1. Detect Fire

Use Case: DetectFire

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The system intends to detect a fire."

Multiplicity: "The system can detect multiple fires simultaneously."

Primary Actor: None

Secondary Actor:

SENSOR::SmokeSensor::1..*

SENSOR::HeatSensor::1..*

SENSOR::CarbonMonoxideSensor::1..*

Main Success Scenario:

"The SmokeSensor detects smoke."

[TriggerAlarm] "The system triggers the alarm."

[AlertUser] "The system alerts the user."

[AlertFireDepartment] "The system alerts the fire department."

[TriggerInitialResponse] "The system triggers the initial response."

Use Case Ends in: SUCCESS

Extensions:

Alternative for 1:

1a. "The HeatSensor detects heat."

1a.1. [TriggerAlarm] "The system triggers the alarm."

1a.2. [AlertUser] "The system alerts the user."

1a.3. [AlertFireDepartment] "The system alerts the fire department."

1a.4. [TriggerInitialResponse] "The system triggers the initial response."

Use Case Ends in: SUCCESS

Alternative for 2:

2a. "The CarbonMonoxideSensor detects carbon monoxide."

2a.1. [TriggerAlarm] "The system triggers the alarm."

2a.2. [AlertUser] "The system alerts the user."

2a.3. [AlertFireDepartment] "The system alerts the fire department."

Use Case Ends in: SUCCESS

Exception for (1-5):

(1-5)a.^ timeout:30s "The system fails to trigger the alarm within 30 seconds."

(1-5)a.1. {SOFTWARE_EXCEPTION::AlarmTriggerFailure} "The system logs the error and continues."

Use Case Ends in: DEGRADED

Exception for (1-5):

(1-5)b. {HARDWARE_EXCEPTION::SensorFailure} "One or more sensors fail."

(1-5)b.1. [HandleSensorFailure] "The system attempts to identify the faulty sensor and notify the user."

Use Case Ends in: DEGRADED

2. Alert User

Use Case: AlertUser

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The system intends to alert the user about a fire."

Multiplicity: "The system can alert multiple users simultaneously."

Primary Actor: None

Secondary Actor:

HUMAN::User::1..*

SOFTWARE::UserApp::1..1

Main Success Scenario:

"The system sends a notification to the UserApp."

"The UserApp displays a fire alert notification to the User."

"The system sounds the alarm."

Use Case Ends in: SUCCESS

Extensions:

Alternative for 1:

1a. "The UserApp fails to receive the notification."

1a.1. [HandleAppNotificationFailure] "The system attempts to send the notification again."

1a.2. "If the notification cannot be sent, the system logs the error and continues."

Use Case Ends in: DEGRADED

Alternative for 2:

2a. "The UserApp fails to display the notification."

2a.1. [HandleAppDisplayFailure] "The system logs the error and continues."

Use Case Ends in: DEGRADED

Exception for (1-3):

(1-3)a.^ timeout:30s "The system fails to alert the user within 30 seconds."

(1-3)a.1. {NETWORK_EXCEPTION::CommunicationFailure} "The system attempts to reconnect."

Use Case Ends in: DEGRADED

Exception for (1-3):

(1-3)b. {SOFTWARE_EXCEPTION::UserAppFailure} "The UserApp fails to function correctly."

(1-3)b.1. [HandleUserAppFailure] "The system attempts to use alternative methods for alerting the user (e.g., SMS, phone call)."

Use Case Ends in: DEGRADED

3. Alert Fire Department

Use Case: AlertFireDepartment

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The system intends to alert the local fire department about a fire."

Multiplicity: "The system can alert multiple fire departments simultaneously."

Primary Actor: None

Secondary Actor:

SOFTWARE::FireDepartmentSystem::1..1

Main Success Scenario:

"The system sends a fire alert notification to the FireDepartmentSystem."

Use Case Ends in: SUCCESS

Extensions:

Alternative for 1:

1a. "The FireDepartmentSystem fails to receive the notification."

1a.1. [HandleFireDepartmentNotificationFailure] "The system attempts to send the notification again."

1a.2. "If the notification cannot be sent, the system logs the error and notifies the user."

Use Case Ends in: DEGRADED

Exception for (1-1):

(1-1)a.^ timeout:30s "The system fails to alert the fire department within 30 seconds."

(1-1)a.1. {NETWORK_EXCEPTION::CommunicationFailure} "The system attempts to reconnect."

