SRS for SafeHome System

Version 1.0

Prepared by

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CS550 Introduction to Software Engineering

KAIST

Table of Contents

Revision History

Name	Date	Reason For Changes	Version
Phase I, Draft 1	2/27/2009	Initial template, intro section completed	0.0
Phase I, Draft 2	3/5/2009	New sections added	0.5
Phase I, Draft 3	3/10/2009	Additional contents completed	1.0

1. Introduction

1.1 Purpose

SafeHome version 1.0 is a home automation system with security and surveillance functions; it is controlled by a very tiny hardware box with wireless Internet connectivity such that the entire system can be controlled by a user through the Internet. As SafeHome evolves in the software product line, it is expected to provide a variety of additional home-related services such as control over telephone answering machines, air conditioning, heating, lights, and home entertainment devices.

1.2 Intended Audience and Reading Suggestions

This document is mainly written for the developers, project manager, and testers of the SafeHome system since it focuses on the required functionality, analysis, and design of the system. It is suggested that the SRS structure overview section is read first before proceeding through the sections that are most pertinent to each reader type. Any information needed for marketing staff will be communicated by the development team. A user manual will eventually be provided along with the product for end users to familiarize themselves with the functionality of the SafeHome system.

1.3 Project Scope

The first generation of the SafeHome software product line will focus primarily on home security and surveillance functions, which is a market that end users will readily understand. As users make use and feel comfortable with the SafeHome product, they can expect new features to be added in future versions to make their home a more comfortable place to live by the use of other automated home-related services.

1.4 References

IEEE Recommended Practice for Software Requirements Specifications (IEEE Std 830-1998)

“Software Engineering: A Practitioner’s Approach (SEPA)” by R. S. Pressman, McGraw-Hill, 6th Edition.

1.5 SRS Structure Overview

Prior to the introduction, the table of contents is listed which shows how the SRS is organized. A revision history of the SRS is included. The introduction mentions SafeHome’s purpose, the SRS’s intended audience, the project scope, and useful references in developing the SRS. The overall description section talks about more details such as the product perspective, product features, user classes, the components of the system, constraints,

business requirements, and assumptions. The third section categorizes system features. Each system feature section consists of use cases followed by specific sub-features and their functional requirements. The fourth section groups together all the non-functional requirements in their respective categories. The remaining numbered sections talk about criteria for validation and training issues. The appendix area includes different sections for prototypes, models, the glossary, an index, and traceability information.

2. OVERALL DESCRIPTION

2.1 Product Perspective

SafeHome version 1.0 is a brand new home automation system conceptualized by managers at CPI Corporation after the creation of a generic universal wireless box that can be hooked up to all kinds of devices. The product to be built from this requirements specification will be the first of a product family, starting out with features only related to home security and surveillance. As can be seen in Figure 2.1.1, the SafeHome system will consist of external devices connected to the wireless box such as alarm sounders, sensors, cameras, and a control panel. The system is controllable via the Internet, it is monitored by a company, and it has support from SafeHome corporate servers.

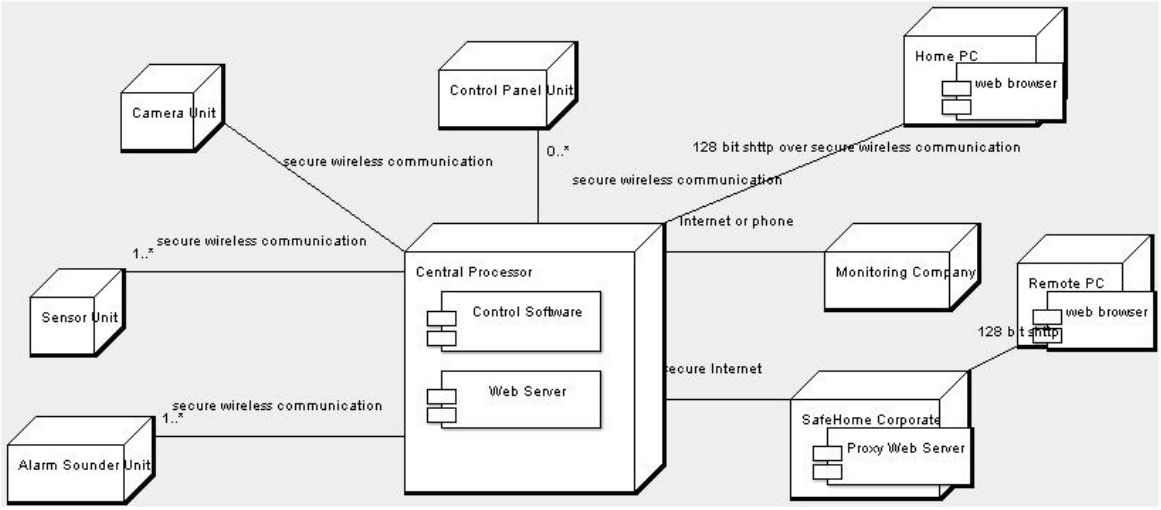

Figure 2.1.1 – SafeHome Deployment Diagram

2.2 Product Features

The first generation of the SafeHome software product line will focus primarily on home security and surveillance features. Home security features include having window, door, and other motions sensors to detect any unauthorized access; monitoring for fire, smoke, and CO levels; monitoring for water levels in the basement; and changing all these security settings via the Internet. Home surveillance features include connecting to a network of cameras placed inside and outside the home, panning and zooming of particular cameras, defining camera monitoring zones, displaying the views of cameras through the Internet, and recording video digitally and replaying it. All other future functions will be added further down the software product line.

2.3 User / Stakeholder Classes and Characteristics

a. **Home Owner**: The target end user who counts on the SafeHome product to provide surveillance and security to his or her home. Many end users are expected to not have installed a SafeHome-like system before if one exists.

b. **Monitoring Personnel:** The people in charge of monitoring all SafeHome systems in case of security breaches or problems, in which case they are responsible for notifying the home owner, the police, fire fighters, etc.

c. **Executive Vice President of Business Development:** This person has the final say on product features and whether or not SafeHome will continue its product line and receive continued funding.

2.4 Operating Environment and Hardware Descriptions

The SafeHome system is simply a network of wireless connections from the wireless box to off the shelf hardware devices (e.g. sensors), all of which are controlled through a physical wall-mounted control panel or virtually through the Internet regardless of OS provided that there is a secure login mechanism. All devices in the system must communicate via wireless protocols such as 802.11b and should be designed for application within existing homes. The system communicates with the SafeHome corporate servers for a home owner's remote access to the SafeHome control mechanism, and also with the monitoring company servers. The hardware shown in Figure 2.1.1 is explained in the following subsections in detail.

2.4.1 Central Processor

The wireless box mentioned before will from now on be referred to as the central processor, which is attached to a home owner's PC. It serves as a wireless Internet base station for communicating with various devices in the SafeHome network, and it uses the PC's Internet connection to communicate also with the SafeHome corporate site and monitoring company. Thus, the home owner's PC needs to be always on and running with continued power supply so that SafeHome's operations can run as expected. It is recommended that a dedicated computer be set up in place of a normally run PC used by people for other reasons.

2.4.2 Sensors and Actuators

Various on the market sensors (e.g. motion sensors, fire detectors, smoke detectors, carbon monoxide detectors, basement water detectors, window / door sensors) and actuators (e.g. alarms, cameras) can communicate directly with the central processor when configured to do so with the SafeHome software system. The range of configurable devices can be expanded in the future.

2.4.3 Control Panels

These hardware devices, each having a keypad and display, provide a simple user interface to enable or disable basic functions to the SafeHome system. Usually, there is one installed per home, but more are possible. To solve the conflict of issuing multiple commands at the same time from multiple control panels, atomicity of a single command is guaranteed. Any first input on any control panel is the beginning of a single command. Until finishing arming/disarming the security system, or resetting password is done, any input from other control panels is all ignored. However, the panic command coming from any control panel is the exception, which in this case, any input that is interrupted gets cancelled and not saved such as when entering a new password. In addition, all commands sent from the control panel have priority over commands sent from the Web service.

2.4.4 Internet Browser

To take advantage of the full functionality of SafeHome which is not available via any control panel, the home owner must connect to the central processor using an Internet browser and logging into his or her SafeHome account. This can be done on the local computer where the central processor is located. However, to keep consistency of the data and to avoid unintended consequences, multiple Web access user sessions to the same SafeHome control software are not allowed. If one logs into the Web service, a new user session begins, replacing the old one. Moreover, there is a session timeout if there is no action triggered by the logged in user after five minutes.

2.4.5 SafeHome Corporate Website

Should a home owner need remote access to his or her home system, he or she can do so via this secure site. Direct external connections to the central processor are forbidden for security reasons.

2.5 Design and Implementation Constraints

All communication between devices and the central processor must be via the wireless 802.11b protocol and encrypted. Because home owners can control the settings of the central processor remotely, special care in security should be implemented so as to prevent outsiders from hacking into the SafeHome system, possibly disarming it and robbing the home. Not doing so can place a heavy liability burden on the company and could weaken our product’s reputation in safety and surveillance areas.

2.6 Business Requirements

2.6.1 Business Opportunity

Sales have been flat at CPI Corporation, so it is expected that the introduction of the SafeHome product into the niche market will help boost sales figures.

2.6.2 Business Objectives and Success Criteria

a. A sizeable 50% return in investment in SafeHome version 1.0 product after one year in the market, with positive user satisfaction feedback and online reviews, so as to continue with the software product line for the foreseeable future.

b. SafeHome's security and surveillance features are effective in preventing real life burglary attempts and detecting safety issues such as flooding. All features of the system are proven to work and be effective as intended.

2.6.3 Customer or Market Needs

a. In many cases, only locks are used to prevent burglar entry, and there are only smoke detectors in case of fires. Thus, most home owners in the USA are not equipped with an adequate home security or surveillance system.

b. The home security and surveillance market is still a niche market; with the possibility of added home automation features in the future, SafeHome can become even more valuable to the home owner.

