SRS for SafeHome System

Version 2.0

Prepared by

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CS550 Introduction to Software Engineering

KAIST

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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
Phase II, Draft 1	3/18/2009	Updated Formatting, SRS Revisions	1.5
Phase II, Draft 2	3/29/2009	Draft version 2.0 Completed	2.0

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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 and use case descriptions, along with other analysis modeling diagrams to explain the use cases, followed by their functional requirements. The fourth section groups together all the non-functional requirements in their respective categories. The appendix area includes different sections for the glossary, an index, meeting minutes, 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*, the SafeHome system will make use of external hardware devices such as alarms, sensors, surveillance cameras, and one or more control panels, all of which communicate wirelessly with the wireless box which we refer to as the central processor. All software which controls SafeHome is located in the central processor; a web server within the central processor makes it possible to interact with the control software. By using a Web service, it is possible to access all information and configure statuses for SafeHome. The control panel provides a very limited subset of the full functionality that is offered through this Web service. Users who want to have access to this Web service remotely must connect securely through a proxy Web server on one of SafeHome's corporate servers for security reasons. The central processor status is monitored directly around the clock by a monitoring company.

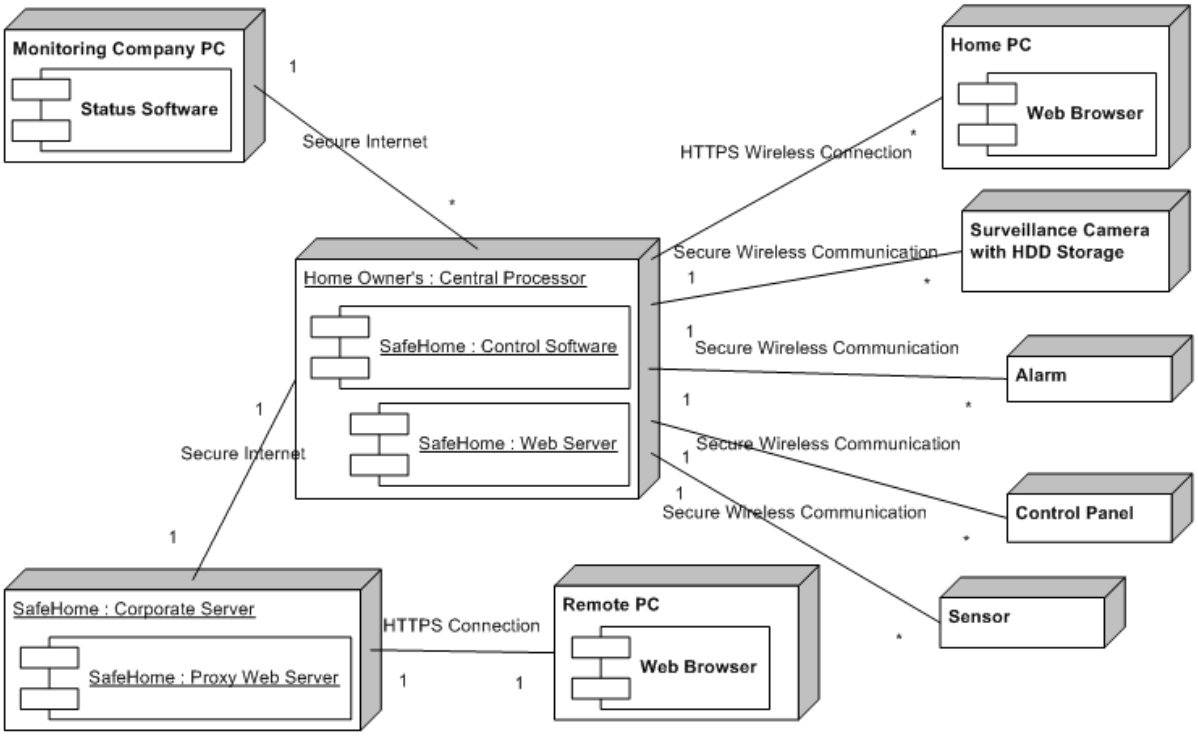

Figure 2.1 – SafeHome Deployment Diagram

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 central processor to off the shelf hardware devices (e.g. sensors), all of which are controlled through one or more wall-mounted control panels, or through the Internet 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 central processor communicates with the SafeHome corporate servers for a home owner's remote access to the SafeHome control mechanism, and it also communicates statuses to 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 is the central processor, which is only attached directly to an electric power source to make sure that SafeHome's operations can run as expected continuously. It serves as a wireless Internet base station for communicating with

various devices in the SafeHome network. It can function independently from a home PC, but it requires an Internet connection source.

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. For those people who want to record video from surveillance cameras, cameras with HDD are required to store the video footage within themselves for later playback. 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 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. 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, except in the case of the monitoring company.

2.5 Design and Implementation Constraints

All communication between devices and the central processor must be via the wireless protocol 802.11b 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 Operation of Control Panel

3.1.1 Description

The SafeHome system is designed to work with one or more control panels within a home.

3.1.2 Use Cases

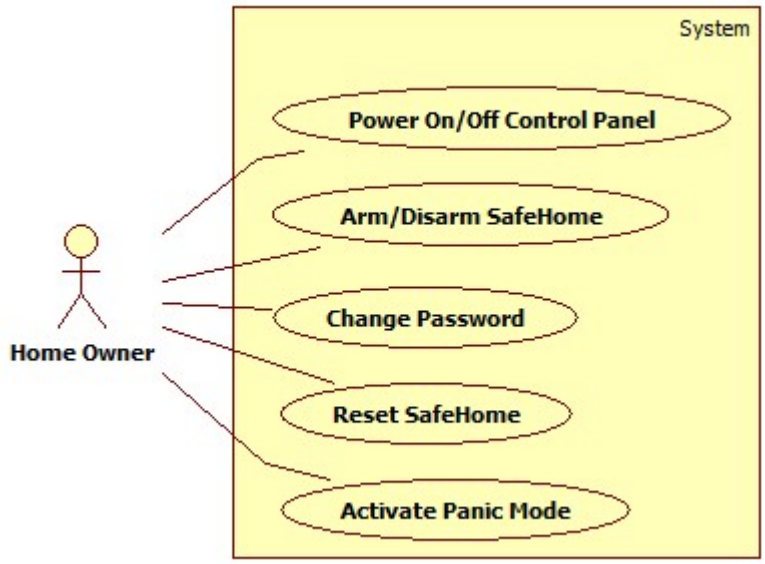

Figure 3.1 – Control Panel Use Case Diagram

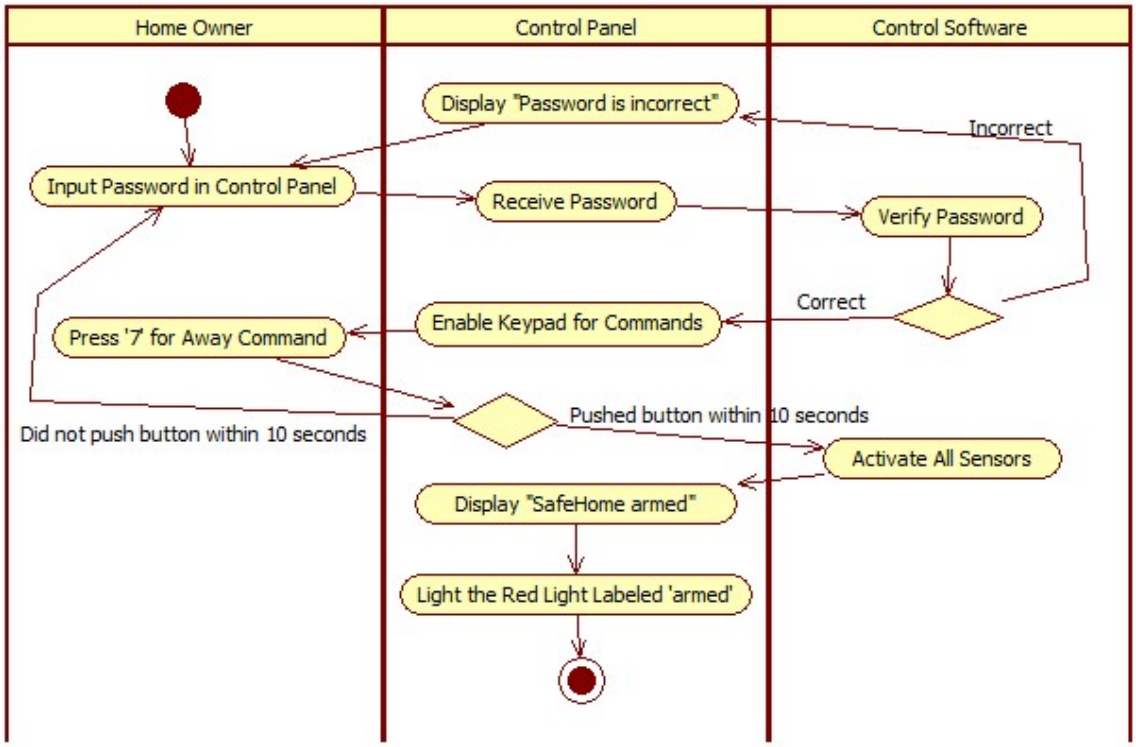

Figure 3.2 – Arm SafeHome via Control Panel Swimlane Diagram

Use Case ID	UC-1	Use Case Name	Arm SafeHome via Control Panel
Diagram Ref ID	Figure 3.1, Figure 3.2	Priority	High
Created By	Jaebok Kim	Last Updated By	Francisco Rojas
Date Created	3/7/2009	Date Last Updated	3/28/2009
Goal	To arm the SafeHome security system via the control panel.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	The security system is not armed.		
Primary Scenario	1. The home owner inputs a four-digit password. 2. The security system verifies whether or not the password is correct. If it is correct, the home owner presses the away button within 10 seconds. 3. The control software activates all the sensors. 4. The control panel displays that SafeHome is armed and lights the red light labeled 'armed'.		
Exceptions	2a. After the home owner inputs the 4-digit password, if the password is incorrect, the control panel will beep once and display that the password is incorrect. The home owner must reenter the password. 2b. If the away button is not pressed within 10 seconds, the home owner must start again by typing the password.		