Use Case Ends in: DEGRADED

Exception for (1-1):

(1-1)b. {SOFTWARE_EXCEPTION::FireDepartmentSystemFailure} "The FireDepartmentSystem fails to function correctly."

(1-1)b.1. [HandleFireDepartmentSystemFailure] "The system logs the error and notifies the user."

Use Case Ends in: DEGRADED

4. Trigger Initial Response

Use Case: TriggerInitialResponse

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The system intends to trigger an initial response to minimize damage and save lives."

Multiplicity: "The system can trigger multiple responses simultaneously."

Primary Actor: None

Secondary Actor:

SOFTWARE::SprinklerSystem::1..1

Main Success Scenario:

"The system sends a notification to the SprinklerSystem to lower the temperature threshold."

Use Case Ends in: SUCCESS

Extensions:

Alternative for 1:

1a. "The SprinklerSystem fails to receive the notification."

1a.1. [HandleSprinklerSystemNotificationFailure] "The system attempts to send the notification again."

1a.2. "If the notification cannot be sent, the system logs the error and continues."

Use Case Ends in: DEGRADED

Exception for (1-1):

(1-1)a.^ timeout:30s "The system fails to trigger the initial response within 30 seconds."

(1-1)a.1. {NETWORK_EXCEPTION::CommunicationFailure} "The system attempts to reconnect."

Use Case Ends in: DEGRADED

Exception for (1-1):

(1-1)b. {SOFTWARE_EXCEPTION::SprinklerSystemFailure} "The SprinklerSystem fails to function correctly."

(1-1)b.1. [HandleSprinklerSystemFailure] "The system logs the error and continues."

Use Case Ends in: DEGRADED

5. Manage System Settings

Use Case: ManageSystemSettings

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The user intends to configure alarm settings and manually turn off the alarm."

Multiplicity: "Multiple users can manage the system settings."

Primary Actor: HUMAN::User::1..*

Secondary Actor:

SOFTWARE::UserApp::1..1

Main Success Scenario:

"The User opens the UserApp."

"The User accesses the system settings."

"The User configures the alarm settings (e.g., sensitivity, notification methods)."

"The User saves the settings."

Use Case Ends in: SUCCESS

Extensions:

Alternative for 1:

1a. "The User chooses to manually turn off the alarm."

1a.1. [TurnOffAlarm] "The system turns off the alarm."

Use Case Ends in: SUCCESS

Exception for (1-4):

(1-4)a.^ timeout:30s "The system fails to respond to the user's request within 30 seconds."

(1-4)a.1. {SOFTWARE_EXCEPTION::UserAppFailure} "The system logs the error and notifies the user."

Use Case Ends in: DEGRADED

6. Monitor System Health

Use Case: MonitorSystemHealth

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "The system intends to monitor its own health and notify the user of any issues."

Multiplicity: "The system monitors its health continuously."

Primary Actor: None

Secondary Actor:

HUMAN::User::1..*

SOFTWARE::UserApp::1..1

Main Success Scenario:

"The system monitors the battery level."

"The system monitors the functionality of all sensors."

"If the battery level is low, the system notifies the user."

"If a sensor fails, the system notifies the user."

Use Case Ends in: SUCCESS

Extensions:

Exception for (1-4):

(1-4)a.^ timeout:30s "The system fails to monitor its health within 30 seconds."

(1-4)a.1. {SOFTWARE_EXCEPTION::SystemHealthMonitoringFailure} "The system logs the error and continues."

Use Case Ends in: DEGRADED

Exception for (1-4):

(1-4)b. {SOFTWARE_EXCEPTION::UserAppFailure} "The UserApp fails to function correctly."

(1-4)b.1. [HandleUserAppFailure] "The system attempts to use alternative methods for alerting the user (e.g., SMS, phone call)."

Use Case Ends in: DEGRADED

Invoked Use Cases:

TriggerAlarm:

Scope: SmartFireAlarmSystem

Level: SUB_FUNCTION

Intention: "The system triggers the alarm."

Multiplicity: "The system can trigger the alarm multiple times."

Primary Actor: None

Main Success Scenario:

"The system activates the alarm siren."

Use Case Ends in: SUCCESS

TurnOffAlarm:

Scope: SmartFireAlarmSystem

Level: SUB_FUNCTION

Intention: "The system turns off the alarm."

Multiplicity: "The system can turn off the alarm multiple times."

