University of Colorado Boulder

Object Oriented Analysis & Design

[CSCI 5448]

Smart Home Management System

Project Part 2

Team Members

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Team

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GitHub Names

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Title

Smart Home Management System

Description

Smart Home Management System is a desktop app, which helps to monitor and update notifications from the smart sensors at Customer's house. The project is assumed to be for a client company, ABC Smart Home which manufactures smart home products, so the Admin will be the company's employee and the customers will be the one who purchases the products from the company. The app will help the customer and the admin to configure sensors in the home network and update any notifications to the user.

Requirements

User Requirement

User Requirement		
User ID	**Description**	**Actors**
UR-01	As an admin/user, I should be able to create a role based account so that I can login	Admin or user
UR-02	As an admin, I should be able to add products into the Product Database	Admin
UR-03	As an admin, I should be able to remove existing products from the Product Database	Admin
UR-04	As a user, I should be able to add secondary users to limit their access to sensors in the network (e.g., creating an account for children)	User
UR-05	As a user, I should be able to provide access to a group of sensors to secondary users (other family members)	User
UR-06	As a user, I should be able to edit access to sensors to secondary users	User
UR-07	As a user, I should be able to remove secondary users from the system	User
UR-08	As a user, I should be able to add sensors to my home network from the Product List	User

UR-09	As a user, I should be able to remove sensors from the Home Sensor Network	User
UR-10	As a user, I should be able to view and configure the settings for each sensor in the Home Sensor Network (e.g., ON/OFF, Threshold Value, Sensor Location, IP address of sensor etc.)	User
UR-11	As a user, I should see a page for individual sensor to show sensor value, help option, sensor type and option to raise a complaint	User
UR-12	As a user, I should be able to access the help menu to get the details about the sensor	User
UR-13	As a user, I should be able to see the statistics of each sensor in the Home Sensor Network with timestamps	User
UR-14	As a user, I should be able to see the ON/OFF periods of the sensors for the past day	User
UR-15	As a user, I should be able to view the sensor statistics based on certain filters (e.g., during a period, based on sensor type, location etc.)	User
UR-16	As a user, I should be able to create custom group of the sensors in the Home Network so that I can control the group (e.g., Turn off all the sensors in the group)	User
UR-17	As a user, I should get notifications if the sensor data goes beyond the threshold value	User
UR-18	As a user, I should be able to set the location of the sensors in the Home Network (eg. In kitchen, in Bedroom)	User
UR-19	As a user, I should be able to set ON/OFF time for the group of sensors in the home network	User
UR-20	As a user I should be able to set the threshold value of the sensor in the settings	User
UR-21	As a user, I should be able to reset the sensor configuration to default settings	User
UR-22	As a user I should be able to raise complaints about a sensor and request for maintenance	User
UR-23	As an admin/user, I should be able to login in to the app so that I can access the application	User
UR-24	As a user I should be able to reset the password	User

Business Requirement

Business Requirement			
ID	**Requirement**	**Topic Area**	**User**
BR-01	Must be implemented in Java, Qt, QML or C++	Implementation	-

Functional Requirement

Functional Requirement		
ID	Requirement	Topic Area
FR-01	Password based authentication	Authentication

FR-02	Users must be able to reset the password	Authentication
FR-03	Timestamp of every actions made w.r.t sensors must be logged	Timestamp

Non-Functional Requirement

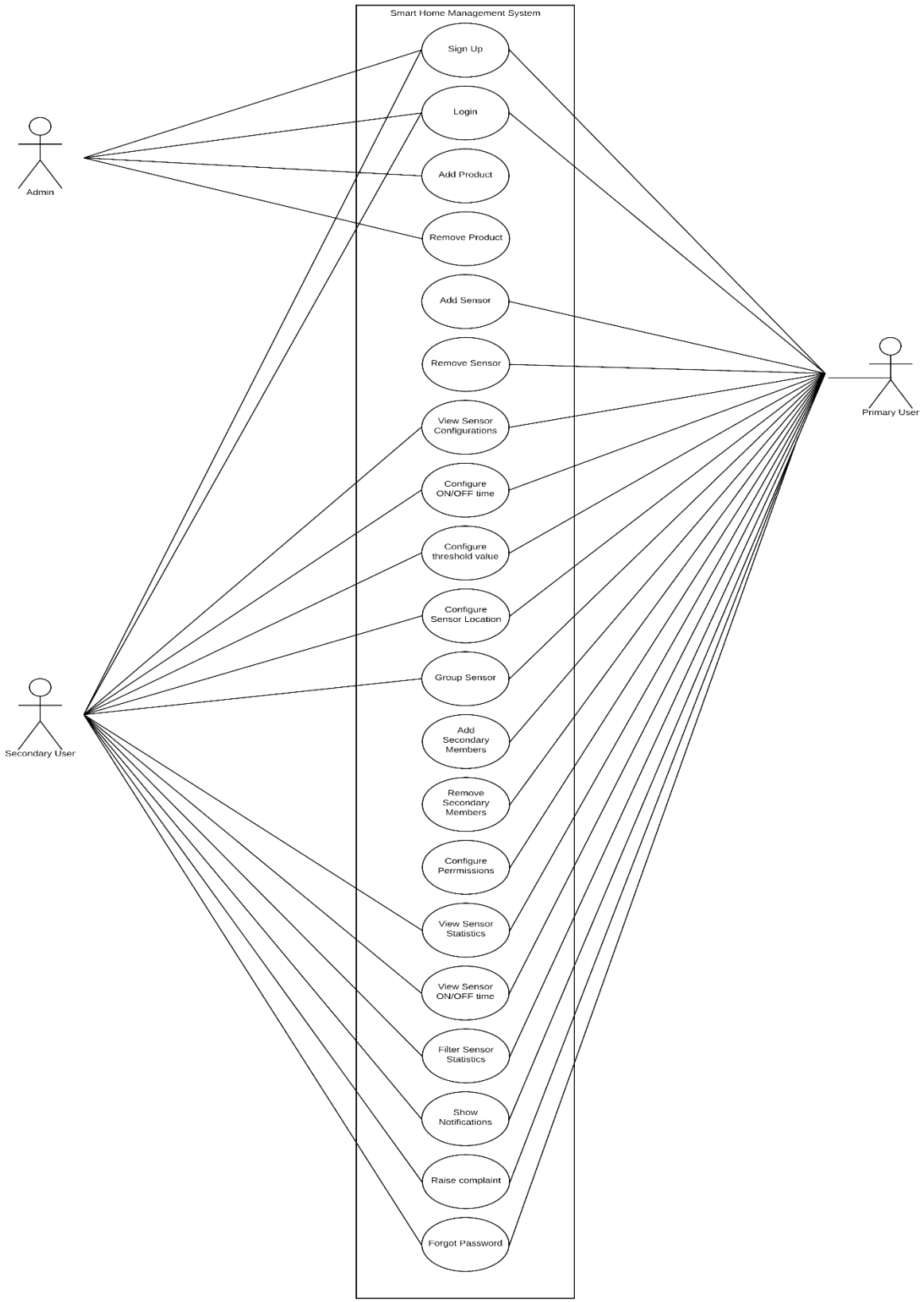
Non-Functional Requirement		
ID	Requirement	Topic Area
NFR-01	System should run 24*7	Performance
NFR-02	The password must be hashed	Security
NFR-03	Weekly backup of the statistics must be made	Reliability
NFR-04	Quick notifications on sensor going beyond threshold	Performance