Post-conditions	The SafeHome system is in away mode with all sensors activated.
Frequency of Use	Frequent, when the home owner goes out of 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 after the correct password is entered 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

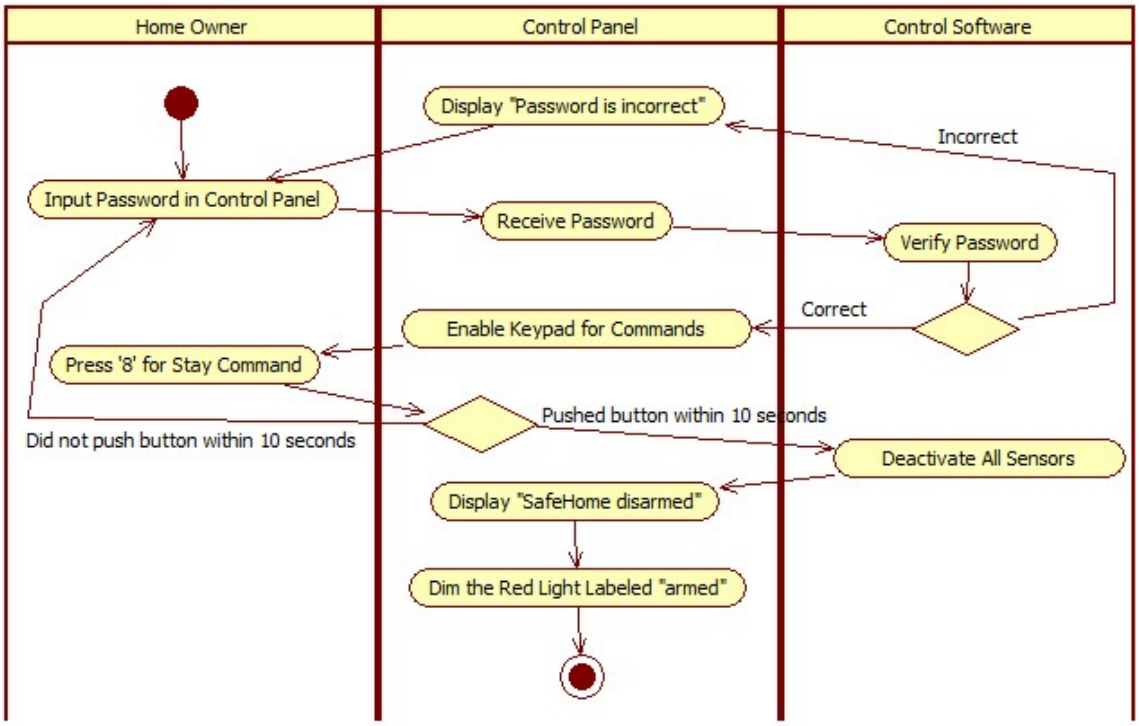

Figure 3.3 – Disarm SafeHome via Control Panel Swimlane Diagram

Use Case ID	UC-2	Use Case Name	Disarm SafeHome via Control Panel
Diagram Ref ID	Figure 3.1, Figure 3.3	Priority	High
Created By	Jaebok Kim	Last Updated By	Francisco Rojas
Date Created	3/7/2009	Date Last Updated	3/28/2009
Goal	To disarm the SafeHome security system via the control panel.		
Actors	**Primary:** Home owner		
Assumptions			
Constraints			
Pre-conditions	The security system is armed.		
Primary Scenario	1. The home owner inputs a four-digit password. 2. The security system verifies whether or not the password is correct. If it is		

	correct, the home owner presses the stay button within 10 seconds. 3. The control software deactivates all the sensors. 4. The control panel displays that SafeHome is disarmed and dims the red light labeled 'armed'.
Exceptions	2a. After the home owner inputs the 4-digit password, if the password is incorrect, the control panel will beep once and display that the password is incorrect. The home owner must reenter the password. 2b. If the stay button is not pressed within 10 seconds, the home owner must start again by typing the password.
Post-conditions	The SafeHome system is in stay mode with all sensors deactivated.
Frequency of Use	Frequent, when the home owner is in the 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 after the correct password is entered 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

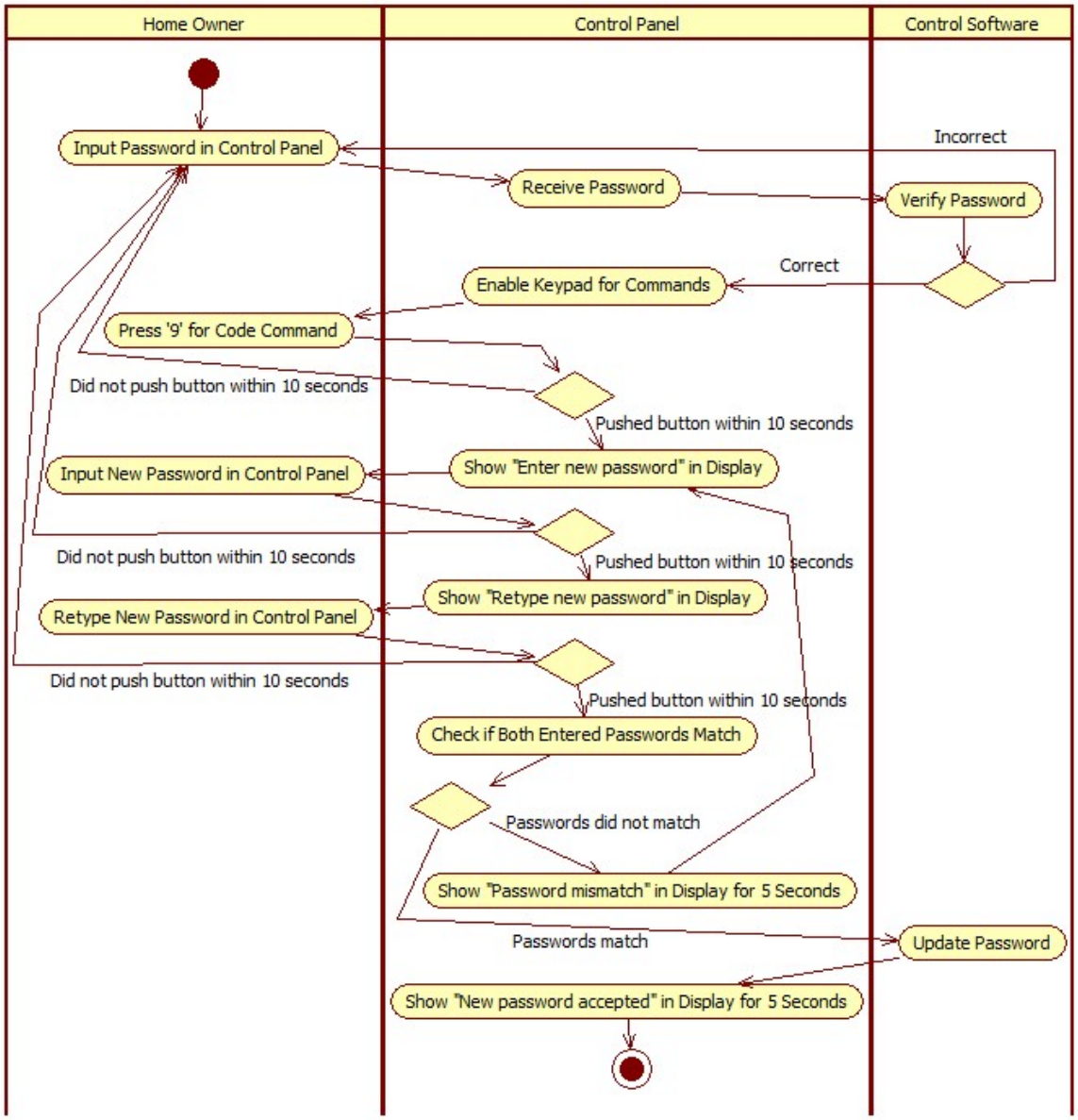

Figure 3.4 – Change Password via Control Panel Swimlane Diagram

Use Case ID	UC-3	Use Case Name	Change Password
Diagram Ref ID	Figure 3.1, Figure 3.4	Priority	High
Created By	Jaebok kim	Last Updated By	Francisco Rojas
Date Created	3/7/2009	Date Last Updated	3/28/2009
Goal	To change the 4-digit control panel password used by SafeHome for issuing commands from any control panel.		
Actors	**Primary:** Home owner		
Assumptions	The 4-digit password has already been set before.		
Constraints			
Pre-conditions			
Primary Scenario	1. A home owner inputs a four-digit password to the control panel 2. The control software validates the password as correct and the control		

	panel enables the keypad for commands. 3. The home owner pushes the button "code" within 10 seconds. The control panel display says to enter the new password, and so the home owner types a new password within 10 seconds. 4. The control panel display says to retype the new password, so the home owner does, and the control panel verifies that both new passwords are the same. 5. The control panel password is saved by the control software. 6. The control panel displays that the new password was accepted.
Exceptions	2a. After the home owner inputs the 4-digit password, if the password is incorrect, the control panel will beep once and display that the password is incorrect. The home owner must reenter the password. 3a. If the code button is not pressed within 10 seconds, the home owner must start again by typing the password. 3b. The home owner fails to enter the new password within 10 seconds, and so must start from the beginning. 4a. The home owner fails to retype the new password within 10 seconds, and so must start from the beginning. 4b. The control panel detects a mismatch between the new passwords entered and displays for 5 seconds that there was a password mismatch. The control panel displays to enter the new password again, repeating the procedure.
Post-conditions	The new password replaces the previous one. The home owner must enter the new password in any of the control panels from now on.
Frequency of Use	Very infrequent.
Business Rules	
Special Requirements	The initial control panel password is given to the home owner via the control software manual printed on the back cover. To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel after the correct password is entered 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	

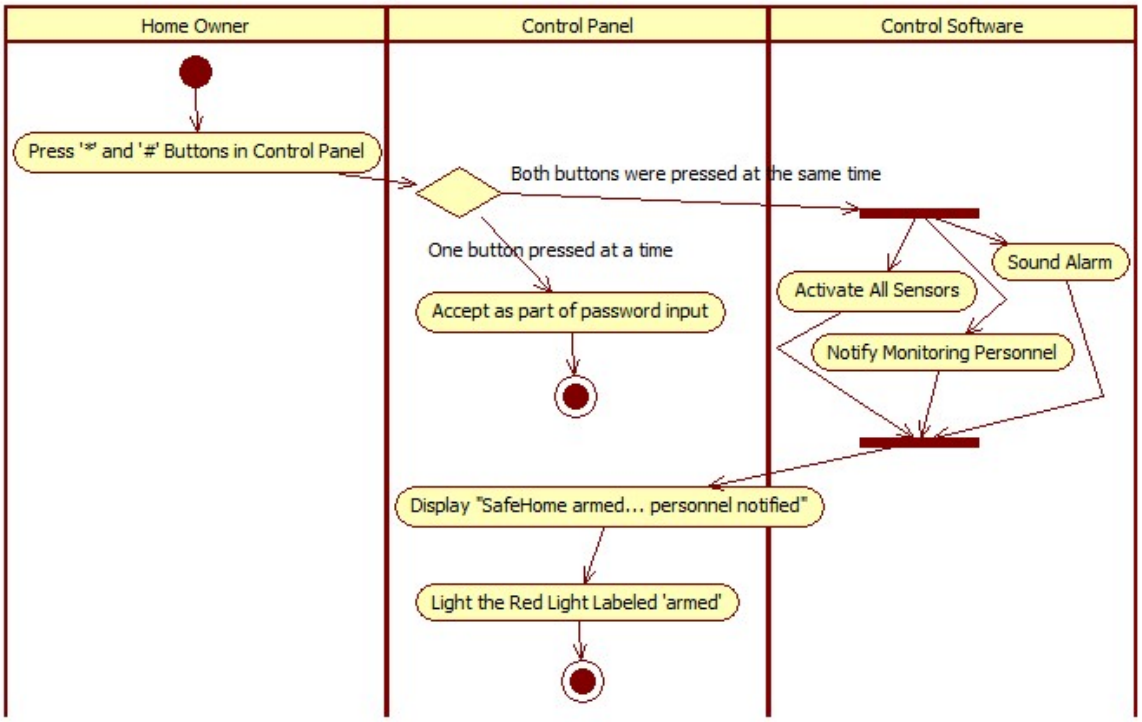

Figure 3.5 – Activate Panic Mode via Control Panel Swimlane Diagram

Use Case ID	UC-4	Use Case Name	Activate Panic Mode
Diagram Ref ID	Figure 3.1, Figure 3.5	Priority	High
Created By	Jaebok kim	Last Updated By	Francisco Rojas
Date Created	3/7/2009	Date Last Updated	3/28/2009
Goal	To activate panic mode via the control panel to alert monitoring personnel, sound the alarm, and arm the SafeHome security system.		
Actors	**Primary:** Home owner		
Assumptions	The SafeHome security system is not already on panic mode.		
Constraints			
Pre-conditions			
Primary Scenario	1. A home owner pushes the button "*" and "#" at the same time. 2. Concurrently, the alarm sounds, the sensors activate, and the monitoring personnel are notified of the panic incident. 3. The control panel displays that the SafeHome system is armed and that personnel has been notified. The red light labeled 'armed' is lit.		
Exceptions	1a. The buttons were not pressed at the same time, so just accept as password input.		
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 seconds.		

