

Software Requirements Specification with Analysis Model

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TEAM 5

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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 through 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 camera, CO level change via CO sensor and water level via water level sensor. In these cases, user will be notified through message that has been sent from SafeHome System.

In this document, we separated core functions into two main stream. First one is control panel which is already installed in house. Another is SafeHome web service which lets users to control or surveil through internet. Fundamentally, The SafeHome server is installed in the house. This main server opens https protocol (443) for the users outside to access through web service with information encryption using SSH layer.

Moreover, concurrent multiple requests is not allowed. If there is case, the former logged in user gets priority. However, using control panel can take away the priority from web user. The usecase for multiple access control is explained in [C.8.4. Multiple Access Control](#).

Efficient use of camera recording is also important. Safehome camera will record only when there is event. The detection of change is conducted by comparing the default image with the current image. The default image is taken every 10 minutes automatically, and this image is also used as thumbnail after make into smaller size. The comparing function is done by calculating sum of the distances of the rgb value of each pixel.

SafeHome also provides automatic report to user by message when there is abnormal event such as appearance of intruder or sensor alarm. If user does not respond for set time period, SafeHome calls the fire station and the police station.

Finally SafeHome also have overall reporting service through e-mail. After collecting data such as user logs or suspicious behaviors, it combines and report to the each user. These are the main activities that SafeHome supports, and user will be satisfied with secure home.

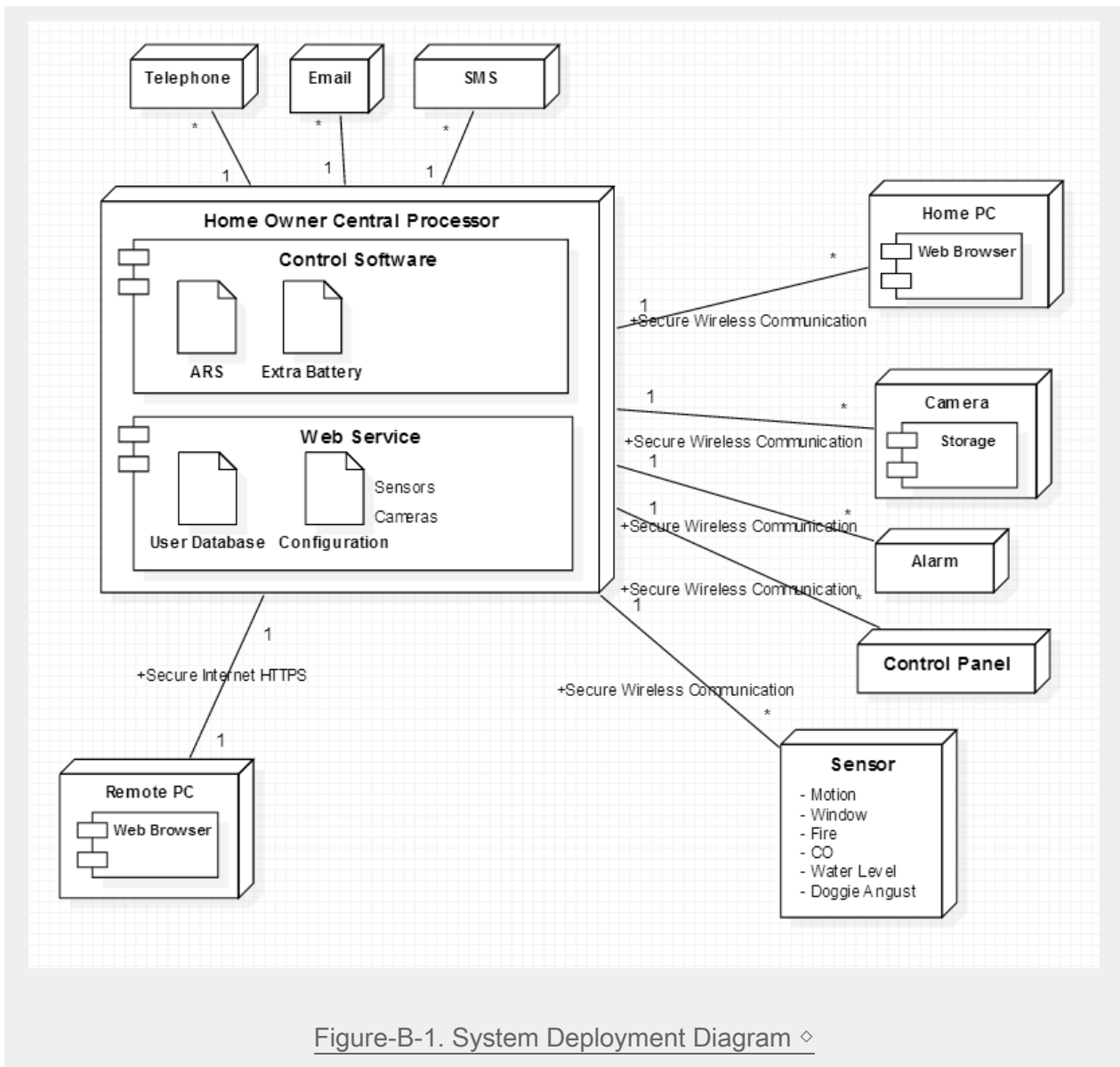
A.2. Main target for this document ◇

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. This document also considered security issues such as SSH layer or RSA encryption of password for suggestion.

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



B.1. Assumptions for SafeHome project ◇

1. **No concurrent user accesses.** e.g.
 - a. Access through a **control panel** and **access through a web page** are exclusive; both cannot happen at the same time.
 - b. Only **one control panel** is installed in a house
 - c. Control panel gets **higher priority** than web user. Control panel can force to logout previous logged in web user.
2. Internet connection between a homeowner (i.e., homeowner's smartphone or notebook) and the SafeHome system is always available.
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 or automatic call, and message report system, 3. Settings and User DB which can only be accessed by admin, 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 wireless using IEEE 802.11b standard. Control Software takes care of internal system. Control Software also includes ARS system(SEE: [C.8.1. Telephone phone call](#)) and Extra battery(SEE: [C.8.2. Extra Power Supply](#)) for non-functional usecases.

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.

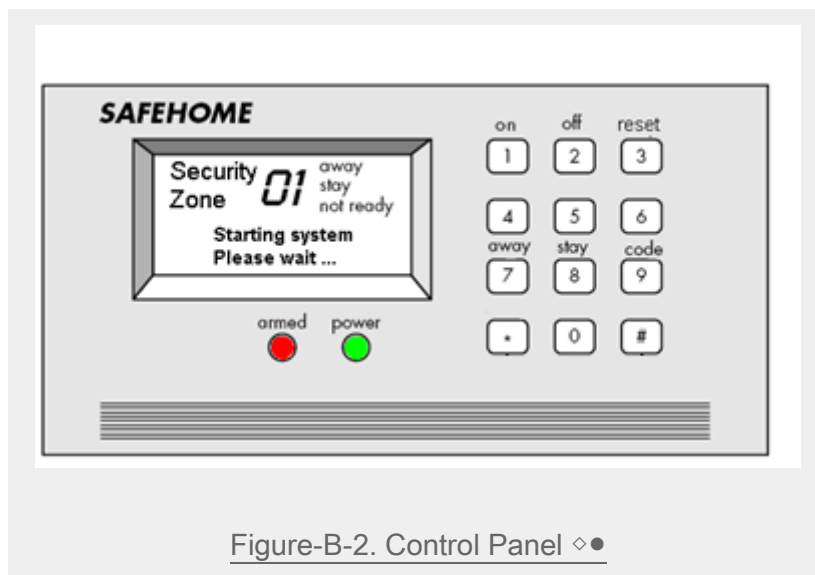


Figure-B-2. Control Panel ◇●

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. Report system

: If there's abnormal events, SafeHome sends message to users. The message contains url to the SafeHome Web Service with event description. User can access to the information of corresponding event conveniently by clicking url and check through internet. (SEE: [C.6. Home Management](#))

: Also every Monday, it sends weekly report to user's mail so that user can check manually.

SEE: [C.2.6. Weekly Mail Report](#)

7. Alarm and automatic call

: If user does not check for the serious event such as intruder or fire in the house, it automatically calls fire station and police station in emergent case.

8. Sensors

: There are six types of sensors: 1. Motion, 2. Window, 3. Fire, 4. CO, 5. Water Level, 6. Doggie August. Each sensor can detect any abnormality if it is turned on. Admin can set their state of on/off.

9. Camera Unit

: Camera has zoom in/out and pan functions. Home Owner can change the gaze of the camera. When motion sensor and window sensor detects intruder or possible intruder, camera unit starts recording automatically.

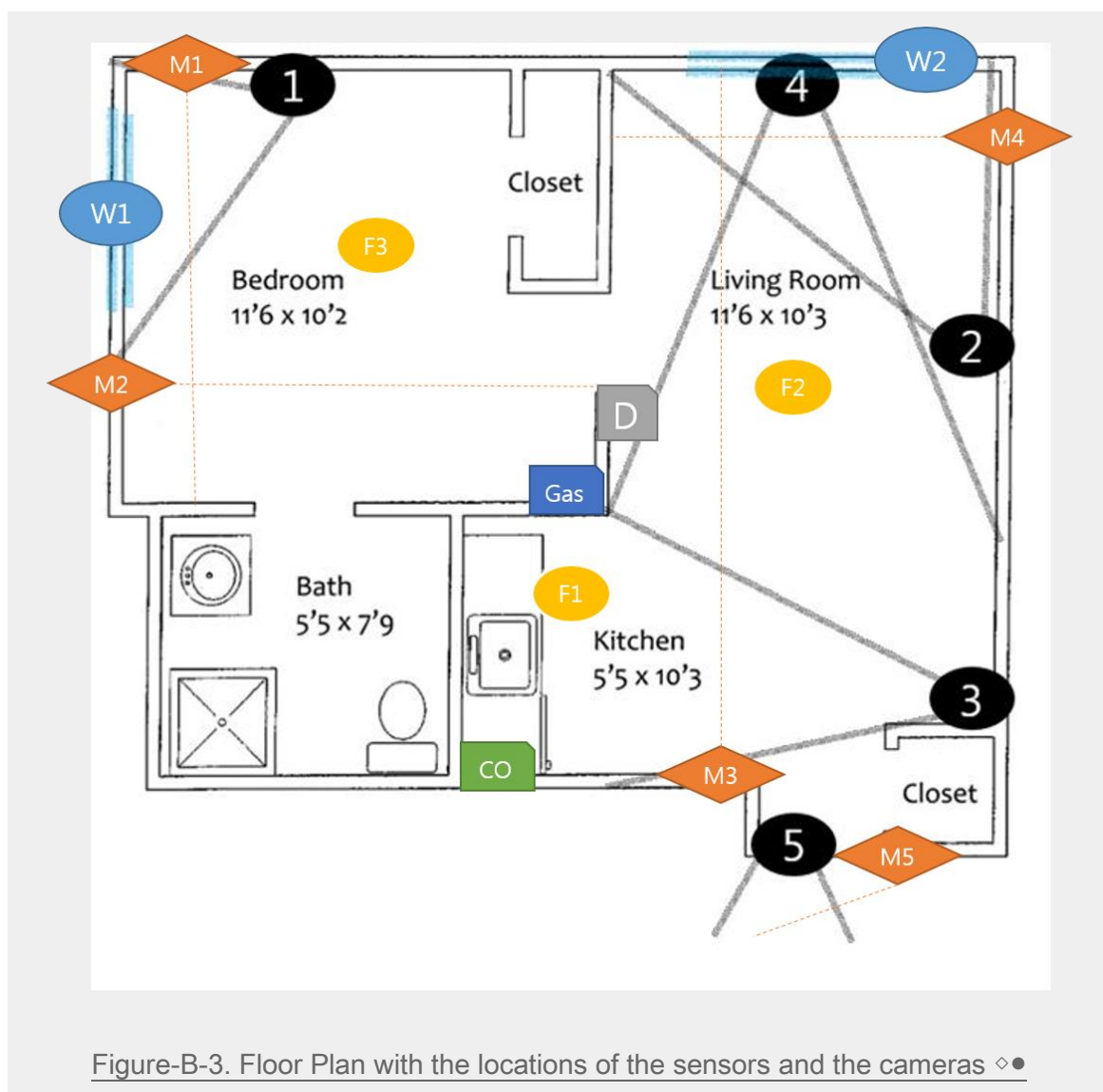
B.3. Information ◇

- **Password type:**
 - Control Panel: 4 digit number
 - Web Service: plain any character string with at least 8 characters.
- **Password wrong**
 - Basically sends SMS to Home Owner if user gets wrong more than 5 times.
- **Password Encryption**
 - RSA (directed encrypting algorithm)
- **Web Service Security**
 - SSH Layer over https protocol
- **Format of recording moving picture**
 - MPEG2
- **Time to record video**
 - maximum 1 hour for each record.
- **Precondition to record**
 - motion sensor and window sensors detects intruder / possible intruder
 - SEE: [C.5. Intruder Prevention System](#) and [C.7.4. Camera Record](#)
- **State of Sensors**
 - read
 - enable
 - disable
- **Camera Function**
 - record
 - play
 - controlling (zoom in/out, pan)
- **State of House**
 - home
 - away
 - overnight travel
 - extended travel

B.4. Motion direction and speed ◇

At first, motion detection is done by motion sensor. Motion sensor helps to call camera to start recording. To calculate speed of the object, there must be some consideration to implement such algorithm. For the basic proposal, at first let's assume that camera takes still image every 10 minutes. It will be treated as background image. later, current images are compared to still image, and each difference in each frame will be help to calculate the speed of the object. This can be conducted by calculation of rgb values in each frame. However, we will look for external API for safety and certainty.

B.5. Security Zone ◇



We used 5 cameras for this floor plan. Camera 1 and 2 is gazing at window so that the camera can detect intruder or stranger. Camera 3 is gazing kitchen to check whether there is fire. Camera 4 is gazing at the door to see who is coming via door. Camera 5 is to check and take photos of the visitor or stranger or intruder.

Also denoted locations of the sensors. W: window sensor, M: motion sensor, D: doggie angust sensor, Gas: gas sensor, CO: CO sensor, F: Fire sensor. Motion sensor and Window sensors help helps to detect intruder, intrude trial or possible intruder so that it calls camera to record for related information.

B.6. Use-case Overview ◇●

Our team grouped use-cases into 8 big categories:

1. Boot

- a. Mainly deals with central processor booting or shutdown.
- b. Use cases for the initialization and the finish of sensors and cameras are also included.

2. Configure

- a. Setting of sensors, cameras, and other options are included in this category.
- b. Weekly mail report and self diagnoses are considered to be regular work and they are also included..
- c. Configuration process is done via Web Service, and saves the setting value for default.

3. User Management

- a. Mainly deals with Login/Logout activities.
- b. Checking user logs, user create, user edit are also included.
- c. Finding ID/password is also a big deal. It is included in this category..

4. Arm/Disarm

- a. Arm/disarm events via control panel or web service are included in this category.
- b. Autoarm is included.
- c. Overnight travel mode or extended travel mode are included.

5. Intruder Prevention System

- a. Detection of intruder, intrude trial, possible intruder are described.

6. Home Management

- a. Sensor alarms
- b. Control of Appliances/Lightning/HVAC via Internet

7. Home Surveillance

- a. Camera control functions such as temporal camera control, camera overview from floor plan, record, play, thumbnails are in this category.

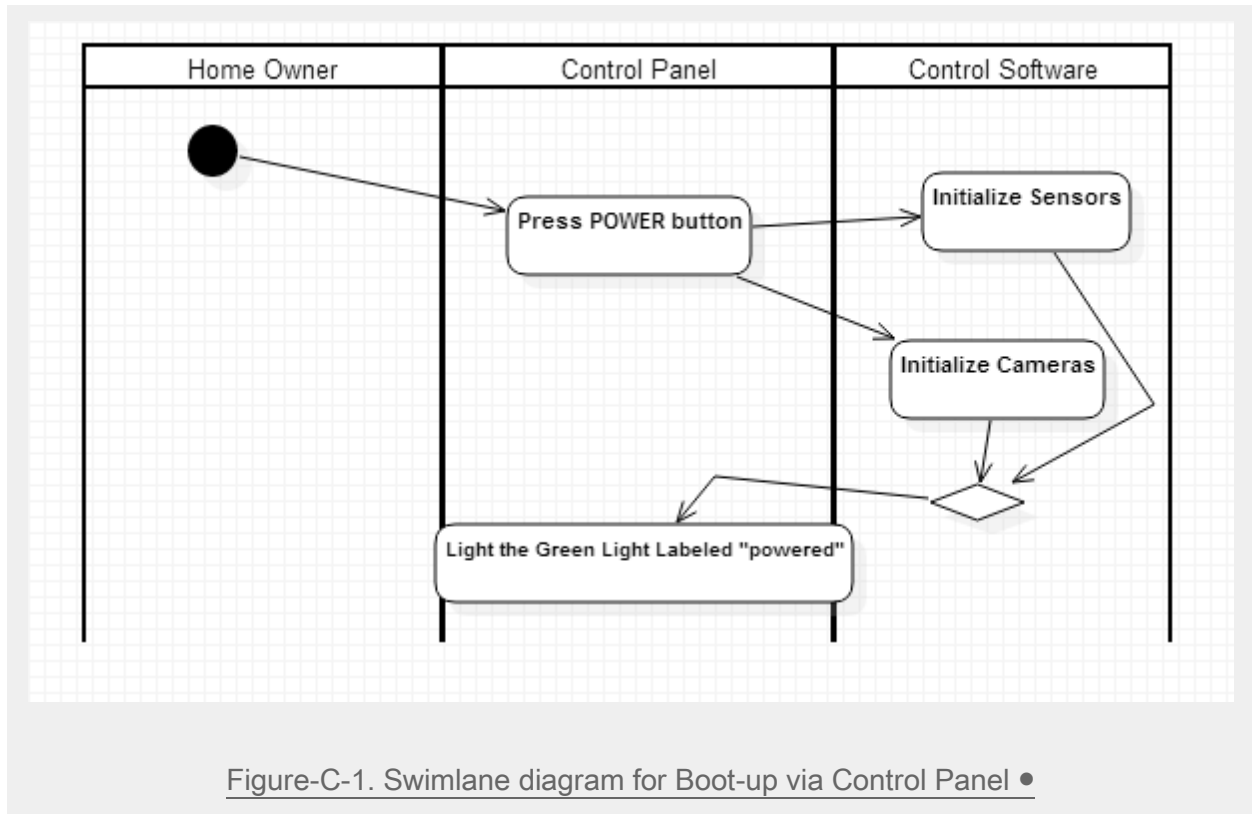
8. Non-Functional Use Cases

- a. Telephone call, extra battery, session timeout, multiple access control are described.

