

# **CEng 490**

## **DOOR SECURITY PROJECT**

by C4-CORP

### **SYSTEM SPECIFICATION REPORT**

1190545 Özkan Kılıç  
1248715 Kerim Şahin  
1255603 Okan Bozkurt  
1255637 M.Bilal Demirkan

<b>SYSTEM REQUIREMENTS SPECIFICATION AND ANALYSIS REPORT .....</b>	<b>1</b>
1 DEFINITION AND SCOPE OF THE SYSTEM.....	3
2 PROCESS TO BE USED FOR THIS ANALYSIS .....	5
3 NEED ANALYSIS (WITH RESPECT TO FINDINGS).....	8
3.1 QUESTIONNAIRE.....	8
3.2 INTERVIEW .....	8
3.3 SURVEY AND TESTS .....	9
4 DATA MODEL .....	10
4.1 DATA FLOW DIAGRAM .....	10
4.2 BEHAVIORAL MODEL .....	12
4.3 BEHAVIORAL MODEL .....	13
5 SELF ANALYSIS .....	14
6 RISK ANALYSIS .....	15
7 TIMELINE AND PRACTICAL PLANNING FOR THE ANALYSIS.....	16
<b>APPENDIX A: .....</b>	<b>18</b>
QUESTIONNAIRE .....	18
<b>APPENDIX B: .....</b>	<b>20</b>
FEATURES OF LINUX OPERATING SYSTEM TO BE USED .....	20
LINUX LIVECD ROUTER.....	20
<i>Features.....</i>	<i>20</i>
<i>Hardware Requirements .....</i>	<i>20</i>
<b>REFERENCES: .....</b>	<b>21</b>
WEB SITES .....	21

# System Requirements Specification and Analysis Report

C4-CORP

---

## Executive Summary

This System Specification Report is written for the project that is the production of a card based wireless door security system. First the definition and goal of the system are specified. Then, the analysis model and the reasons why we chose that model are explained. Further in the report, the findings we obtained during the analysis process are clarified with respect to users, hardware and software. Data model of the project is given together with data description, data flow figures and behavior model in a detailed way. Moreover, self-analysis of the project members and risk analysis are conducted in order to lessen the probability of project failure and to guarantee that the project will be carried out successfully. Eventually, the timetable and schedule of the project is given.

## 1 Definition and scope of the system

---

Software and hardware for establishment of a card based wireless door control system. A standalone door control system consists of one or two card readers, an electronic lock and a controller. Based on the predefined card ids, lock is released when a granted card is read. When multiple doors in a site exist (i.e. our departments laboratories), door controllers are connected to a master computer and all access information is downloaded from and all events taking place in doors are reported to the master computer. Project involves establishing a wireless secure network connection between the designed controllers and the master computer. Also the master computer software with access control of the doors, card management, access group management, event and status reporting of the doors, and lock control will be designed and implemented.

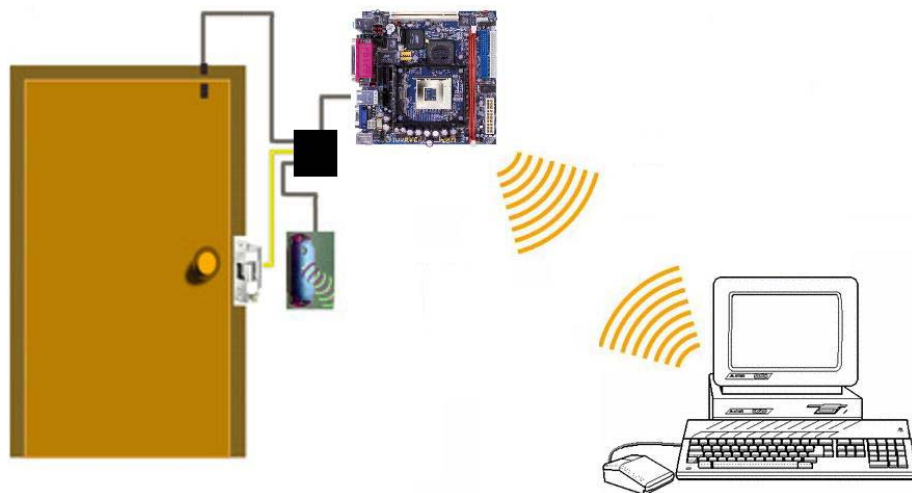
This project is the production of a card based wireless door security system. The hardware mechanism of the system will be composed of card readers, electronic locks, controllers, sensors and computers. Locks will be released when a granted card whose id is

predefined in the master computer is read by a card reader. In case of multiple doors, accesses to the rooms will be determined by a master computer and all the information will be reported to the master computer by controllers. The communication between main computer and controllers will be based on wireless communication according to some protocols to improve security. Indeed, there will be software running on the master computer for card management, group management, control of the doors, locks, and reporting events and logs.

