Software Requirements Specification

with

Analysis Model

and

Design Model

FINAL Revision: 20150607

TEAM 5

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*Responsibility is denoted by ◇**(Sumin Han), and ●(Joonhoo Oh)**

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A. Project Overview

A.1. Introduction ◇

SafeHome is automated system which enables users to surveil home anytime anywhere when the user is inside thorugh control panel or outside through the internet. In addition, user can access to some of the functions and control their behaviors. If there's any abnormal event such as intruder detection via Windoor sensor or Motion sensor. In these cases, user will be konw through Web service that has been notifed by SafeHome System.

A.2. Main target for this document ◇

This documents is intended to share information for the programmers, project managers, designers, and testers. This document contains both internal systems and behaviors of SafeHome systems, functionality, and designs including floor plan GUI and control panels.

A.3. Responsibility ◇●

The authorship information for the work product in this document is denoted as ●(Joonhoo Oh) and ◇(Sumin Han) for accountability and maintainability.

B. SafeHome Overview

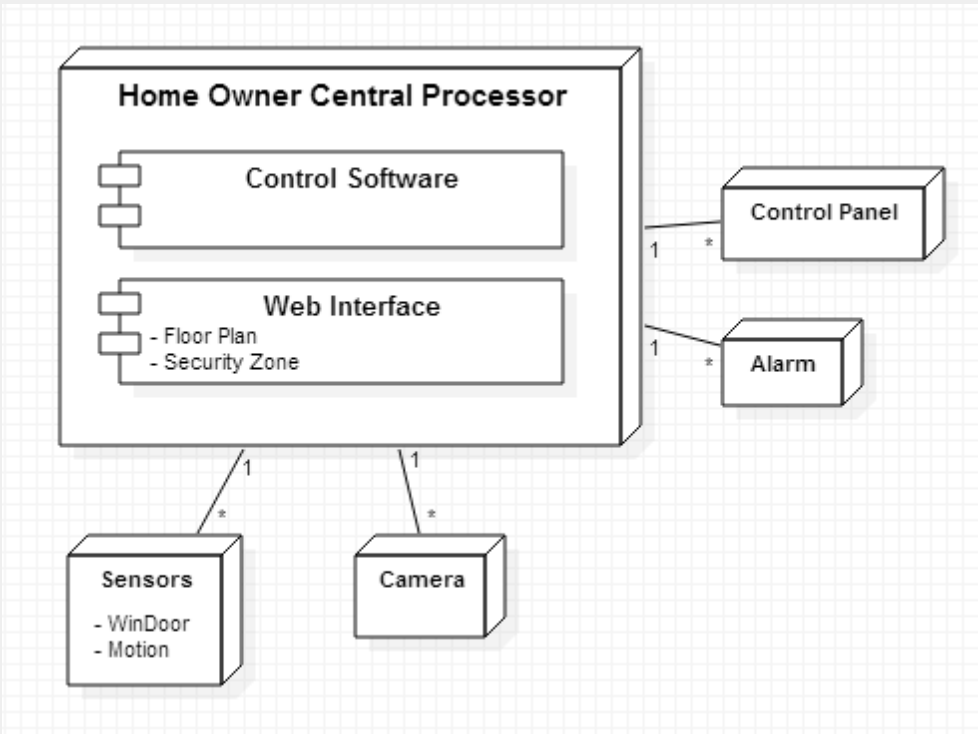


Figure-B-1. System Deployment Diagram ◇

B.1. Assumptions for SafeHome project ◇

1. Internet connection between a homeowner (i.e., homeowner's smartphone or notebook) and the SafeHome system is always available.
2. No physical control panel, no web GUI, but standalone Java program supporting all web-based features such as security zone configuration and camera views, etc.
3. All devices including cameras, sensors, and the SafeHome main system communicate using **IEEE 802.11x**

B.2. SafeHome Units ◇

1. **SafeHome Main Server**
   :Controls entire functionalities: 1. Control panel and Web Service, 2. Alarm, 3. Settings and User DB, 4. Sensors and Camera Unit which detects actual abnormality.
2. **Control Software**
   : Mostly related to the direct control with sensors and cameras. Also include devices that are connected wirless using IEEE 802.11b standard. Control Software takes care of internal system.

3. **Control Panel**
   : Control panel is installed only one inside house. To use functions via Control Panel, it only requires 4-digit numbered password. It can take off power from logged in Web User. Since control panel is connected with wireless IEEE 802.11b, there's no need for internet connection.

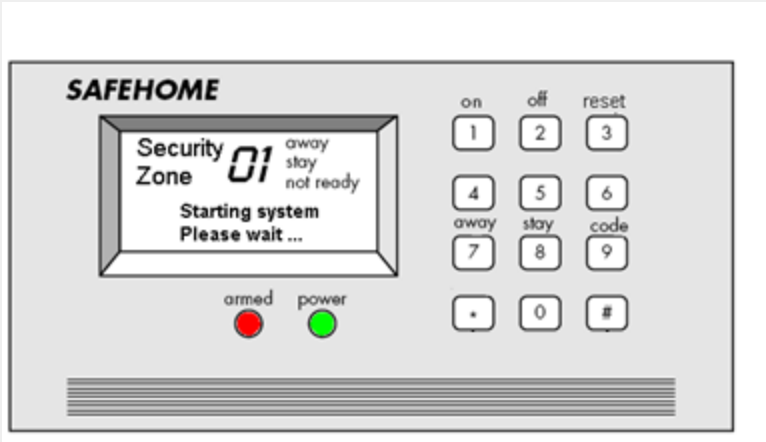


Figure-B-2. Control Panel ◇●

4. **Web Service**
   : Web service enables ubiquitous access to the SafeHome main server. User must enter their ID and passwords to be logged in. Both control panel and web user can access data though, however, user of the control panel gets the higher authority.
   : Web service runs on JRE so in order to use Web service, the computer should have JRE installed to view on webpage.
5. **User DB and Configuration**
   : Control panel and Web service has different port however, they share the same user DB and settings.
6. **Alarm**
   : Alarm is class that will be implemented. This class will be used to check whether there is new event, and note that this is not actual alarm. Web Service and Control Software should continuously check alarm element to get the news.
7. **Sensors**
   : There are three types of sensors: 1. Motion, 2. Window, 3. Door. However, at the implementation level they would have no differences. They have same functions: read/enable/disable/test.
8. **Camera Unit**
   : Camera has zoom in/out and pan functions. Home Owner can change the gaze of the camera.

B.3. Information ◇

- **Password type:**
  - Control Panel: 4 digit number
  - Web Service: plain any character string with at least 8 characters.
- **State of Sensors**
  - read
  - enable
  - disable
  - test
- **Camera Function**
  - play
  - controlling (zoom in/out, pan)
- **State of House**
  - away (arm)
  - stay (disarm)
- **Method to get Asynchronous Data**
  - Interrupt is not available!!! (should be implemented using thread and check by backgroudn loop statement)

B.4. Security Zone ◇

Security zone is group of sensors and cameras that is used to separate zones in the house to manage rather efficiently. Therefore, there can be multiple zones and each zones may have different number of cameras or sensors. If there's no camera assigned to specific zone, that zone doesn't support surveillance in the web service.

B.5. Use-case Overview ◇●

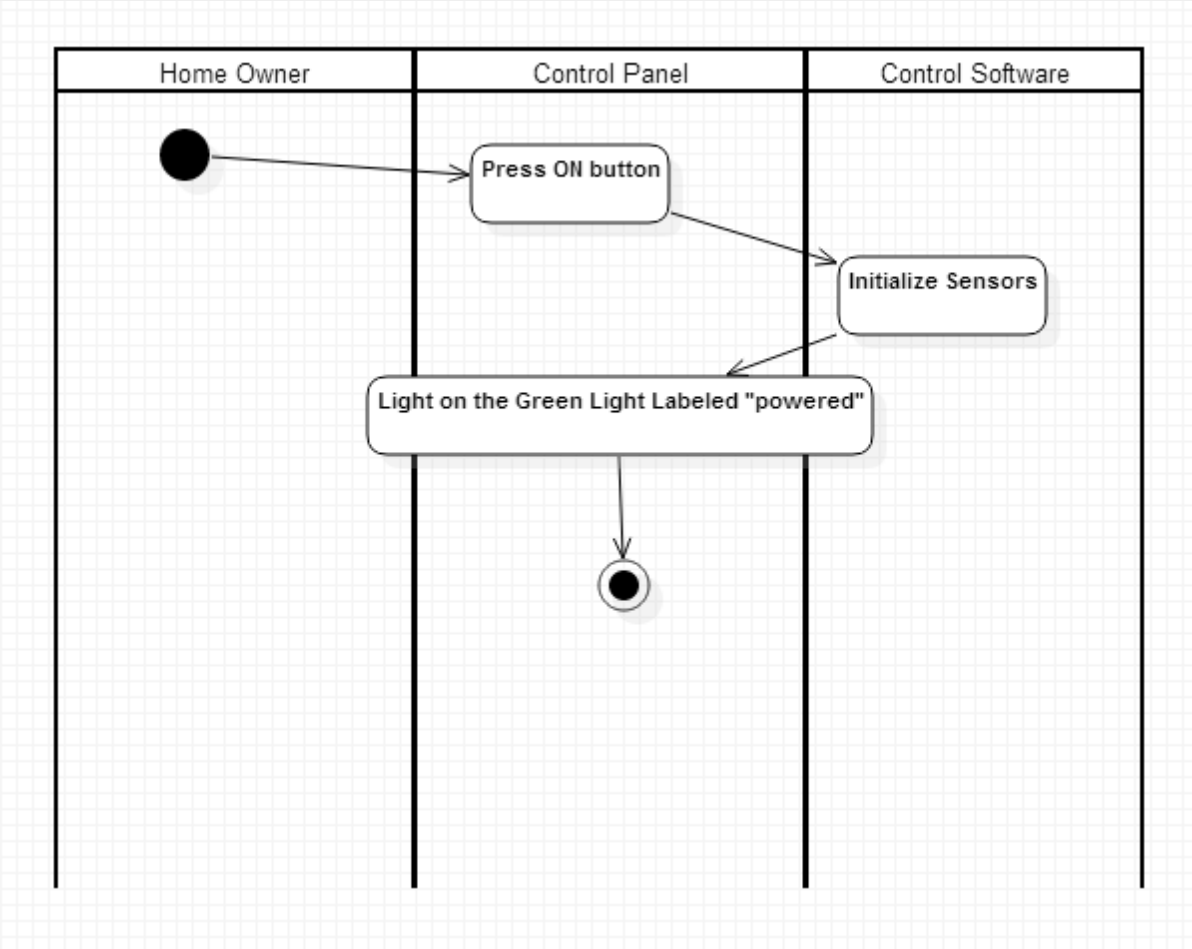
Our team grouped use-cases into 8 big categories and have lots of change :

1. **Boot**
    a. Mainly deals with central processor booting or shoutdown.
    b. Use cases for the initialization and the finish of sensors are also included.
    c. However since camera doesn't have enable and disable (on and off), we removed initialize and finish camera. When boot up, each camera just follows previous setting value of pan and zoom.
2. **Configure**
    a. Setting sensors use or not use
3. **User Management**
    a. Mainly deals with Login activities.
4. **Arm/Disarm**
    a. Arm/disarm events via control panel or web service are included in this category.
5. **Intruder Prevention System**
    a. Basically intruder detector is running on background, therefore they check every sensors and compare with alarm type
6. **Home Management**
    a. In the reality, sensors are not considered separately. They just have different 'sensorType' for each element.
7. **Home Surveillance**
    a. Camera control functions such as camera overview from floor plan, thumbnails , camera setting are in this category.