C. Use cases

C.1. Boot

C.1.1. Boot-up (CP) •



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	<ol style="list-style-type: none"> 1. Home Owner presses the POWER button on Control Panel. 2. Safehome do UC:Initialize Sensor and UC:Initialize Camera 3. Light the Green Light labeled "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	

C.1.2. Shutdown (CP) •

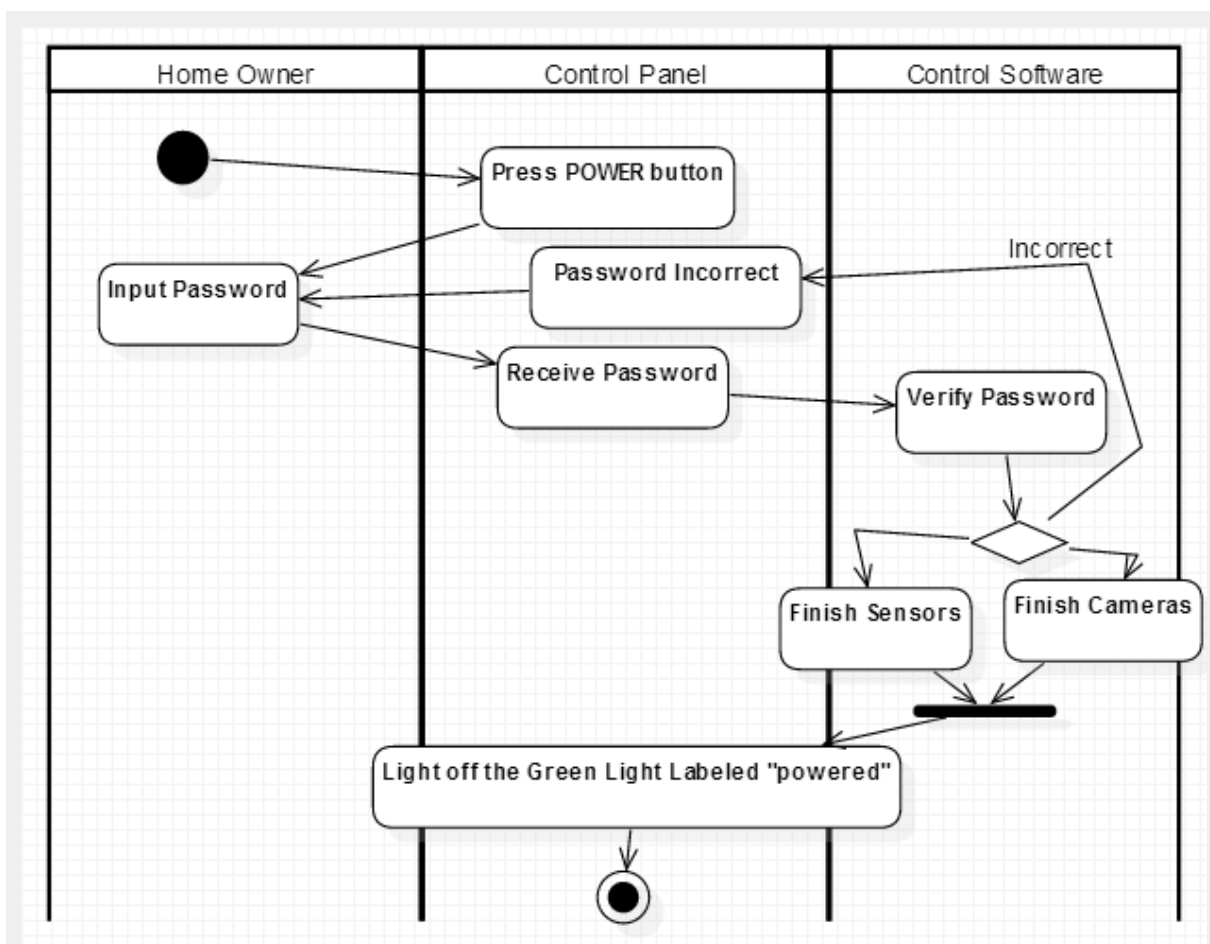


Figure-C-2. Swimlane diagram for Shutdown via Control Panel •

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 POWER button upto 3 seconds
Scenario	<ol style="list-style-type: none"> 1. Home Owner presses the POWER button on Control Panel and enters password. 2. Safehome do UC:finish Sensor and UC:finish Camera
Exceptions	
Priority	middle
Frequency	sometimes
Open issues	SafeHome do not offer function to shutdown by request from Web Service.
Channel to actor	
Secondary actors	

C.1.3. Initialize Sensors •

Use Case ID	UC-1-3
Use Case Name	Initialize Sensors
Primary actor	Control Software
Goal in context	Enable and initialize the sensors.
Preconditions	All of the sensors are disabled.
Trigger	UC:Boot-up
Scenario	<ol style="list-style-type: none"> 1. Home Owner pressed POWER button 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, CO sensor, Fire sensor, Water level sensor, Doggie Angst Sensor) and checks for the malfunction.
Exceptions	2a. If any malfunction is detected, SafeHome:Control Software notifies to Home Owner via SMS.
Priority	High
Frequency	Sometimes
Open issues	- How to detect the malfunction (e.g. poor connection, sensor

	misbehave.)
Channel to actor	
Secondary actors	

C.1.4. Initialize Cameras •

Use Case ID	UC-1-4
Use Case Name	Initialize Cameras
Primary actor	Control Software
Goal in context	Enable and initialize the cameras.
Preconditions	Camera off
Trigger	UC:Boot-up
Scenario	<ol style="list-style-type: none"> 1. Home Owner pressed POWER button and the Central Processor has been booted up. 2. Control Software restores setting values(degree of zoom in/out, pan) 3. Enables all the cameras and set to the restored setting values. Check for the malfunction.
Exceptions	3a. If any malfunction is detected, SafeHome:Control Software notifies to Home Owner via SMS.
Priority	High
Frequency	Sometimes
Open issues	- How to detect malfunctionality of the cameras (e.g. connection error).
Channel to actor	
Secondary actors	

C.1.5. Finish Sensors •

Use Case ID	UC-1-5
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	<ol style="list-style-type: none"> 1. Home Owner pressed POWER button and the Central Processor is about to shutdown. 2. Control Software disables all the sensors (Motion sensor, Window sensor, CO sensor, Fire sensor, Water level sensor, Doggie Angst Sensor)
Exceptions	
Priority	High
Frequency	Sometimes
Open issues	
Channel to actor	
Secondary actors	

C.1.6. Finish Cameras •

Use Case ID	UC-1-6
Use Case Name	Finish Camera
Primary actor	Control Software
Goal in context	Disable and finish the cameras.
Preconditions	Cameras are enabled
Trigger	UC:Shutdown
Scenario	<ol style="list-style-type: none"> 1. Home Owner pressed POWER button and the Central Processor is about to shutdown. 2. Control Software saves setting values(degree of zoom in/out, pan) 3. Disables all the cameras.
Exceptions	
Priority	High
Frequency	Sometimes

Open issues	
Channel to actor	
Secondary actors	

C.2. Configure

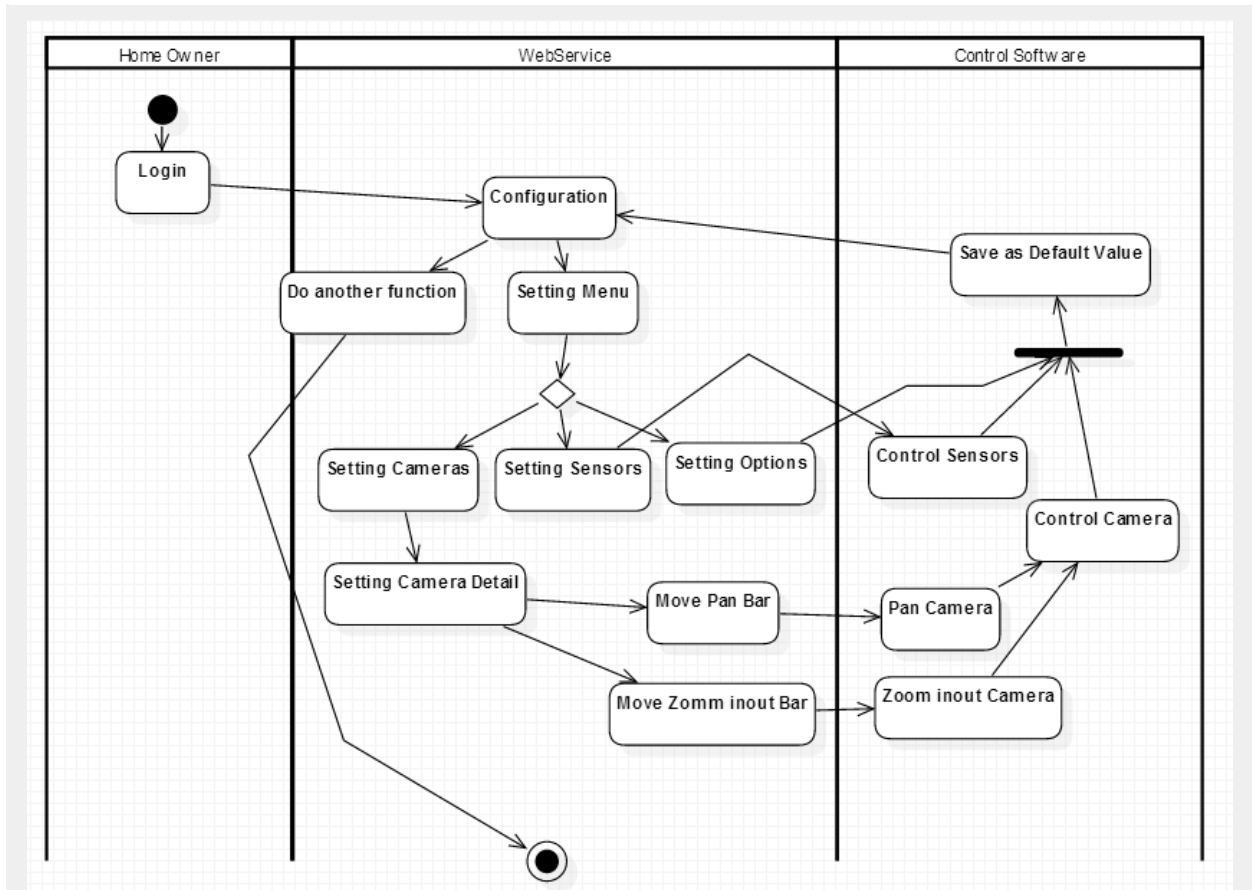


Figure-C-3. Swimlane diagram for Setting Configuration ◇

C.2.1. Setting Main (Web) ◇

Use Case ID	UC-2-1
Use Case Name	Setting Main (Web)
Primary actor	Home Owner (Web)
Goal in context	Configure which sensors to enable/disable.
Preconditions	Login through SafeHome:Web Service.
Trigger	Select Setting
Scenario	<ol style="list-style-type: none"> 1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner clicks on SETTING button. 3. SafeHome Web Service displays main SETTING screen.

Exceptions	3a. Main screen contains buttons to move another screen including SENSOR button (UC: Setting Sensors), CAMERA button (UC: Setting Camera), and DETAIL button (UC: Setting Detail).
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.2.2. Setting Sensors (Web) ◇

Use Case ID	UC-2-2
Use Case Name	Setting Sensors (Web)
Primary actor	Home Owner (Web)
Goal in context	Configure which Sensor to enable/disable.
Preconditions	Login through SafeHome:Web Service.
Trigger	Select Setting - Sensors
Scenario	<ol style="list-style-type: none"> 1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner clicks on SETTING button. 3. SafeHome Web Service displays main SETTING screen. 4. Home Owner clicks on SENSORS button. 5. SafeHome Web Service displays Floor Plan with locations of all the Sensor icons. 6. Home Owner selects specific Sensors icon on the screen to enable/disable
Exceptions	4a. If Home Owner exits from current display, UC:Setting Main comes out.
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.2.3. Setting Cameras (Web) ◇

Use Case ID	UC-2-3
Use Case Name	Setting Cameras (Web)
Primary actor	Home Owner (Web)
Goal in context	Select specific Camera for detailed setting.
Preconditions	Login through SafeHome:Web Service.
Trigger	Select Setting - Camera
Scenario	<ol style="list-style-type: none"> 1. Home Owner successfully log in to SafeHome: Web Service. 2. Home Owner clicks on SETTING button. 3. SafeHome Web Service displays main SETTING screen. 4. Home Owner clicks on CAMERA button. 5. SafeHome Web Service displays Floor Plan with locations of all the Camera icons. 6. Home Owner selects specific Camera icon on the Floor Plan for Detail. (UC:Setting Cameras Detail)
Exceptions	4a. If Home Owner exits from current display, UC:Setting Main comes out.
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.2.4. Setting Cameras Detail (Web) ◇

Use Case ID	UC-2-4
Use Case Name	Setting Cameras Detail (Web)
Primary actor	Home Owner (Web)
Goal in context	Configure which Camera to enable/disable.
Preconditions	UC: Setting Cameras. Home Owner clicked Camera Icon at the Floor Plan in

	the Setting-Camera display.
Trigger	Select Setting - Camera
Scenario	<ol style="list-style-type: none"> 1. Home Owner selects specific Camera icon on the Floor Plan in display of Setting Camera. 2. Home Owner clicks the “left” button to move gaze left or clicks the “right” button to move gaze right. 3. Home Owner clicks the “zoom in” button to zoom in the camera or “zoom out” button to zoom out the camera. 4. Home Owner clicks the “save” button to save current setting or clicks “default” to restore previous setting.
Exceptions	2a. If Home Owner exits from current display, UC:Setting Camera comes out.
Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.2.5. Setting Options (Web) ◇

Use Case ID	UC-2-5
Use Case Name	Setting Options (Web)
Primary actor	Home Owner (Web)
Goal in context	Setting the options.
Preconditions	Login
Trigger	Select Setting
Scenario	<ol style="list-style-type: none"> 1. Home Owner can change system respond time. 2. Home Owner can decide specific behaviors to do if Home Owner does not respond to the intruder or fire: i.e. Home Owner can decide whether using automatic call to police or fire station or not. 3. Home Owner can test whether sensors are running well. 4. Home Owner can set status of Appliances/Lightning/HVAC as well. 5. Home Owner can set to use Autoarm or not. 6. Home Owner can choose to receive week daily report or not.
Exceptions	

Priority	High
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.2.6. Weekly Mail Report •

Use Case ID	UC-2-6
Use Case Name	Weekly Mail Report
Primary actor	SafeHome: Web Service
Goal in context	System send mail to Home Owner about weekly statistic
Preconditions	Every Monday 10:00 a.m.
Trigger	Data has been accumulated for weekly report and be ready to be sent to users.
Scenario	<ol style="list-style-type: none"> 1. Data has been accumulated for a weekly report. 2. System automatically produces statistics and send it through the mail.
Exceptions	If system operated in a week, it only accounts for currently accumulated data. If there's no comparative data, don't compare it. (such cases like the system is recently operated and has no proper previous data)
Priority	middle
Frequency	weekly
Open issues	System automatically compares information about intruders, intrude trials, suspicious strangers, number of alarms, and time taken of user to check message, between last week, 4 weeks ago(last month), and 52 weeks ago(last year) with current week data.
Channel to actor	
Secondary actors	

C.2.7. Self-Diagnosis •

Use Case ID	UC-2-7
Use Case Name	Self-Diagnosis
Primary actor	Control Software
Goal in context	System diagnosis itself
Preconditions	
Trigger	Every 12:00 PM
Scenario	<ol style="list-style-type: none"> 1. System start Self-Diagnosis at noon 2. System check Sensors malfunction 3. System check Cameras malfunction 4. System check Alarm malfunction
Exceptions	2,3,4a If System find malfunction notify to Home Owner about malfunction
Priority	High
Frequency	Daily
Open issues	
Channel to actor	
Secondary actors	

C.3. User Management

C.3.1. Login (Web) ◇

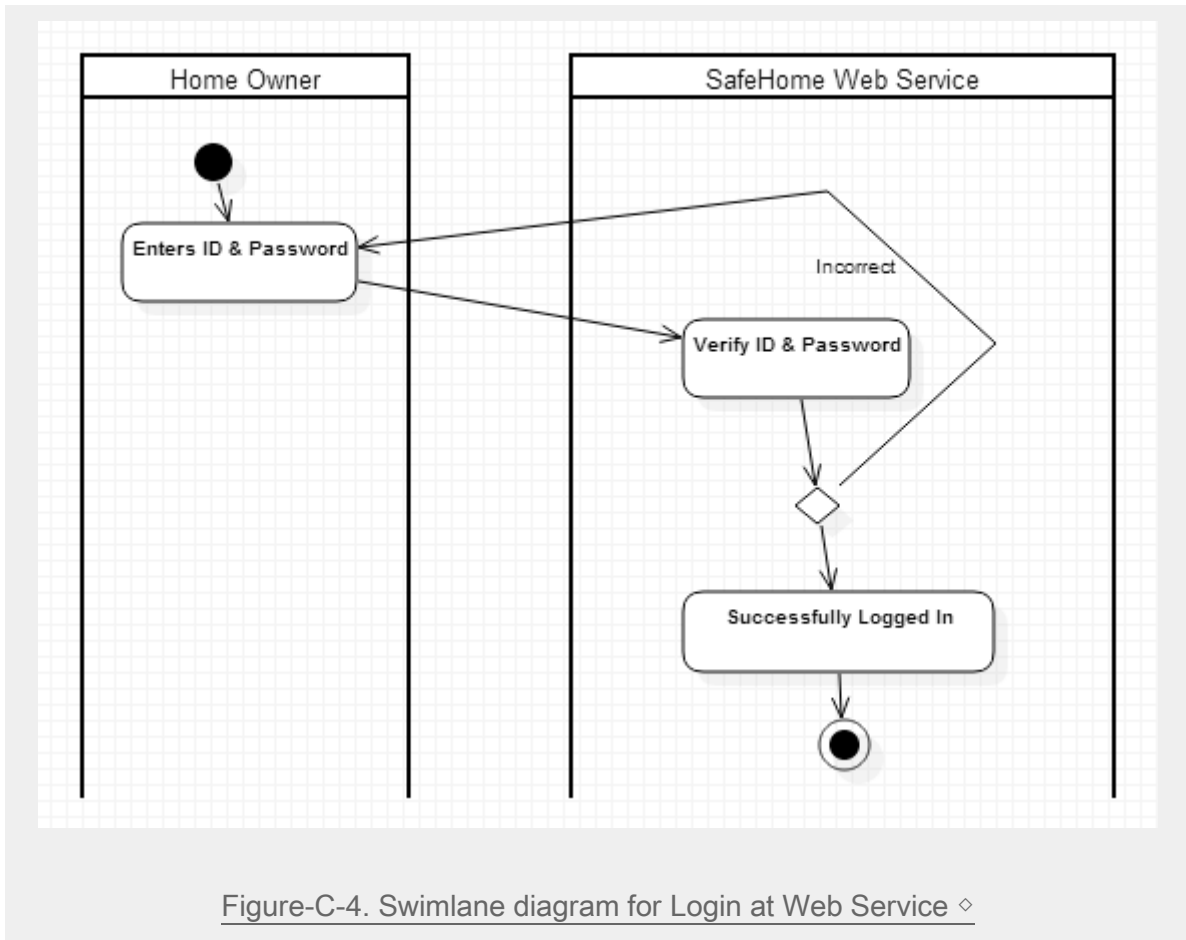


Figure-C-4. Swimlane diagram for Login at Web Service ◇

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	<ol style="list-style-type: none"> 1. Home Owner enters the ID 2. Home Owner enters the password 3. SafeHome displays GUI for major functions including sensors, cameras and current floor plan.

Exceptions	1a. If “auto login” has been checked, SafeHome skip the login process to 3 rd scenario. 2a. If ID or password is incorrect, it shows warning message. If it gets wrong more than 5 times, SafeHome notify to Home Owner via SMS, and blocks that IP.
Priority	Essential
Frequency	Frequent
Open issues	
Channel to actor	
Secondary actors	

C.3.2. Logout (Web) ◇

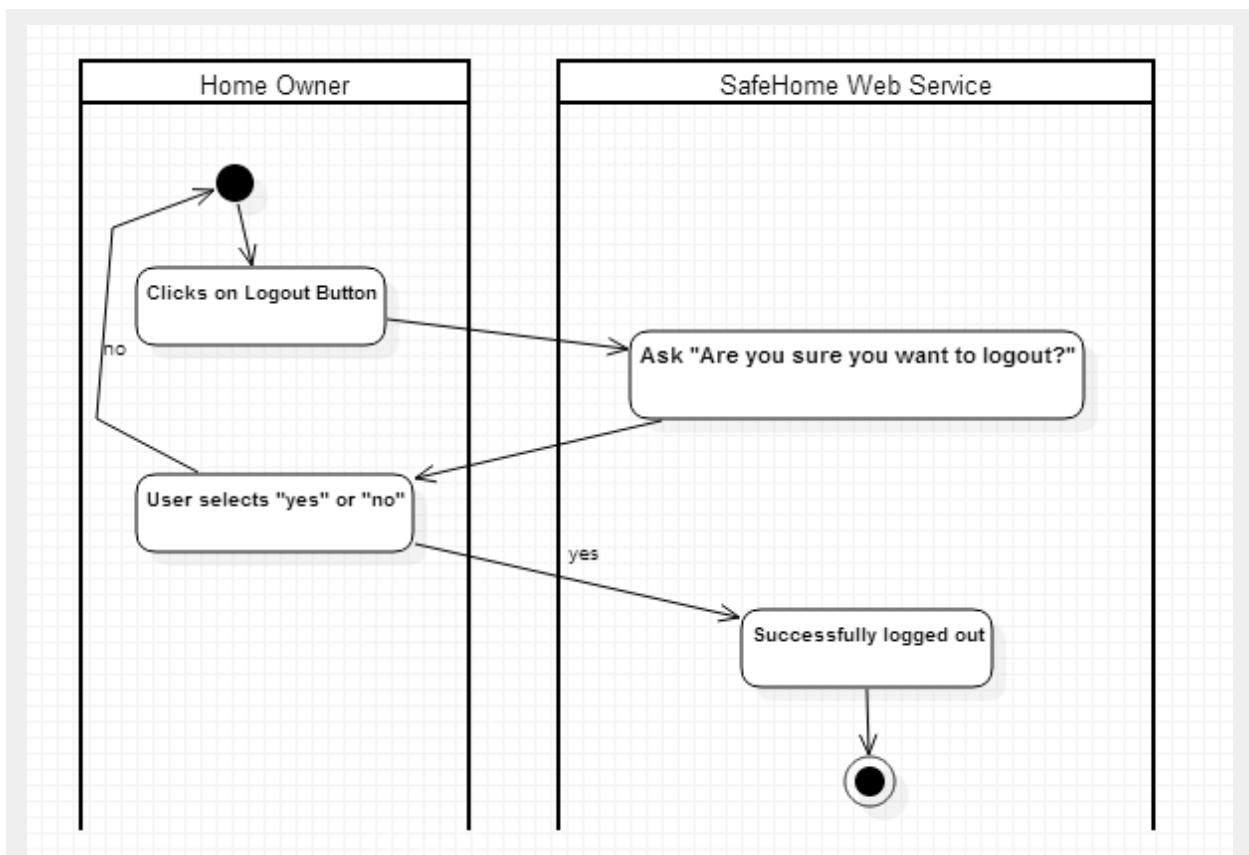


Figure-C-5. Swimlane diagram for Logout at Web Service ◇

Use Case ID	UC-3-2
Use Case Name	Logout
Primary actor	Home Owner(Web)
Goal in context	Logout activity
Preconditions	Log-in
Trigger	Home Owner try to disconect SafeHome Web Service
Scenario	<ol style="list-style-type: none"> 1. Home Owner select logout. 2. Web Service asks Home Owner "are you sure you want to logout?". 3. Home Owner select yes. 4. System disconnect SafeHome Web Service.
Exceptions	
Priority	Essential
Frequency	Frequent
Open issues	
Channel to actor	Via web application
Secondary actors	internet

