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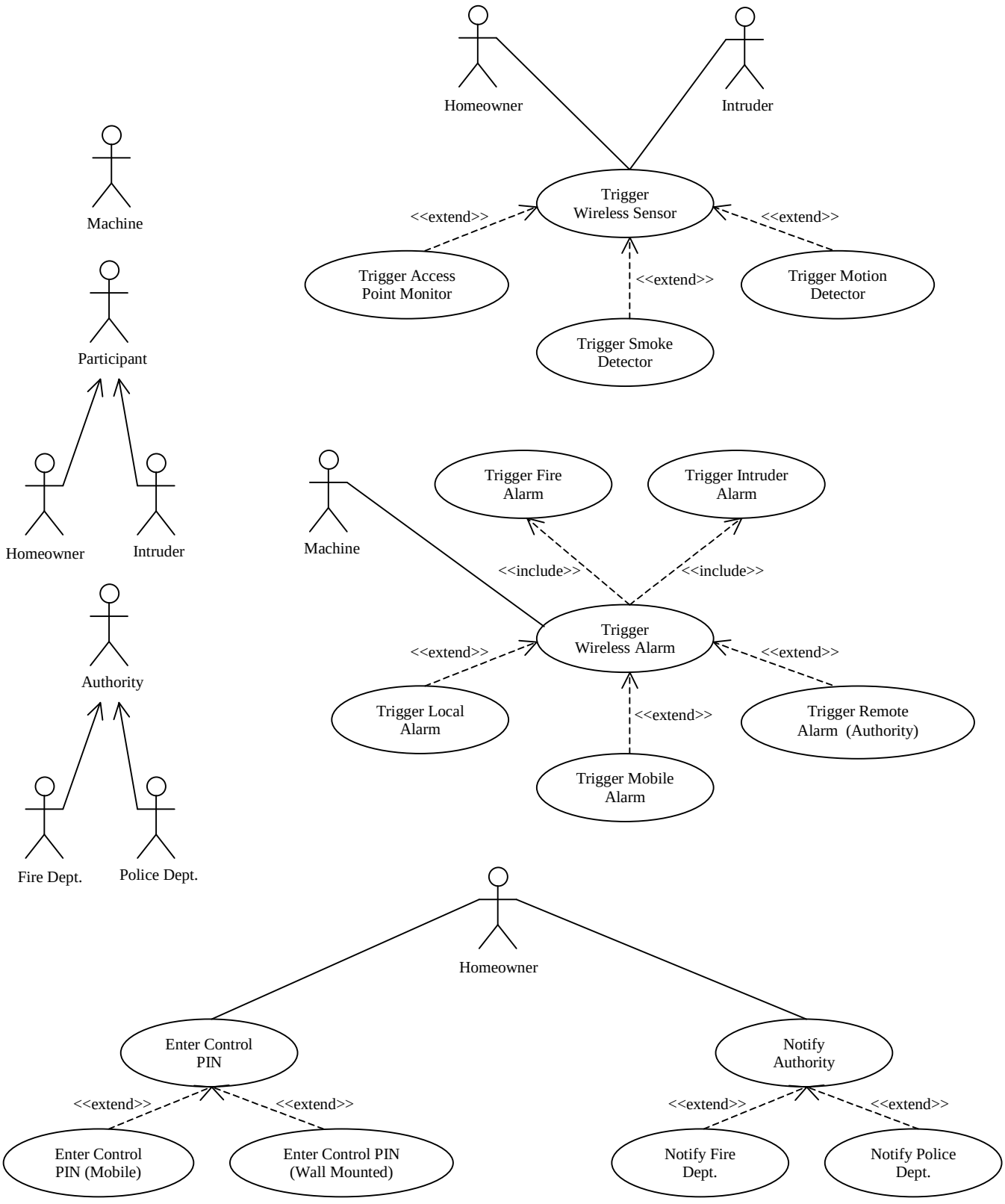