Use Case Diagram

Actors

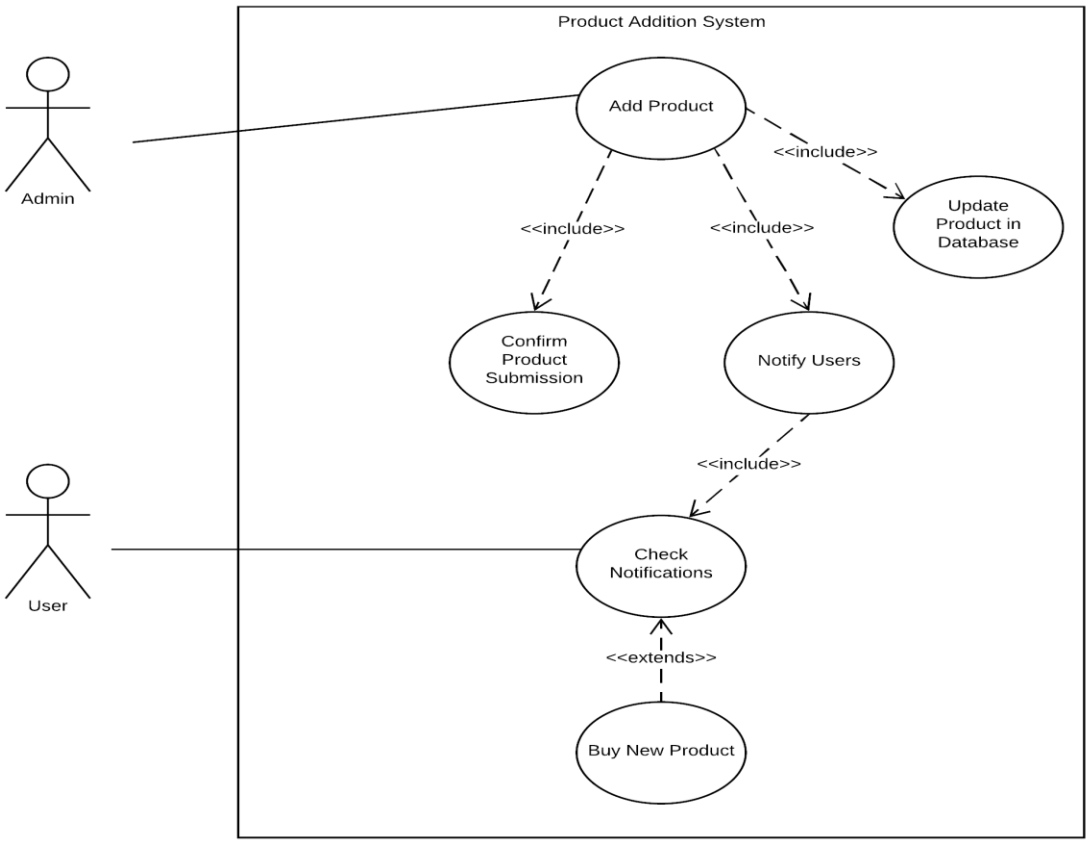
Admin, Primary User, Secondary User

Use Case Diagram

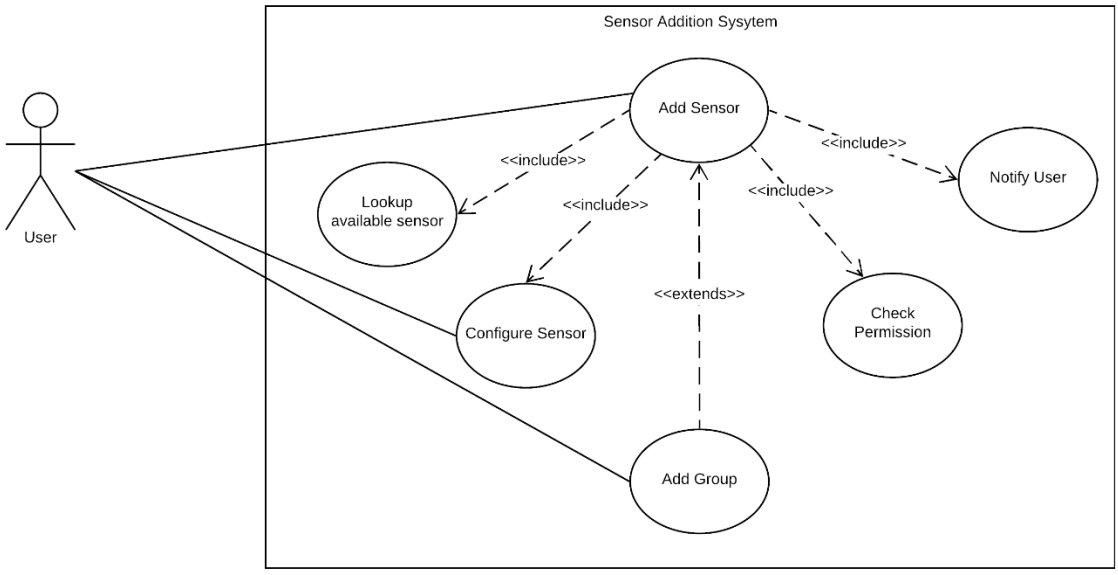


Sub Diagrams:

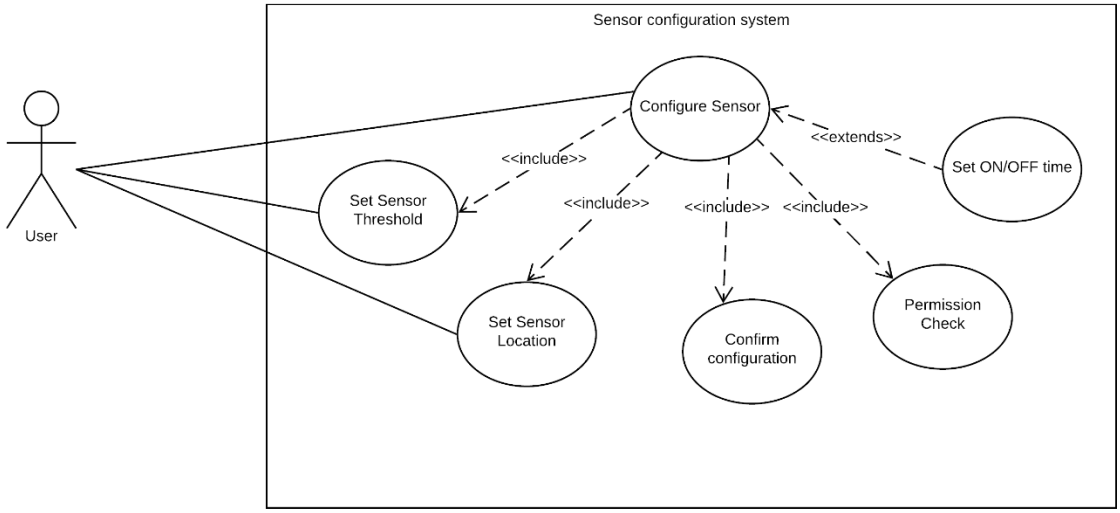
Sub-diagram for adding a new Product by Admin (Use Case ID: UR-02)



