King Fahd University of Petroleum and Minerals

College of Computer Science and Engineering

COE300: Principles of Computer Engineering Design

Progress Report 2

By:

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For:

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Descriptive Abstract

The objective of this report is to investigate the current requirement and specification of new kind of access lock system, and to identify various solutions and recommendations that can help build this system.

4 April 2020

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1. INTRODUCTION

Keys are one of the most important innovations in the world. they help to secure your home, office, money, and all your valuable belongings. Traditional keys have been around for so long. However, it has just improved mechanically a little bit. Because of that, traditional keys have several problems that restrict their efficiency and security.

Figure 1: Various kind of keys.

Nowadays, technology improvements during the last few decades should facilitate the transition to an innovative. Numerous technologies were invented to improve and replace traditional keys. To illustrate, mechanical lock system, password lock system, Biometric lock system and wireless based lock system can be a possible replacement of traditional keys. Although most people use traditional mechanical keys, they are probably going to shift to more advanced kind of keys if they find it more convincing and practical. In this essay, we will discuss the problems of traditional mechanical keys and show some attempts tried to solve the issues related to it.

2. LITERATURE REVIEW
2.1 An Access Control System for Intelligent Buildings[1]

The authors in this paper proposed a smartphone-based access system that is composed of an experimental system named as "Smart-Phone-Controlled-Lock" (SPCL), a light security protocol, survey methods to study the candidates' attitude.

2.1.1 SPCL System

As shown in figure 1, the SPCL architecture contains five essential parts: The cloud server, Personal Computers, smartphones, switches and smart locks.
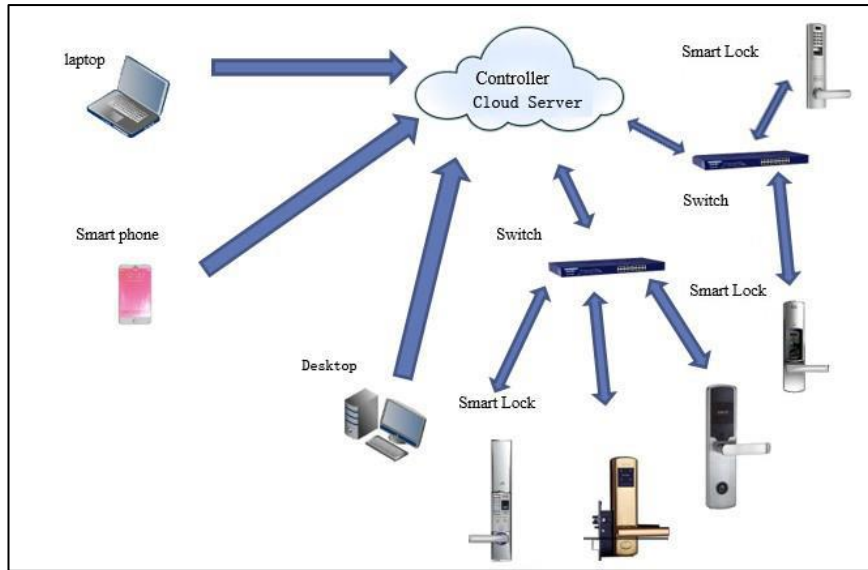
Figure2: SPCL system structure

The cloud server processes the information and communicates to both client and smart devices. Smart locks can connect to cloud server using various technologies such as Bluetooth or Wi-Fi.