	To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel after the correct password is entered 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	

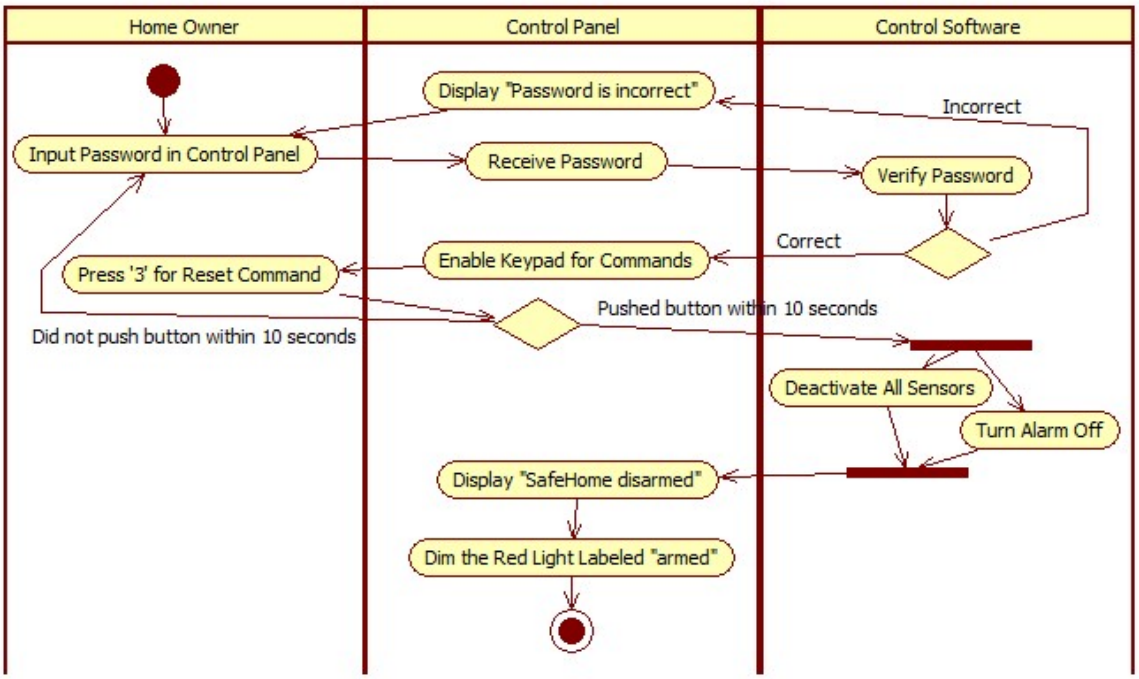

Figure 3.6 – Reset SafeHome via Control Panel Swimlane Diagram

Use Case ID	UC-5	Use Case Name	Reset SafeHome
Diagram Ref ID	Figure 3.1, Figure 3.6	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/28/2009	Date Last Updated	3/28/2009
Goal	To deactivate panic mode via the control panel or to reset the state of SafeHome to normal, such as recovering from an error.		
Actors	**Primary:** Home owner		
Assumptions	The SafeHome security system needs to be reset to normal.		
Constraints			
Pre-conditions			
Primary Scenario	1. The home owner enters the control panel password, which the control software verifies is correct. The keypad is enabled for just one command: reset. 2. The home owner presses the ‘reset’ button within 10 seconds. 3. The control software concurrently disables the alarm sound and deactivates all sensors. 4. The control panel displays that SafeHome was disarmed and dims the red		

	light labeled ‘armed’.
Exceptions	1a. The password was incorrect and the control panel makes this known. 2a. The home owner did not press the ‘reset’ button within 10 seconds, and so must start from the beginning.
Post-conditions	
Frequency of Use	Low, when the urgent situation occurs.
Business Rules	
Special Requirements	Only ‘reset’ button is enabled after inputting the password to the control panel. To solve conflict occurring from multiple panels, atomicity of a single command is guaranteed. Any first input on any control panel after the correct password is entered 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	

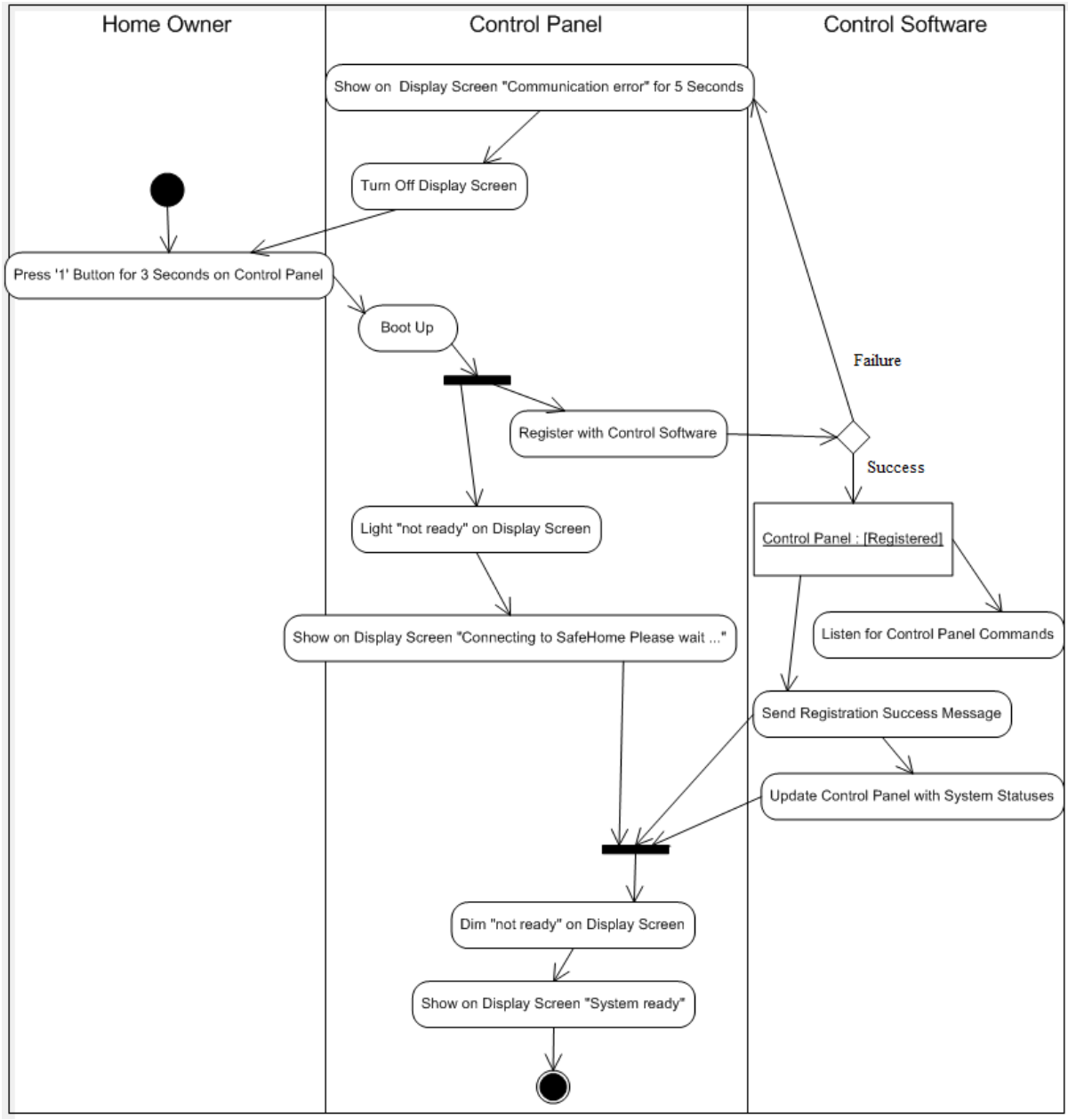

Figure 3.7 – Power On Control Panel Swimlane Diagram

Use Case ID	UC-6	Use Case Name	Power On Control Panel
Diagram Ref ID	Figure 3.1, Figure 3.7	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/28/2009	Date Last Updated	3/28/2009
Goal	To turn on the control panel and to have it connect with the SafeHome control software.		
Actors	**Primary:** Home owner		
Assumptions	The control panel is off and SafeHome's control software is running somewhere within wireless range.		
Constraints			
Pre-conditions			
Primary Scenario	1. The home owner presses the 'on' button.		

	2. The control panel gets registered by the control software. 3. The control software is prepared for receiving commands from the registered control panel. 4. The control panel indicates on the display that it is ready.
Exceptions	2a. The control panel fails to register with the control software due to a communication error and shuts down after displaying this problem.
Post-conditions	
Frequency of Use	Low, usually the control panel is always on.
Business Rules	
Special Requirements	
Notes and Issues	

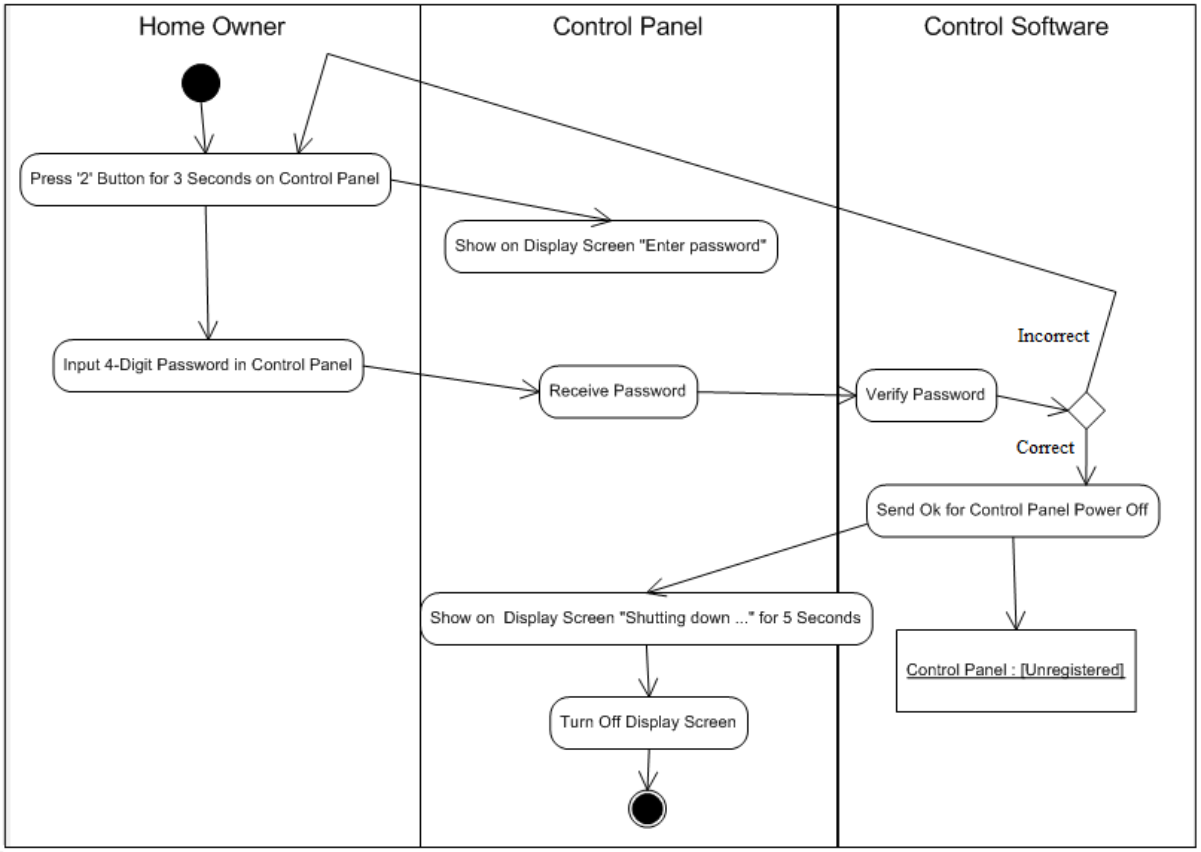

Figure 3.8 – Power Off Control Panel Swimlane Diagram

Use Case ID	UC-7	Use Case Name	Power Off Control Panel
Diagram Ref ID	Figure 3.1, Figure 3.8	Priority	High
Created By	Francisco Rojas	Last Updated By	Francisco Rojas
Date Created	3/28/2009	Date Last Updated	3/28/2009

Goal	To turn off the control panel.
Actors	**Primary:** Home owner
Assumptions	The control panel is on.
Constraints	
Pre-conditions	
Primary Scenario	1. The home owner presses the 'off' button then enters the correct password. 2. The control panel turns itself off.
Exceptions	1a. The password is incorrect, so start again.
Post-conditions	
Frequency of Use	Low, usually the control panel does not need to be turned off.
Business Rules	
Special Requirements	
Notes and Issues	

3.1.3 Functional Requirements

3.1.3.1 Arm/Disarm System

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

3.1.3.2 Encounter Error Conditions

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

3.1.3.3 Reset Password

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

3.1.3.4 Set Panic Mode

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

3.2 SafeHome Web Service and Configuration

3.2.1 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.