C.3.3. User Log (Web) ◇

Use Case ID	UC-3-3
Use Case Name	User Log
Primary actor	Web Service
Goal in context	Web page shows user usage record.
Preconditions	log-in
Trigger	Select user log
Scenario	<ol style="list-style-type: none"> 1. User clicks log icon in "users" menu 2. System shows logs for each user
Exceptions	3a. Automatic login
Priority	Low

Frequency	Not frequent
Open issues	
Channel to actor	
Secondary actors	

C.3.4. User Create (Web) ◇

Use Case ID	UC-3-4
Use Case Name	User Create
Primary actor	Home Owner (Web)
Goal in context	System creates new user
Preconditions	Login
Trigger	select create new account
Scenario	<ol style="list-style-type: none"> 1. User selects create new account button in GUI 2. System displays user crating page. 3. User enters ID and password and checks for the authority 4. Presses create button
Exceptions	4a. Pressing cancel button cancels current process and current data is gone.
Priority	Low
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.3.5. User edit (Web) ◇

Use Case ID	UC-3-5
Use Case Name	User Edit

Primary actor	Home Owner (Web)
Goal in context	Change the authority of registered user or delete user account.
Preconditions	Login
Trigger	Select Edit
Scenario	<ol style="list-style-type: none">1. The user selects edit menu in the GUI.2. This system shows edit display about account.3. The user checks authority or remove registered account.4. The user can save the changes after edit button again.
Exceptions	4a. Pressing cancel does not save change and exit from edit screen.
Priority	Low
Frequency	Low
Open issues	
Channel to actor	
Secondary actors	

C.3.6. Finding ID/Password (Web) ◇

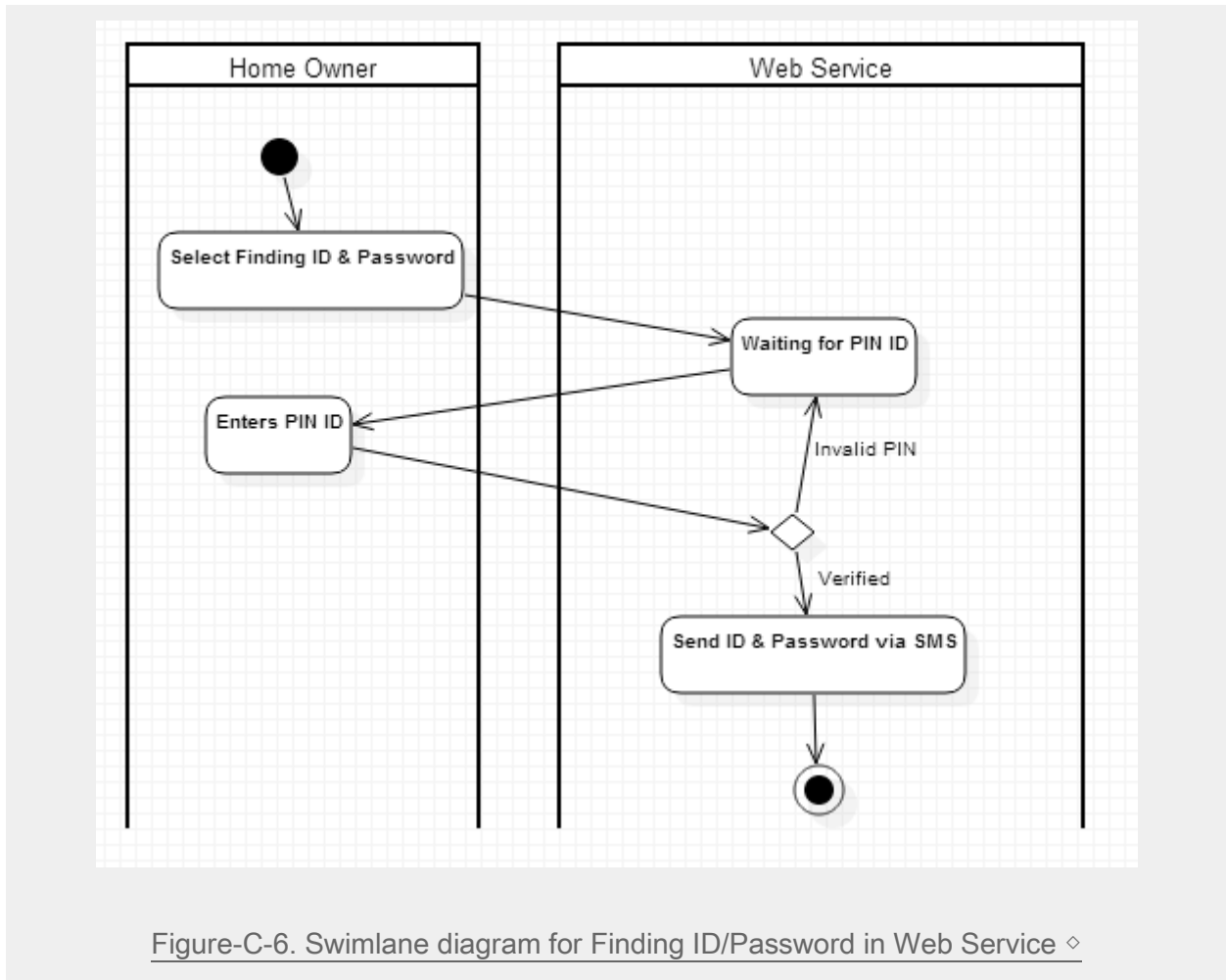


Figure-C-6. Swimlane diagram for Finding ID/Password in Web Service ◇

Use Case ID	UC-3-6
Use Case Name	Finding ID/Password(Web)
Primary actor	Home Owner
Goal in context	Finding ID/Password when Home Owner forgot them
Preconditions	
Trigger	Select Finding ID/Password
Scenario	<ol style="list-style-type: none"> 1. Home Owner select Finding ID/Password 2. Home Owner enters PIN(Personal Identification Number) ID 3. System send ID/Password via SMS
Exceptions	2a. If Home Owner forgets PIN ID, Home Owner should call CPI Corporation for further guidance
Priority	Middle

Frequency	Sometimes
Open issues	The research for security problem during the certification of Home Owner is needed.
Channel to actor	
Secondary actors	

C.4. Arm/Disarm

C.4.1. Arm System via Control Panel (CP) •

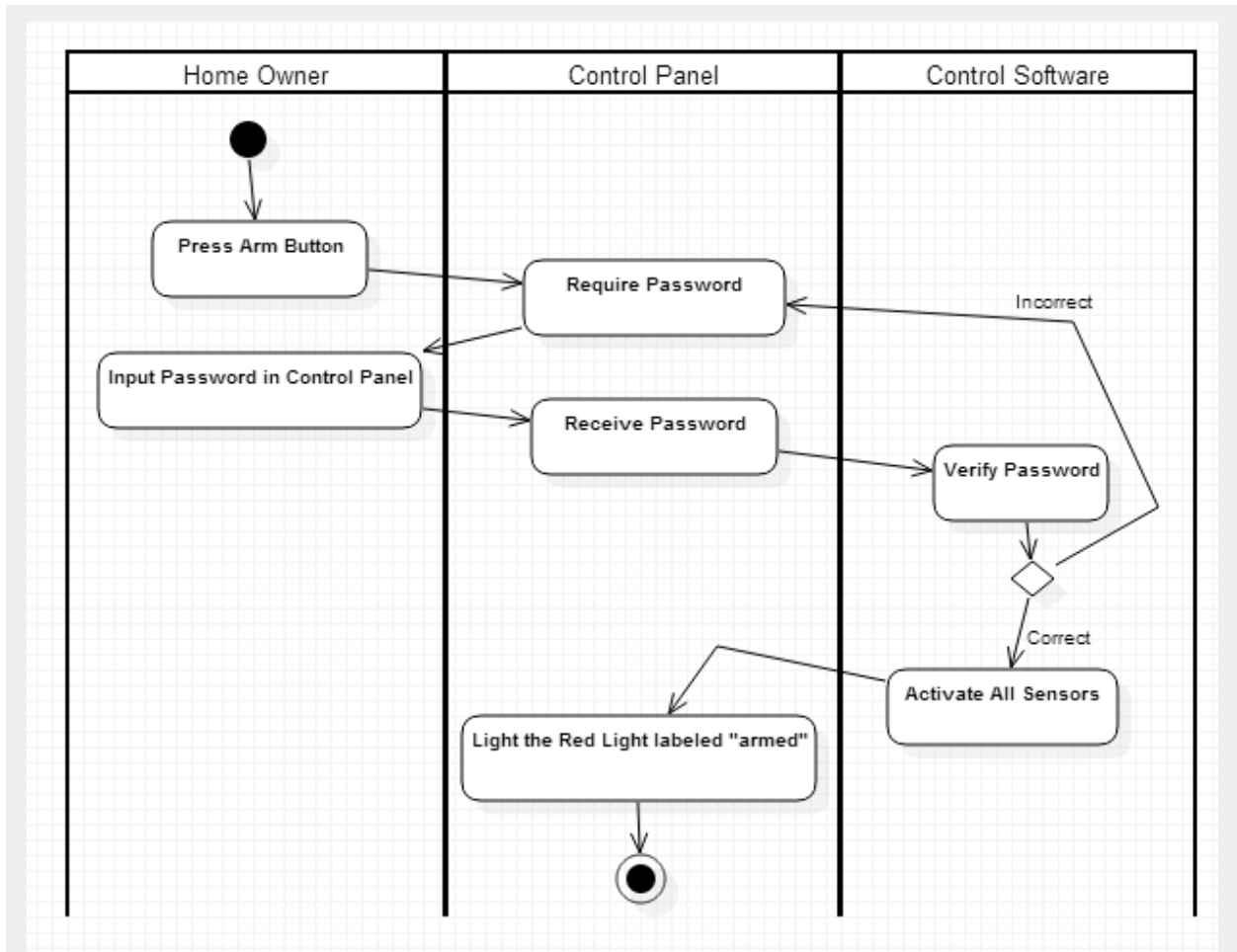


Figure-C-7. Swimlane diagram for Arm System via Control Panel •

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	<ol style="list-style-type: none"> 1. Home Owner presses Arm/Disarm button 2. Home Owner inputs a Control Panel password 3. The Control Software activates all the 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	

C.4.2. Disarm System via Control Panel (CP) •

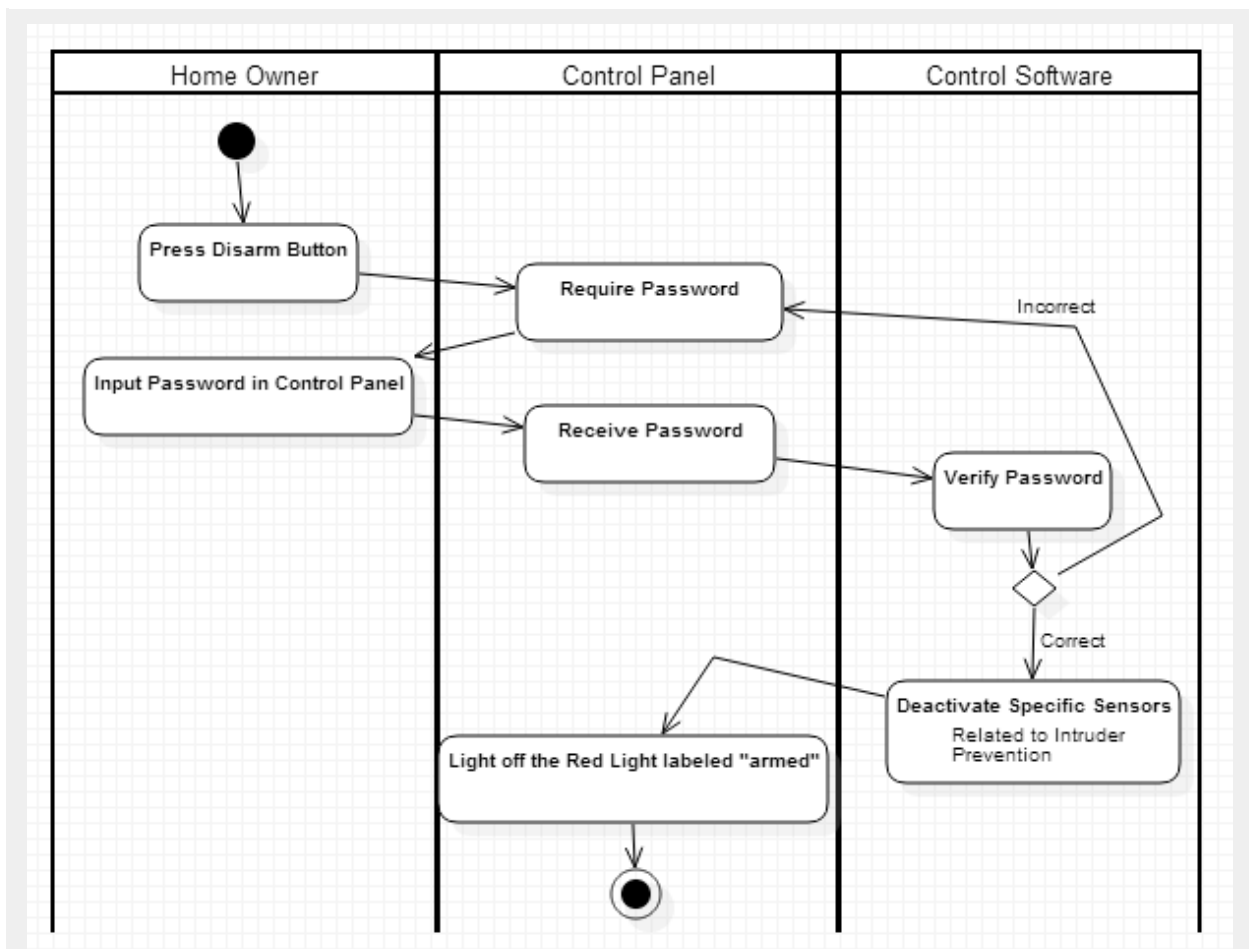


Figure-C-8. Swimlane diagram for Disarm System via Control Panel •

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	<ol style="list-style-type: none"> 1. The Home Owner enters correct password and enters the home 2. The Control Software deactivates specific sensors related to Intruder Prevention (Motion sensors and Window sensors). 3. The Control Panel displays that SafeHome is disarmed with red light labeled 'armed' turned off.
Exceptions	1a. If the Home Owner gets wrong, Home Owner can re-enter password.
Priority	High
Frequency	Frequent
Open issues	Blocks the system and send SMS to Home Owner if someone gets wrong more than 5 times.
Channel to actor	
Secondary actors	

C.4.3. Arm System via Internet (Web) ◇

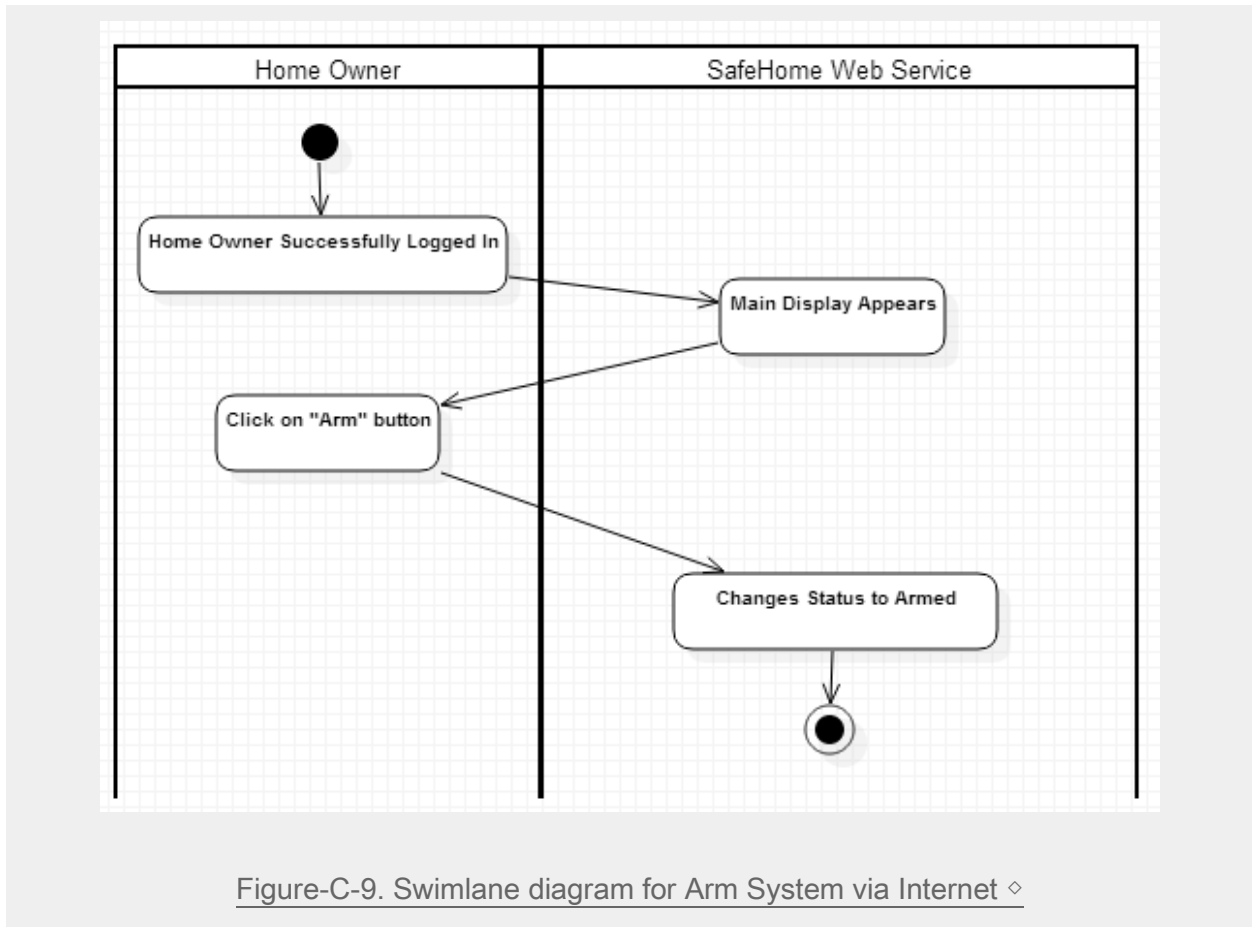
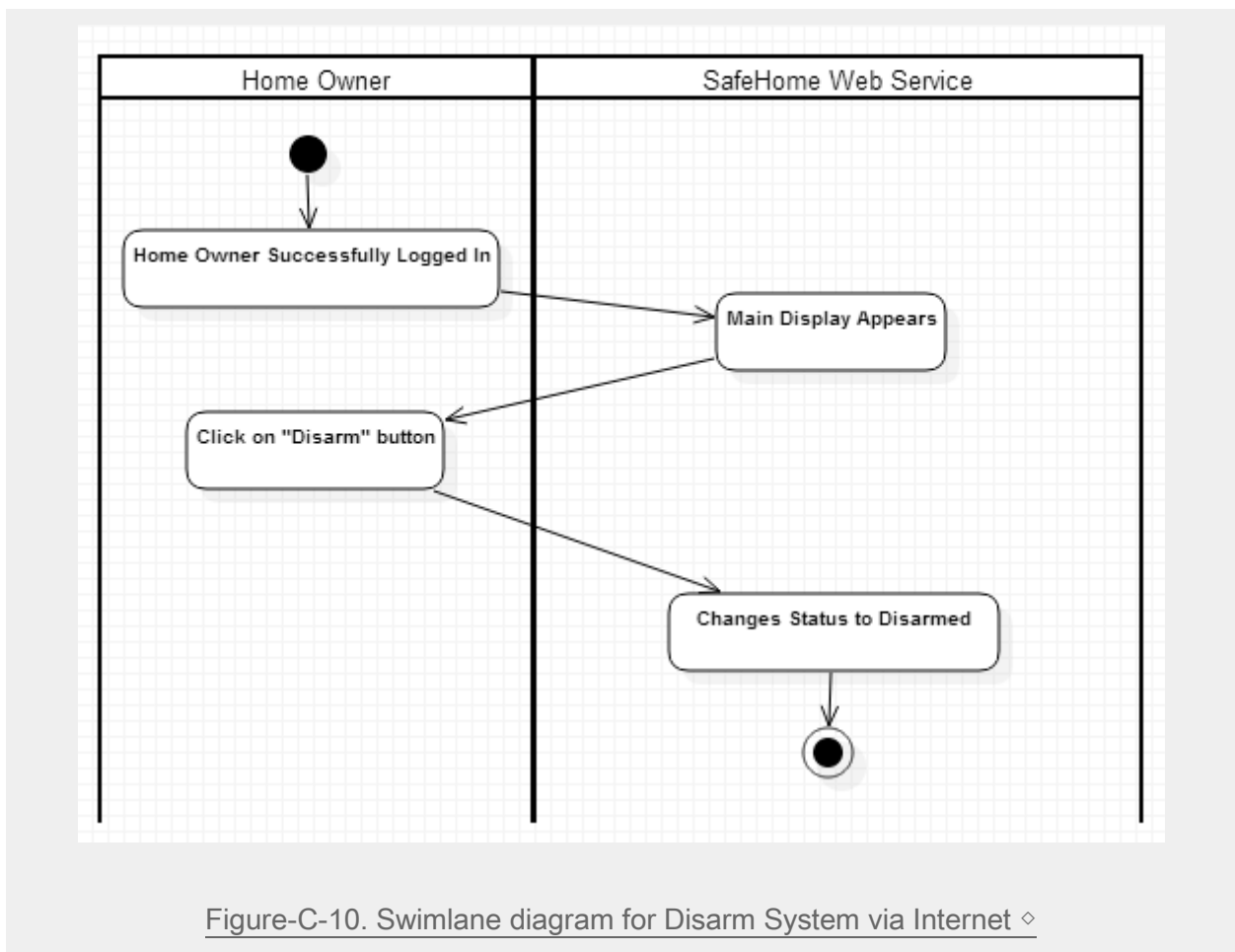


Figure-C-9. Swimlane diagram for Arm System via Internet ◇

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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1a. If the password gets wrong, the Home Owner should enter the correct password again. 1b. Auto login is doesn't require login proces.
Priority	High
Frequency	Frequent.