2.1.2 Security Protocol Mechanism

An authentication mechanism is proposed to resist any impersonation attacks to access the system using a pre-shared key between the lock and the server. The server shall send an open request to the lock. The lock will respond with a nonce N and at the same time calculate HMAC(N). Server will receive N and calculate HMAC(N) and send it to lock. If the HMAC from the server matches HMACH from lock, the lock shall open. Otherwise the lock will remain closed. Figure 2 demonstrates this mechanism.
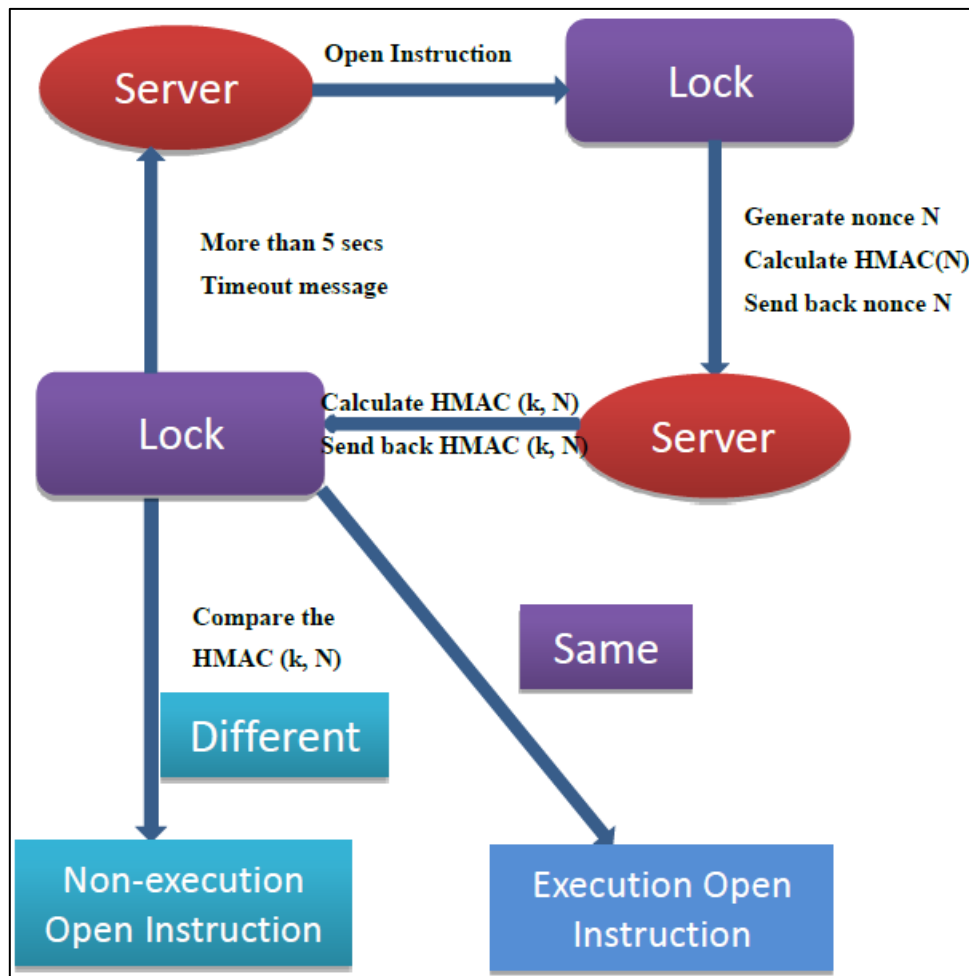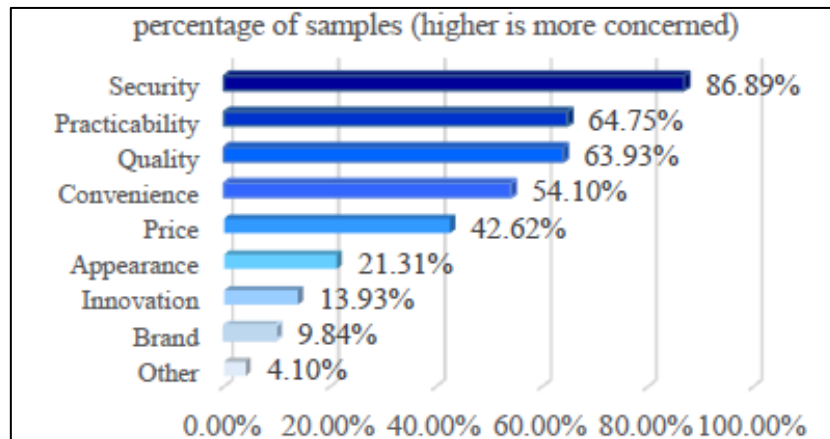

Figure3: Security Mechanism Workflow

2.1.2 Survey

The survey is aimed to specify which feature is most important to users and what unlocking method is more favorable than other methods. The hypothesis was that security and fingerprint are the answers to these questions. The results of the surveys in figure 3 indicated that Security the most significant factor as hypothesized

at first. This result shows why people still choose a traditional lock over a smart one. It is because they still believe that a smart look is not secure and can be unlocked

percentage of samples (higher is more concerned)

Security	86.89%
Practicability	64.75%
Quality	63.93%
Convenience	54.10%
Price	42.62%
Appearance	21.31%
Innovation	13.93%
Brand	9.84%
Other	4.10%

0.00% 20.00% 40.00% 60.00% 80.00% 100.00%

easily by criminals. Also, figure 4 shows that biometric unlock is the most favorable unlocking method as hypothesized.