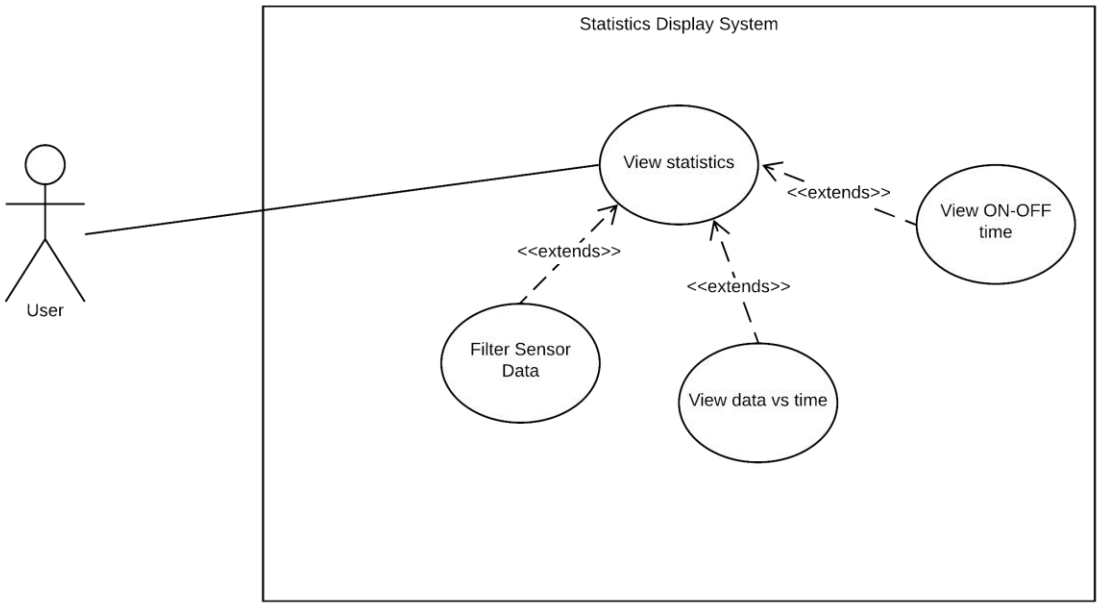
Sub-diagram to add a sensor to the home network by the primary user (Use Case ID: UR-08)



Sub-diagram for configuring the sensor (Use case ID: UR-10)



Sub-diagram to display statistics (Use Case ID: UR-13)



Use Case Documentation

Adding a sensor to the network

Use case description for adding a new sensor is given below:

Use Case ID:	**UR-08**
Use Case Name:	Add Sensor
Description:	Add new sensor to the home network by the user from the Product List.

Actors:	**Primary User**		
Pre Conditions:	User must be logged into the system		
Post Conditions:	Sensor added into the Home Network		
Frequency of Use:	Whenever user wants to add a sensor into the Home Network		
Flow of events:		**Actor Action**	**System Response**
	1.	Click on Add Sensor button	List of products in the Product List is displayed
	2.	Select the sensor name from the list and confirm selection	Check if sensor already exists. If yes, Display error else ask to enter the location
	3.	Enter the location of the sensor	Ask for Threshold value
	4.	Enter the threshold value	Add the sensor into the Home Network and newly added sensor is displayed in the sensor list along with other sensors. Also notify user.
Variations:	No variations, the process should follow the same flow of events		
Exceptions:	If the sensor already exists in the list		
Developer Notes:	There might be different sensors of same type but each sensor has a unique number as its identity		

Adding a sensor to the group

Use case description for adding a sensor to a group of sensors is given below:

Use Case ID:	**UR-16**
Use Case Name:	Group Sensor
Description:	The user can categorize the sensors in the Home Network into different categories

Actors:	**Primary User/ Secondary User**		
Pre Conditions:	There are sensors available in the sensor list and there are categories under which the sensors can be grouped		
Post Conditions:	The sensors are grouped under desired category		
Frequency of Use:	Whenever the user wants to categorize		
Flow of events:		**Actor Action**	**System Response**
	1.	From the home screen, the user selects “Group Sensors” from the dropdown	Takes to the page with one Radio Button for each group
	2.	Select one of the Radio Button and confirm the selection	Takes to the page with all the sensors listed in the Home Network
	3.	Tick the checkbox of the sensors to be added into the Group and confirm selection	The sensors are added under the desired group
	4.		Display a page with all groups and sensors within each group
Variations:	If sensors are already present in another group, they are removed from that group and added into the new group		
Exceptions:	1. If there are no sensors in the list, notify error to the user 2. If the user cancels while grouping the sensor, no changes done and the user is taken back to the home screen		
Developer Notes:	When a new group is created a different use case will be followed		

Configuring a sensor in the network

Use case description for configuring a sensor is given below:

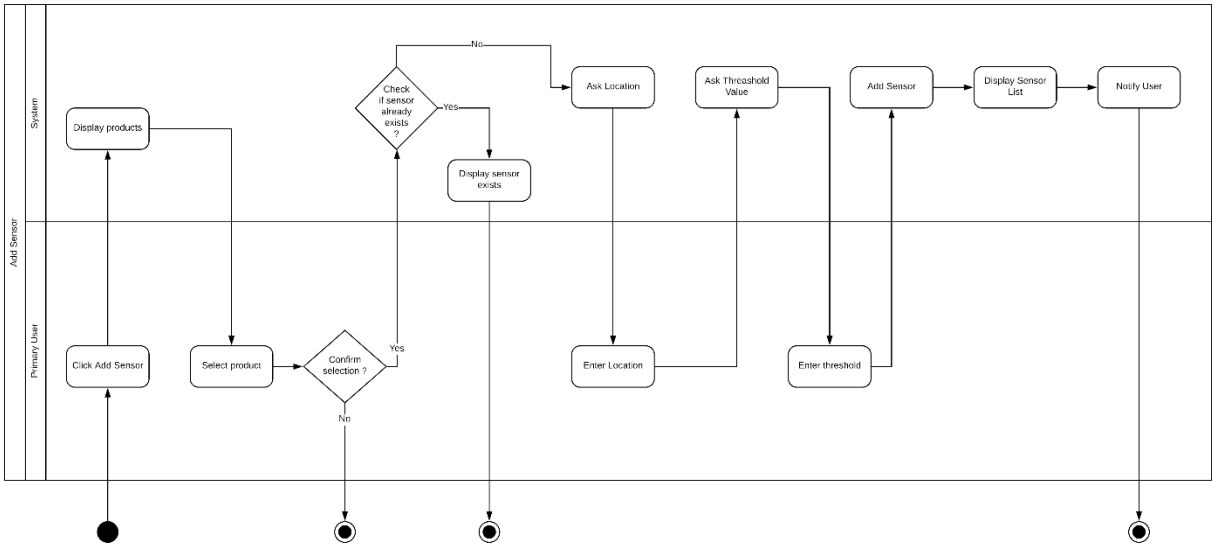
Use Case ID:	**UR-10**
Use Case Name:	Configure Sensor
Description:	As a user, I should be able to view and configure the settings for each sensor in the Home Sensor Network (e.g., ON/OFF, Threshold Value, Sensor Location, IP address of sensor etc.)

Actors:	**Primary User / Secondary User**		
Pre Conditions:	Primary User/ Secondary User must be logged into the system		
Post Conditions:	Sensor must be configured successfully		
Frequency of Use:	Whenever user wants to configure the sensor		
Flow of events:		**Actor Action**	**System Response**
	1.	Click on the sensor to be configured	Show the current settings of the sensor
	2.	Click on configure sensor	Check if the user is permitted to configure and display a page to configure
	3.	Change the sensor settings such as threshold, location and click submit	Check the validity of the fields and save the changes and display the new sensor configurations to the user and notify user
Variations:	If the user does not have permissions, an error message should be shown		
Exceptions:	If the user is not permitted to configure the sensor		
Developer Notes:	Check the other use cases for details about the options for location settings		

Activity Diagram

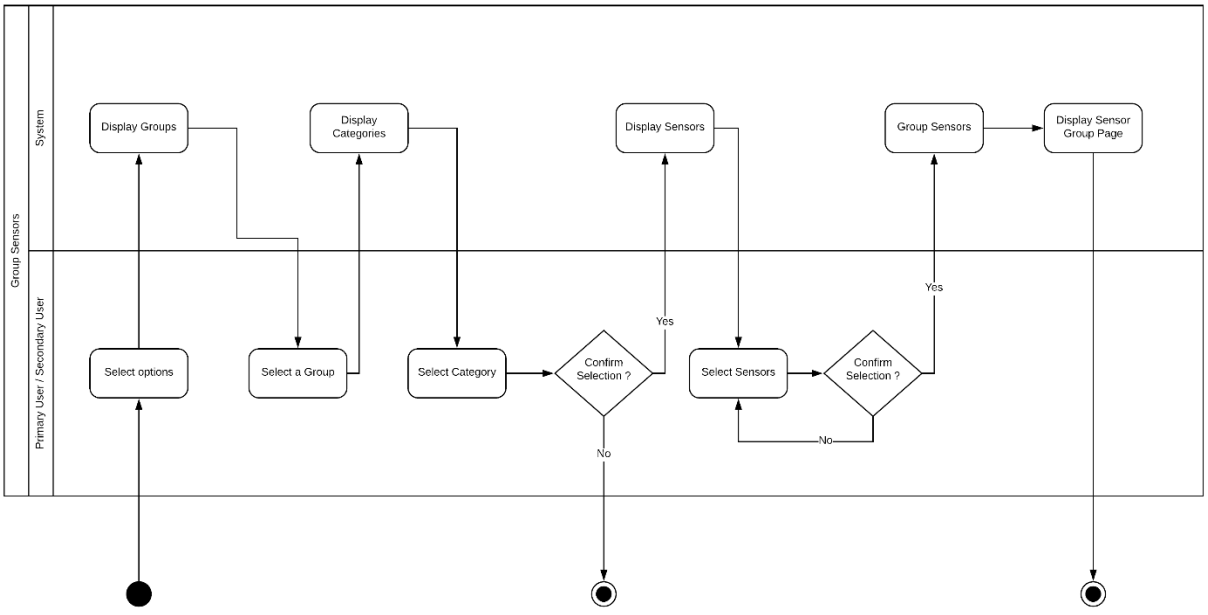
Adding a sensor to the network

Use Case Name: Add Sensor [Use Case ID #UR-08]
Description: Add new sensor to the home network by the user from the Product List.



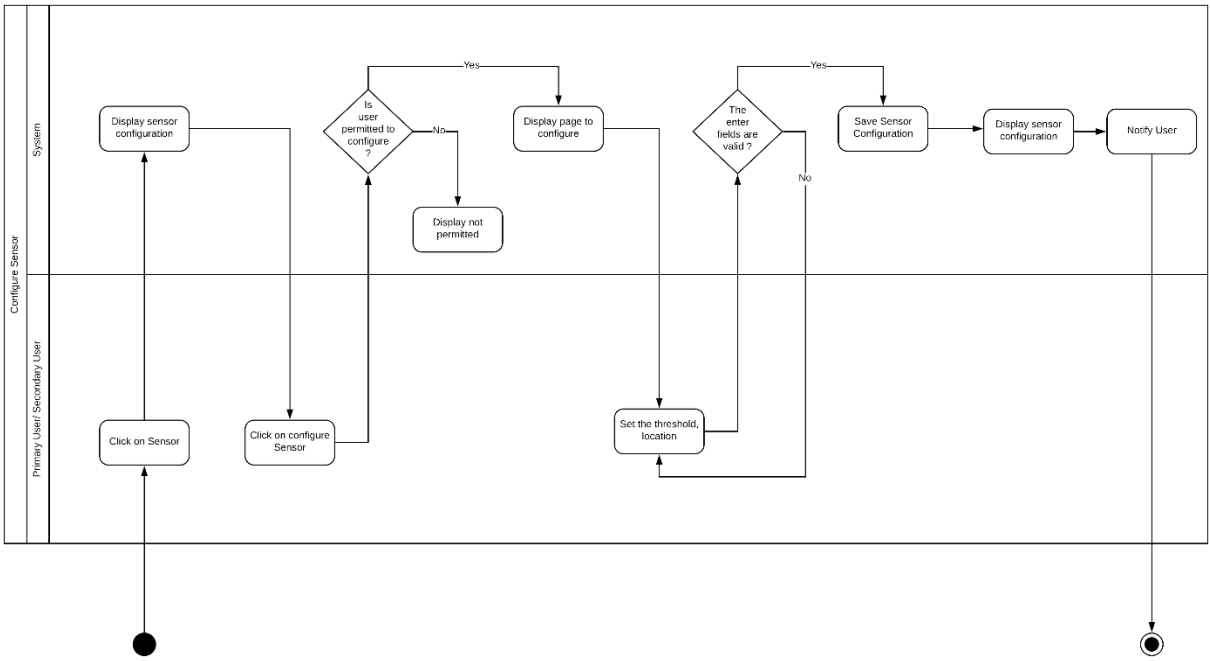
Adding a sensor to the group

Use Case Name: Group Sensor [Use Case ID #UR-16]
Description: The user can categorize the sensors in the Home Network into different categories



Configuring a sensor in the network

Use Case Name: Configure Sensor [Use Case ID #UR-10]
Description: As a user, I should be able to view and configure the settings for each sensor in the Home Sensor Network (e.g., ON/OFF, Threshold Value, Sensor Location, IP address of sensor etc.)