#### Hardware Specifications:

- VIA ITX Main board with 2xUSB + 1xSerial + 1xPCI + 1xParallel port
- 128MB-memory
- 128MB-Disk space
- WiFi Ethernet

The system we are going to develop is similar to this figure:



According to the surveys we carried out, there are some problems with the existing system. Our aim for the project is to develop a more competent and powerful system that will minimize troubles and meet users' needs, which will be explained in the following sections.

## 2 Process to be used for this analysis

---

In order to “design” and consequently “develop” a project, a “systematic” analysis covering the important aspects of the desired system is going to be made to gain its overall view and state the critical aspects, this point in mind, we give special importance to the analysis phase in general since this is primarily serving as a basis for the design phase of our project. In our general analysis process, we will make use of the Spiral Model and we will cover the following analyses:

- Need Analysis (with respect to findings)
- Data Model Analysis
- Self Analysis
- Risk Analysis

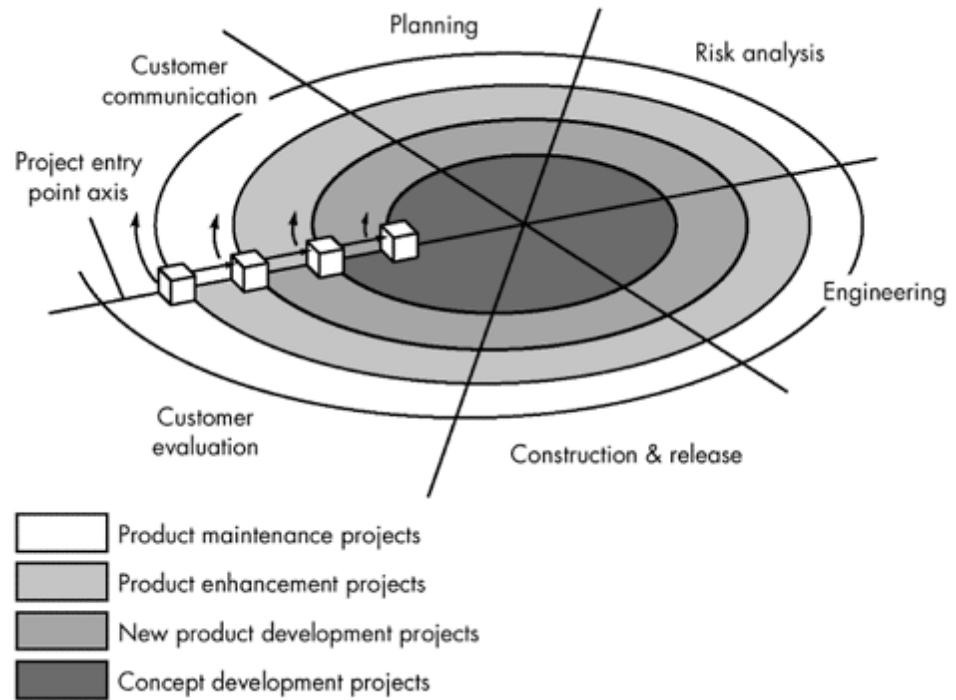
In order to determine users’ needs and deficiency of existing system we conducted an online questionnaire for the students of the department of computer engineering (*see Appendix A*). The questionnaire aims to find out what user knows, what they complain about and what they need for more about the existing system. Knowing users need is very important because even though you create a perfect system, it is definitely not used if not needed. We plan to develop the system with respect to users’ responses.

We interviewed with İsmail Öztürk about the current system. He was so helpful to us and explained the current system carefully in a detailed way. Thankfully to the meeting, we had chance to observe both what we should do and what the absent parts of the existing system are.

We performed online survey to determine the possible hardware and software that we plan to use for the project. The Internet is full of information about variety of hardware and software. The important point is to find out reliable and applicable information. Consequently, we compared findings from each site we visited to ensure reliability (*See References*). Then, we sometimes tested our findings. For example, we tested a Linux version and Windows CE, which require little memory space, as we need for the project. We observed their compatibility with the hardware.

We will use the Spiral Model which integrates the best features of the Classic Life Cycle and Prototyping, while at the same time adding a new element: Risk Analysis.