C. Use cases

C.1. Boot

UC-1-1. Boot-up (CP) ●

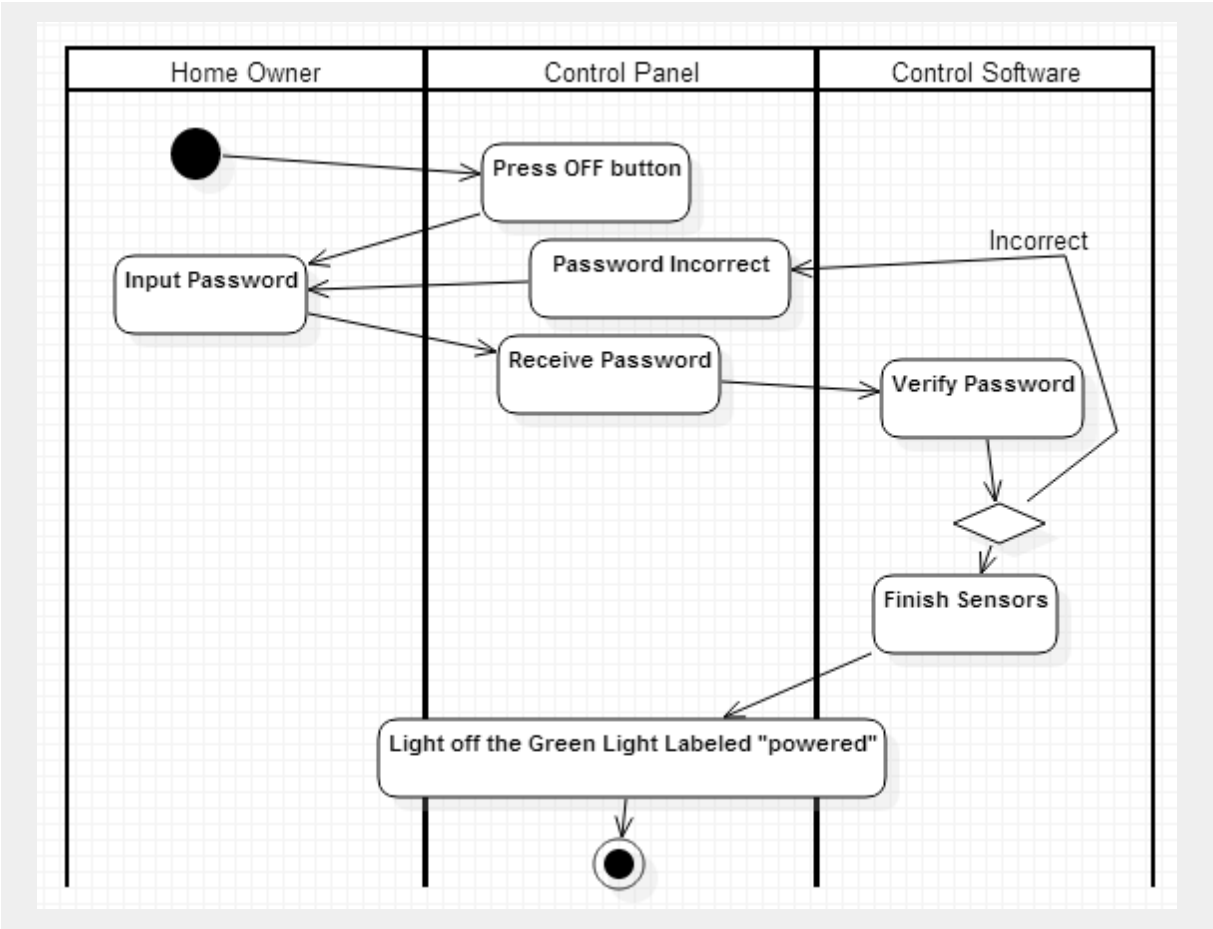


FC-1. Swimlane diagram for Boot-up via Control Panel ●

Use Case ID	UC-1-1
Use Case Name	Boot-up (CP)
Primary actor	Home Owner
Goal in context	Boot-up the Home Owner's Central Processor
Preconditions	Central Processor has bene shutdown.
Trigger	Home Owner press the POWER button

Scenario	1. Home Owner presses the ON button(Num 1) on Control Panel. 2. Safehome do UC:Initialize Sensor 3. Light the Green Light labled “powered”
Exceptions	
Priority	High
Frequency	Sometimes
Open issues	SafeHome do not offer function to boot-up by request from Web Service.
Channel to actor	
Secondary actors	

UC-1-2 Shutdown (CP) ●



FC-2. Swimlane diagram for Shutdown via Control Panel ●

Use Case ID	UC-1-2
Use Case Name	Shutdown (CP)
Primary actor	Home Owner
Goal in context	Shutdown the Home Owner's Central Processor
Preconditions	System Boot-up
Trigger	Home Owner presses the OFF button(Num 2)
Scenario	1. Home Owner presses the OFF button(Num 2) on Control Panel and enters password. 2. Safehome UC:finsh Sensor
Exceptions	
Priority	middle
Frequency	sometimes
Open issues	SafeHome do not offer function to shutdown by request from Web Service.
Channel to actor	
Secondary actors	

UC-1-3. Initialize Sensors ●

Use Case ID	UC-1-3
Use Case Name	Initialize Sensors
Primary actor	Control Software
Goal in context	Enable and intialize the sensors.
Preconditions	All of the sensors are disabled.
Trigger	UC:Boot-up
Scenario	1. Home Owner pressed ON button(Num 1) and the Central Processor has been booted up.

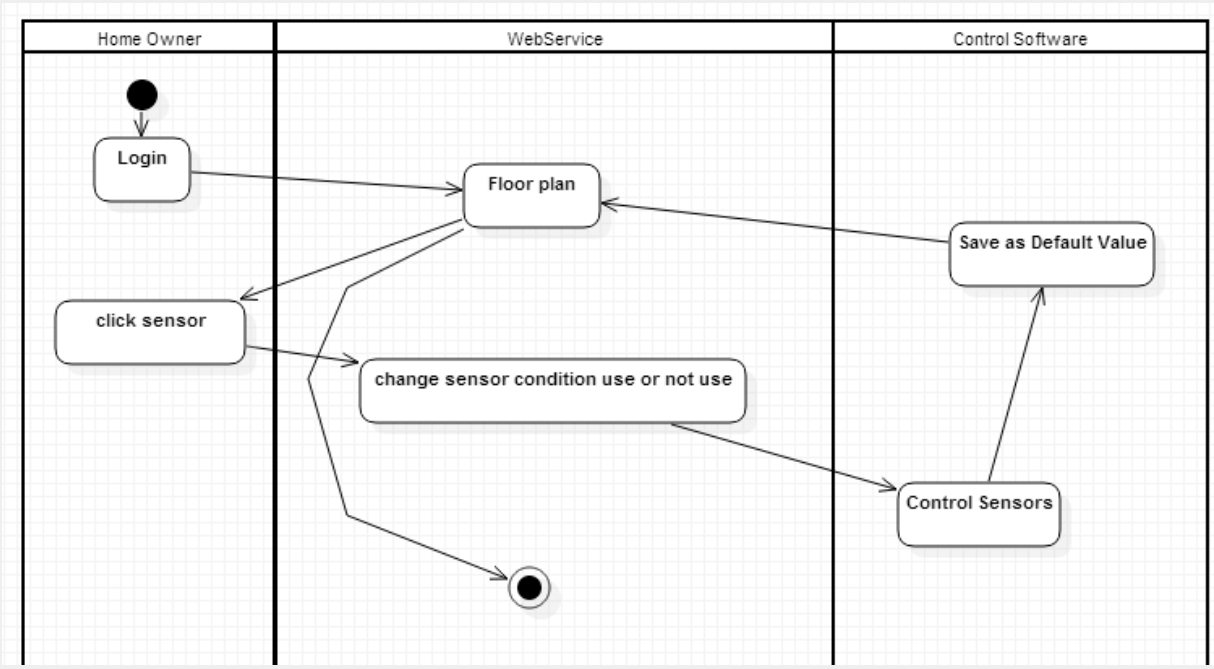
	2. Control Software restores the setting values and determines which sensors to enable. 3. Control Software enables specific sensors from restored values(Motion sensor, Window sensor)
Exceptions	
Priority	High
Frequency	Sometimes
Open issues	- How to detect the malfunction (e.g. poor connection, sensor misbehave.)
Channel to actor	
Secondary actors	

UC-1-4 Finish Sensors ●

Use Case ID	UC-1-4
Use Case Name	Finish Sensors
Primary actor	Control Software
Goal in context	Disable and finish the sensors.
Preconditions	Sensors are enabled
Trigger	UC: Shutdown
Scenario	1. Home Owner pressed OFF button(Num 2) and the Central Processor is about to shutdown. 2. Control Software disables all the sensors (Motion sensor, Window sensor)
Exceptions	
Priority	High
Frequency	Sometimes
Open issues	
Channel to actor	

Secondary actors	

C.2. Configure



FC-3. Swimlane diagram for Setting Configuration ◇

UC-2-1 Setting Sensor Arm/Disarm (Web) ●

Use Case ID	UC-2-1
Use Case Name	Setting Sensor Arm/Disarm (Web)
Primary actor	Home Owner (Web)
Goal in context	Configure which Sensor to enable/disable.
Preconditions	Login through SafeHome:Web Service.
Trigger	click sensor icon when arm
Scenario	1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner clicks Sensor icon when armed 3. clicked Sensor will change condition enable/disable
Exceptions	

Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

UC-2-2 Setting Sensor Usage (Web) ●

Use Case ID	UC-2-2
Use Case Name	Setting Sensor Usage (Web)
Primary actor	Home Owner (Web)
Goal in context	Configure which Sensor to use/not use.
Preconditions	Login through SafeHome:Web Service.
Trigger	click sensor icon when disarm
Scenario	1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner clicks Sensor icon when disarmed 3. Clicked Sensor marked X or unmarked 4. Clicked Sensor will not enable when arming
Exceptions	
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

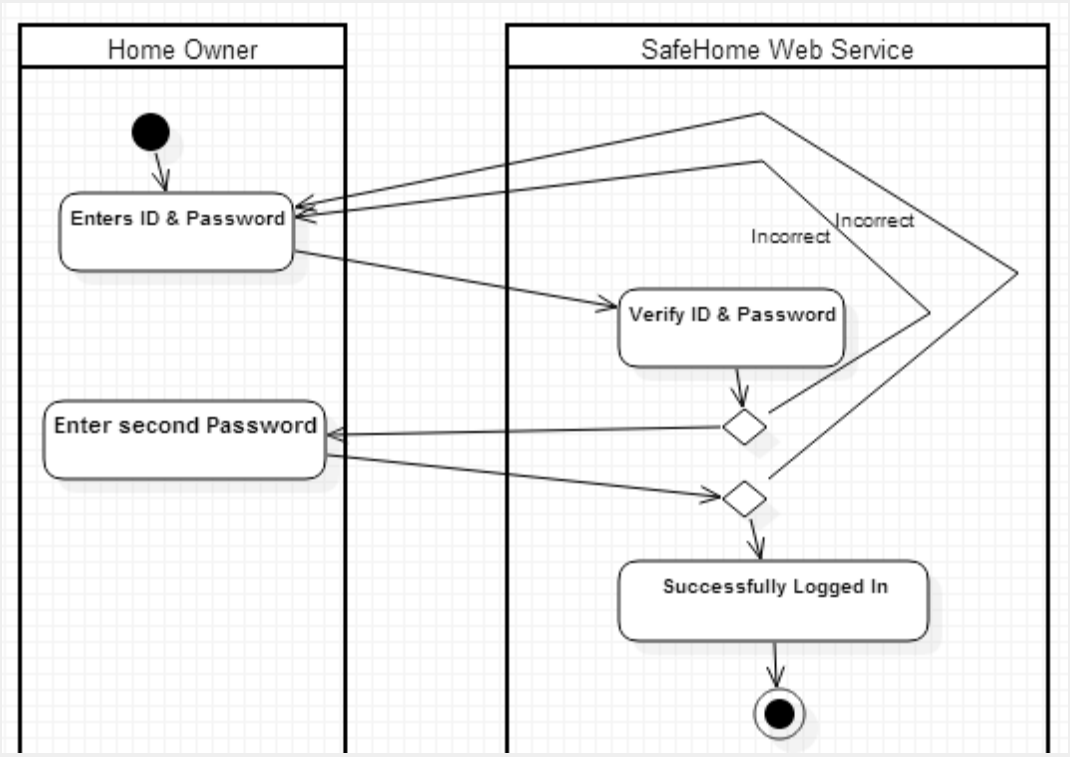
UC-2-3 Setting Security Zone (Web) ●

Use Case ID	UC-2-3
Use Case Name	Setting Security Zone (Web)

Primary actor	Home Owner (Web)
Goal in context	Configure Security Zone
Preconditions	Login through SafeHome:Web Service.
Trigger	
Scenario	1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner click Zone button 3. Home Owner select Security Zone for configure 4. Home Owner click icon(Sensors and Cameras) in Floor plan 5. Clicked device assigned Security Zone
Exceptions	5a. if Home Owner click assigned device it will removed in selected Security Zone
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.3. User Management