2.6.4 Business Risks

a. Possibility of competitors from ubiquitous research companies that focus on improving home lifestyles

b. Venture capitalists may not consider the initial version of SafeHome as unique to the market, so they may request that more features be added to make our product more unique.

c. Home owners in the USA usually feel safe in their homes and may be satisfied with just a door lock and smoke detector.

2.7 User Documentation

Each SafeHome product will be packaged with a user manual for the home owner. Also, on our company website, information about the SafeHome product and its versions can be viewed, such as short video clip tutorials and a list of off the shelf devices that have been verified to work with SafeHome. Also, for the sake of future development of the SafeHome product line and its maintenance, heavy documentation emphasis will be placed on the system architecture and functionality.

2.8 Assumptions and Dependencies

The SafeHome central processor software version can be updated via the Internet in case of important security patches, new compatible devices, or for adding more functionality. The SafeHome central processor can assume only wireless encrypted communication, and that it is operated using the power supply directly from the house so that it always remains operational.

3. SYSTEM FEATURES

3.1 Home Security

Description

The SafeHome system is expected to keep the home safe by monitoring a wide variety of sensors and detectors. It shall automatically alert the monitoring personnel when needed, as well as the home occupants.

Use Cases

Use Case ID	UC-1	Use Case Name	Monitor Windows and Doors
Diagram Ref ID	D-1	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/6/2009	Date Last Updated	3/6/2009
Goal	To notify the monitoring personnel about a possible intrusion into the home.		
Actors	**Primary:** Possible Intruder **Secondary:** Home Owner, Monitoring Personnel		
Assumptions	1. The home owner has enabled the monitor windows and doors options. 2. The home owner enables this during night time or when away with family.		
Constraints	1. The enablement can only be done if all windows and doors are closed.		
Pre-conditions	1. The monitor windows and doors options are not set.		
Primary Scenario	1. The home owner decides to take his entire family out for a considerable amount of time, so he or she closes all the windows and doors. 2. The home owner, outside with his family, enables the monitoring of windows and doors remotely using a remote control. 3. A door or window opens by a possible intruder as detected by the magnetic switch while the options are enabled, thus alerting SafeHome to send a notification to the monitoring personnel so that they can phone the police. An alarm bell goes off in the home, perhaps scarying the possible intruder. 4. The possible intruder runs away.		
Exceptions	1a. Or the family goes to bed for the night, expecting no visitors. 2a. The home owner enables the monitoring of windows and doors using the control panel inside the house then goes to bed. 2b. The monitoring option for windows or doors fails to enable because a window or door is not shut, so the home owner checks and shuts the appropriate opening(s) and is finally able to enable the monitoring options. 4a. The possible intruder is not an intruder, so he/ she disables the alarm by typing the correct pin and cancels the notification already made to monitoring personnel		

Post-conditions	1. Personnel are alerted of intrusion (and informed it was a false alarm if the correct pin is entered to disable the alarm, otherwise, the police are phoned). 2. If the alarm doesn't stop after five minutes, the monitoring personnel disable it.
Frequency of Use	Every night, Whenever out for considerable amount of time (e.g. shopping)
Business Rules	
Special Requirements	
Notes and Issues	None

Use Case ID	UC-2	Use Case Name	Monitor Outside Movement
Diagram Ref ID	D-2	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/8/2009	Date Last Updated	3/8/2009

Goal	1. To warn the home owner that someone might be approaching the house. 2. To notify the monitoring personnel of a potential intruder if this motion is detected in areas around the house other than the path to the front door or garage if there is one, where friends, family, or strangers normally go to interact with the home owner.
Actors	**Primary:** Unidentified Moving Object, Wireless Outside Motion Detector **Secondary:** Monitoring Personnel, Home Owner
Assumptions	1. If enabled, the wireless motion sensors along the path to the front door (and possibly garage door) are not configured to notify the monitoring personnel, but all other outside motion sensors are since these most likely involve suspicious activity. 2. If enabled, all wireless motion sensors outside the house are configured to warn the home owner of a visitor by having the control panel make a distinct sound that is audible throughout the home. 3. This use case makes sense if the home has at least a front, back, or side yard.
Constraints	
Pre-conditions	1. First two assumptions are enabled.
Primary Scenario	1. An unidentified moving object approaches the home by not following the path to the front door (or garage door if there is one). 2. The outdoor sensors detect the object, and decide that it is not an animal. 3. The home owner is notified immediately by voice through the speakers of the control panel and PC with the attached central processor that someone is approaching the house the unconventional way (not to the front door or garage). 4. The monitoring personnel are notified of this status just for observation sake. If use case 1 occurs however, then they definitely alert the police if the alarm is not disabled.
Exceptions	1a. An unidentified moving object approaches the home by going to the front door or garage door. 2a. The sensors decide that the object cannot be human (use case ends here).

	3a. The home owner is notified immediately by voice through the speakers of the control panel and PC with the attached central processor that someone is approaching the house to the front door or garage. 4a. If 1a and 3a, then the monitoring personnel are not notified.
Post-conditions	1. Home owner is always aware if someone is approaching the house (but not animals) conventionally or not. 2. Monitoring personnel are only aware if someone is approaching the house if following an unconventional route.
Frequency of Use	All the time
Business Rules	
Special Requirements	
Notes and Issues	None

Use Case ID	UC-3	Use Case Name	Monitor for Fire and Smoke
Diagram Ref ID	D-3	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/8/2009	Date Last Updated	3/8/2009
Goal	1. To warn the home owner that there is fire and smoke in the house. 2. To notify the monitoring personnel of fire and smoke so that they can contact the fire department.		
Actors	**Primary:** Fire's Smoke, Smoke Detector **Secondary:** Monitoring Personnel, Home Owner, Fire Fighters		
Assumptions	1. Monitoring for fire and smoke is enabled at all times; it cannot be disabled. 2. The smoke detector senses the smoke and is responsible for the very loud electronic horn to wake people up; where there is smoke, there is a fire.		
Constraints			
Pre-conditions	1. A fire has started in the home, regardless where the home owner may be.		
Primary Scenario	1. The fire produces smoke and sets off the smoke alarm with a loud electronic horn. 2. SafeHome detects the smoke alarm distress and notifies the monitoring personnel, who in turn call the fire department. The home owner is also contacted.		
Exceptions	2a. SafeHome falls victim to the fire already before the monitoring personnel can be notified about the fire.		
Post-conditions	Fire fighters have a better chance of fighting the fire when arriving earlier.		
Frequency of Use	All the time		
Business Rules			
Special Requirements			
Notes and Issues	None		

Use Case ID	UC-4	Use Case Name	Monitor for Carbon Monoxide
Diagram Ref ID	D-4	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/8/2009	Date Last Updated	3/8/2009
Goal	1. To warn the home owner that there is carbon monoxide in the home and should get out immediately. 2. To notify the monitoring personnel of carbon monoxide so that they can contact the fire department.		
Actors	**Primary:** Carbon Monoxide, CO Detector **Secondary:** Monitoring Personnel, Home Owner, Fire Fighters		
Assumptions	1. Monitoring for carbon monoxide is enabled at all times; it cannot be disabled. 2. The CO detector senses the CO and is responsible for the very loud electronic horn to wake people up (it sounds different than the smoke detector alarm).		
Constraints			
Pre-conditions	1. CO is accumulating from something, regardless where the home owner may be.		
Primary Scenario	1. The CO concentration in the air is enough for the CO detector to sound a loud electronic horn. 2. SafeHome detects the CO detector distress and notifies the monitoring personnel, who in turn call the fire department.		
Exceptions			
Post-conditions	Fire fighters arrive at the scene to determine the cause of the CO.		
Frequency of Use	All the time		
Business Rules			
Special Requirements			
Notes and Issues	None		

Use Case ID	UC-5	Use Case Name	Monitor for Basement Water Levels
Diagram Ref ID	D-5	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/8/2009	Date Last Updated	3/8/2009
Goal	To warn the home owner that the water level is rising. To notify the monitoring personnel about the rising water so that they can contact the appropriate people.		
Actors	**Primary:** Water, Water Level Detector **Secondary:** Monitoring Personnel, Home Owner, Emergency People		
Assumptions	1. A water sensor or basement flood alarm is installed in the house, in the basement if there is one. 2. There is no water problem at the moment. 3. This monitoring cannot be disabled.		
Constraints			
Pre-conditions	1. Water is starting to rise (perhaps from a flood).		
Primary Scenario	1. The water level reaches the water level detector and a distinctive electronic horn sounds off.		

	2. SafeHome detects the water level detector distress and notifies the monitoring personnel, who in turn call the emergency people.
Exceptions	1a. No electronic horn sound can be heard from under water. 2a. The SafeHome central processor falls victim to the water before the monitoring personnel can be notified about the rising water.
Post-conditions	Home owner and family can try to go to higher ground; help is on the way.
Frequency of Use	All the time
Business Rules	
Special Requirements	To prevent damage to the central processor when needed during a flood, it ought to be placed at a higher level in the home.
Notes and Issues	None

Use Case ID	UC-6	Use Case Name	Arm/Disarm Security System
Diagram Ref ID	D-6	Priority	High
Created By	Jaebok Kim	Last Updated By	Jaebok Kim
Date Created	3/7/2009	Date Last Updated	3/7/2009
Goal	To arm/disarm the security system by the control panel.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	The security system is not armed.		
Primary Scenario	1. A home owner inputs a four-digit password. 2. The security system validates the password. If it's correct, the control panel waits for additional input from the home owner. 3. The home owner push the button "stay", "away", or "off".		
Exceptions	2a After the home owner inputs the full password, if the password is incorrect, the control panel will beep once and wait for input of password again. 2b If the time gap between each input digit is longer than 2 second, the control panel will reset itself for new input of password. It will beep three times. 2c If the home owner inputs wrong password three times in a row, see Set Panic Mode (UC-9). 3a If the home owner pushes the button the "stay", the security system will become stay mode. The control panel beeps twice and a stay light becomes on; All outside motion detecting sensors are activated. All windows, doors sensors and inside motion detecting sensors are deactivated. The security system turns on the red alarm light to indicate that SafeHome has been armed. 3b If the home owner pushes the button the "away", the security system will become away mode. The control panel beeps three times and away light becomes on; all sensors are activated. The security system turns on the red alarm light to indicate that Safehome has been armed. 3c If the home owner pushes the button the "off', the security system will be disarmed. All sensors are deactivated.		