Open issues	
Channel to actor	
Secondary actors	

C.4.4. Disarm System via Internet (Web) ◇



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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1a. If the password gets wrong, the Home Owner should enter the correct password again. 1b. Auto login is doesn't require login proces.
Priority	High
Frequency	Frequent.
Open issues	
Channel to actor	
Secondary actors	

C.4.5. Auto Arm System ◇●

Use Case ID	UC-4-5
Use Case Name	Auto Arm System
Primary actor	Control Software
Goal in context	Automatically arm if there is no detection of people inside house.
Preconditions	No people or no pets are in the house.
Trigger	
Scenario	<ol style="list-style-type: none"> 1. Autoarm is set to turned on from UC:Setting Options. 2. Motion sensor detects no events for 10 mintues. 3. Control Software arms the security system automatically.
Exceptions	2a. Time interval can be set by Home Owner via UC:Setting Options.
Priority	High
Frequency	High
Open issues	If there is pets, how to define automatic arm?
Channel to actor	

Secondary actors	
-------------------------	--

C.4.6. Overnight Travel Mode (Web) ◇●

Use Case ID	UC-2-8
Use Case Name	Overnight Travel Mode
Primary actor	Home Owner (Web)
Goal in context	Arm security mode for overnight travel
Preconditions	Home Owner successfully logged in.
Trigger	SafeHome receive the command arm Overnight Travel Mode
Scenario	<ol style="list-style-type: none"> 1. Home Owner clicks on “Overnight Travel Mode” button 2. SafeHome arm Overnight Travel Mode and Security System 3. Overnight Travel Mode control appliance, HVAC, lightning according to the setting
Exceptions	
Priority	Low
Frequency	When Overnight Travel
Open issues	
Channel to actor	
Secondary actors	

C.4.7. Extended Travel Mode (Web) ◇●

Use Case ID	UC-2-9
Use Case Name	Extended Travel Mode
Primary actor	Home Owner
Goal in context	Arm security mode for extended travel
Preconditions	Home Owner successfully logged in.
Trigger	SafeHome receive the command arm Extended Travel Mode

Scenario	<ol style="list-style-type: none">1. Home Owner clicks on "Extended Travel Mode" button2. SafeHome arm Extended Travel Mode and Security System3. Extended Travel Mode control appliance, HVAC, lightning according to the setting4. Extended Travel Mode turn on light when night(Light intensity is lower than baseline) and turn off at 12:00AM
Exceptions	
Priority	Low
Frequency	When Extended Travel
Open issues	
Channel to actor	
Secondary actors	

C.5. Intruder Prevention System

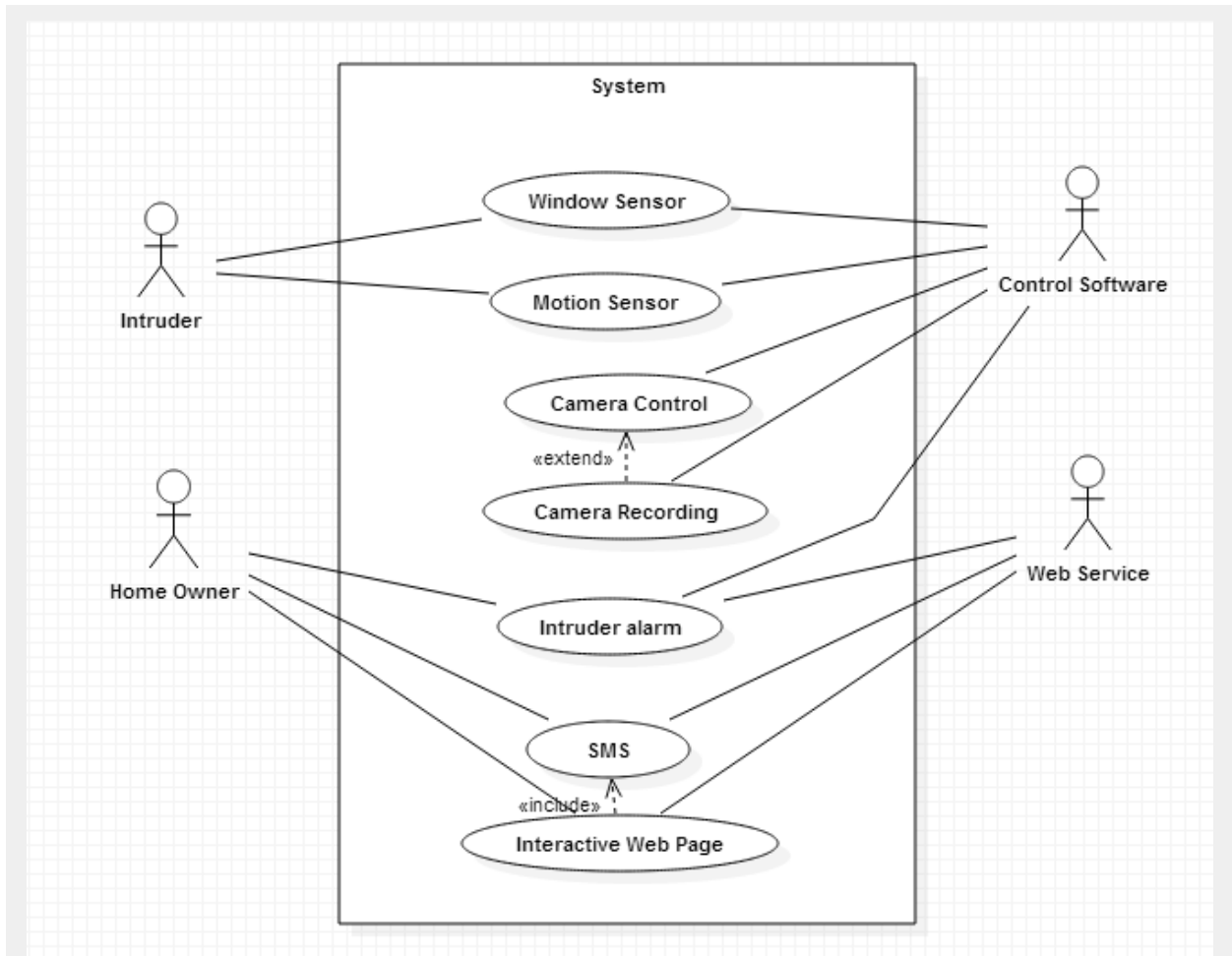
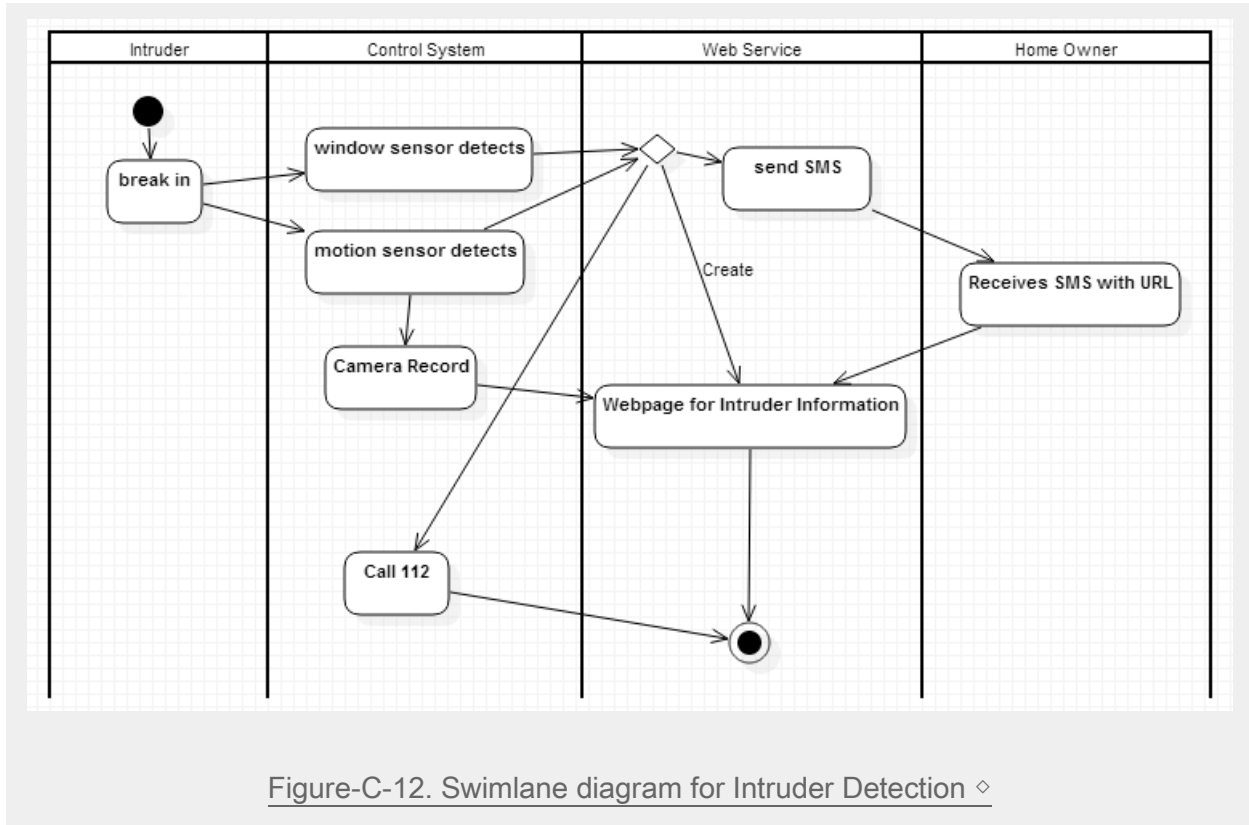


Figure-C-11. Usecase diagram for Inturder Prevention System ◇

C.5.1. 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	<ol style="list-style-type: none"> 1. Intruder break-in home. 2. Window sensor detects there is breakin. 3. Motion sensor detects Intruder and starts recording(see: UC: Camera Record) and rings Intruder Alarm. 4. System notify to Home Owner about intruder is appeared via SMS (System produces SMS including url with information) 5. Home Owner clicks url, then shows web page waiting for log in. 6. If Home Owner successfully logged in, the web page shows the information about intruder.
Exceptions	3a. If auto-login option is checked already, it is automatically logged in.

	5a. If Home Owner does not respond over the setting time, system conducts promised behavior such as calling police or siren ring.
Priority	High
Frequency	Not frequent

C.5.2. Intrude Trial Detection ◊

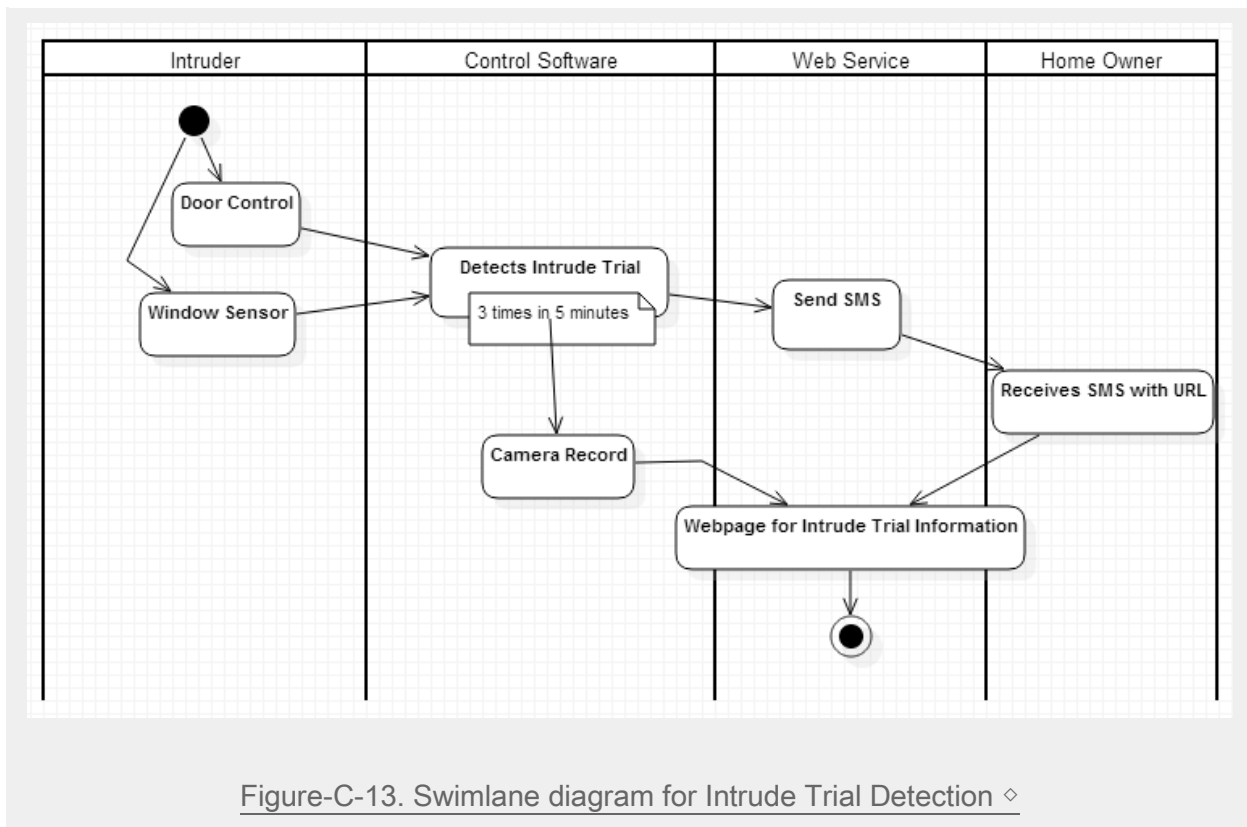


Figure-C-13. Swimlane diagram for Intrude Trial Detection ◊

Use Case ID	UC-5-2
Use Case Name	Intrude Trial Detection
Primary actor	Control Software
Goal in context	If intrude trial is detected, SafeHome notify to Home Owner.
Preconditions	Safe home system is ready to detect intrude trial.
Trigger	Intrude Trial Detected
Scenario	<ol style="list-style-type: none"> 1. Intrude Trial is detected by Window sensors and Door lock. 2. Control Software takes photo who tried to intrude. 3. If the trial detected more than 3 times in 5 minutes, System notify to

	Home Owner via SMS about there is intrude trial detected with location of the sensor and images.
Exceptions	3a. If auto-login option is checked already, it is automatically logged in.
Priority	High
Frequency	Frequent
Open issues	Intrude trial is detected by such actions: when Home Owner entered wrong password for door lock, or when there has been force to break down the door lock.

C.5.3. Possilbe Intruder Alarm ◇

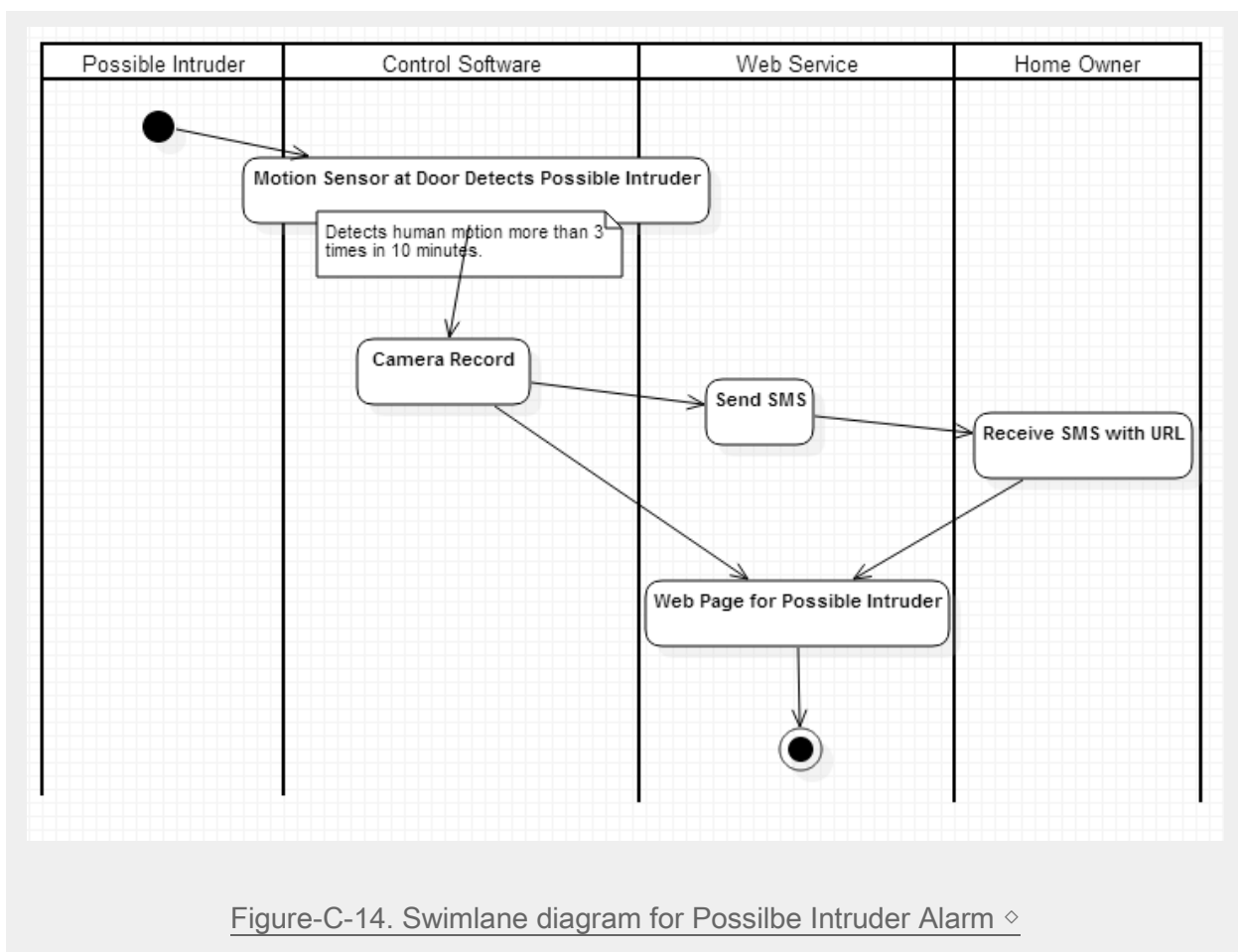


Figure-C-14. Swimlane diagram for Possilbe Intruder Alarm ◇

Use Case ID	UC-5-3
Use Case Name	Possible Intruder Alarm

Primary actor	Control Software
Goal in context	If Possible Intruder pace up and down in front of door, notify to Home Owner about this event via SMS.
Preconditions	Safe home system detects stranger.
Trigger	If there are frequent appearances detected by the camera at the door or for long time
Scenario	<ol style="list-style-type: none"> 1. Detects Possible Intruder in front of house by Motion sensor. 2. Camera Records the Possible Intruder 3. Control Software notify to Home Owner about Possible Intruder via SMS 4. Login screen appers when click the url in the SMS that is sent to Home Owner 5. Shows information after successful login
Exceptions	4a. If auto login is checked, then login automatically.
Priority	High
Frequency	Frequent
Open issues	If motion sensor detects human in front of door and if the detection is frequently occurred (more than 3 times in 10 minutes) it judges that human as possible intruder.

