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Florida International University
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Biosensor

Final Document

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Abstract

In this document, we present the Biosensor application which is developed to help the doctors to monitor their patients closely. The iOS app gets the readings from different sensors like heart rate and temperature, display that live data on the iOS application in different forms. It also sends the data to the cloud where it is stored for different purposes like generating reports and analyzing patient's health. In this document, we include the detailed description of all the user stories implemented and the ones which are pending, the software and hardware resources needed, system design and validation techniques.

Table Of Content

INTRODUCTION

People with heart issues and other such problems have to be monitored very carefully and continuously by their doctors. They have to visit the doctor on regular basis and still there is a chance that doctor might not get some of the information. So our idea was to develop a mobile application that would use different sensors like heart rate, alcohol, humidity and temperature and after applying different algorithms on that raw data, it would show some results. Not only that, it would also send that data collected from sensor to the AWS cloud where it is stored. We have a web interface of that cloud where the doctor can see all the reading about the patient and do the analysis.

Current System

There is a mobile app provided by the Sensortag manufacturer which connects to any Bluetooth sensor and shows its raw data on the app. There are some major limitations that is why we had to develop our own application such as:

- Only shows raw data
- Is not user friendly
- Is not customizable

Purpose of New System

Since the current system cannot be customized, we had to develop our own system where we could read the data from sensors and manipulate it the way we want it. The main user of the app is the patient who can see his/her data and act accordingly. On the other hand, the website will be used by doctors or technical staff who would be able to monitor the patient and generate the reports if they want.

USER STORIES

The following section provides the detailed user stories that were implemented in this iteration of the Biosensor project. These user stories served as the basis for the implementation of the project's features. This section also shows the user stories that are to be considered for future development.

Implemented User Stories

1. User Story #126 Read data from sensortag device
2. User Story #127 Display sensor data on the app
3. User Story #132 Setting up the AWS cloud
4. User Story #140 Download patient data from website
5. User Story #147 Monitor patient data on the website
6. User Story #150 Design a profile page in iOS app
7. User Story #153 Design a Login page in iOS app
8. User Story #156 Make a Homepage in iOS app
9. User Story #158 Design an UI for iPhone 5
10. User Story #159 Connect and read data from new sensor (made by our team)
11. User Story #160 Implement Login Feature
12. User Story #161 Convert hexadecimal data from new sensor to decimal form
13. User Story #165 Register for the system
14. User Story #166 Login to the system
15. User Story #167 Logout of the system
16. User Story #168 View a patient's heart rate data in a chronological line graph
17. User Story #169 View a patient's temperature data in a chronological line graph
18. User Story #170 View a patient's blood pressure in a chronological line graph
19. User Story #172 List all the patients
20. User Story #173 Search for patient
21. User Story #174 View a patient's profile

Pending User Stories

There were some other things that we planned to do but could not complete due to time limit and resources.

1. User Story #144 Email .csv file from iOS app
2. User Story #146 Add sensor control feature in iOS app
3. User Story #152 Make a Line graph in the iOS app
4. User Story #171 Add/Delete patients

PROJECT PLAN

This section describes the planning that went into the realization of this project. This project incorporated the agile development techniques and as such required the sprints to be planned. These sprint plannings are detailed in the section. This section also describes the components, both software and hardware, chosen for this project.

Hardware and Software Resources

The following is a list of all hardware and software resources that were used in this project:

Software Resources

- Xcode version 8.1
- MacOS 10.12.1

Hardware Resources

- MacBook
- Iphone 5

Sprints Plan

Sprint 1

In the first sprint of the project phase we focused at research about the project and learning the iOS development and swift language because we had no experience in the iOS development.

Sprint 2

In this sprint we actually started the implementation. We worked on the following items:

1. Database schema
2. Mockup design for iOS app
3. Setting up the AWS (Amazon Web Service) cloud
4. Reading sensor data and sending it to cloud
5. Monitor patient data on website

Sprint 3

1. User Story #**127** Display Data In the iOS App home page

   - As a User, I would want to see the live data that is collected from sensor to be shown on the iOS app
   - App has some basic interface by now

   Acceptance Criteria

   - The app should connect the sensor successfully and get the data from the sensor
   - The data should be displayed on the appropriate data tag

   Use Case # 1 Detect the sensor device
   Use Case # 2 Connect to the sensor device
   Use Case # 3 Get data from sensor
   Use Case # 4 Display data on the app home page

2. User Story #**140** Download the user data from website for that particular time period

- As a doctor I would like to download a patient's data so that I am able to put the data into a healthy report or use the data to do some advanced analysis.

Acceptance Criteria:

- A specific period of data could be selected
- The selected data will be exported to a .xls file
- The data will be downloaded automatically

3. User Story #**126** Read data appropriately from sensor SensorTag CC 2650

As a user, I want to connect to the sensor, so that I can get the data and signal strength (RSSI) from sensor and input data to AWS cloud database per 15 seconds.

Acceptance Criteria:

- my application can run on the IOS device
- The ios device successfully connect to TI CC SensorTag 2650 via BLE(turn on Bluetooth module on the device)
- The ios device successfully read data and signal strength(RSSI) from SensorTag CC 2650
- The ios device successfully input data to AWS cloud database per 15 seconds.

Use Case #1– Connect to the sensor

Use case name	**Connect to the sensor**
Actors	**Administrator**
ID	**UC_001**

Conditions	As an user I would like to connect to sensor SensorTag CC 2650
Flow of Events	1. Run my application run on the IOS device 2. turn on Bluetooth module on the IOS device 3. Push the power button on the SensorTag CC 2650 4. The ios device successfully connect to CC 2650 automatically

Use Case #2 _ Read data and RSSI from Sensor

Use case name	**Reading data and RSSI from Sensor**
Actors	**Administrator**
ID	**UC_002**
Conditions	As an user I would like to read data from the sensor appropriately with correct data tag As an user I would like to see the signal strength of the sensor after the sensor connected so that I could see if the signal is strong or weak
Flow of Events	**Data and RSSI can be displayed on the IOS app automatically.**

Use Case #3 _ input data to AWS cloud database

Use case name	**Input data to AWS cloud database**

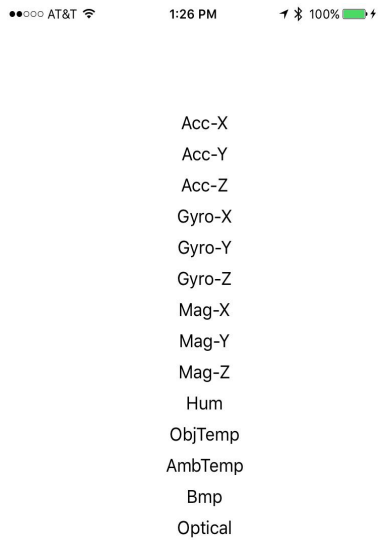
Actors	**Administrator**
ID	**UC_003**
Conditions	As an user I would like to input data to AWS cloud database per 15 seconds
Flow of Events	**1. Send request to AWS server** **2. Receive response from AWS server** **3. Connect to the AWS server** **4. Begin to input data to AWS server per 15 seconds.**

Visual User Guide

Connect to sensor:

Read data:

Input data:



54.70.11.186:8080/BioSensingWeb/showdata.jsp

```
UserID TimeStamp ACC-X Acc-Y Acc-Z Gyro-X Gyro-Y Gyro-Z Mag-X Mag-Y Mag-Z Hum ObjTemp AmbTemp Bmp Optical
00002 09262016100932001 0.03662109 0.008666992 0.5089111 -3.572519 4.427481 -2.267176 -17 2 645 39.48975 21.3125 28.21875 1016.95 592.96
00001 09262016100932001 0.03662109 0.008666992 0.5089111 -3.572519 4.427481 -2.267176 -17 2 645 39.48975 21.3125 28.21875 1016.95 592.96
00001 100520162142450 0.04138184 0.04821777 0.4949951 -3.656489 3.961832 -3.267176 -41 312 583 73.53516 21.9375 28.59375 1010.16 26.43
00001 100520162143001 0.04772949 0.03259277 0.5015869 -5.832061 5.305344 -1.801527 -40 322 573 73.47412 22.125 28.65625 1010.18 25.79
00001 100520162143152 0.0369873 0.005249023 0.4914551 -7.748092 1.465649 -1.48855 -38 316 583 73.27881 22.4375 28.6875 1010.16 26.43
00001 100520162143303 0.04931641 0.001586914 0.5068359 -2.129771 5.687023 -0.1755725 -41 312 583 72.89429 22.3125 28.71875 1010.15 26.83
00001 100520162143454 0.05004883 -0.0007324219 0.4848633 0.2442748 7.984733 -2.21374 -43 316 574 72.40601 22.28125 28.71875 1010.15 26.76
00001 100520162144005 0.05163574 0.02075195 0.5024414 -6.709924 4.396946 -2.068702 -40 313 582 72.30835 22.5625 28.75 1010.19 26.68
00001 100520162144510 0.04943848 0.01379395 0.5067139 -4.38168 5.450382 -0.3664122 -44 315 589 72.21069 22.34375 28.71875 1010.13 25.31
00001 100520162145061 0.07141113 0.02209473 0.5081787 -4.541985 3.89313 -2.442748 -40 322 577 72.01538 22.5625 28.71875 1010.15 25.47
00001 100520162145212 0.04101562 -0.002685547 0.4958496 -2.603053 4.175572 -2.969466 -44 320 582 72.11304 22.40625 28.75 1010.15 25.23
00001 100520162145363 0.0526123 0.02441406 0.5081787 -7.870229 3 -2.564885 -38 319 592 72.11304 22.71875 28.75 1010.18 25.31
00001 100520162145514 0.03295898 0.009277344 0.5062256 -3.412214 6.824428 -2.80916 -42 315 587 72.11304 22.875 28.78125 1010.19 25.23
00001 101120161827300 -0.06774902 -0.2038574 0.4771729 -33.72519 32.56488 10.25191 -383 352 453 54.82178 18.46875 26.78125 1016.81 476.64
00001 101120161827451 -0.1212158 0.02062988 0.4805908 2.122137 5.900764 0.5877863 -421 402 304 54.85229 20.53125 26.84375 1016.88 527.04
00001 101120161828002 0.05187988 -0.4666748 -0.004882812 23.22137 -0.8015267 -9.290076 -90 627 323 54.85229 21.03125 26.90625 1016.9 15.29
00001 101120161828153 -0.1429443 0.3963623 -0.4451904 17.86259 -144.2061 -54.43512 -361 126 -245 54.85229 27.6875 27 1016.85 5.39
00001 101120161828304 0.1427002 0.2827148 0.3851318 76.24428 65.68702 -17.82443 -16 303 751 54.85229 19.78125 27.0625 1016.9 334.88
00001 101120161828455 0.4372559 0.3662109 -0.15625 -23.9542 6.679389 -2.129771 -505 234 225 54.85229 15.84375 27.15625 1016.88 27.56
00001 101120161914560 -0.008178711 0.0333252 0.4941406 -6.610687 2.740458 -3.328244 -162 407 528 42.8772 23.875 32.65625 1016.77 178.72
```

4. User Story #**172** List all the patients

- As a doctor I would like to be able to list all my patients so that I can view all my patients and select to view a patient's information in details from the list.

Acceptance Criteria:

- All the patients in the doctor's catalog could be listed on the webpage

Sprint 4

1. User Story #**150** Show profile page

   As a User, I want to have a profile page so that i can see my information like name, phone no, email address etc.

   Acceptance Criteria:

   - It should have a profile picture
   - It should display information about the user
   - It should have a logout button

   Usecase # 1 Turn on the sensor device
   Usecase # 2 Open the application
   Usecase # 3 Login with correct username and password
   Usecase # 4 Click on the profile icon at the bottom
   Usecase # 5 Profile page will be displayed with the user information

2. User Story #**156** Show Home page
   - As a User, I want to see a good and interactive Home page so I would be pleased to use the app

   Acceptance Criteria:

   - There should be some circular progress bars on the homepage and each of them will show a reading for a separate sensor. For example temperature, pressure, humidity etc
   - There should be details button with every circular progress which will take the user to details page

Use Case # 1 Turn on the sensor
Use Case # 2 Open the application
Use Case # 3 Detect the sensor
Use Case # 4 Connect to the sensor device
Use Case # 5 Get data from sensor
Use Case # 6 Display data on the app home page

3. User Story #1**73** Search for a patient

- As a doctor I would like to be able to search for a patient so that I can locate a specific patient quickly.

Acceptance Criteria:

- The doctor is provided a list of patients that match the searching criteria
- The doctor can click on a patient to view the detail information
- The item on the list will show basic information of patients

4. User Story #**174** View a patient's profile

- As a doctor I would like to be able to view a patient's profile so that I can know the patient's information and consider it to treatment strategies.

Acceptance Criteria:

- The doctor is provided a page contains a selected patient's profile

Sprint 5

1. User Story #**158** Design interface for iphone 5 screen

   As a developer, I want the app to be able to run on iPhone 5 as well so that customers don't need to buy iPhone 6 or other latest phones to run the app.

   Acceptance Criteria:

   - No item on home page should be hidden or overlapped.
   - Profile page should display every item properly
   - Items on all the screens should be properly displayed

   Usecase # 1 Turn on the sensor device
   Usecase # 2 Turn on the bluetooth
   Usecase # 3 Open the application
   Usecase # 4 Login with correct username and password
   Usecase # 5 Show the Homepage
   Usecase # 6 Click on Profile button

2. User Story #**159** Read data from sensor device nrf 51822

   As a user, I want to connect to the sensor, so that I can get the data from sensor.
   Acceptance Criteria:

   - my application can run on the IOS device
   - The ios device successfully connect to sensor rf 51822 via BLE(turn on Bluetooth module on the device)

- The ios device successfully read data from sensor nrf 51822

Use Case #1– Connect to the sensor

Use case name	**Connect to the sensor**
Actors	**Administrator**
ID	**UC_001**
Conditions	As an user I would like to connect to sensor nrf 51822
Flow of Events	1. Run my application run on the IOS device 2. turn on Bluetooth module on the IOS device 3. Push the power button on the sensor nrf 51822 4. The ios device successfully connect to sensor nrf 51822 automatically

Use Case #2 _ Read data from Sensor

Use case name	**Reading data from Sensor**
Actors	**Administrator**

ID	**UC_002**
Conditions	As an user I would like to read data from the sensor appropriately with correct data tag
Flow of Events	**Data can be displayed on the IOS app automatically.**

3. User Story **#165** Register for the system
   - As a doctor I would like to be able to register for the system so that I am able to login to my account and access the system features

Acceptance Criteria:

- The user must enter valid information like username, password, confirms
- The password is encrypted.
- The user receives a successful message upon registering

4. User Story **#166** Log into the system
   - As a doctor I would like to be able to login to my account so that I can list all my patients and monitor their healthy status

Acceptance Criteria:

- The system notifies the user when he/she attempts to login with invalid Credentials
- The system validates the username with its corresponding password

- The user can only login once he/she has verified his/her account

5. User Story #167 Logout of the system

- As a doctor I want to be able to logout of the system so that I can keep my account security when I leave my work and log back to my account after I come back.
-

Sprint 6

1. User Story #**160** Login feature

As a user, I want to login to the application so that I have my personal account and profile data.

Acceptance Criteria:

- Open the application
- Type username and password
- Click on Login Button
- It should show error if the username or password is wrong
- If the username and password are correct, it should login and show homepage

UseCase # 1 Turn on the sensor device
UseCase # 2 Turn on the bluetooth
UseCase # 3 Open the application
UseCase # 4 Login with correct username and password
UseCase # 5 Data shown on homepage in decimal form

2. User Story #**161** Convert sensor data from Hexadecimal to Decimal

The raw data that is read from the sensor is in hexadecimal form and it should be converted to decimal form so that a User can see it properly in the iOS app.

