



Occupancy Engine USER MANUAL

Team Project Group 8

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Revision Sheet

Release No.	Date	Revision Description
1.0	4/24/2015	Initial Revision

USER MANUAL

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1.0 GENERAL INFORMATION

1.1 System Overview

The Occupancy Engine system is intended to accurately quantify the number of people in each room of a selected building. It is based on the information coming from different sensors. All the received data is stored on a database. This historical data is used for different queries and analyses. The system provides a user interface which shows the occupancy in every room. It also provides different reports and executes queries according to the data search, entered by the user. Based on the historical data, the system performs further analyses for the calculation of the occupancy pattern and for the future occupancy prediction. The system also calculates confidence level for a number of people in a room by using all the confidence levels for each of the doors, connected to this room. The confidence level comes from the sensors located at the doors. When enough data is gathered, the confidence level will be calculated, based on the number of people, moved through the particular room and make the automatic corrections, made from the system for the doors, connected to the same room. The system then makes automatic correction of the errors. Error handling module performs automatic check-errors and correct-errors functions. Automatic procedures for checking errors and making errors correction are executed after every transmission of data. There is also checking rules procedure, which is scheduled periodically at a pre-defined time and interval (i.e. every night at 00.00) and performs automatic checking and error corrections according to user-defined rules. Using these rules, the system will be able to determine unusual activities in a room and correct them, tracing them back to the entrance/exit of the building using breath first search algorithm. Later on, when there is enough data for analyses a system could creates its own set of rules based on the historical data. All automatic corrections, made by the system, are stored in the database for further analyses. Set of tables are provided for the system parameters for rules, crowdedness, period and time for scheduled procedures for error handling module and occupancy convex calculation.

1.2 Points of Contact

For additional information, Team Group 8 can be contacted through Project Leader Aleksandar Rusinov (aleksandar.rusinov.13@ucl.ac.uk).

2.0 SYSTEM SUMMARY

2.1 System Configuration

The system is web based, it contains modules for data receiving, storing and processing, MySQL database, web site with responsive design built using foundation framework. Additional modules for system initialization and simulator of data transmission from hardware sensors are provided. Overall structure of the system is shown in Fig. 1.1