UC-3-1 Login (Web) ◇



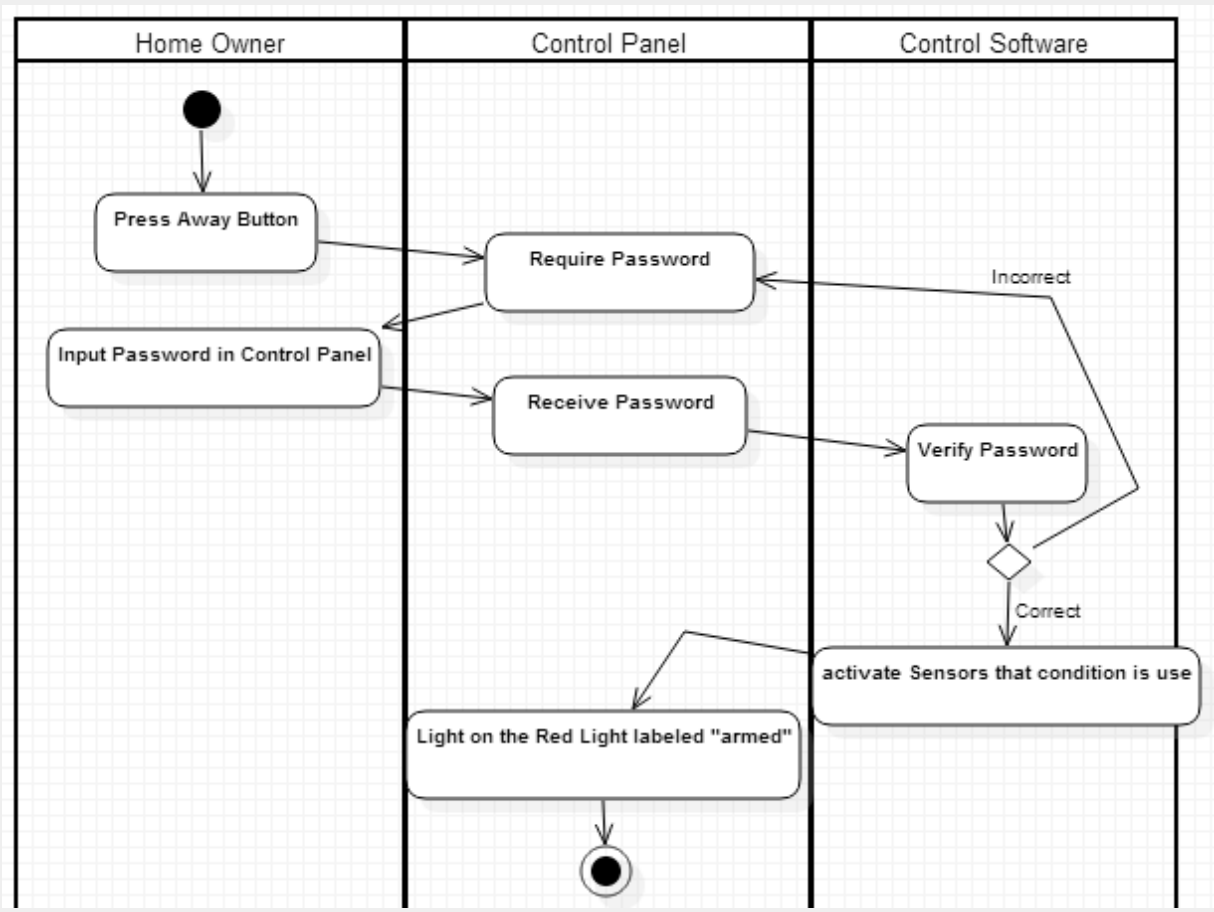
FC-4. Swimlane diagram for Login at Web Service ◇

Use Case ID	UC-3-1
Use Case Name	Login
Primary actor	Home Owner(Web)
Goal in context	Login activity
Preconditions	Home owner should enter appropriate ID and password.
Trigger	Home Owner try to access SafeHome Web Service through the internet
Scenario	1. Home Owner enters the ID 2. Home Owner enters the password 3. Home Owner enters the second password 4. SafeHome displays GUI for major functions including sensors, cameras and current floor plan.
Exceptions	

Priority	Essential
Frequency	Frequent
Open issues	
Channel to actor	
Secondary actors	

C.4. Arm/Disarm

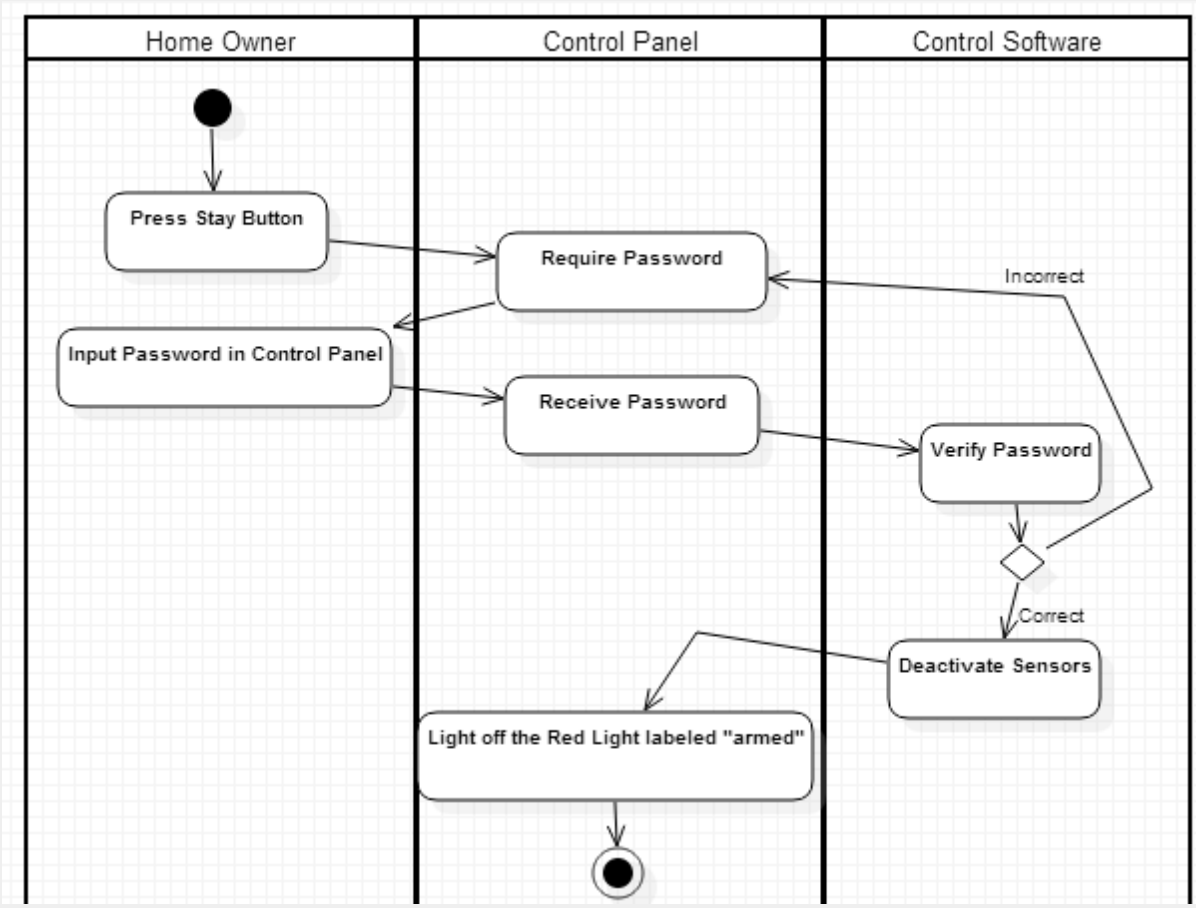
UC-4-1 Arm System via Control Panel (CP) ●



FC-5. Swimlane diagram for Arm System via Control Panel ●

Use Case ID	UC-4-1
Use Case Name	Arm System via Control Panel (CP)
Primary actor	Home Owner
Goal in context	Arm Security System
Preconditions	Disarmed Security System
Trigger	Home Owner press Arm/Disarm
Scenario	1. Home Owner presses Away button(Num 7) 2. Home Owner inputs a Control Panel password 3. The Control Software activates Sensors. 4. The Control Panel displays that SafeHome is armed with red light labeled ‘armed’ turned on.
Exceptions	2a. If the password gets wrong, the Home Owner should enter the correct password again.
Priority	High
Frequency	Frequent. Every time the Home Owner goes out of home.
Open issues	
Channel to actor	
Secondary actors	

UC-4-2 Disarm System via Control Panel (CP) ●

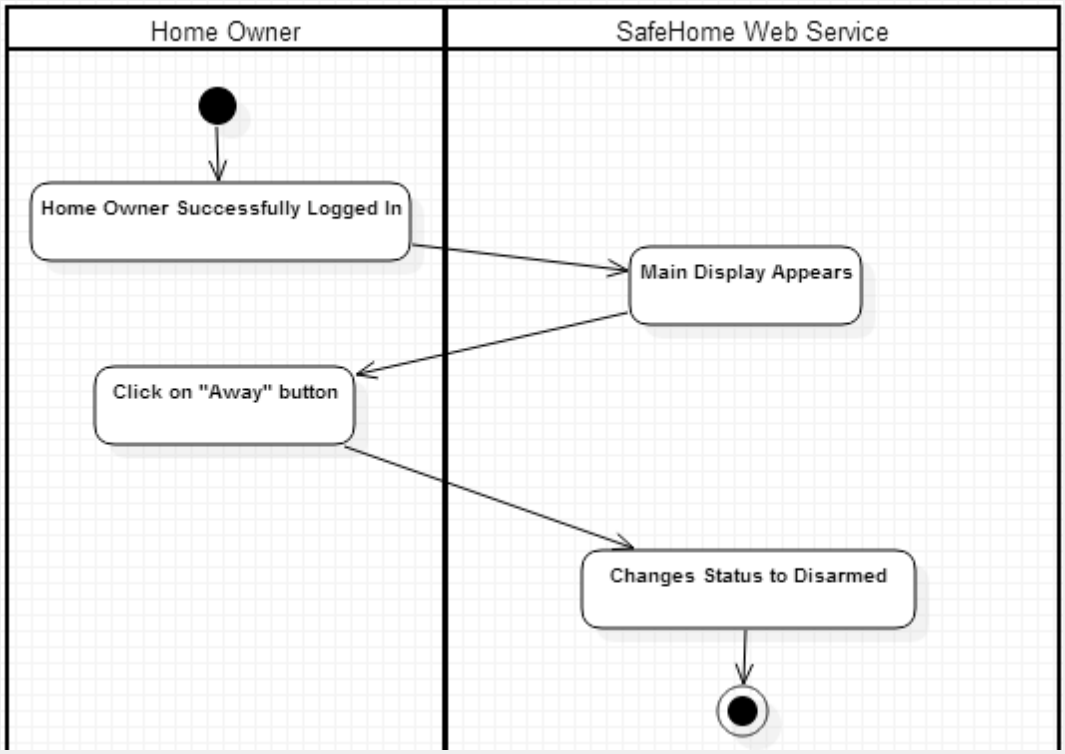


FC-6. Swimlane diagram for Disarm System via Control Panel ●

Use Case ID	UC-4-2
Use Case Name	Disarm System via Control Panel (CP)
Primary actor	Home Owner
Goal in context	Disarm security system
Preconditions	Armed security system.
Trigger	Opens the door legally.
Scenario	1. Home Owner presses Stay button(Num 8) 2. Home Owner inputs a Control Panel password 3. The Control Software deactivates sensors(Motion sensors and Window sensors). 4. The Control Panel displays that SafeHome is disarmed with red light labeled ‘armed’ turned off.
Exceptions	2a. If the Home Owner gets wrong, Home Owner can re-enter password.