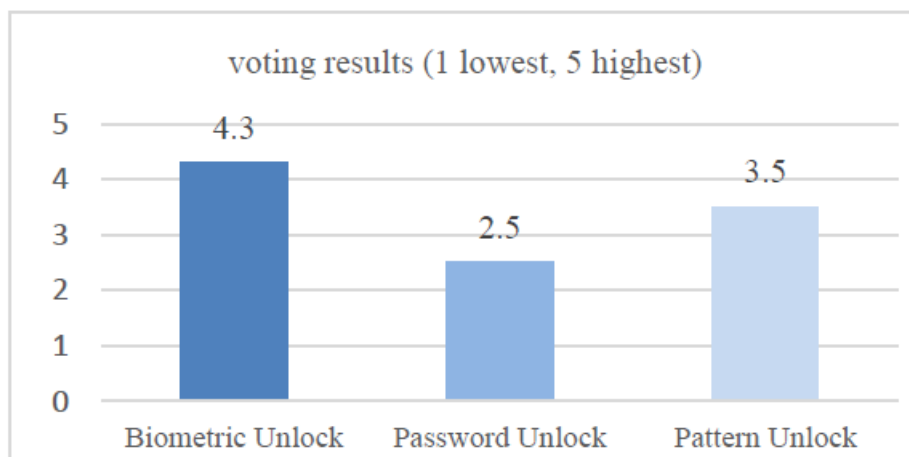Figure4: Factors affect the type of lock chosen by people.

voting results (1 lowest, 5 highest)

Biometric Unlock	4.3
Password Unlock	2.5
Pattern Unlock	3.5

Figure5: Comparison among different types of unlocking methods.

3. REQUIREMENTS

According to our problem statement we can extract the requirements for this project. These requirements will allow us to understand the customers need for more practical, convincing, and secure kind of locks.

Functional	Non-functional
Access control system (ACS) shall be faster to use than the regular traditional keys.	The ACS shall weight less than traditional lock.
ACS shall have more than one kind of access.	The ACS shall be smaller volume than traditional lock.
ACS shall emergence unlock when there is no internet or electricity.	The ACS shall be made by high quality material.
Customers shall be able to share and remove the access code easily with other users.	The ACS shall be difficult to be broken.
ACS shall record the users who accessed from the door.	ACS shall be difficult to hack or steal.
Customer shall be able to review the user who accessed from the door.	
Customer shall be able to control door access remotely.	
Lock system shall have cloud storage ability.	

3.1. Mobility and Performance

One of the main problems with traditional keys is being carrying them in your pocket. There shall be more advanced method to minimize their volume and weight as much as to be ignorable. Currently, traditional keys take a considered time and effort to unlock the required door. There shall be more sophisticated door lock system that speed up unlocking the doors. that did not make the client take something out of your pocket and search for specific access key to unlock the door.

3.2. Security

Security is one of the greatest fears in our world. Losing traditional keys is one of the most popular problem that people suffer of. When you lost the only one copy that you have for the lock you will spend a lot of time replacing your lock system. The system shall have safe and easy reachable back up copy of the lock in case you lose it.

In addition, it is easy for thieves to copy traditional keys. The lock system shall be well encrypted which make it difficult to hack or steal.

3.3. Sharing

One of the exhausting parts with traditional keys is sharing them with others. The lock system shall be well prepared to handle comfortable and safe sharing ability by making database and configure network that connect the clients. They shall be able easily to control the lock system remotely.

4. PRODUCT SPECIFICATON

Specification
ACS shall open the door in less than 5 second.
ACS shall have Wireless ability such as WIFI, NFC, or Bluetooth.
ACS shall allow manual unlocks when there is no internet and electricity.
ACS shall have application to control customer command.
ACS shall have internal storage.
ACS shall be programed inside the network.
ACS shall have server and database.
ACS device shall weight less than 200grams.
ACS device shall be smaller than 15 cm³.
ACS shall have advanced method of encryption.

4.1. Mobility and Performance

The access device for the lock system shall add to the clients less weight and volume than average traditional keys which are about 10 grams. The lock system shall unlock the door faster than traditional keys that take more than 5 seconds to take them out of your pocket and find specified key to unlock the door.

4.2. Security

The lock system shall be encrypted with sophisticated system to prevent hackers and thieves to interrupt the system by warning you. Clients shall be able to deactivate lost devices remotely to prevent the lock systems from strangers.

4.3 Sharing

The access lock system shall allow the user to invite up to 100 guest and record their access information such as the time, date, and picture of them when the access to the locked door. The lock access system shall provide great application architecture and network to handle clients request in less than 2 second only. The network shall be able to connect the clients in every were in the world from long distances with high efficiency.