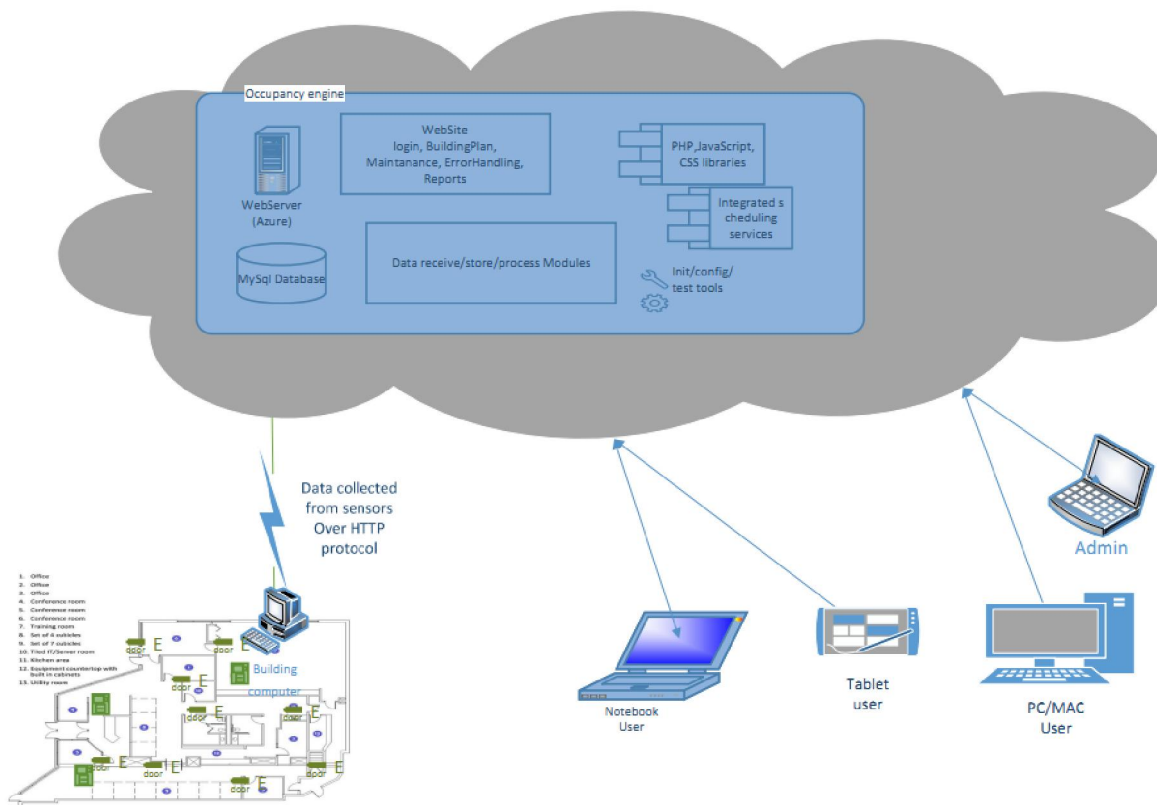


Fig. 1.1 System overview schema

2.2 Data sending mechanism

The below diagrams describe flow of the process of sending sensor data form monitored building to server with installed QOE. System supports data from 3 types of sensors – Doors, Room and Wi-Fi.