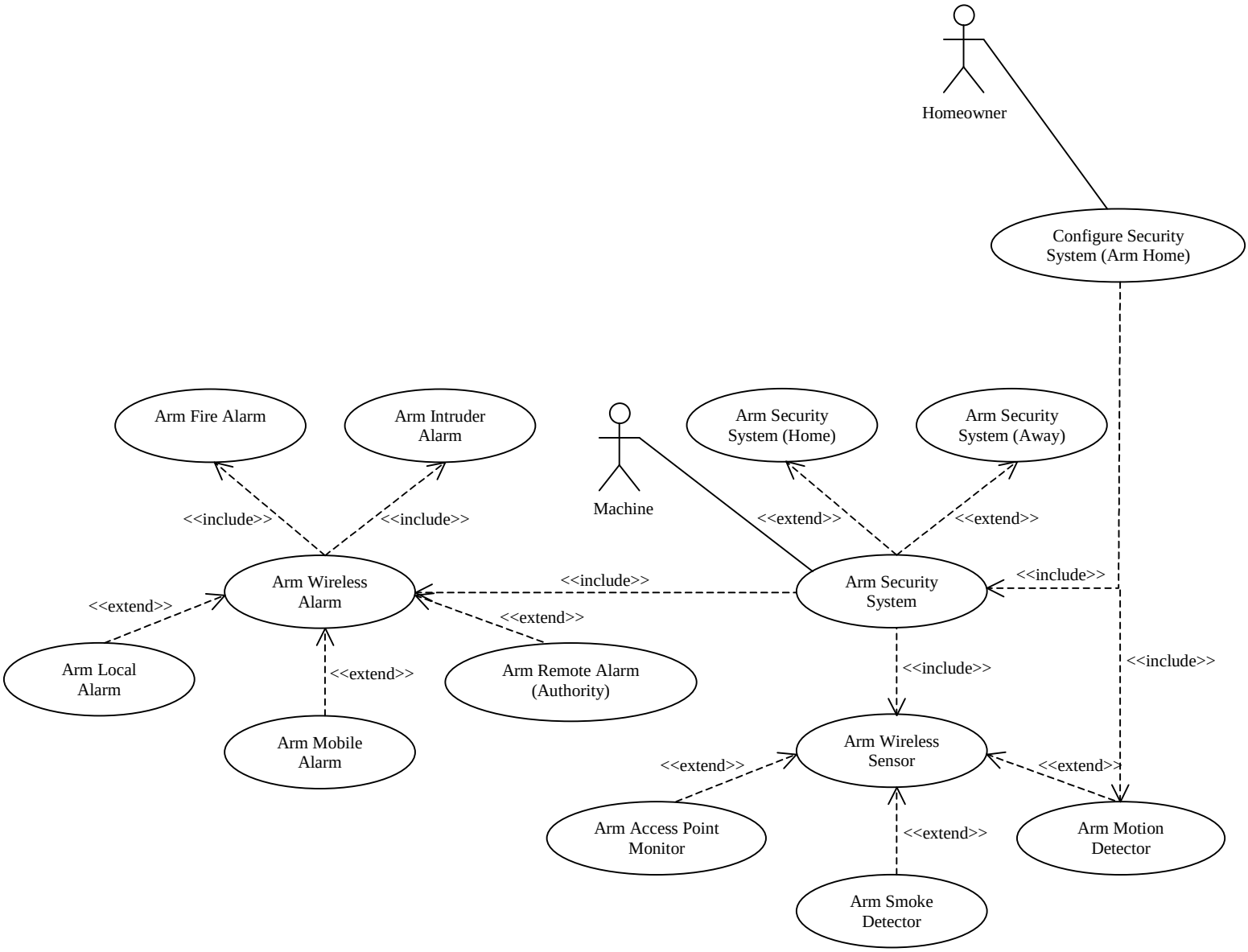
CSCI 6448 - Object-Oriented Analysis and Design (Spring 2001)
Homework #3 – Use Cases