Acceptance Criteria:

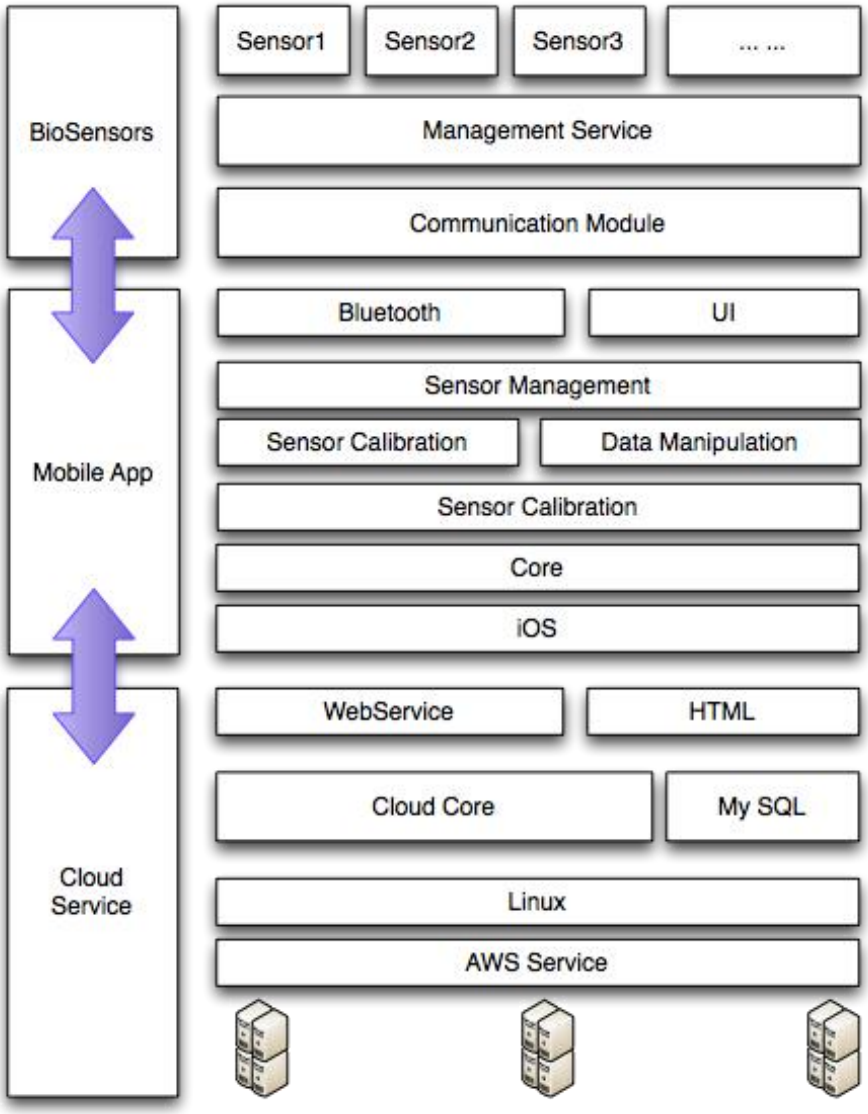
- Read the data from sensor
- Convert it to decimal
- Show that on the iOS app

UseCase # 1	Turn on the sensor device
UseCase # 2	Turn on the Bluetooth
UseCase # 3	Open the application
UseCase # 4	Login with correct username and password
UseCase # 5	Data shown on homepage in decimal form

SYSTEM DESIGN

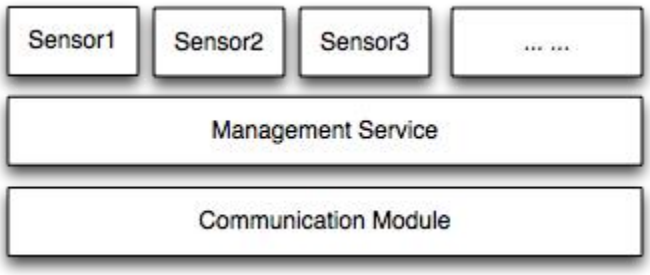
This section contains information on the design decisions that went into this project. The architecture patterns are outlined and explained. The entire system is shown in a package diagram and the subsystems are explained. Finally, the design patterns used in the project are discussed.

Architectural Patterns

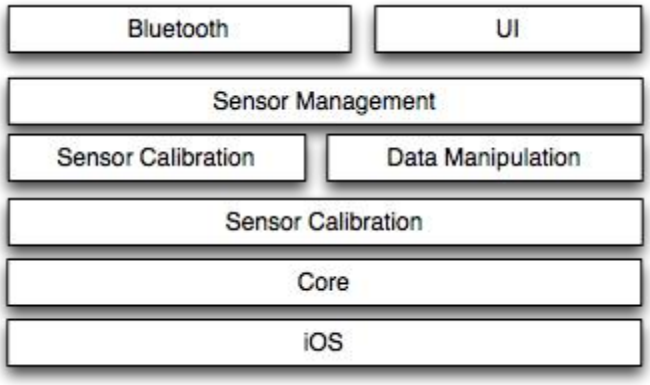

BioSensors
Sensor1
Sensor2
Sensor3
... ...
Management Service
Communication Module
Mobile App
Bluetooth
UI
Sensor Management
Sensor Calibration
Data Manipulation
Sensor Calibration
Core
iOS
Cloud Service
WebService
HTML
Cloud Core
My SQL
Linux
AWS Service

System and Subsystem Decomposition

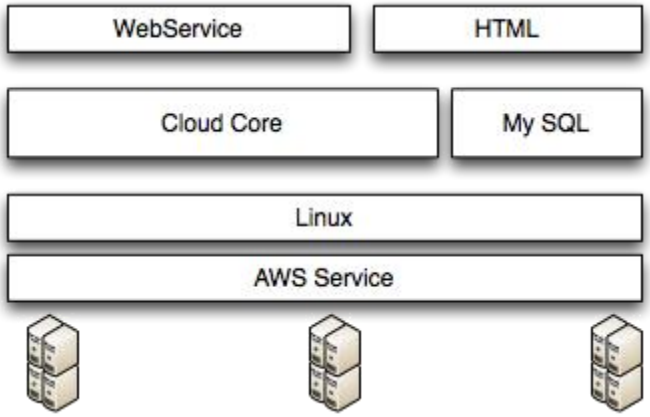
Biosensors Subsystem



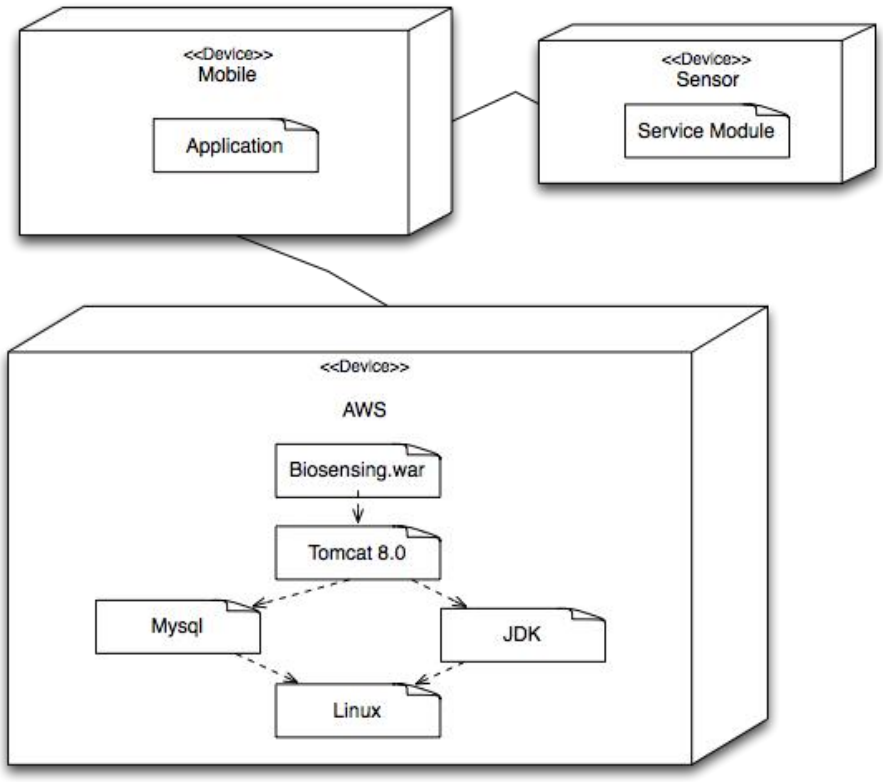
Mobile Application



Cloud Service Subsystem



Deployment Diagram



Design Patterns

The design patterns that we use in our system is singleton.

We decided to utilize the singleton pattern due to it allowing us to restrict the instantiations of our classes. For example, all of our models such as Patients, Search, View and Profile only exist as a single instance and are reused in several of our other classes such as View Profile, Add/Delete, and Download. This gives us the benefit of keeping our code clean and concise.

SYSTEM VALIDATION

- User Story #127
    - Subsystem testing

Test ID: 1	
Purpose:	Show data on the ios app home page
Preconditions:	IOS APP, sensor SensorTag CC 2650
Input:	1.Run the application on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Push the power button on the SensorTag CC 2650 4.Login with correct username and password
Expected Output:	1. The ios device successfully connect to CC 2650 automatically 2. Home page will appear 3. Data will be shown on the home page

- **User Story #126**
    - Subsystem testing

Test ID: U-270-1	
Purpose:	read data appropriately from sensor SensorTag CC 2650
Preconditions:	IOS APP, sensor SensorTag CC 2650
Input:	1.Run my application run on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Push the power button on the SensorTag CC 2650
Expected Output:	1. The ios device successfully connect to CC 2650 automatically 2. Data and RSSI can be displayed on the IOS app automatically 3. input data to AWS server per 15 seconds

- System testing

Test ID: U-270-2	
Purpose:	read data appropriately from sensor SensorTag CC 2650
Preconditions:	IOS APP, sensor SensorTag CC 2650

Input:	1.Run my application run on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Push the power button on the SensorTag CC 2650
Expected Output:	1. The ios device successfully connect to CC 2650 automatically 2. Data and RSSI can be displayed on the IOS app automatically 3. input data to AWS server per 15 seconds

- **User Story #140**

Test ID: 140
Purpose:
- To test the functionality when a user select a specific period data for a patient to download

Precondition:
- User should have access to his/her account
- The patient's data and information are in the system database
- The user must be on the patient's data page

Input:
- Time period (selected via calendar tool box)

Expected output:
- The system automatically download a .xls file with the data in the selected time period

- **User Story #150**
  - Subsystem testing

Test ID: U-270-1	
Purpose:	As a user, I want to see the profile page which should have my information
Preconditions:	IOS APP
Input:	1.Turn on the sensor device 2.Turn on Bluetooth module on the IOS device 3.Open the application 4.Login with correct username and password 4.Click on the profile icon at the button of the home page
Expected Output:	1. The ios device successfully connect to sensor device 2. After clicking on the profile icon, profile page will be shown which will have user information

- System testing

Test ID: U-270-1	
Purpose:	As a user, I want to see the profile page which should have my information
Preconditions:	IOS APP
Input:	1.Turn on the sensor device 2.Turn on Bluetooth module on the IOS device 3.Open the application 4.Login with correct username and password 4.Click on the profile icon at the button of the home page
Expected Output:	1. The ios device successfully connect to sensor device 2. After clicking on the profile icon, profile page will be shown which will have user information

- **User Story #156**
  - Subsystem testing

Test ID: U-270-1	
Purpose:	As a user, I would like to see the home page in the app
Preconditions:	IOS is installed and user has an account
Input:	1.Run the application on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Turn on the sensor device 4.Enter correct username and password 5.Click on Login button
Expected Output:	1. The ios device successfully connect to the sensor device 2. After user login, Home page will appear

- System testing

Test ID: U-270-1	
Purpose:	As a user, I would like to see the home page in the app
Preconditions:	IOS is installed and user has an account

Input:	1.Run the application on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Turn on the sensor device 4.Enter correct username and password 5.Click on Login button
Expected Output:	1. The ios device successfully connect to the sensor device 2. After user login, Home page will appear

- **User Story #158**
  - Subsystem testing

Test ID: U-270-1	
Purpose:	As a developer, I want to make sure that my app interface is compatible for iphone 5 screen as well.
Preconditions:	iOS app installed and user has an account
Input:	1.Turn on the sensor device 2.Turn on the Bluetooth

	3.Open the application on the IOS device 4.Login with your username and password 5.Click on profile icon
Expected Output:	1. After the login, it should show the home page without anything overlapping or cut. 2. When user clicks on profile icon, profile page should appear with everything properly displayed.

- System testing

Test ID: U-270-1	
Purpose:	As a developer, I want to make sure that my app interface is compatible for iphone 5 screen as well.
Preconditions:	iOS app installed and user has an account
Input:	1.Turn on the sensor device 2.Turn on the bluetooth 3.Open the application on the IOS device 4.Login with your username and password 5.Click on profile icon

Expected Output:	1. After the login, it should show the home page without anything overlapping or cut. 2. When user clicks on profile icon, profile page should appear with everything properly displayed.

- **User Story #159**
  - Subsystem testing

Test ID: U-270-1	
Purpose:	read data appropriately from sensor nrf 51822
Preconditions:	IOS APP, sensor nrf 51822
Input:	1.Run my application run on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Push the power button on the sensor nrf 51822
Expected Output:	1. The ios device successfully connect to nrf 51822 automatically 2. Data can be displayed on the IOS app automatically

- System testing

Test ID: U-270-2	
Purpose:	read data appropriately from sensor nrf 51822
Preconditions:	IOS APP, sensor nrf 51822
Input:	1.Run my application run on the IOS device 2.Turn on Bluetooth module on the IOS device 3.Push the power button on the sensor nrf 51822
Expected Output:	1. The ios device successfully connect to snesor nrf 51822 automatically 2. Data can be displayed on the IOS app automatically

- **User Story #160**
  - Subsystem testing

Test ID: U-276-1	
Purpose:	Test the login feature

Preconditions:	iOS app installed, User have an account
Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application 4. Enter correct username and password 5. Click on Login button
Expected Output:	1. Logged in successfully

Test ID: U-277-1	
Purpose:	Test the login feature
Preconditions:	iOS app installed, User have an account
Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application 4. Enter incorrect username and password 5. Click on Login button
Expected Output:	1. Login failed error message shown

- System testing

Test ID: U-276-2	
Purpose:	Test the login feature
Preconditions:	iOS app installed, User have an account
Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application 4. Enter correct username and password 5. Click on Login button
Expected Output:	1. Logged in successfully

Test ID: U-277-2	
Purpose:	Test the login feature
Preconditions:	iOS app installed, User have an account

Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application 4. Enter incorrect username and password 5. Click on Login button
Expected Output:	1. Login failed error message shown

- **User Story #161**
  - Subsystem testing

Test ID: U-275-1	
Purpose:	Display the sensor data in decimal form
Preconditions:	iOS app installed, User have an account
Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application

	4. Login with correct username and password
Expected Output:	1. The ios device successfully connect to the sensor 2. Data from sensor is displayed on the homepage in decimal form

- System testing

Test ID: U-275-2	
Purpose:	Display the sensor data in decimal form
Preconditions:	iOS app installed, User have an account
Input:	1.Turn on the sensor 2.Turn on Bluetooth module on the IOS device 3. Open the application 4. Login with correct username and password
Expected Output:	1. The ios device successfully connect to the sensor 2. Data from sensor is displayed on the homepage in decimal form

- **User Story #165**

Test ID: 165
Purpose:
- To test the functionality when a user type in valid information

Precondition:
- User should have access to the system
- The user must be on register page

Input:
- User information

Expected output:

- The user is redirected to a success page

- **User Story #172**

Test ID: 172
Purpose:
- To test the functionality when a user list all the patients

Precondition:
- User should have access to his/her account
- The patient's data and information are in the system database
- The user must be on user's homepage

Input:
- None

Expected output:
- The system lists all the patients in the doctor's catalog on the webpage

- **User Story #173**

Test ID: Test#173
Purpose:
- To test the functionality when a user type in keywords to search for patients

Precondition:
- User should have access to his/her account
- The patient's data and information are in the system database
- The user must be on user's homepage

Input:
- Patient's name

Expected output:
- The system lists all the patients which match the keywords

- **User Story #174**

Test ID: 174
Purpose:
- To test the functionality when a doctor click a patient to view the patient's profile

Precondition:
- User should have access to his/her account
- The patient's data and information are in the system database
- The user must be on a patient lists page

Input:
- None

Expected output:
- The doctor is provided a page which contains the selected patient's profile

GLOSSARY

Biosensor

Biosensors are physiological devices that sense biological & chemical events.Currently biosensors are being used for applications like environmental monitoring, biological/chemical agent detection, soil monitoring, food and water analysis, and medical parameter monitoring. A typical biosensor converts one or more chemical or biological parameters into electrical form which can be read by a tiny microcontroller onboard the sensor. Once the information provided by the sensor is understood, the next step is sharing this information with others. Typical biosensor applications need to transfer small amount of data where the data transfer rate ranges from low to medium speed. Since in most cases biosensors operate as stand-alone units, power is typically supplied through batteries. Having limited battery life, power consumption is regarded as a very critical issue in such applications [2]. Being so critical, power budget aspect of stand-alone sensors is studied extensively by many researchers. Previous studies indicated that most of the power consumption is due to the transceiver part of the unit which provides connectivity. One such study indicates that almost 50% of the power consumption is done by the transceiver. Out of this 50%, 80% of it is consumed by the receiver section [3]. This indicates how critical it is to select a suitable network with suitable protocol to minimize power consumption for biosensor applications.

Biosensing

The precise interpretation of the term “biosensing” depends on the research domain. In embodied robotics, for example, biosensing is interpreted as the various ways in which natural systems “sense” their environments. Understanding these processes is important to this domain as embodied robotics seeks to learn from life-like systems. In other engineering domains biosensing can have a different meaning. It can be understood as a sensing process that incorporates biological material or reactions into a sensor, either to improve an existing system, add new features, or create a completely new sensor, even one that might not exist as such in existing living systems.