We chose this model because the idea behind it that basically, it is evolutionary development; it is intended to help manage risks. In this model, one does not have to define the entire system in detail at first. He only defines the features with the highest priority, as we did in the Project Scope. In the Spiral Model, the developers define and implement those features, then get feedback from customer/user. This feedback distinguishes evolutionary and incremental development. With this knowledge, we will go back to define, develop (prototype), implement more features in smaller portions.



Since our door security project is combination of hardware and software parts that grow up gradually, we chose this model that enables us to construct a prototype and to improve it to a complete system that meets the system specification requirements. By using this model, we can produce the system step-by-step manner; first a prototype that works with a single door and minimum system requirements like hardware, software and memory. Then, the system will evolve with respect to the users' feedback; increasing the capacities and abilities of the system as specified in the system specification requirements. Although this model seems time consuming, it is very useful to cope with system failure and other risks beforehand. Since it requires more user interaction during the design and development phases, the users' satisfaction from the project will probably be maximized.

## 3 Need analysis (with respect to findings)

---

### 3.1 Questionnaire

The questionnaire has shown us that the users see the existing system just an automatic door opening system. They think that it is not safe enough. Moreover, they complain about thieves, foreign users and malfunctioning doors. Most of the users know that the current system is wired to a server. For a wireless system, they think that it will be more secure but more expensive.

Ultimately, we concluded that the user should realize that the wireless system will be worth for expenses and it will work more efficiently. They want system to have logs for entrance by force, record for every entrance, precautions for system failure, screen for displaying available computers and existing users in the laboratory and such. These needs we get from questionnaire will lead us during design and development of the project.

### 3.2 Interview

By means of the interview with Mr. Öztürk, we saw some parts we had not known, such as, camera recording system and the software part of the current system. We brainstormed about what we could add some compatible parts to the project after the Mr. Öztürk's meeting. For example, we thought how we could develop software management part of the project better. Our software for the system management will have an improved web graphical user interface. The software will keep detailed logs with user hierarchy and it will manage urgent cases. For example, the monitoring software will unlock the doors in case of energy failure. It will set the permission attributes of users and may block some punished users for a period of time.



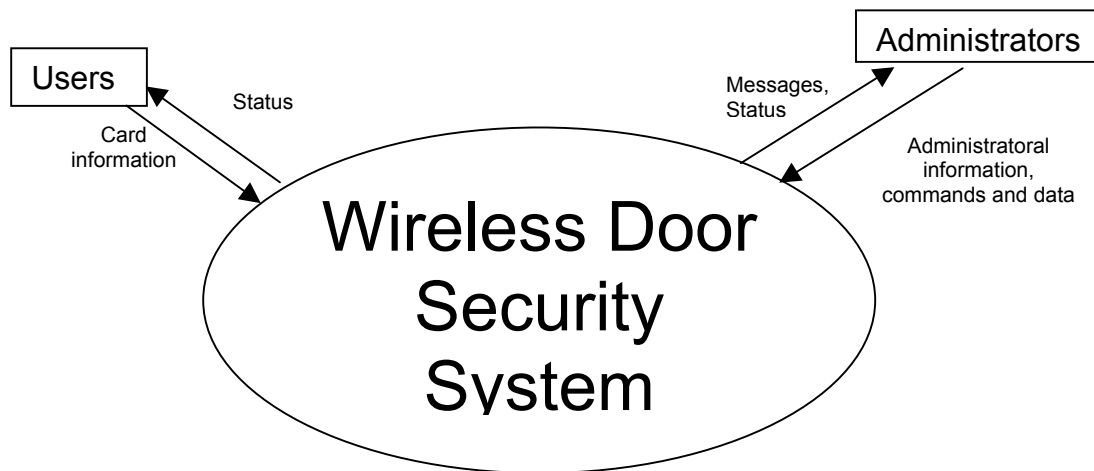
### **3.3 Survey and Tests**

We performed surveys through the Internet. We combined our findings from the sites (*see References*) to refine them. We collected information about Wiegand protocol, proximity card readers and such. We did not include this raw information here; it is given in References section instead. However, they are insufficient. We need to interview with experts from commercial companies and such about how to design and develop such a system. We have not been able to arrange any interview yet. We sent e-mails and are still waiting for responses.