3.2.2 Use Cases

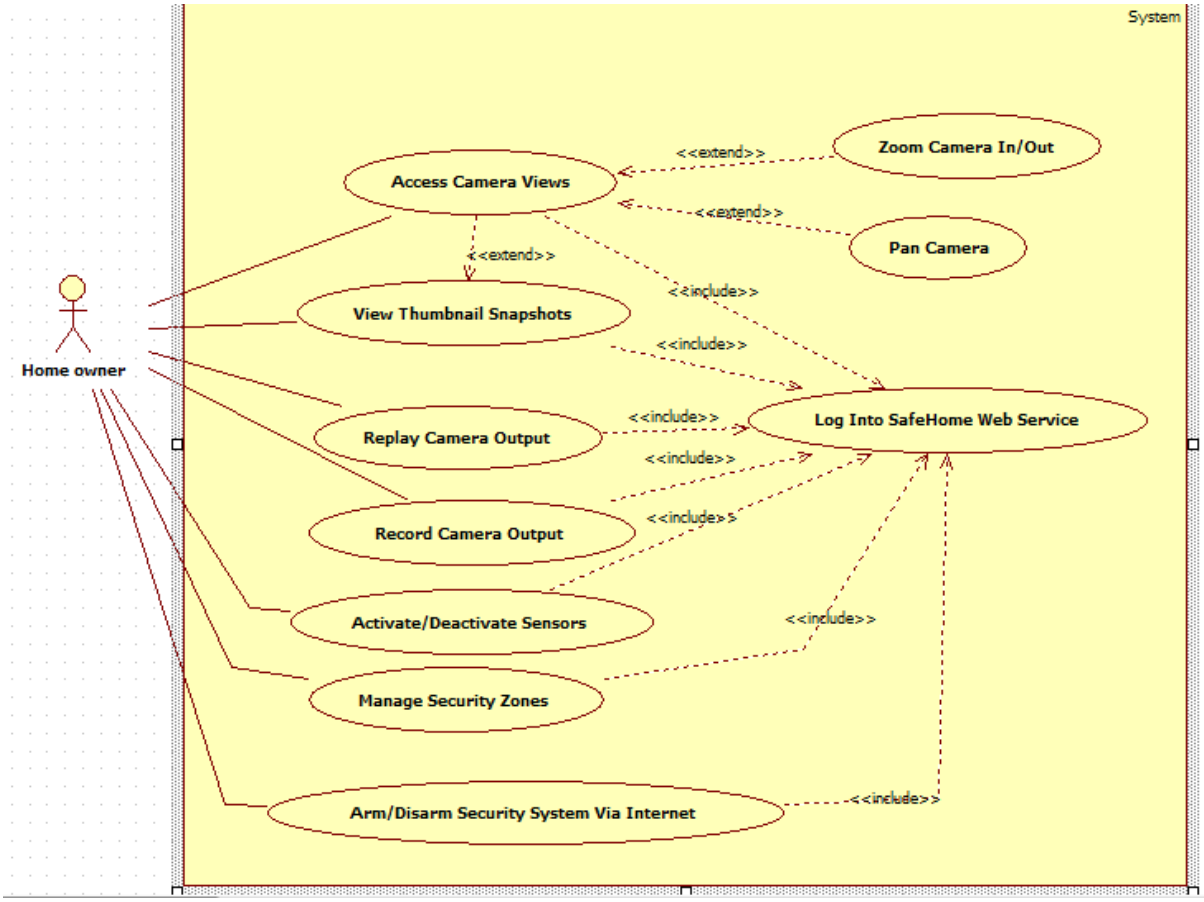

Figure 3.9 – SafeHome Web Service Use Case Diagram

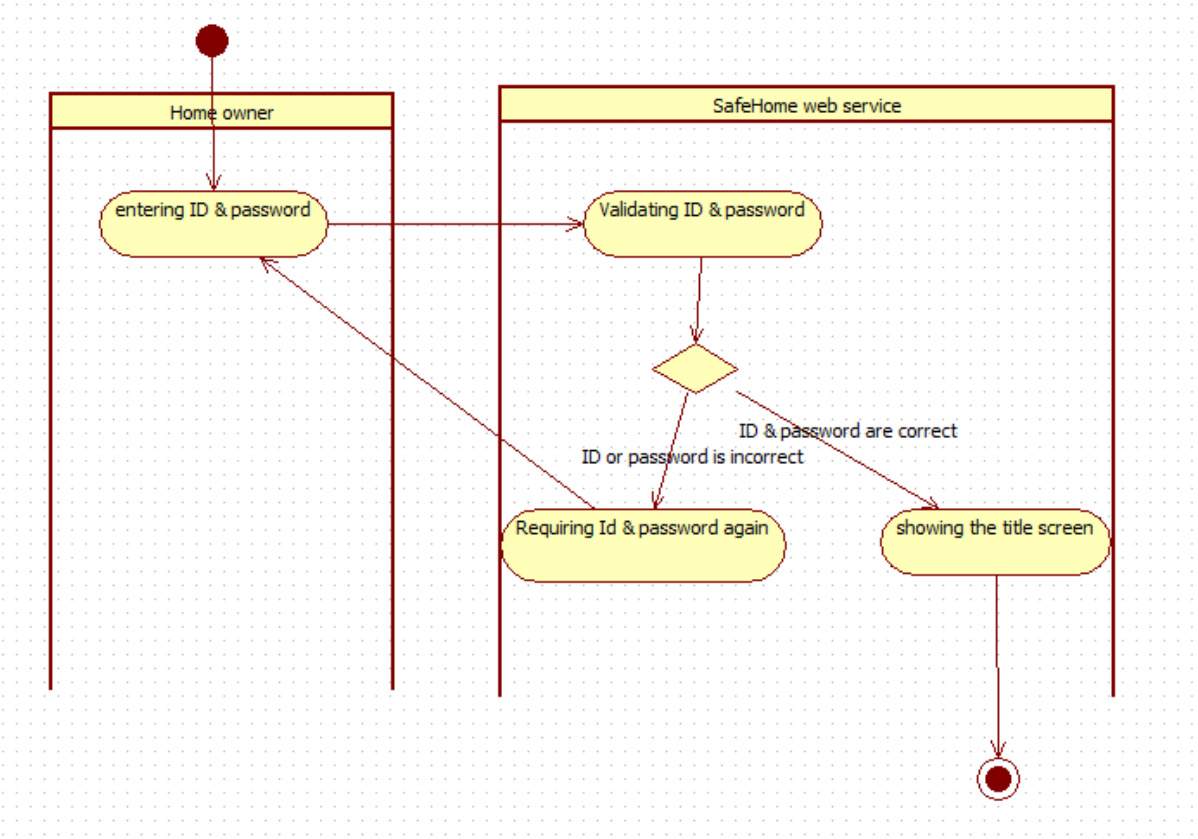

Figure 3.10 Log Into SafeHome Web Service

Use Case ID	UC-8	Use Case Name	Log Into SafeHome Web Service
Diagram Ref ID	Figure 3.9, Figure 3.10	Priority	High
Created By	Jaebok Kim	Last Updated By	Jaebok Kim
Date Created	3/6/2009	Date Last Updated	3/29/2009
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	

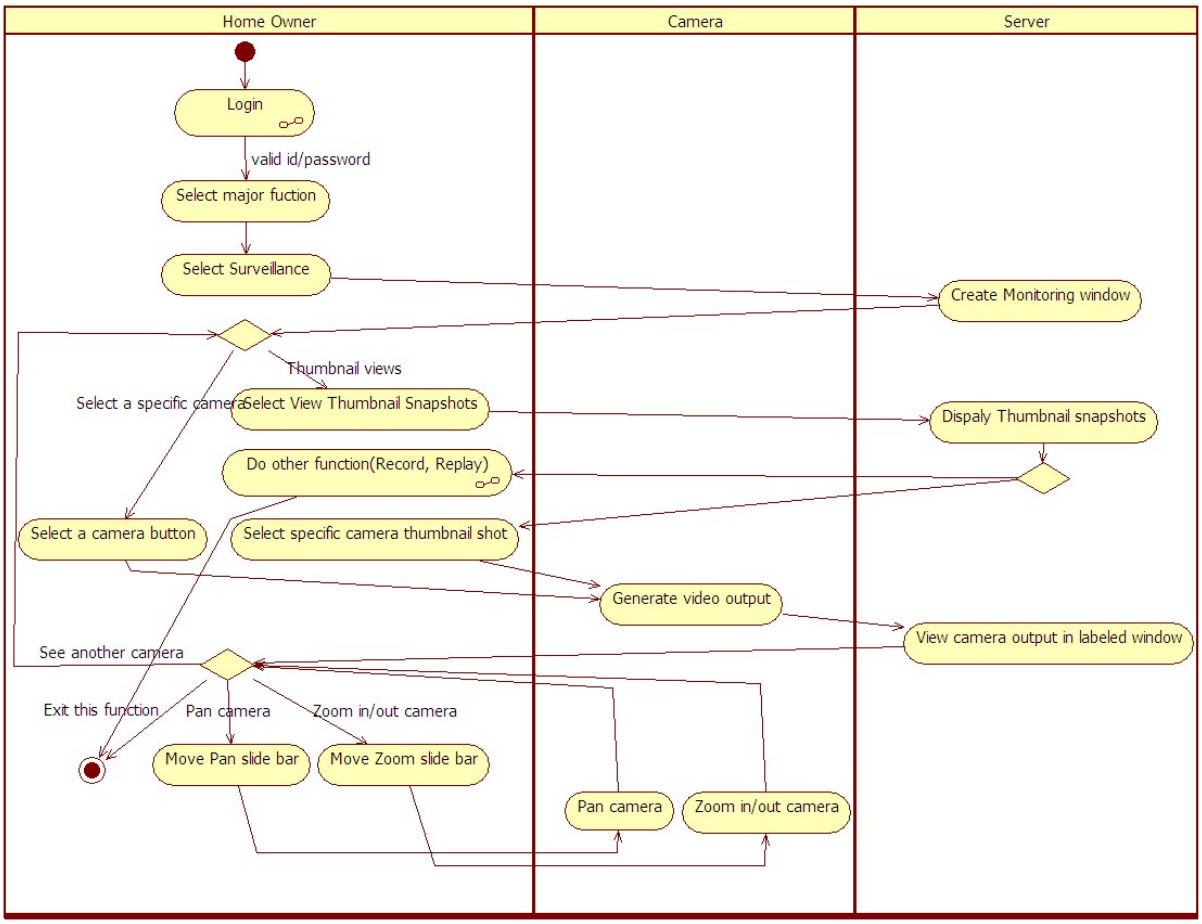

Figure 3.11 Access the camera and Pan and zoom in/out camera.