APPENDIX

Appendix A - UML Diagrams

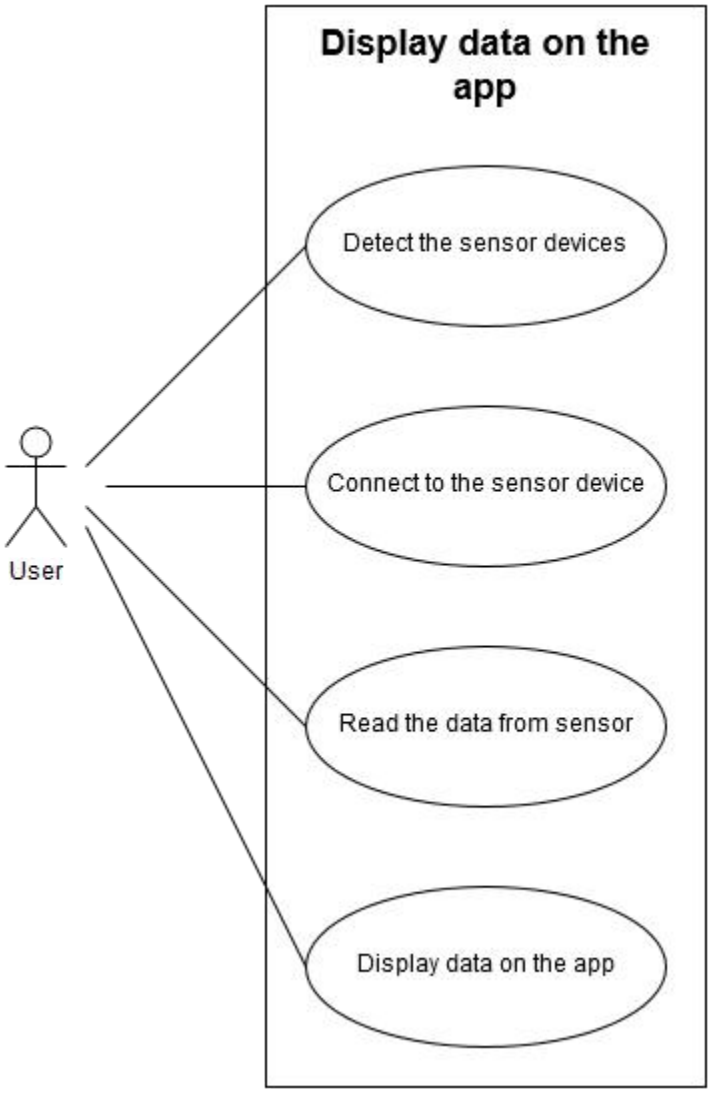


Figure 1- Use case diagram for User Story #127

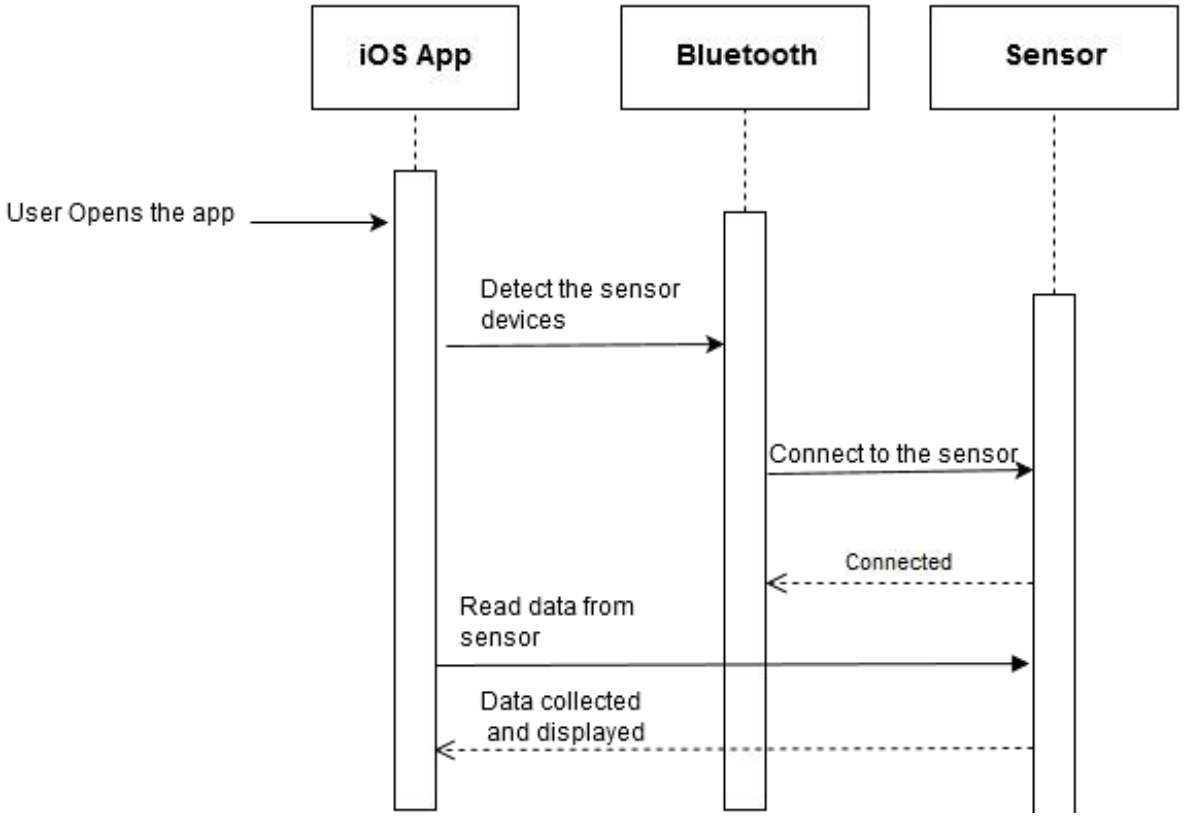


Figure 2- Sequence diagram for User Story #127

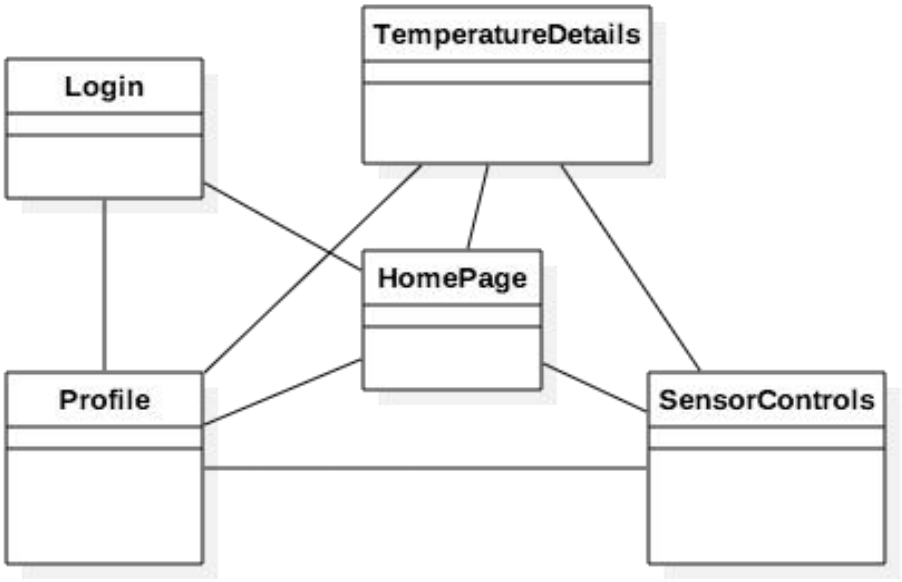


Figure 3- Class diagram for whole system

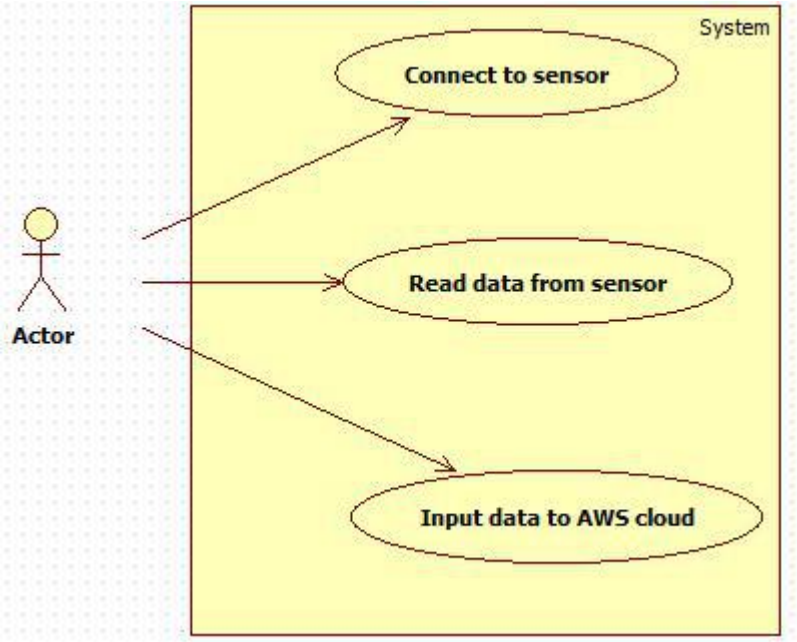


Figure 4- Use case diagram for User Story #126

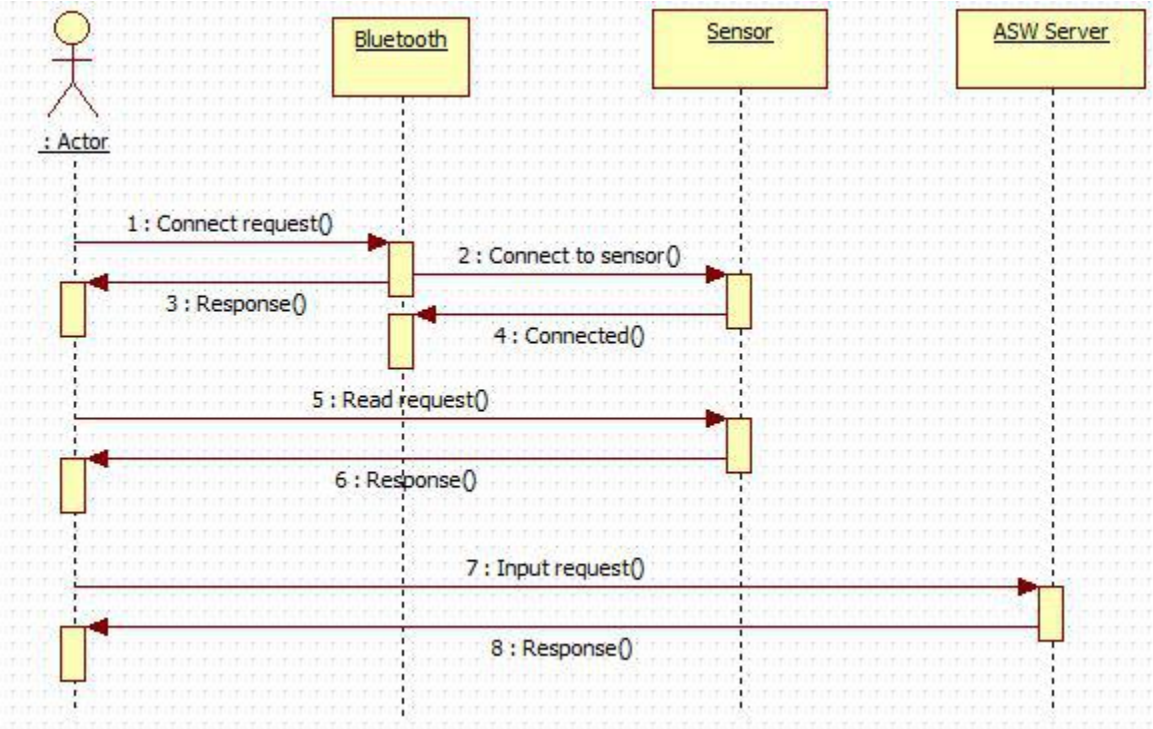


Figure 5- Sequence diagram for User Story #126

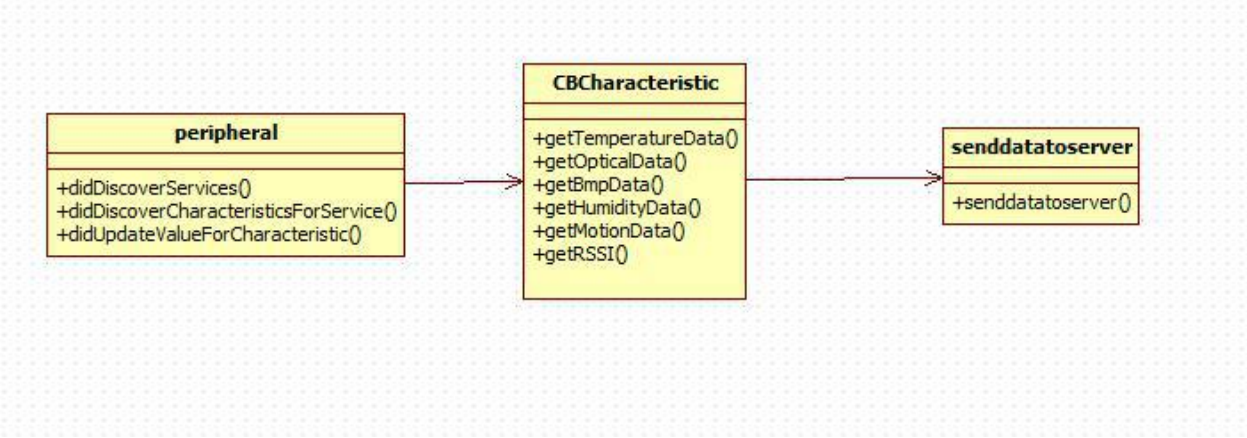


Figure 6- Class diagram for User Story #126

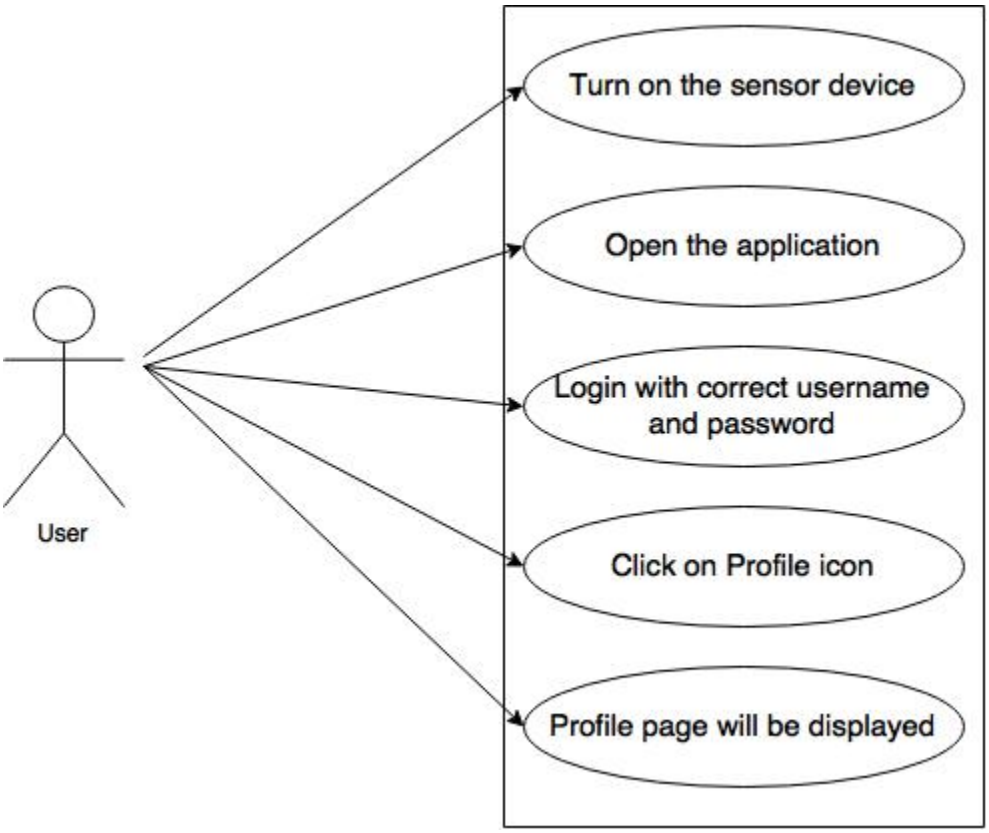


Figure 7- Use case for User Story #150

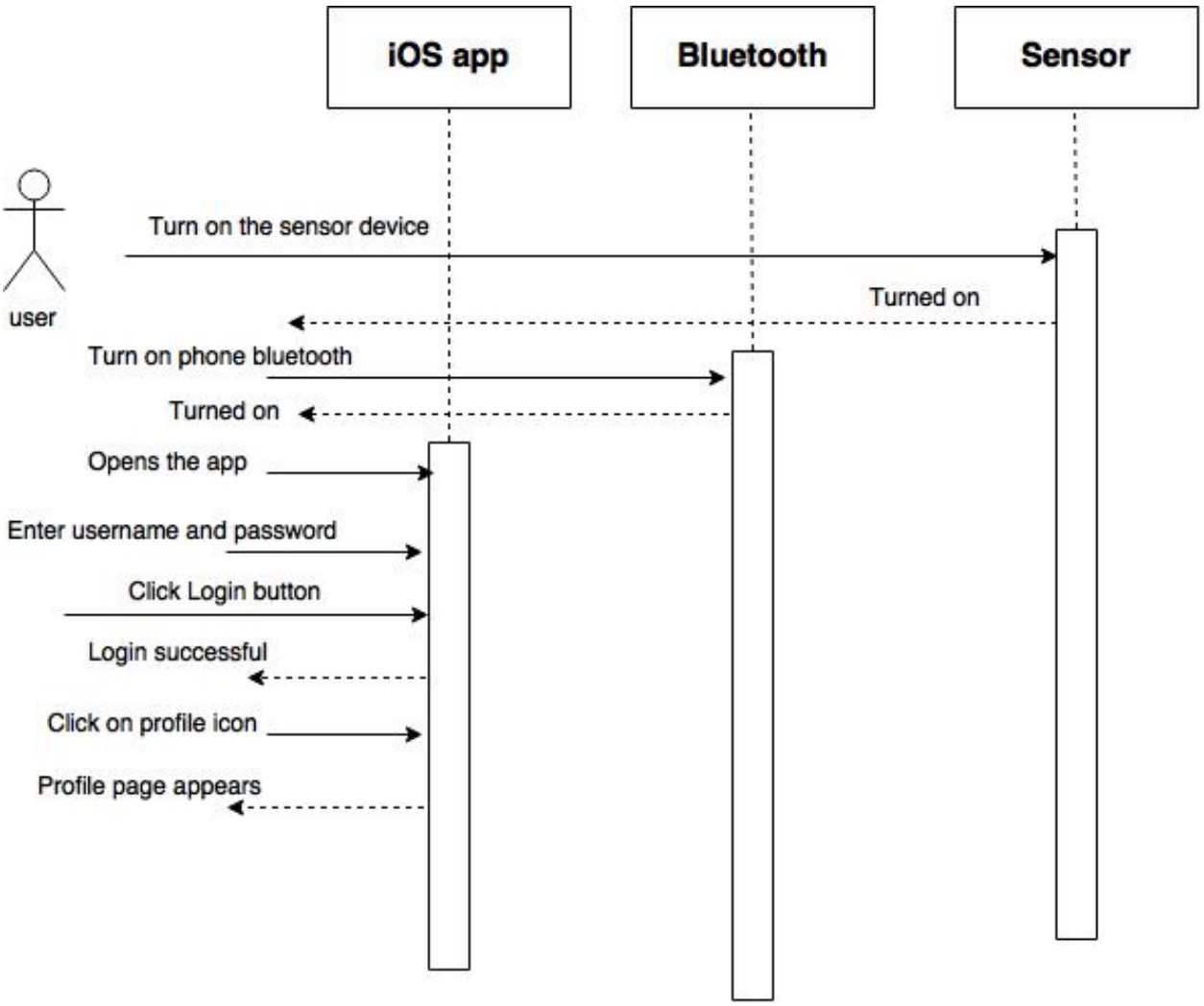


Figure 8- Sequence diagram for User story #150

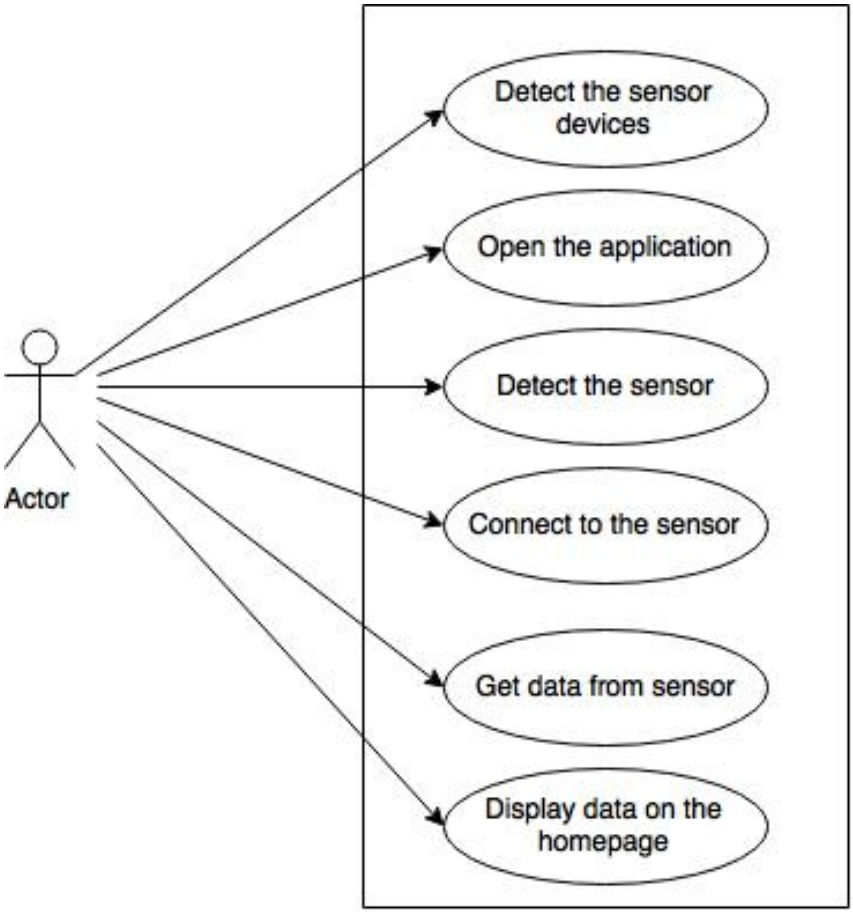


Figure 9- Use case diagram for User story #156

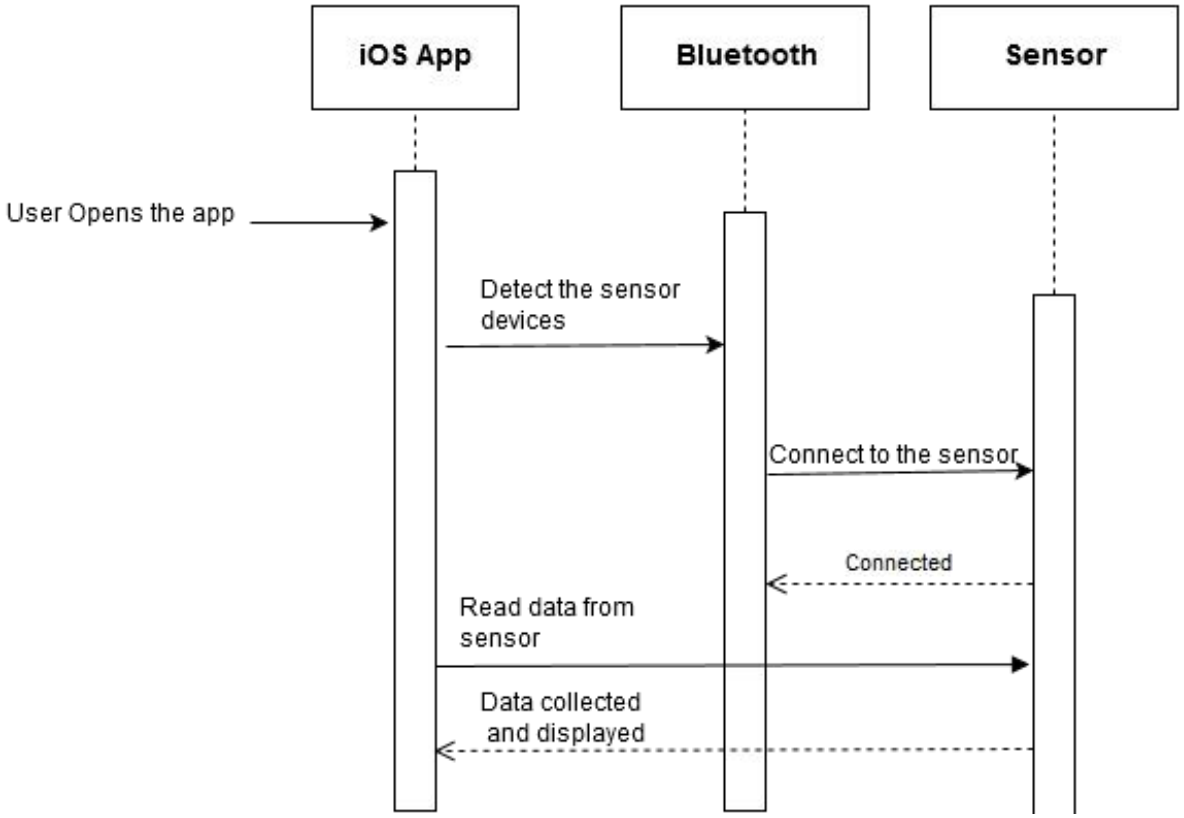


Figure 10- Sequence diagram of User Story # 156

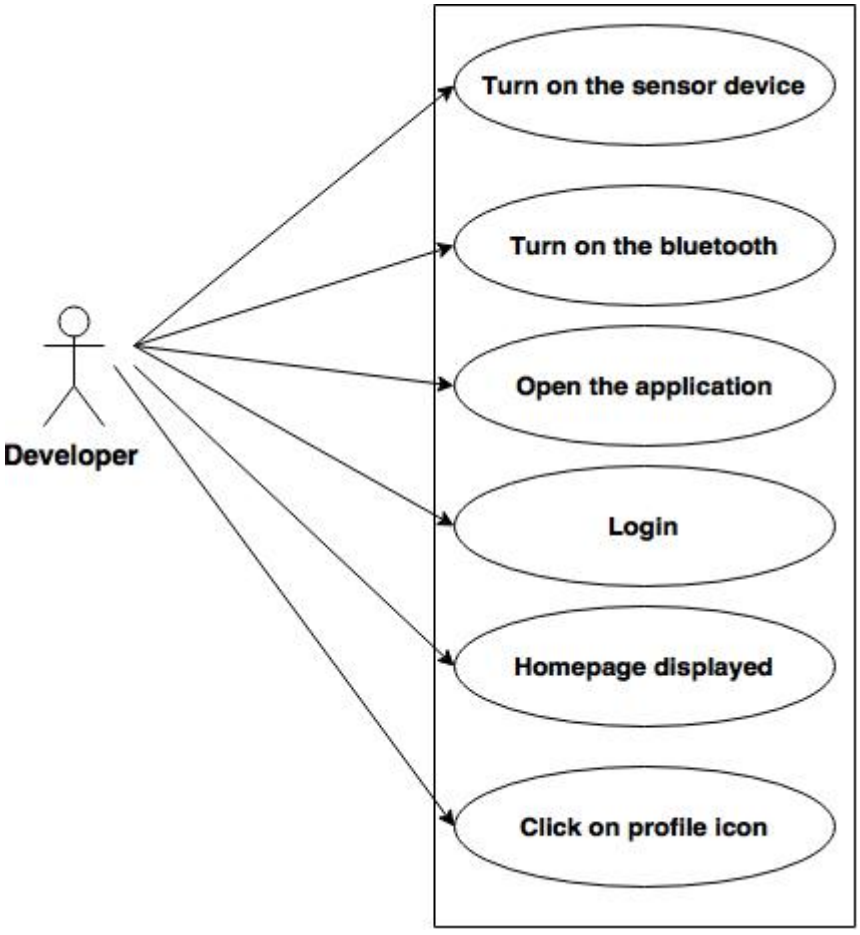


Figure 11- Use case diagram for User story #158

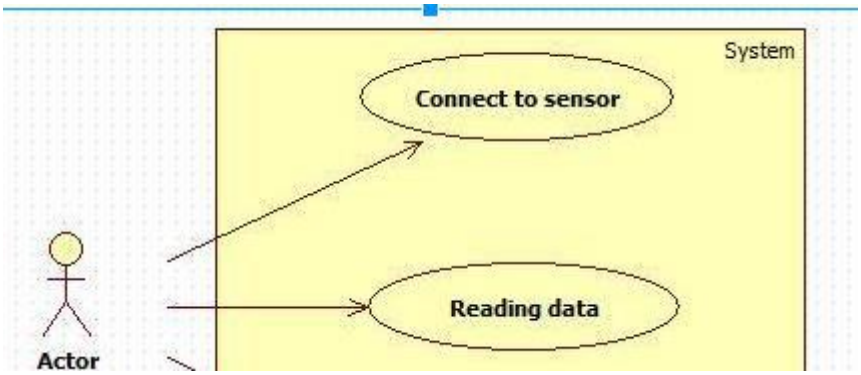


Figure 12- Use case diagram for User story #159

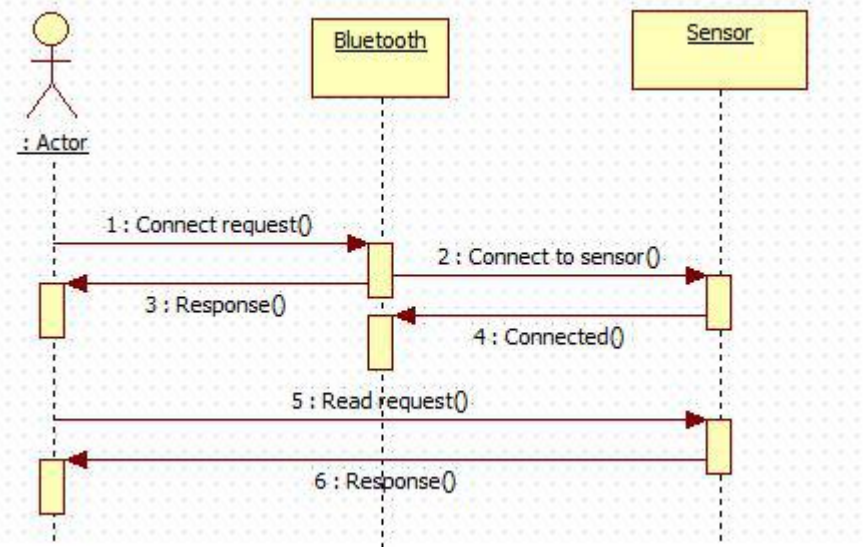