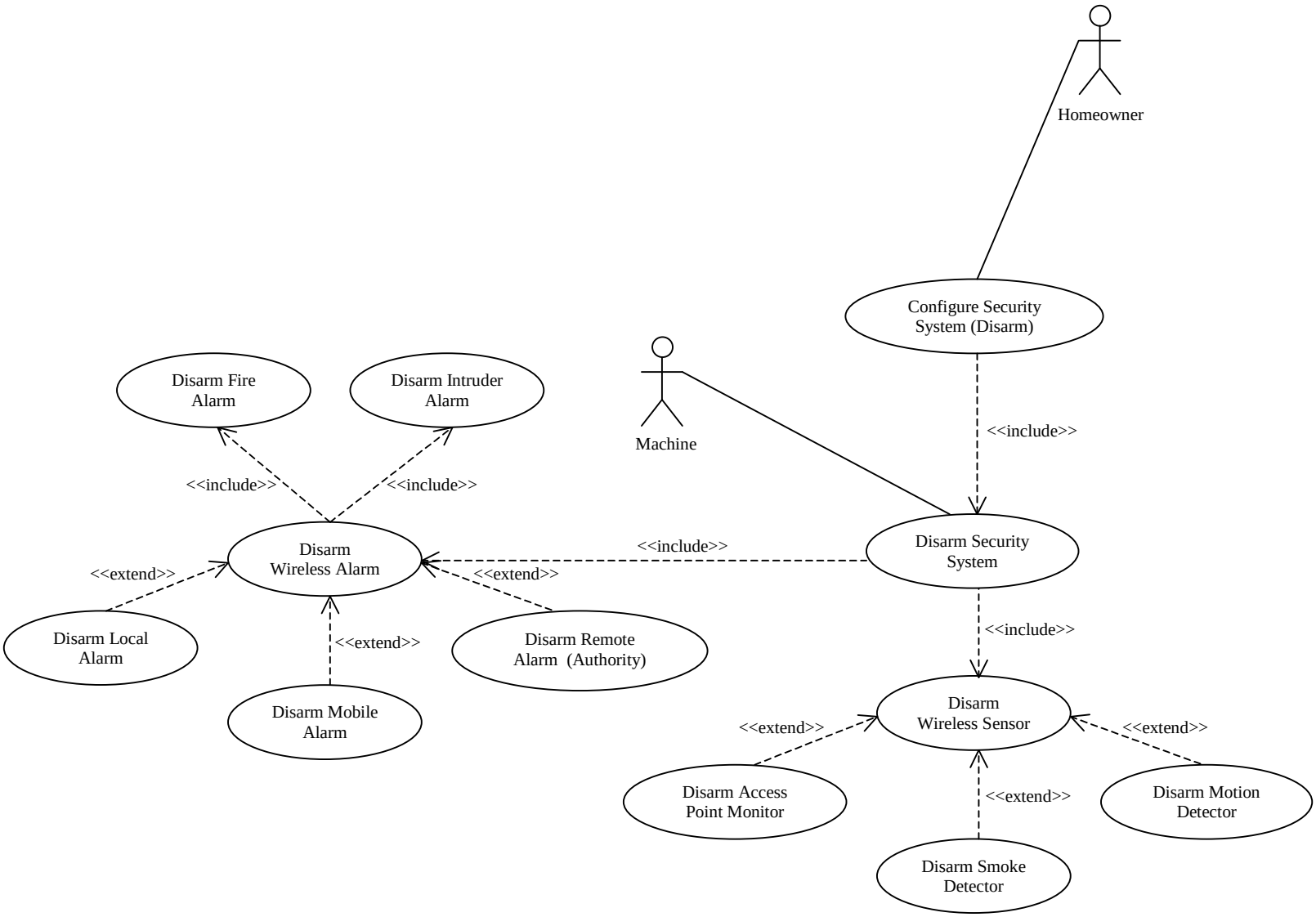
Use Case Diagram



Use Case Diagram (continued)



Use Case Diagram (continued)



Use Case 1 Trigger Smoke Detector
("A smoke detector detects smoke in the house.")

Primary Actor: Machine

Goal in Context: Smoke detector (a wireless sensor integrated with the home security system) detects smoke in the house and triggers. The machine triggers the local, mobile and remote fire alarms (wireless alarms). The remote fire alarm or homeowner notifies the fire department authority of the smoke detection (the local/mobile fire alarm notifies the home owner of the smoke detection).

Scope: Machine – the overall home security mechanism with specific regard to the fire monitoring system as seen by the primary and secondary actors.

Level: Summary

Stakeholders and Interests:

Home Owner – wants notification of the smoke detection via the local/mobile fire alarm.
Fire Department – wants notification of the smoke detection via the remote fire alarm or homeowner.