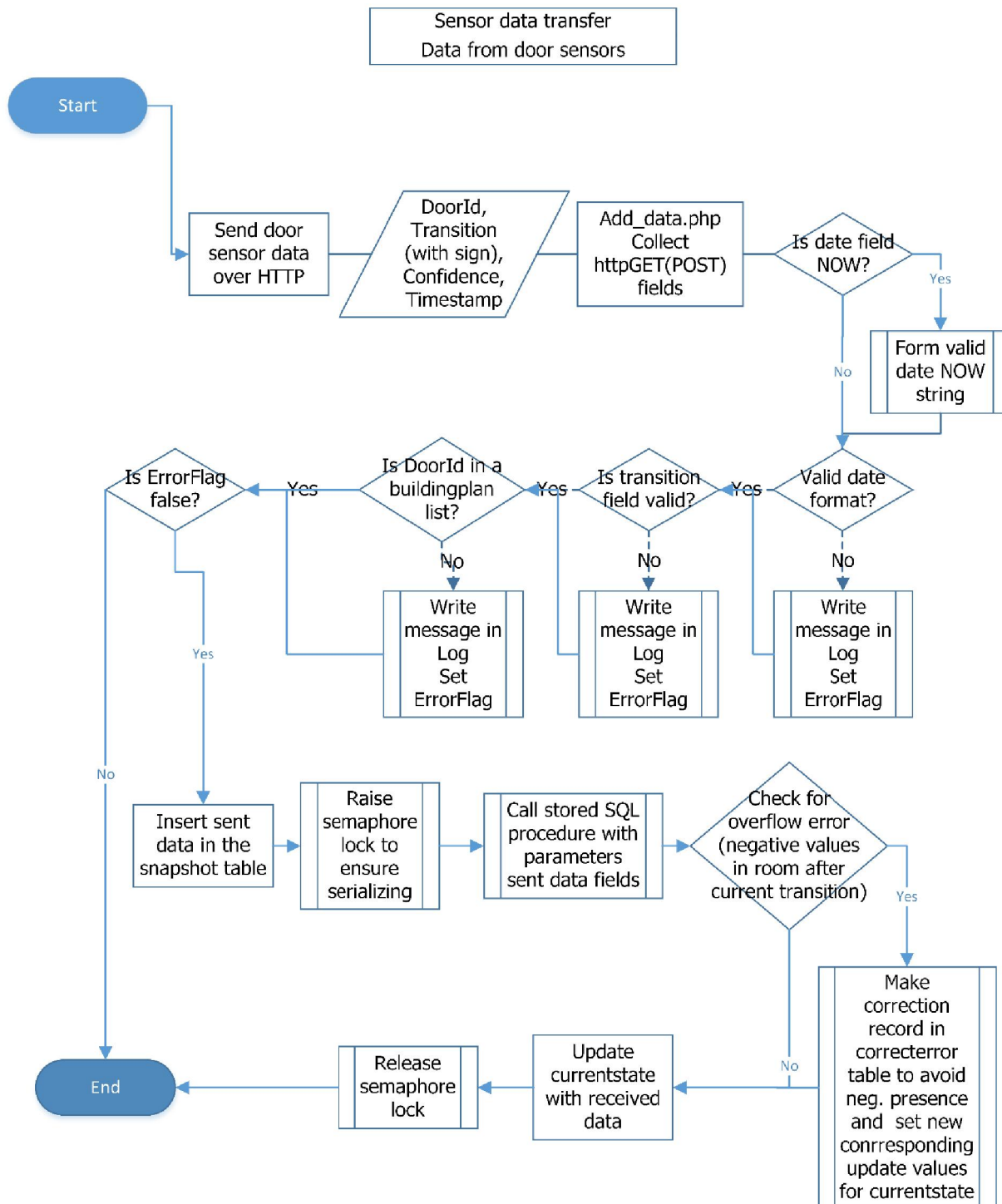


Fig. 2.1 – Send data from door sensors

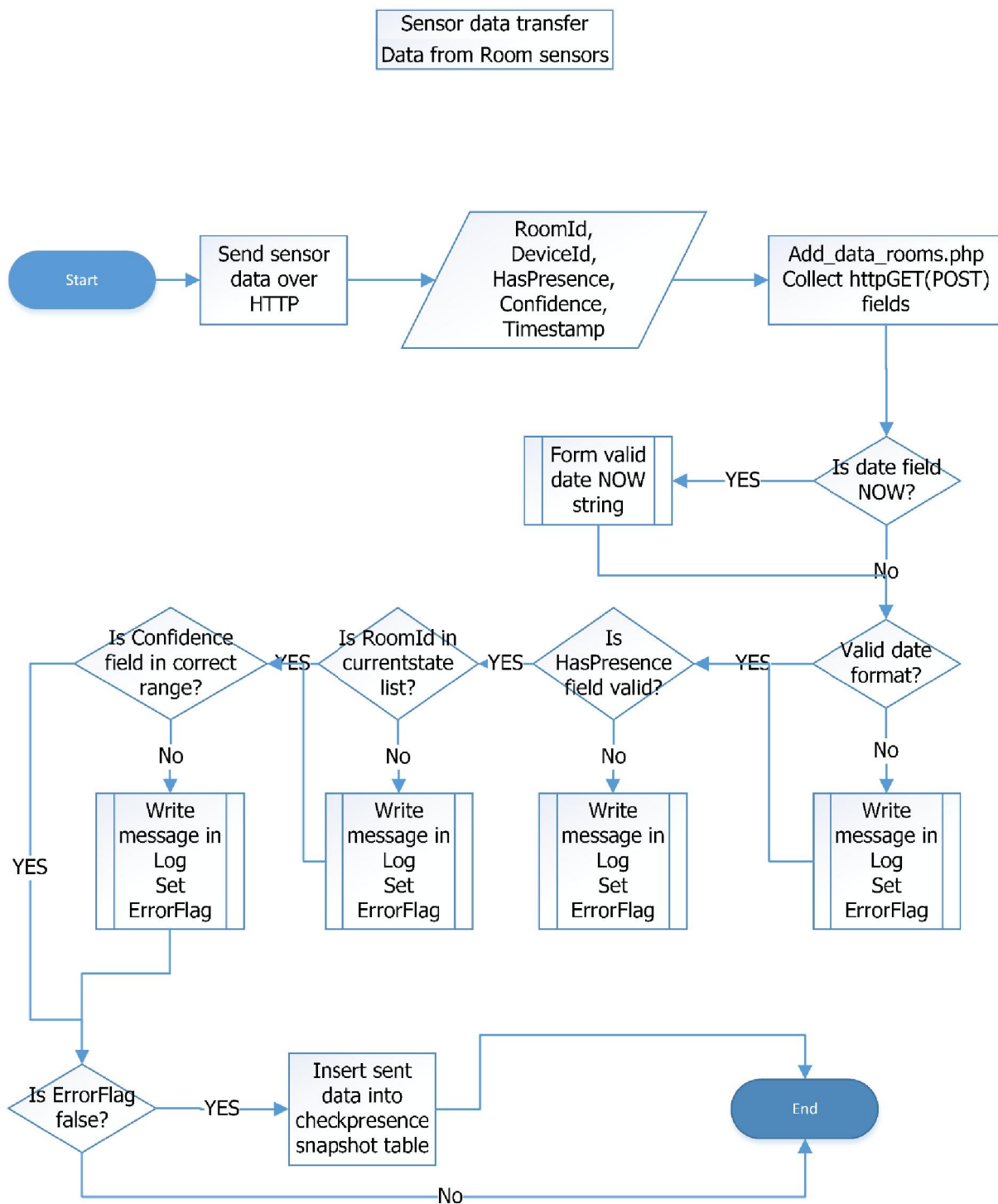


