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SECP1513 – TECHNOLOGY INFORMATION SYSTEM

SECTION 03

PROJECT – PART 1 [LOW FIDELITY PROTOTYPE]

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INTRODUCTION

About Our app:

To solve some problems faced by our home like security, wasting of water and electricity, temperature and humidity, we will design a smart home app. The name of our smart home app is 'Domusation'. The word 'Domus', which is a Latin word, brings a meaning of home. We combine it with 'Automation', 'Domusation' means an automation home, and many devices can work automatically. Thus, 'Domusation' is the best name based on our opinion. Through this, the users can be more aware of their energy usage daily. Smart home automation is based on IoT. What is the Internet of Things (IoT), and how does it work? The process of connecting everyday physical objects to the Internet is known as the Internet of Things (IoT), ranging from light bulbs to medical assets, including medical equipment, wearable gadgets, smart devices, and even smart cities. Everyone has access to the Internet. It also encompasses any physical device system capable of receiving and transmitting data over a wireless network with minimal human interaction. All of this is made feasible by incorporating computer devices into a wide range of things.

Objective:

Our objective is to solve the following problems:

1. User's "sieve like memory"
2. Security concern
3. Wastage of water and electricity
4. Temperature and humidity regulation

Background:

With the advancement of technology in the twenty-first century, smart houses have entered our life. Many people are unfamiliar with smart houses. Smart houses may provide us with additional benefits and provide us with a living environment that is both safe and environmentally favourable. A smart home is a living environment that combines system, framework, customer support, and administration with housing developments as a console, as well as essential building equipment, enables communication, info equipment, and devices robotization, to develop a more efficient, relaxed, secure, comfortable, and ecologically friendly living condition. Smart houses eliminate the passive mode and transform into a contemporary tool with actionable intelligence while preserving traditional residential functions.

Smart homes are there to provide a variety of information sharing operations. However, they also improve lifestyles and living conditions, help the people plan their time wisely, preserve varied sources of energy, and enforce household appliance control, lighting systems, outdoor and indoor remote, roller blinds control systems, anti-theft alert system, computerized systems, scheduling hold, and mobile phone remotely controlled operation.

CONTENT OF REPORT

Potential clients:

We all know that 5G and IoT have become a new trend for creating a convenient and comfortable life. Smart homes are one of the blueprints. Smart homes consist of a variety of ordinary furniture equipped with sensors to sense the outer change and communicate and exchange information. Hence, they can act as your worker for serving your daily life. A crucial problem that may arise in your mind is how we integrate and collaborate to fulfil various daily tasks? Our app could be considered a “commander” and the other smart home device like your “personal worker”. Through our app, you could convey with your smart device to know their situations at any moment just in one click. Besides, you can set a routine that allows them to work together or control all of the devices instantly just in your phone without changing many of the remote controls. Based on the elaboration above, our app is very suitable and fits the clients with smart devices and considering how to control them just in one phone.

Problems and Solutions:

Problem	Description	Solution
User's “sieve like memory”	Nowadays, our lives are fragmented into small pieces of time by different kinds of technology	Our app could be your private home guard as it will know the situation of every door and window in your house at any moment. The

	<p>interruptions. Did you meet the problem before, which is when you are going to leave your house, and your boss inbox you and you have to reply immediately, a phone call or any other interruption from your phone but you have to do it right now? The result is always forgetting to lock the door or windows, giving the thief a chance to “visit” our house.</p>	<p>app could work well and corporate with the sensor and smart device on your door and windows. Hence even if you forget to check them before you leave your house, you still can check whether our app locks them. Wait, but what can I do when I have left my house even though I know they are unlocked? Don’t worry, because our app can communicate with the smart device on your door and windows, and we still can lock them even if you are in another country with just one click. Besides, through the movement sensor in the smart device, smart camera and detecting the availability of your phone, the app can know whether you are in the house. From here, you can set in our app to allow the device to lock itself automatically whenever you leave your house or remind you through the app.</p>
Security concern	<p>Recently, the increasing frequency of housebreaking and theft cases has raised the topic of home security as the most highlighted problem by all of us. In Denmark, there was 3949 theft per 100,000 people based on the summary by theglobaleconomy.com in 2016.[1] The theft gimmick also develops to more “advanced” and “variety”, which in turn lead to our home</p>	<p>Our app can work well and communicate with our house device to avoid and warn. You can set a simulated presence routine when the sensors detect nobody in the house to avoid your house being the target of theft. The simulated presence is that the app could control the light, wind, aircon, television and other voice devices to work together to make the illusion that the owner is really at home. In the warning phase, the smart camera that has the function of facial recognition can instantly</p>

