Hairul Azhar was the one in charge of making the flow diagram and description of the business, also providing low-fidelity mock-ups. We had a meeting on google meets to brainstorm and discuss our project and how to exactly do each task. We then progressed into doing our task and just like part 1, when someone finishes their task they would send their work on our whatsapp group for the other members to evaluate and give their approval. Finishing task by task! We were able to finish our report and project on 22nd of January 2022. These are some of the discussion that we had in the whatsapp group:









3.Detail description

3.1 Problem statement

A contractor is in charge of designing, leading, executing, supervising, and inspecting a building construction project in general. Regardless of the project's scope, the duty extends from the beginning to the end. Furthermore, a contractor also needs to ensure health and safety on the construction site by establishing appropriate procedures and developing worker awareness.

Unfortunately, there are also reports on the death of workers in construction sites because of the heat. For example, a 50-year-old construction worker was found unconscious in Tokyo Big Sight and died and heat stroke is suspected to be the cause of death of a worker at the Tokyo Olympic construction site in 2019 (harian metro, 2019). The problem here is a contractor did not know the exact temperature of the day to determine whether it is convenient to do work or not.

3.2 4th IR Technology to solve the problem

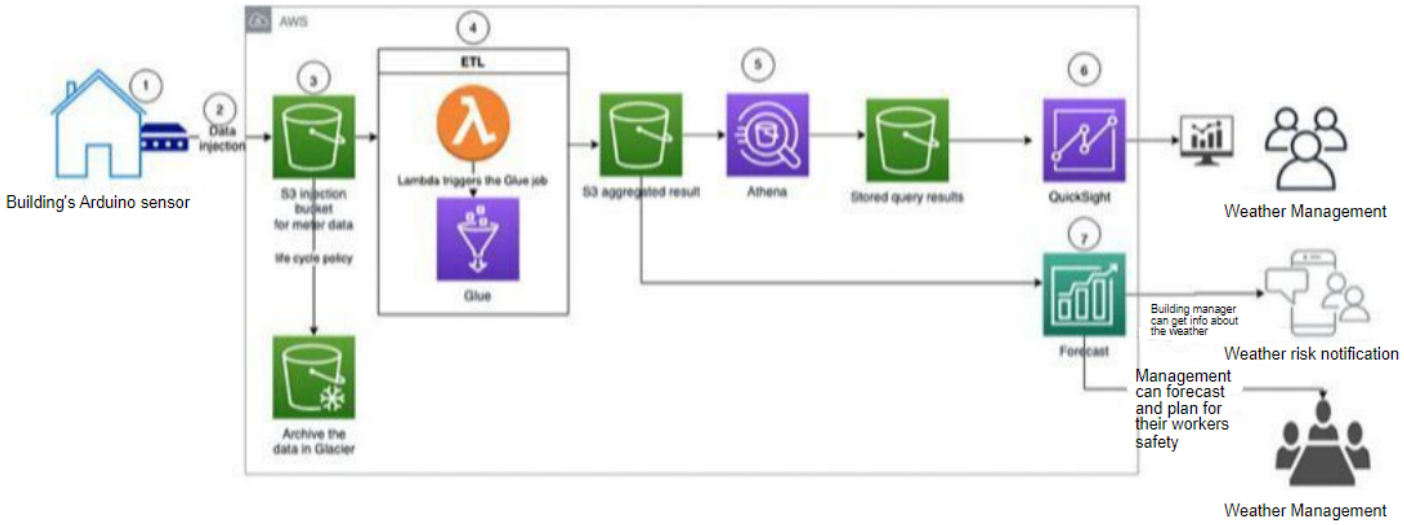
Internet of things(Iot) is the right choice to solve the problem. In this case, the type of Iot that we chose is Consumer Internet of Things (CIoT) that refers to use of IoT for consumer applications and devices. By implementing Iot in this problem we came up with this solution called smart weather reporting system which was created to make it easier to report weather data via the internet. The system is equipped with temperature, humidity, and rain sensors that can monitor the weather and deliver real-time weather updates.

The contractor now can examine weather statistics online at any time using their smartphone without relying on the weather forecast agencise' data. It is because this system is automated and always-on that uses WIFI connection to deliver data from a microcontroller to a server. This system also can warn the contractor when the temperature exceeds the threshold value that has been set by the contractor. So, the contractor managed to avoid an accident by informing the workers to stop working for a while.