C.6. Home Management

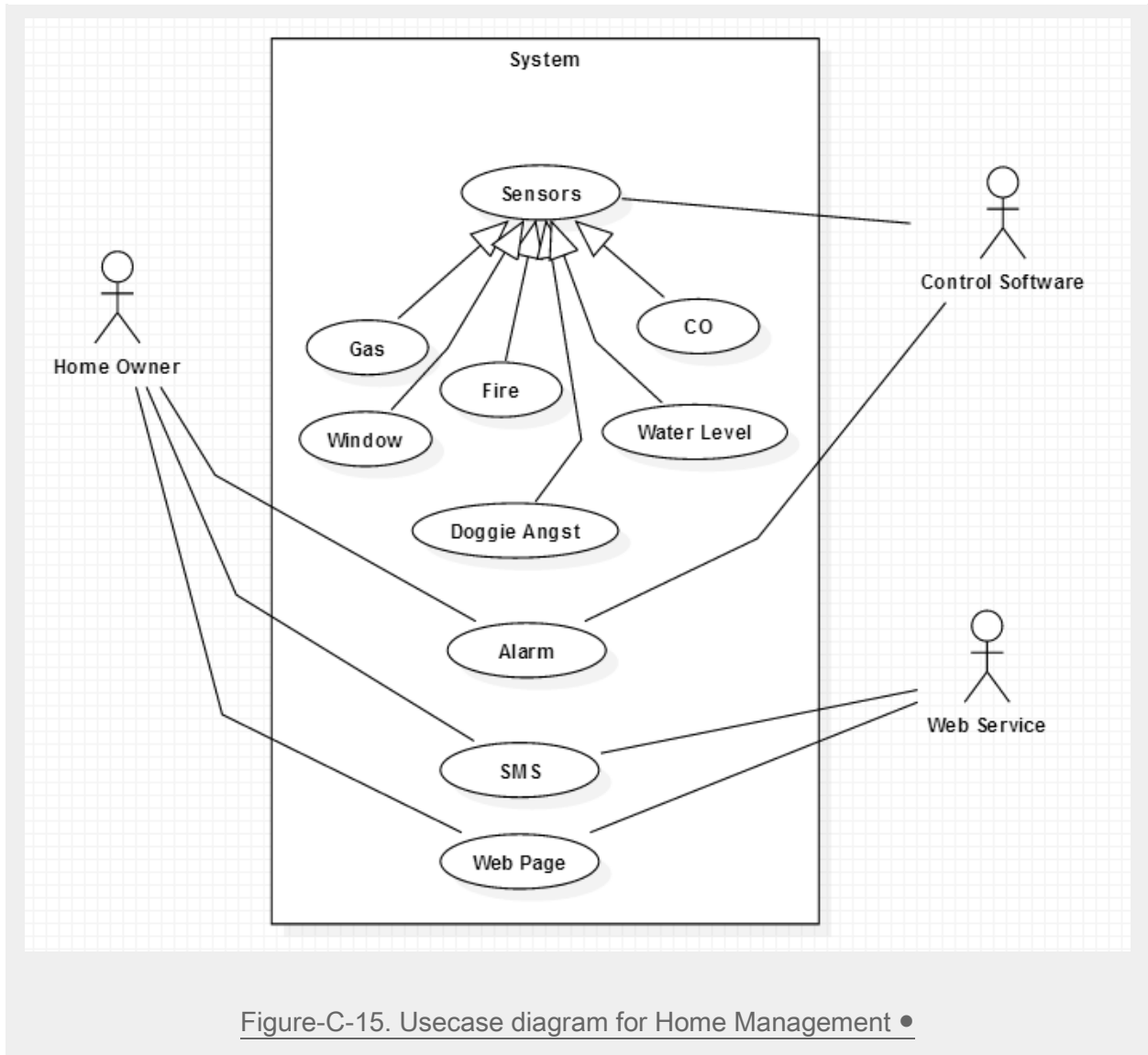


Figure-C-15. Usecase diagram for Home Management •

C.6.1. Fire Alarm •

Use Case ID	UC-6-1
Use Case Name	Fire Alarm
Primary actor	Control Software
Goal in context	Notify to Home Owner that there is fire in the house.
Preconditions	
Trigger	Sensor detects CO level or detects abnormal high temperature.

Scenario	<ol style="list-style-type: none"> 1. Sensor detects CO or temperature abnormality through sensors. 2. Notify to Home Owner about current event via SMS. 3. Home Owner checks url in the SMS and logs in. 4. SafeHome shows current event through web page. 5. Home Owner choose next action
Exceptions	<ol style="list-style-type: none"> 1a. Home Owner can exclude location to be notified like a gas range in kitchen. 3a. If Home Owner does not check url in time, SafeHome calls 119 automatically. 3b. SafeHome executes fire extinguishing.
Priority	High
Frequency	Not frequent
Open issues	
Channel to actor	Phone call
Secondary actors	Fire station

C.6.2. Gas Alarm •

Use Case ID	UC-6-2
Use Case Name	Gas Alarm
Primary actor	Control Software
Goal in context	If air has abnormal gas, notify to Home Owner.
Preconditions	
Trigger	Sensor detects CO or high density of hydrocarbon (methane, ethane etc.).
Scenario	<ol style="list-style-type: none"> 1. Sensor detects abnormality. 2. SafeHome notify to Home Owner via SMS. 3. Home Owner check through url sent by SMS and logs in. 4. Home Owner checks situation and decide to enable air conditioning.
Exceptions	<ol style="list-style-type: none"> 3a. Auto login. 4a. If Home Owner does not respond for a certain period, call 119 and if it is not hydrocarbon, then turns on air conditioning.
Priority	High
Frequency	Not frequent

Open issues	
Channel to actor	Phone call
Secondary actors	Fire station

C.6.3. Water Level Abnormality Alarm •

Use Case ID	UC-6-3
Use Case Name	Water Level Abnormality Alarm
Primary actor	Control Software
Goal in context	Notify to Home Owner about flooding
Preconditions	
Trigger	Sensor detects flooding
Scenario	<ol style="list-style-type: none"> 1. Water flooding sensor touches water. 2. System notify to Home Owner and call 119 3. Home Owner can check the information through url after logged in.
Exceptions	3a. Automatic login
Priority	Middle
Frequency	Not frequent
Open issues	
Channel to actor	Phone call
Secondary actors	Fire station

C.6.4. Doggie Angust Alarm •

Use Case ID	UC-6-4
Use Case Name	Doggie Angust Alarm
Primary actor	Control Software
Goal in context	Notify to Home Owner about dog barking
Preconditions	Dog barks more than a minute
Trigger	Sensor detects dog barks
Scenario	<ol style="list-style-type: none"> 1. Dog barks more than a minute 2. Doggie Angust Alarm detects dog barking 3. System notify to Home Owner 4. Home Owner can check the inforamtion through url after loged in 5. Home Owner can offer food remotely for dog not to bark.
Exceptions	4a. Automatic login
Priority	Middle
Frequency	Not frequent
Open issues	
Channel to actor	
Secondary actors	

C.6.5. Display Sensor Data •

Use Case ID	UC-6-5
Use Case Name	Display Sensor Data
Primary actor	Home Owner(Web)
Goal in context	Displays CO, Temperature, Water, Gas level and their turn on/off switch and history.
Preconditions	Home Owner successfully logged in.
Trigger	Home Owner phone call
Scenario	<ol style="list-style-type: none"> 1. Home Owner clicks on sensor data button. 2. SafeHome displays CO Level, Temperature, Water, Gas level and thire on/off switch. Also button for history. 3. By clicking turn on/off switch, it turns on/off the sensor. 4. By clicking history button, it displays history of level graph in time period.
Exceptions	3a. The one should have admin authority to control on/off switch.
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.6.6. Control Appliances/Lightning/HVAC via Internet (Web) ◇

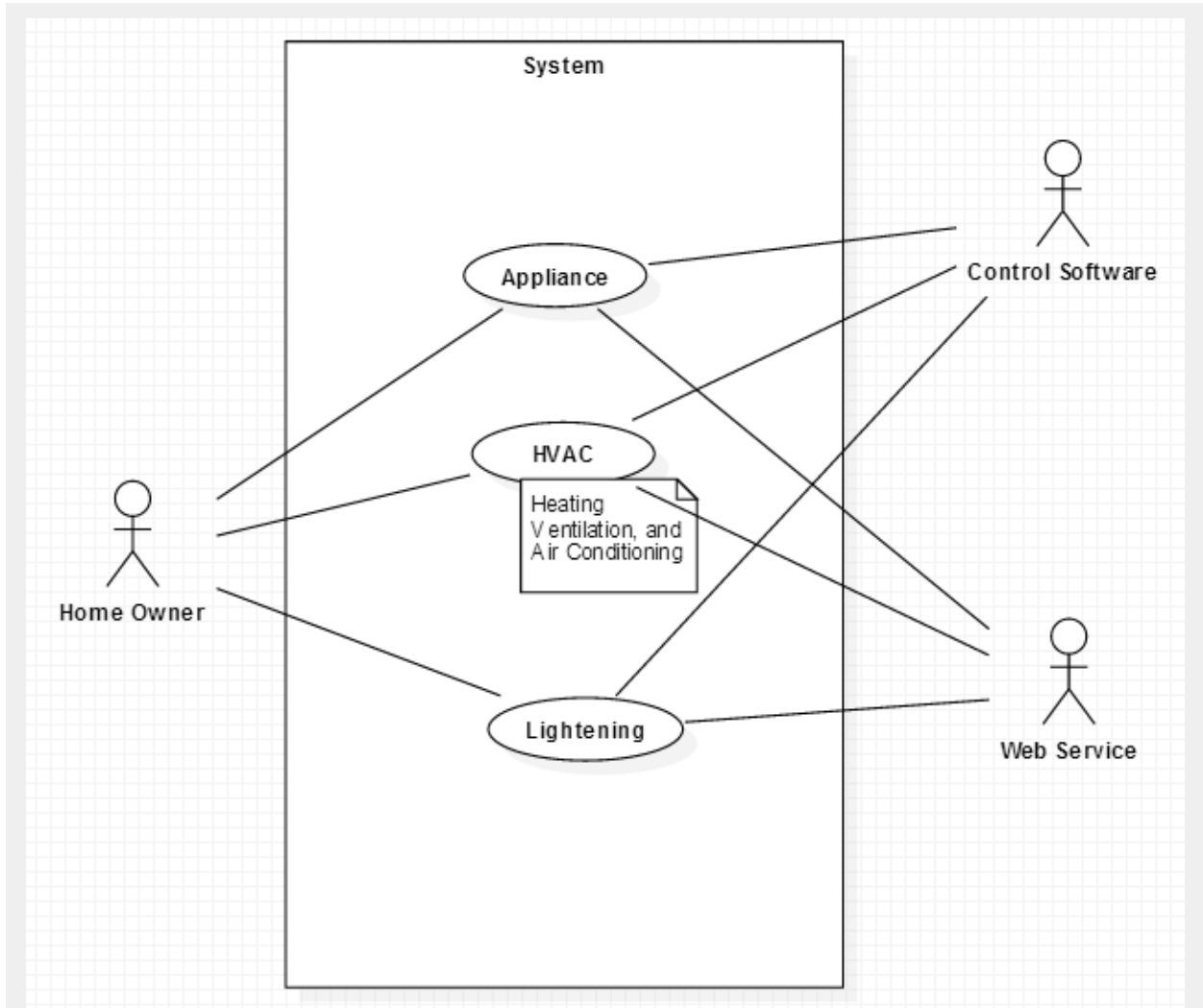


Figure-C-16. Usecase diagram for Control Appliances/Lightning/HVAC via Internet ◇

Use Case ID	UC-6-6
Use Case Name	Control Appliances/Lightning/HVAC via Internet (Web)
Primary actor	Home Owner(Web)
Goal in context	Home Owner controls status of appliance/lightning/HVAC via Internet
Preconditions	Home Owner successfully logged in
Trigger	Home Owner clicked on Home Management button
Scenario	1. Home Owner clicked on Home Management button

	2. Home Owner now can control the status of each appliance, lightning, HVAC.
Exceptions	
Priority	High
Frequency	Frequent
Open issues	
Channel to actor	
Secondary actors	

C.7. Home Surveillance

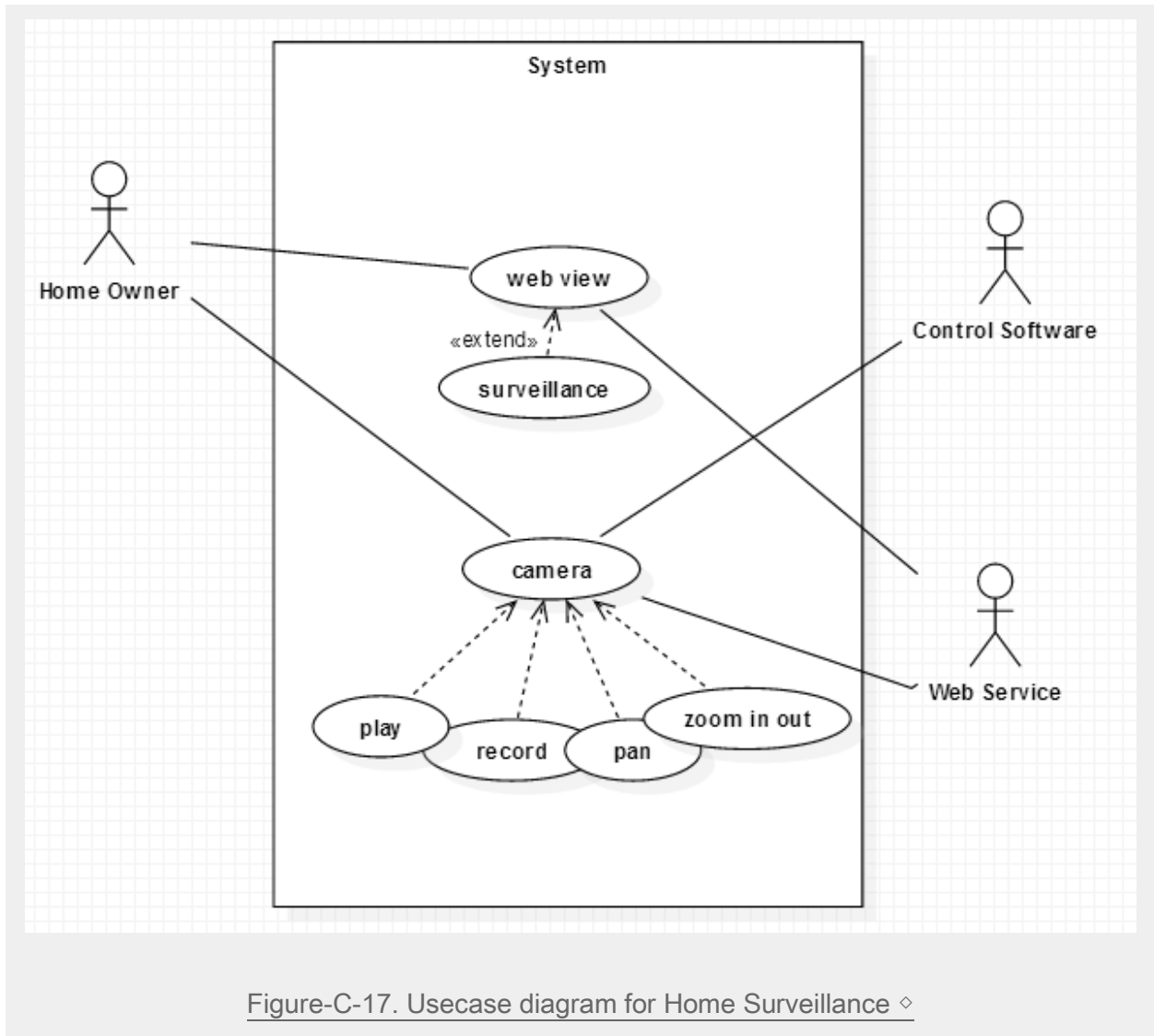


Figure-C-17. Usecase diagram for Home Surveillance ◇

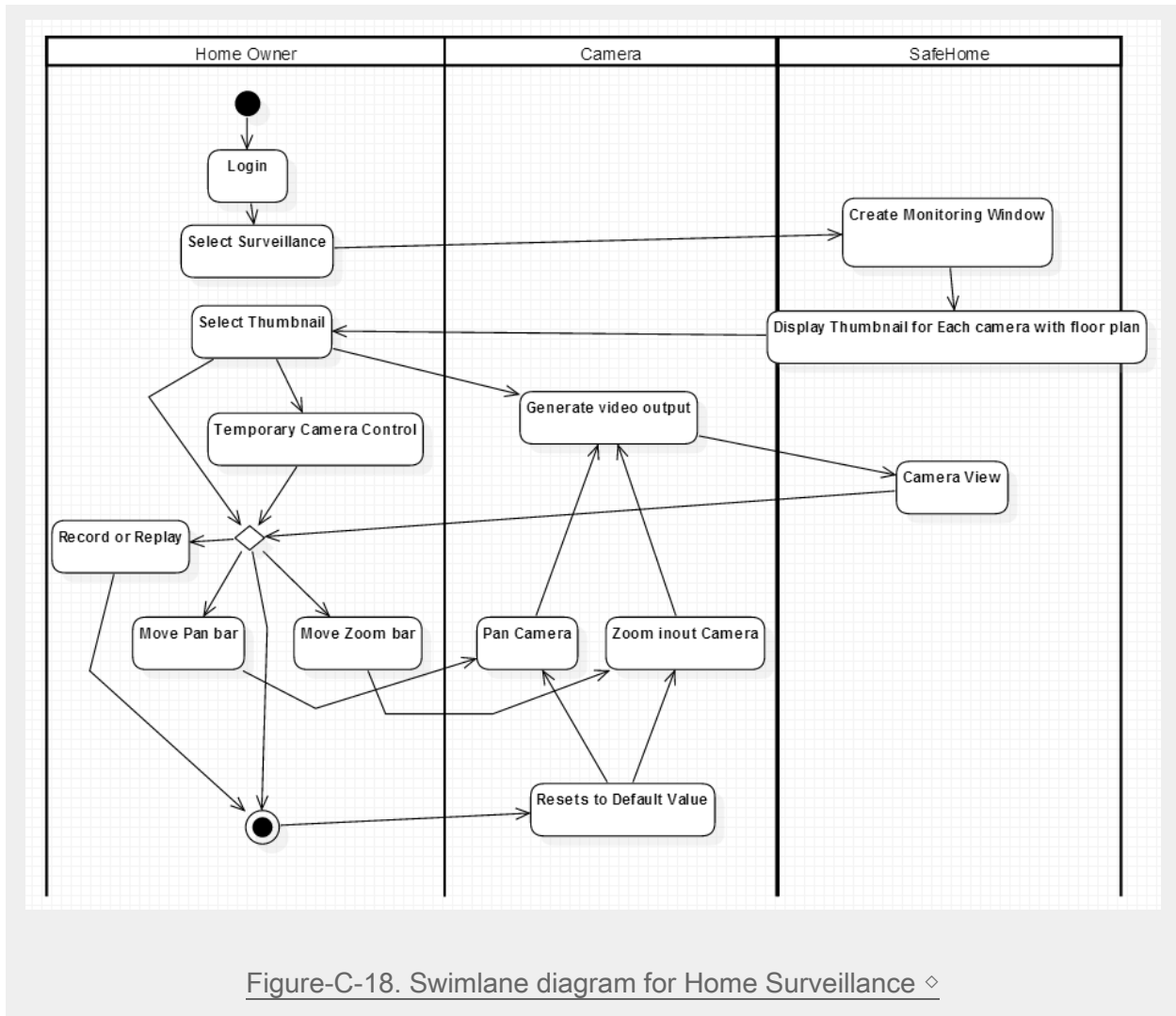


Figure-C-18. Swimlane diagram for Home Surveillance ◇

C.7.1. Temporary Camera Control (Web) ◇

Use Case ID	UC-7-1
Use Case Name	Temporary Camera Control (Web)
Primary actor	Home Owner(Web)
Goal in context	Pan camera view and its zoom level through internet via SafeHome Web Service.
Preconditions	Home Owner already logged in successfully.
Trigger	Home Owner selected “surveillance” menu, and clicked on “Temporary camera control” menu.
Scenario	<ol style="list-style-type: none"> 1. Home Owner clicks the “left” button to move gaze left or clicks the “right” button to move gaze right. 2. Home Owner clicks the “zoom in” button to zoom in the camera or “zoom out” button to zoom out the camera.