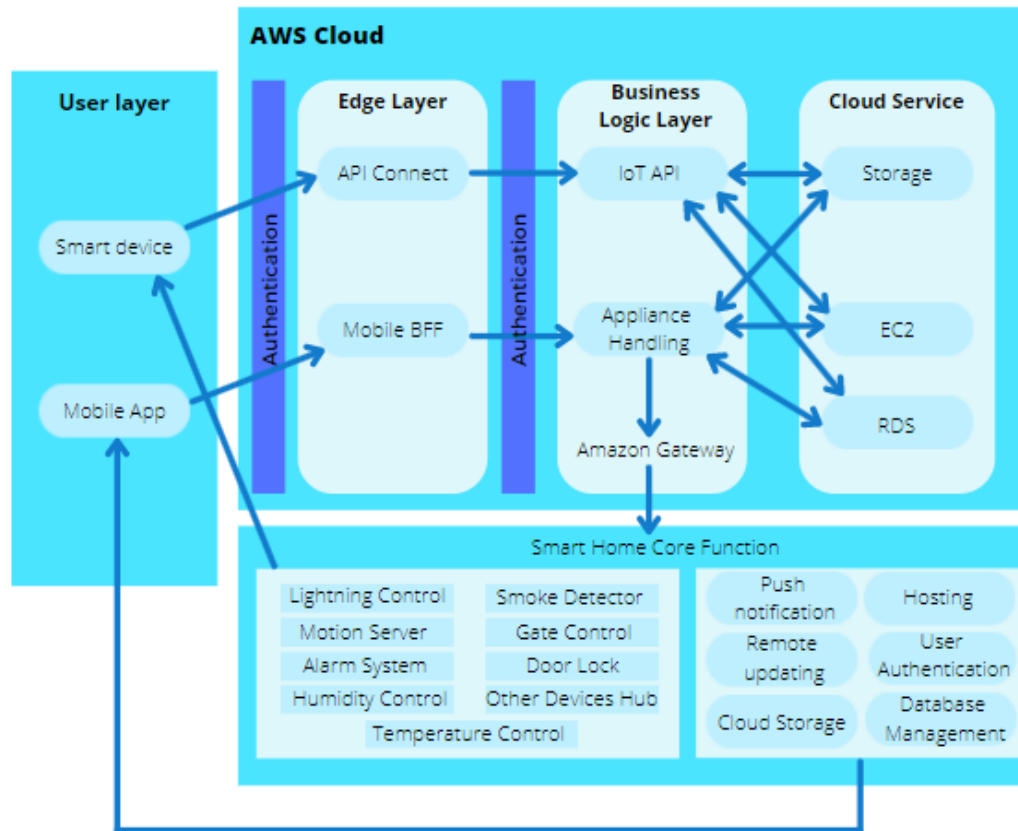
	<p>security having to develop as well as against their “skill”.</p>	<p>send the face detected to your app. The app will recognize whether this is a familiar face in its database and send a soft reminder to you that someone strange is in the surrounding area. Besides, the smart house device also possesses a motion sensor. When the motion sensors detect unusual movement and action that a person is doing, like cracking or chiselling, they will warn you. You can view the situation of your home via the smart camera just in one click to determine whether your house is safe. If you are at home, the system will trigger the alarm directly to warn you that the thief is in your house. Besides, if this is an emergency like the thief has success and is trying to leave your house, you can set it in our app to call your neighbours or even the police directly to seek help. Last but not least, the recorded videos by the smart camera also will be sent to our cloud storage so you can easily access them when you need them.[2][3][4]</p>
Wastage of water and electricity	<p>According to the exclusive report by World of Buzz [5], each Malaysian wastes 45 litres of water per day or 16,425 litres of water per year. This unbelievable number of wastages also results in the water bills of every Malaysian and is one of the</p>	<p>Our application can work perfectly with Internet of Things (IoT) devices such as smart lighting and smart sensors to detect water wastage and lighting usage in the house area. We can set up the lighting temperature, brightness and working hour manually through the application. Furthermore, we can</p>