Post-conditions	1. In stay or away mode, the system awaits the home owner's password input. 2. In Off mode, the system exempts the home owner from validation process of the password. The home owner could pushes the button "stay", "away", or "off".
Frequency of Use	Frequent, when the home-owner goes out or comes back home.
Business Rules	
Special Requirements	To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel is the beginning of a single command. Until finishing arming/disarming the security system, or resetting password is done, any input from other control panels is all ignored. However, panic command is exceptional, and anytime a home user can set panic mode by any panels. In addition, all commands sent from control panel have priority over commands sent from web service.
Notes and Issues	None

Use Case ID	UC-7	Use Case Name	Encounter Error Conditions
Diagram Ref ID		Priority	High
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/7/2009	Date Last Updated	3/9/2009
Goal	Not to let possible errors influence the security system.		
Actors	**Primary:** Central processor		
Assumptions			
Constraints			
Pre-conditions	The central processor is connected to Internet.		
Primary Scenario	1. A possible system error occurs while the system operates. 2. The previously defined error handler catches the error. It makes the report for this case. All operating functions are stopped forcefully. 3. The report will be send to CPI through by email.		
Exceptions			
Post-conditions	The security system turns to away mode.		
Frequency of Use	Low		
Business Rules			
Special Requirements			
Notes and Issues			

Use Case ID	UC-8	Use Case Name	Reset Password
Diagram Ref ID	D-6	Priority	Medium
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/7/2009	Date Last Updated	3/9/2009
Goal	To reset password used in the control panel.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			

Pre-conditions	
Primary Scenario	1. A home owner input a four-digit password 2. The central processor validates the password. 3. The home owner pushes the button “reset” 4. The control panel beeps once. 5. The home owner inputs a new four-digit password. 6. The central processor stores the new password. 7. The control panel beeps twice.
Exceptions	2a After the home owner inputs the full password, if the password is incorrect, the control panel will beep once and wait for input of password again. 2b If the time gap between each input digit is longer than 2 second, the control panel will reset itself for new input of password. It will beep three times. 2c If the home owner inputs wrong password three times in a row, see Set Panic Mode(UC-9). 5a If the time gap between each input digit is longer than 2 second, the control panel will reset itself for new password. It will beep three times.
Post-conditions	The new password replaces the previous one. The home owner can use the new one from this time.
Frequency of Use	Low
Business Rules	
Special Requirements	Initial password is given to a home owner by CPI web service. To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel is the beginning of a single command. Until finishing arming/disarming the security system, or resetting password is done, any input from other control panels is all ignored. However, panic command is exceptional, and anytime a home user can set panic mode by any panels. In addition, all commands sent from control panel have priority over commands sent from web service.
Notes and Issues	

Use Case ID	UC-9	Use Case Name	Set Panic Mode
Diagram Ref ID	D-6	Priority	High
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/7/2009	Date Last Updated	3/9/2009
Goal	To set panic mode in the control panel.		
Actors	**Primary:** Home owner		
Assumptions	The security system is set to stay mode.		
Constraints			
Pre-conditions			
Primary Scenario	1. A home owner pushes the button “*” and “#” at the same time.		

	2. The control panel keeps beeping until the home owner inputs password.
Exceptions	2a If the input password is incorrect, the control panel keeps beeping. 2b If the input password is incorrect two times in a row, the central system sends the urgent message to the previously defined police station. 3c If the input password is correct, the control panel stops beeping and the security system turns to stay mode.
Post-conditions	
Frequency of Use	Low, when the urgent situation occurs.
Business Rules	
Special Requirements	The time gap between pushing the button "*" and "#' should be less than 0.5 second. To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel is the beginning of a single command. Until finishing arming/disarming the security system, or resetting password is done, any input from other control panels is all ignored. However, panic command is exceptional, and anytime a home user can set panic mode by any panels. In addition, all commands sent from control panel have priority over commands sent from web service.
Notes and Issues	

3.1.1 Window / Door Motion Sensor Monitoring

3.1.1.1 If the magnetic switch attached to the door is separated and the monitoring doors option is enabled, then an electronic alert is issued to the monitoring personnel via the Internet displaying which door is the cause.

3.1.1.2 If the magnetic switch attached to the door is separated and the monitoring doors option is enabled, then the alarm in the house turns on and remains sounding until a four digit pin number is entered into the control panel or the monitoring personnel disable it remotely after five minutes of continued sounding.

3.1.1.3 If the magnetic switch attached to the window is separated and the monitoring windows option is enabled, then an electronic alert is issued to the monitoring personnel via the Internet displaying which window is the cause.

3.1.1.4 If the magnetic switch attached to the window is separated and the monitoring windows option is enabled, then the alarm in the house turns on and remains sounding until a four digit pin number is entered into the control panel or the monitoring personnel disable it remotely after five minutes of continued sounding.

3.1.2 Outside Movement Monitoring

3.1.2.1 If the outdoor motion detector(s) sense an approaching object which is determined to be a human, then the central processor shall immediately initiate a default audible voice alert warning the home owner that “Somebody is approaching your home” using the speakers from the PC with the central processor connected to it, and also from the control panel(s).

3.1.2.2 If somebody is approaching the home by not going to the front door or garage, then the audible voice alert coming from the speakers of the PC with central processor and control panel(s) is stated as “Somebody is approaching the X side of your home” where X is replaced by “front”, “back”, “left”, or “right”. In addition, one or more status notifications shall be sent to the monitoring personnel including the sensor ID which last detected the person, the sensor location, the home ID, and the time of occurrence so that they are aware. See the data requirements section for specific data representation details.

3.1.3 Fire and Smoke Monitoring

3.1.3.1 The central processor’s control software shall notify about the house ID, the current time, and the smoke detector location in the home to the monitoring personnel in the event that the smoke detector detects a fire.

3.1.4 Carbon Monoxide Monitoring

3.1.4.1 The central processor’s control software shall notify about the house ID, the current time, and the CO detector location in the home to the monitoring personnel in the event that the CO detector detects the presence of CO in the air.

3.1.5 Basement Water Levels Monitoring

3.1.5.1 The central processor’s control software shall notify about the house ID, the current time, and the basement water level in the home to the monitoring personnel.

3.1.6 Arm/Disarm System

3.1.6.1 The control panel allows the home owner to arm/disarm the security system.

3.1.7 Encounter Error Conditions

3.1.7.1. The central processor reports all possible errors to development team in CPI via TCP data transmission within 5 seconds after the errors occur.

3.1.8 Reset Password

3.1.8.1 The control panel allows the home owner to reset 4 digits password.

3.1.9 Set Panic Mode

3.1.9.1 The control panel allows the home owner to set panic mode in case of emergency.

3.2 SafeHome Web Service

Description

Using the SafeHome Web service, a home owner can utilize the full functionality of SafeHome such as the ability to monitor camera zones and configure cameras and sensors. Moreover, the home owner can access this secure Web service from a remote place via the Internet through the SafeHome corporate site.

Use Cases

Use Case ID	UC-10	Use Case Name	Log Into SafeHome Web Service
Diagram Ref ID	D-7	Priority	High
Created By	Jaebok Kim	Last Updated By	Jaebok Kim
Date Created	3/6/2009	Date Last Updated	3/6/2009
Goal	To enter SafeHome web service from any remote location through the Internet.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints	The computer a home owner uses must have JRE1.5 and Internet web browser.		
Pre-conditions	System must be completely configured; a home owner must obtain appropriate user ID and password.		
Primary Scenario	1. A home owner enters ID (shorter than eight characters in length). 2. The home owner enters password (at least eight characters in length). 3. The system displays all major function buttons and the current floor plan.		
Exceptions	2a If ID or password is incorrect, a warning message will be displayed, and then the home owner will be required to input ID and password again.		
Post-conditions	Logging into the web service is successful, so the system displays all major		

	function buttons and the current floor plan.
Frequency of Use	Frequent
Business Rules	B-1, B-2
Special Requirements	When the home owner input wrong ID or password, there must be no error which allows the home owner to enter the web service. To keep consistency, multiple web accesses are not allowed. If one logs into the web service, new trial of access takes the old one's control and the old session becomes dead. Moreover, there is timeout for session if there is no action triggered by a user. After 5 minutes, the session becomes dead automatically.
Notes and Issues	

Use Case ID	UC-11	Use Case Name	Pan Camera
Diagram Ref ID	D-7	Priority	Medium
Created By	Jaebok Kim	Last Updated By	Jaebok Kim
Date Created	3/6/2009	Date Last Updated	3/6/2009
Goal	To pan output of camera view placed throughout the house from any remote location through the Internet web service.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After a home owner starts to use Accessible Camera View (UC-13), this use case is available.		
Primary Scenario	1. A home owner pushes the button "Left" to move the camera view to left or pushes the button "Right" to move the camera view to right.		
Exceptions			
Post-conditions	The display of the selected camera shows the moved view.		
Frequency of Use	Frequent		
Business Rules			
Special Requirements	A camera view can't move over its original range defined by the device.		
Notes and Issues			

Use Case ID	UC-12	Use Case Name	Zoom Camera In/Out
Diagram Ref ID	D-7	Priority	Medium
Created By	Jaebok Kim	Last Updated By	Jaebok Kim
Date Created	3/6/2009	Date Last Updated	3/6/2009
Goal	To zoom in/out output of camera view placed throughout the house from any remote location through the Internet web service.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After a home owner starts to use Accessible Camera View (UC-13), this use case is available.		
Primary Scenario	1. A home owner pushes the button "Zoom In" to zoom in the camera view or pushes the button "Zoom Out" to zoom out the camera view.		
Exceptions			
Post-conditions	The display of the selected camera shows the zoomed in/out view.		