Figure 13- Sequence diagram for User Story #159

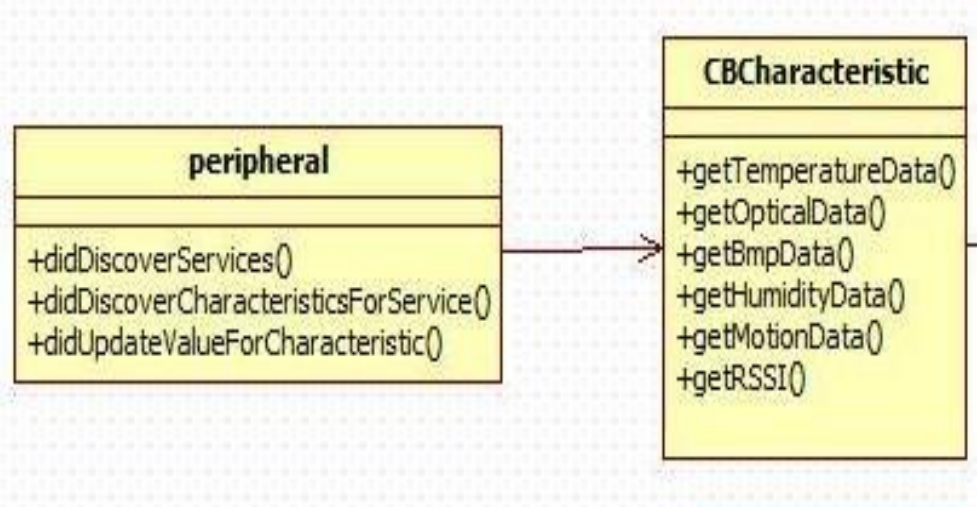


Figure 14- Class diagram for User Story #159

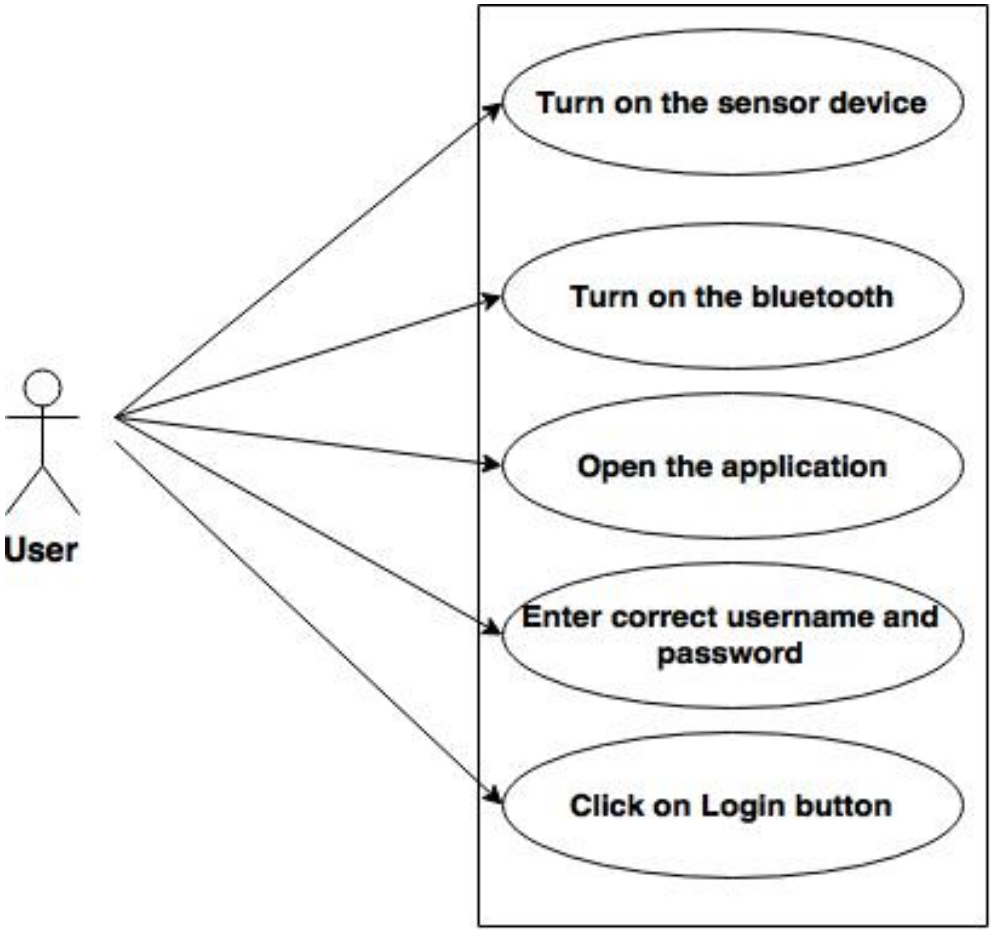


Figure 15- Use case diagram for User Story #160

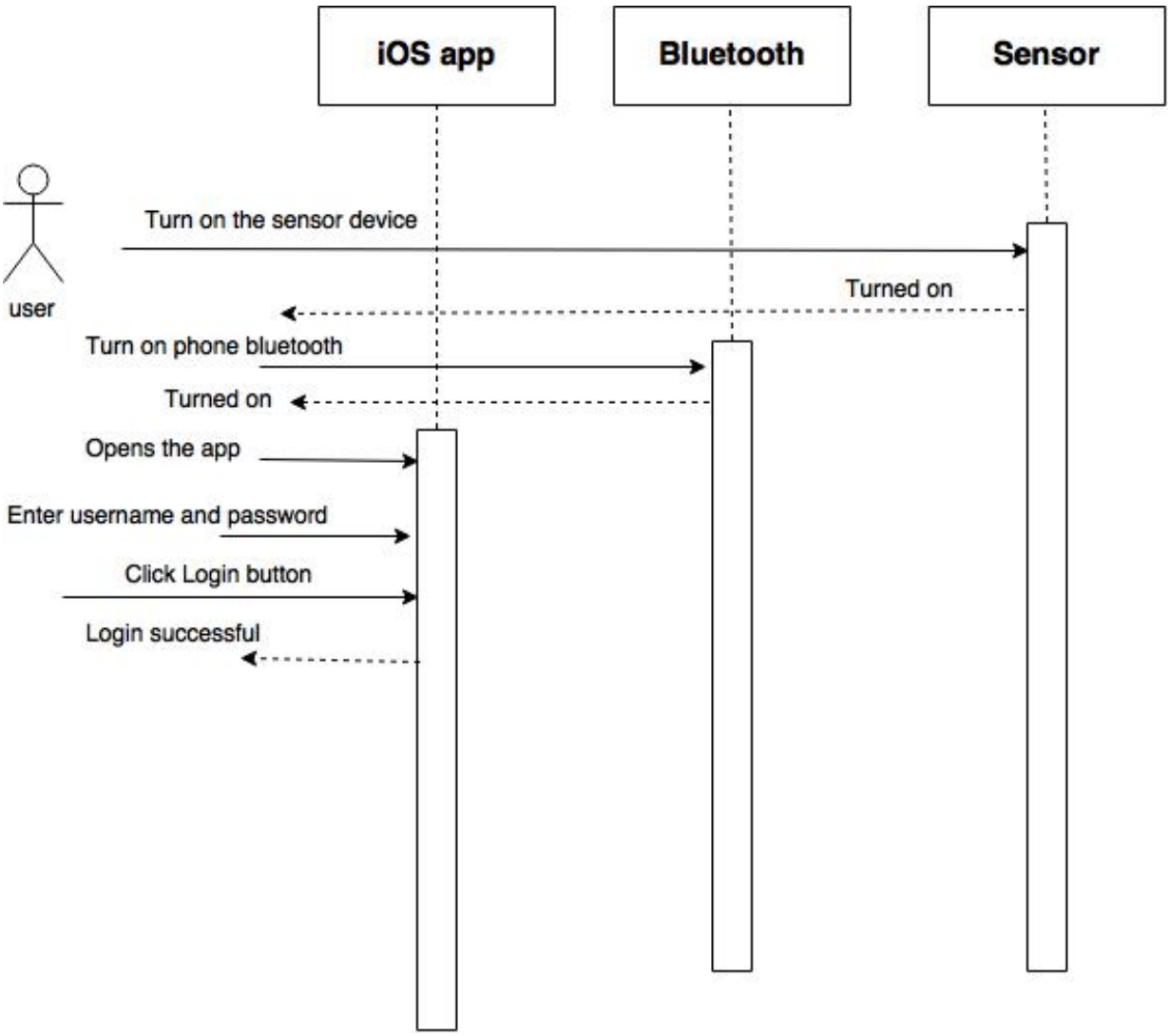


Figure 16- Sequence diagram for User Story #160

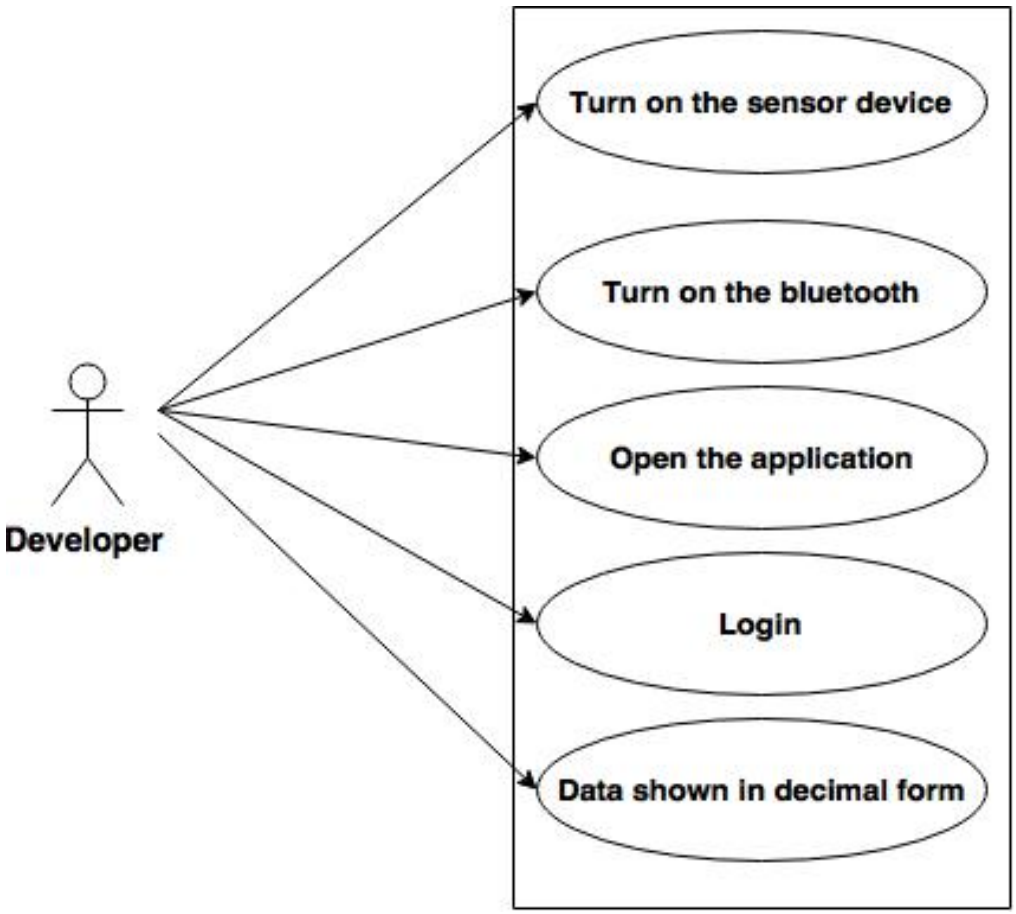


Figure 17- Use case diagram for User Story #161

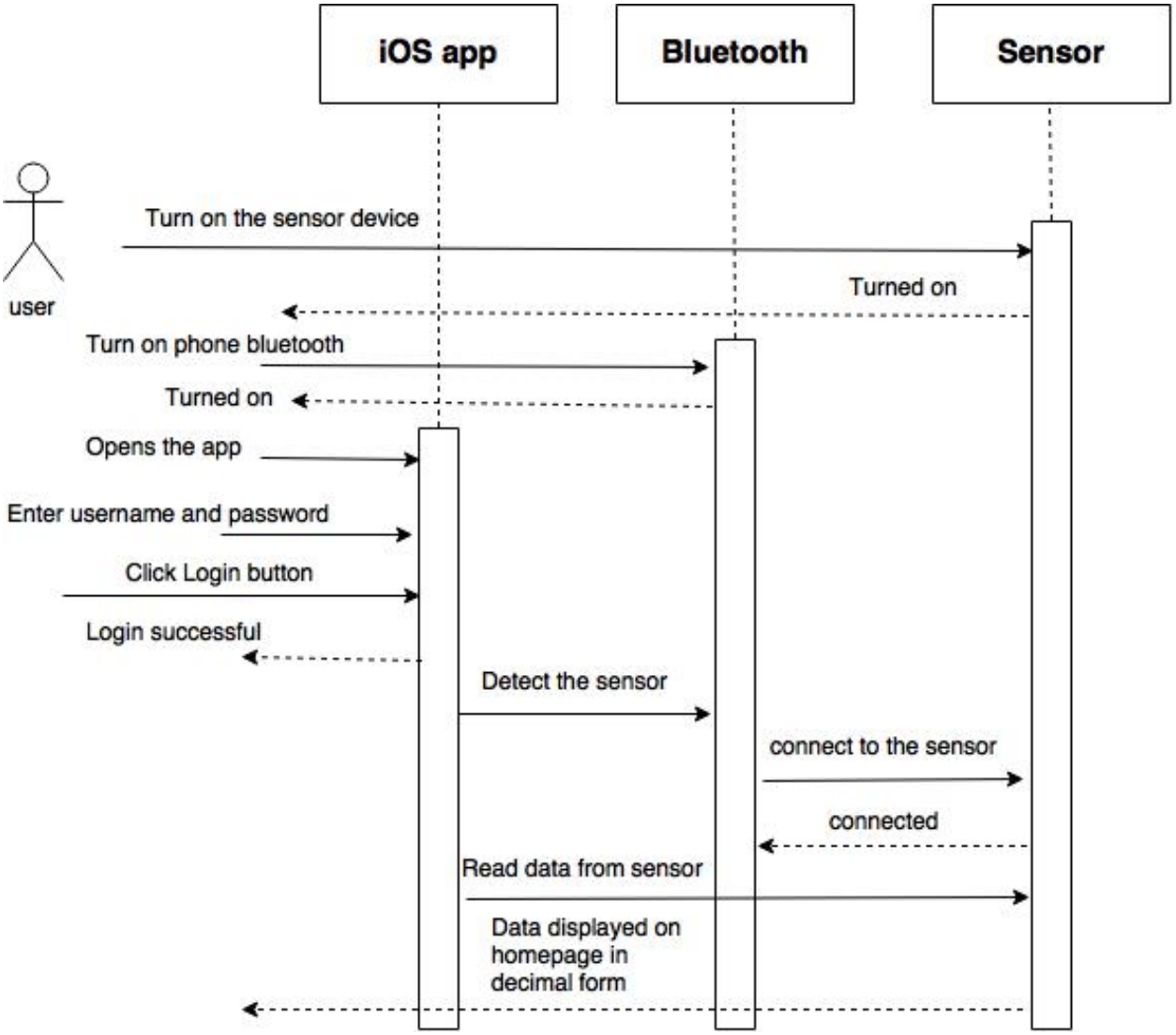


Figure 18- Sequence diagram for User Story #161

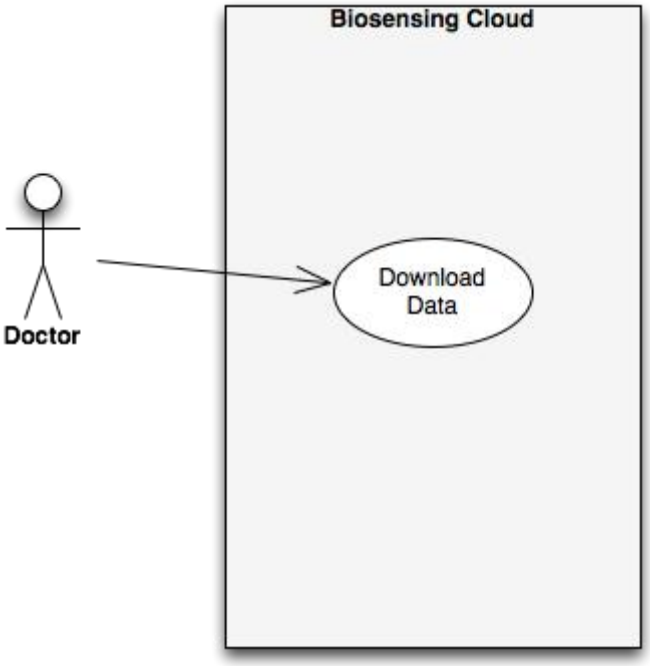


Figure 19- Use case diagram for User Story #140

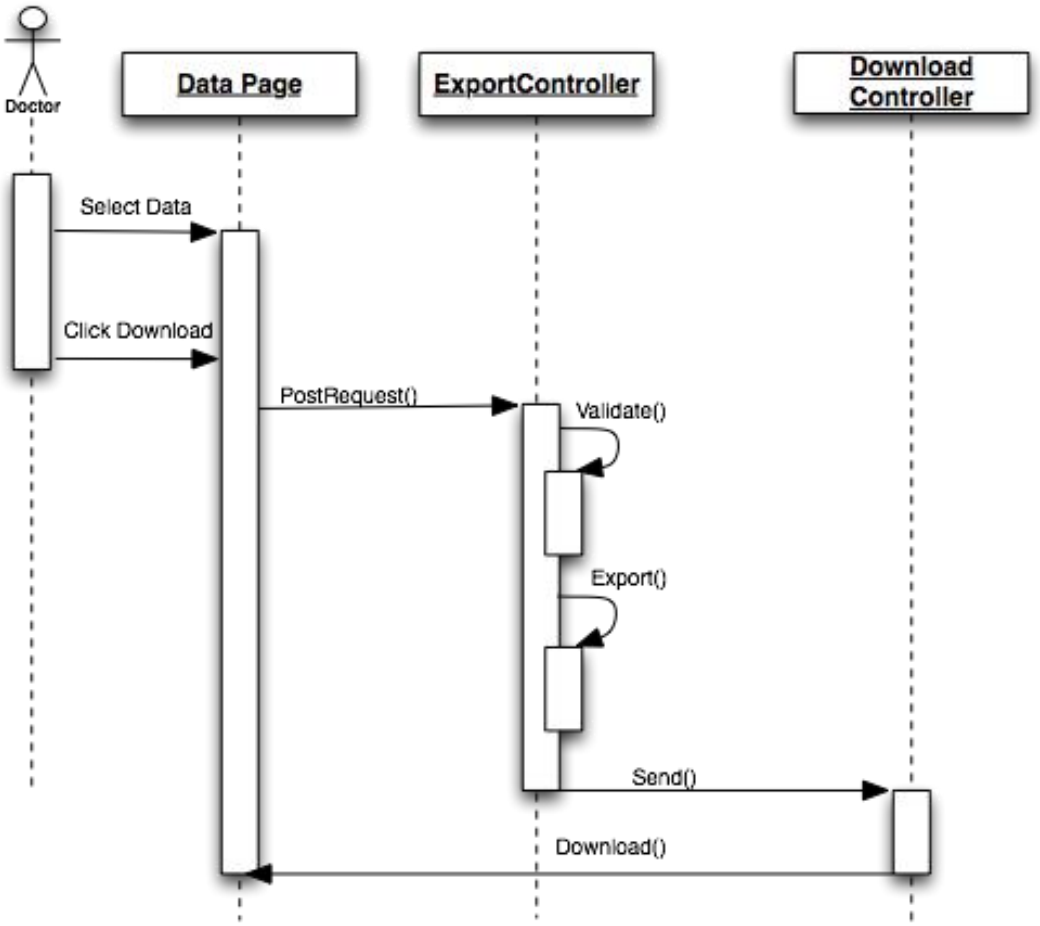


Figure 20- Sequence diagram for User Story #140

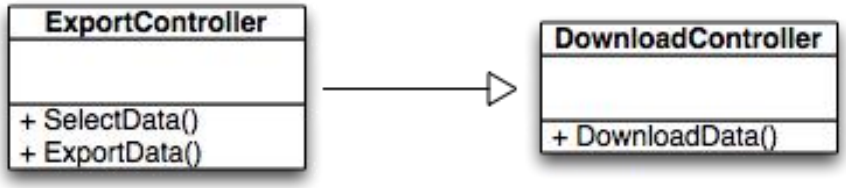


Figure 21- Class diagram for User Story #140

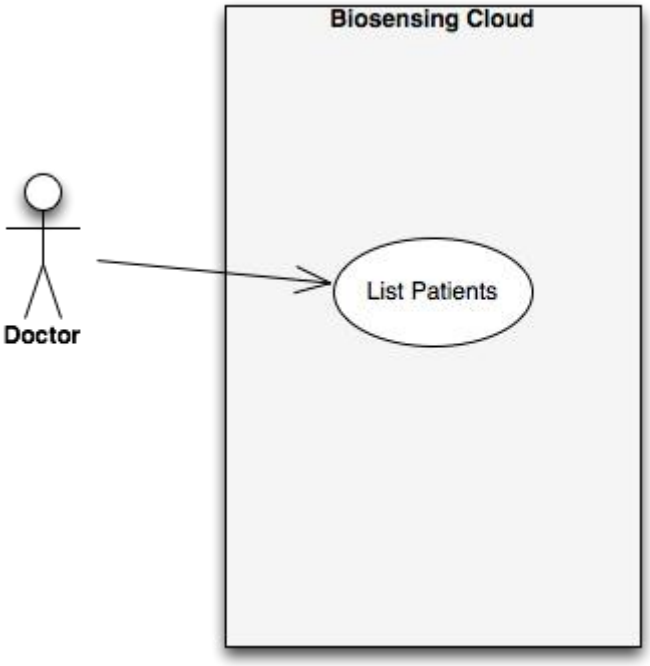


Figure 22- Use case of User Story #172

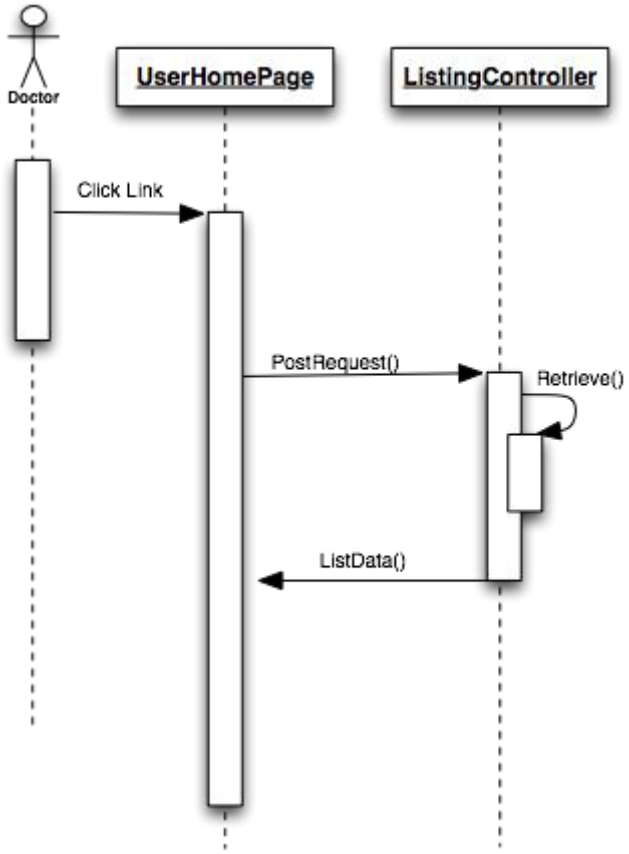


Figure 23- Sequence diagram for User Story #172

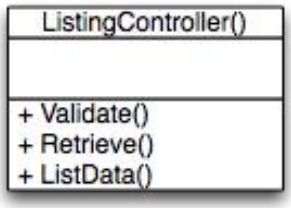


Figure 24- Class diagram for User Story #172

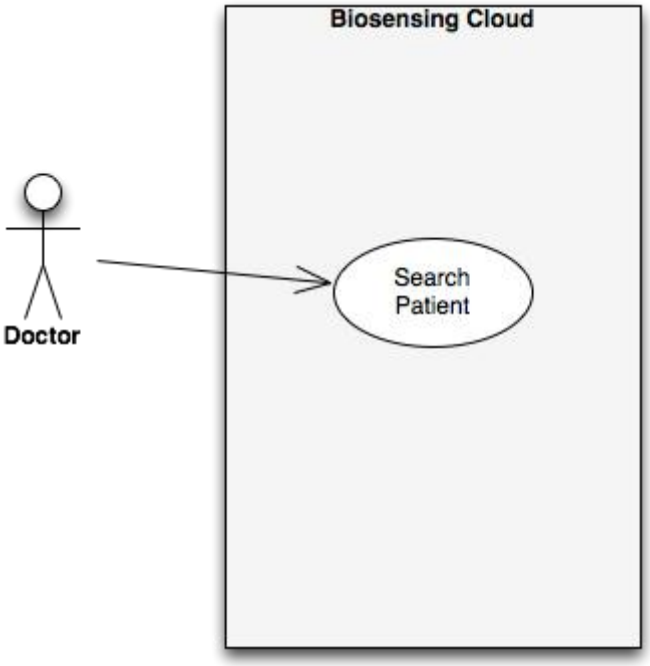


Figure 25- Use case diagram for User Story #173