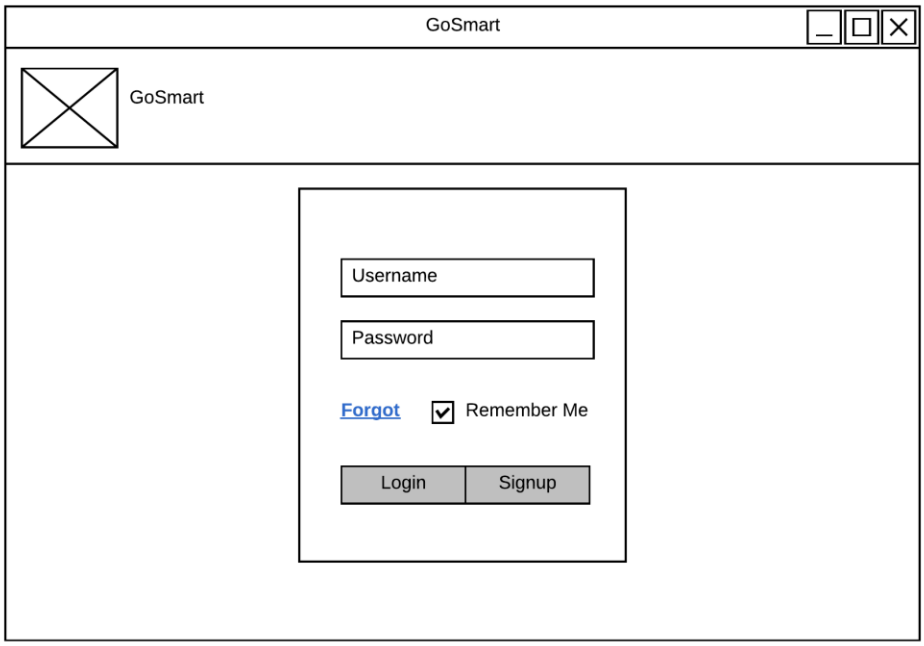
Data Storage

The database for all the sensors and the system data will be maintained in the host system, as we are mocking the application as a desktop application. A web application would give the system an impressive look but as we are focusing on object-oriented techniques, we would try and make it as a web app, if time permits. So the database will be maintained in the same system in which the app runs.

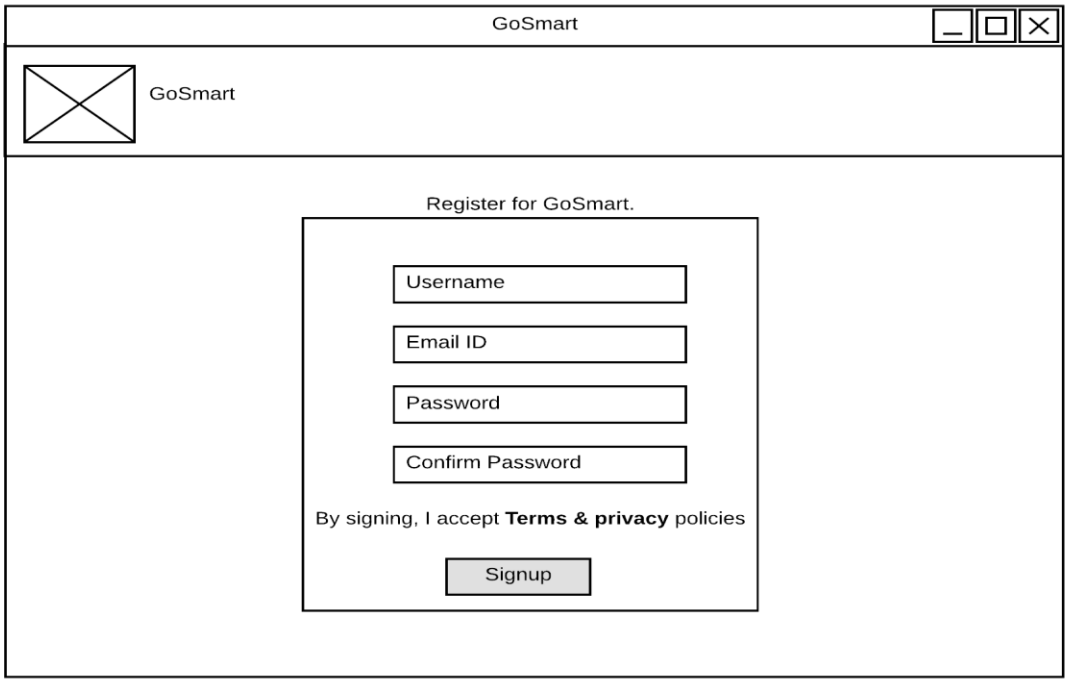
UI Mockups

The UI screens for different use cases are shown in this section.

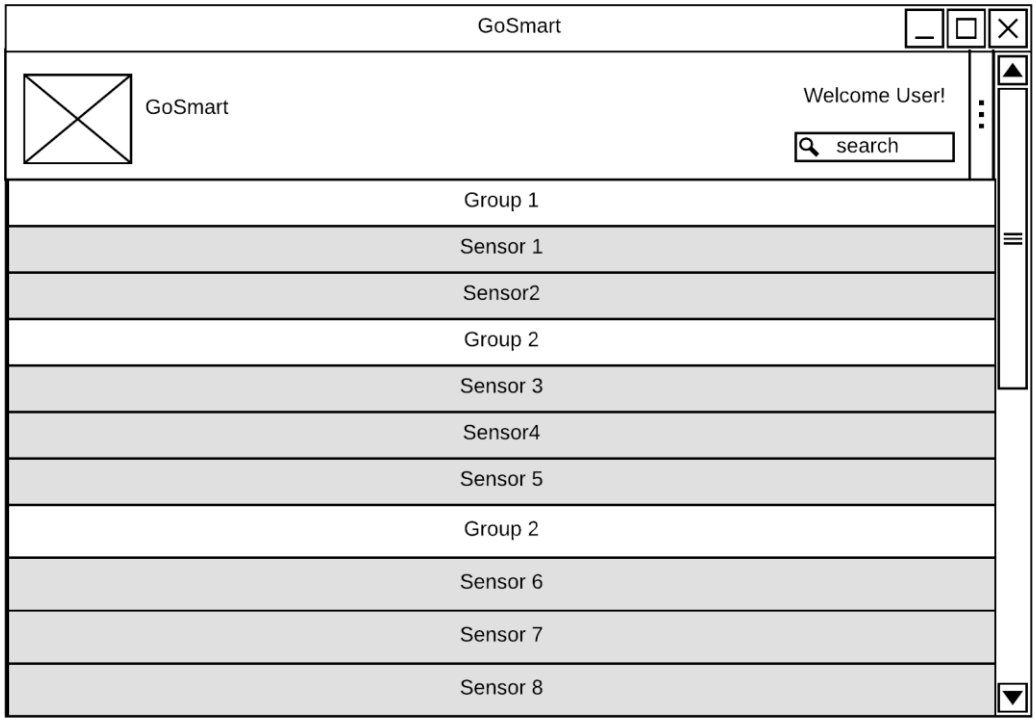
Sign Up/ Login Page:



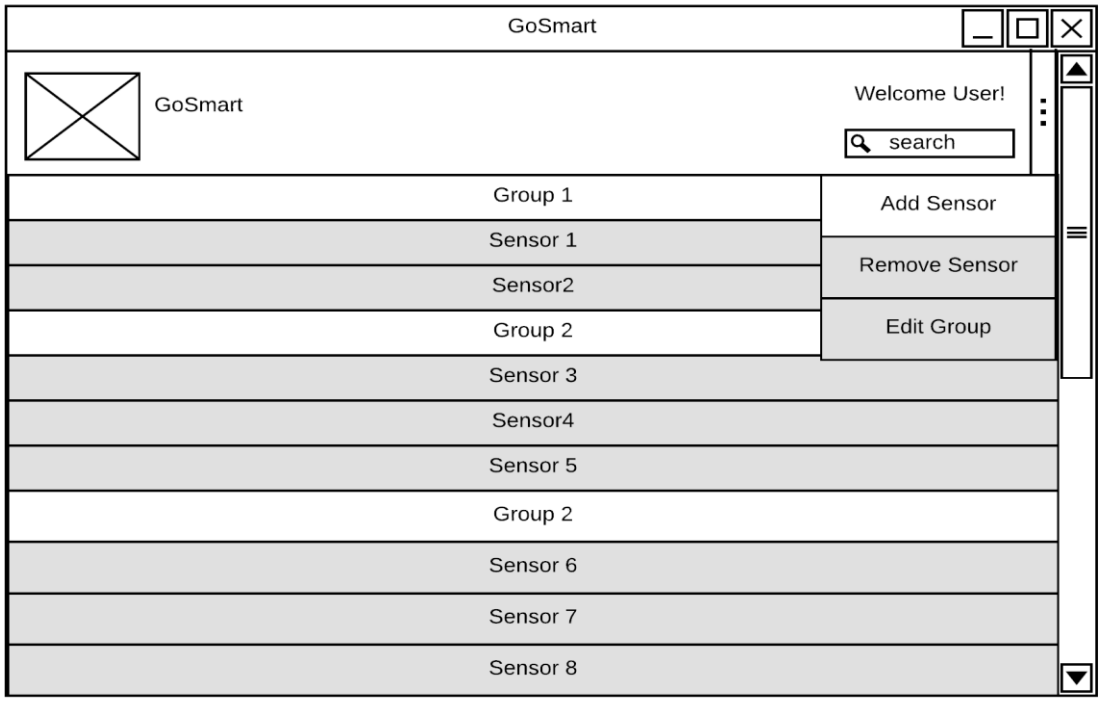
Sign Up



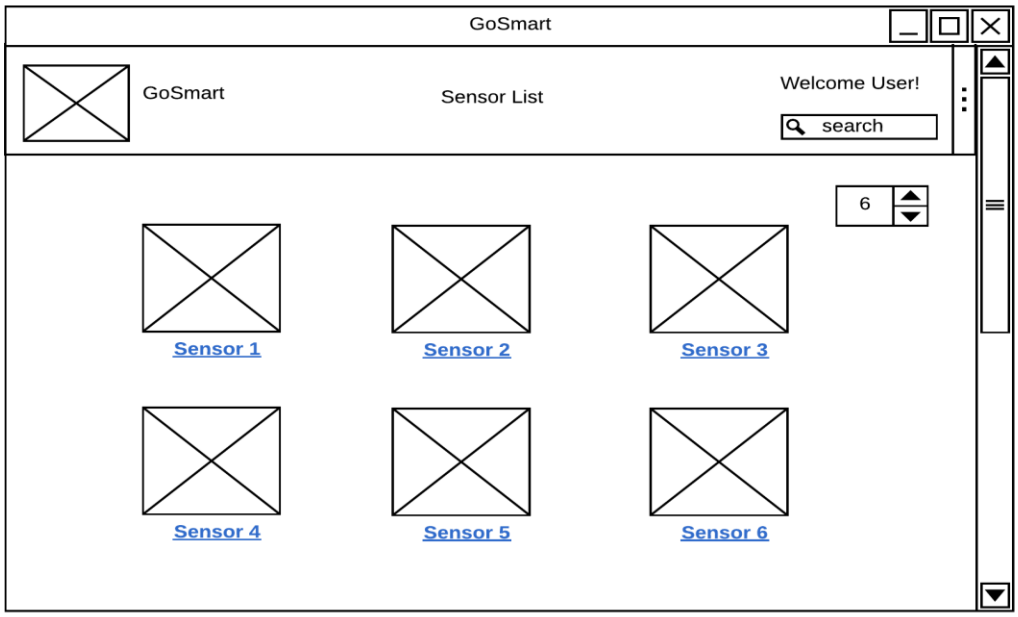
Group Sensor



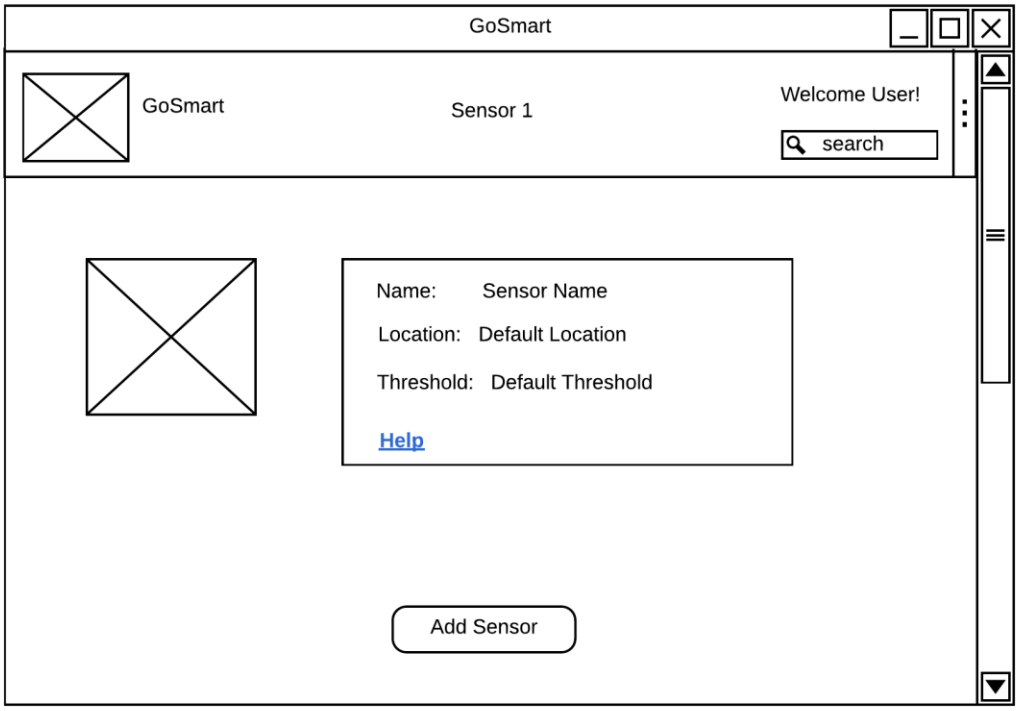
Home Screen options