Frequency of Use	Frequent
Business Rules	
Special Requirements	The system zooms the camera view in/out in the original scope defined by the device.
Notes and Issues	

Use Case ID	UC-13	Use Case Name	Access Camera View
Diagram Ref ID	D-7	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/8/2009	Date Last Updated	3/8/2009
Goal	To view output of camera placed throughout the house from any remote location via the internet.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After the configuration manager starts to use Log Into SafeHome Web Service (UC-10), this use case is available.		
Primary Scenario	1. The home owner selects “Surveillance” from the major function buttons. 2. The system displays the floor plan of the house. 3. The home owner selects a camera icon from the floor plan.		
Exceptions	1a Follow use case of View Thumbnail Snapshots (UC-7). 1b The home owner selects one thumbnail snapshot. 1c Follow Post conditions. 2a If a floor plan has not been configured, system displays appropriate error message.		
Post-conditions	The system displays a viewing window that is identified by the camera ID.		
Frequency of Use	Medium		
Business Rules	B-2		
Special Requirements	The system displays video output within the viewing window at 5 frames per second.		
Notes and Issues			

Use Case ID	UC-14	Use Case Name	View Thumbnail Snapshots
Diagram Ref ID	D-7	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/8/2009
Goal	To view thumbnail snapshot of camera placed throughout the house from any remote location via the internet.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After a home owner enters SafeHome web service via Access SafeHome Web Service (UC-10), this use case is available.		

Primary Scenario	1. The home owner selects “View Thumbnail Snapshot” from the major function buttons to view thumbnail snapshot of camera placed throughout the house.
Exceptions	
Post-conditions	The system displays the thumbnail snapshot of cameras and other functional buttons and check boxes.
Frequency of Use	Medium
Business Rules	
Special Requirements	When system displays check boxes, the value (i.e. tick mark) of check boxes is loaded as previous saved value.
Notes and Issues	The functional buttons are “Save” button and “Replay” button. Check boxes are for recording.

Use Case ID	UC-15	Use Case Name	Record Camera Output
Diagram Ref ID	D-7	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/8/2009
Goal	To record output of each camera.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After the home owner starts to use View Thumbnail Snapshots (UC-14), this use case is available.		
Primary Scenario	1. The home owner clicks into the check box of each camera. 2. The home owner pushes the button “Save”.		
Exceptions	1a When the check box is already selected, if the home owner clicks into the check box, check box is disselected. 2a If the home owner goes to another page from current page without saving, modified item will not be saved. And it doesn’t influence current recording condition. (i.e. Use case terminates without post conditions.)		
Post-conditions	The selected cameras start to record and unselected cameras stop recording and save the record file.		
Frequency of Use	Medium		
Business Rules			
Special Requirements	The recording file named as “day.month.year-hour” The recording files are stored at the PC connected with central processor through Ethernet. Because of the space limit, stored files will be removed by FIFO rule when the total size of all files reaches the maximum capacity of the hard disk.		
Notes and Issues			

Use Case ID	UC-16	Use Case Name	Replay Camera Output
Diagram Ref ID	D-7	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/6/2009

Goal	To replay record of camera output.
Actors	**Primary:** Home owner
Assumptions	
Constraints	
Pre-conditions	After a home owner starts to use View Thumbnail Snapshots (UC-14), this use case is available.
Primary Scenario	1. A home owner pushes the button "Replay" placed on bottom of each thumbnail snapshot. 2. The system displays a replaying window that is identified by the camera ID.
Exceptions	1a If selected camera to replay is recording, sends alert message and terminates. 1b If saved record of selected camera does not exist, sends alert message and terminates.
Post-conditions	The selected record will be played.
Frequency of Use	Medium
Business Rules	
Special Requirements	
Notes and Issues	

Use Case ID	UC-17	Use Case Name	Activate/Deactivate Sensors
Diagram Ref ID	D-7	Priority	High
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/7/2009	Date Last Updated	3/9/2009
Goal	To activate/deactivate sensors selectively via SafeHome web service.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	This use case is available after Log Into SafeHome Web Service (UC-10) is done successfully.		
Primary Scenario	1. A home owner clicks the button "Activate/Deactivate sensors" on the menu bar. 2. The web service displays the sub-menu consisting of status of all sensors and buttons to activate/deactivate each sensor. 3. The home owner clicks the button "On" to activate a sensor she or he wants. 4. The central processor activates the selected sensor.		
Exceptions	3a If the home owner clicks the button "Off" to activate a sensor she or he wants. And then the central processor deactivates the selected sensor.		
Post-conditions	Even if the selected sensors belong to specific zones, the result whether they are on/off is totally dependent on the latest change.		

Frequency of Use	Low
Business Rules	
Special Requirements	
Notes and Issues	

Use Case ID	UC-18	Use Case Name	Manage Security Zones
Diagram Ref ID	D-7	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/8/2009	Date Last Updated	3/8/2009
Goal	To make a security zone, some sensors and some cameras are grouped for convenient use.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After the configuration manager starts to use Log Into SafeHome Web Service (UC-10), this use case is available.		
Primary Scenario	1. The home owner selects “Manage Security Zones” from the major function buttons. 2. The system displays the floor plan of the house and a grouping window for managing security zone. 3. The home owner selects some sensors and some cameras. 4. The home owner pushes the button “Make the zone”.		
Exceptions	3a The home owner select a zone already configured. 3b The home owner pushes the button “Delete”. 3c Use case terminates. 3a The home owner select a zone already configured. 3b The home owner select some camera and sensors 3c The home owner pushes the button “Add to zone” or “Remove from zone”.		
Post-conditions	The system save the modified conditions and redisplay the grouping window.		
Frequency of Use	Medium		
Business Rules			
Special Requirements	Both cameras and any kinds of sensors can be grouped into a security zone.		
Notes and Issues			

Use Case ID	UC-19	Use Case Name	Arm/Disarm Security System Via Internet
Diagram Ref ID	D-7		
Created By	Jaebok Kim	Priority	High

Date Created	3/10/2009	Last Updated By Date Last Updated	Jaebok Kim 3/10/2009
Goal	To arm/disarm the security system by SafeHome web service.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	After the configuration manager starts to use Log Into SafeHome Web Service (UC-10), this use case is available.		
Primary Scenario	1. A home owner can choose the mode of the security system among Stay, Away, Off, or Panic.		
Exceptions			
Post-conditions	The mode of the security system will change to the choice among Stay, Away, Off, or Panic.		
Frequency of Use	Frequent, when the home-owner wants to set the mode of the security system from the remote place.		
Business Rules			
Special Requirements			
Notes and Issues	None		

Use Case ID	UC-20	Use Case Name	Configuring Floor Plan
Diagram Ref ID		Priority	High
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/10/2009	Date Last Updated	3/10/2009
Goal	To set up a new floor plan or edit a current floor plan		
Actors	Floor Plan Specialist		
Assumptions			
Constraints			
Pre-conditions	CPI provides a floor plan designer to handle this work instead of a home owner.		
Primary Scenario	1. A floor plan specialist visits a house whose owner uses SafeHome for the first time. 2. The floor plan specialist investigates each floor of a house and design floor plans for safeHome. 3. The floor plan specialist updates floor plans stored in the CPI server. 4. The CPI server reflects any changes on the floor plans.		
Exceptions	1a The home owner wants to change the current floor plan. The floor plan specialist will modify the floor plan depending on the home owner's demand.		
Post-conditions	The floor plans are updated.		
Frequency of Use	Low		
Business Rules	B-2		
Special Requirements	The SafeHome control software shall permit the multiple use of floor plans so long as there is only one per floor. The safeHome control software shall only make use of static floor plans which are not reconfigurable; the only way it can be changed is for the floor plan specialist		

	to update the floor plan and resubmit it to safeHome for overwrite on a particular floor
Notes and Issues	

Use Case ID	UC-21	Use Case Name	Control Security System Via Multiple Control Panels
Diagram Ref ID			
Created By	Jaebok kim	Priority	High
Date Created	3/10/2009	Last Updated By	Jaebok kim
		Date Last Updated	3/10/2009
Goal	To control SafeHome security system via multiple control panels.		
Actors	Home Owner		
Assumptions	**There is no exact same time to push the buttons on multiple control panels.**		
Constraints			
Pre-conditions	A home owner has more than one control panel.		
Primary Scenario	1. A home owner and one of the family members try to control SafeHome security system via multiple control panels at the similar time spot. 2. Only one input is accepted, and the other one is ignored. 3. The central processor accepts only one command.		
Exceptions			
Post-conditions	Only one input is accepted, and the other one is ignored.		
Frequency of Use	Low		
Business Rules			
Special Requirements	To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel is the beginning of a single command. Until finishing arming/disarming the security system, or resetting password is done, any input from other control panels is all ignored. However, panic command is exceptional, and anytime a home user can set panic mode by any panels. In addition, all commands sent from control panel have priority over commands sent from web service.		
Notes and Issues			

Use Case ID	UC-22	Use Case Name	Access SafeHome Web Service Via Multiple Web Browsers
Diagram Ref ID			
Created By	Jaebok kim	Priority	High
Date Created	3/10/2009	Last Updated By	Jaebok kim
		Date Last Updated	3/10/2009
Goal	To access SafeHome web service via multiple web browser		
Actors	Home Owner		
Assumptions	**There is no exact same time to access the web service via multiple web browsers.**		
Constraints			
Pre-conditions	A home owner tries to log on SafeHome web service while someone has already logged on it by his ID and password.		
Primary Scenario	1. A home owner enters ID and password to log on SafeHome web service. 2. The CPI server detects the trial to log on, and finds out there is already a logging session.		

	3. The CPI server replace the old session by a new one.
Exceptions	
Post-conditions	Only one input is accepted, and the other one is ignored.
Frequency of Use	Low
Business Rules	
Special Requirements	To keep consistency of the data and to avoid unintended consequences, multiple Web access user sessions to the same SafeHome control software are not allowed. If one logs into the Web service, a new user session begins, replacing the old one. Moreover, there is a session timeout if there is no action triggered by the logged in user after five minutes.
Notes and Issues	

3.2.1 Log into SafeHome Web Service

3.2.1.1 If the home owner inputs wrong ID or password three times in a row, the web service, the web service will stops, and give a message that contact information of the security company. Since this case happens, the web service is unavailable.