Use Case ID	UC-9	Use Case Name	Pan Camera
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Jaebok Kim	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/27/2009
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-11), 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	Frequent		

Use	
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-10	Use Case Name	Zoom Camera In/Out
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Jaebok Kim	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/27/2009
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-11), 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-11	Use Case Name	Access Camera View
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/8/2009	Date Last Updated	3/27/2009
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-8), 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-12). 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-12	Use Case Name	View Thumbnail Snapshots
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/27/2009
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-8), 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.		

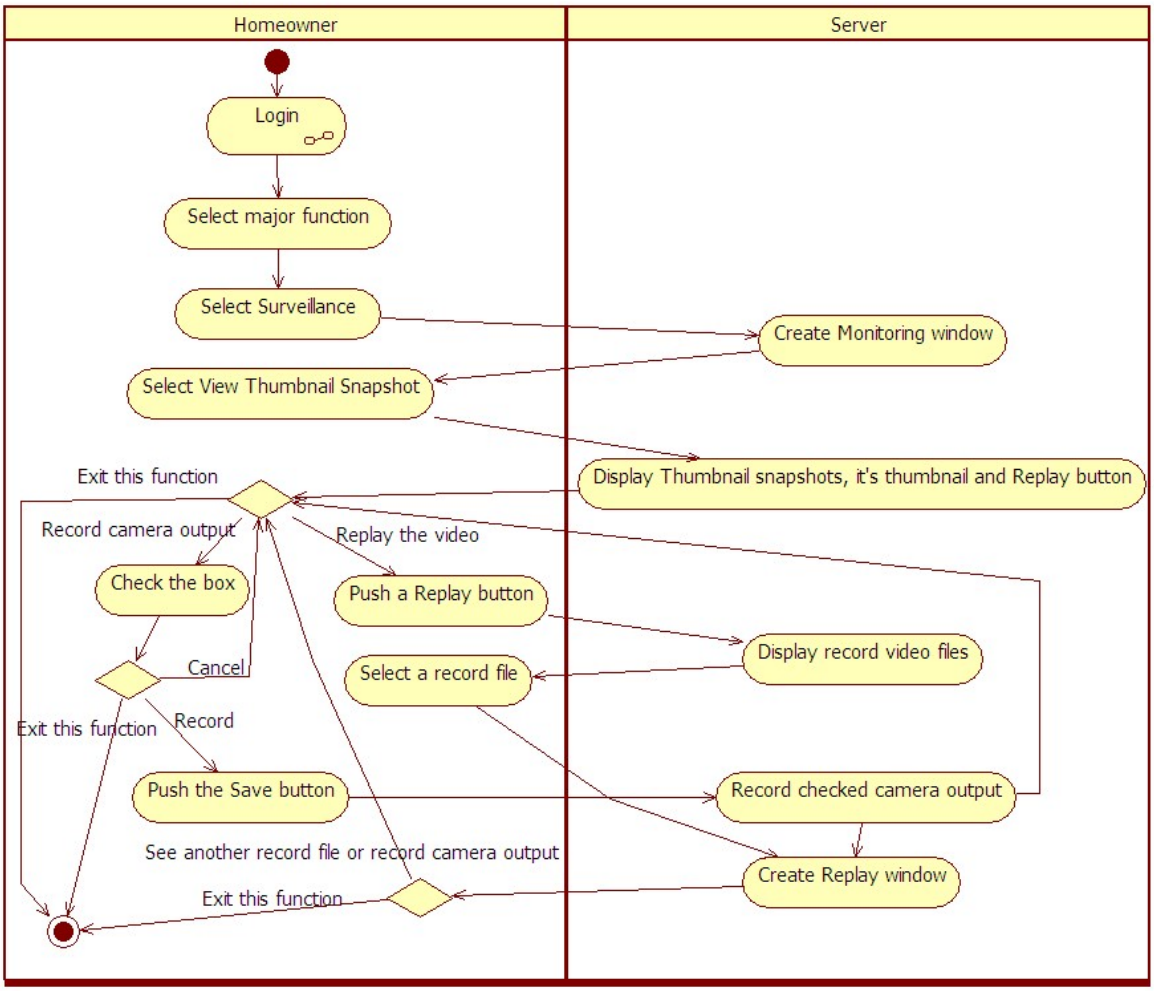

Figure 3.11 Record camera output and Replay the record file.

Use Case ID	UC-13	Use Case Name	Record Camera Output
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/27/2009
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-12), 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-14	Use Case Name	Replay Camera Output
Diagram Ref ID	Figure 3.9	Priority	Medium
Created By	Hyunsik Cho	Last Updated By	Hyunsik Cho
Date Created	3/6/2009	Date Last Updated	3/27/2009
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-12), 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			

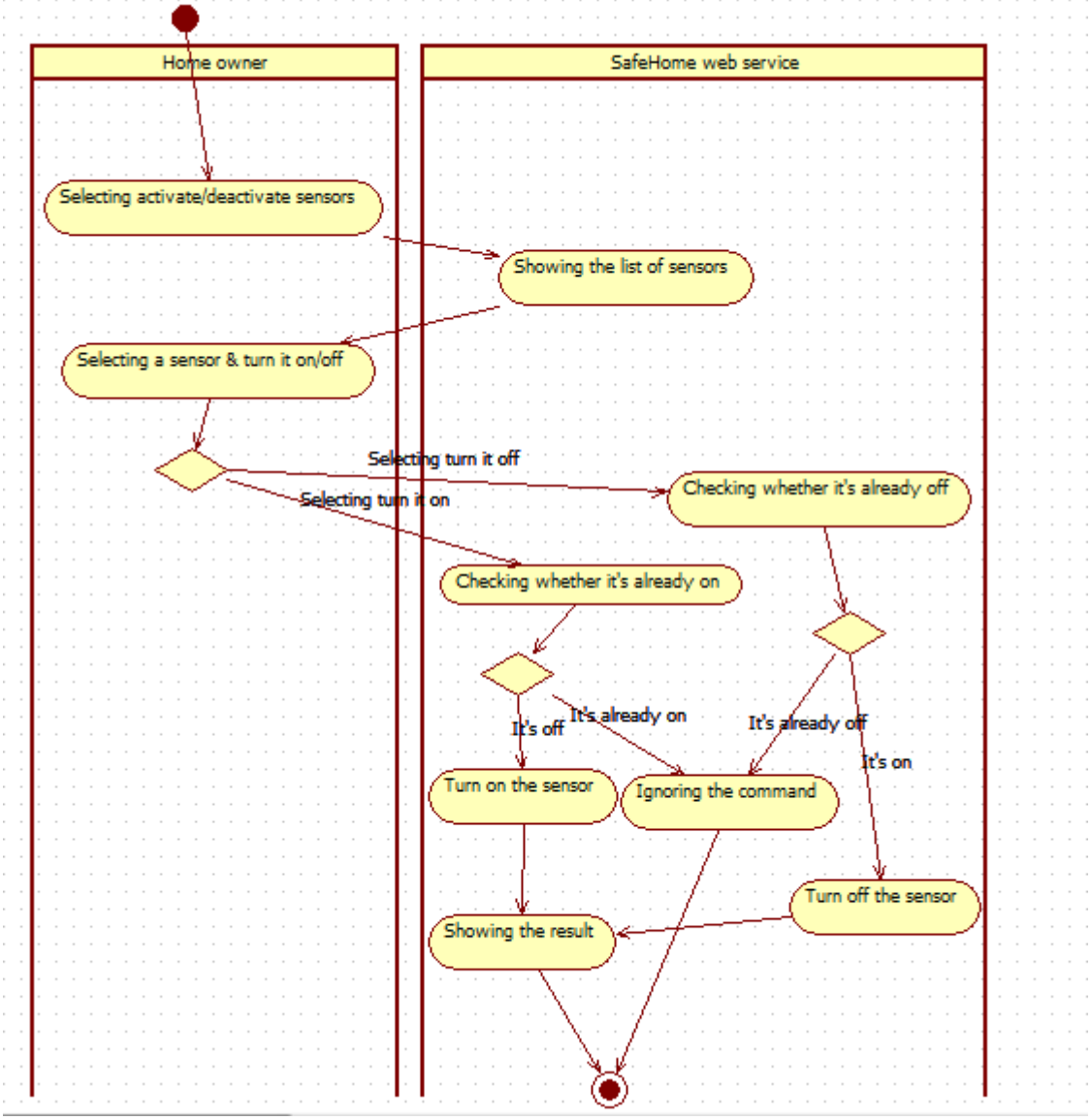

Figure 3.13 Activate/Deactivate Sensors

Use Case ID	UC-15	Use Case Name	Activate/Deactivate Sensors
Diagram Ref ID	Figure 3.9 Figure 3.13	Priority Last Updated By	High Jaebok kim
Created By	Jaebok kim	Date Last	3/29/2009
Date Created	3/7/2009	Updated	
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	

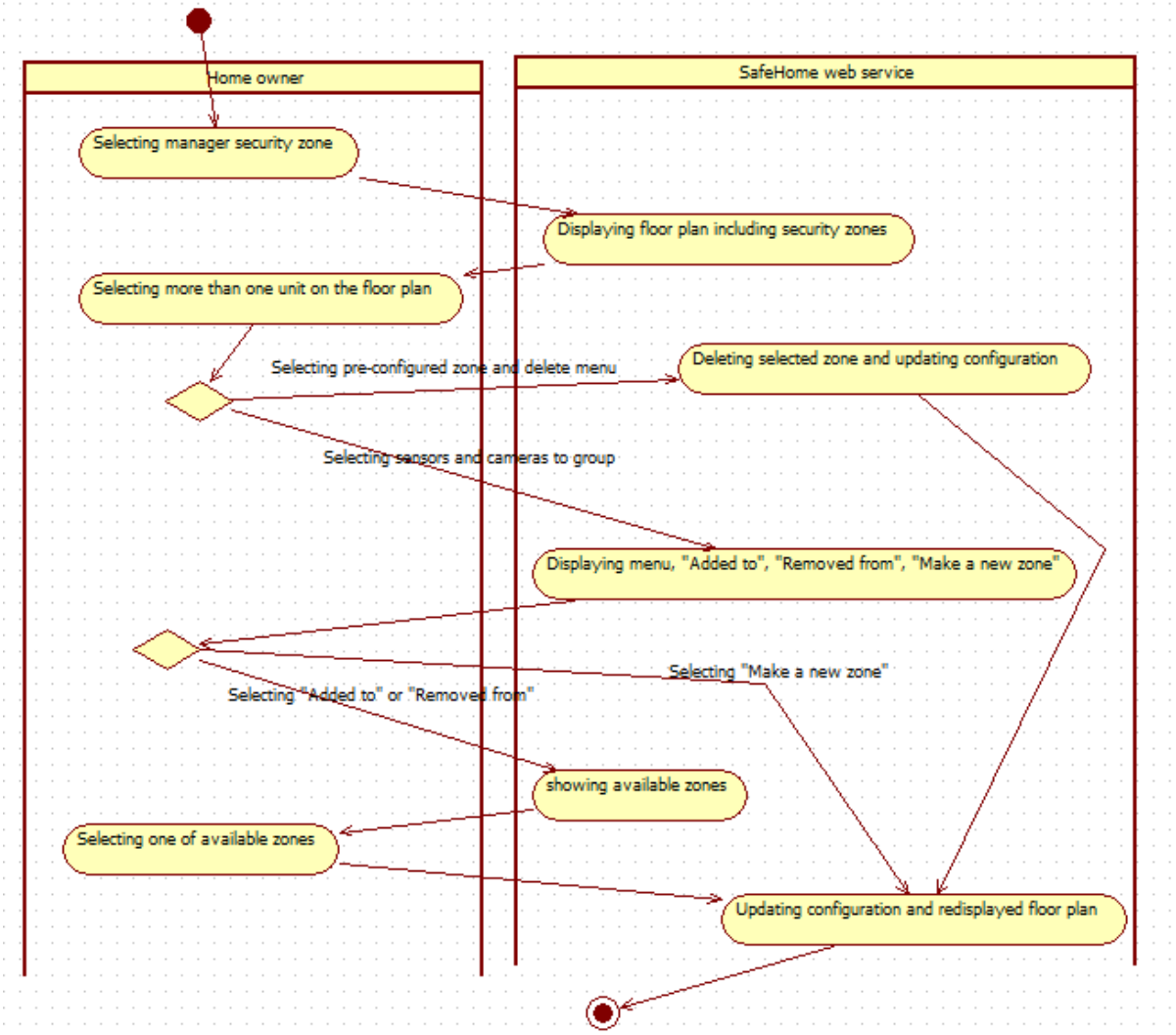

Figure 3.14 Manage Security Zones

Use Case ID	UC-16	Use Case Name	Manage Security Zones
Diagram Ref ID	Figure 3.9	Priority	Medium