	<p>problems that cause water shortage in certain areas. Other than that, there is uncountable electricity waste in Malaysia and worldwide that result in the electricity bills. What is the effective way to solve the wastage problems of water and electricity?</p>	<p>also make it work automatically by changing the lighting temperature, brightness, and on/off status based on the environment and user's requirements. The application can also make a user's analysis based on the data uploaded to the cloud. The user's analysis will conclude the usage of water and electricity in a month and will provide advice for improvement based only on the analysis.</p>
<p>Temperature and humidity regulation</p>	<p>On this day, the temperature and humidity are always different day by day. It is pretty inconvenient for people nowadays to keep adjusting the temperature of the air conditioner and heater to meet the perfect temperature. Besides that, the humidity level is also different based on the environment temperature. High humidity will cause condensation on windows and wet stains on particular objects. On the other hand, too low humidity level will cause health issues such as dry skin, lips, and bloody noses.</p>	<p>Our smart home application can detect the temperature and humidity all around the home area through smart sensors. The indoor, outdoor, and body temperature and humidity will automatically be measured and synchronised to the application. The immediate alert will be given to the user through the application whenever the user is. The user can adjust manually through the application or automatically adjust with some touches on the application itself through the appliances or devices such as ventilation, heater, and air conditioner. The updated data of temperature and humidity will be sent to the user with precise analysis and statistics.</p> <p>[6]</p>

Reference:

1. Christian, L. L. (2020, April 27). *Each Malaysian Wastes 16,425 Litres Of Water A Year & Here's What You Need To Know About It - WORLD*. WORLD OF BUZZ. <https://worldofbuzz.com/each-malaysian-wastes-16425-litres-of-water-a-year-heres-what-you-need-to-know-about-it/>
2. *Indoor Comfort Issues: Too Much Or Too Little Humidity?* (2016). Coolray.Com. https://www.coolray.com/help-guides/indoor_comfort_issues_to_much_or_too_little_humidity
3. John R. Delaney. (2021, December 10). *The Best Smart Home Security Systems for 2022*. Sea.Pcmag.Com. <https://sea.pcmag.com/surveillance-cameras/10049/the-best-smart-home-security-systems-for-2020>
4. X. Anitha Mary , V. Evelyn Brindha , Kingston Stanley , Jency Joseph J, Santhosh Kumar (2021) *DEVELOPMENT OF ANTI-THEFT SYSTEM FOR SMART HOME*. turkjphysiotherrehabil.org. <https://turkjphysiotherrehabil.org/pub/pdf/321/32-1-208.pdf>
5. *Theft rate by country, around the world*. (2016). TheGlobalEconomy.Com. <https://www.theglobaleconomy.com/rankings/theft/>
6. *Smart home: how it will protect you from thieves*. Smarthouse.Ua. <https://www.smarthouse.ua/en/umnyj-dom-kak-imenno-on-budet-zashhishhat-ot-vorov.html>

ARCHITECTURE AND PLANNING



[2][3]

The frontend of cloud architecture is what the user sees and interacts with. It comprises all of the client's user interfaces and apps with various visual elements for users trying to interact with to access the cloud computing services and resources. Before that, an infrastructure is required to have the applications. User interfaces are the main frontend components to access the cloud platform. Our client infrastructure is mobile smartphones.