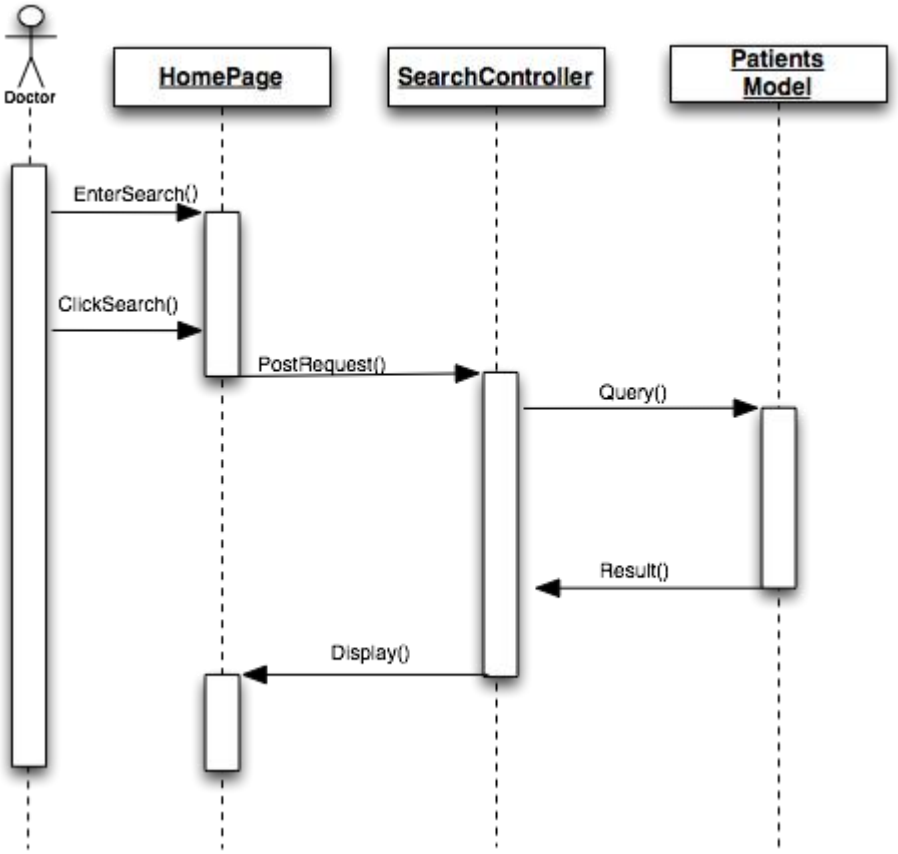


Figure 26- Sequence diagram for User Story #173

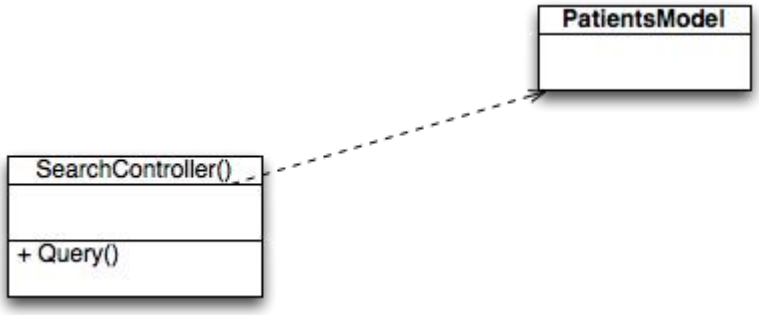


Figure 27- Class diagram for User Story #173

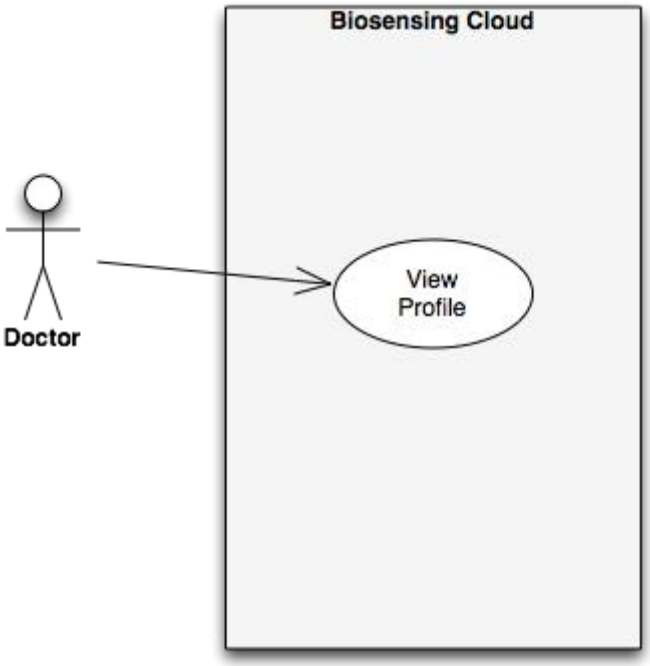


Figure 28- Use case diagram for User Story #174

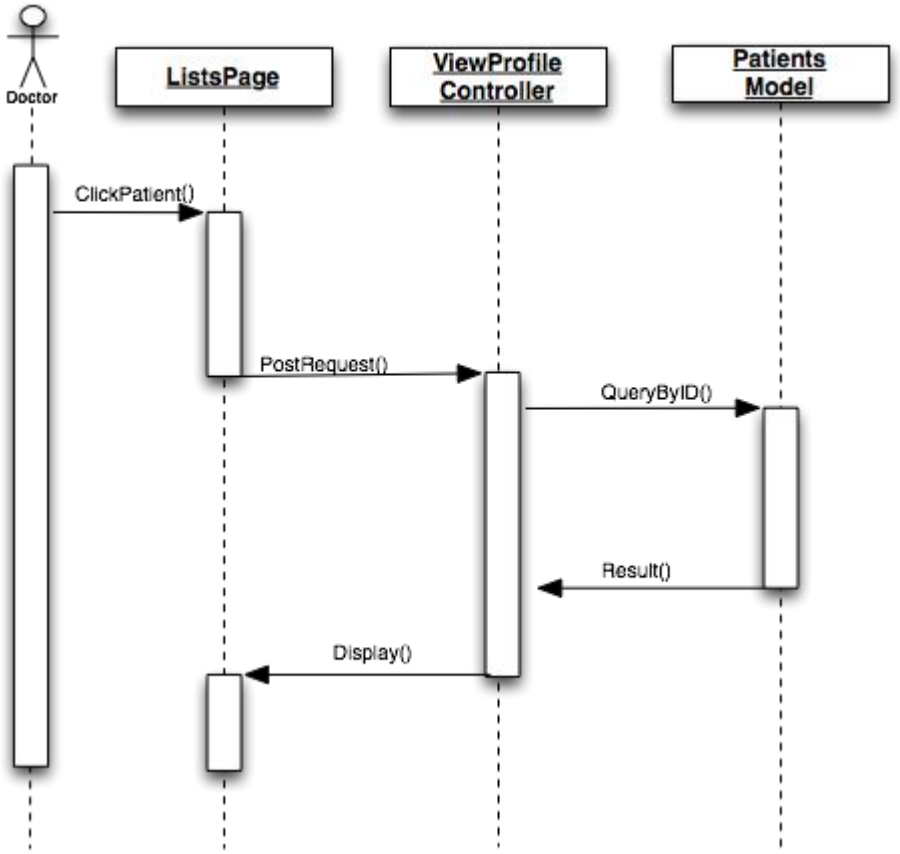


Figure 29- Sequence diagram for User Story #174

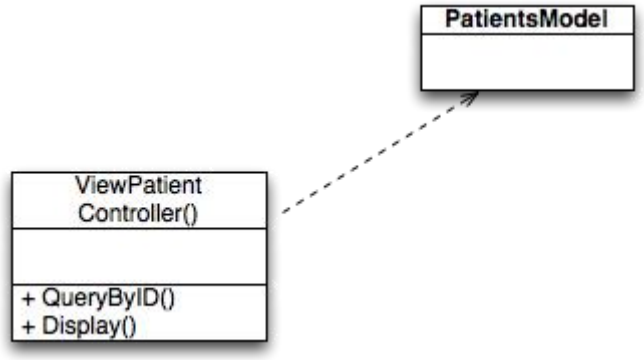


Figure 30- Class diagram for User Story #174

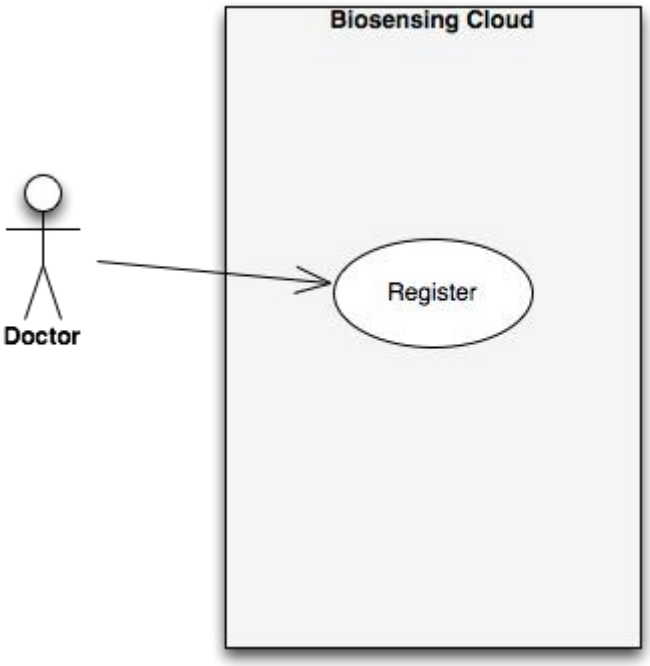


Figure 31- Use case diagram for User Story #165

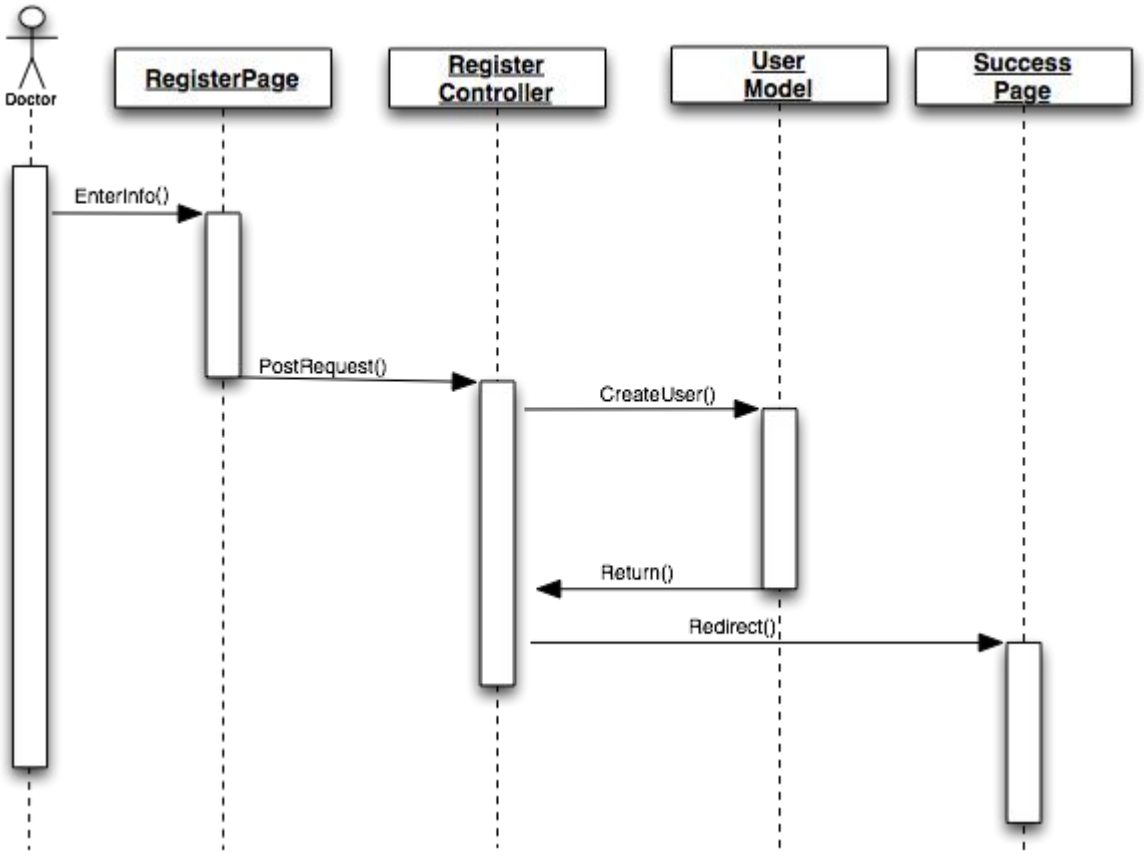


Figure 32- Sequence diagram for User Story #165

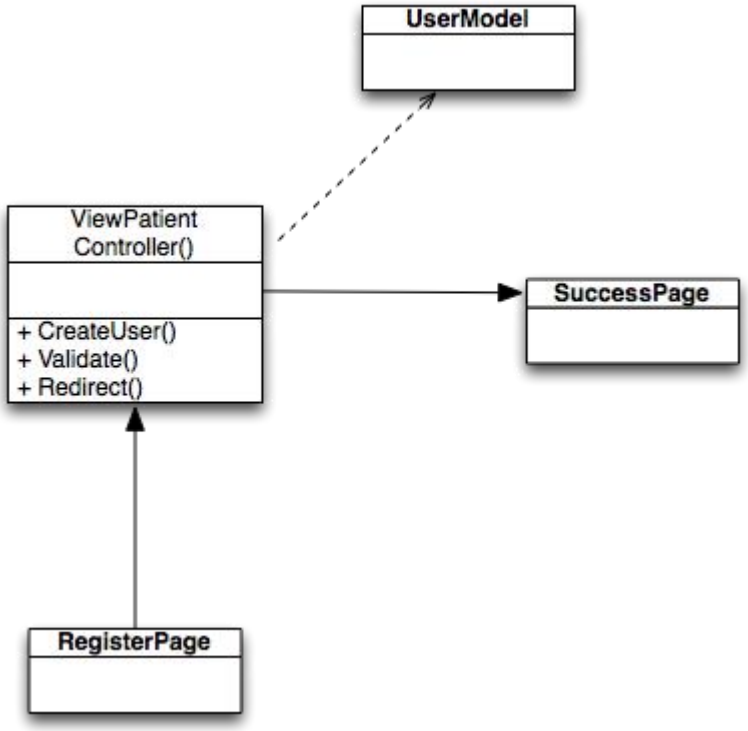


Figure 33- Class diagram for User Story #165

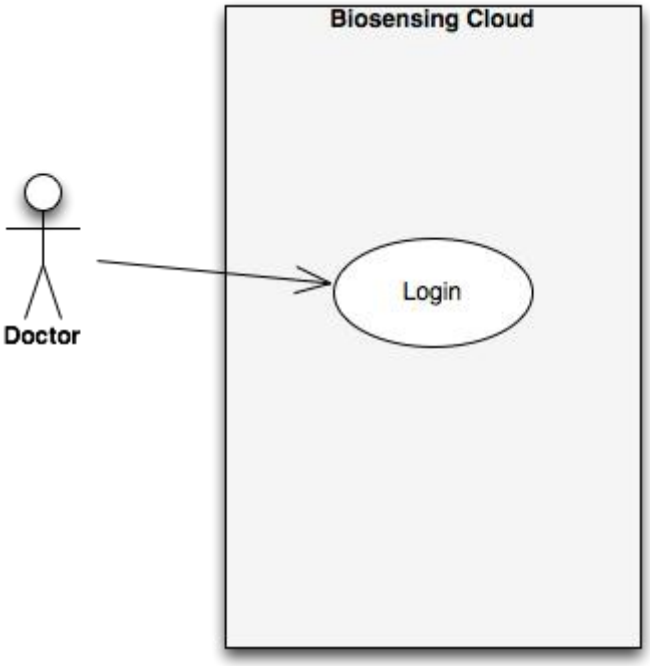


Figure 34- Use case diagram for User Story #166

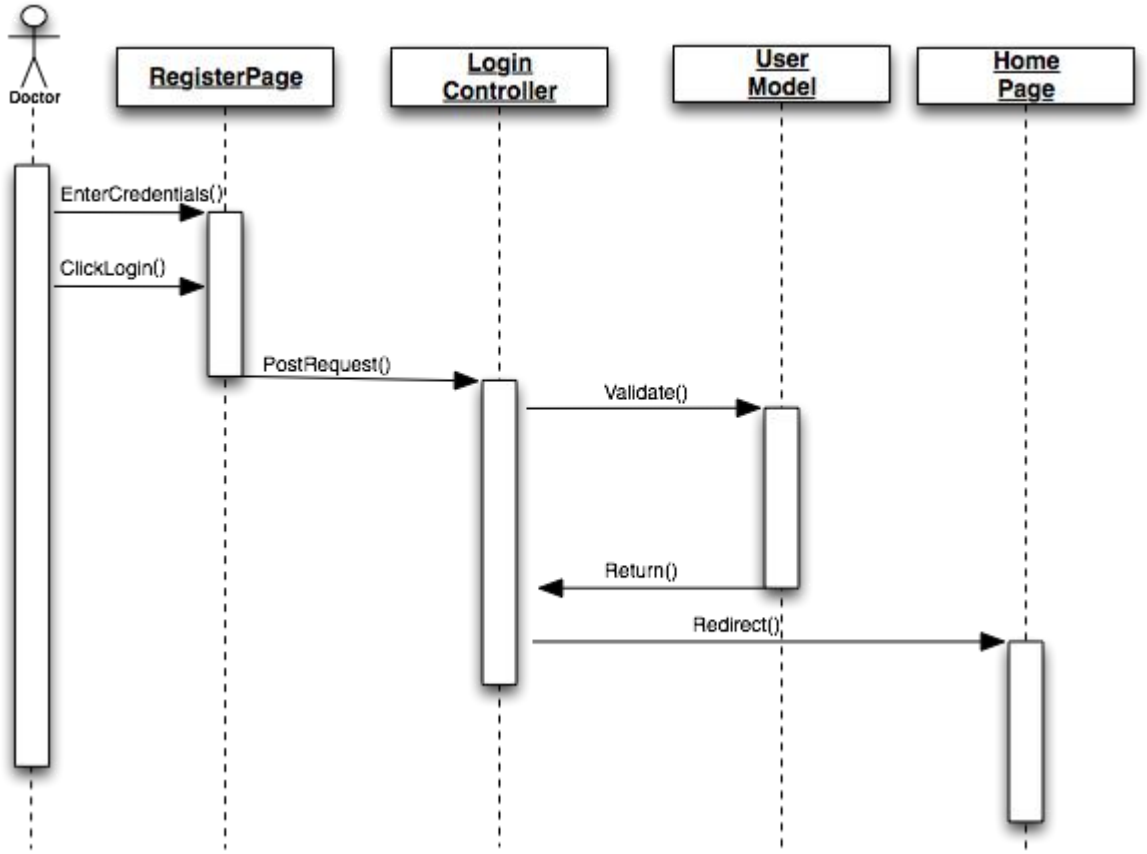


Figure 35- Sequence diagram for User Story #166

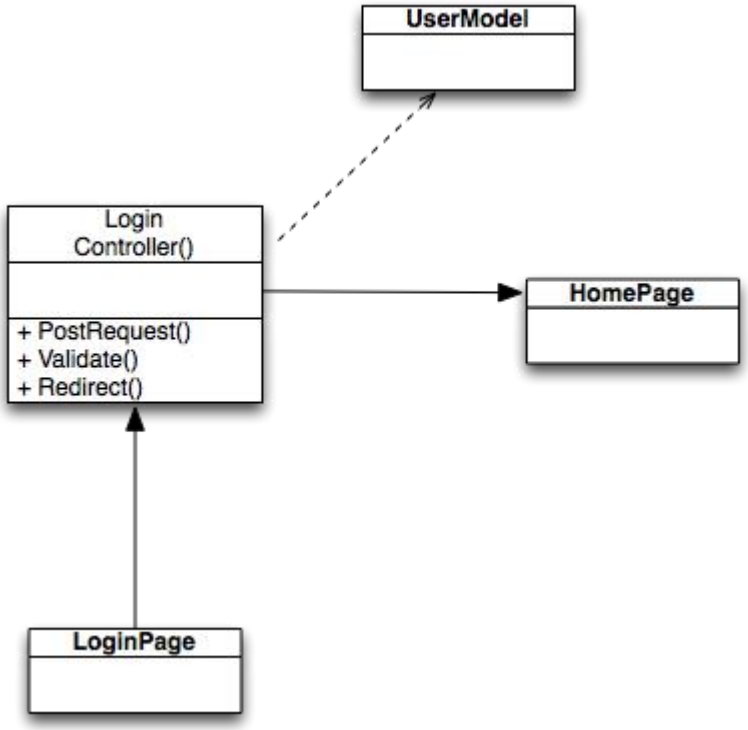


Figure 36- Class diagram for User Story #166

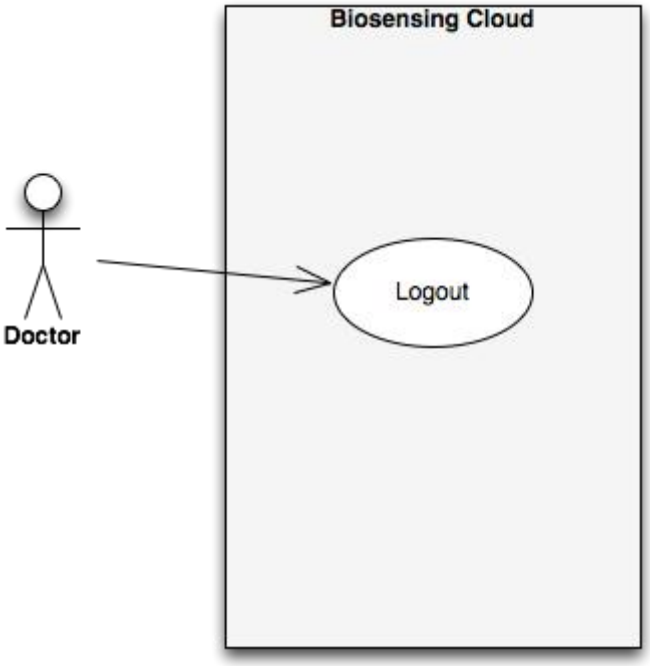


Figure 37- Use case diagram for User Story #167

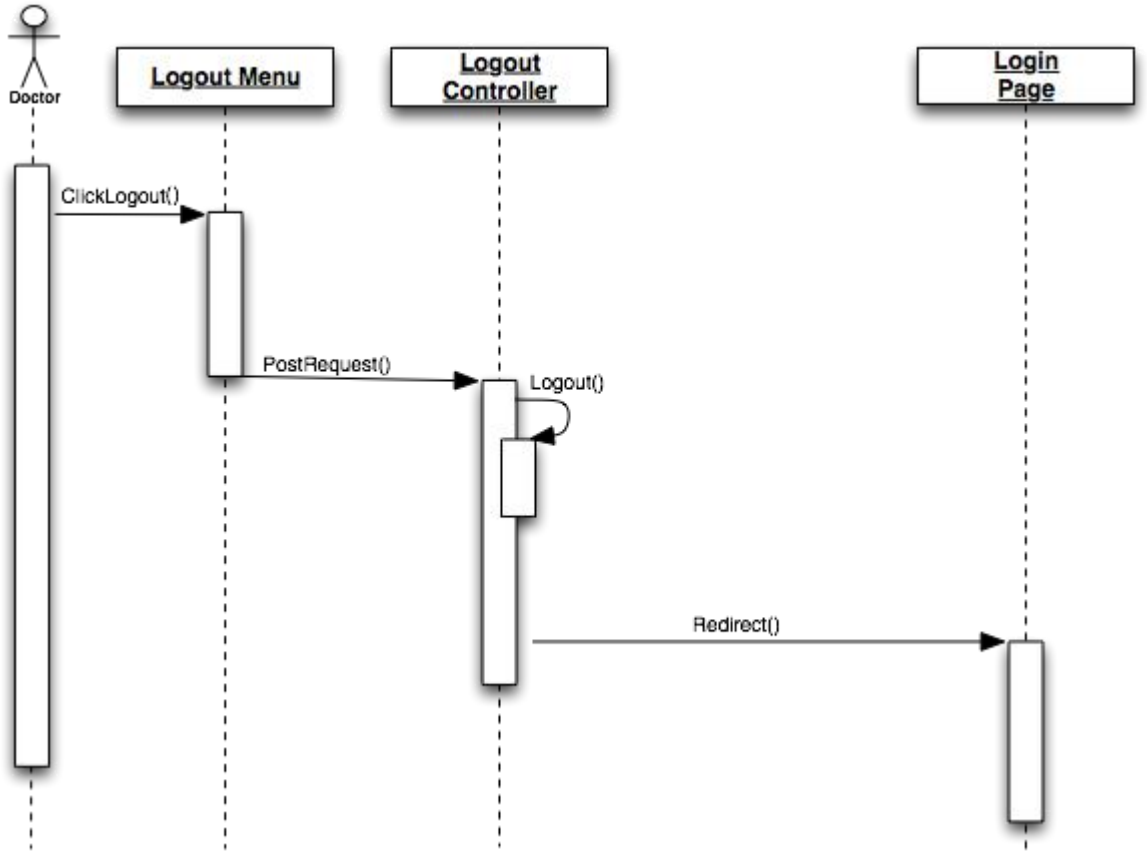