Fig. 2.2 – Send data from room sensors

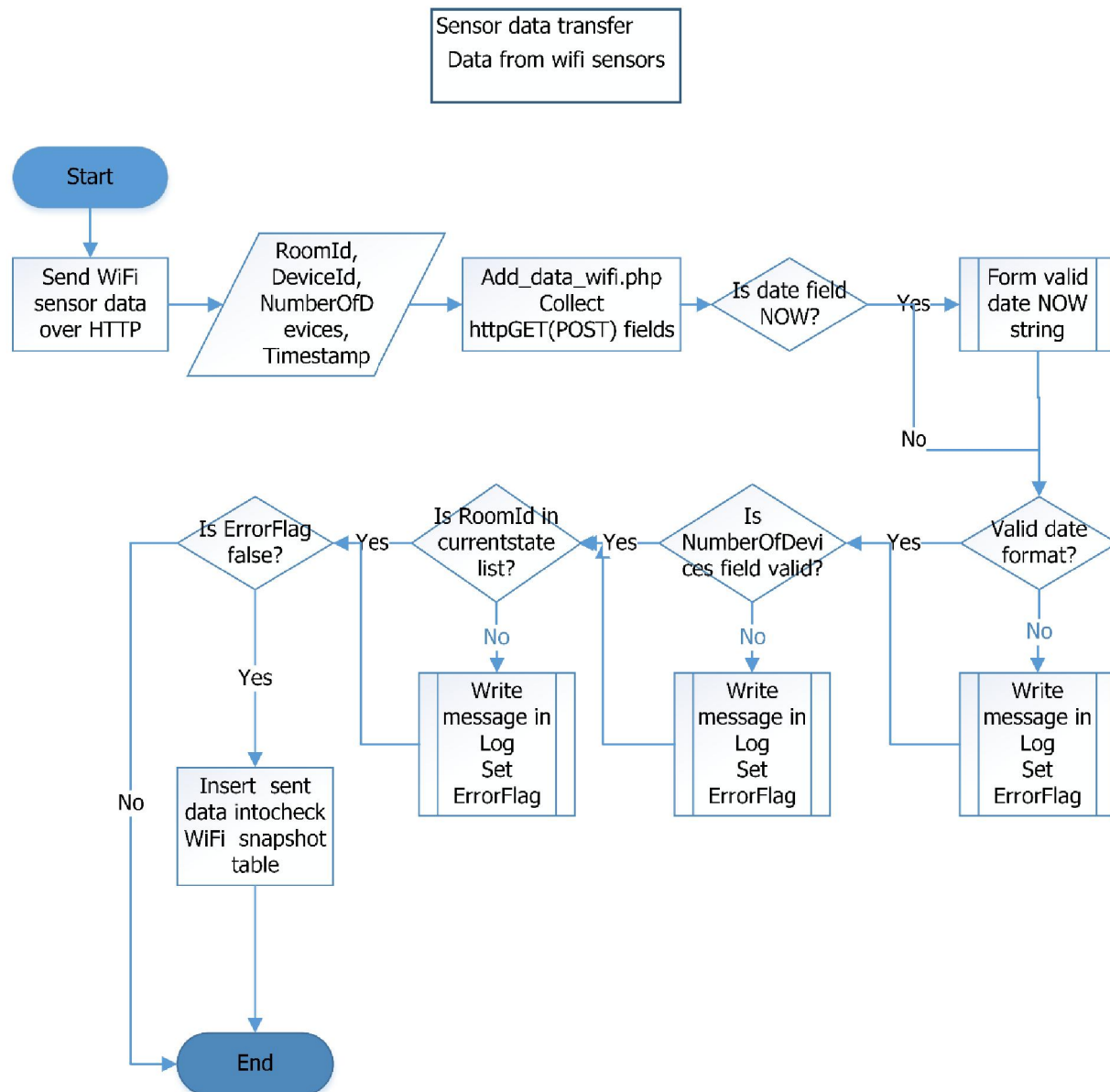


Fig. 2.3 – Send data from Wi-Fi sensors

2.3 Client side Function Flows

The below diagram describes the normal flow of the QOE in client interaction part.