	Figure 3.14	Last Updated By	Jaebok Kim
Created By	Hyunsik Cho	Date Last	3/29/2009
Date Created	3/8/2009	Updated	
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 home owner 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 SafeHome web service displays sub menu, including “Added to”, “Removed from”, “Making a new zone” 5. The home owner selects “Added to” 6. The SafeHome web service displays the ID list of available zones 7. The home owner selects one of available zones on the list. 8. The selected sensors and cameras are added to the selected zone.		
Exceptions	3a The home owner selects a zone already configured, and then The home owner pushes the button “Delete”. The selected zone is removed. 4a The home owner selects “Removed from”. The use case follows 6 and 7, and then the selected sensors and cameras are removed from the selected zone. 4b The home owner selects “Making a new zone”. The web service gives available ID for new zone.		
Post-conditions	The system updates the configuration of zones and redisplays the floor plan with security zones.		
Frequency of Use	Medium		
Business Rules			
Special Requirements	All security zones have their own ID. It starts from 0, and the maximum is 10. Both cameras and any kinds of sensors can be grouped into a security zone. It’s not allowed for groups to include redundant sensors or cameras.		
Notes and Issues			

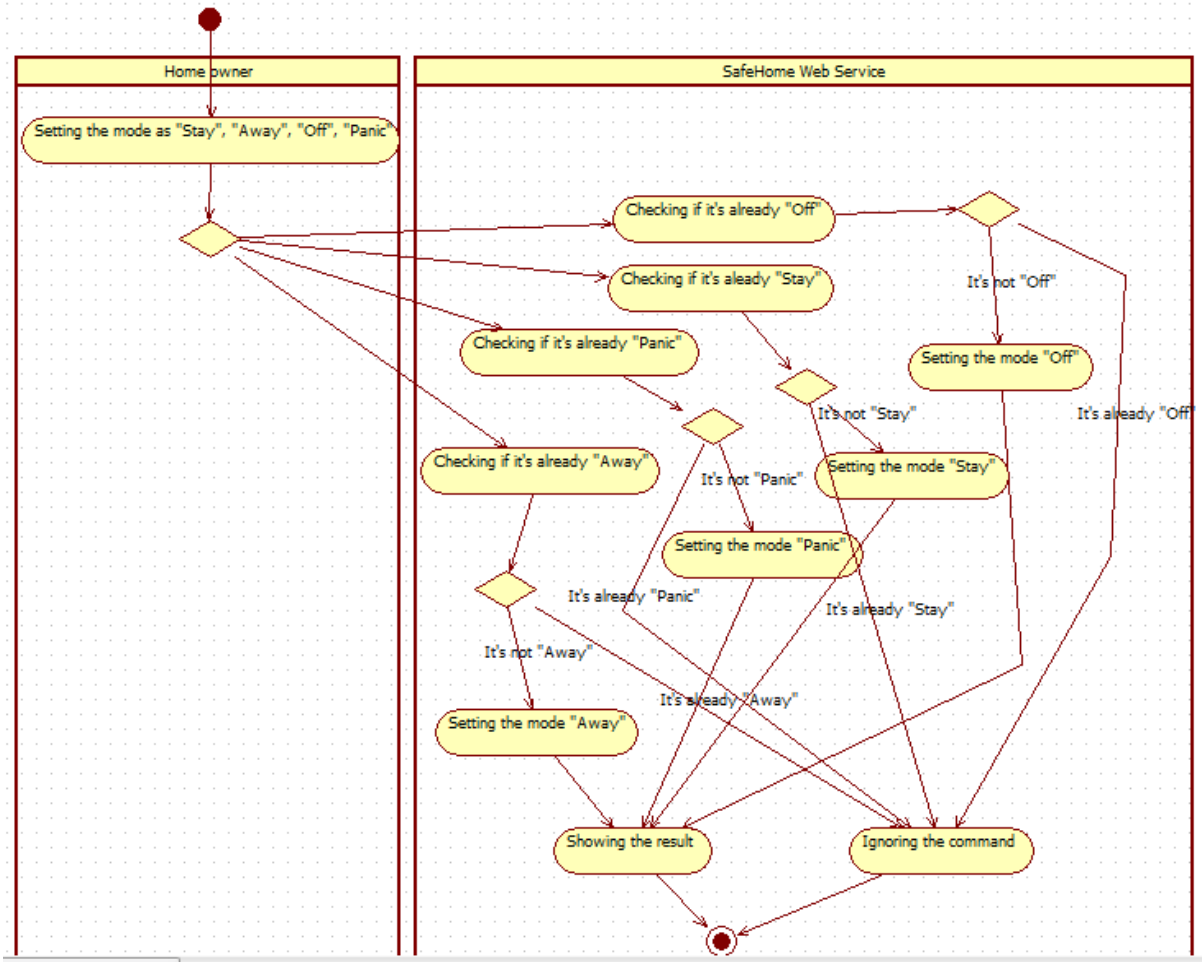

Figure 3.15 Arm/disarm Security System Via Internet

Use Case ID	UC-17	Use Case Name	Arm/Disarm Security System Via Internet
Diagram Ref ID	Figure 3.9 Figure 3.15	Priority Last Updated By	High Jaebok Kim
Created By	Jaebok Kim	Date Last	3/10/2009
Date Created	3/10/2009	Updated	
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

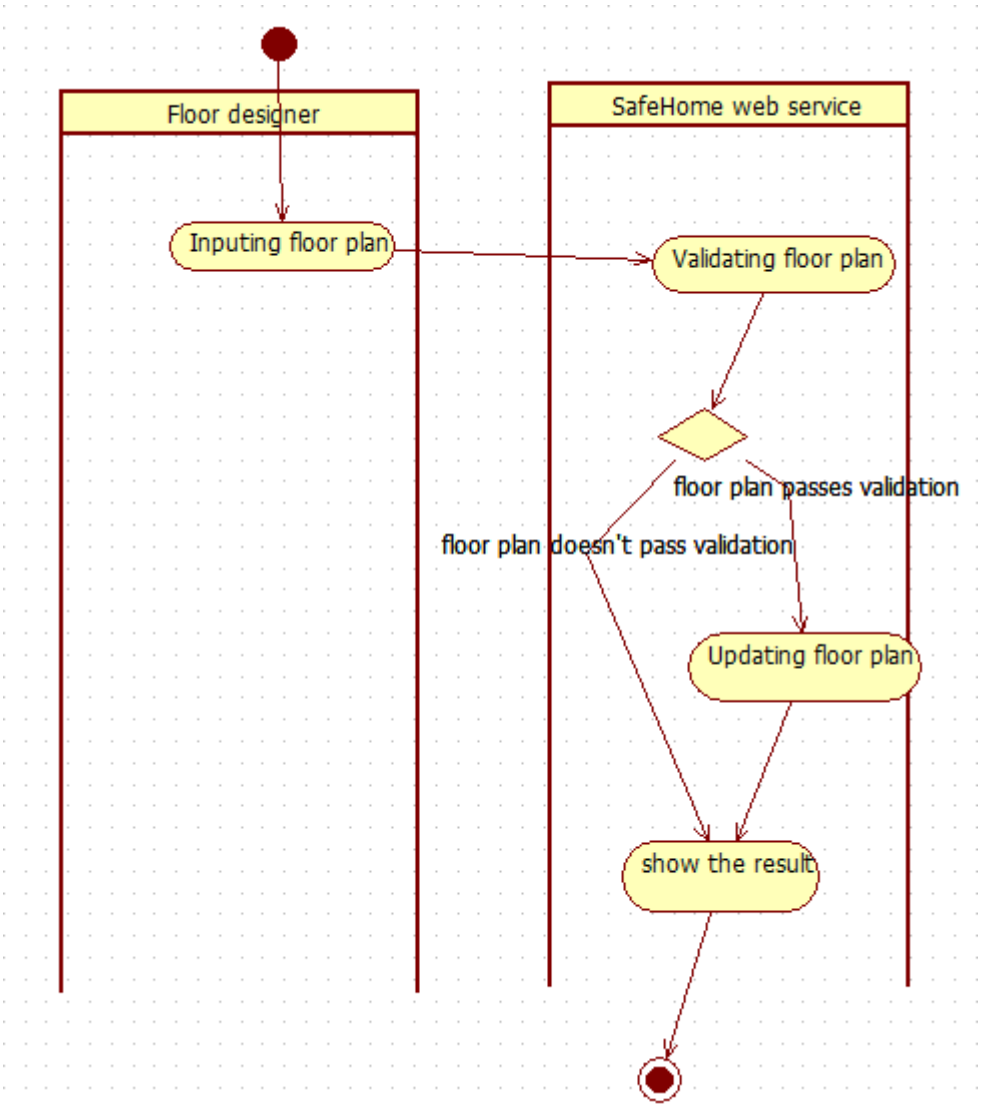

Figure 3.16 Configure Floor Plan

Use Case ID	UC-18	Use Case Name	Configure Floor Plan
Diagram Ref ID	Figure 3.16	Priority	High
Created By	Jaebok kim	Last Updated By	Jaebok kim
Date Created	3/10/2009	Date Last Updated	3/29/2009
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 central processor.
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-19	Use Case Name	Control System via Multiple Control Panels
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 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-20	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	

3.2.3 Functional Requirements

3.2.3.1 Log into SafeHome Web Service

3.2.3.1.1 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.

3.2.3.2 Pan Camera

3.2.3.2.1 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.

3.2.3.2.2 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.

3.2.3.2.3 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.

3.2.3.3 Zoom Camera In/Out

3.2.3.3.1 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.

3.2.3.3.2 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.

3.2.3.3.3 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.

3.2.3.4 Accessible Camera Views

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

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

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

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

3.2.3.5 View Thumbnail Snapshots

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

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

3.2.3.6 Record Camera Output

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

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

3.2.3.6.3 When it stops recoding, the file is saved.

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

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

3.2.3.6.6 The home owner can delete record files.

3.2.3.7 Replay Camera Output

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

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

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

3.2.3.7.4 If a camera never perform recording, the system don't perform replaying function.

3.2.3.8 Activate/Deactivate Sensors

3.2.3.8.1 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.

3.2.3.9 Manage Security Zones

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

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

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

3.2.3.9.4 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.

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

3.2.3.10 Arm/Disarm Security System via Internet

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

3.2.3.11 Control Security System Via Multiple Control Panels

3.2.3.11. 1 Only one command is accepted according to atomicity of a command.