Precondition: Home security system is armed at either the off, home or away security level.
Smoke detector(s) (wireless sensors integrated with the home security system) are armed and operable via wireless connection.
Local, mobile and remote fire alarms are armed and operable via wireless connections.

Minimal Guarantees:

None

Success Guarantees:

The local/mobile fire alarm notifies the homeowner of the smoke detection (attempted, not guaranteed).
The remote fire alarm or homeowner notifies the fire department of the smoke detection.

Trigger: Smoke detector (a wireless sensor integrated with the home security system) detects smoke in the house and triggers.

Main Success Scenario:

1. Smoke in the house triggers a smoke detector.
2. The machine triggers the local fire alarm (a wireless alarm).
3. The machine triggers the mobile fire alarm (a wireless alarm).
4. The machine triggers the remote fire alarm (authority) (a wireless alarm).
5. Homeowner is notified of the smoke detection via the local/mobile fire alarm trigger (attempted, not guaranteed).
6. Fire department is notified of the smoke detection via the remote fire alarm trigger or homeowner notification.

Extensions:

1a. Smoke detector is inoperative (smoke detector trigger fails): Use case terminates in failure.

2a. Local fire alarm is inoperative (local fire alarm trigger fails): Mobile fire alarm is triggered simultaneously (?), use case continues.
2b. Local fire alarm triggers with no homeowner at home: Use case continues.
3a. Mobile fire alarm is inoperative (mobile fire alarm trigger fails): Remote fire alarm (authority) triggers simultaneously, use case continues.
3b. Mobile fire alarm triggers while not in possession of homeowner: Use case continues.
4a. Remote fire alarm (authority) is inoperative:
    4a1. Local fire alarm triggers with homeowner at home (if the local fire alarm is inoperative, use case continues to extension 4a3): Homeowner notifies authority (fire department) via other channels, use case continues.
    4a2. Local fire alarm triggers with no homeowner at home: Mobile fire alarm triggers simultaneously, use case continues to extension 4a3.
    4a3. Mobile fire alarm triggers while in possession of homeowner (if the mobile fire alarm is inoperative, use case terminates in failure): Homeowner notifies authority (fire department) via other channels, use case continues.
    4a4. Mobile fire alarm triggers while not in possession of homeowner: Use case terminates in failure.

Technology and Data Variations List:
Wireless alarm types (local fire alarm, mobile fire alarm and remote fire alarm installed at authority).

Priority: High

Releases: Several

Response Time: Various

Frequency of Use: Unknown

Channels to Primary Actor:
Wireless infrastructure

Secondary Actors: Home Owner, Fire Department

Channels to Secondary Actors:
Home Owner - Local fire alarm, mobile fire alarm, telephone (main/emergency numbers on record at fire department)
Fire Department - Remote fire alarm, telephone (911 emergency system)

Open Issues:
What is the expected frequency of use for this use case for any one installation (i.e., a single home)?
Is the 911 emergency system considered to be a “24 by 7” availability system?
Is the remote fire alarm (authority) system considered to be a “24 by 7” availability system?
Do the fire alarms (local, mobile and remote) trigger simultaneously or in sequence?

Use Case 2 Configure Security System (Disarm)
("Returning to a house armed in away mode.")

Primary Actor: Home Owner
Goal in Context: A homeowner returns to house with the home security system armed in away mode. The homeowner disarms the home security system prior to entering the home with the mobile (wireless) control interface. The homeowner may also disarm the home security system after entering the home with the wall mounted control interface.
Scope: The home security system with specific regard to disarming the system as seen by the primary and secondary actors.
Level: Summary
Stakeholders and Interests:
Home Owner – returns to house with the home security system armed in away mode (wants to disarm the home security system without triggering a "false" alarm).
Police Department – does not want home security system of primary actor to trigger a "false" alarm.
Precondition: Home security system is armed at the away security level.
Access point monitors and motion detectors (wireless sensors) are armed and operable via wireless connection.
Local, mobile and remote intruder alarms are armed and operable via wireless connections.
Minimal Guarantees:
System disarms or the remote intruder alarm (authority) triggers ("false" alarm).
Success Guarantees:
The homeowner disarms the home security system without triggering a "false" alarm.
The police department does not receive a "false" alarm triggered by the home security system of the primary actor.
Trigger: A homeowner returns to house armed in away mode.
Main Success Scenario:

1. Homeowner returns to house armed in away mode.
2. Homeowner enters the control PIN via the mobile (wireless) control interface prior to entering home.
3. Homeowner disarms the home security system via the mobile (wireless) control interface prior to entering home.