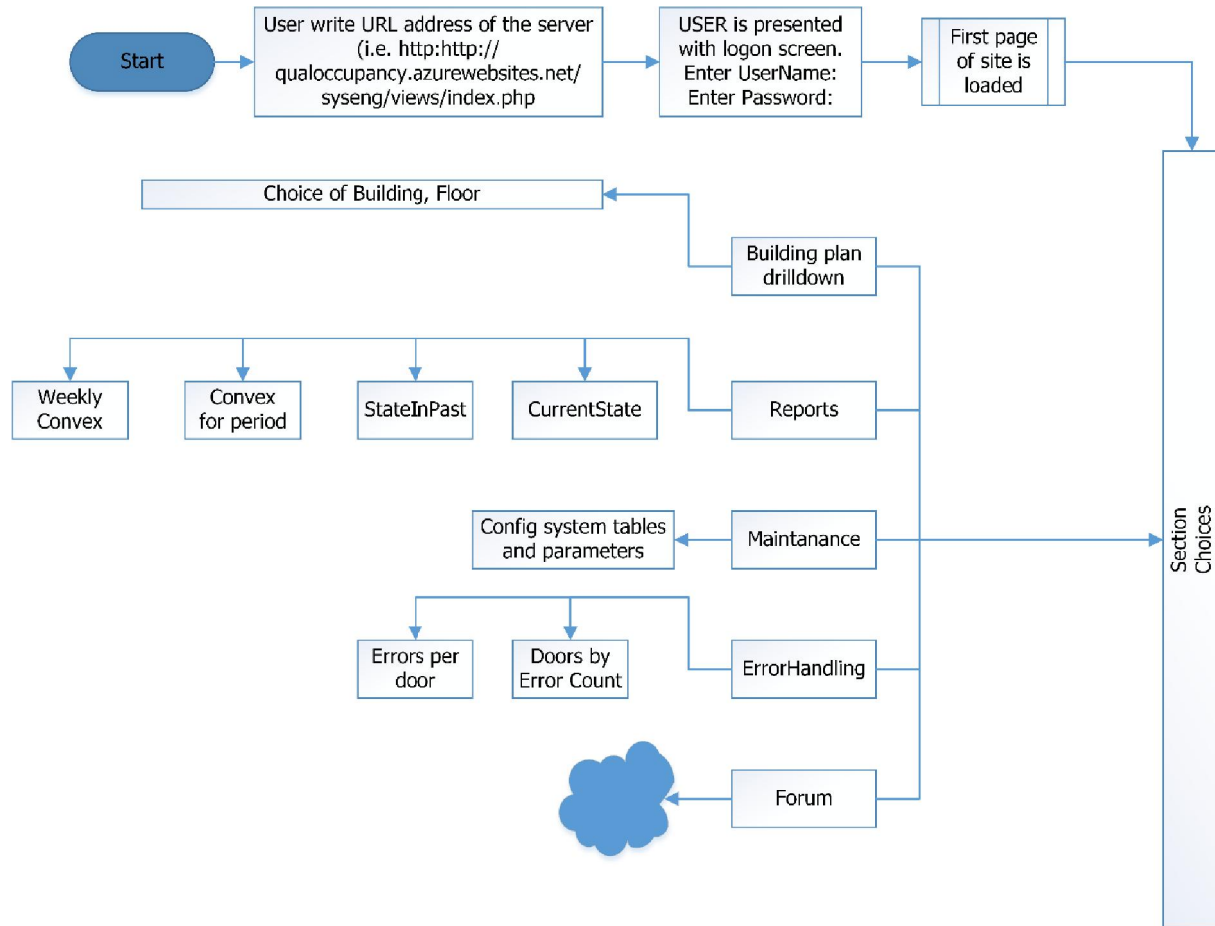
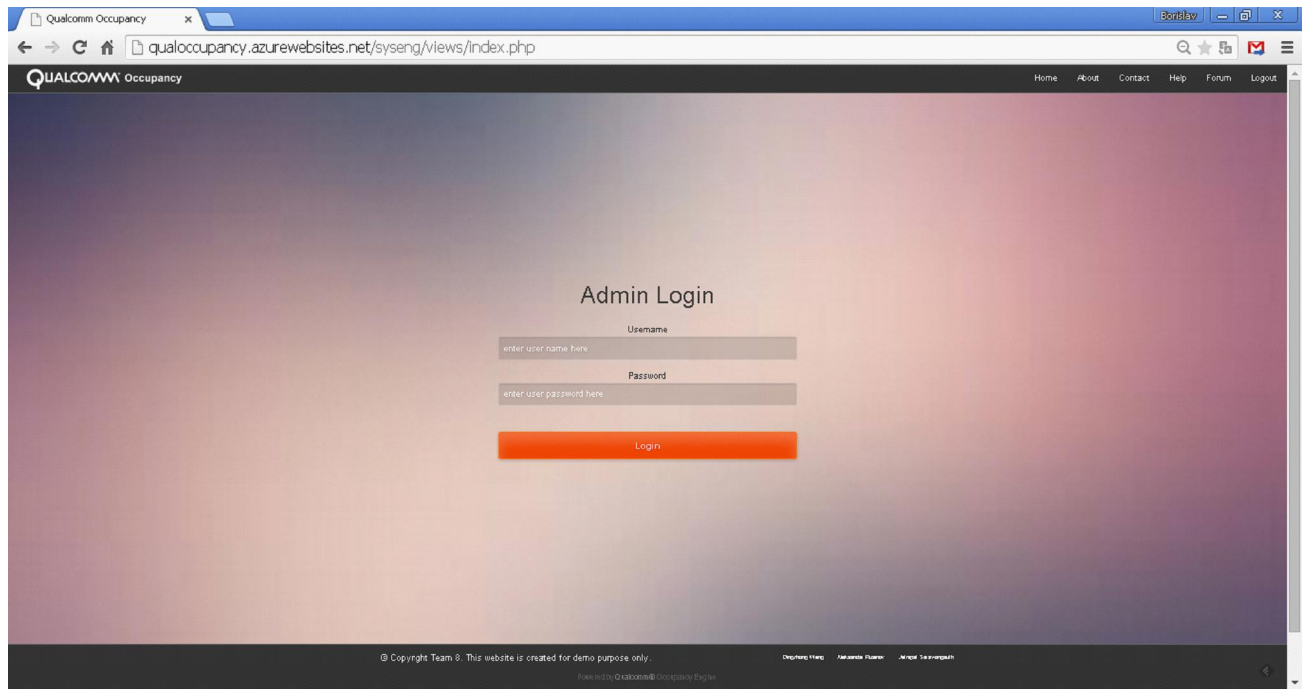
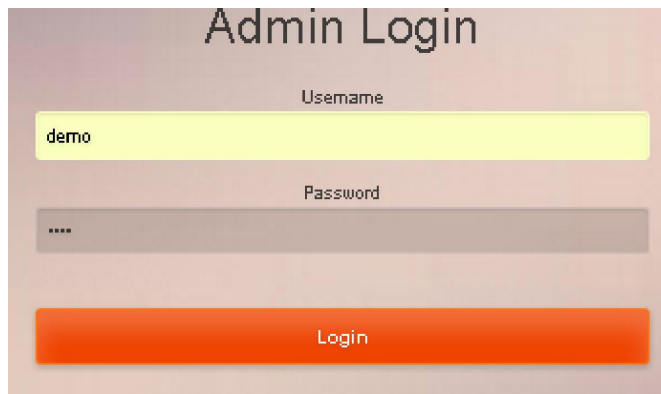