Figure 38- Sequence diagram for User Story #167

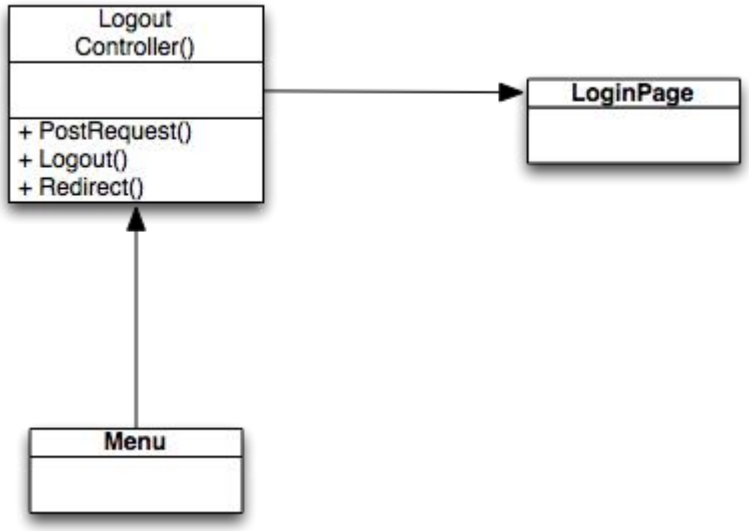


Figure 39- Class diagram for User Story #167

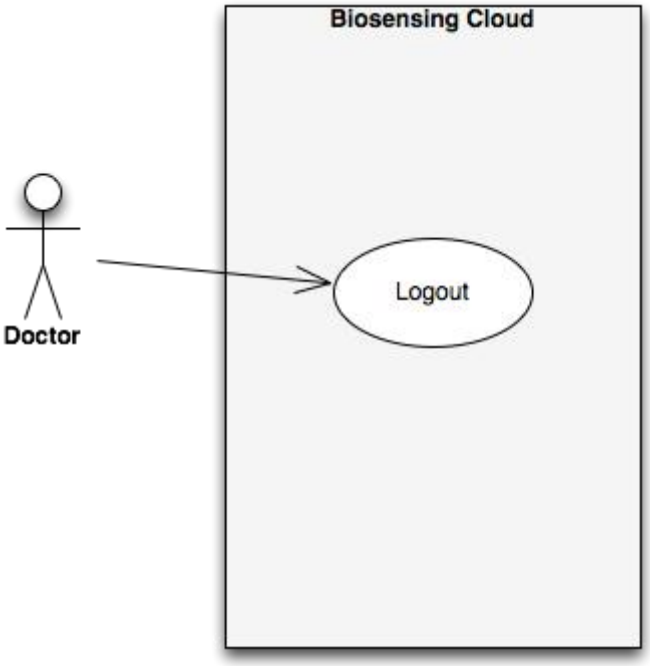


Figure 40- Use case diagram for User Story #168

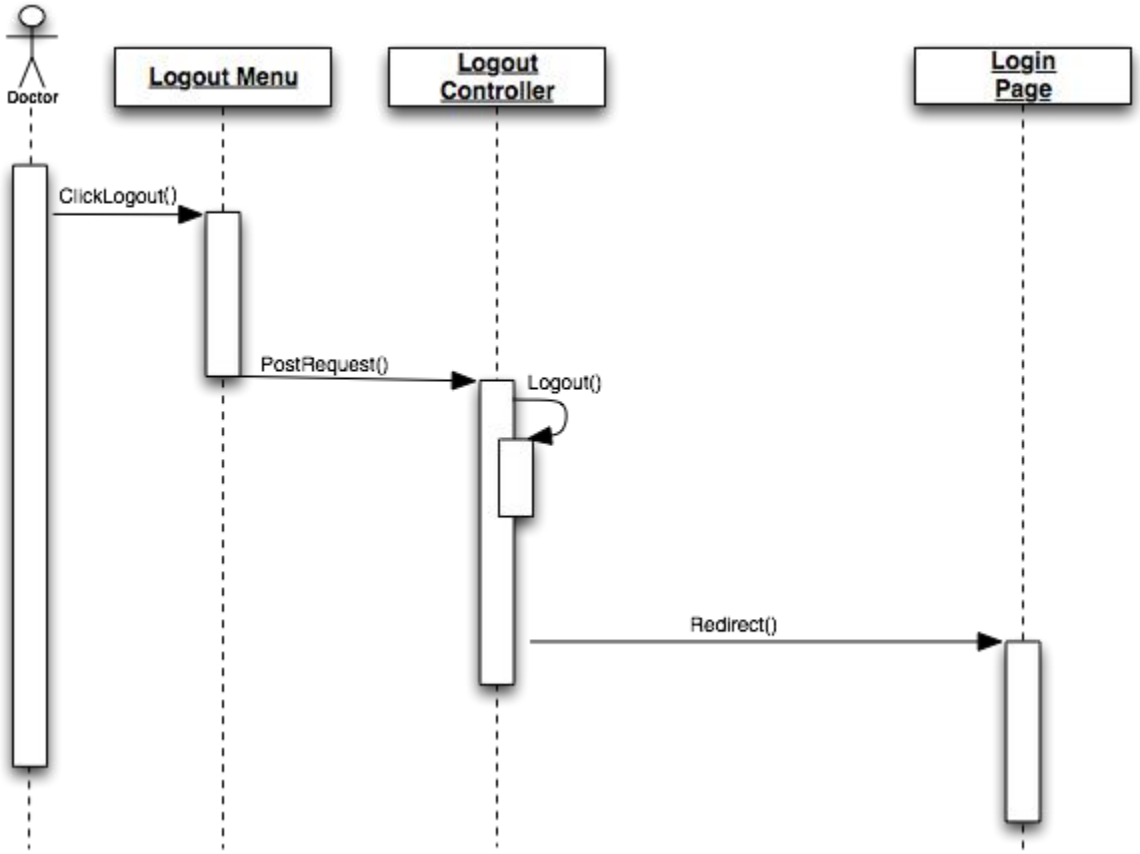


Figure 41- Sequence diagram for User Story #168

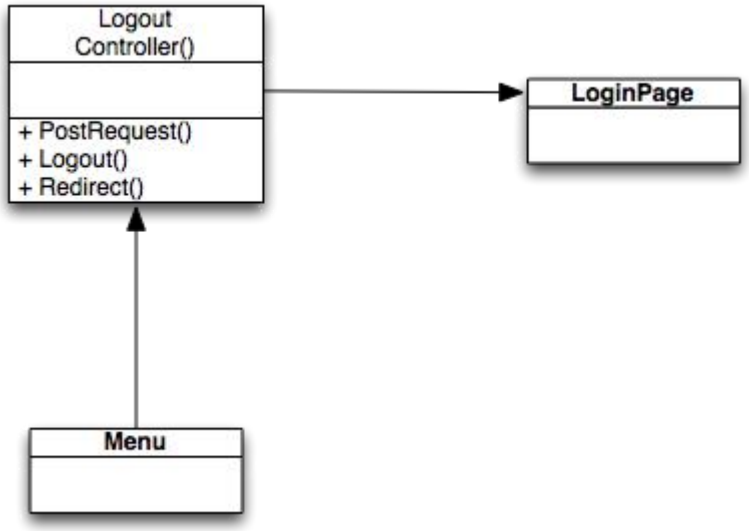
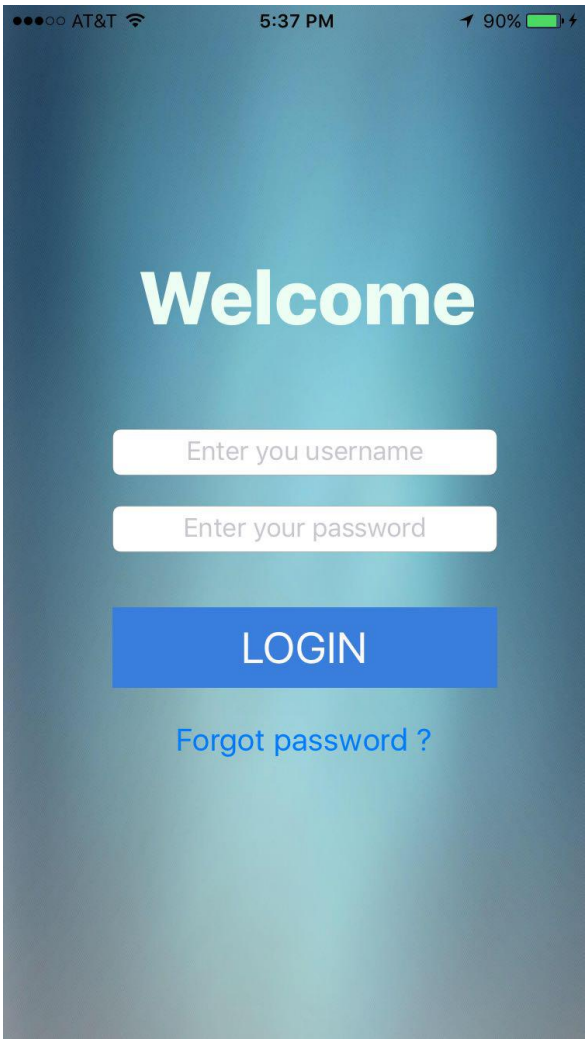
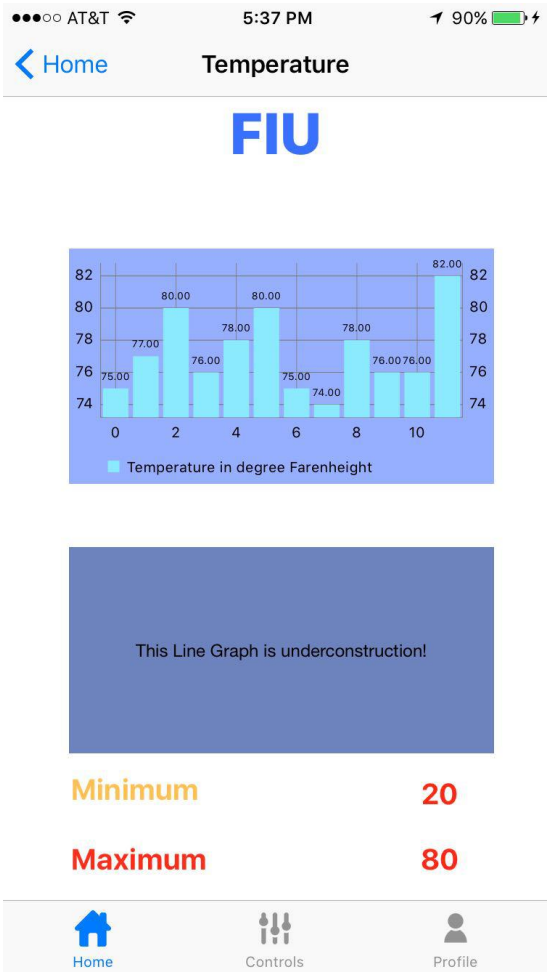
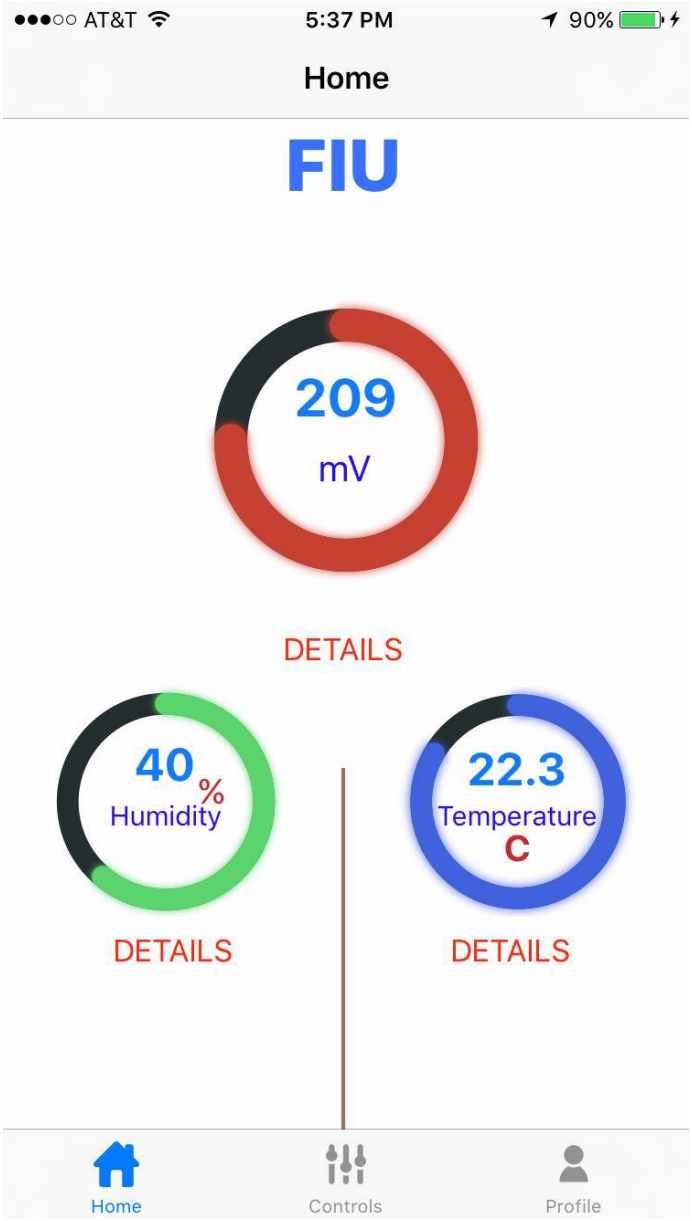


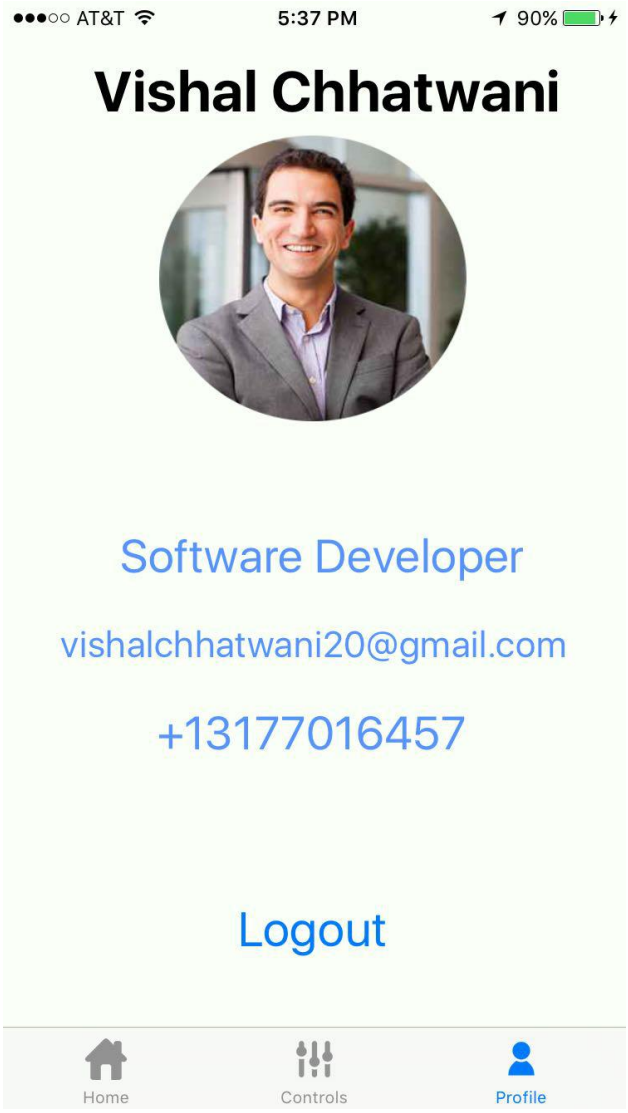
Figure 42- Class diagram for User Story #168

Appendix B - User Interface Design




AT&T
5:37 PM
90%
Home
Temperature
FIU
82
80
78
76
74
75.00
77.00
80.00
76.00
78.00
80.00
75.00
74.00
78.00
76.00
76.00
82.00
0
2
4
6
8
10
Temperature in degree Farenheight
This Line Graph is underconstruction!
Minimum
20
Maximum
80
Home
Controls
Profile


●●●○○ AT&T
5:37 PM
90%
Home
FIU
209
mV
DETAILS
40
%
Humidity
DETAILS
22.3
Temperature
C
DETAILS
Home
Controls
Profile


●●●○○ AT&T
5:37 PM
90%
Vishal Chhatwani
Software Developer
vishalchhatwani20@gmail.com
+13177016457
Logout
Home
Controls
Profile

Appendix C - Sprint Review Reports