Priority	High
Frequency	Frequent
Open issues	Blocks the system if someone gets wrong more than 5 times.
Channel to actor	
Secondary actors	

UC-4-3 Arm System via Internet (Web) ◇

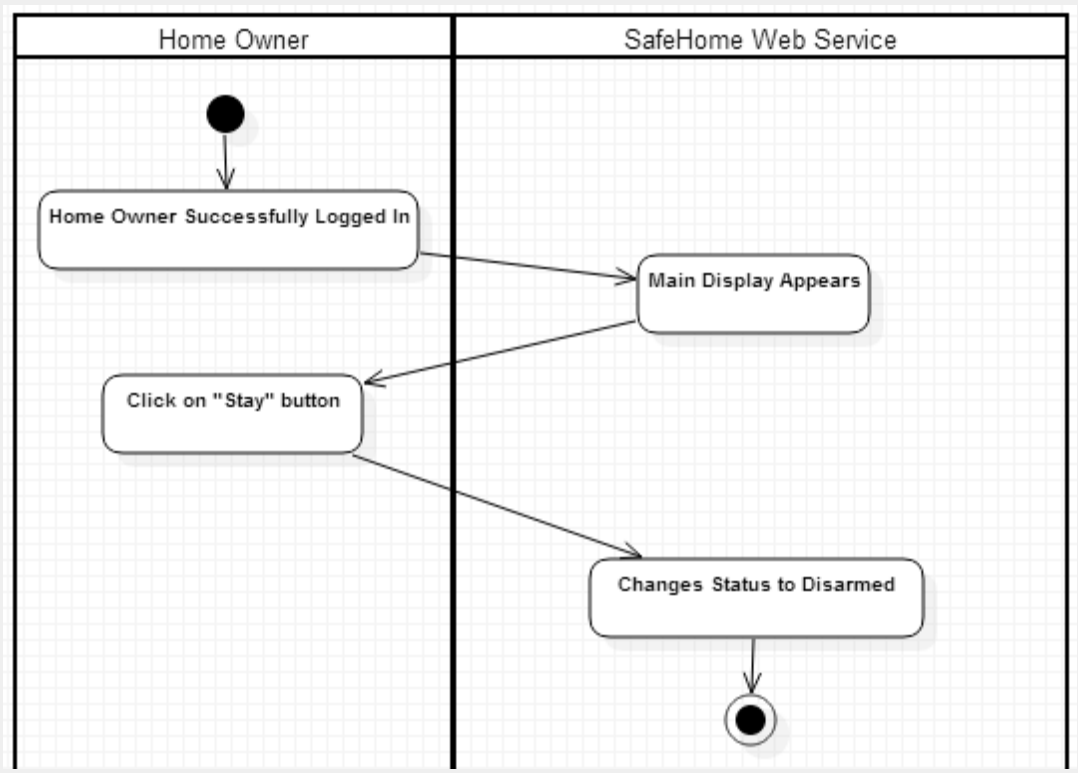


FC-7. Swimlane diagram for Arm System via Internet ◇

Use Case ID	UC-4-3
Use Case Name	Arm System via Internet (Web)
Primary actor	Home Owner (Web)
Goal in context	Arm Security System via Internet
Preconditions	Disarmed Security System
Trigger	Home Owner clicks on “arm” button on the SafeHome Web Service.
Scenario	1. Home Owner successfully log in to the Web Service. 2. Home Owner clicks on arm button 3. The Web Service displays that SafeHome is armed.
Exceptions	1a. If the password gets wrong, the Home Owner should enter the correct password again.
Priority	High
Frequency	Frequent.

Open issues	
Channel to actor	
Secondary actors	

UC-4-4 Disarm System via Internet (Web) ◇

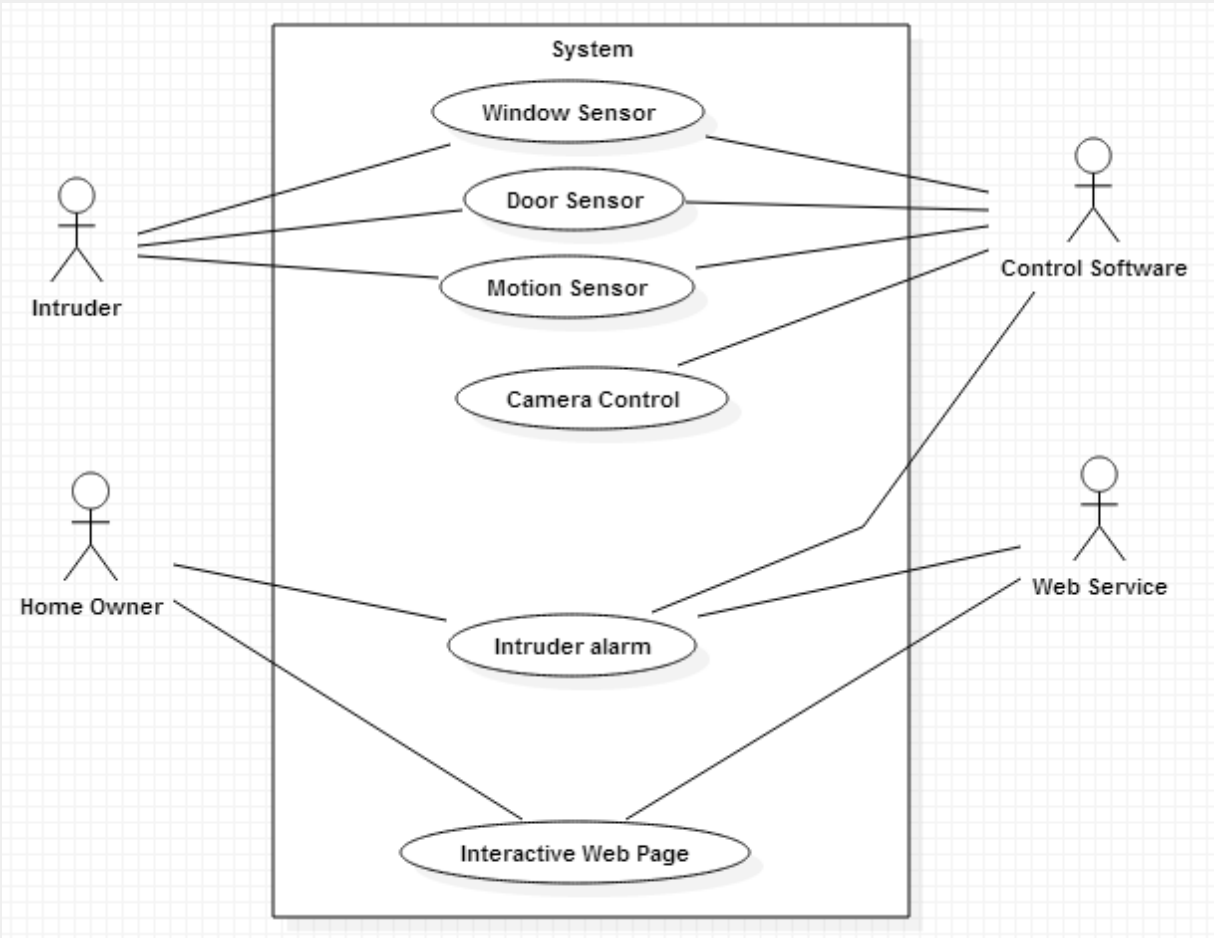


FC-8. Swimlane diagram for Disarm System via Internet ◇

Use Case ID	UC-4-4
Use Case Name	Disarm System via Internet (Web)
Primary actor	Home Owner (Web)
Goal in context	Disarm Security System via Internet
Preconditions	Armed Security System
Trigger	Home Owner clicks on “disarm” button on the SafeHome Web Service.
Scenario	1. Home Owner successfully log in to the Web Service. 2. Home Owner clicks on disarm button 3. The Web Service displays that SafeHome is disarmed.
Exceptions	1a. If the password gets wrong, the Home Owner should enter the correct password again.

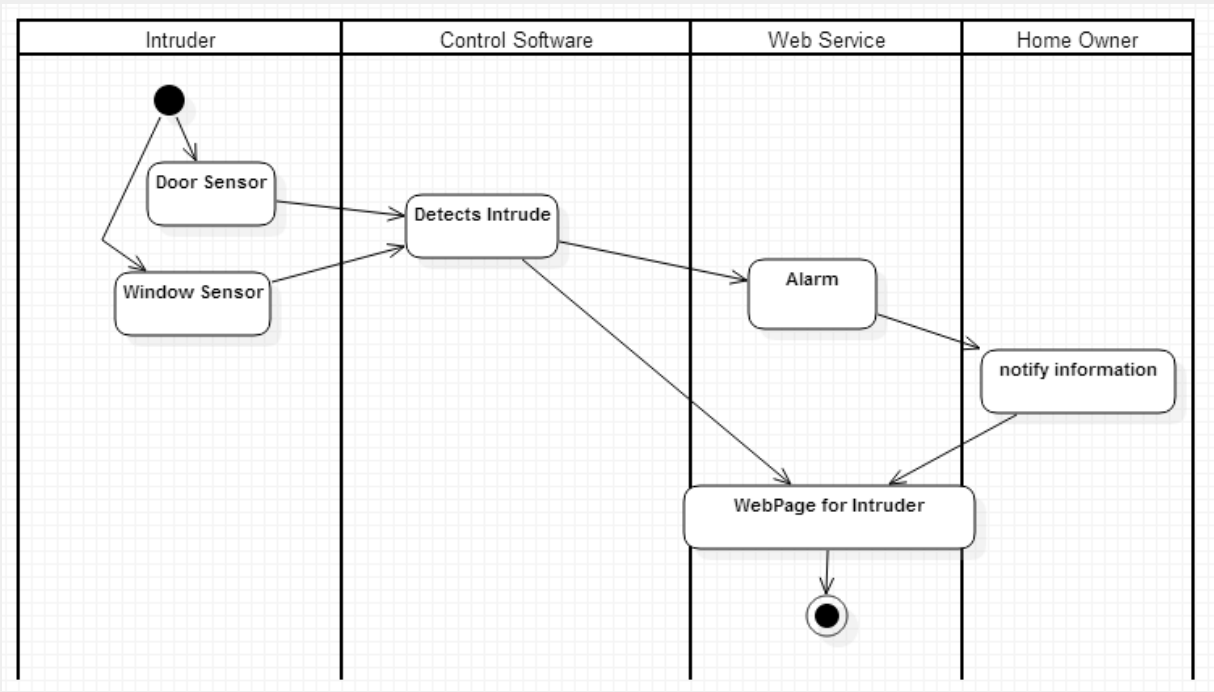
Priority	High
Frequency	Frequent.
Open issues	
Channel to actor	
Secondary actors	

C.5. Intruder Prevention System



FC-9. Usecase diagram for Inturder Prevention System ◇

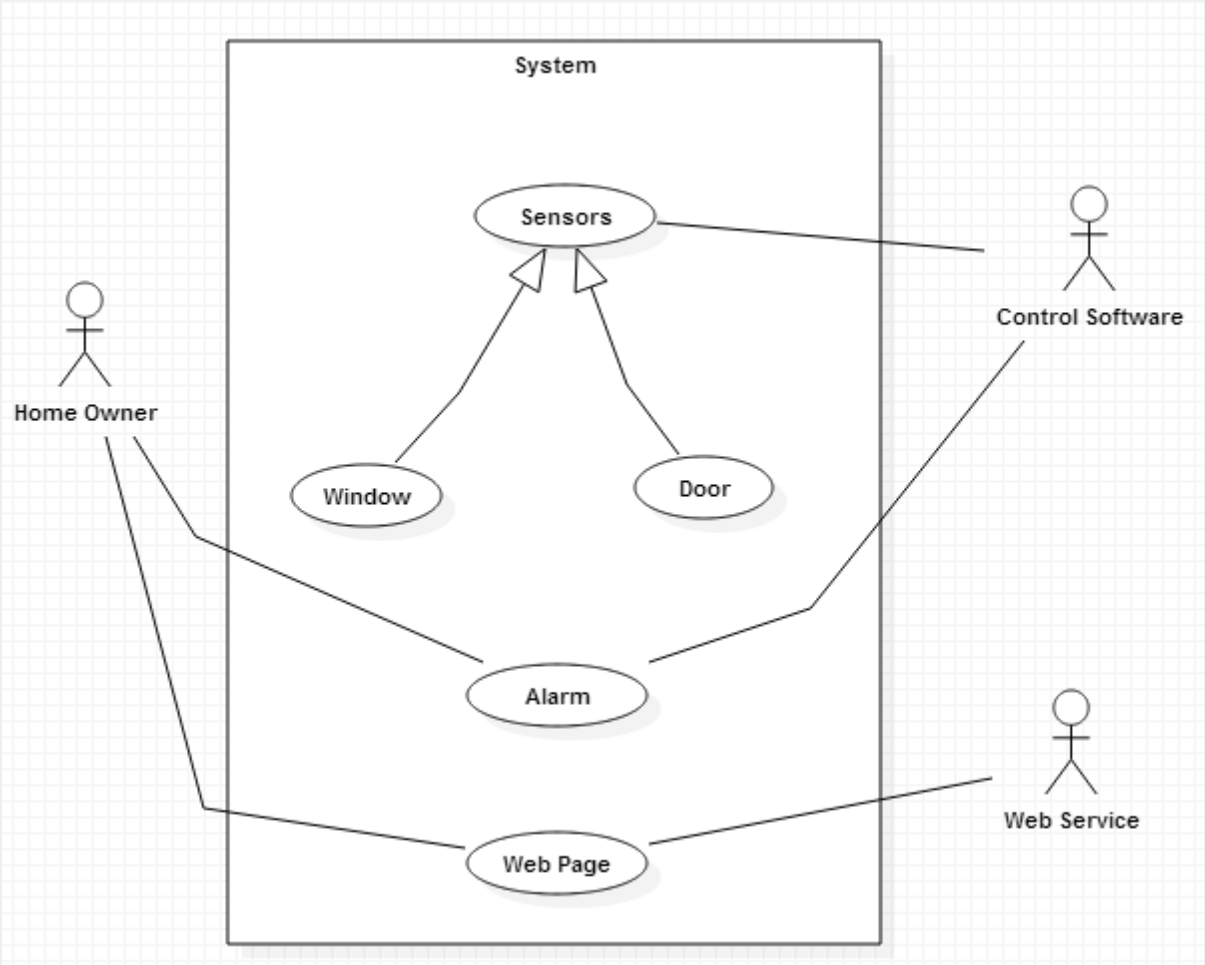
UC-5-1 Intruder detection ◇



FC-10. Swimlane diagram for Intruder Detection ◇

Use Case ID	UC-5-1
Use Case Name	Intruder Detection
Primary actor	Control Software
Goal in context	When there is detected intruder, notify to Home Owner.
Preconditions	Intruder detecting mode in Safe home system
Trigger	Intruder intrude inside home
Scenario	1. Intruder break-in home. 2. Window sensor detects there is breakin. 3. Motion sensor detects Intruder and rings Intruder Alarm. 4. If Home Owner successfully logged in, the web page shows the information about sensors of detect abnormal condition.
Exceptions	
Priority	High
Frequency	Not frequent

