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SECP1513 – TECHNOLOGY INFORMATION SYSTEM

SECTION 08

Project Part 1 (Low Fidelity Prototype)

Emerging IoT in Tracking and Management System

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1.0 Introduction

Low fidelity prototype is a quick and simple tangible representation of a concept, flow of usage or information structure created for obtaining feedback and product improvement. Based on the technologies in Industrial Revolution 4.0, we have decided to create a low fidelity prototype related to the Internet of Things (IoT) which refers to all of the physical devices around the world that have the ability to connect to the internet in order to collect and share data.

1.1 Problem background

In this technology era, electronic commerce, commonly known as e-commerce has become a popular way for people to sell or purchase things. The e-commerce platforms such as Lazada, Shopee, Alibaba, Amazon and many more have allowed the user to start their online shopping or selling journey. Online shopping has brought a lot of benefits to people and hence more and more people are starting to use their electronic devices such as computers and smartphones to buy the items that can be delivered to their homes instead of shopping at physical stores. The number of online orders is increasing, and the number of parcels that the sellers need to deliver is also increasing. For instance, Amazon ships over 66000 orders per hour. During the transportation of the package from the seller to the buyer, we have observed that many problems may arise. For instance, the parcel is damaged due to a collision when the parcel is in transit. The buyer felt disappointed and gave a low rating to the seller although that is not the seller's fault.

1.2 Proposed Solution

Hence, we decided to create a tracking and management system with some advanced functions to overcome the problems faced during the transaction of the parcels. This is because although there are a lot of tracking systems in the market, there are also some limitations of the function that did not fulfill the requirement of the user.

1.3 Objective

1. To allow the users to track the real-time location of their parcel to avoid losing.
2. To allow the user to check the condition of their parcel.
3. To help the user to choose the most suitable logistic company for them.
4. To make the operation of tracking easier and more concise with an easy to user interface.
5. To simplify the process of assigning parcels to the courier with an auto generated tracking number and sync the details to the user that receives the parcel.

1.4 Scope

We need to create a low-fidelity prototype of a tracking and management system. In this system, we have 2 types of users which are seller and buyer and need them to enter their information to login. For sellers, this system allows them to manage their parcels and assign their parcels to the courier with the autogenerated tracking number and then sync the tracking number generated to the buyer via email. For buyers, this system allows them to track the real-time location and condition of their parcels and rating for the experience in using the specific couriers. The real-time location is shown in the map form and the condition is in pictures and text form.

2.0 Detail and description of the project

2.1 Problem statement

With the growing trend that most people start shifting to online shopping, courier services have played a prominent role in transporting our parcels from one location to another. Despite online shopping having started to gain acceptance from the society, there are quite some challenges faced by this industry as there are feedbacks from customers that their parcels have been delayed, damaged, stolen, or even lost in transit. Based on the Seller Rules and Policies of one of the leading e-commerce companies, Shopee, both seller and buyer should bear the responsibilities if parcels are lost and damaged. Generally, it is the courier's responsibility to deliver undamaged parcels to the buyers within a specific time frame but it is always the sellers who receive those negative reviews from their dissatisfied customers.

Hence, our group decided to come out with an IoT-based parcel tracking system that will provide almost full visibility to the entire parcel delivery process by updating you on the inner condition and near real-time location of your parcel once it arrives at each hub and even starts traveling. We believe that through our proposed innovation, we can enhance the overall online shopping experience for both sellers and buyers, elevate the reputation of courier service companies, and also build an excellent e-commerce ecosystem to all levels of customer.

2.2 Internet of Things (IoT)

In this project, we have used Internet of Things (IoT) as Fourth Industrial Revolution (IR4.0) technology to complete the task. The IoT is a huge network that uses the Internet to connect objects for information and data exchange. People can use wireless information sensors such as Radio Frequency Identification (RFID) technology to monitor their parcels in real time. People can manage the parcels through numbers to ensure that the parcels are in good condition and current location.

After the seller receives an order from his customer, the seller will use his mobile phone or computer to confirm the parcels and send the data to the cloud and the smart cabinet will transmit the inventory information to the seller. At the same time, an email will be generated and sent to the buyer automatically to make sure that the order has been accepted. The information of the parcels will be sent to the logistics company and the courier will embed the information into a microchip or RFID tag for each parcel so that they can store and transmit the data easily. The cloud will transmit the message to the truck to a balanced temperature for parcels before shipping.When the information sensor inside of the truck detects temperature rises or drops that threaten the quality of the parcels, the information sensor itself will send an alarm message to the owner and driver to control the room temperature. The data saved in the cloud database can be used by courier to predict the weather of the day so that they can decide the ways and route of the transport.