	3. Home Owner out from camera setting, camera setting reset to default 4. Home Owner can start record manually
Exceptions	1a, 2a. If Home Owner wants default value, it resets to default via default button.
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

For the default setting, see UC-2.4. Setting Cameras Detail (Web). Notice that this UC:Temporary Camera Control is only for temporary zoom in/out and pan to check real-time status.

C.7.2. Camera Overview (Web) ◇

Use Case ID	UC-7-2
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" menu.
Scenario	<ol style="list-style-type: none"> 1. Home Owner clicked "surveillance" button 2. The system shows thumbnails of each camera view. The location of each camera and gaze is displayed in floor plan. 3. The detection logs of camera are gathered and sorted in time order and displayed in the main. 4. Home Owner clicks each camera for detail. 5. Bigger screen for current camera scenary appears with more details including logs of change detection.
Exceptions	<p>1a. If Home Owner wants default value, it resets to default via default button.</p> <p>5a. This follows use-case of "Camera Detail"</p>
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.7.3. Camera Detail (Web) ◇

Use Case ID	UC-7-3
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” menu.
Trigger	<ul style="list-style-type: none"> a. Home Owner clicked thumbnail of camera from surveillance display. b. Home Owner clicked detection log for detail information for targeting camera.
Scenario	<ul style="list-style-type: none"> 1. Home Owner clicks thumbnail of camera or specific detection log. 2. Current camera display and detection log of that camera appears. 3. If Home Owner clicks specific log, it ready to play recorded video.
Exceptions	<ul style="list-style-type: none"> 2a. Detection of change is done by rgb value and their distance: 2b. Maximum recording time is 1 hour.
Priority	Middle
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.7.4. Camera Record ◇

Use Case ID	UC-7-4
Use Case Name	Camera Record
Primary actor	Control Software
Goal in context	Camera automatically records video by detecting change.
Preconditions	Intruder Prevention system detected Intruder or Possible Intruder.
Trigger	Current scenary image has difference from stationary scenary (default).
Scenario	<ol style="list-style-type: none"> 1. If Motion sensor detects signal or Window sensor detects signal, the camera starts recording, suspecting as intruder. 2. Safehome notify to Home Owner about camera starts recording via SMS
Exceptions	2a. Maximum recording time is 1 hour.
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.7.5. Create Camera thumbnail ◇

Use Case ID	UC-7-5
Use Case Name	Create Camera Thumbnail
Primary actor	Web Service
Goal in context	Create camera thumbnail for camera overview.
Preconditions	Camera creates still image every 10 min.
Trigger	Default scenary created.
Scenario	<ol style="list-style-type: none"> 1. Automatically still image is created every 10 min. 2. Image file is saved, and convert it into smaller size. 3. Next, this smaller image is used as current thumbnail for camera.
Exceptions	2a. Home Owner clicks on another log or camera during the play. When it occurs, stop the video and change the display.
Priority	Middle
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.7.6. Play recorded video ◇

Use Case ID	UC-7-6
Use Case Name	Play Recorded Video
Primary actor	Home Owner(Web)
Goal in context	Play recorded video.
Preconditions	Camera creates still image every 10 min.
Trigger	Home Owner clicks on still image with play button at the center.
Scenario	<ol style="list-style-type: none"> 1. Home Owner clicks on still image. 2. Playing the recorded video with playing state bar displayed.
Exceptions	2a. Home Owner clicks on another log or camera during the play. When it occurs, stop the video and change the display.
Priority	High
Frequency	High
Open issues	
Channel to actor	
Secondary actors	

C.8. Non-Functional Use Cases

C.8.1. Telephone Call Control •

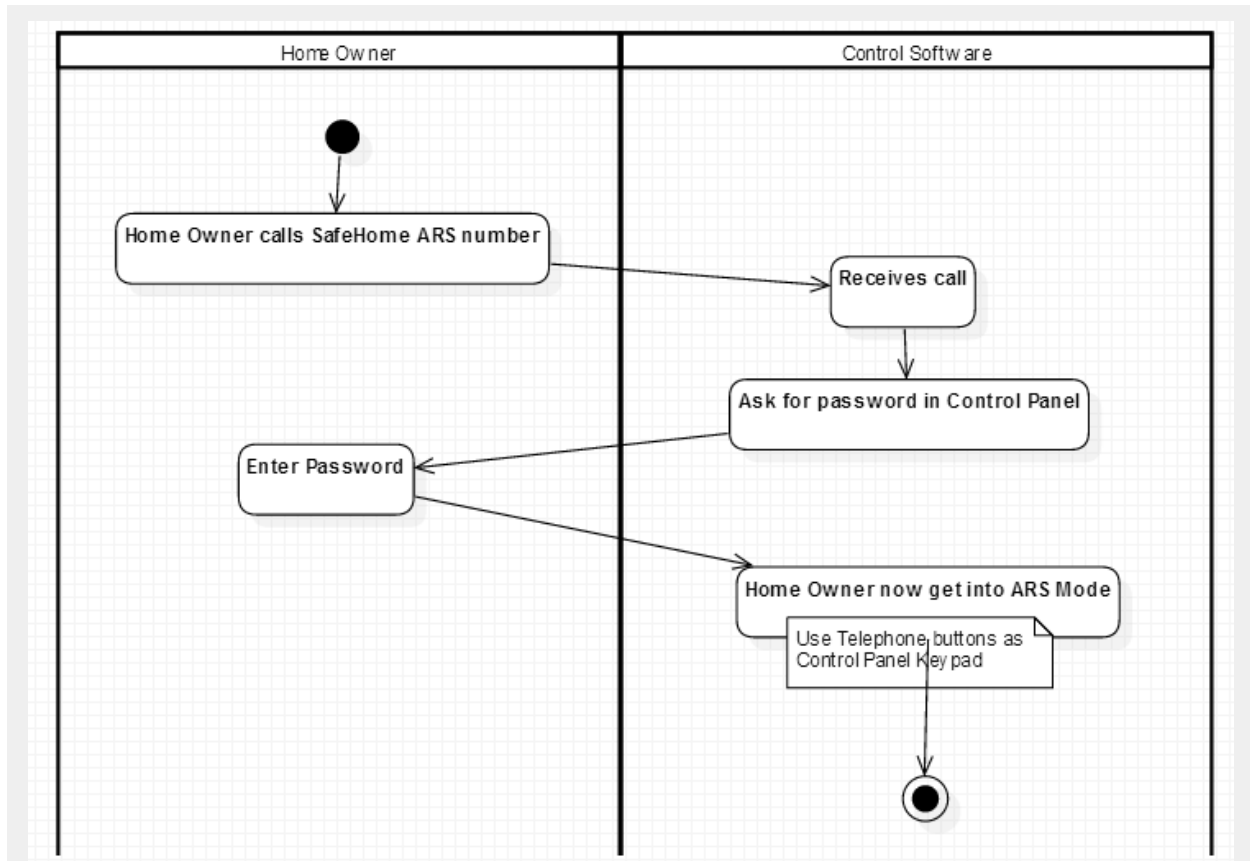


Figure-C-19. Swimlane diagram for Telephone Call Control •

Use Case ID	UC-8-1
Use Case Name	Telephone Call Control
Primary actor	Control Software
Goal in context	Where there is no internet, Home Owner can control simple function via phone call through ARS system.
Preconditions	Home Owner need to access SafeHome however there is no internet
Trigger	Home Owner phone call
Scenario	<ol style="list-style-type: none"> 1. Home Owner calls to the SafeHome ARS number and sharp(#) for ARS system 2. Enter the ARS password and sharp(#) into the telephone 3. If correct, get into ARS mode.
Exceptions	

Priority	High
Frequency	Low
Open issues	Home Owner using ARS can control disarm/arm, and sensor turn on/off.
Channel to actor	
Secondary actors	

C.8.2. Extra Power Supply •

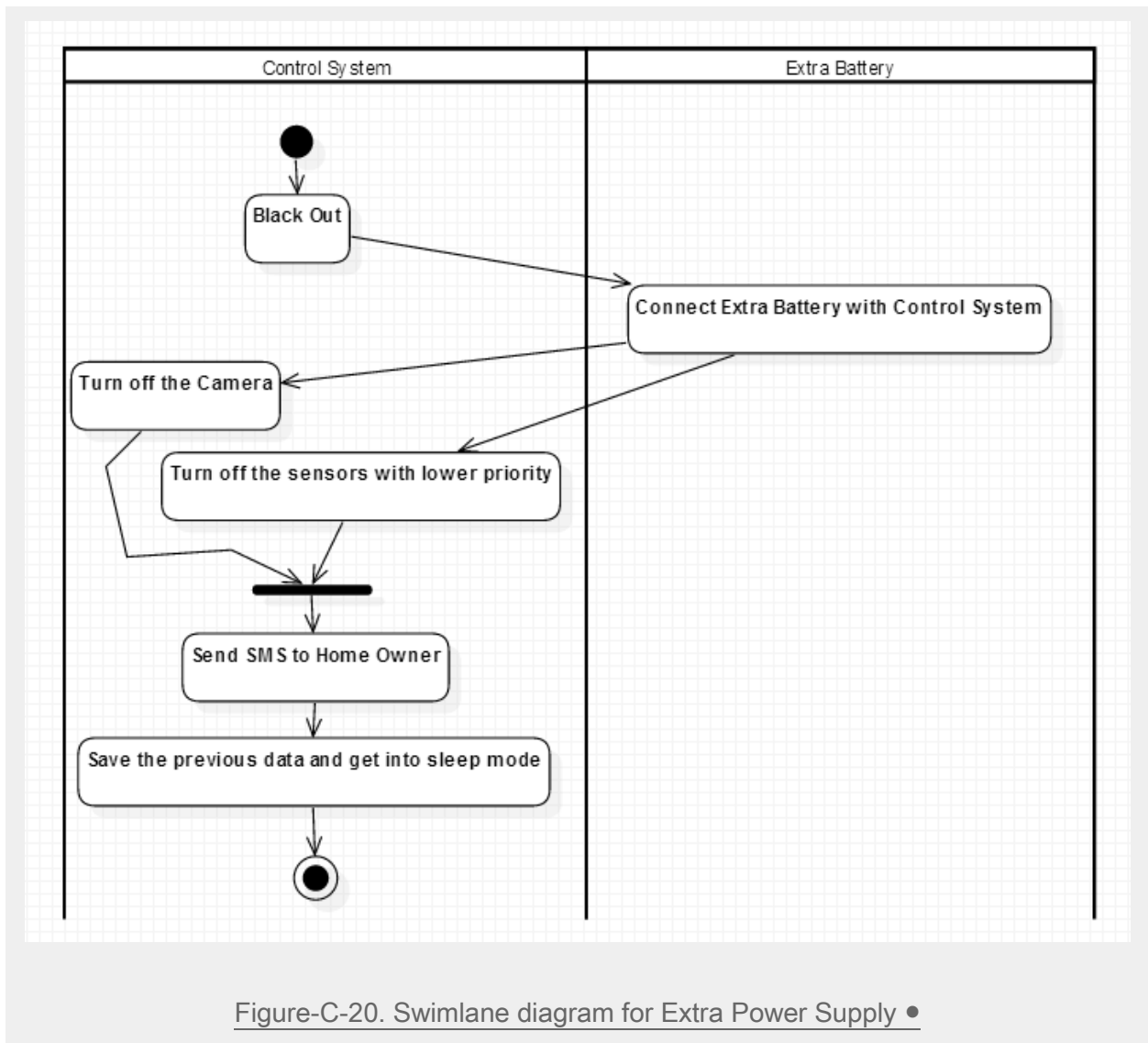


Figure-C-20. Swimlane diagram for Extra Power Supply •

Use Case ID	UC-8-2
Use Case Name	Extra Power Supply
Primary actor	Control Software
Goal in context	Extra power supply for SafeHome in blackout.
Preconditions	Black out and emergent situation
Trigger	Blackout
Scenario	<ol style="list-style-type: none"> 1. Blackout 2. Extra power battery is on, and SafeHome can sustain 30 more minutes 3. SafeHome notify to Home Owner about blackout via SMS. 4. SafeHome gets turns off cameras and sensors except motion and window sensors to save energy

Exceptions	
Priority	Middle
Frequency	
Open issues	<ul style="list-style-type: none">- How much time does extra battery can support in the blackout?- What if blackout is not accident, but on purpose for intruder?
Channel to actor	
Secondary actors	

C.8.3. Session Timeout ◇

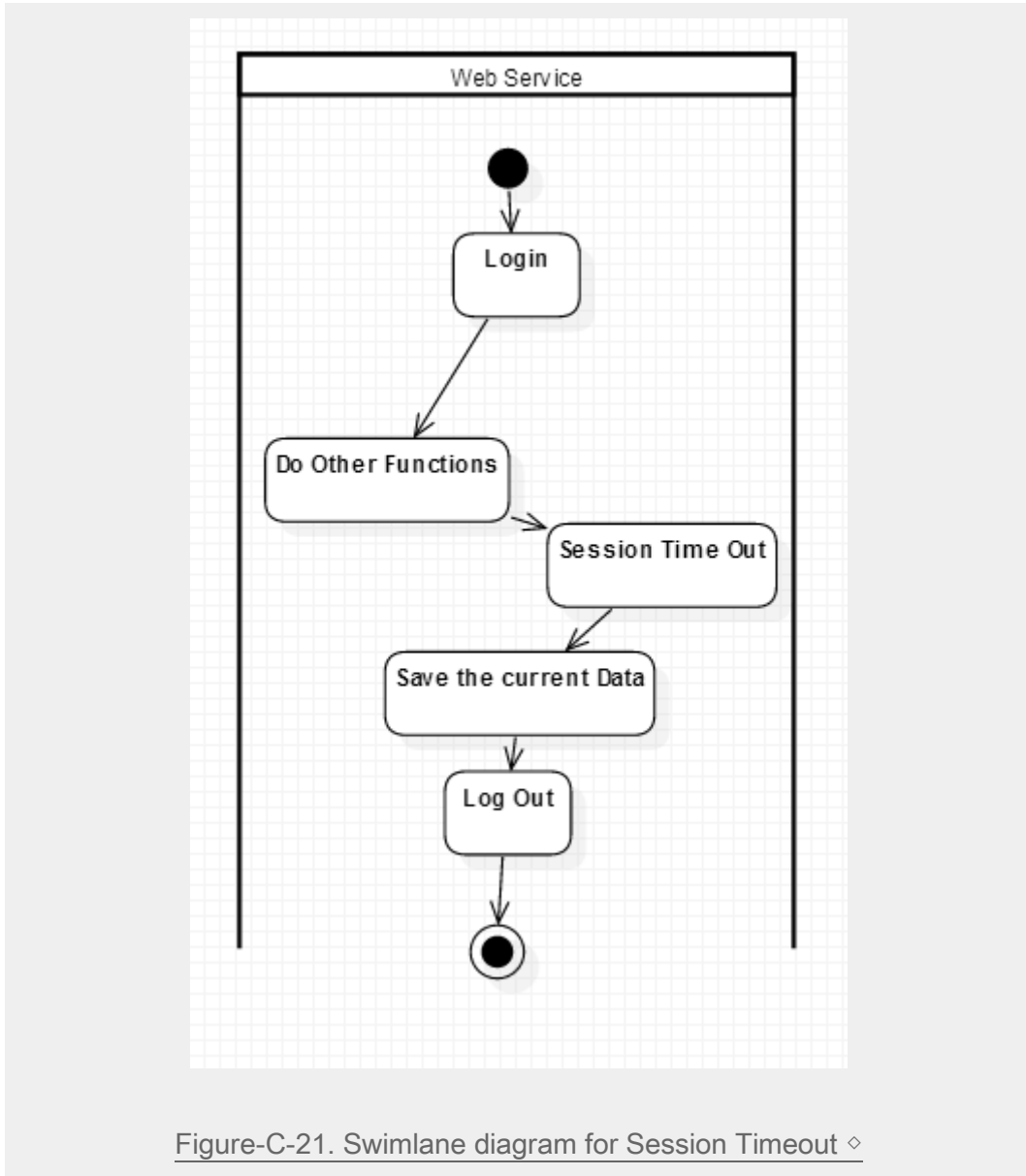


Figure-C-21. Swimlane diagram for Session Timeout ◇

Use Case ID	UC-8-3
Use Case Name	Session Timeout
Primary actor	Web Service
Goal in context	Home Owner automatically logged out if it took 30 minutes after logged in.
Preconditions	Home Owner Logged in
Trigger	30 minutes left since Home Owner logged in

Scenario	<ol style="list-style-type: none">1. Session Time Out (It took 30 minutes since logged in)2. Home Owner automatically logged out.3. Home Owner should re-enter ID and Password to logged in.
Exceptions	2a. If Home Owner is using auto login, he still should do some login activity to get a new session token. However, this case doesn't require additional ID and Password enter.
Priority	Middle
Frequency	
Open issues	If Home Owner is using auto login, session timeout will be effective to solve security problems?
Channel to actor	
Secondary actors	