C.6. Home Management



FC-11. Usecase diagram for Home Management ●

UC-6-1 Display Sensor Data ●

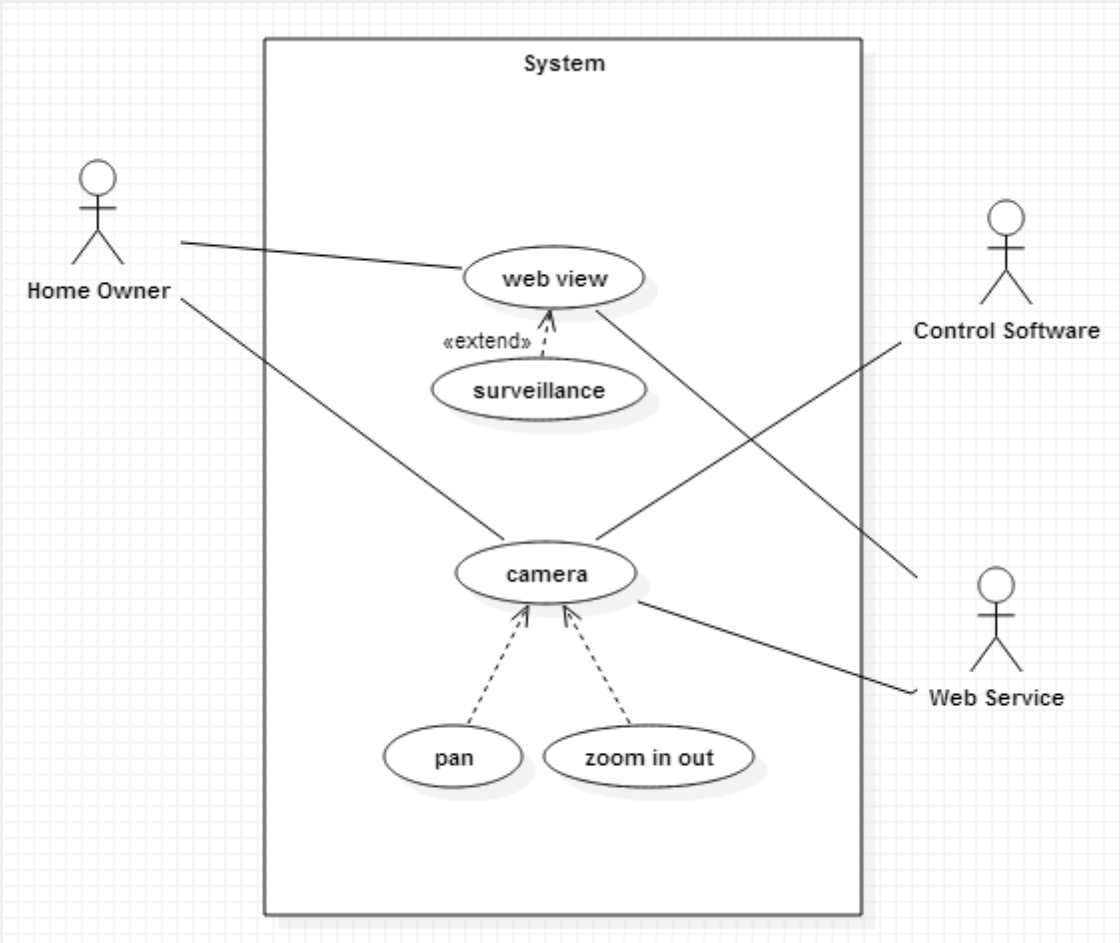
Use Case ID	UC-6-1
Use Case Name	Display Sensor Data
Primary actor	Home Owner
Goal in context	Displays sensors data
Preconditions	Home Owner successfully logged in.

Trigger	Home Owner phone call
Scenario	1. Home Owner clicks on sensor data button. 2. SafeHome displays sensors data
Exceptions	
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

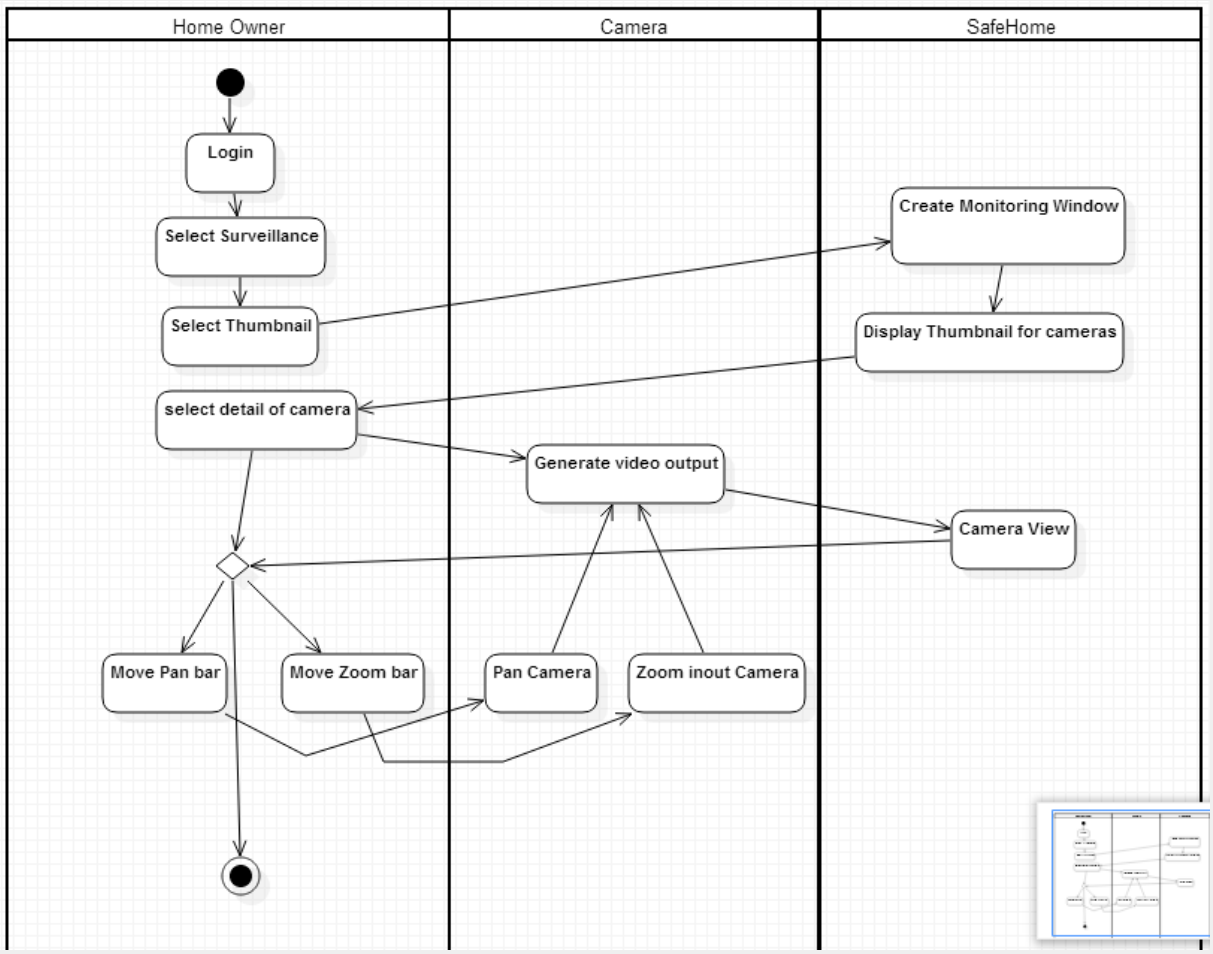
UC-6-2 Alarm ●

Use Case ID	UC-6-2
Use Case Name	Alarm
Primary actor	Control Software, IntruderDetector
Goal in context	Notify to Home Owner via Web page
Preconditions	
Trigger	Sensor or IntruderDetector detect change
Scenario	1. Sensor detects and status changes. 2. IntruderDetector detects intruder intruder 3. Notify to Home Owner via webpage.
Exceptions	Unlike previous version, we don’t have sms or another way to notify home owner.
Priority	High
Frequency	Not frequent
Open issues	
Channel to actor	
Secondary actors	

C.7. Home Surveillance



FC-12. Usecase diagram for Home Surveillance ◇



FC-13. Swimlane diagram for Home Surveillance ◇

UC-7-1 Camera thumnail(Web) ◇

Use Case ID	UC-7-1
Use Case Name	Camera Overview (Web)
Primary actor	Home Owner(Web)
Goal in context	Home Owner can check the overview through thumbnails of each camera views, and by clicking into it, Home Owner can show the current scenary.
Preconditions	Home Owner already logged in successfully.
Trigger	Home Owner selected “surveillance” - ”View thumnails” in menu.
Scenario	1. Home Owner clicked “surveillance” button 2. Home Owner clicked “View thumnails” button

	3. The system shows thumbnails of each camera view. The location of each camera and gaze is displayed in floor plan. 4. Home Owner clicks “Detail” button each camera for detail. 5. Bigger screen for current camera scenary appears with more details including logs of change detection.
Exceptions	5a. This follows use-case of “Camera Detail”
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

UC-7-2 Camera Detail (Web) ◇

Use Case ID	UC-7-2
Use Case Name	Camera Detail (Web)
Primary actor	Home Owner(Web)
Goal in context	Home Owner checks for details for camera
Preconditions	Home Owner already logged in successfully and clicked “surveillance” - “View thumnails” in menu.
Trigger	a. Home Owner clicked thumbnail of camera from surveillance display. b. Home Owner clicked detection log for detail information for targeting camera.
Scenario	1. Home Owner clicks thumbnail of camera or specific camera in Floor plan. 2. Current camera display. 3. Home Owner can Setting camera
Exceptions	3a. This follows use-case of “Setting Camera”
Priority	Middle
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

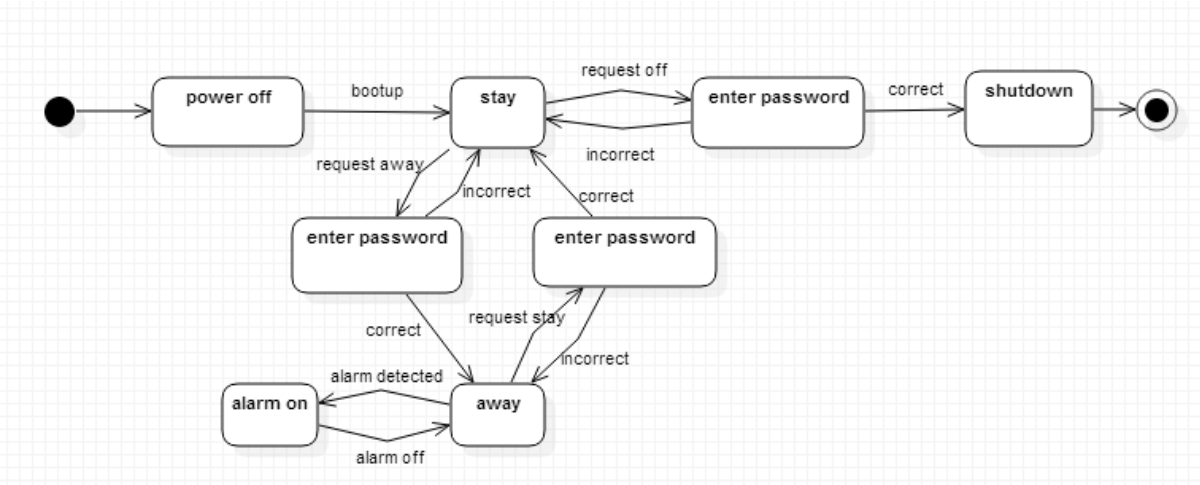
UC-7-3 Setting Camera ◇

Use Case ID	UC-7-3
Use Case Name	Setting Camera
Primary actor	Home Owner(Web)
Goal in context	Setting Camera
Preconditions	Home Owner already logged in successfully and clicked “surveillance” - “View thumnails” in menu.
Trigger	Home Owner clicks on still image with play button at the center.
Scenario	1. Home owner can pan left or right 5times from center 2. Home owner can ZoomIn to maximum x9 and ZoomOut to minimum x1
Exceptions	
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