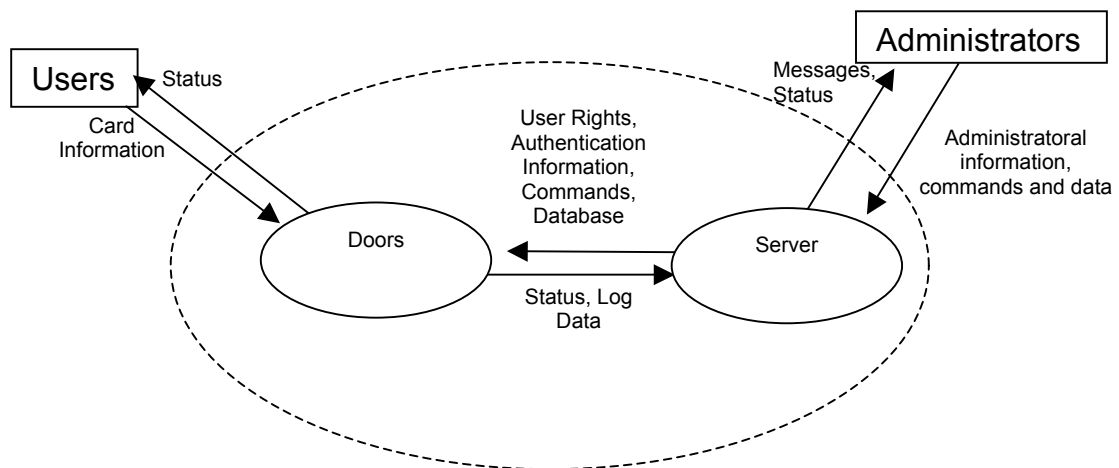
We tested our wireless card and possible operating systems. Windows CE is unable meet our need because of driver problems. Fortunately, we have found some Linux versions that support the hardware requirements of the system (*see Appendix B*).