3.2.2 Pan Camera

3.2.2.1 If the user clicks the button “Left”, the camera view will move in the left direction. The movement unit per a single click is defined by the camera.

3.2.2.2 If the user clicks the button “Right”, the camera view will move in the right direction. The movement unit per a single click is defined by the camera.

3.2.2.3 If there is no space for camera to turn left or right because of the limitation of the movement range, the camera doesn’t move in that direction anymore.

3.2.3 Zoom Camera In/Out

3.2.3.1 If the home owner clicks the button “Zoom In”, the camera view will zoom in. The zoom in unit per a single click is defined by the camera.

3.2.3.2 If the home owner clicks the button “Zoom Out”, the camera view will zoom out. The zoom out unit per a single click is defined by the camera.

3.2.3.3 Because of the limitation of the range, even if the home owner clicks the button “Zoom In” or “Zoom Out”, the camera doesn’t zoom in/out anymore.

3.2.4 Accessible Camera Views

3.2.9.1 The web services allow the home owner to access camera view through select a camera icon of Floor Plan.

3.2.9.2 The web services allow the home owner to access camera view through select a thumbnail snapshot of camera.

3.2.9.3 If the floor plan isn't configured, the home owner can't use Access Camera View function using floor plan.

3.2.9.4 The system displays video output as moving pictures in new window.

3.2.5 View Thumbnail Snapshots

3.2.5.1 The web service allows a home owner to View Thumbnail Snapshots.

3.2.5.2 The check box value is loaded when this service begins.

3.2.6 Record Camera Output

3.2.6.1 The home owner can record view of each camera separately using web services.

3.2.6.2 The home owner can stop recording of each camera separately using web services.

3.2.6.3 When it stops recoding, the file is saved.

3.2.6.4 A recording file can be saved for 24hours at most but does not exceed redundant space of disk.

3.2.6.5 If disk does not have free size (ex. for 24h) when camera starts to record, the system removes the oldest file.

3.2.6.6 The home owner can delete record files.

3.2.7 Replay Camera Output

3.2.7.1 The home owner can replay the record files using web services.

3.2.7.2 The home owner can stop, pause, fast forward and fast rewind the video file.

3.2.7.3 The home owner can choose a file of all saved record files to replay.

3.2.7.4 If a camera never perform recording, the system don't perform replaying

function.

3.2.8 Activate/Deactivate Sensors

3.2.8.1 The result of update is totally dependent on the latest update. For example, after a sensor is activated by a home owner, if she or he changes the security mode to stay, the status of all sensors will be modified by the policy of stay mode.

3.2.9 Manage Security Zones

3.2.9.1 To manage sensors and motion detectors for more convenient activation and deactivation, the home owner can group sensors and motion detectors as zone.

3.2.9.2 The home owner can create the zone by selecting some sensors and some motion detectors.

3.2.9.4 The home owner can delete the zone defined by the home owner.

3.2.9.5 The home owner can modify the zone. In other words, the home owner inserts a sensor and a motion detector to the zone and also can remove a sensor and a motion detector from the zone.

3.2.9.6 The home owner can know which sensor belong to the zone.

3.2.10 Arm/Disarm Security System Via Internet

3.2.10.1 The operations of each mode is the exactly same as the control panel modes.

3.2.11 Control Security System Via Multiple Control Panels

3.2.12.1 Only one command is accepted according to atomicity of a command.

3.2.12 Access SafeHome Web Service Via Multiple Web Browsers

3.2.13.1 Multiple Web access user sessions to the same SafeHome control software are not allowed. If one logs into the Web service, a new user session begins, replacing the old one. Moreover, there is a session timeout if there is no action triggered by the logged in user after five minutes.

4. NONFUNTIONAL REQUIREMENTS

4.1 Process Requirements

4.1.1 Management Requirements

4.1.1.1 The document for requirement specification should be submitted on 10th Mar.
4.1.1.2 The document for analysis model should be submitted on 24th Mar.
4.1.1.3 The document for design model should be submitted on 12th Apr.
4.1.1.4 The document for construction & deployment should be submitted on 28th Apr.
4.1.1.5 All output of development should be updated through Tortoise SVN.
4.1.1.6 The summary report of all meeting should be submitted.

4.1.2 Implementation Requirements

4.1.2.1 The system should be developed using the java language.
4.1.2.2 The system should be developed using the Eclipse/NetBeans tools.
4.1.2.3 The modeling of system should be done using StarUML/ArgoUML/MSvisio tools.

4.1.3 Standards Requirements

4.1.3.1 The development process should be conformant with waterfall model process.

4.2 Product Requirements

4.2.1 Usability Requirements

4.2.1.1 Measurement condition:
Employees are supposed to know only the password.
They’re all new comers and not knowledgeable for the system.

4.2.1.2 The average time for employees to learn all features of the user interface via PC must be less than one hour.

4.2.1.3 The average time for employees to learn all features of the web-based user interface via Internet must be less than two hours.

4.2.1.4 When a new employee tries to input password, the average probability of making consecutive three errors must be less than 10%

4.2.2 Performance Requirements

(Following IEEE830)

4.2.2.1 Static performance

4.2.2.1.1 The control software of SafeHome requires 30 MB of memory at the running time.

4.2.2.1.2 The control software of SafeHome is limited to 100 MB of hard disk space of central processor for installment.

4.2.2.1.3 The hard disk for recorded video files requires at least 20 GB.

4.2.2.2 Dynamic performance

4.2.2.2.1 In stay mode, when the motion sensor at windows, doors, and outside detects intruders, the system must report it to users through PC within 500 milliseconds.

4.2.2.2.2 In away mode, it must report the trespass (mentioned in 4.2.2.2.1) to the nearest security office, located in a range of 5 km, within 1 second.

4.2.2.2.3 When a client watch camera monitoring zone, the delay between capturing image and displaying image must be less than 500 milliseconds. The number of cameras can't exceed 10. The video codec is MPEG-4, requiring 0.6 GB for 8 hours recording with 5 frames.

4.2.3 Reliability Requirements

4.2.3.1 There must be no malfunction of signing on the web service. For example, if ID or password is not correct, the web service never allows the user to enter the service.

4.2.3.2 There must be no malfunction of validating PIN number. For example, if the input PIN number is not correct, the control panel never allows the user to use all functions of the control panel.

4.2.3.3 All possible exceptions and errors must be handled and reported to CPI customer center. Since it must guarantee no system-down, the system adopts exception handling.

4.2.4 Availability

4.2.4.1 The system must operate 24 hours a day. There must be no system-down caused by program bugs.

4.2.5 Platform Constraints

4.2.5.1 The system operates in Microsoft Windows XP and Vista.

4.2.5.2 The system utilizes JRE 1.5, so JRE 1.5 must be installed before the system is deployed.

4.2.6 Modifiability

4.2.5.1 If a client wants to add more cameras or sensors, programming effort to achieve it must be less than 1 person-week.

4.2.5.2 If a client wants to modify the location of current cameras or sensors, programming effort to achieve it must be less than 1 person-week.

4.3 External Requirements

4.3.1 Business Rules

ID	Rule Definition	Type of Rule	Static or Dynamic	Source
B-1	There can only be one SafeHome system installed per home.	Constraint	Static	Corporate Policy
B-2	CPI is obligated to design a new floor plan for a customer and edit it for their convenience.	Constraint	Static	Corporate Policy

4.3.2 Legal Constraints

4.3.2.1 The SafeHome control software version must not be updated once release as a product.

4.3.2.2 Homes with the SafeHome system installed must have round-the-clock monitoring seven days a week.

4.3.2.3 Under privacy laws, permission must be obtained from home owners or from a court order before recorded video footage is released to investigators.

4.3.2.4 Under no circumstances can SafeHome personnel or the monitoring company snoop through surveillance cameras; only the home owner has permission to do this unless the home owner hits the panic button or through a signed agreement with the home owner something wrong is detected by SafeHome that is security or safety related.

4.3.2.5 Indoor surveillance cameras must clearly be visible when mounted on walls or the ceiling and not installed in bathrooms.

4.3.3 Economic Constraints

4.3.3.1 The development budget for the first release version of SafeHome control software cannot exceed one million dollars.

4.3.4 Interoperability Requirements

4.3.4.1 User Interfaces

4.3.4.1.1 The home owner must be able to use a physical wall-mounted control panel with keypad to activate and deactivate certain features of the SafeHome system.

4.3.4.1.2 The home owner must be able to to activate and deactivate certain features of the SafeHome system using the Internet through a logged-in user session, and do additional things such as configuration of the system and viewing surveillance camera footage.

4.3.4.1.3 The monitoring personnel will use an application to monitor SafeHome statuses, and should an alert be issued, have instant access to a particular home owner's device statuses and surveillance footage.

5. VALIDATION CRITERIA

5.1 Final testing and acceptance for SafeHome System shall be done by an independent third party.

5.2 Criteria to address include system inputs, system processes, and system outputs.

5.3 Testing and acceptance shall follow the standards for time and mission critical computer based system that is used in the public safety arena.

5.4 Testing and acceptance processes should be expressed by

a. Observing time intervals
b. Comparing known inputs and expected outputs with actual outputs
c. Getting the required results regarding:
   (i) Volumes
   (ii) Speed of processing
   (iii) Accuracy
   (iv) System reliability
   (v) Proving recovery processes of system
   (vi) Compliance with requirements stated in SRS

5.5 Must pass following testing sequence:

a. Functionality testing

   Functionality testing must confirm functionality as presented in the SRS.

b. System and network management testing

   This testing is concerned with demonstrating the ability to remotely maintain all parts of the network and help desk functionality.

c. Resilience testing

   Make sure back-up and recovery capabilities work and do so reliably for a continuous period of time.

d. Performance testing

   The system must demonstrate that it can provide the contracted performance including in interfaces and sub-systems.

e. Scenario testing

This testing makes sure that what happens in real world scenarios is applicable and works correctly in the system operational environment.