On the other hand, a backend is a cloud software architecture whereby designers employ the backend aspects of a mobile and web application, enabling them to write and manage only the

front end. On the system's backend, numerous computers, servers, and data storage systems make up the "cloud" of computing services.[7] Our backend part consists of:

a) Database Management

Through this, every individual can access the database dynamically, analyze the information, and data alteration based on their requests. The user inputs their data, such as username, email address, phone number, connected smart household devices to control their household appliances according to their preferences. All the data are gathered, organized, secured, and stored for further action.

b) Cloud storage

The cloud is a type of data storage that arranges digital data to theoretical groups. The cloud provider responds to keep the data and the external structure secure, safe, and functional. For example, cloud storage makes storing and accessing recorded videos easier. Users can know the situation at home anytime. It is an excellent function that users can timely handle if anything happens at home. Users can access their recorded video, such as videos that record their pets or family members when users are not at home.

c) User Authentication

A process used to verify the identity of a user that requests access to a system, network, or device. We propose the use of user authentication to prevent unauthorized users from accessing other users' information. For instance, user A only can have complete control of their household appliances but cannot control the other household users' appliances unless using the authorization code-shared by the first registered user (admin) in the same households for access to the smart home app when they sign up for an account. Every first-time user is required to register for an account. Our method of user registration is according to credentials like username, email address, phone number, unlike the simple registration methods, which are through social media account because it is related to data security. After that, the user can choose to receive a verification code either via SMS or by email. The usual user will have the same access as the admin to control

the appliances.

d) Push Notification

It is a message that appears on a mobile device. The message can be sent at any time by app publishers, and users do not need to open the app to receive the message, such as Shopee, an e-commerce app. When users buy something, there will pop up a push notification that shows that users have made the payment. It is almost the same as the smart home app. One of the essential benefits of the smart home automation mobile app is that it allows customers to be careful and alert within the household at any given time. This means when something happens in the house like users forgot to switch off the air conditioner, users will receive a notification that reminds users to switch off.[5]

e) Remote Updating

Remote updating means the system can update automatically. It is needed because, over time, it will face many system maintenance and management problems. If unable to handle them timely and effectively, this will impact users. Remote updating will be one of our backend components to serve our users up to their satisfaction. We will try our best to create the most user-friendly smart home automation app by constantly reviewing the current users' feedback after using our app.

f) Hosting

A hosted application is any piece of software running on another infrastructure rather than your own. Usually, the hosted application is hosted over the Internet and provides a web-based user interface for users to interact. App hosting allows us to run the backend in the cloud-hosted by our chosen cloud service provider, Amazon Web Services (AWS). Cloud hosting has been chosen among the hosting services as we do not have to worry about the problem of reliability, scalability, versatility because all the demands and services are established in the cloud.[6]

IoT core is preferred to enable the connection of various IoT devices efficiently and ensure that the message is being conveyed to the cloud services for further action.

API refers to Application Programming Interface, and it is the interaction between different software applications. API works as a synthetic connection, transferring data from one device to another. APIs connect the different elements of a production system to ensure that the data is directed to the right place. These connection locations provide an enclosed communication channel and a method for external applications to get a piece of comparable data. The arachnid genus will be classified into two parts: private APIs and open APIs.

Developers and degreed users at various levels within an organization have limited access to private APIs. This arthropod genus often connects internal team operations to reduce isolated work and enhance teamwork. On the other hand, Open APIs provide the most straightforward approach for external developers to access and combine data from one tool. Developers save time by connecting their platform to already existing tools rather than creating new functionality via an open or public API. APIs can be used to find, collect, and share data, as well as to automate repetitive tasks and foster innovation and cooperation.[4]

Some IoT APIs can be used in our apps, such as Google Assistant API, Amazon Alexa Home Skills API, and Amazon API Gateway. Google Assistant API allows users to control and communicate with their gadgets. The Google Assistant API lets users operate their phone, speakers, smart displays, cars, watches, laptops, TVs, and other Google Home products with users' voices. Users may use Google to look up weather, sports, traffic, news, and travel information, set reminders, manage projects, and control smart home devices. In contrast, the Amazon Alexa Smart Home Skills API enables Alexa voice interaction and sends messages to cloud-connected devices. Developers may use the API to create Alexa skills that control TVs, alarms, door locks, lighting, and a variety of other smart home devices. The Amazon API Gateway service is a highly scalable service that enables building, publishing, maintaining, monitoring, and protecting APIs of any scale. APIs provide a "front door" for applications to access data, business logic, and functionality from backend services.[1]