3.3 Team working

We won't be able to accomplish this task properly if we don't have good collaboration skills. Teamwork skills enabled us to have a better knowledge of each other, and as a result, they enabled us to have a better conversation about the project such that none of us had any issues with it. Collaboration, communication, and responsibility are three teamwork abilities that have proven to be quite beneficial. Collaboration enables us to strive toward a common objective. It is critical to collaborate with other colleagues in order to share ideas, enhance each other's work, and aid in the formation of a solid team. Following that, we are able to communicate openly with one another in order to avoid misunderstandings. It is critical to offer pertinent thoughts, ideas, and crucial information when working with others. Last but not least, we are all personally accountable for every aspect of the project. Within the collaboration dynamic, it is critical that we include both parties in understanding the job for which they are accountable and making every attempt to perform those duties on time and to the anticipated level.

4. Aws architecture design



1. Building Arduino sensors in buildings often measure energy hourly or more regularly and report to the weather company at least daily.

2. If the sensors support IoT, we can transmit data to AWS IoT Core through a MQTT topic.

3. The raw meter data is stored on Amazon S3. Amazon S3 serves as the primary storage platform for the data lake solution built on Amazon S3. Because of its infinite scalability, Amazon S3 is an ideal basis for a data lake. You can increase storage from gigabytes to petabytes seamlessly and pay only for what you use.

4. The raw zone is an S3 bucket where ingested data is stored. When the data is ready, an Amazon S3 trigger calls an AWS Lambda function, which processes and transports the data to a new S3 bucket called the processed zone.

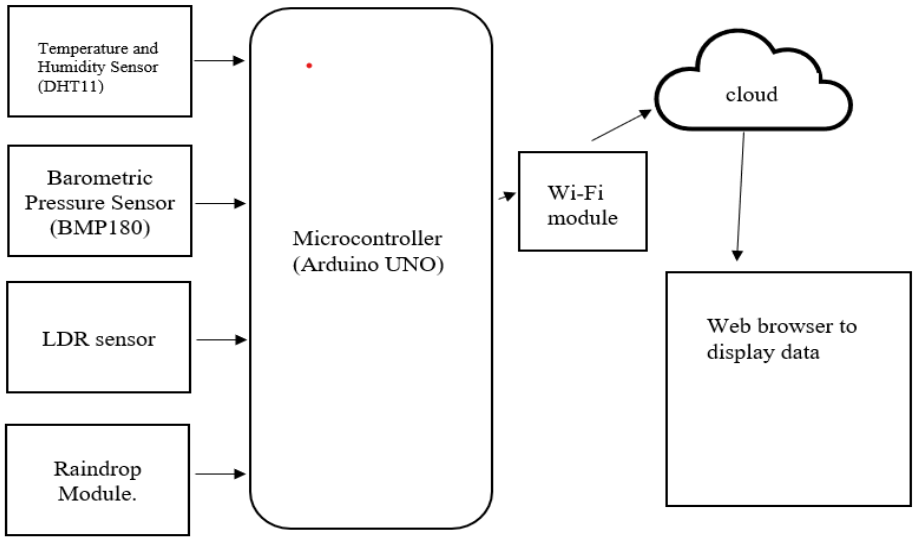
5. We may use Amazon Athena to query the data in Amazon S3. Athena is a query service that allows you to examine data directly in Amazon S3 using regular SQL.

Athena records query results and metadata information for each query that executes in an Amazon S3 query result location that you define.

6. Amazon QuickSight allows us to access the query result bucket. Amazon QuickSight is a business analytics solution that allows us to create visualizations, do ad hoc research, and gain business insights from our data. It can locate AWS data sources automatically and also works with our own sources.

7. Forecast may be used to create predictions based on the processed data from Amazon S3. These data may be used by construction workers to see future weather forecasts, allowing them to be more cautious while working. We may utilize the Query API and link it with our mobile or web application to offer visibility into future demand and assist increase consumption.

5. Business process flow diagram



Smart weather reporting systems are built from four sensors to detect environmental parameters such as pressure and temperature. Those four sensors are temperature and humidity sensor, barometric pressure sensor, LDR sensor, and raindrop module. To process the analog voltage to analog data, we use Arduino UNO as a microcontroller. Cloud services that we used are AWS services to store and analyze the data.