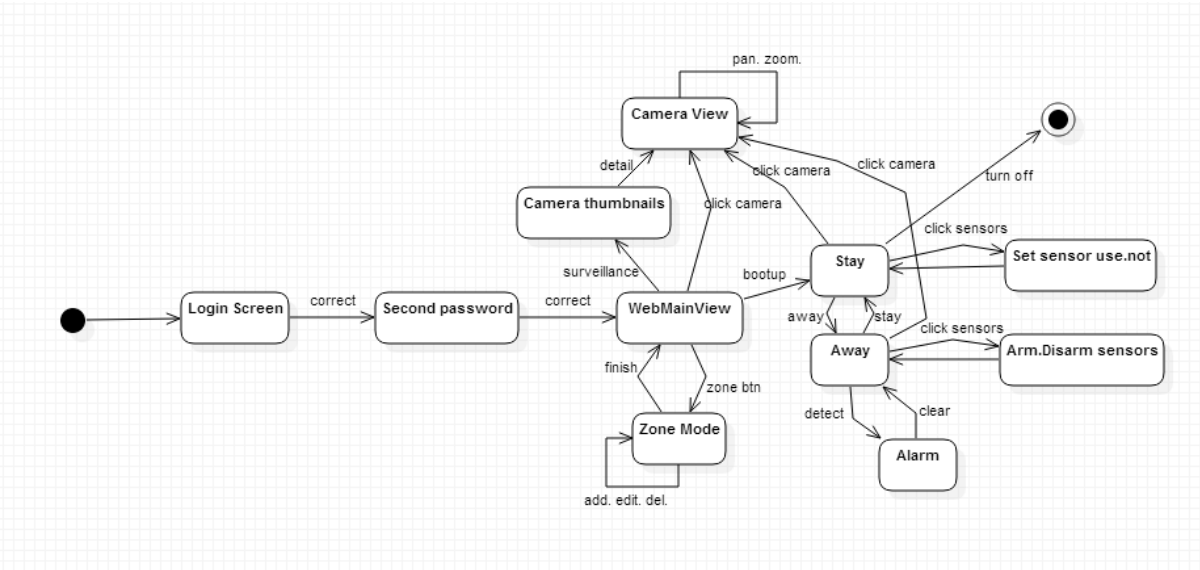
D. Design Model

D.1. State Diagram

SD-1. State diagram using control panel ●

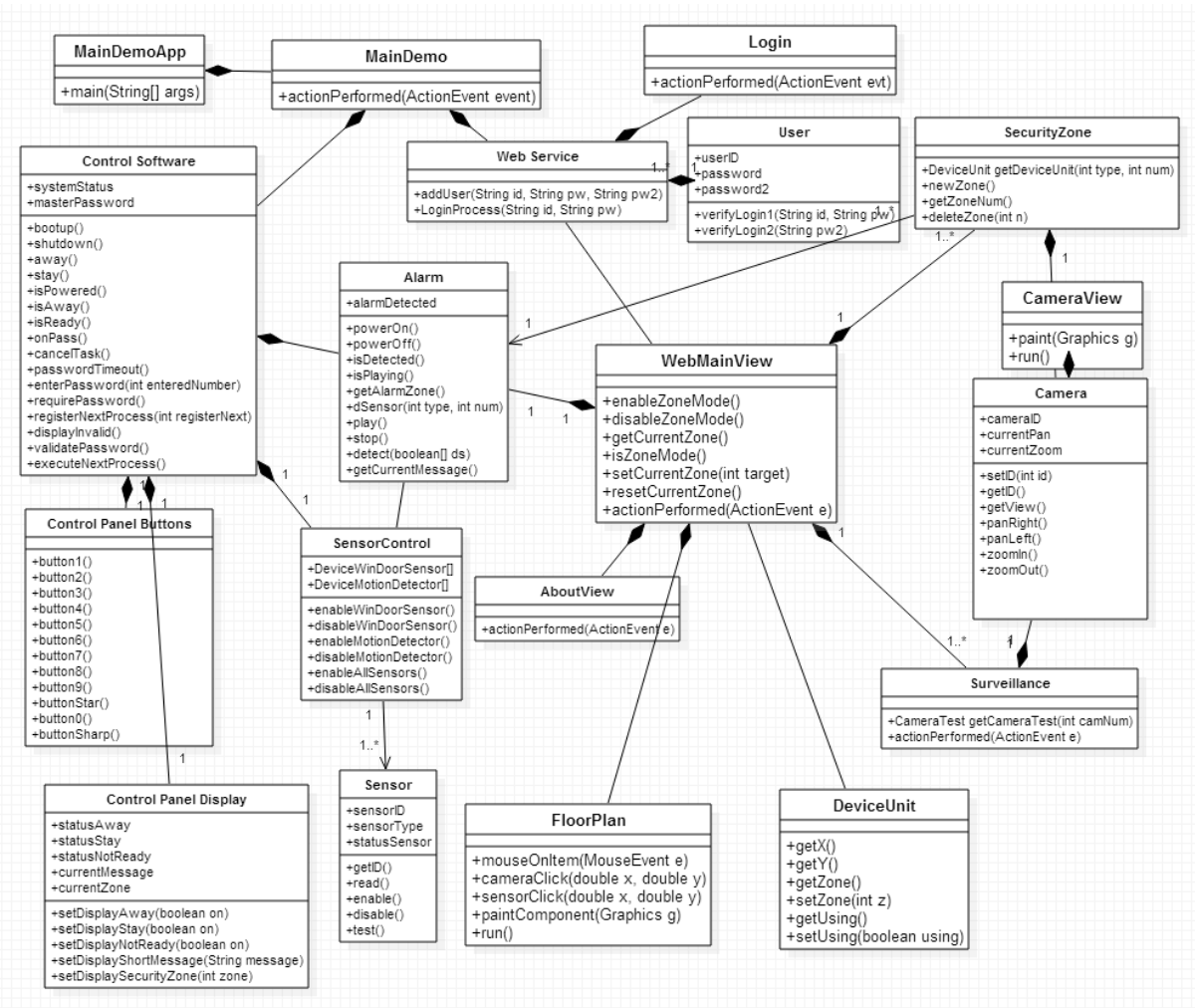


SD-2. State diagram using web ◇



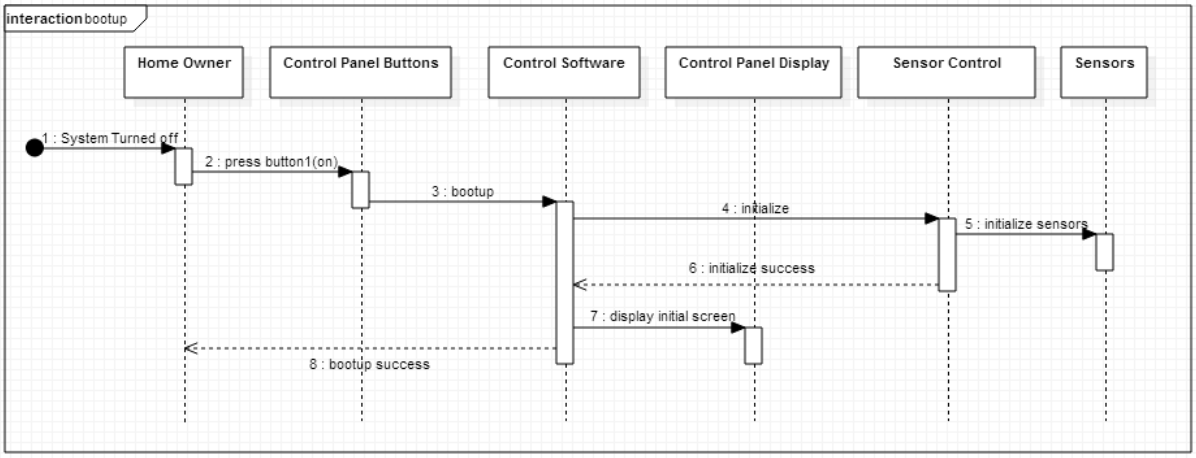
D.2. Class Diagram

CD-1. Class Diagram for overall implementation. ◇●

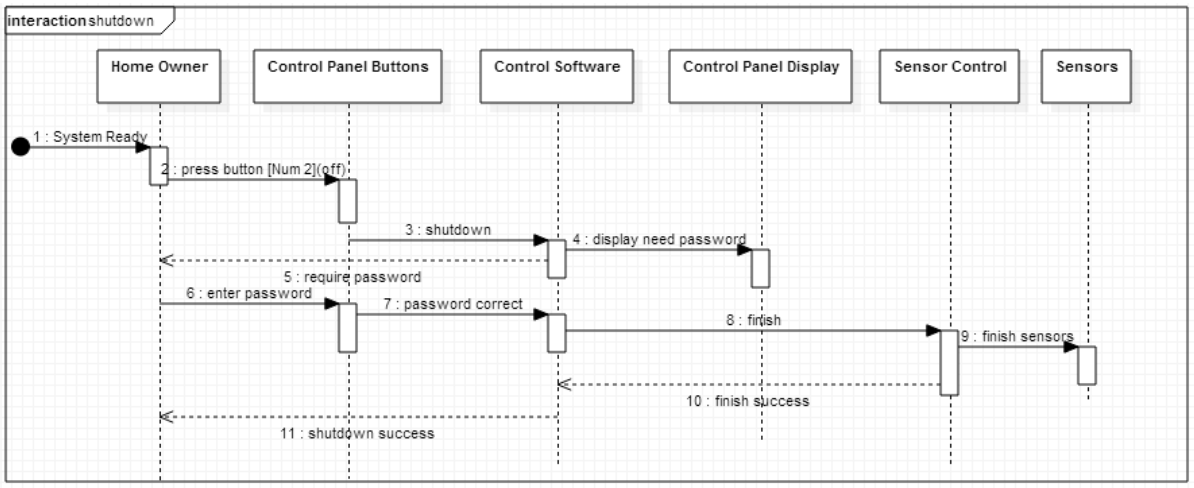


D.3. Sequence Diagram

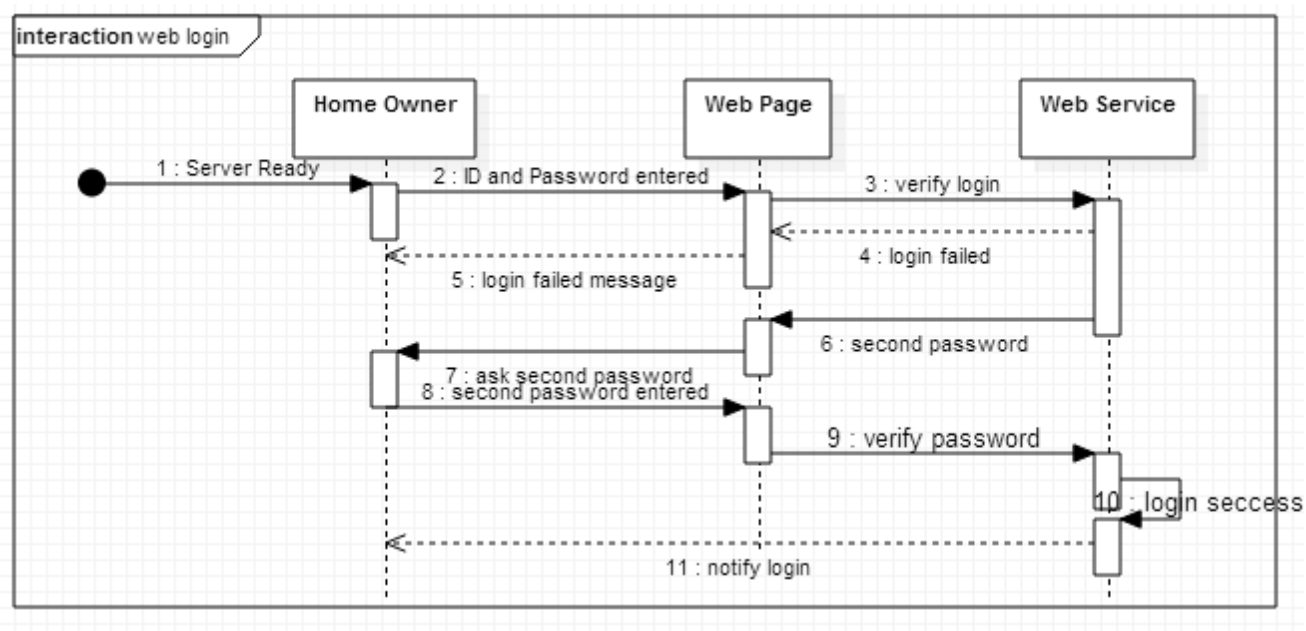
SqD-1. bootup (uc-1-1) ●



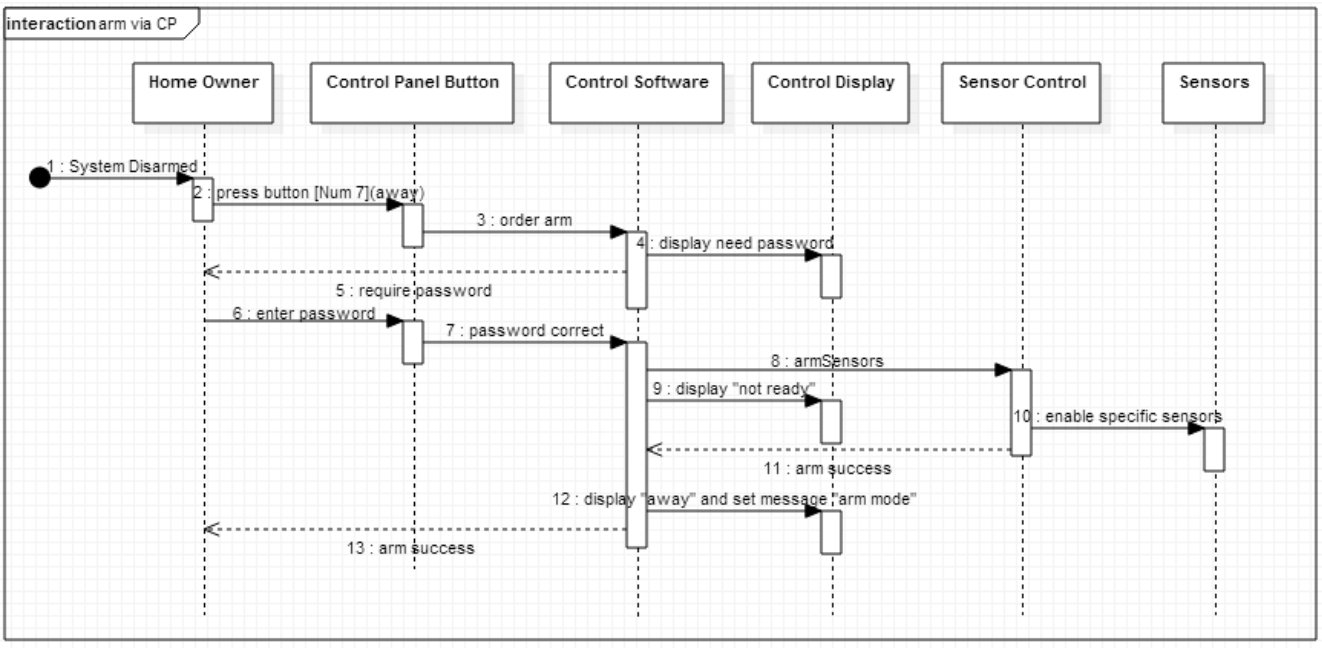