APPENDIX A: DIAGRAMS

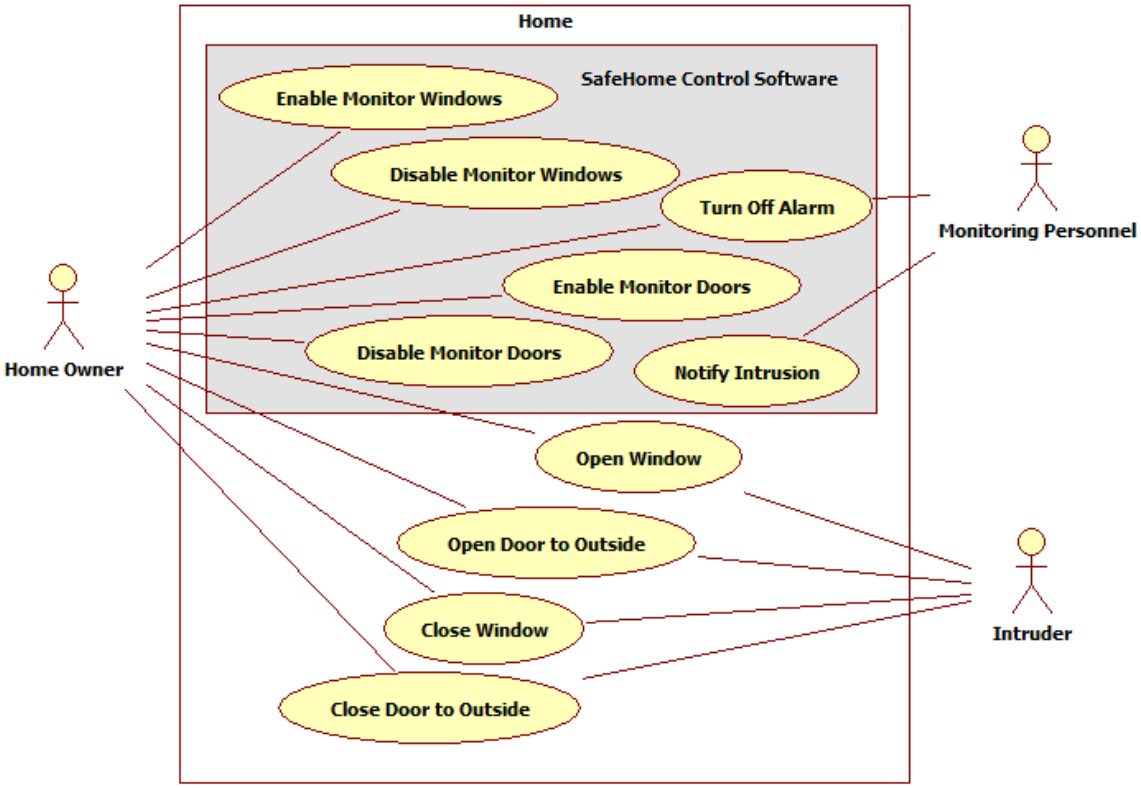

Figure D-1 – Use Case Diagram for Monitoring Windows and Doors

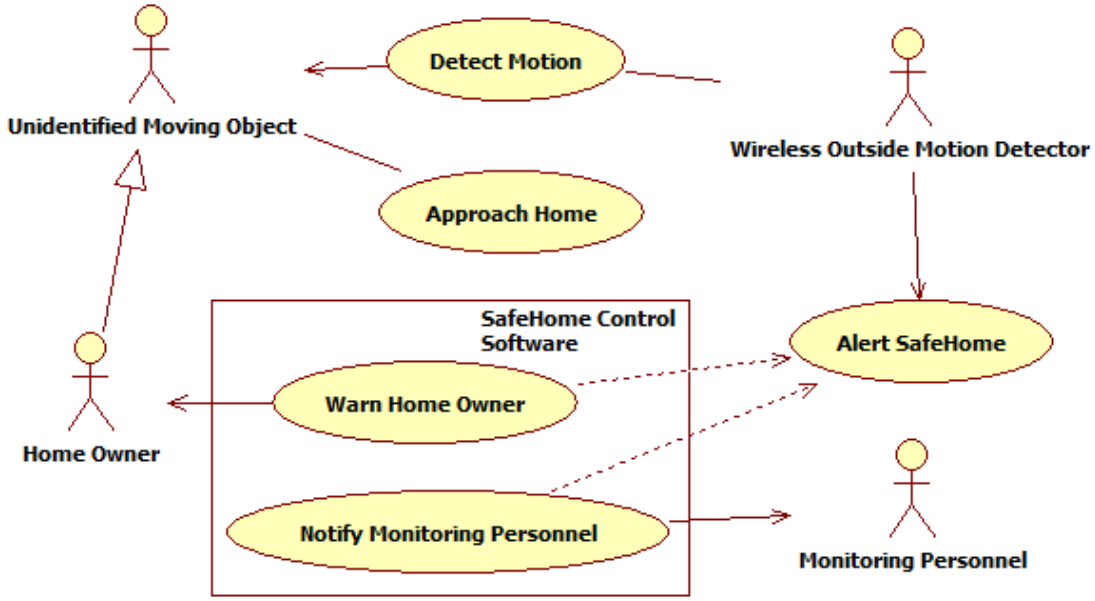

Figure D-2 – Use Case Diagram for Monitoring Outside Movement

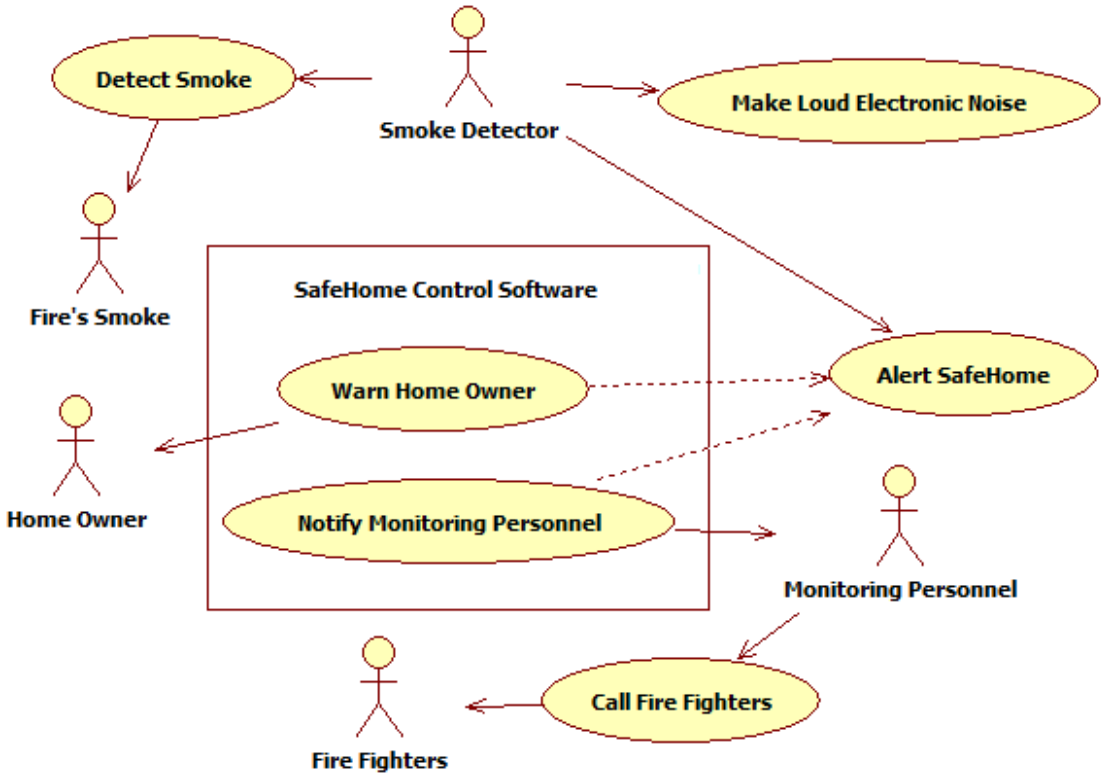

Figure D-3 – Use Case Diagram for Monitoring Fire and Smoke

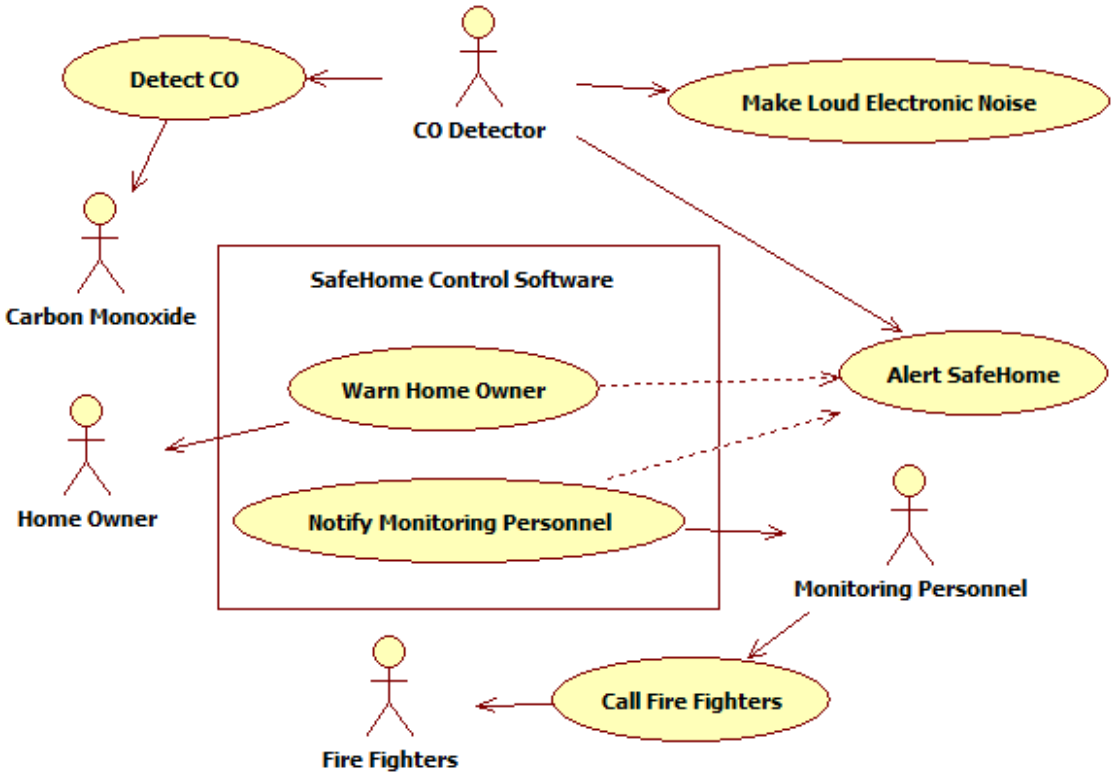

Figure D-4 – Use Case Diagram for Monitoring Carbon Monoxide (CO)