C.8.4. Multiple Access Control ◊●

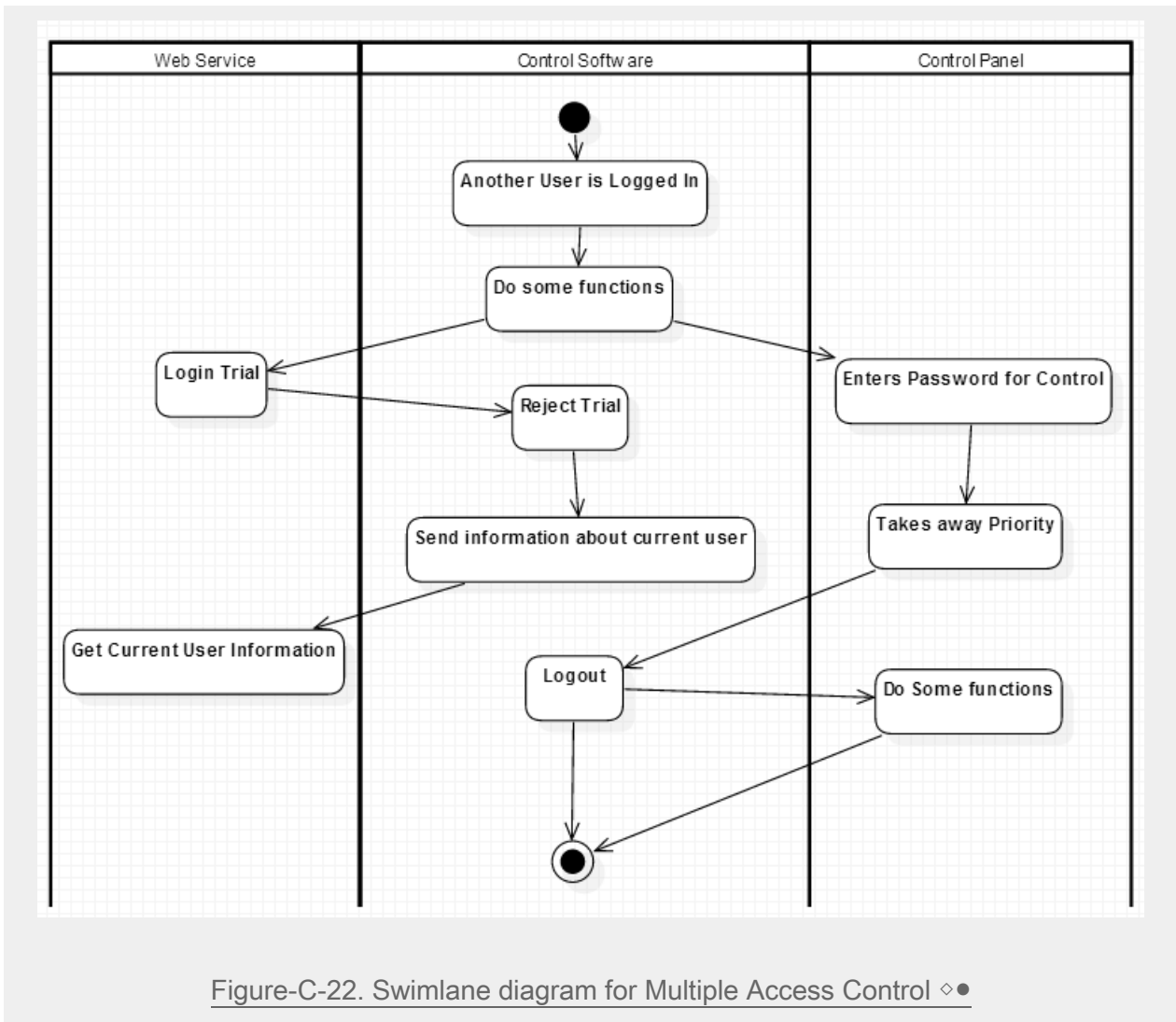
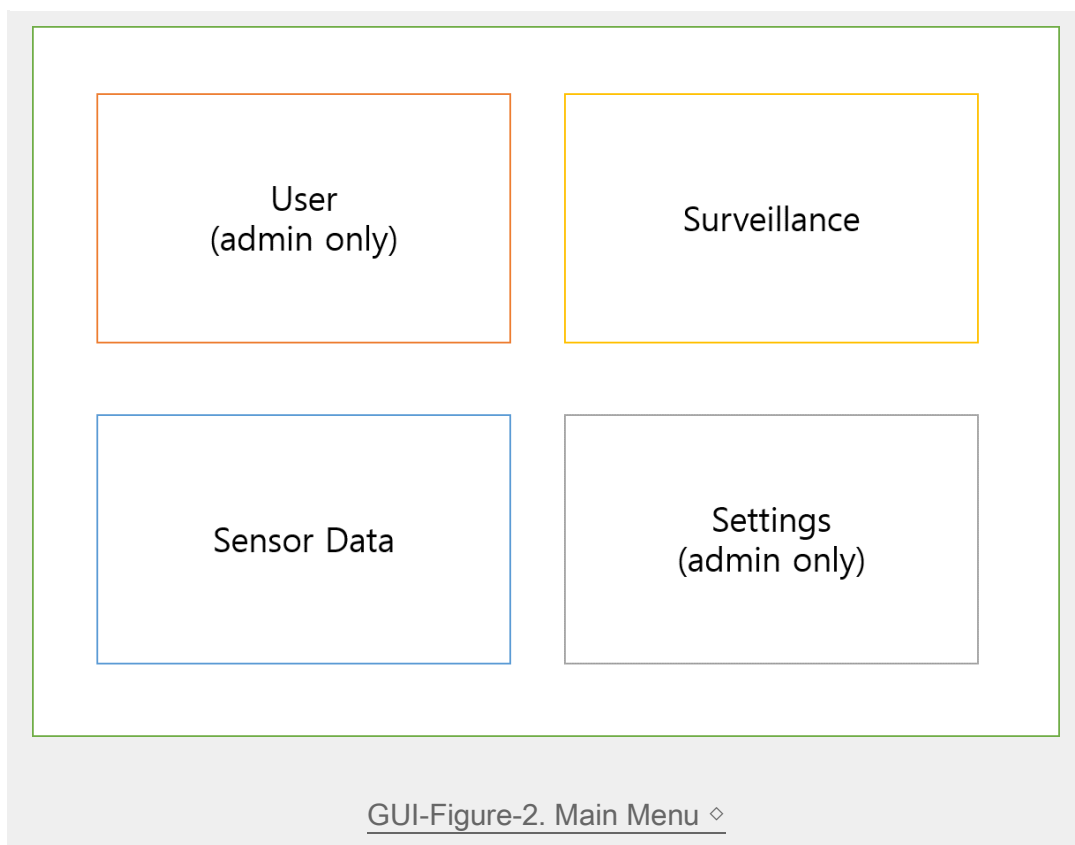
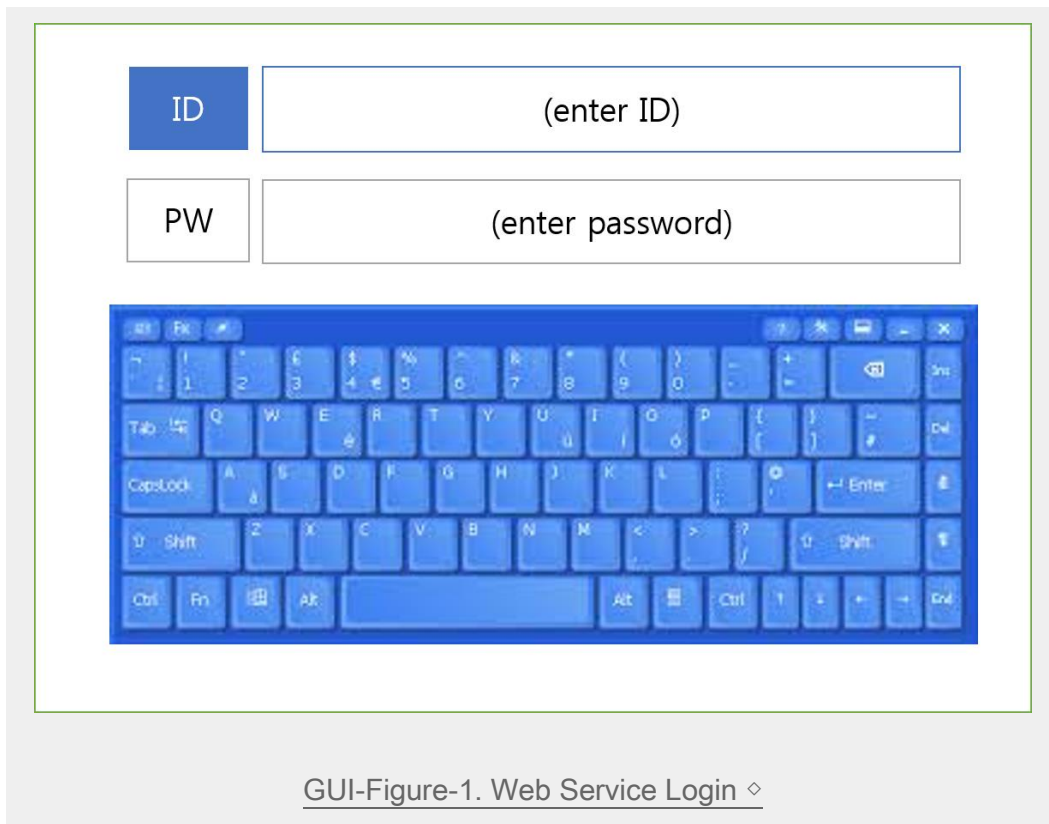


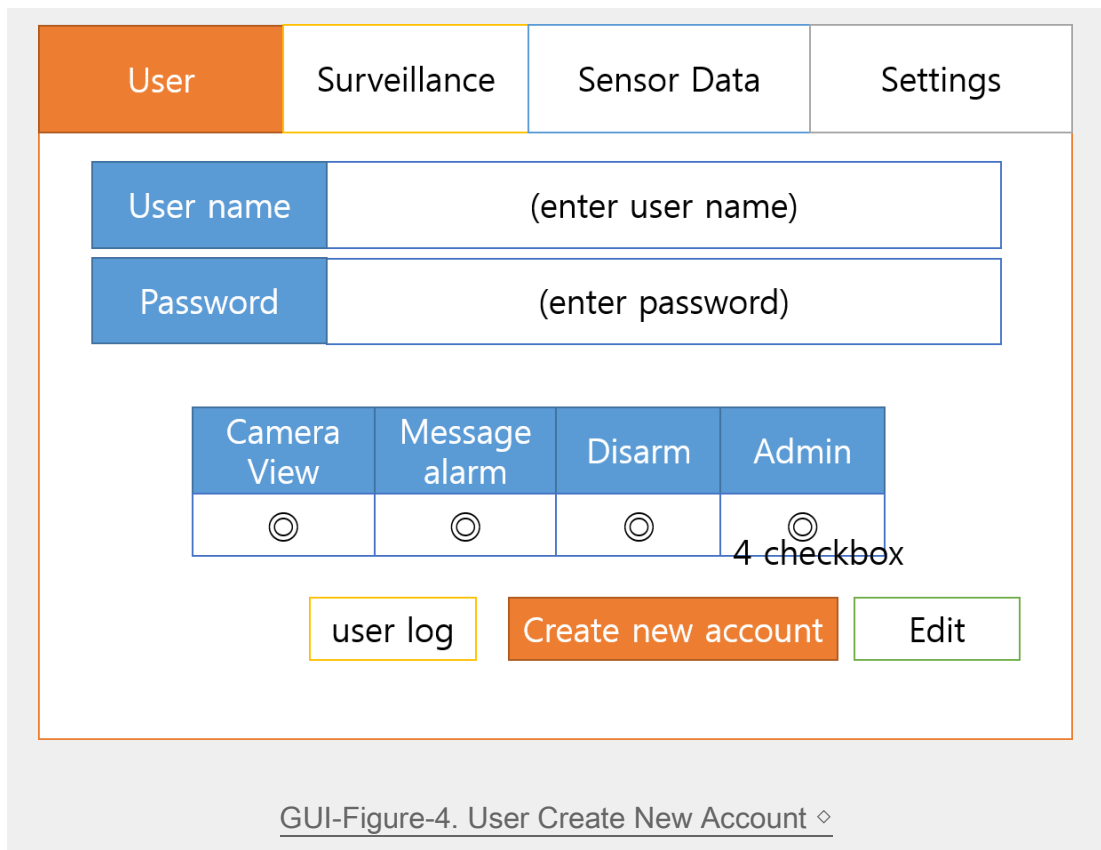
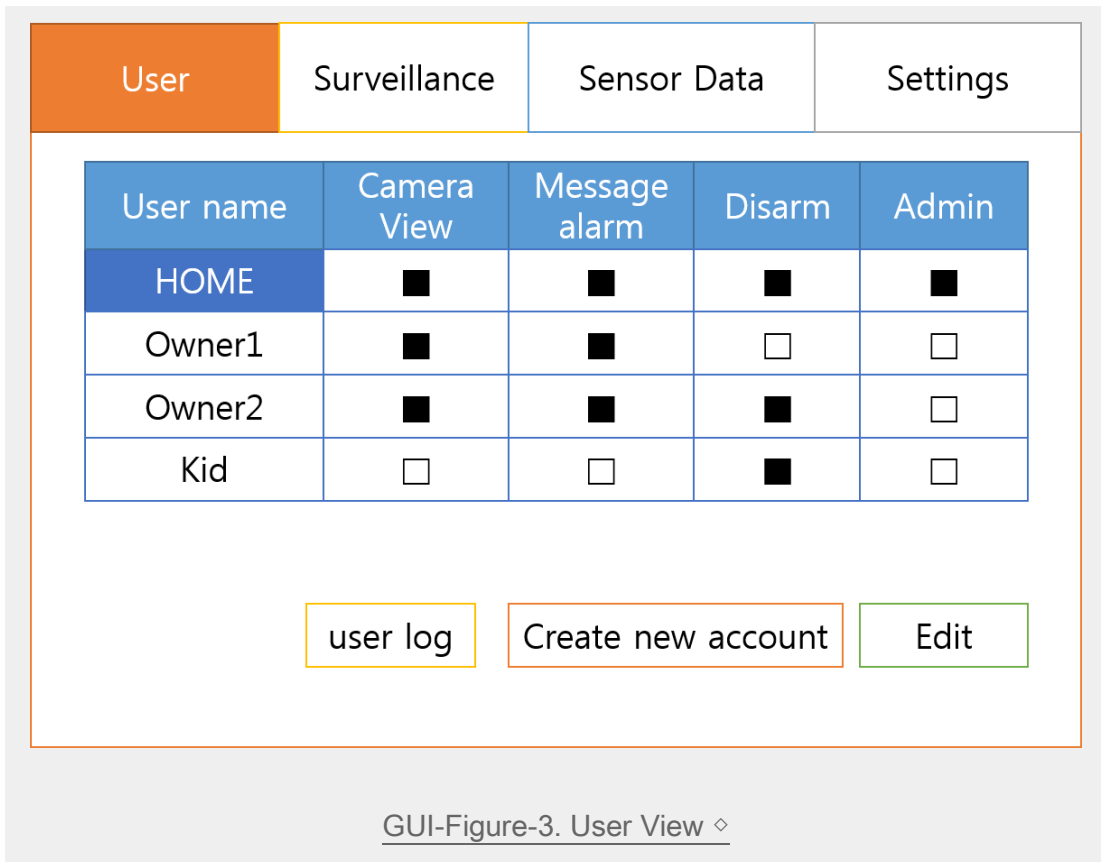
Figure-C-22. Swimlane diagram for Multiple Access Control ◊●

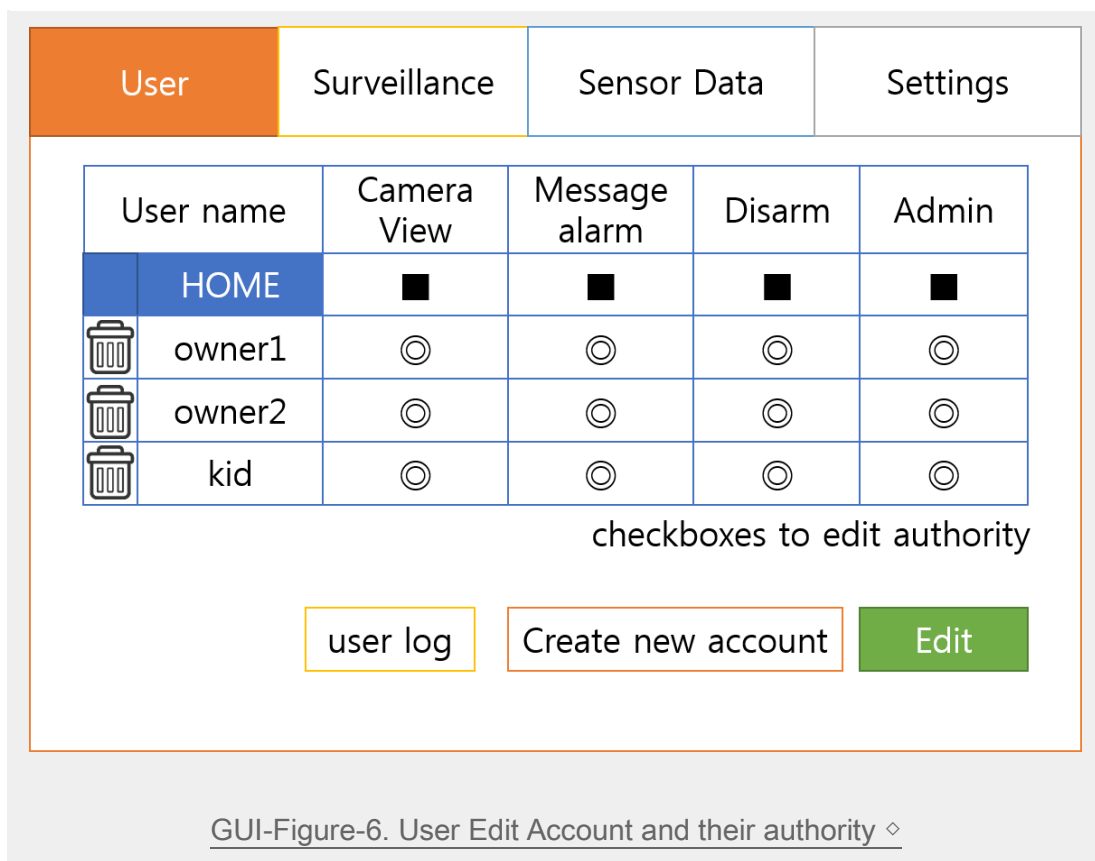
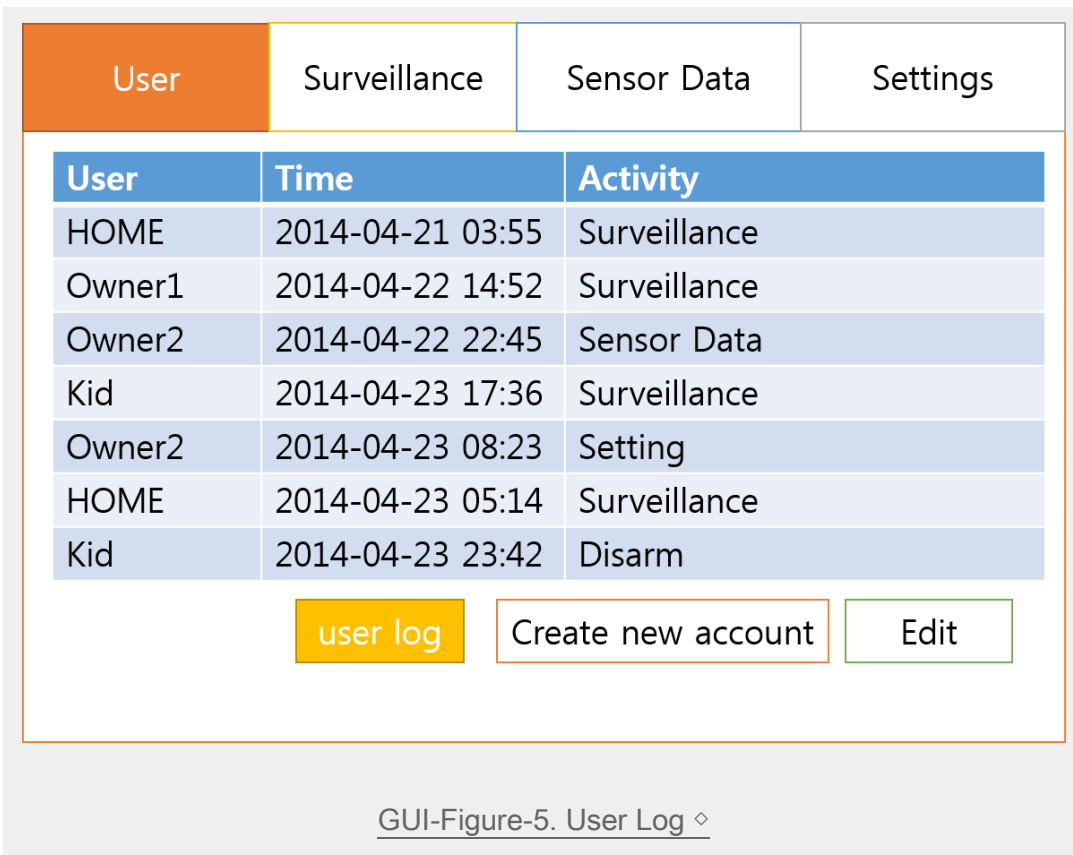
Use Case ID	UC-8-4
Use Case Name	Multiple Access Control
Primary actor	Web Service
Goal in context	SafeHome doesn't allow multiple concurrent access.
Preconditions	Login trial occurred while another user is in use.
Trigger	Login Trial
Scenario	<ol style="list-style-type: none"> 1. Home Owner try to log in while other User is in use 2. Web Service blocks Home Owner and shows messages "another user is in use" with user ID in use. 3. Home Owner can identify the user in use and contact that user.