Extensions:

2a. Control PIN entry fails (e.g., home owner forgets the control PIN):
    2a1. Home owner triggers wireless sensor:
        2a1a. Mobile (wireless) control interface is not in possession of homeowner: use case continues to 3b1a.
        2a1b. Use case continues to 4a.
3b. Mobile (wireless) control interface is not in possession of homeowner:

3b1. Home owner triggers wireless sensor:
3b1a. Home owner enters the control PIN via the wall mounted (wireless) control interface after entering home:
3b1a1. Home owner fails to disarm the home security system within 90 seconds:
3b1a1a. Use case continues to 4a.
3b1a2. Control PIN entry fails:
3b1a2a. Use case continues to 4a.

4a. Home owner notifies authority (police department) of "false" alarm via other channels:
4a1. Home owner fails to notify authority of "false" alarm within 90 seconds: Use case terminates in failure.

Technology and Data Variations List:
Wireless control interface types (wall mounted and mobile).
Wireless alarm types (local intruder alarm, mobile intruder alarm and remote intruder alarm installed at authority).

Priority: Medium
Releases: Several
Response Time: Various
Frequency of Use: Unknown

Channels to Primary Actor:
Wall mounted control interface, mobile control interface, local intruder alarm, mobile intruder alarm, telephone (main/emergency numbers on record at police department)

Secondary Actors: Police Department

Channels to Secondary Actors:
Police Department - Remote intruder alarm, telephone (911 emergency system)

Open Issues:
What is the expected frequency of use for this use case for any one installation (i.e., a single home)?
Is the 911 emergency system considered to be a "24 by 7" availability system?
Is the remote intruder alarm (authority) system considered to be a "24 by 7" availability system?

Use Case 3 Trigger Wireless Sensor
("The security system detects an intruder.")

Primary Actor: Machine

Goal in Context: Wireless sensor (either an access point monitor or motion detector) detects an intruder and triggers. The machine triggers the local, mobile and remote intruder alarms (wireless alarms). The remote intruder alarm or homeowner notifies the police department authority of the intruder detection (the local/mobile intruder alarm notifies the homeowner of the intruder detection).

Scope: Machine – the overall home security mechanism with specific regard to the intruder monitoring system as seen by the primary and secondary actors.

Level: Summary

Stakeholders and Interests:

Home Owner – wants notification of the intruder detection via the local/mobile intruder alarm.
Police Department – wants notification of the intruder detection via the remote intruder alarm or homeowner.

Precondition: Home security system is armed at either the home or away security level.
Access point monitors and/or motion detectors (wireless sensors) are armed and operable via wireless connection.
Local, mobile and remote intruder alarms are armed and operable via wireless connections.

Minimal Guarantees:

None

Success Guarantees:

The local/mobile intruder alarm notifies the homeowner of the intruder detection (attempted, not guaranteed).
The remote intruder alarm or homeowner notifies the police department of the intruder detection.

Trigger: Access point monitor or motion detector (wireless sensors) detects an intruder in the house and triggers.

Main Success Scenario:

4. Access point monitor triggers or motion detector triggers via detection of an intruder in the home.
5. The machine triggers the local intruder alarm (wireless alarm).
6. The machine triggers the mobile intruder alarm (wireless alarm).
7. The machine triggers the remote intruder alarm (authority) (wireless alarm).
8. Homeowner is notified of the intruder detection via the local/mobile intruder alarm trigger (attempted, not guaranteed).
9. Police department is notified of the intruder detection via the remote intruder alarm trigger or homeowner notification.