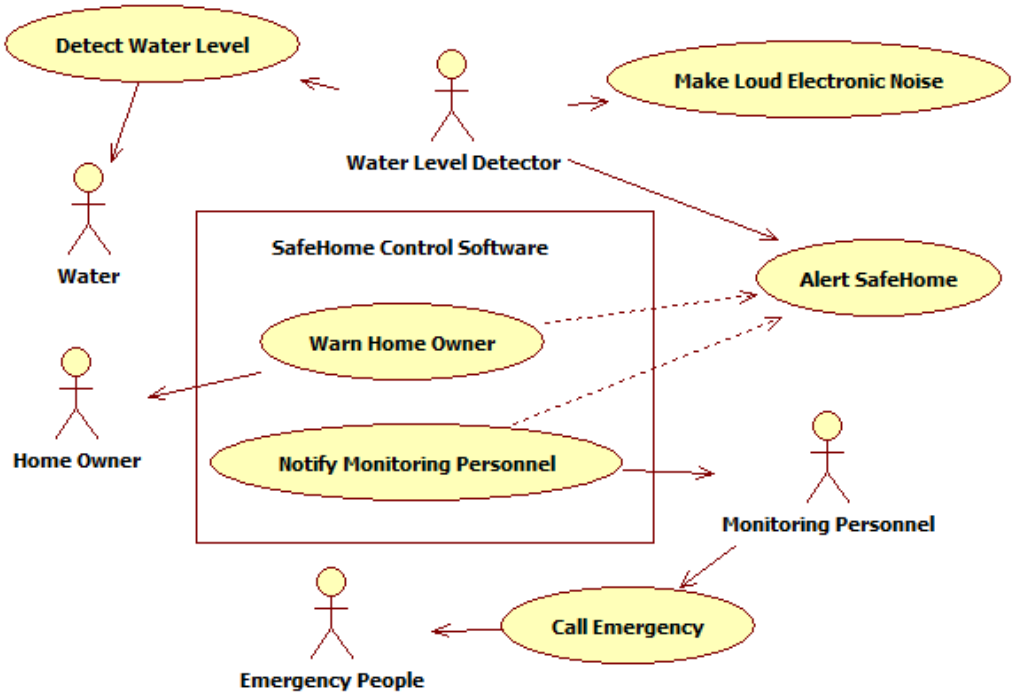

Figure D-5 – Use Case Diagram for Monitoring Water Levels

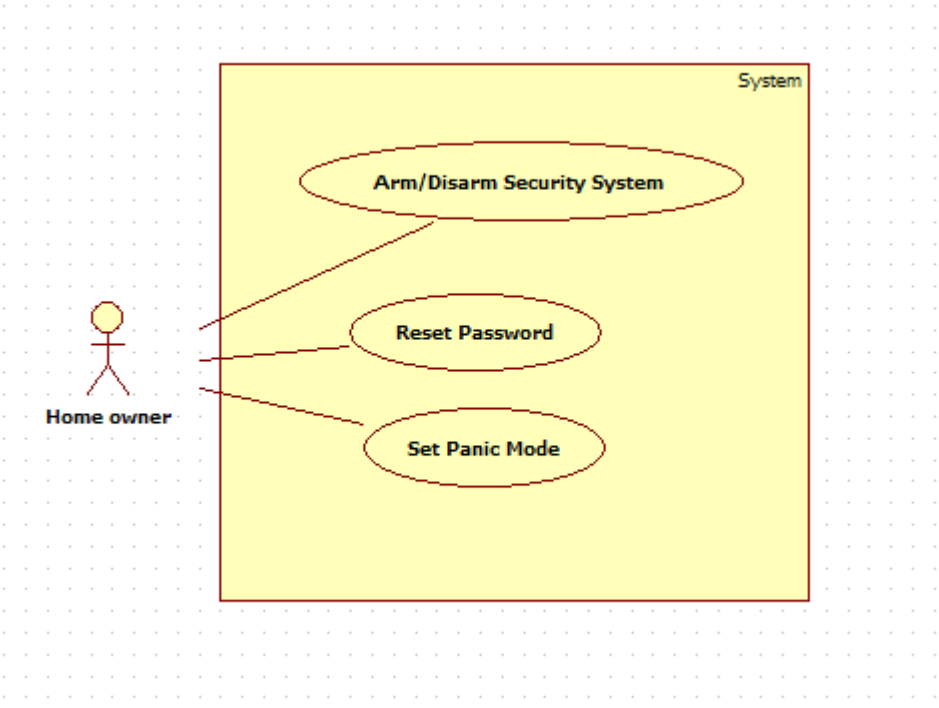

Figure D-6 – Use Case Diagram for Arm/Disarm Security System, Reset Password, Set Panic Mode

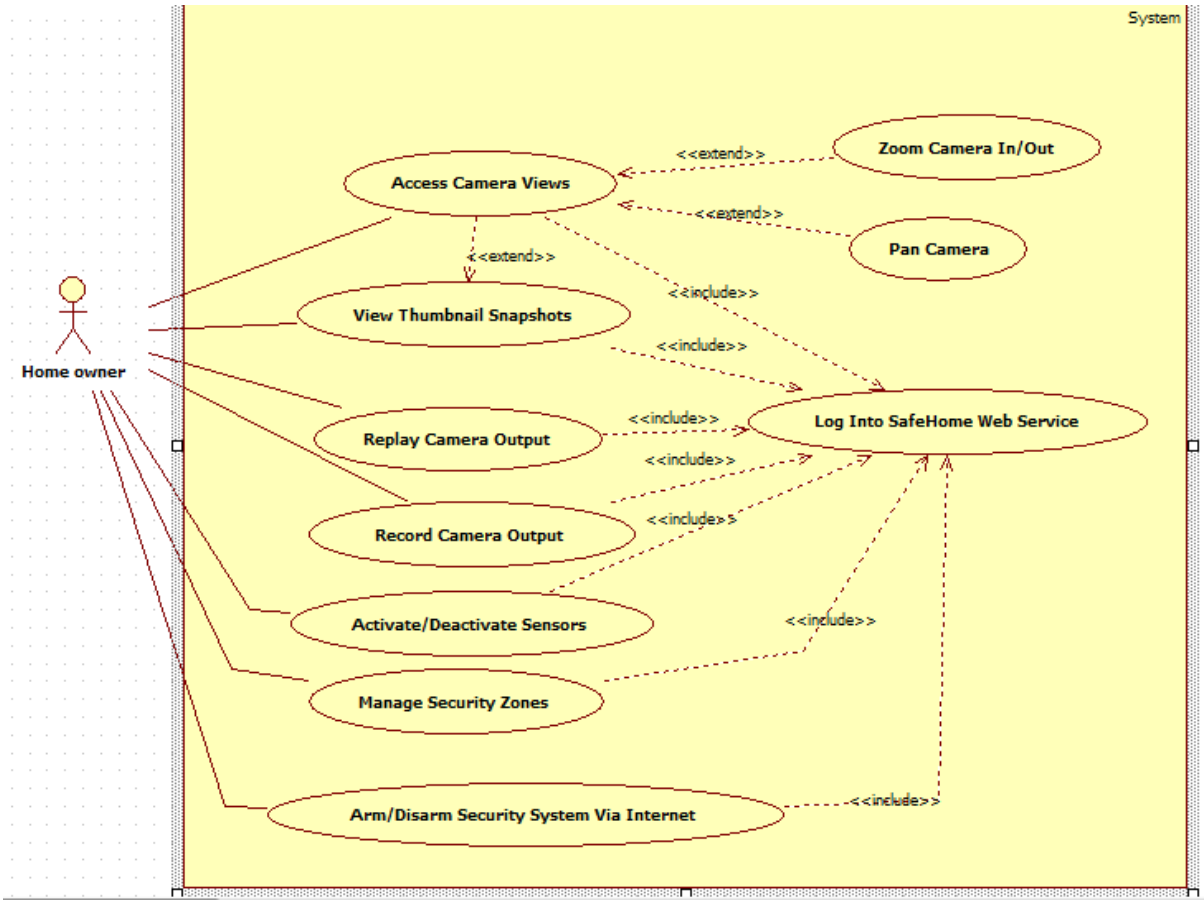

Figure D-7 – Use Case Diagram for SafeHome Web Service

APPENDIX B: GLOSSARY AND ACRONYMS

Glossary	**Explanation**
Away	It's a mode for the time when a home owner or her/his family goes out. All sensors are activated to detect intruders.
Control panel	This is a simple control panel for a home owner to use basic SafeHome functions such as arming/disarming the security system, setting panic mode, resetting 4 digits password. This control panel can be deployed anywhere the home owner wants. For example, the home owner can place it on a door of a refrigerator. Moreover, there can be more than one control panel.
Floor plan	This is a map showing the current plan of a home owner's house. It shows all security equipment such as cameras, window/door sensors, and motion detectors. It's designed by the security designer employed by CPI.
Off	It's a mode for the time when a home owner disarms the security system. It means all sensors are not working during this mode.
Panic	It's a mode for emergency. The control panel beeps until a home owner enters the correct 4 digits password.
SafeHome web service	This is a web service accessed via Internet. By accessing it, a home owner can utilize full functions such as monitoring cameras and configuring floor plan.
Security Zone	This is a zone defined by a home owner by grouping window sensors, door sensors, and motion detectors.
Stay	It's a mode for the time when a home owner or her/his family stays at home. All outside sensors are activated to detect intruders. However, all windows, doors and inside motion sensors are deactivated.