3.2.3.12 Access SafeHome Web Service Via Multiple Web Browsers

3.2.3.12.1 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.

3.3 Window/Door Motion Sensor Monitoring

3.3.1 Description

The SafeHome uses a network of sensors to detect the opening and closing of windows and doors.

3.3.2 Use Cases

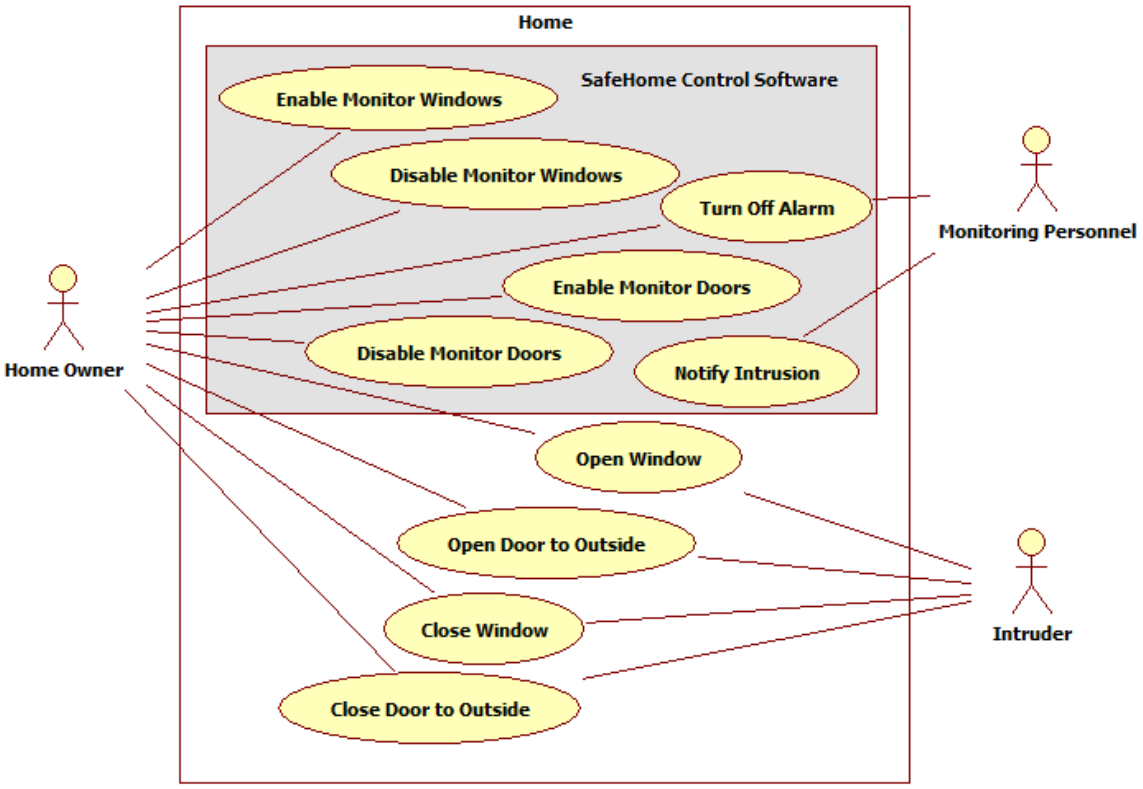

Figure 3.17 – Monitoring Windows and Doors Use Case Diagram

Use Case ID	UC-21	Use Case Name	Monitor Windows and Doors
Diagram Ref ID	Figure 3. Figure 3.17	Priority	High
		Last Updated By	Francisco Rojas
Created By	Francisco Rojas	Date Last Updated	3/6/2009
Date Created	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

3.3.3 Functional Requirements

3.3.3.1 Window / Door Motion Sensor Monitoring

3.3.3.1.1 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.

3.3.3.1.2 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.

3.3.3.1.3 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.

3.3.3.1.4 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.

3.4 Outside Movement Monitoring

3.4.1 Description

The SafeHome system must monitor outside movement.

3.4.2 Use Cases

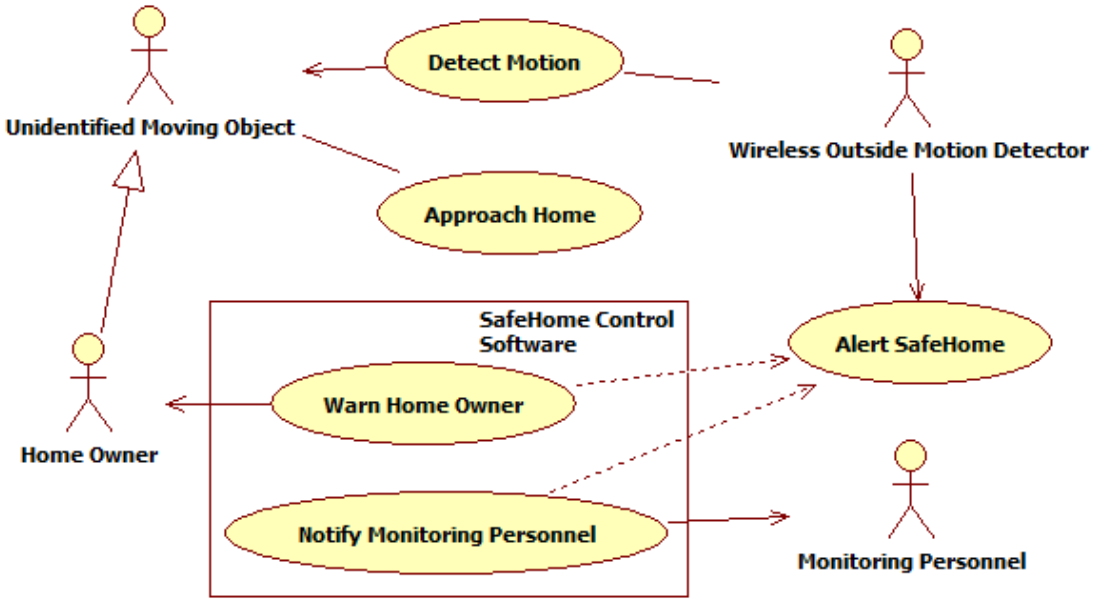

Figure 3.18 – Monitoring Outside Movement Use Case Diagram

Use Case ID	UC-22	Use Case Name	Monitor Outside Movement
Diagram Ref ID	Figure 3. Figure 3.18	Priority	High
		Last Updated By	Francisco Rojas
Created By	Francisco Rojas	Date Last Updated	3/8/2009
Date Created	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

3.4.3 Functional Requirements

3.4.3.1 Outside Movement Monitoring

3.4.3.1.1 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).

3.4.3.1.2 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.

3.5 Fire and Smoke Monitoring

3.5.1 Description

The SafeHome system must monitor for fire and smoke.

3.5.2 Use Cases

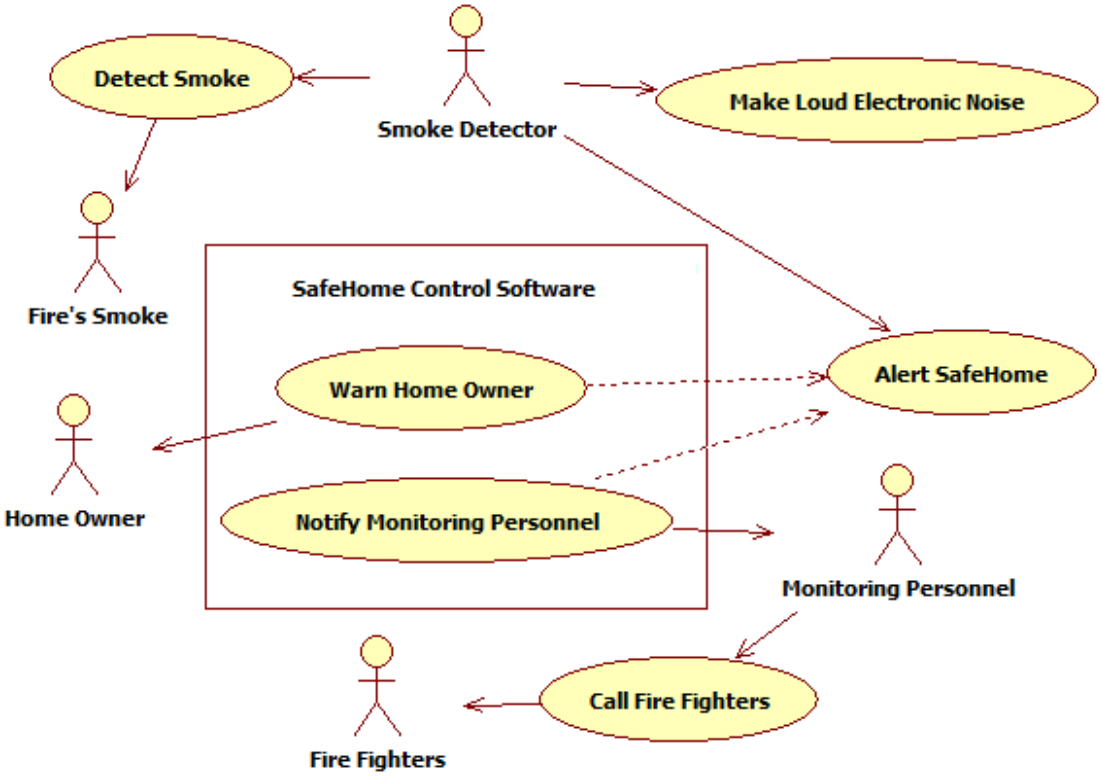

Figure 3.19 – Monitoring Fire and Smoke Use Case Diagram

Use Case ID	UC-23	Use Case Name	Monitor for Fire and Smoke
Diagram Ref ID	Figure 3.19	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

3.5.3 Functional Requirements

3.5.3.1 Fire and Smoke Monitoring

3.5.3.1.1 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.

3.6 Carbon Monoxide Monitoring

3.6.1 Description

The SafeHome system must monitor for carbon monoxide.

3.6.2 Use Cases

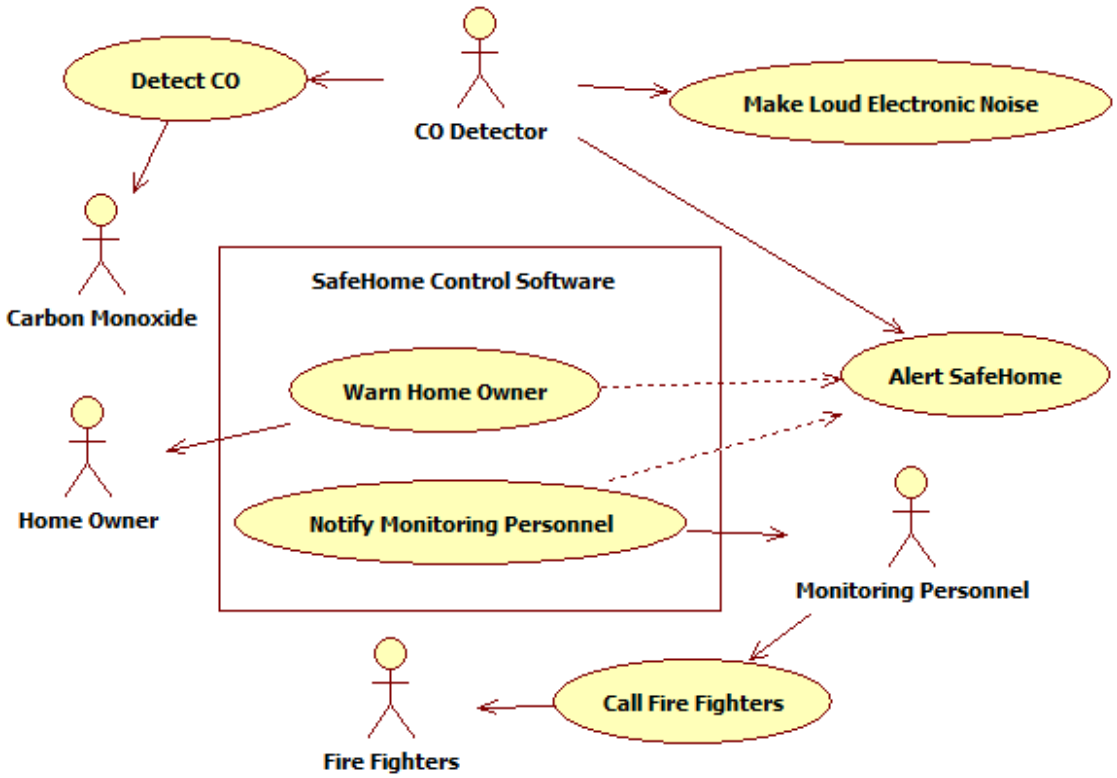

Figure 3.20 – Monitoring Carbon Monoxide (CO) Use Case Diagram

Use Case ID	UC-24	Use Case Name	Monitor for Carbon Monoxide
Diagram Ref ID	Figure 3.20	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

3.6.3 Functional Requirements

3.6.3.1 Carbon Monoxide Monitoring

3.6.3.1.1 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.