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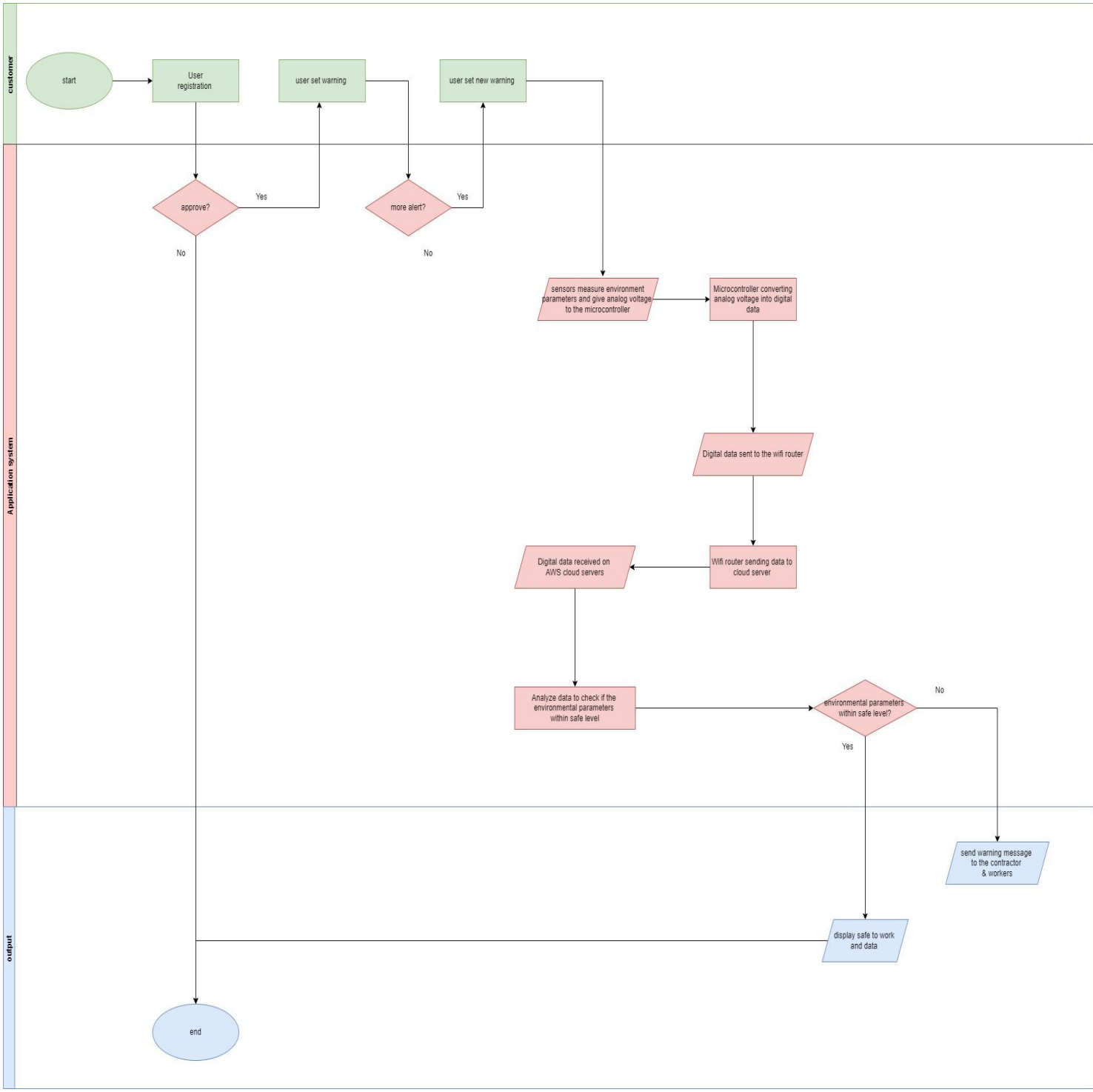
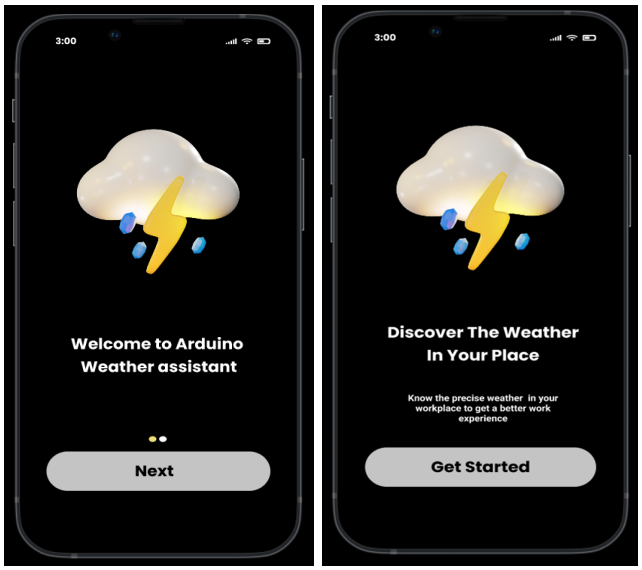