Extensions:

1a. Access point monitor or motion detector is inoperative (access point monitor or motion detector trigger fails): Use case terminates in failure.
2a. Local intruder alarm is inoperative (local intruder alarm trigger fails): Mobile intruder alarm is triggered simultaneously (?), use case continues.
2b. Local intruder alarm triggers with no homeowner at home: Use case continues.
3a. Mobile intruder alarm is inoperative (mobile intruder alarm trigger fails): Remote intruder alarm (authority) triggers simultaneously, use case continues.
3b. Mobile intruder alarm triggers while not in possession of homeowner: Use case continues.
4a. Remote intruder alarm (authority) is inoperative:
    4a1. Local intruder alarm triggers with homeowner at home (if the local intruder alarm is inoperative, use case continues to extension 4a3): Homeowner notifies authority (police department) via other channels, use case continues.
    4a2. Local intruder alarm triggers with no homeowner at home: Mobile intruder alarm triggers simultaneously, use case continues to extension 4a3.
    4a3. Mobile intruder alarm triggers while in possession of homeowner (if the mobile intruder alarm is inoperative, use case terminates in failure): Homeowner notifies authority (police department) via other channels, use case continues.
    4a4. Mobile intruder alarm triggers while not in possession of homeowner: Use case terminates in failure.

Technology and Data Variations List:

Wireless sensor types (access point monitor and motion detector).
Wireless alarm types (local intruder alarm, mobile intruder alarm and remote intruder alarm installed at authority).

Priority: High
Releases: Several
Response Time: Various
Frequency of Use: Unknown
Channels to Primary Actor:

Wireless infrastructure

Secondary Actors: Home Owner, Police Department
Channels to Secondary Actors:

Home Owner - Local intruder alarm, mobile intruder alarm, telephone (main/emergency numbers on record at police department)
Police Department - Remote intruder alarm, telephone (911 emergency system)

Open Issues:

What is the expected frequency of use for this use case for any one installation (i.e., a single home)?
Is the 911 emergency system considered to be a “24 by 7” availability system?

Is the remote intruder alarm (authority) system considered to be a “24 by 7” availability system?
Do the intruder alarms (local, mobile and remote) trigger simultaneously or in sequence?

Use Case 4 Configure Security System (Arm Home)
("Setting the security system to monitor only parts of the house.")

Usage Narrative

Homeowners with home security systems generally use the home security level when they are at home. The home security level arms the access point monitors but not the motion detectors so that the homeowner may move freely about the home (while still maintaining a level of security at the access points such as doors and windows). However, homeowners that are at home occasionally desire the home security level of home (with only access point monitors armed) but with a configurable set of motion detectors armed as well. This scenario is seen typically with homeowners that work out of their home; while they are working, the homeowner does not expect to roam about the house in their normal fashion (for example). Home owners that are not at home also occasionally desire the home security level of home (with only access point monitors armed) but with a configurable set of motion detectors armed as well. This scenario is seen typically with home owners that own indoor pets; while they are out of the home, the home owner keeps their indoor pets in a certain area of the home (for example).

Primary Actor: Home Owner

Goal in Context: A homeowner arms the home security system at the home security level and arms a configurable set of motion detectors as well. The machine arms the wireless sensors as is appropriate (i.e., the access point monitors and the configured subset of motion detectors) and the wireless alarms.

Scope: The home security system with specific regard to arming the system at the home security level, with a configurable set of motion detectors armed as well, as seen by the primary actor and secondary actors.

Level: Summary

Stakeholders and Interests:

Home Owner – arms the home security system at the home security level and arms a configurable set of motion detectors as well.

Machine - arms the wireless sensors as is appropriate (i.e., the access point monitors and the configured subset of motion detectors) and the wireless alarms.

Precondition: Home security system is disarmed.

Access point monitors and motion detectors (wireless sensors) are operable via wireless connection.

Local, mobile and remote intruder alarms (wireless alarms) are operable via wireless connections.

Minimal Guarantees:

None

Success Guarantees:

Homeowner arms the security system at the home security level and arms a configurable set of motion detectors as well.

Trigger: A home owner desires to arm the security system at the home security level but for a number of possible reasons wants a configurable set of motion detectors armed as well.

Main Success Scenario:

1. Homeowner enters the control PIN via the mobile (wireless) control interface.
2. Homeowner arms the security system at the home security level (via a wireless control interface).
3. Homeowner arms motion detectors in a configuration as desired (via a wireless control interface).