Sprint 3
Attendees: <Visha Chhatwani,Xin Zhao, Zhiyuan Shi>
Start time: <3:00 pm Oct 7>
End time: <4:00 pm Oct 7>

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:
User Story <126> Read data from sensor
User Story <127> Display data on the app
User Story <140> Download patients' monitoring data
User Story <172> List all patients

Sprint 4
Attendees: <Visha Chhatwani,Xin Zhao, Zhiyuan Shi>
Start time: <3:00 pm Oct 21>
End time: <4:00 pm Oct 21>

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:
User Story <150> Open a profile page
User Story <153> Open a login page
User Story <156> Make a home page UI

Sprint 5
Attendees: <Visha Chhatwani,Xin Zhao, Zhiyuan Shi>
Start time: <3:00 pm Nov 4>
End time: <4:00 pm Nov 4>

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:
User Story <158> Design the interface for iPhone 5 screen

User Story <159> Read data from new sensor device
User Story <165> Register for the system on cloud
User Story <166> Log into the system
User Story <167> Log out of the system
User Story <175> Design the sensor control page on iOS app

Sprint 6
Attendees: <Visha Chhatwani,Xin Zhao, Zhiyuan Shi>
Start time: <3:00 pm Nov 18>
End time: <4:00 pm Nov 18>

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:
User Story <152> Show line graph on iOS app
User Story <160> Login feature on iOS app
User Story <161> Convert hexadecimal data format into decimal
User Story <168> View a patient's heart rate data in a chronological line graph
User Story <169> View a patient's body temperature data in a chronological line graph
User Story <170> View a patient's blood pressure data in a chronological line graph
User Story <171> Add/Delete patients

Appendix D - User Manuals, Installation/Maintenance Document, Shortcomings/Wish list Document and other documents

Installation/Maintenance Document

Cloud Service Installation

1. System requirement
2. Operation System deployment
3. Running Environment deployment
4. Web application server installation
5. Database Installation
6. Bio-sensing cloud service installation

Shortcomings/Wish List

1. Display the data in a real time line chart in the mobile application
2. Add/Drop patients in the cloud service platform

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