Sensor List



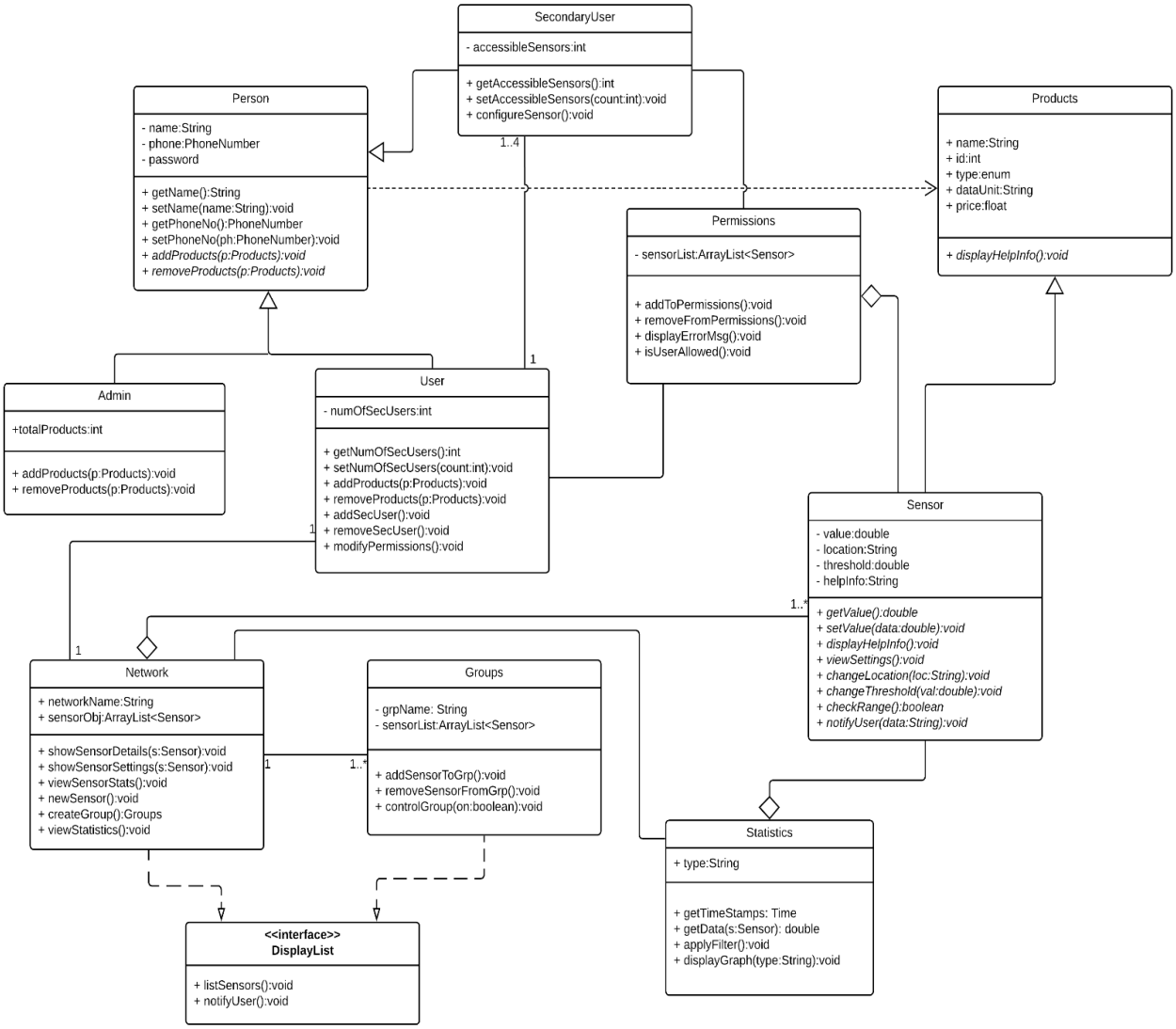
Individual Sensor



Class Diagram

The class diagram of the system is shown below. The system consists of the following classes,