Extensions:

1a. Control PIN entry fails (e.g., home owner forgets the control PIN): Use case terminates in failure.

1b. Mobile (wireless) control interface is not in possession of homeowner:

1b1. Home owner enters the control PIN via the wall mounted (wireless) control interface:

1b1a. Control PIN entry fails: Use case terminates in failure.

Technology and Data Variations List:

Wireless control interface types (wall mounted and mobile).
Wireless sensor types (access point monitor and motion detector).

Priority: Medium

Releases: Several

Response Time: Various

Frequency of Use: Unknown

Channels to Primary Actor:

Wall mounted control interface, mobile control interface

Secondary Actors: Machine

Channels to Secondary Actors:

Wireless infrastructure

Open Issues:

What is the expected frequency of use for this use case for any one installation (i.e., a single home)?
What other reasons are there not already mentioned in the usage narrative for arming the system with a configurable set of motion detectors (may provide motivation for increasing configurability of the home security system even further)?

Other Use Case Definitions (Low-Ceremony)

Use Case Name	Actor	Goal	Brief
Trigger Wireless Sensor (superclass of the trigger access point monitor, trigger motion detector and trigger smoke detector use cases; therefore use case extensions exist as defined below)	Wireless Sensor	Notifies the machine of a triggerable event.	Sensing a triggerable event, the wireless sensor notifies the machine of the event as triggered.
Trigger Access Point Monitor (subclass of the trigger wireless sensor use case; therefore use case is an extension)	Access Point Monitor	Notifies the machine of a triggerable event.	Sensing a triggerable event, the access point monitor notifies the machine of the event as triggered.
Trigger Motion Detector (subclass of the trigger wireless sensor use case; therefore use case is an extension)	Motion Detector	Notifies the machine of a triggerable event.	Sensing a triggerable event, the motion detector notifies the machine of the event as triggered.
Trigger Smoke Detector (subclass of the trigger wireless sensor use case; therefore use case is an extension)	Smoke Detector	Notifies the machine of a triggerable event.	Sensing a triggerable event, the smoke detector notifies the machine of the event as triggered.
Trigger Wireless Alarm (superclass of the trigger local alarm, trigger mobile alarm and trigger remote alarm (authority) use cases; therefore use case extensions exist as defined below)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless alarm triggers and notifies various actors of the event as alarmed.
Trigger Local Alarm (subclass of trigger wireless alarm use case; therefore use case is an extension)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless local alarm triggers and notifies various actors of the event as alarmed.
Trigger Mobile Alarm (subclass of trigger wireless alarm use case; therefore use case is an extension)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless mobile alarm triggers and notifies various actors of the event as alarmed.
Trigger Remote Alarm (Authority) (subclass of trigger wireless alarm use case; therefore use case is an extension)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless remote alarm (authority) triggers and notifies various actors of the event as alarmed.
Trigger Fire Alarm (type of wireless alarm)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless fire alarm triggers and notifies various actors of the event as alarmed.
Trigger Intruder Alarm (type of wireless alarm)	Machine	Machine triggers wireless alarm that notifies various actors of an alarmable event.	Notified of an alarmable event, the wireless intruder alarm triggers and notifies various actors of the event as alarmed.
Notify Authority (superclass of the notify fire department and notify police department use cases; therefore use case extensions exist as defined below)	Home Owner	Notifies the authority of an alarmable event.	The homeowner notifies the authority of an alarmable event.
Notify Fire Department (subclass of notify authority use case; therefore use case is an extension)	Home Owner	Notifies the fire department authority of an alarmable event.	The homeowner notifies the fire department authority of an alarmable event.
Notify Police Department (subclass of notify authority use case; therefore use case is an extension)	Home Owner	Notifies the police department authority of an alarmable event.	The homeowner notifies the police department authority of an alarmable event.
Enter Control PIN (superclass of the enter control PIN (mobile) and	Home Owner	Homeowner gains control access to the home security system.	The homeowner enters the control PIN into the home security system.