3.7 Basement Water Levels Monitoring

3.7.1 Description

The SafeHome system must monitor for basement water levels.

3.7.2 Use Cases

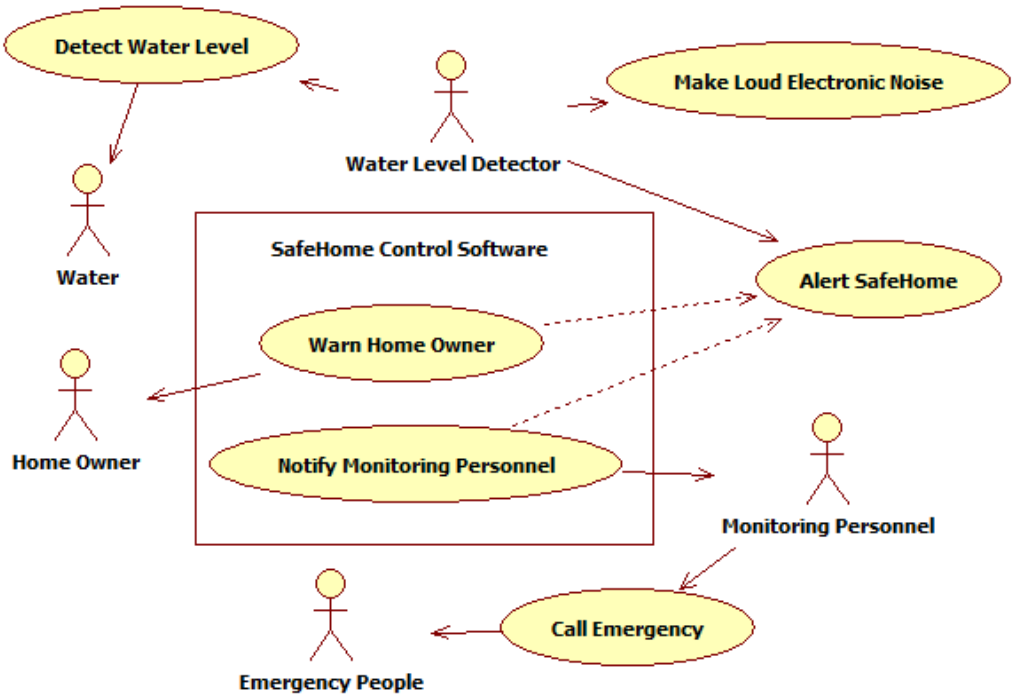

Figure 3.21 – Monitoring Water Levels Use Case Diagram

Use Case ID	UC-25	Use Case Name	Monitor for Basement Water Levels
Diagram Ref ID	Figure 3.21	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

3.7.3 Functional Requirements

3.7.3.1 Basement Water Levels Monitoring

3.7.3.1.1 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.

4. Nonfunctional 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.

APPENDIX

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

Word Index

Traceability

Table 1 – Functional Requirements to Use Cases Traceability Matrix

		Use Case																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Functional Requirement	3.1.3.1.1	•	•																		
	3.1.3.2.1																				
	3.1.3.3.1			•																	
	3.1.3.4.1				•																
	3.2.3.1.1								•	•	•	•	•	•	•						
	3.2.3.2.1								•			•									
	3.2.3.2.2								•			•									
	3.2.3.2.3								•			•									
	3.2.3.3.1								•			•									
	3.2.3.3.2								•			•									
	3.2.3.3.3								•			•									
	3.2.3.4.1								•	•	•		•	•	•						
	3.2.3.4.2								•	•	•		•	•	•						
	3.2.3.4.3								•	•	•		•	•	•						
	3.2.3.4.4								•	•	•		•	•	•						
	3.2.3.5.1								•			•									
	3.2.3.5.2								•			•									
	3.2.3.6.1								•				•								
	3.2.3.6.2								•				•								
	3.2.3.6.3								•				•								
	3.2.3.6.4								•				•								
	3.2.3.6.5								•				•								
	3.2.3.6.6								•				•								
	3.2.3.7.1								•				•								
	3.2.3.7.2								•				•								
	3.2.3.7.3								•				•								
	3.2.3.7.4								•				•								
	3.2.3.8.1															•					
	3.2.3.9.1																		•		
	3.2.3.9.2																		•		
	3.2.3.9.3																		•		
	3.2.3.9.4																		•		
	3.2.3.9.5																		•		
	3.2.3.10.1																	•			
	3.2.3.11.1																			•	
	3.2.3.12.1																				•

		21	22	23	24	25
	3.3.3.1.1	•				
	3.3.3.1.2	•				
	3.3.3.1.3	•				
	3.3.3.1.4	•				
	3.4.3.1.1		•			
	3.4.3.1.2		•			

	3.5.3.1.1			•		
	3.6.3.1.1				•	
	3.7.3.1.1					•

Table 2 – Functional Requirements to System Features Traceability Matrix

		System Features						
		1	2	3	4	5	6	7
Functional Requirement	3.1.3.1.1	•						
	3.1.3.2.1	•						
	3.1.3.3.1	•						
	3.1.3.4.1	•						
	3.2.3.1.1		•					
	3.2.3.2.1		•					
	3.2.3.2.2		•					
	3.2.3.2.3		•					
	3.2.3.3.1		•					
	3.2.3.3.2		•					
	3.2.3.3.3		•					
	3.2.3.4.1		•					
	3.2.3.4.2		•					
	3.2.3.4.3		•					
	3.2.3.4.4		•					
	3.2.3.5.1		•					
	3.2.3.5.2		•					
	3.2.3.6.1		•					
	3.2.3.6.2		•					
	3.2.3.6.3		•					
	3.2.3.6.4		•					
	3.2.3.6.5		•					
	3.2.3.6.6		•					
	3.2.3.7.1		•					
	3.2.3.7.2		•					
	3.2.3.7.3		•					
	3.2.3.7.4		•					
	3.2.3.8.1		•					
	3.2.3.9.1		•					
	3.2.3.9.2		•					
	3.2.3.9.3		•					
	3.2.3.9.4		•					
	3.2.3.9.5		•					
	3.2.3.10.1		•					
	3.2.3.11.1		•					
	3.2.3.12.1		•					
	3.3.3.1.1			•				
	3.3.3.1.2			•				
	3.3.3.1.3			•				
	3.3.3.1.4			•				
	3.4.3.1.1				•			
	3.4.3.1.2				•			
	3.5.3.1.1					•		
	3.6.3.1.1						•	
	3.7.3.1.1							•

Table 3 - Figures to Use Cases Traceability Matrix

		Use Case																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	21	22
Figure	3.1	•	•	•	•	•	•	•													
	3.2	•																			
	3.3		•																	•	
	3.4			•																	•
	3.5				•																
	3.6					•															
	3.7						•														
	3.8							•													
	3.9								•	•	•	•	•	•	•	•	•	•			
	3.10								•												
	3.11									•	•	•	•								
	3.12													•	•						
	3.13															•					
	3.14																•				
	3.15																	•			
	3.16																		•		
	3.17																			•	
	3.18																				•
	3.19																				

		23	24	25
	3.19	•		
	3.20		•	
	3.21			•

Meeting Logs

Phase I: Requirements Specification

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

Phase II: Analysis Model

1st Meeting

TIME AND LOCATION	March 26th 2009, 2:00PM-3:00PM, CS Building Near Computer Lab
TYPE OF MEETING	Division of Labor on Producing Analysis Model Diagrams
FACILITATOR	Francisco A. Rojas
ATTENDEES	Francisco A. Rojas, Jaebok Kim, Hyunsik Cho
DOCUMENT PREPARED BY	Francisco A. Rojas

DISCUSSION	
1 – Agreeing which members do which parts for analysis model. Who will do presentation on Monday.	
2 – How to finish diagrams, FRs, and reorganize SRS before Sunday deadline.	
CONCLUSIONS	
1 – The breakdown of analysis modeling work is figured out.	
2 – Francis will perform presentation on Monday.	

ACTION ITEMS	**PERSON RESPONSIBLE**	**DEADLINE**
Control Panel UML analysis phase diagrams, presentation	Francisco A. Rojas	3/5/2009
Web service UML analysis phase diagrams	Jaebok Kim	3/5/2009
Video camera related UML analysis phase diagrams	Hyunsik Cho	3/5/2009

Authorship

Phase I: Requirements Specification

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

Phase II: Analysis Model

Note: Vast updates and changes were made to the SRS (including the section numbering and figure numbering); if a section is not listed, then no change was made to that section.

Sections	**Authors**
1.5 SRS Structure Overview	Francisco A. Rojas
2.1 Product Perspective	Francisco A. Rojas
2.4 Operating Environment and Hardware Descriptions	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
2.8 Assumptions and Dependencies	Francisco A. Rojas
3.1 Operation of Control Panel	Francisco A. Rojas
3.1.1 Description	Francisco A. Rojas
3.1.2 Use Cases	Francisco A. Rojas
3.3 Window/Door Motion Sensor Monitoring	Francisco A. Rojas
3.3.1 Description	Francisco A. Rojas

3.13 - Activate/deactivate sensors	Jaebok Kim
3.14 - Manage Security Zones	Jaebok Kim
3.15- Arm/disarm Security System Via Internet	Jaebok Kim
3.16 - Configure Floor Plan	Jaebok Kim
3.11 - Access the camera and Pan and zoom in/out camera	Hyunsik Cho
3.12 - Record camera output and Replay the record file	Hyunsik Cho

Use Case Descriptions	**Authors**
1 - Arm SafeHome via Control Panel	Francisco A. Rojas
2 - Disarm SafeHome via Control Panel	Francisco A. Rojas
3 - Change Password	Francisco A. Rojas
4 - Activate Panic Mode	Francisco A. Rojas
5 - Reset SafeHome	Francisco A. Rojas
6 - Power On Control Panel	Francisco A. Rojas
7 - Power Off Control Panel	Francisco A. Rojas
8 – Log into SafeHome Web Service	Jaebok Kim
15 – Activate/Deactive Sensors	Jaebok Kim
18 – Configure Floor Plan	Jaebok Kim
9 – Pan Camera	Hyunsik Cho
10 – Zoom Camera In/Out	Hyunsik Cho
11 – Access Camera View	Hyunsik Cho
12 – View Thumbnail Snapshots	Hyunsik Cho
13 – Record Camera Output	Hyunsik Cho
14 – Replay Camera Output	Hyunsik Cho