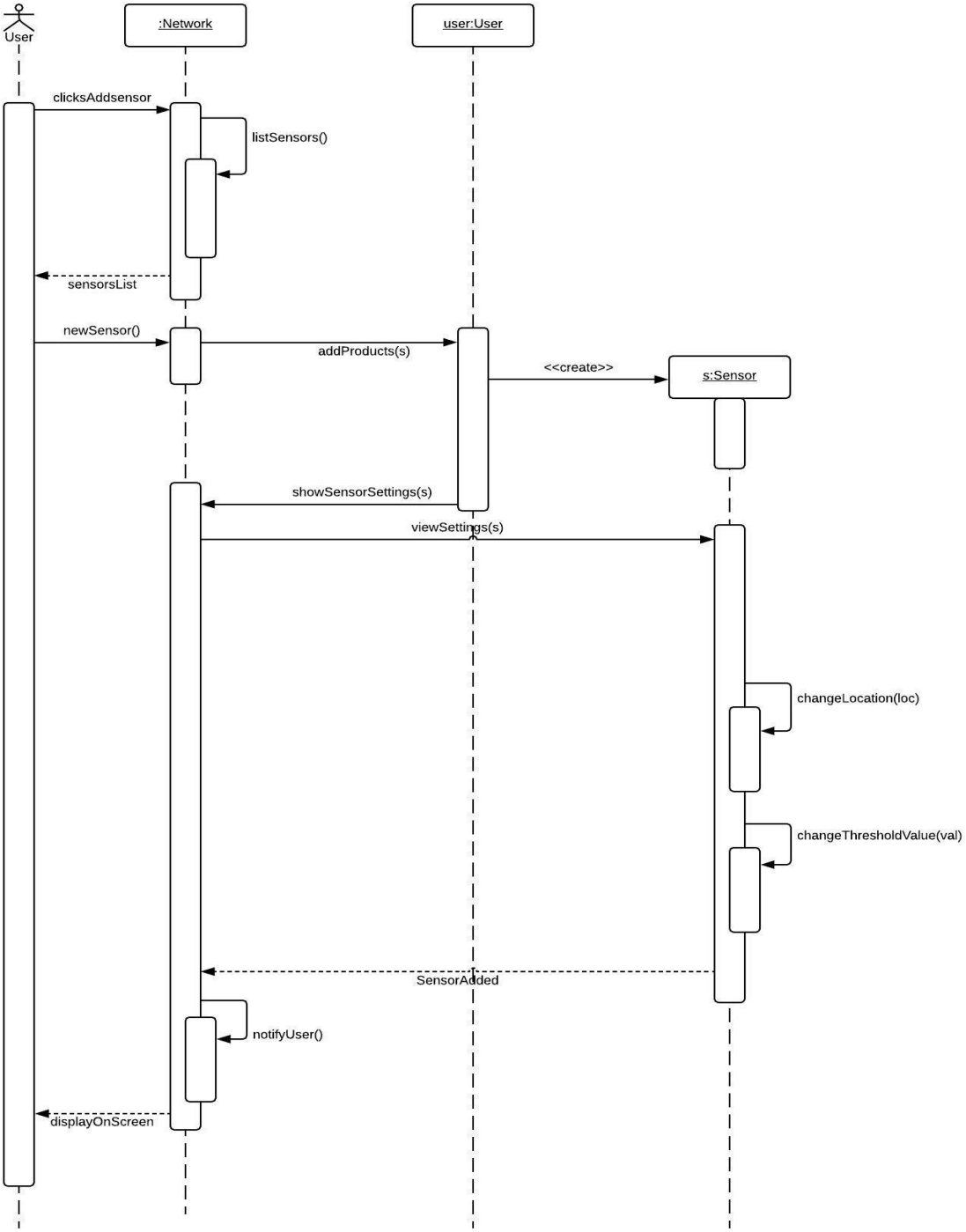
- Person
- Admin
- User
- SecondaryUser
- Permissions
- Products
- Sensor
- Network
- Groups
- Statistics



Sequence Diagram

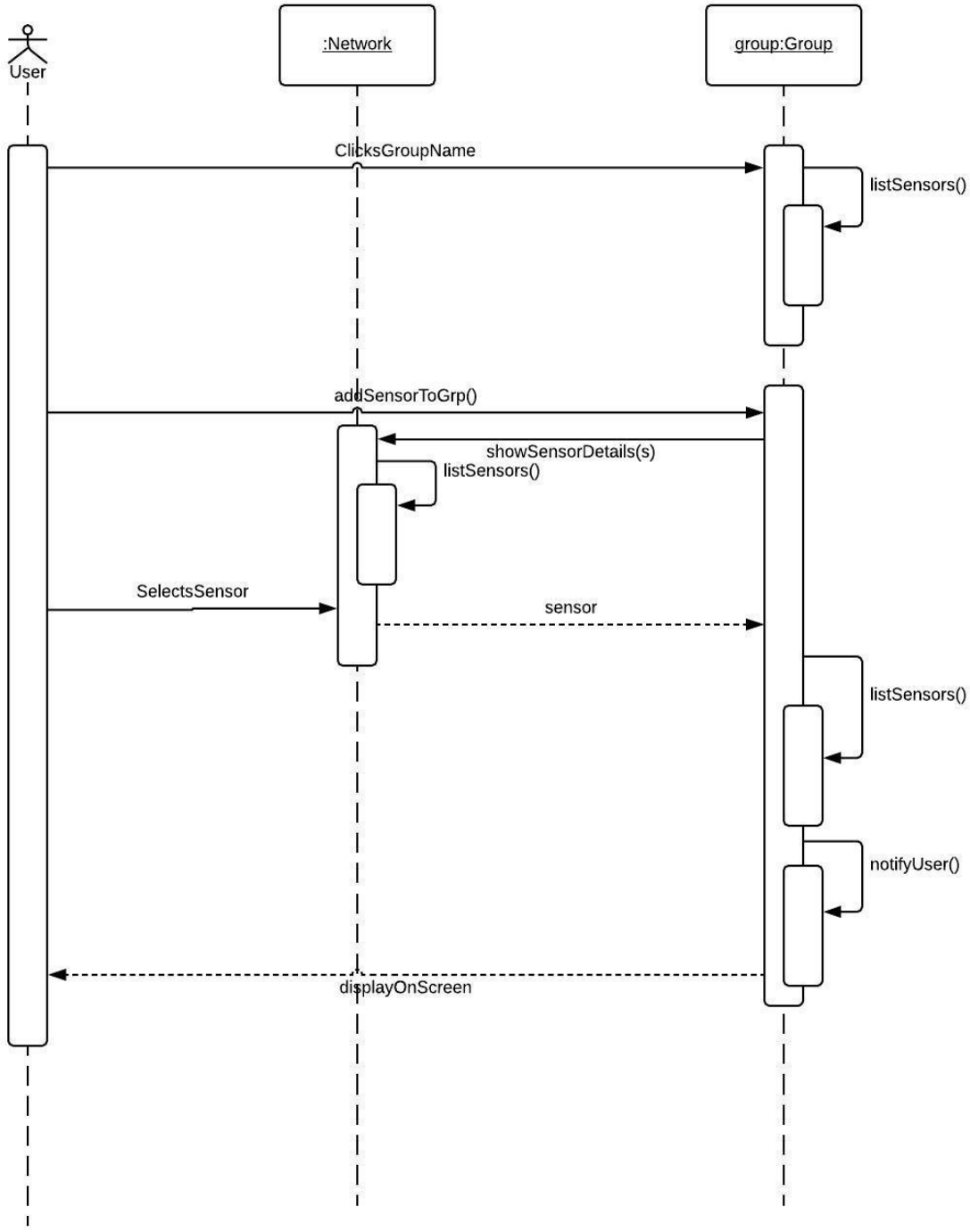
Adding a sensor to the network

Use Case Name: Add Sensor [Use Case ID #UR-08]
Description: Add new sensor to the home network by the user from the Product List.



Adding a sensor to the group

Use Case Name: Group Sensor [Use Case ID #UR-16]
Description: The user can categorize the sensors in the Home Network into different categories



Configuring a sensor in the network

Use Case Name: Configure Sensor [Use Case ID #UR-10]
Description: As a user, I should be able to view and configure the settings for each sensor in the Home Sensor Network (e.g., ON/OFF, Threshold Value, Sensor Location, IP address of sensor etc.)