## 4 Data Model

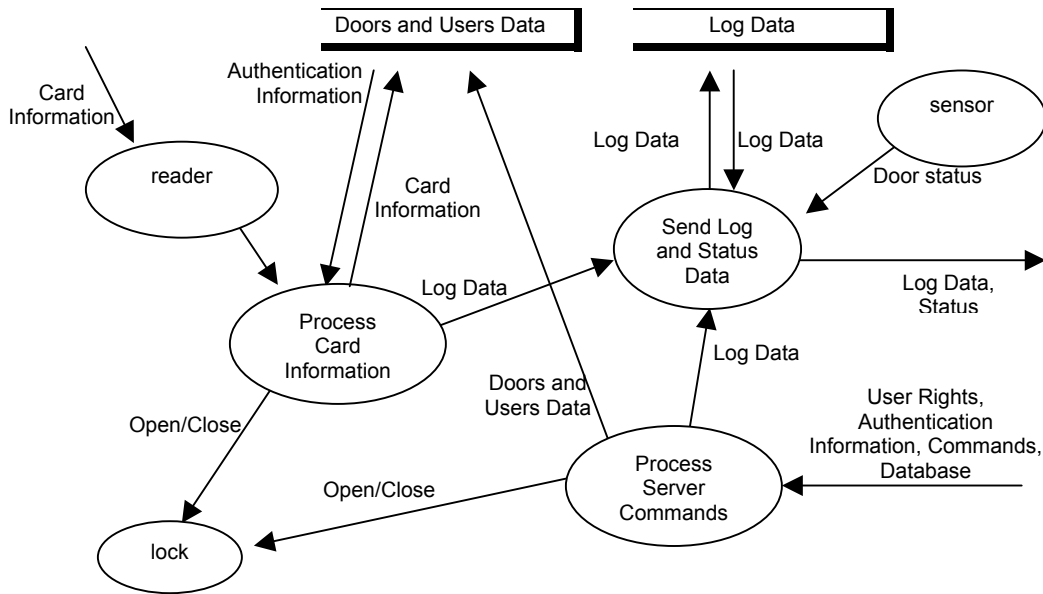
### 4.1 Data Flow Diagram



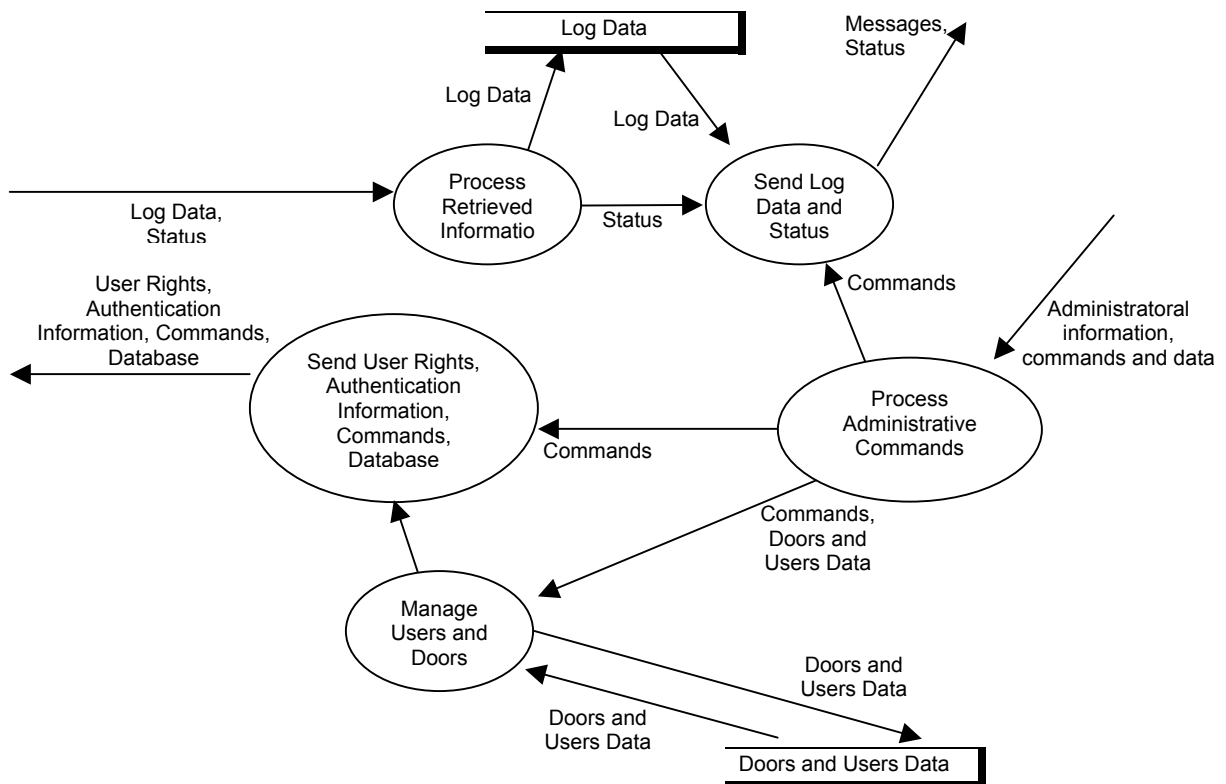
Level 0 DFD for Wireless Door Security System– Context Diagram