SqD-2. shutdown (uc-1-2) ●



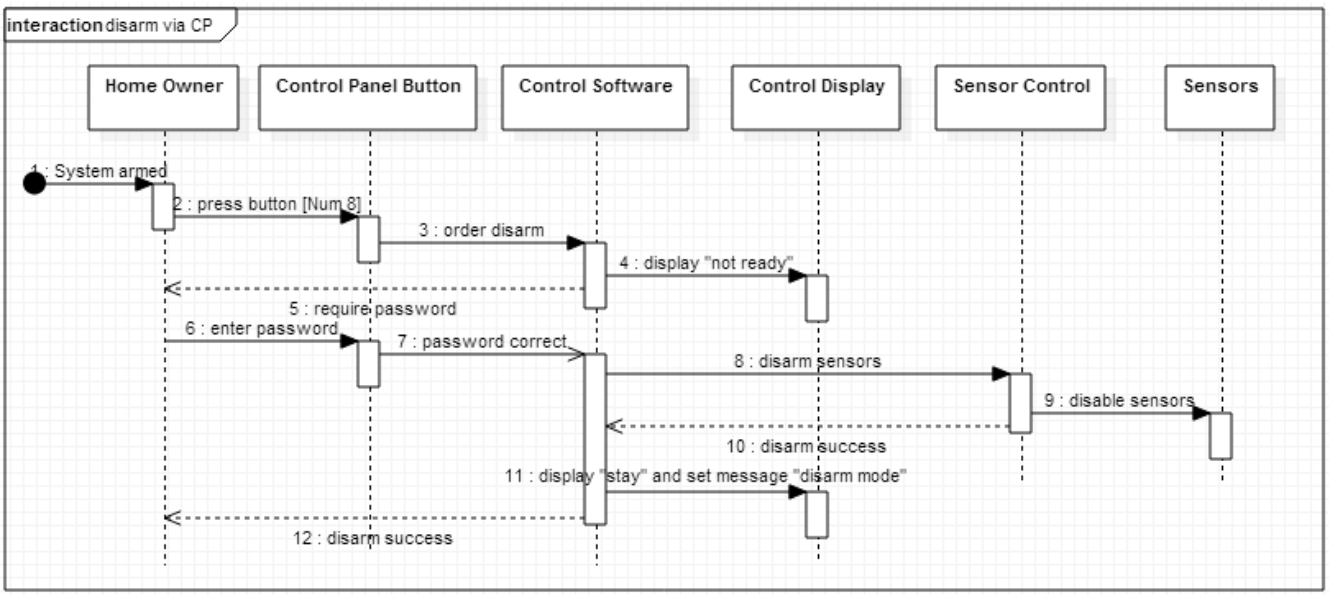
SqD-3. web login (uc-3-1) ◇



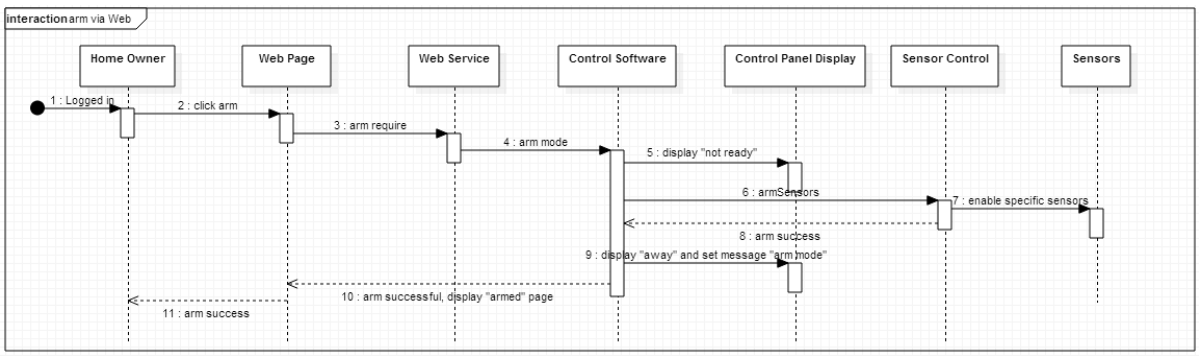
SqD-4. arm via CP (uc-4-1) ●



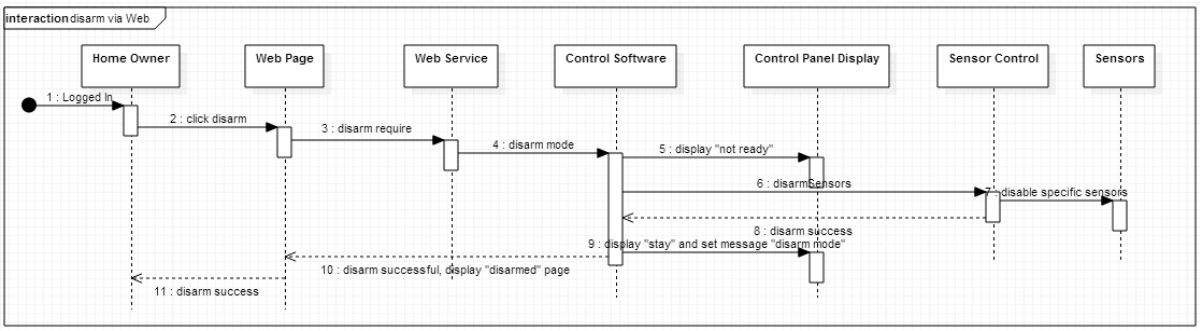
SqD-5. disarm via CP (uc-4-2) ●



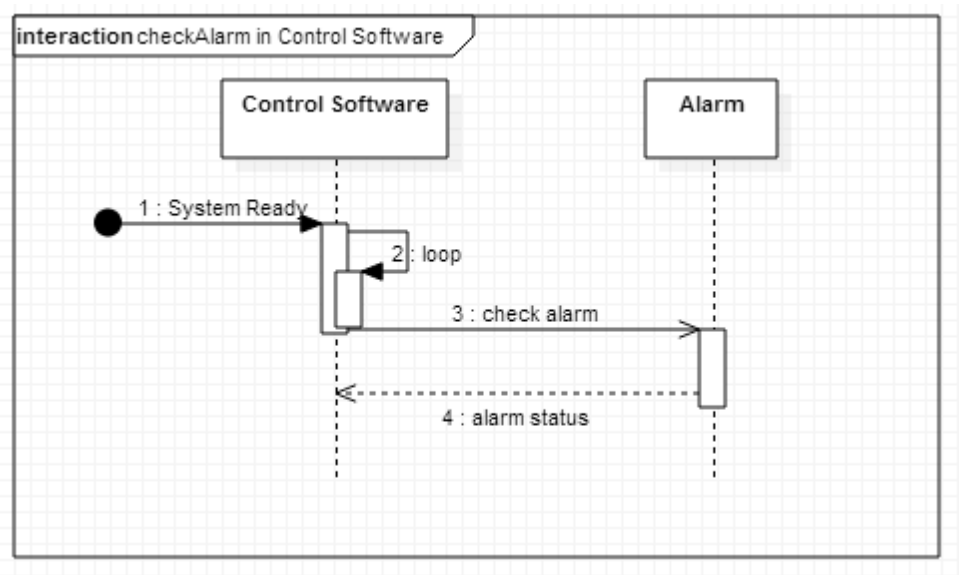
SqD-6. arm via Web (uc-4-3) ◇



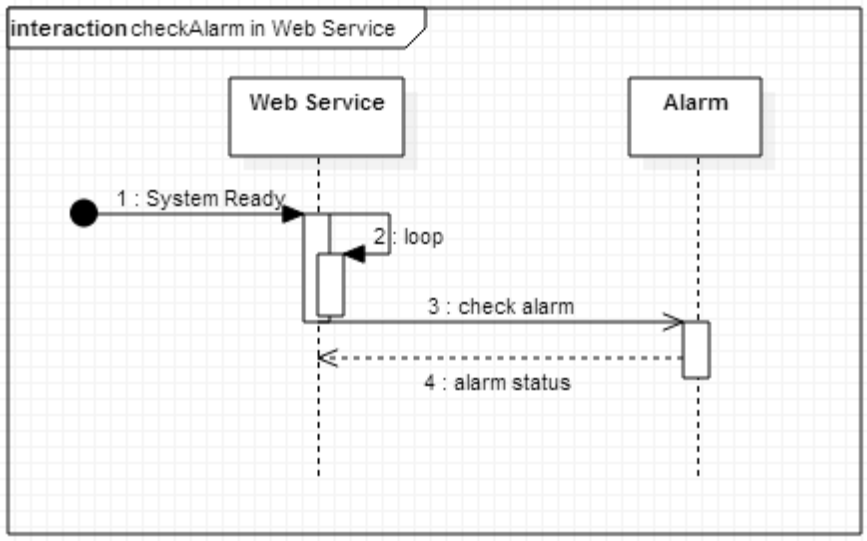
SqD-7. disarm via Web (uc-4-4) ◇



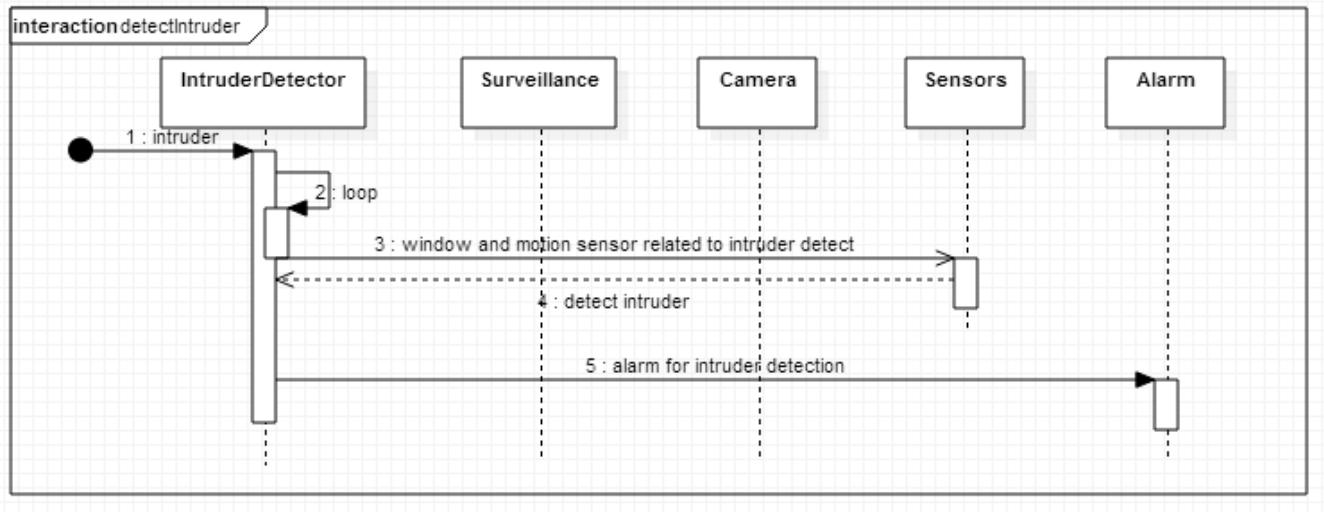
SqD-8. checkAlarm in Control Softwware (uc-6-6) ◇