5. CONCEPTUAL DESIGN

5.1. Use Case Diagramed

Figure 6 shows the use case diagram of our project. There is one actor who may interact with the system, the access control system (ACS), and the ACS consist of micro controller unit (MCU), real time clock module, NFC reader and buzzer to determined ether open or close the magnetic lock.
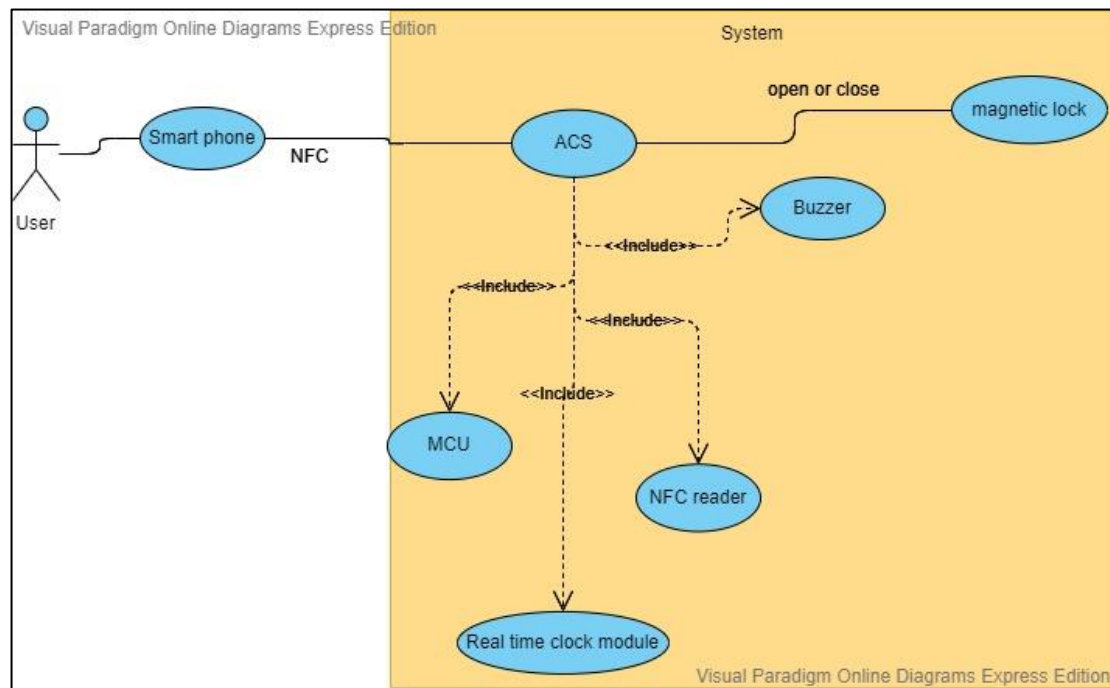

Figure6: Use case diagram

6. REFERENCES

[1] N. Xue, L. Liang, J. Zhang, and X. Huang, "An Access Control System for Intelligent Buildings," *Proceedings of the 9th EAI International Conference on Mobile Multimedia Communications*, pp. 11–17, Jun. 2016.

7. Appendices

7.1. Meeting Notes

Meeting Notes			
Meeting No.	**Day & Date**	**Start Time**	**End Time**
2	Wednesday 1/4/2020	11:55 AM	1:00 PM
Purpose	Distribute the work among group members and assigning the responsibilities to each one for progress report 2.		
Agenda	1- Discuss the requirement. 2- Create the use case diagrams. 3- Design the report file layout. 4- Discuss the specifications of the product. 5- Write the literature review.		
Attendees	1- Osama Bujweied 2- Ali Aljanbi 3- Taqi Alajmi		
Discussion	1- Osama will organize the report document. He will also work on writing the requirement and product specifications. 2- Taqi will edit the use case diagram and write the meeting note. 3- Ali will work on the Appendices; he will write the literature review.		

Action Items					
	Task Name	**Person(s)**	**Description**	**Deliverables**	**Deadline**
	requirement	Osama	Discuss the requirement.	The requirement.	4/4/2020
	report file layout	Osama	organizing the report document.	Report templet.	4/4/2020
	product specifications	Osama	Discuss the specifications of the product.	product specifications	4/4/2020
	Use case diagram	Taqi	Prepare the use case diagrams.	Use case diagrams	4/4/2020
	Appendices	Ali, Taqi	Prepare the meeting notes and the literature review.	The meeting notes and the literature review.	4/4/2020