In order to allow consumers to track the location of parcels in a timely and accurate manner, logistics companies can also use the Global Positioning System(GPS) to provide various information such as the flow route, stay time and location of the parcels. Buyers can enter the tracking number to check the location of their parcels and the time to their destination in nearly real-time. The information sensor transmits all recorded data to the cloud to achieve efficient business operations with the help of low-cost computing cloud, big data and analysis technology through the Internet.

2.3 Radio Frequency Identification

Radio Frequency Identification technology known as RFID uses radio frequency for non-contact two-way communication to exchange data to achieve the purpose of identification. The main components of RFID Technology are a reader, an antenna and a tag which contains a microchip with a specific code and hidden in the parcels. The RFID reader sends a microwave inquiry signal to the RFID tag through the antenna. Then the RFID tag is activated and responds after receiving the microwave signal and sends out an echo signal with RFID tag data information. As the parcels have arrived at the warehouse, all the RFID tags will be received by readers like RFID gate, RFID smart shelves and RFID X-ray Security Scanner to record and upload the data such information, quantity, image and et cetera to cloud database automatically.

After the invoice items have been recorded by the company, the parcels with the RFID tag will enter the recognition range of the reader of the truck once the RFID tag is connected and the data read by the reader will be fed back to the vehicle terminal. The vehicle terminal will send the data to the background database after processing to complete the "carriage task" of the parcels. After the parcels have completed the "carriage task", the RFID reader can upload the read RFID tag information to the on-board terminal at intervals according to the system requirements to update the working status of the parcels in real time. As a result, these logistics companies can improve business efficiency and ensure quality of the parcels since they can collect real-time information in warehouses which are equipped with RFID inspections and share them with their customers.

2.4 Potential client (s)

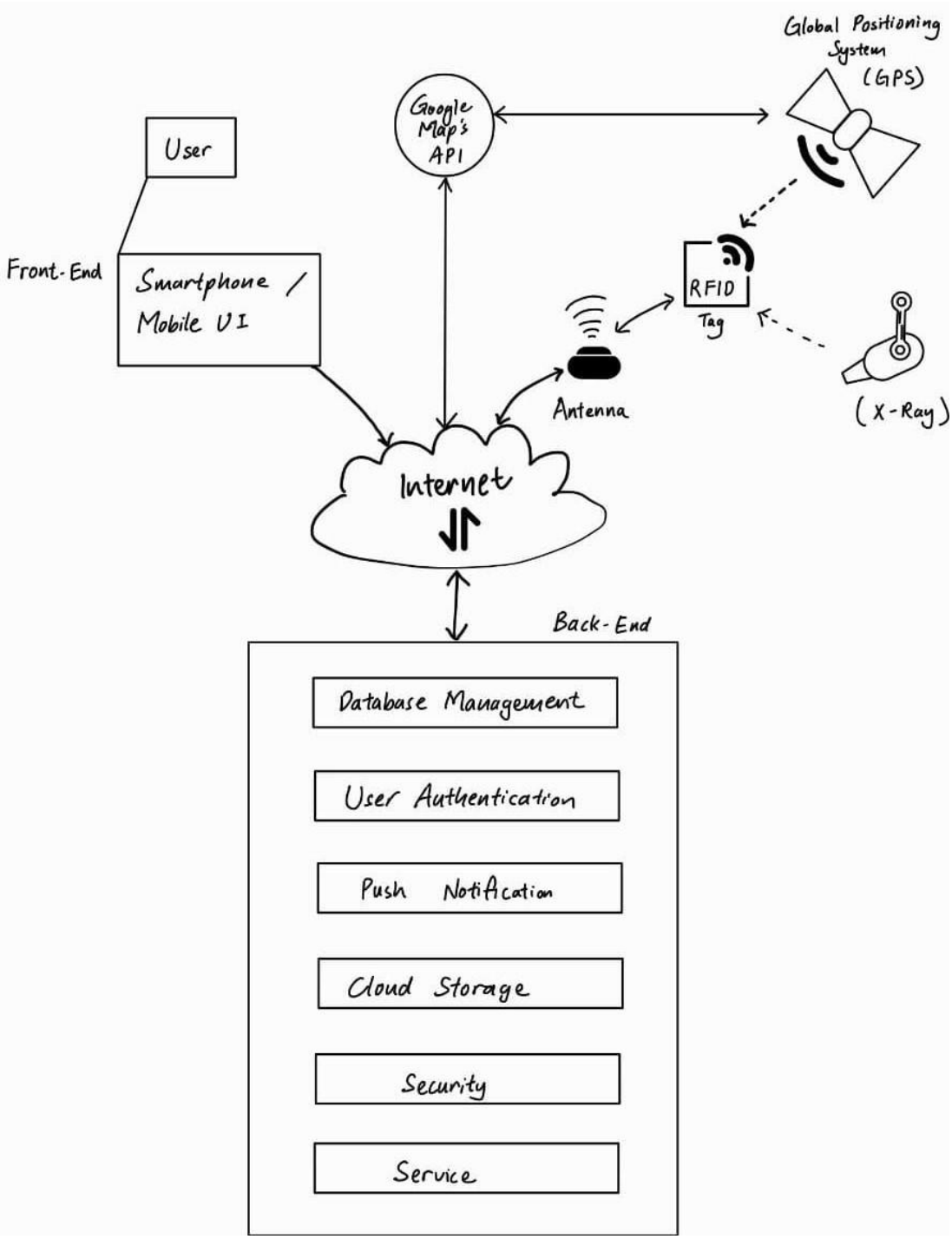
We have defined some potential clients that will provide input to our system. To list them out, they are courier service companies, sellers that sell their products on e-commerce websites or applications, and also buyers that pay for their products.