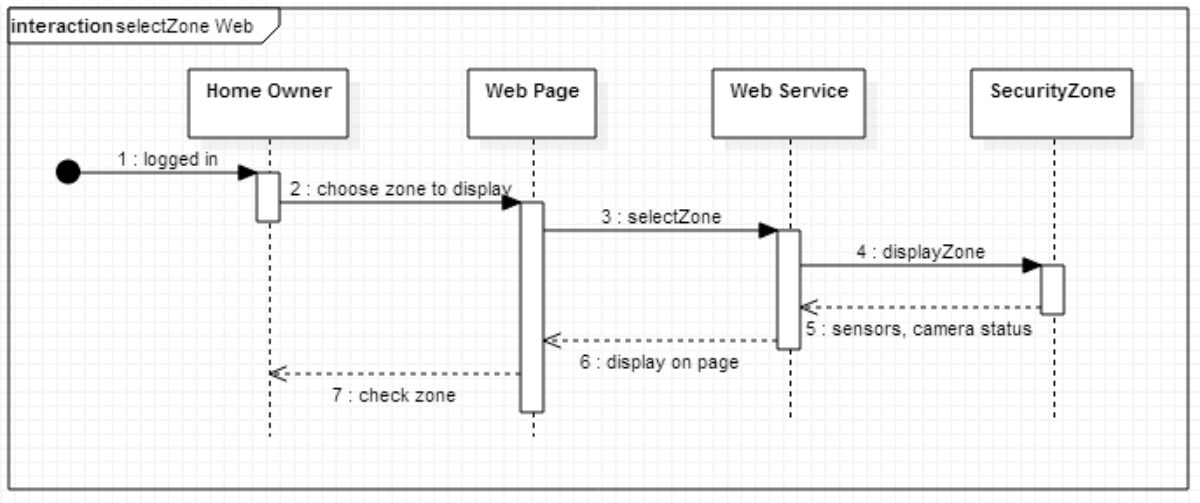
SqD-9. checkAlarm in Web Service (uc-6-6) ◇



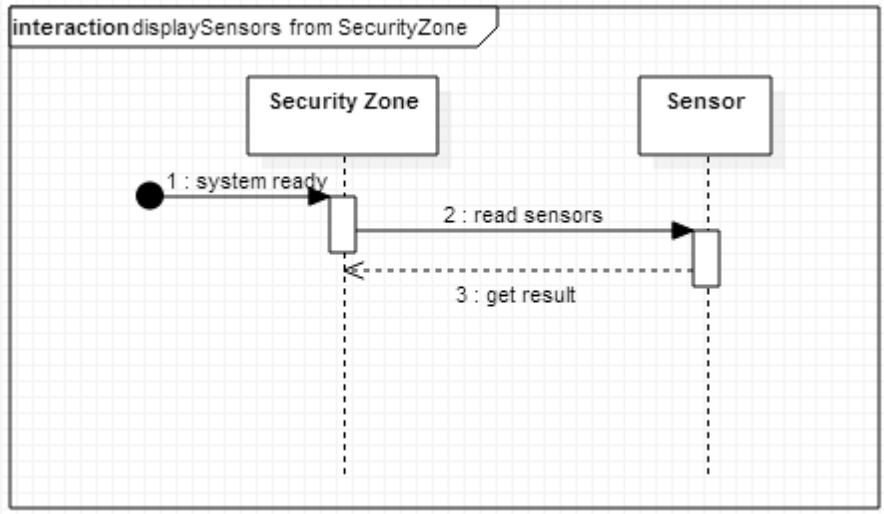
SqD-10. detectIntruder (uc-5-1) ◇



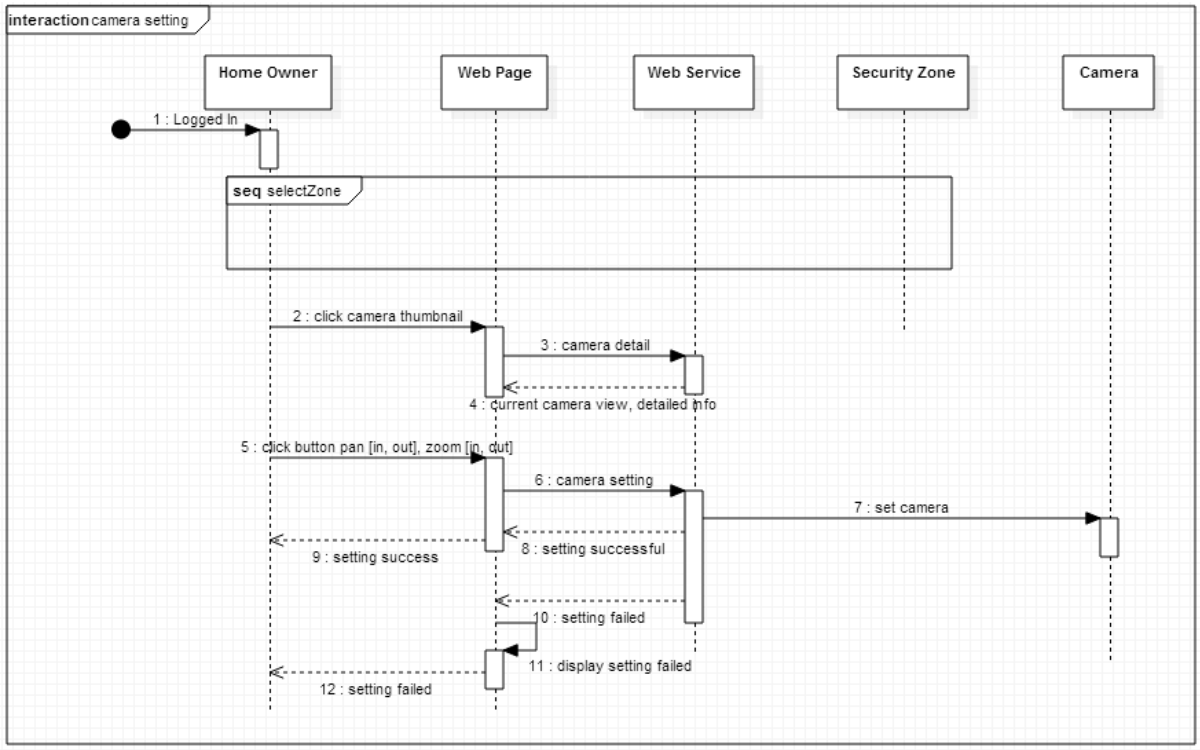
SqD-11. selectZone Web (uc-2-1) ◇



SqD-12. displaySensors from Security Zone (uc-6-5) ◇



SqD-13. camera setting (uc-7-3) ◇



E. Glossary ●◇

Home security: the action of securely protect house from both intruders and internal accidents such as fires, flooding, gas efflux.

Home surveillance: the action of surveil through camera from both control panels and web service.

Control Panel: The panel to control SafeHome system inside house. It has touch screen and turn on/off button.

Web Service: Internet service to access SafeHome system. It has same GUI with control panel display, and they are run on JRE therefore they share the same JAVA code.

Security zone: Securely protected area in the floor plan which is coverd by sensors and cameras.

Surveillance zone: The zones where camera can provide view to users.

Sensor: The device that detects events inside house such as CO level, temperature change, water flood, and gas efflux.

Arm/disarm: If the security is on, it is called ‘armed’ state. If security is off, then it is called ‘disarmed’ state.

House condition: The condition that how many sensors or camera and which location they need in the house floor plan. It depends on the characteristics of houses.

Main Server: The server that mainly working on the SafeHome. It is fundamentally installed in the house and provides web access via internet.

F. Traceability

F-1. Traceability Matrix

	SD-1	SD-2	SD-3	SD-4	SD-5	SD-6	SD-7	SD-8	SD-9	SD-10	SD-11	SD-12	SD-13	SD-14	SD-15	SD-16	SD-17
UC1-1	v																
UC1-2		v															
UC1-3																	
UC1-5																	
UC2-1														v	v		
UC2-2																	
UC2-3																	v
UC2-4																	
UC3-1			v														
UC3-2				v													
UC4-1					v												
UC4-2						v											
UC4-3							v										
UC4-4								v									
UC5-1												v					
UC5-2												v					
UC5-3												v					
UC6-5																v	
UC6-6										v	v						
UC7-1																	
UC7-2																	
UC7-3																	
UC7-4									v								
UC7-5																	
UC7-6													v				
UC7-7																	

G. Revision History

2015/06/07(Final) SRS + Analysis + Design

- System do not support functionalities

Delete

- UC.2.1. Setting main
- UC.2.3. Setting cameras
- UC.2.4. Setting cameras Detail
- UC.3.2. Logout
- UC.5.2. Intruder Trial Detection
- UC.5.3. Possible Intruder Alarm
- UC.7.1. Temporary Camera Control
- UC.7.4. Camera Record
- UC.7.5. Create Camera thumnail
- UC.7.6. Play recorded video
- SD-4. web logout
- SD-9. record Video
- SD-13. startPlay
- SD-15. selectZone(CP)
- FC-3.
- FC-5.

New

- Figure-B-3.
- G. Revision history

Update

- B.2.1.
- B.2.7.
- B.2.8.
- B.3 Information
    - Delete
        - Password wrong
        - Format of recording moving picture
        - Precondition to record
    - Change
        - Camera Funtion
            - delete
                - record
                - play
        - Method to get Asynchronous Data

        - delete
            - Video Record is also conducted similarly
- B.6.
- some Use-case

2015/05/20 SRS + Analysis, Design

- Reason of Hardware

Delete

- B.4. Motion derection and speed
- C.1.4. Initialize Cameras
- C.1.6. Finish Cameras
- C.2.5. Setting Options(Web)
- C.2.6. Weekly Mail Report
- C.2.7. Self-Diagnosis
- C.3.3. User Log(Web)
- C.3.4. User Create(Web)
- C.3.5. User edit(Web)
- C.3.6. Finding ID/Password(Web)
- C.4.5. Auto Arm System
- C.4.6. Overnight Travel Mode(Web)
- C.4.7. Extended Travel Mode(Web)
- C.6.1. Fire Alarm
- C.6.2. Gas Alarm
- C.6.3. Water Level Abnormality Alarm
- C.6.4. Doggie Angust Alarm
- C.6.6. Control Appliances/Lightnig/HVAC via internet(Web)
- C.8. Non-Functional Use Cases
- Figure-B-3.
- Figure-C-6.
- Figure-C-13.
- Figure-C-14.
- Figure-C-16.
- Figure-C-19.
- Figure-C-20.
- Figure-C-21.
- Figure-C-22.
- GUI-Figure.

New

- C.6.6 Alarm

- D. Design Model

Change

- Figure-C-2.
- Figure-C-11.
- Figure-C-12.
- Figure-C-15.
- Figure-C-18.
- Some numbering

2015/05/10 SRS + Analysis

Delete

- Figure-1.
- New
- B.2. SafeHome Units
- B.6. Use-Case Overview
- C. Use Case
- Traceability Matrix
- Figure B-1
- Figure B-2
- Figure C
- GUI-Figure-12.

2015/05/04 SRS

A. Project Overview
    1. Introduction
    2. Main target for this document
    3. Responsibility
B. SafeHome Overview
    1. SafeHome contains following functionalities:
    2. Information
    3. Motion direction and speed
    4. Security Zone
C. Use cases
    1. Main System and control panel.
        1) Use-case: Intruder detection
        2) Use-case: Detection of intrude trial.
        3) Use-case: Stranger alarm