Primary Actor: None

Main Success Scenario:

"The system deactivates the alarm siren."

Use Case Ends in: SUCCESS

Handler Use Cases:

HandleSensorFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle sensor failure."

Multiplicity: "The system can handle sensor failures for multiple sensors."

Primary Actor: None

Contexts and Exceptions:

DetectFire {HARDWARE_EXCEPTION::SensorFailure}

Main Success Scenario:

"The system attempts to identify the faulty sensor."

"The system notifies the user about the sensor failure."

Use Case Ends in: SUCCESS

HandleAppNotificationFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle UserApp notification failure."

Multiplicity: "The system can handle notification failures for multiple users."

Primary Actor: None

Contexts and Exceptions:

AlertUser {SOFTWARE_EXCEPTION::UserAppFailure}

Main Success Scenario:

"The system attempts to send the notification again."

"If the notification cannot be sent, the system logs the error and continues."

Use Case Ends in: DEGRADED

HandleAppDisplayFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle UserApp display failure."

Multiplicity: "The system can handle display failures for multiple users."

Primary Actor: None

Contexts and Exceptions:

AlertUser {SOFTWARE_EXCEPTION::UserAppFailure}

Main Success Scenario:

"The system logs the error and continues."

Use Case Ends in: DEGRADED

HandleUserAppFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle UserApp failure."

Multiplicity: "The system can handle UserApp failures for multiple users."

Primary Actor: None

Contexts and Exceptions:

AlertUser {SOFTWARE_EXCEPTION::UserAppFailure}

MonitorSystemHealth {SOFTWARE_EXCEPTION::UserAppFailure}

Main Success Scenario:

"The system attempts to use alternative methods for alerting the user (e.g., SMS, phone call)."

Use Case Ends in: DEGRADED

HandleFireDepartmentNotificationFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle FireDepartmentSystem notification failure."

Multiplicity: "The system can handle notification failures for multiple fire departments."

Primary Actor: None

Contexts and Exceptions:

AlertFireDepartment {SOFTWARE_EXCEPTION::FireDepartmentSystemFailure}

Main Success Scenario:

"The system attempts to send the notification again."

"If the notification cannot be sent, the system logs the error and notifies the user."

Use Case Ends in: DEGRADED

HandleFireDepartmentSystemFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle FireDepartmentSystem failure."

Multiplicity: "The system can handle FireDepartmentSystem failures for multiple fire departments."

Primary Actor: None

Contexts and Exceptions:

AlertFireDepartment {SOFTWARE_EXCEPTION::FireDepartmentSystemFailure}

Main Success Scenario:

"The system logs the error and notifies the user."

Use Case Ends in: DEGRADED

HandleSprinklerSystemNotificationFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle SprinklerSystem notification failure."

Multiplicity: "The system can handle notification failures for multiple sprinkler systems."

Primary Actor: None

Contexts and Exceptions:

TriggerInitialResponse {SOFTWARE_EXCEPTION::SprinklerSystemFailure}

Main Success Scenario:

"The system attempts to send the notification again."

"If the notification cannot be sent, the system logs the error and continues."

Use Case Ends in: DEGRADED

HandleSprinklerSystemFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle SprinklerSystem failure."

Multiplicity: "The system can handle SprinklerSystem failures for multiple sprinkler systems."

Primary Actor: None

Contexts and Exceptions:

TriggerInitialResponse {SOFTWARE_EXCEPTION::SprinklerSystemFailure}

Main Success Scenario:

"The system logs the error and continues."

Use Case Ends in: DEGRADED

HandleAlarmTriggerFailure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle alarm trigger failure."

Multiplicity: "The system can handle alarm trigger failures for multiple alarms."

Primary Actor: None

Contexts and Exceptions:

DetectFire {SOFTWARE_EXCEPTION::AlarmTriggerFailure}

Main Success Scenario:

"The system logs the error and continues."

Use Case Ends in: DEGRADED

HandleSystemHealthMonitoringFail ure:

Scope: SmartFireAlarmSystem

Level: SUMMARY

Intention: "To handle system health monitoring failure."

Multiplicity: "The system can handle system health monitoring failures for multiple systems."

Primary Actor: None

Contexts and Exceptions:

MonitorSystemHealth {SOFTWARE_EXCEPTION::SystemHealthMonitoringFailure}

Main Success Scenario:

"The system logs the error and continues."

Use Case Ends in: DEGRADED