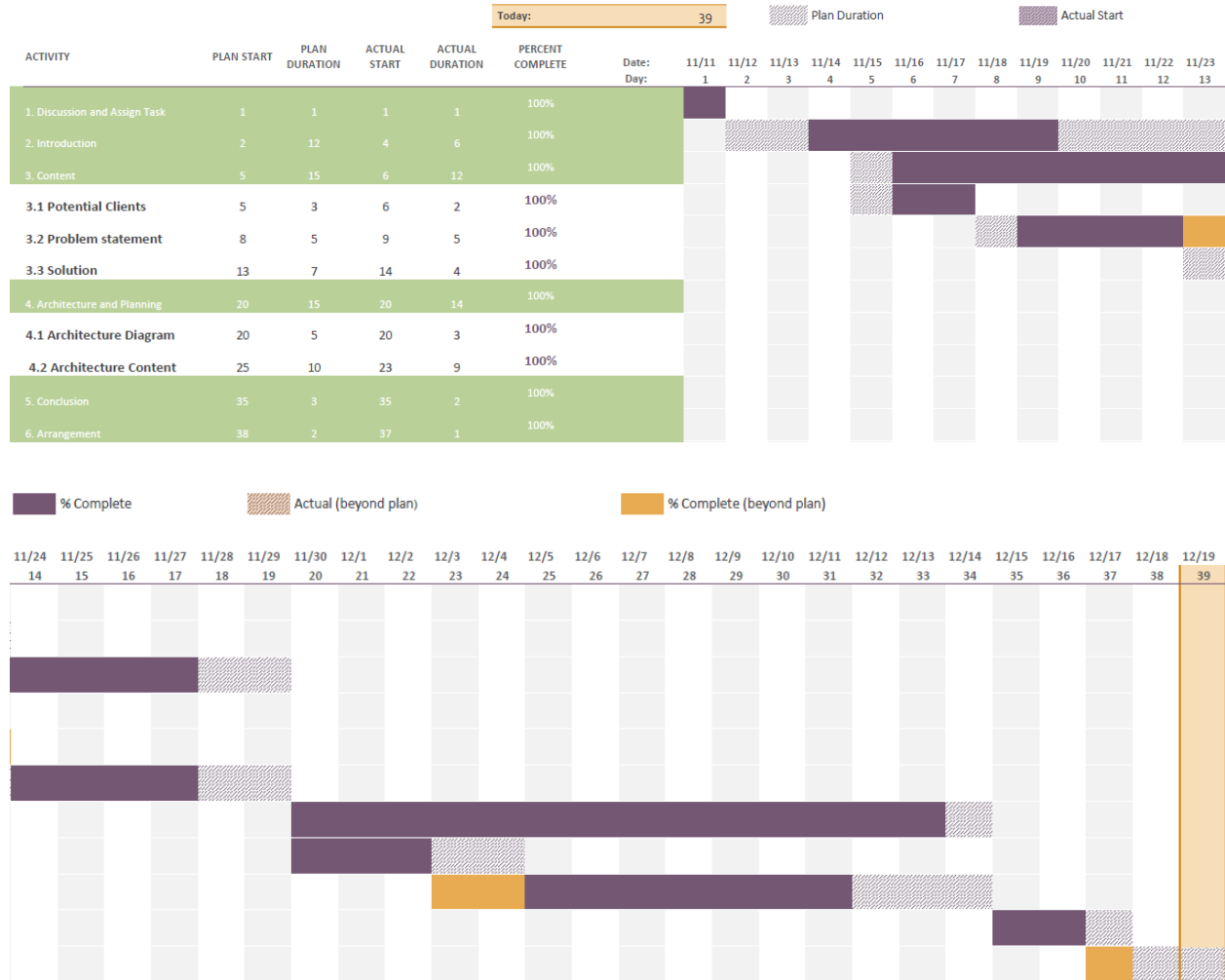
Home automation systems consist of sensors and actuators. Actuators immediately execute any action related to what the sensors have detected after push notifications about the alert have been sent to the users.