customer
Application system
output
start
User registration
user set warning
user set new warning
approve?
Yes
No
more alert?
Yes
No
sensors measure environment parameters and give analog voltage to the microcontroller
Microcontroller converting analog voltage into digital data
Digital data sent to the wifi router
Wifi router sending data to cloud server
Digital data received on AWS cloud servers
Analyze data to check if the environmental parameters within safe level
environmental parameters within safe level?
No
Yes
send warning message to the contractor & workers
display safe to work and data
end

Smart weather reporting systems will start when the end user starts to open the application and register themselves. Then the administrator will decide to approve the registration or not. After getting the approval, the end user can set their warning notification message settings to inform them that the weather is not safe for work. Next, all the sensors will measure the environmental parameters to give analog voltage to the microcontroller.

Microcontroller will receive the analog voltage from the sensors then convert it into digital data then send it to the wi-fi module. The process will continue where the wi-fi module sends the data to the AWS cloud server. From there, the data will be processed and analysis will be made to decide whether the current weather is safe or not for the workers to work. If the weather is safe to work the application will display all the digital data meanwhile if the weather is not safe for the workers to work the system will notify the contractor that the current weather conditions are not safe to work.

6. Low-fidelity mock-ups

6.1 Open app

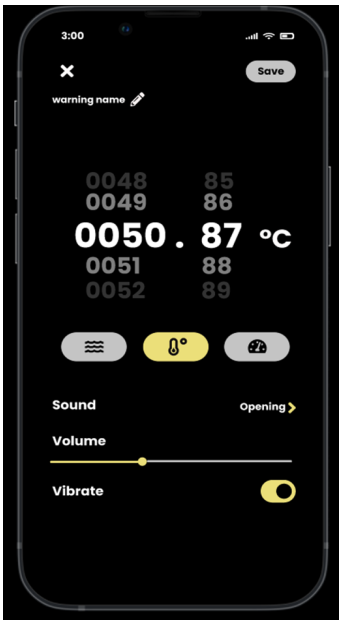


When the end user opens the mobile application, they will see these displays then they need to press get started to continue registering themselves to use this application.

6.2 Registration page

After the user taps get started, they need to register to use this application. They need to fill in the full name, password, and confirm password.

6.3 Set the warning



Next, after the registration is done, they need to set an alert for each parameter and if any of the parameters exceed the set level,the system will notify the user. They can also set the notification sound that they like and decide whether to turn on the vibrate mode or not.

6.3 Main page

In this page, the user can see the result whether they can work or not at that time. This page also will display all the data that the sensors collected. For example, they can see the temperature, the pressure , and the raindrop module data. Meanwhile, if any of the parameters exceed the level that they have been set, the system will vibrate and notify the user by sending a warning message.

6.4 Other features.

There are also some other features that our system offers such as the user can set more than one warning and see the forecast for that day. They just need to choose from the menu icon at the left hand side, then they see and use these features.

7. Reflection of every team member.

- **Haris Izudin Bin Hairul Azhar**

a. What have you learned and your motivation to complete this project?

From this project, I learned that teamwork is very important to make this project complete. Without teamwork, this project will not be as good as the one that we made, and we cannot make it in time. I also learned that technologies can be used to avoid tragic deaths such as the death of the workers at the construction site. One of the reasons why I managed to complete this project is the support from my teammate and lecturer during this project. With their help, I managed to come up with some ideas on how this project will be and how it can work.

b. What issues and solutions are implemented to make the project a success?

The issues that we used to make this project are the issues on the death of the workers at the construction site. We discovered that the cause of the death is the weather. so, we had an idea to make an Internet of Things (IOT) system to track real-time weather conditions. We also added some features to the system such as a warning notification message to notify the contractor that the weather is not safe to work.

c. What is your direction after completing this project?