Use Case Name	Actor	Goal	Brief
enter control PIN (wall mounted) use cases; therefore use case extensions exist as defined below)			
Enter Control PIN (Mobile) (subclass of enter control PIN use case; therefore use case is an extension)	Home Owner	Homeowner gains control access to the home security system.	The homeowner enters the control PIN into the home security system via the mobile (wireless) control interface.
Enter Control PIN (Wall Mounted) (subclass of enter control PIN use case; therefore use case is an extension)	Home Owner	Homeowner gains control access to the home security system.	The homeowner enters the control PIN into the home security system via the wall mounted (wireless) control interface.
Arm Security System (superclass of the arm security system (home) and arm security system (away) use cases; therefore use case extensions exist as defined below)	Machine	Home security system armed.	Machine arms the security system.
Arm Security System (Home) (subclass of the arm security system use case; therefore use case is an extension)	Machine	Home security system armed (home).	Machine arms the security system at the home security level.
Arm Security System (Away) (subclass of the arm security system use case; therefore use case is an extension)	Machine	Home security system armed (away).	Machine arms the security system at the away security level.
Arm Wireless Sensor (superclass of the arm access point monitor, arm motion detector and arm smoke detector use cases; therefore use case extensions exist as defined below)	Machine	Wireless sensor armed.	Machine arms the wireless sensor.
Arm Access Point Monitor (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Access point monitor (wireless sensor) armed.	Machine arms the access point monitor (wireless sensor).
Arm Motion Detector (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Motion detector (wireless sensor) armed.	Machine arms the motion detector (wireless sensor).
Arm Smoke Detector (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Smoke detector (wireless sensor) armed.	Machine arms the smoke detector (wireless sensor).
Arm Wireless Alarm (superclass of the arm local alarm, arm mobile alarm and arm remote alarm (authority) use cases; therefore use case extensions exist as defined below)	Machine	Wireless alarm armed.	Machine arms the wireless alarm.
Arm Local Alarm (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Local alarm armed.	Machine arms the local alarm (wireless alarm).
Arm Mobile Alarm (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Mobile alarm armed.	Machine arms the mobile alarm (wireless alarm).
Arm Remote Alarm (Authority) (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Remote alarm armed.	Machine arms the remote alarm (wireless alarm).
Arm Fire Alarm (type of wireless alarm)	Machine	Fire alarm armed.	Machine arms the fire alarm (wireless alarm).
Arm Intruder Alarm (type of wireless alarm)	Machine	Intruder alarm armed.	Machine arms the intruder alarm (wireless alarm).
Disarm Security System	Machine	Home security system disarmed.	Machine disarms the security system.

Use Case Name	Actor	Goal	Brief
Disarm Wireless Sensor (superclass of the disarm access point monitor, disarm motion detector and disarm smoke detector use cases; therefore use case extensions exist as defined below)	Machine	Wireless sensor disarmed.	Machine disarms the wireless sensor.
Disarm Access Point Monitor (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Access point monitor (wireless sensor) disarmed.	Machine disarms the access point monitor (wireless sensor).
Disarm Motion Detector (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Motion detector (wireless sensor) disarmed.	Machine disarms the motion detector (wireless sensor).
Disarm Smoke Detector (subclass of the arm wireless sensor use case; therefore use case is an extension)	Machine	Smoke detector (wireless sensor) disarmed.	Machine disarms the smoke detector (wireless sensor).
Disarm Wireless Alarm (superclass of the arm local alarm, arm mobile alarm and arm remote alarm (authority) use cases; therefore use case extensions exist as defined below)	Machine	Wireless alarm disarmed.	Machine disarms the wireless alarm.
Disarm Local Alarm (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Local alarm disarmed.	Machine disarms the local alarm (wireless alarm).
Disarm Mobile Alarm (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Mobile alarm disarmed.	Machine disarms the mobile alarm (wireless alarm).
Disarm Remote Alarm (Authority) (subclass of arm wireless alarm use case; therefore use case is an extension)	Machine	Remote alarm disarmed.	Machine disarms the remote alarm (wireless alarm).
Disarm Fire Alarm (type of wireless alarm)	Machine	Fire alarm disarmed.	Machine disarms the fire alarm (wireless alarm).
Disarm Intruder Alarm (type of wireless alarm)	Machine	Intruder alarm disarmed.	Machine disarms the intruder alarm (wireless alarm).