Acronyms	**Explanation**
SRS	Software Requirement Specification
JRE	Java Runtime Environment
CO	Carbon Monoxide

APPENDIX C: WORD INDEX

APPENDIX D: TRACEABILITY

Table E-1: Requirements Traceability Matrix

Functional Requirements	Other Elements		
	Use Case	Use Case Diagram	Non Functional Requirement
3.1.1 Window / Door Motion Sensor Monitoring	UC-1	D-1	
3.1.2 Outside Movement Monitoring	UC-2	D-2	
3.1.3 Fire and Smoke Monitoring	UC-3	D-3	
3.1.4 Carbon Monoxide Monitoring	UC-4	D-4	
3.1.5 Basement Water Levels Monitoring	UC-5	D-5	
3.1.6 Arm/Disarm System	UC-6	D-6	4.2.2.2.1 4.2.2.2.2
3.1.7 Encounter Error Conditions	UC-7		4.2.3.3
3.1.8 Reset Password	UC-8	D-6	4.2.3.1 4.2.3.2
3.1.9 Set Panic Mode	UC-9	D-6	
3.2.1 Log into SafeHome Web Service	UC-10	D-7	4.2.3.1
3.2.2 Pan Camera	UC-11	D-7	4.2.2.2.3
3.2.3 Zoom Camera In/Out	UC-12	D-7	4.2.2.2.3
3.2.4 Accessible Camera Views	UC-13	D-7	4.2.2.2.3
3.2.5 View Thumbnail Snapshots	UC-14	D-7	4.2.2.2.3
3.2.6 Record Camera Output	UC-15	D-7	4.2.2.1.3
3.2.7 Replay Camera Output	UC-16	D-7	
3.2.8 Activate/Deactivate Sensors	UC-17	D-7	
3.2.9 Manage Security Zones	UC-18	D-7	
3.2.10 Arm/Disarm Security System Via Internet	UC-19	D-7	4.2.2.2.1 4.2.2.2.2
3.2.11 Control Security System Via Multiple Control Panels	UC-21		
3.2.12 Access SafeHome Web Service Via Multiple Web Browsers	UC-22		

APPENDIX E: Meeting Logs

1st Meeting

TIME AND LOCATION	March 3rd 2009, 12:40PM-1:30PM, CS Building Computer Lab
TYPE OF MEETING	Division of Labor on SRS
FACILITATOR	Francisco A. Rojas
ATTENDEES	Francisco A. Rojas, Jaebok Kim, Hyunsik Cho
DOCUMENT PREPARED BY	Francisco A. Rojas

DISCUSSION	
1 – Agreeing on Template for SRS, Use Case, Requirement Annotation	
2 – Division of Labor on SRS for Completing Phase 1	
CONCLUSIONS	Next meeting on Thursday, March 5 after lunch.
1 – The templates are agreed upon for all discussed items	
2 – The division of labor is decided with possible future adjustment	

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Complete section 1, most of section 2 , 3.1, 4.3	Francisco A. Rojas	3/5/2009
Working on 4.2	Jaebok Kim	3/5/2009
Working on 4.1	Hyunsik Cho	3/5/2009

2nd Meeting

TIME AND LOCATION	March 5rd 2009, 12:40PM-1:30PM, CS Building Computer Lab
TYPE OF MEETING	Division of Labor on SRS
FACILITATOR	Francisco A. Rojas
ATTENDEES	Francisco A. Rojas, Jaebok Kim, Hyunsik Cho
DOCUMENT PREPARED BY	Francisco A. Rojas

DISCUSSION	
1 – Agreeing on Use Case, Requirement Annotation	
2 – Division of Labor on SRS for Completing Phase 1	
CONCLUSIONS	Next meeting on Friday March 6th.
1 – The use cases are agreed upon for all discussed items	
2 – The division of labor is decided with possible future adjustment	

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Working on section 1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5	Francisco A. Rojas	3/5/2009
Working on section 3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.9, 3.2.1, 3.2.2, 3.2.3, 3.2.8, 3.2.10	Jaebok Kim	3/5/2009
Working on section 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.9	Hyunsik Cho	3/5/2009

3rd Meeting

TIME AND LOCATION	March 9th 2009, 6:20PM-7:20PM, CS Building Computer Lab
TYPE OF MEETING	Division of Labor on SRS
FACILITATOR	Francisco A. Rojas
ATTENDEES	Francisco A. Rojas, Jaebok Kim, Hyunsik Cho
DOCUMENT PREPARED BY	Francisco A. Rojas

DISCUSSION	
1 – Agreeing on Use Case, Requirement Annotation	
2 – Division of Labor on SRS for Completing Phase 1	
CONCLUSIONS	
1 – The use cases are agreed upon for all discussed items	
2 – The division of labor is decided with possible future adjustment	
3 – The presentation about SRS will be delivered by Jaebok Kim	

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE

Working on section 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5	Francisco A. Rojas	3/10/2009
Working on section 3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.9, 3.2.1, 3.2.2, 3.2.3, 3.2.8, 3.2.10	Jaebok Kim	3/10/2009
Working on section 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.9	Hyunsik Cho	3/10/2009

APPENDIX F: Authorship

Sections	Authors
1.1 Purpose	Francisco A. Rojas
1.2 Intended Audience and Reading Suggestions	Francisco A. Rojas
1.3 Project Scope	Francisco A. Rojas
1.4 References	Francisco A. Rojas
1.5 SRS Structure Overview	Francisco A. Rojas
2.1 Product Perspective	Francisco A. Rojas
2.2 Product Features	Francisco A. Rojas
2.3 User / Stakeholder Classes and Characteristics	Francisco A. Rojas
2.4.1 Central Processor	Francisco A. Rojas
2.4.2 Sensors and Actuators	Francisco A. Rojas
2.4.3 Control Panels	Francisco A. Rojas
2.4.4 Internet Browser	Francisco A. Rojas
2.4.5 SafeHome Corporate Website	Francisco A. Rojas
2.5 Design and Implementation Constraints	Francisco A. Rojas
2.6.1 Business Opportunity	Francisco A. Rojas
2.6.2 Business Objectives and Success Criteria	Francisco A. Rojas
2.6.3 Customer or Market Needs	Francisco A. Rojas
2.6.4 Business Risks	Francisco A. Rojas
2.7 User Documentation	Francisco A. Rojas
2.8 Assumptions and Dependencies	Francisco A. Rojas
3.1.1 Window / Door Motion Sensor Monitoring	Francisco A. Rojas
3.1.2 Outside Movement Monitoring	Francisco A. Rojas
3.1.3 Fire and Smoke Monitoring	Francisco A. Rojas
3.1.4 Carbon Monoxide Monitoring	Francisco A. Rojas
3.1.5 Basement Water Levels Monitoring	Francisco A. Rojas
3.1.6 Arm/Disarm System	Jaebok Kim
3.1.7 Encounter Error Conditions	Jaebok Kim
.1.8 Reset Password	Jaebok Kim

3.1.9 Set Panic Mode	Jaebok Kim
3.2 SafeHome Web Service	Jaebok Kim
3.2.1 Log into SafeHome Web Service	Jaebok Kim
3.2.2 Pan Camera	Jaebok Kim
3.2.3 Zoom Camera In/Out	Jaebok Kim
.2.4 Accessible Camera Views	Hyunsik Cho
3.2.5 View Thumbnail Snapshots	Hyunsik Cho
3.2.6 Record Camera Output	Hyunsik Cho
3.2.7 Replay Camera Output	Hyunsik Cho
3.2.8 Activate/Deactivate Sensors	Jaebok Kim
3.2.9 Manage Security Zones	Hyunsik Cho
3.2.10 Arm/Disarm Security System Via Internet	Jaebok Kim
3.2.11 Control Security System Via Multiple Control Panels	Jaebok Kim
3.2.12 Access SafeHome Web Service Via Multiple Web Browsers	Jaebok Kim
4.1.1 Management Requirements	Hyunsik Cho
4.1.2 Implementation Requirements	Hyunsik Cho
4.1.3 Standards Requirements	Hyunsik Cho
4.2.1 Usability Requirements	Jaebok Kim
4.2.2 Performance Requirements	Jaebok Kim
4.2.3 Reliability Requirements	Jaebok Kim
4.2.4 Availability	Jaebok Kim
4.2.5 Platform Constraints	Jaebok Kim
4.2.6 Modifiability	Jaebok Kim
4.3.1 Business Rules	Francisco A. Rojas
4.3.2 Legal Constraints	Francisco A. Rojas
4.3.3 Economic Constraints	Francisco A. Rojas
4.3.4 Interoperability Requirements	Francisco A. Rojas
4.3.4.1 User Interfaces	Francisco A. Rojas
4.3.4.2 Hardware Interfaces	Francisco A. Rojas
4.3.4.3 Software Interfaces	Francisco A. Rojas
4.3.4.4 Communication Interfaces	Francisco A. Rojas

APPENDIX A: DIAGRAMS	Francisco A. Rojas, Jaebok Kim, Hyunsik Cho
APPENDIX B: GLOSSARY AND ACRONYMS	Jaebok Kim
APPENDIX C: WORD INDEX	Jaebok Kim
APPENDIX D: TRACEABILITY	Jaebok Kim
APPENDIX E: Meeting Logs	
1st Meeting	Francisco A. Rojas
2nd meeting	Jaebok Kim
3rd meeting	Jaebok Kim
APPENDIX F: Authorship	Jaebok Kim