After completing this project, I wanted to explore more about IOT because I think it will be widely used in the future as it will be implemented in every aspect of life. So, I will be updated about the technologies and can survive in the future.

d. What is the improvement necessary for you to improve your potential in the industry?

I need to keep updated with all the technologies that will be implemented into our lives in the future such as cloud computing, augmented reality, and IOT. With that, I can also learn some skills to handle these technologies so that I manage to be employed in the future since the technologies will dominate every industrial sector.

- **Aiman Haikal Bin Zainuddin**

a. What have you learned and your motivation to complete this project?

In this project, I have learned quite a handful of information regarding the cloud computing industry and its convenient parts and how the system works as a whole. It amazes me how we were able to plan the project from the start till finish with the help of the technology software provided with minimal difficulties. Although it seems hard to understand at first, it works out in the end as we indulge ourselves in a trial and error period during the construction of the project. What motivates me to continue working on this project is how attracted I am towards the inner workings of the cloud computing software and I was thrilled to dive in and explore the software on my own. My teammates also helped me understand the system well and I sincerely indebted to them for working with me on this project.

b. What issues and solutions are implemented to make the project a success?

The issue was how we are contemplating the daily struggles of workers in our society. From construction workers to food vendors at the night market, everyone is affected when heavy rains hit the ground. The daily work life is disrupted and the source of income and budgets is lost due to the loss of equipment or waste of products that were supposed to be sold that day. By implementing this device which could tell the workers about the upcoming weather beforehand, they can plan ahead of time on how to effectively use their time and resources in order to avoid damages and loss due to natural occurrences which can easily be diverted.

c. What is your direction after completing this project?

I would say that after this project, I may have been attracted to the cloud computing industry where I can work on different softwares to develop a lot of different kinds of innovation which can really bring us to the future where everything is truly at an arm's length. It may not be a direct approach but I would like to think that I am making progress towards achieving the dreams of tomorrow. It would be an experience where I can have the front-seat to the evolution of mankind's technological advancements.

d. What is the improvement necessary for you to improve your potential in the industry?

I have to enrich myself with more knowledge on how the industry works so that I can understand the system better and how I can effectively use every part of the system fully to its full potential. I would love to have an opportunity to listen and converse with an expert who can easily answer all my questions with precise and useful information.

- **Muhammad Danial Wajdi Bin Safiay**

a. What have you learned and your motivation to complete this project?

This project really taught me a lot of things, mostly about the Internet of things and the AWS architecture design. After a lot of research on AWS architecture design and how IoT was really helpful for us, I realized that completing this project successfully will be the indicator for me on how much I understand about the Iot and the AWS architecture design. Also, without support from my groupmates, I don't think I will manage to complete this project successfully.

b. What issues and solutions are implemented to make the project a success?

The issue raised is about the death rate for the worker at the construction site. It was so horrible how the manager did not take this thing as a serious matter. Without the workers, so many buildings cannot be built. The safety of the workers should be the first thing to be considered. With the weather right now being unpredictable, we think by developing an app that could help the workers to predict the weather should be able to decrease the death tolls. So that they don't have to worry about the weather as this app will give a warning for them whether it is safe to work or not.

c. What is your direction after completing this project?

I would love to pursue my study in the IoT course as I think it is a very cool thing and my ambition right now is to build a smart city where people live safely with the help of technology.

d. What is the improvement necessary for you to improve your potential in the industry?

I should work on my time management skills as it could help me be more productive and able to do many tasks in time allocation very well.

- **Mohamed Ali Mohamed Ali**

a. What have you learned and your motivation to complete this project?

   Working in this project I learned more about Cloud computing and how it works providing me with more knowledge compared to what I had before. Also building a system and bringing up an idea to help other people and make their lives easier is the best motivation anyone can have to do something and that was indeed my motivation when I worked on this project with my professional teammates.

b. What issues and solutions are implemented to make the project a success?

   The Main Issue we discussed and tried to find a solution for in this project is the safety of people before anything else
   and by providing a user friendly and Efficient system to solve the problem using 4th IR technology and AWS cloud computing with other Human useful inventions.

c. What is your direction after completing this project?

   I intend to continue learning more and more about my major and improve myself as best as I can so that in the Future I can be of use to the rest of Humanity and the world.

d. What is the improvement necessary for you to improve your potential in the industry?

   I am a practical guy, By that I mean I love doing things over just theorising and studying without trying, So I think the best thing to do to get an Improvement is indulging myself in more practical training and Experiments.