References:

1. Culbertson, J. (2020, March 29). *10 Top APIs for the Internet of Things*. ProgrammableWeb. Retrieved December 15, 2021, from <https://www.programmableweb.com/news/10-top-apis-internet-things/brief/2020/03/29>
2. Delaney, J. R. (2021, December 10). *The Best Smart Home Security Systems for 2022*. PCMag Asia. Retrieved December 16, 2021, from <https://sea.pcmag.com/surveillance-cameras/10049/the-best-smart-home-security-systems-for-2020>
3. Perrins, M. (2018, March 13). *How to build a cloud-native app in 30 minutes*. IBM. Retrieved December 15, 2021, from <https://www.ibm.com/cloud/blog/building-cloud-native-app-30-minutes>
4. Slate, A. (2019, May 31). *Application Programming Interface (API), Explained*. Wrike. Retrieved December 15, 2021, from <https://www.wrike.com/blog/application-programming-interface-api-explained/>
5. Vakhnenko, H. (n.d.). *Guide to Building Perfect Applications for Home Automation Systems*. Agile. Retrieved December 15, 2021, from <https://agilie.com/en/blog/guide-to-building-perfect-applications-for-home-automation-systems>
6. Vidyakin, A. (2021, September 27). *What Is Mobile App Hosting And Why Do You Need It?* Purrrweb. Retrieved December 15, 2021, from <https://www.purrrweb.com/blog/mobile-app-hosting/>
7. *What is BaaS? | Backend-as-a-Service vs. serverless*. (n.d.). Cloudflare. Retrieved December 15, 2021, from <https://www.cloudflare.com/learning/serverless/glossary/backend-as-a-service-baas/>

WORK PROGRESSION

LOW FIDELITY PROJECT PART 1



1. Discussion and Assign Task: Discuss the 4IR technology we will deploy, the content covered of each part and assign them to all of our team members
2. Introduction: Contents about introduction of our app and what is the smart home
3. Content: Cover the main problems meet by our potential clients and how our app to provides the solution
 - 3.1 Potential Clients: Introduce who is our potential client for our app
 - 3.2 Problem Statement: Introduce the main problems met by our clients

3.3 Solutions: Introduce how our app solve the problems

4. Architecture and Planning: Explain briefly how our app can deploy on AWS cloud and its basic architecture

4.1 Architecture Diagram: A brief diagram to show our Architecture

4.2 Architecture Contents: Elaboration of our architecture

5. Conclusion: Conclude the contents above
6. Arrangement: Arrange the page, font size, table of contents and cover page

CONCLUSION

We had achieved some achievements that we discussed deeply to determine the problems that we are facing in the real world and offer the solutions accordingly through the innovation of the application. Before going further on to our application, we figure out the potential clients and users that print out the focusing community of our application so that we would not walk slightly off the path on the next step. Our application acts as a helpful assistant for the community, such as a forgetful person, people who are aware of security issues in the home, trying to reduce wastage of water and electricity and require temperature and humidity regulation. According to the people facing the problems above, we provided the best solution through our application.

After gaining a clearer image of the application, we built up the application's basic architecture, such as the front and back end. The backend consists of seven significant portions: data management, cloud storage, user authentication, push notification, remote updating, hosting, and IoT API. All these functions play a significant role to provide efficient solutions for the problem faced that encourages us to use our application.

Based on the experience all along the time to complete part one of the low fidelity project, we had faced some tricky problems or challenges. One of the challenges is that we could not hold the meeting face to face because of the pandemic, but we tried our best to gain the best information from each other through online meeting platforms such as Google Meet. Other than that, some of our teammates also face internet connection issues that affect our project's performance and progress rate. We all work hard together to make sure that we can catch up with the progress rate as scheduled, like updating our progress through the WhatsApp group.

In conclusion, we all had formed an outstanding team spirit that resulted in our teamwork performance while doing this project together. Furthermore, we can improve our communication skills because of the meetings and discussions we are making with the teammates that we have never met before while completing this project. We also had set up some goals for this project that we could learn more about, such as basic knowledge on application creation and designing. As preparation for part two, our team always keeps in touch to gain further knowledge and a clear idea of our next step through the discussions that ensure we are always well prepared. In the brief of part two, we set up the goal to apply more of the knowledge and skills we learn from the technology and information system course into our application or project.