In terms of courier service companies, our system can faster the process of reading and updating the information of parcels when arrive at each hub, ease the process of monitoring and tracking of parcels if there is any delay, damage and loss of parcel during the transportation with the aid of parcel x-ray diagrams, provide information such as flow route, stay time and location of parcels to the buyers, provided with temperature information to control the temperature of temperature sensitive parcels and also updated with route optimization for parcels delivering .

For the sellers, our system will provide a courier service satisfaction ranking that will be updated on a day-to-day basis to help the sellers to filter out the best courier service company, a simple inventory system that will assist you in managing all available stocks in a simpler way, and a user-friendly interface for sellers that just started up their online shopping business.

In respect of buyers, there will be a simple yet easy to use interface for near real-time tracking of parcels, updated with parcel x-ray diagrams that can provide information about the inner condition and quantity of your parcels once they are arrive at each hub and a 24-hour report system if there is any delay (information of parcels is not updated for 1 day) , damage, and loss of parcel during the transit.

3.0 Architecture planning and design



3.1 Design Thinking

RFID Tag on parcels will be detected, a picture of the parcel's inner situation will be captured by X-Ray camera, the location can be identified by GPS by accessing Google Maps APl such that everything must be connected to the Internet to access the function. Front-end mainly consists of what the users can see, which is the mobile user interface (UI), making them able to access our service in a more convenient way by giving them a set of graphical instructions. In the process of designing cloud architecture, we think that it's suitable to include cloud storage to store our data in cloud for the ease of accessing, everything can be done by a click. In the back-end, here is what the users are not able to see. We have several components included in the back-end, they are database management, user authentication, push notifications, security and service.

4.0 Conclusion

4.1 Problem solution

By using our system, the quality of products can be guaranteed. It is because the condition of the packages will be captured when they arrive in every hub and it will be uploaded to our system. Our customers are able to monitor the condition of their products. In this way, the workers in the hub will be more careful when managing the packages as if customers find out the packages are damaged, they can track back on every hub by seeing the captured photos.

We have introduced a rating system to let our customers rate the courier from many aspects based on the parcel handling, delivery speed and the response rate. And then our system will calculate the rating and the rank will be displayed based on the overall rating. By this way, the customers can see the overall performance and rating of each courier and they are able to choose the best courier to deliver their parcels. The couriers have to improve their quality if the customers do not satisfy their services. The quality of couriers will get better as they have to get a better rating to attract customers to choose them to provide delivery service.

Our system uses RFID technology and GPS to track the real time location of the parcels. Our customers are able to monitor the location of their parcels using our system, ensuring the parcels are always on track. The status of the parcels always live-updated on maps until reaching the proper destination. The status can be checked if the parcels are not received on time and investigation can be made in more detail. The customers are able to disburden as they can always keep track of their parcels instead of worrying. After the parcels arrive, the RFID tag will be collected by courier for reuse.

4.2 Summary

Our customers experience better service as our system provides a well-managed and user-friendly interface to track their parcels. They are always able to track the location of the parcels. This saves many complicated steps in the past. Besides, sellers can also manage shipments more efficiently through our software. The customers will be satisfied when receiving the parcels in good condition as the parcels are always monitored in every hub.

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