Level 1 DFD for Wireless Door Security System – Overview Diagram

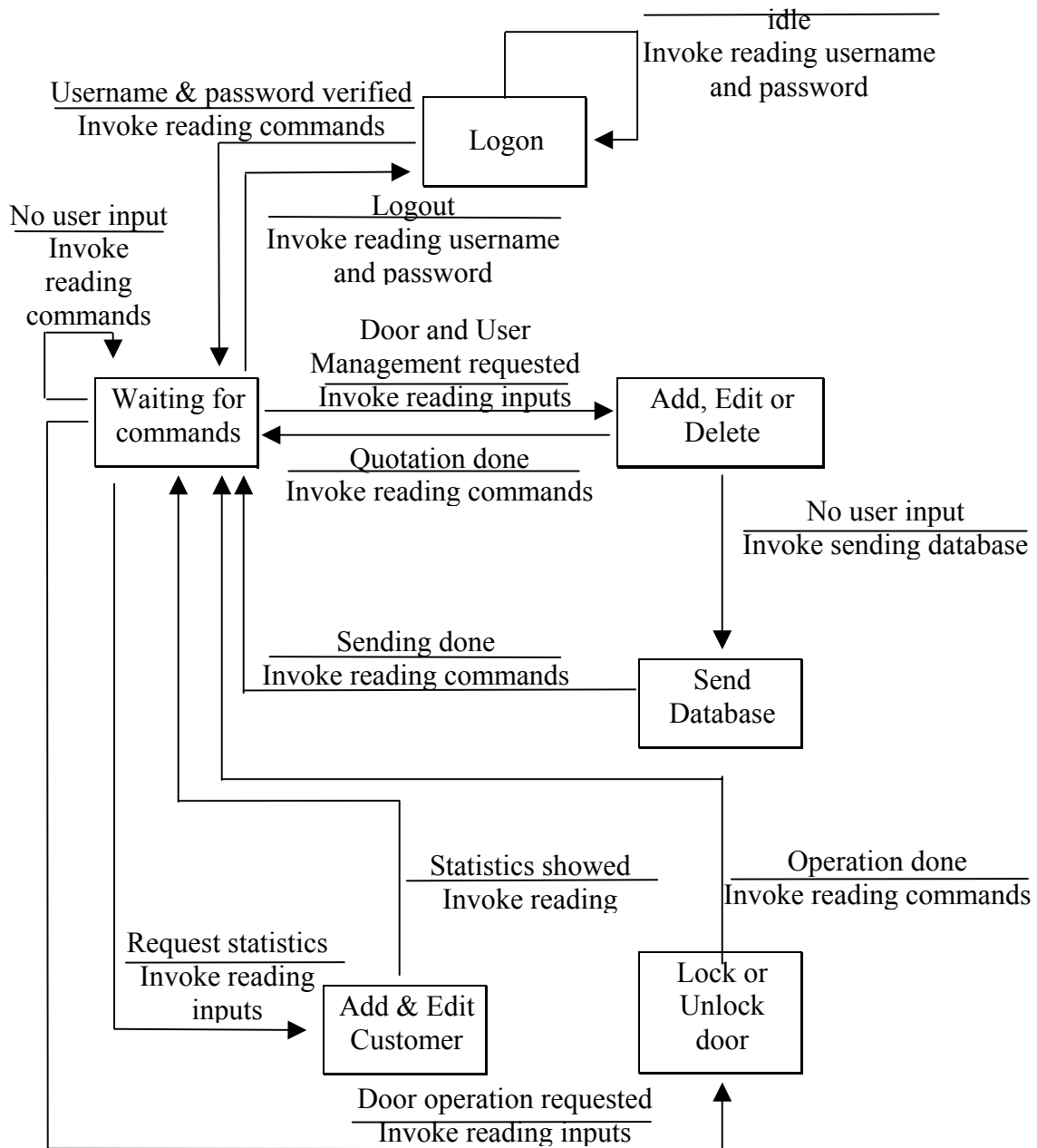


Level 2 DFD for "Doors"



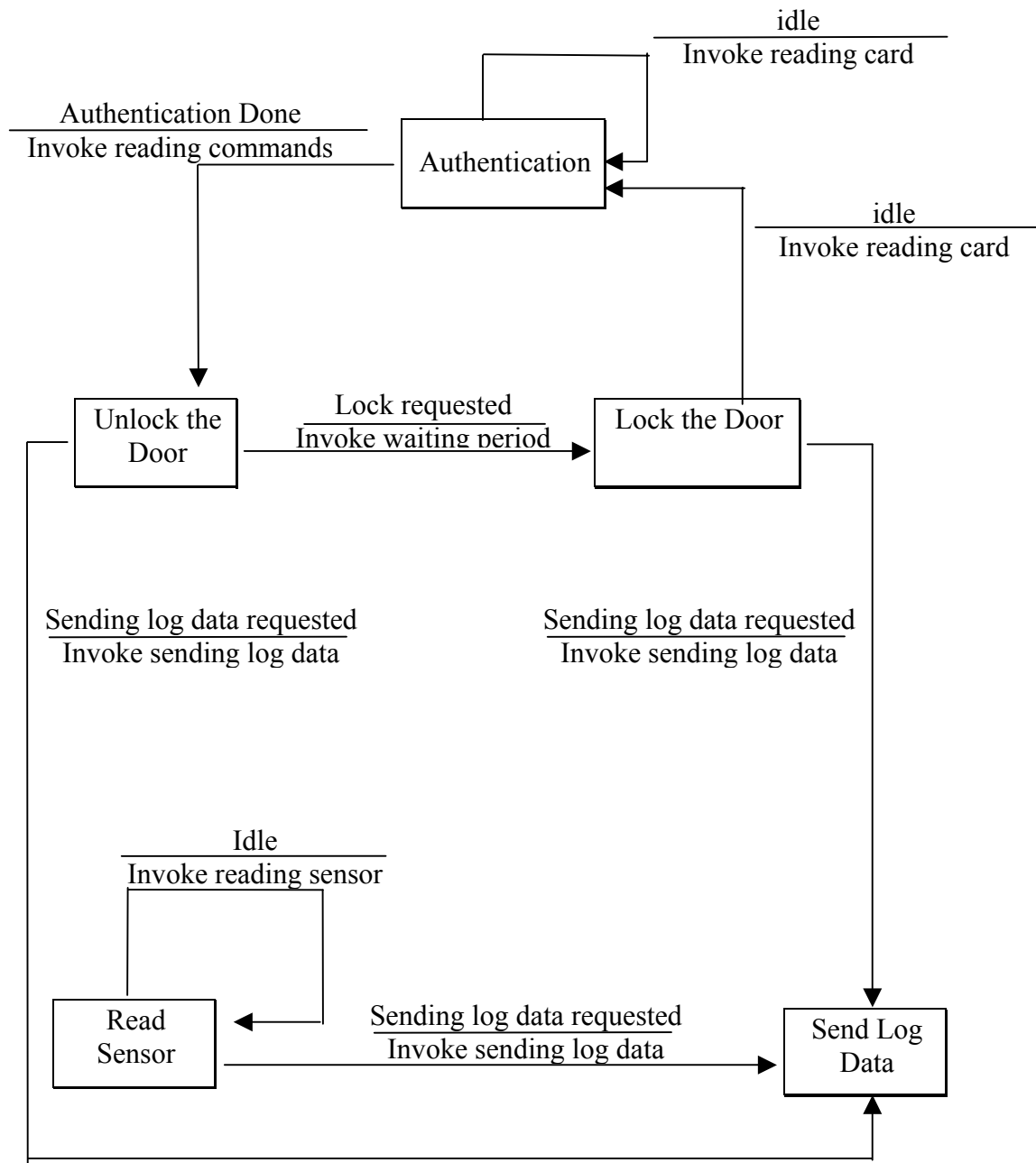
Level 2 DFD for "Server"