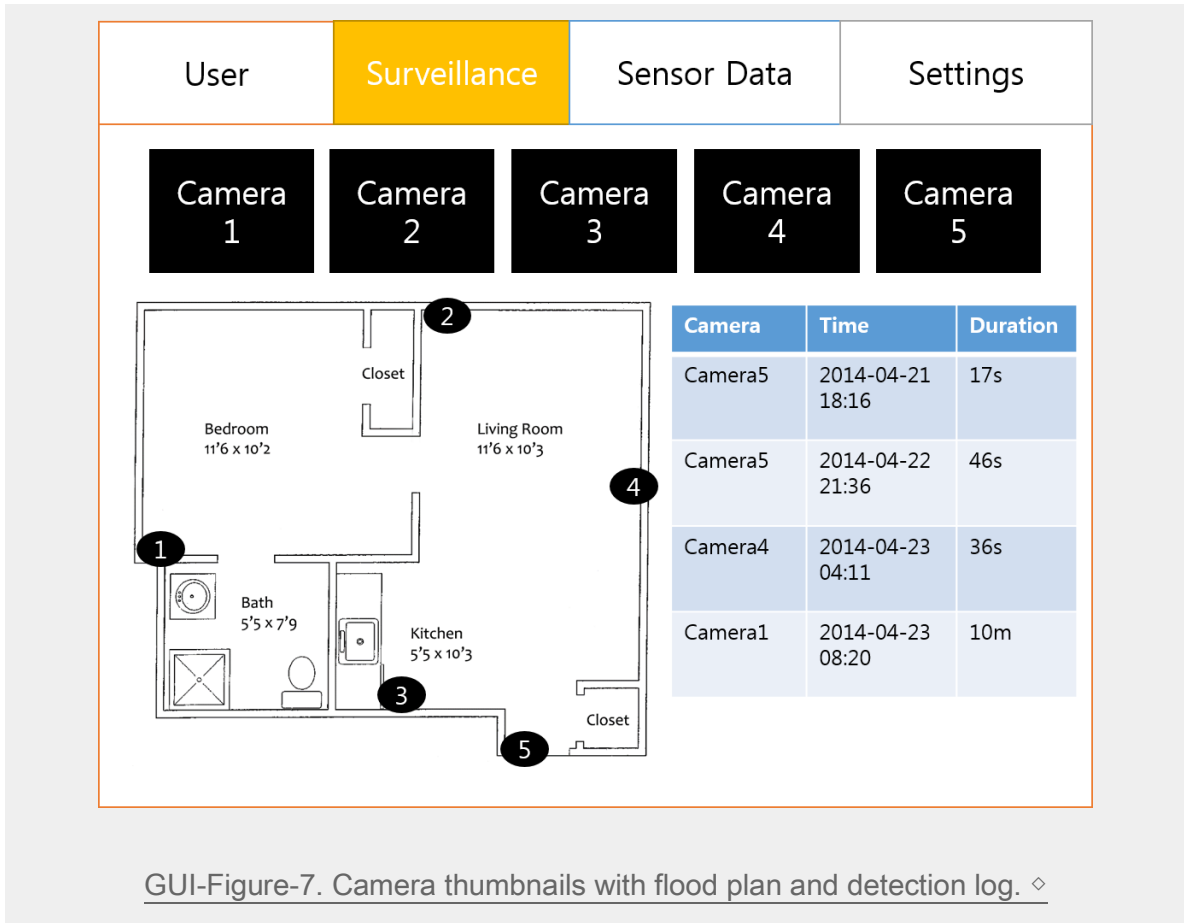
Exceptions	2a. Using Control Panel can ignore previous logged in user and set the configuration with higher priority. If someone is using Control Panel, no one can access to Web Service.
Priority	High
Frequency	Often
Open issues	For emergent case, SafeHome should support master administrator account to logout the previously logged in user and use with higher priority.
Channel to actor	
Secondary actors	

D. GUI for SafeHome Web Service

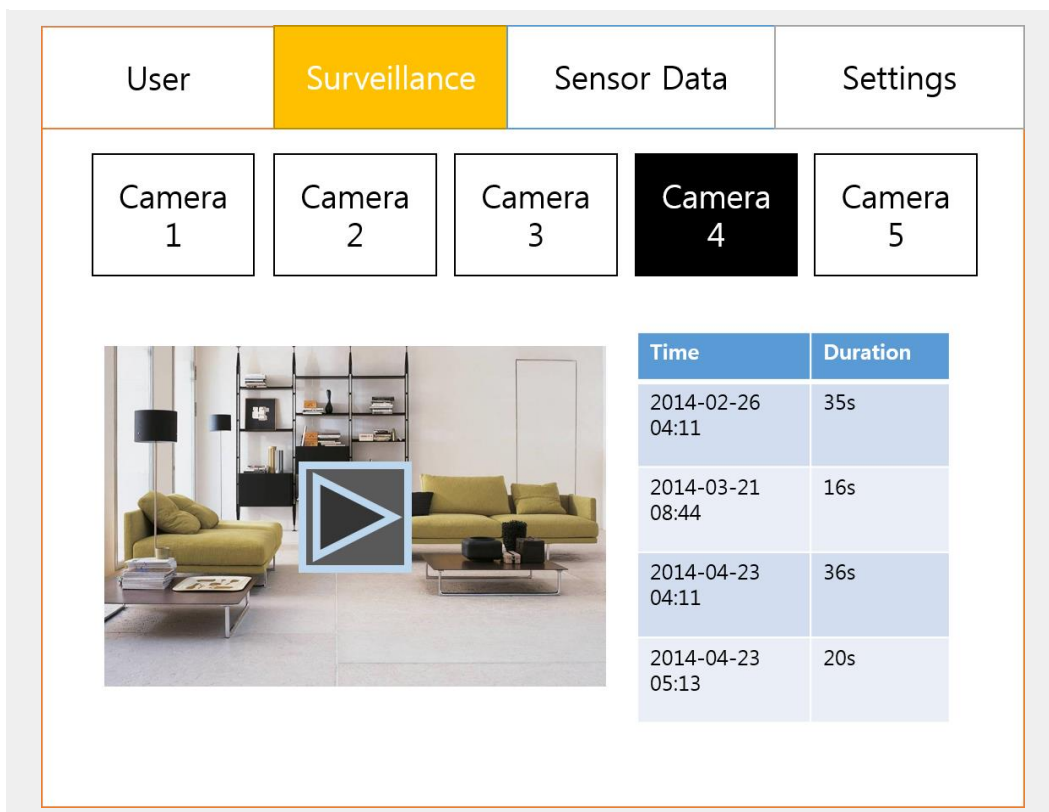








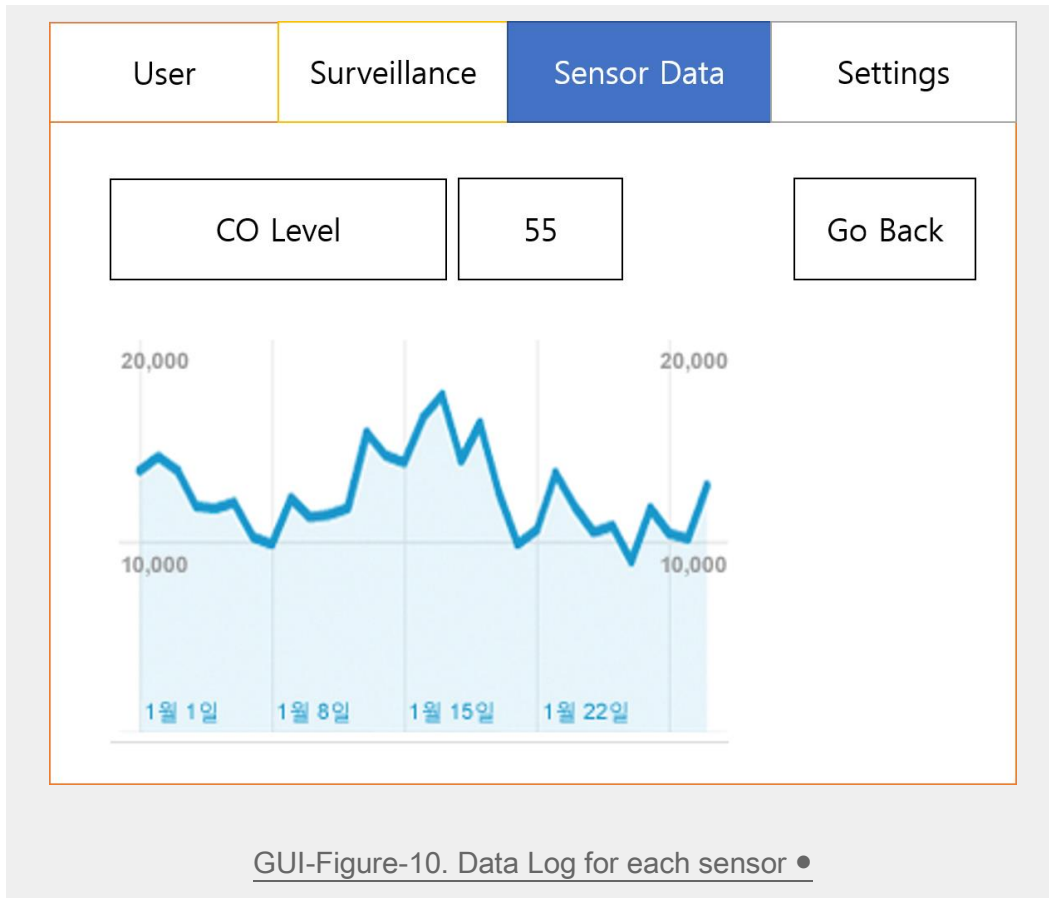
GUI-Figure-7. Camera thumbnails with flood plan and detection log. ◇



GUI-Figure-8. When click into camera detail ◊

User	Surveillance	Sensor Data	Settings
CO Level	55	On/Off	Log
Temperature	22	On/Off	Log
Water Level	0	On/Off	Log
Gas Level	0	On/Off	Log

GUI-Figure-9. Sensor Data Display ◊

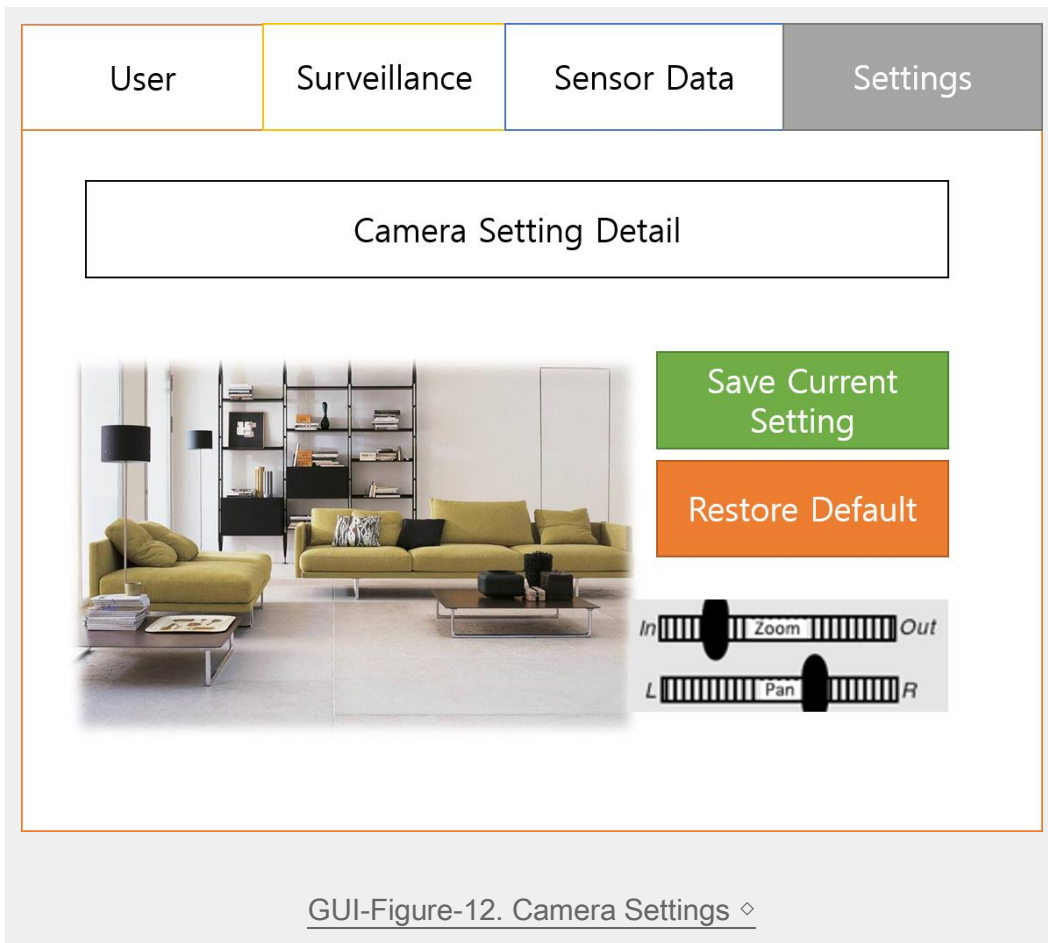


User	Surveillance	Sensor Data	Settings
------	--------------	-------------	----------

Sensor Setting				Detail
F1	ON	W1	ON	
F2	ON	M1	ON	
F3	ON			

Camera Setting	Detail
Weekly Mail Report	ON
Self-Diagnosis	RUN

GUI-Figure-11. Settings •



GUI-Figure-12. Camera Settings ◊

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 is running on JRE therefore the user should install JRE before access to Web Service.

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

Surveillance zone: The zones on the floor plan where camera vision is reached and can be recorded. Home Owner can set camera zomm in/out or pan to reset the surveillance zone.

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

Arm/disarm: If the security for the home management and home surveillance is on, it is called 'armed' state. Otherwise 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.

Default Image(scenary): The SafeHome automatically takes photo in every 10 min to make camera thumbnail. SafeHome recognizes this picture as background.

F. Traceability Matrix ●◇

	C.1. Boot						C.2. Configure							C.3. User Management					
	C.1.1. Boot-up (CP) ●	C.1.2. Shutdown (CP) ●	C.1.3. Initialize Sensors ●	C.1.4. Initialize Cameras ●	C.1.5. Finish Sensors ●	C.1.6. Finish Cameras ●	C.2.1. Setting Main (Web) ◇	C.2.2. Setting Sensors (Web) ◇	C.2.3. Setting Cameras (Web) ◇	C.2.4. Setting Cameras Detail (Web) ◇	C.2.5. Setting Options (Web) ◇	C.2.6. Weekly Mail Report ●	C.2.7. Self-Diagnosis ●	C.3.1. Login (Web) ◇	C.3.2. Logout (Web) ◇	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) ◇
Figure-B-1. System Deployment Diagram ◇	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Figure-B-2. Control Panel ◇●	v	v																	
Figure-B-3. Floor Plan with the locations of the sensors and the cameras								v	v										
Figure-C-1. Swimlane diagram for Boot-up via Control Panel ●	v	v	v	v															
Figure-C-2. Swimlane diagram for Shutdown via Control Panel ●		v			v	v													
Figure-C-3. Swimlane diagram for Setting Configuration ◇							v	v	v	v	v	v	v						
Figure-C-4. Swimlane diagram for Login at Web Service ◇														v					
Figure-C-5. Swimlane diagram for Logout at Web Service ◇															v				
Figure-C-6. Swimlane diagram for Finding ID/Password in Web Service ◇																			v
Figure-C-7. Swimlane diagram for Arm System via Control Panel ●																			
Figure-C-8. Swimlane diagram for Disarm System via Control Panel ●																			
Figure-C-9. Swimlane diagram for Arm System via Internet ◇																			
Figure-C-10. Swimlane diagram for Disarm System via Internet ◇																			
Figure-C-11. Usecase diagram for Inturder Prevention System ◇																			
Figure-C-12. Swimlane diagram for Intruder Detection ◇																			
Figure-C-13. Swimlane diagram for Intrude Trial Detection ◇																			
Figure-C-14. Swimlane diagram for Possilbe Intruder Alarm ◇																			
Figure-C-15. Usecase diagram for Home Management ●																			
Figure-C-16. Usecase diagram for Control Appliances/Lightning/HVAC ◇																			
Figure-C-17. Usecase diagram for Home Surveillance ◇																			
Figure-C-18. Swimlane diagram for Home Surveillance ◇																			
Figure-C-19. Swimlane diagram for Telephone Call Control ●																			
Figure-C-20. Swimlane diagram for Extra Power Supply ●																			
Figure-C-21. Swimlane diagram for Session Timeout ◇																			
Figure-C-22. Swimlane diagram for Multiple Access Control ◇●																			
GUI-Figure-1. Web Service Login ◇														v					
GUI-Figure-2. Main Menu ◇							v	v	v	v	v	v	v	v	v	v	v	v	v
GUI-Figure-3. User View ◇																v	v	v	
GUI-Figure-4. User Create New Account ◇																	v		
GUI-Figure-5. User Log ◇															v				
GUI-Figure-6. User Edit Account and their authority ◇																			v
GUI-Figure-7. Camera thumbnails with flood plan and detection log. ◇																			
GUI-Figure-8. When click into camera detail ◇																			
GUI-Figure-9. Sensor Data Display ◇																			
GUI-Figure-10. Data Log for each sensor ●																			
GUI-Figure-11. Settings ●							v	v	v	v	v								
GUI-Figure-12. Camera Settings ◇									v										

	C.4. Arm/Disarm							C.5. Intruder Prevention System			C.6. Home Management					
	C.4.1. Arm System via Control Panel (CP)	C.4.2. Disarm System via Control Panel (CP)	C.4.3. Arm System via Internet (Web)	C.4.4. Disarm System via Internet (Web)	C.4.5. Auto Arm System	C.4.6. Overnight Travel Mode (Web)	C.4.7. Extended Travel Mode (Web)	C.5.1. Intruder detection	C.5.2. Intrude Trial Detection	C.5.3. Possible Intruder Alarm	C.6.1. Fire Alarm	C.6.2. Gas Alarm	C.6.3. Water Level Abnormality Alarm	C.6.4. Doggie Angust Alarm	C.6.5. Display Sensor Data	C.6.6. Control Appliances/Lightning/HVA
Figure-B-1. System Deployment Diagram ◇	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Figure-B-2. Control Panel ◇ ●	v	v														
Figure-B-3. Floor Plan with the locations of the sensors and the cameras ◇ ●								v	v	v	v	v	v	v	v	
Figure-C-1. Swimlane diagram for Boot-up via Control Panel ●																
Figure-C-2. Swimlane diagram for Shutdown via Control Panel ●																
Figure-C-3. Swimlane diagram for Setting Configuration ◇																
Figure-C-4. Swimlane diagram for Login at Web Service ◇																
Figure-C-5. Swimlane diagram for Logout at Web Service ◇																
Figure-C-6. Swimlane diagram for Finding ID/Password in Web Service ◇																
Figure-C-7. Swimlane diagram for Arm System via Control Panel ●	v															
Figure-C-8. Swimlane diagram for Disarm System via Control Panel ●		v														
Figure-C-9. Swimlane diagram for Arm System via Internet ◇			v													
Figure-C-10. Swimlane diagram for Disarm System via Internet ◇				v												
Figure-C-11. Usecase diagram for Inturder Prevention System ◇							v	v	v							
Figure-C-12. Swimlane diagram for Intruder Detection ◇							v									
Figure-C-13. Swimlane diagram for Intrude Trial Detection ◇								v								
Figure-C-14. Swimlane diagram for Possilbe Intruder Alarm ◇									v							
Figure-C-15. Usecase diagram for Home Management ●										v	v	v	v	v	v	
Figure-C-16. Usecase diagram for Control Appliances/Lightning/HVAC ◇																v
Figure-C-17. Usecase diagram for Home Surveillance ◇																
Figure-C-18. Swimlane diagram for Home Surveillance ◇																
Figure-C-19. Swimlane diagram for Telephone Call Control ●																
Figure-C-20. Swimlane diagram for Extra Power Supply ●																
Figure-C-21. Swimlane diagram for Session Timeout ◇																
Figure-C-22. Swimlane diagram for Multiple Access Control ◇ ●																
GUI-Figure-1. Web Service Login ◇																
GUI-Figure-2. Main Menu ◇											v	v	v	v	v	v
GUI-Figure-3. User View ◇																
GUI-Figure-4. User Create New Account ◇																
GUI-Figure-5. User Log ◇																
GUI-Figure-6. User Edit Account and their authority ◇																
GUI-Figure-7. Camera thumbnails with flood plan and detection log. ◇																
GUI-Figure-8. When click into camera detail ◇																
GUI-Figure-9. Sensor Data Display ◇														v		
GUI-Figure-10. Data Log for each sensor ●														v		
GUI-Figure-11. Settings ●																
GUI-Figure-12. Camera Settings ◇																

	C.7. Home Surveillance						C.8. Non-Functional Use Cases			
	C.7.1. Temporary Camera Control (Web)	C.7.2. Camera Overview (Web)	C.7.3. Camera Detail (Web)	C.7.4. Camera Record	C.7.5. Create Camera thumbnail	C.7.6. Play recorded video	C.8.1. Telephone Call Control	C.8.2. Extra Power Supply	C.8.3. Session Timeout	C.8.4. Multiple Access Control
Figure-B-1. System Deployment Diagram ◇	<	<	<	<	<	<	<	<	<	<
Figure-B-2. Control Panel ◇●										
Figure-B-3. Floor Plan with the locations of the sensors and the cameras ◇●	v									
Figure-C-1. Swimlane diagram for Boot-up via Control Panel ●										
Figure-C-2. Swimlane diagram for Shutdown via Control Panel ●										
Figure-C-3. Swimlane diagram for Setting Configuration ◇										
Figure-C-4. Swimlane diagram for Login at Web Service ◇										
Figure-C-5. Swimlane diagram for Logout at Web Service ◇										
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Figure-C-15. Usecase diagram for Home Management ●										
Figure-C-16. Usecase diagram for Control Appliances/Lightning/HVAC ◇										
Figure-C-17. Usecase diagram for Home Surveillance ◇	v	v	v	v	v	v				
Figure-C-18. Swimlane diagram for Home Surveillance ◇	v	v	v	v	v	v				
Figure-C-19. Swimlane diagram for Telephone Call Control ●							v			
Figure-C-20. Swimlane diagram for Extra Power Supply ●								v		
Figure-C-21. Swimlane diagram for Session Timeout ◇									v	
Figure-C-22. Swimlane diagram for Multiple Access Control ◇●										v
GUI-Figure-1. Web Service Login ◇										
GUI-Figure-2. Main Menu ◇	v	v	v	v	v	v				
GUI-Figure-3. User View ◇										
GUI-Figure-4. User Create New Account ◇										
GUI-Figure-5. User Log ◇										
GUI-Figure-6. User Edit Account and their authority ◇										
GUI-Figure-7. Camera thumbnails with flood plan and detection log. ◇	v	v								
GUI-Figure-8. When click into camera detail ◇			v							
GUI-Figure-9. Sensor Data Display ◇										
GUI-Figure-10. Data Log for each sensor ●										
GUI-Figure-11. Settings ●										
GUI-Figure-12. Camera Settings ◇										