## 4.2 Behavioral Model



State Transition Diagram For "Server"

### 4.3 Behavioral Model



State Transition Diagram For "Doors"

## 5 Self analysis

---

Knowing the self is very important because if you know yourself, you are more powerful. If a member knows his power and takes place in the related part, then he will be more productive. On the other hand, if he knows his deficiencies, then he will cope with it more easily.

This project is a combination of hardware and software. However, we have very limited or no information about hardware specification for wireless systems. Therefore, we all needed to make literature survey on it. This is our main weakness in common.

Okan BOZKURT: This member is hardworking, careful, and diligent but perfectionist. However, he usually complains about the completeness of the stages because of perfectionism. He is interested in hardware tools.

M. Bilal DEMİRKAN: He is hardworking, motivating, and funny member. He is good at web tools and design as well. However, his home is far away from the members' and has difficulties to attend urgent group meetings.

Özkan KILIÇ: Another hardworking and busy member is Özkan. He is motivating, creative, researcher, and good at organizing the tasks and schedule. However, he is a graduate program student beside to Computer Engineering and working.

Kerim ŞAHİN: He is logical, researcher and hardworking member. He is good at developing algorithms. However, he has no internet connection at his home which prevents him to join all the online meetings.

## 6 Risk analysis

---

Indeed there will be unexpected interferences during the project. In order to not fail the project, risk analysis and management are very essential. Spiral Model helps us to consider and handle the risks before the project grows up step-by-step. We can figure out the followings as the main risks:

- **Inexperienced Staff:** Since we are not experienced enough in developing such hardware and software combination systems, there could be unexpected delays during the project. Hence, the schedule may not be followed. In order to overcome such a risk, we will first divide the task into small chunks, and then provide ourselves with extensive, flexible and also reasonable time intervals. Further, each member will be ready to help others if one seems to fail his/her sub-task.
- **System Failure:** We can face with a system failure during the preparation of the system. In order to prevent this problem, we will often back up our work and be ready for urgent hardware replacements.
- **Product Failure:** After all work, the user may not like and use the product. In order to overcome this risk, we will have regular meetings and overviews with target users in order to assure the usability of the product. Further, by keeping stick to our Spiral Model to guarantee that we are doing what we meant to do can be other risk resolution method.

## 7 Timeline and practical planning for the analysis

---

Having a timeline and schedule is very vital because the overall task gets complicated more and more by the time. Thus, outline and being stick to outline will aid us to have less risky and more productive project.

### Responsibilities in Analysis:

- Bilal and Okan were responsible for online questionnaire production.
- Kerim and Özkan were responsible for question preparation.
- All the members joined to interview with Mr. Öztürk.
- All the members carried out literature survey independently and combined them together.
- Okan carried out operating system test.
- Analysis Report is written together.

### Further Timeline:

- Until 20 November, the interviews with the experts will be done.
- Until 26 November, system modules, data flow, database design, data dictionaries, E-R and/or UML diagrams, state diagrams, syntax specifications will be finalized.
- December 5 Initial Design Report will be written.



- Hardware-software testing and simple implementations start after initial design report.
- Re-implementation with respect to Spiral Model. Revisions.
- Jan 10 Detailed Design Report will be written.
- Implementation phase accelerates after Jan 10. Revision of prior implementations and tests to prepare prototype.
- Jan 19 Prototype Demonstration.

# Appendix A:

## Questionnaire

---

1) Bölümümüzdeki mevcut kapı güvenlik sistemi hakkında neler biliyorsunuz?

- a) Kapılardaki kart okuyucular birbirinden bağımsız, sadece kapının kilidini açıyor
- b) Bütün laboratuvar kapıları bir kartla açılabilir
- c) Kapıyı kartla açıp girenlerin kayıtları tutuluyor, bütün laboratuvar kapıları bir kartla açılabilir, herkesin laboratuvarlara girme yetkisi aynı.
- d) Kapıyı kartla açıp girenlerin kayıtları tutuluyor, bütün laboratuvar kapıları bir kartla açılabilir, farklı yetki grupları var(grupların laboratuvarlara girme yetkileri birbirinden farklı)
- e) d şikkındakiler ve ayrıca tüm kapılar bir merkezden kontrol edilebiliyor yani açılıp kapanabilir.

2) Sizce yeterince güvenli mi?

- a) Kesinlikle güvenli
- b) Güvenli
- c) Ne güvenli, ne güvensiz
- d) Güvenli değil
- e) Kesinlikle güvenli değil

3) Laboratuvarların güvenliği ile ilgili en sık karşılaştığınız sorun nedir?

- a) Hırsızlık
- b) Açık bıraktığım hesabımı yabancılar kullandı
- c) Kartlar çalışmıyor, kapılar açılmıyor
- d) Kapılar kapanmıyor, açık kalıyor
- e) Hiç bir sorun yaşamadım

4) Mevcut kapı güvenlik sisteminin kablo tesisatı ile ana makineye bağlı olduğunu biliyor musunuz?

- a) Evet, biliyorum
- b) Hayır, bilmiyorum

5) Kablosuz bir sistemin güvenlik sistemi açısından getirisi ne olur?

- a) hiçbir şey
- b) masraf
- c) daha güvenli
- d) yönetimi kolay
- e) c ve d

6) Güvenliği arttırmak açısından sistemde tutulmasını gerekli gördüğünüz kayıtlar nelerdir?

Örneğin: Giren kişinin giriş saati, çıkış saati, kapıların zorla açılma bilgisi vs.

# Appendix B:

## Features of Linux Operating System to be used

---

### Linux LiveCD Router

The Linux Live-CD Router allows you to share and firewall your broadband connection and use WIFI. You can use DSL, ADSL, Cable Modem, T1, Fixed IPs, Dial-Up, WIFI, build you own Access Point and more

#### Features

- Share and Firewall your broadband or dedicated Internet connection
- Includes Firewall Shorewall and Masquerading (NAT)
- Does not require any installation. It is a LiveCD, your computer simply boots straight from the CD. Does not require a hard disk
- Supports DSL, Cablemodem, Fixed IP and Dial-Up
- Use standard and low cost computer, networking and wifi hardware (also USB)
- Can use multiple ethernet and wifi 802.11a/b/g cards. Supports PCI, USB and PCMCIA cards (can replace external Access Points!)
- Traffic Control, QoS
- DHCP Client and Server
- Remote SSH administration
- Includes DNS Cache to accelerate surfing
- Includes SNMP Monitoring, MRTG graphical statistics
- Linux Software compatible with Windows and Mac Networks

### Hardware Requirements

One dedicated computer with the following minimum specifications: 486 Processor, 16 MBytes of RAM, 2X CDROM Reader, Floppy Drive, 1 or 2 ethernet cards. NO hard disk! Optionally a WIFI card

# References:

## Web Sites

---

- <http://www.cypresscom.com/tech/Converters/cvt2xxx.htm>
- <http://www.diodata.com/Cypress/TechSupport/CVT-2000-W.htm>
- <http://www.wifi.com.ar/english/cdrouter.html>
- <http://msdn.microsoft.com/embedded/usewinemb/ce/default.aspx>
- [www.ibtechnology.co.uk/Wiegand2.pdf](http://www.ibtechnology.co.uk/Wiegand2.pdf)
- [www.impro.co.za/catalogue/wiegand%2026%20reader.pdf](http://www.impro.co.za/catalogue/wiegand%2026%20reader.pdf)