Fig. 3.1 System use diagram

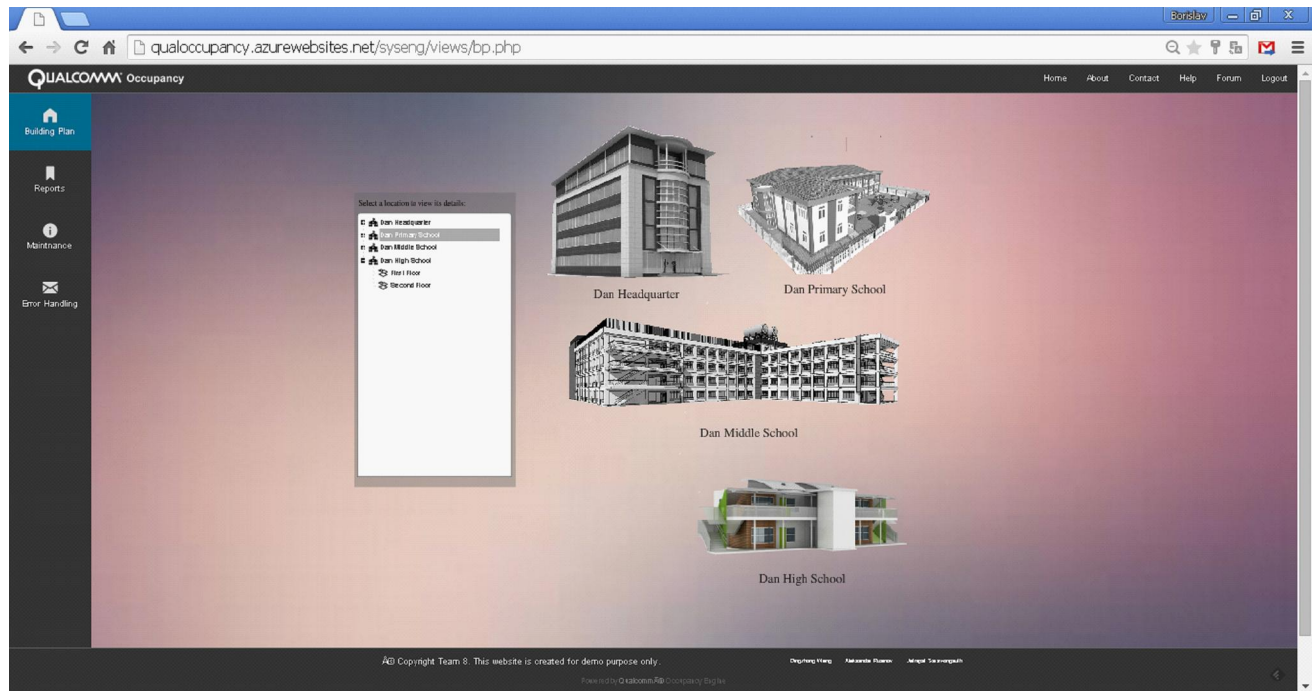
2.3.1 Login screen



These screenshots shows the first page the user will be directed to when they try to access the website. Only authroised users are allowed to access the content of this page. For this example, the username is *demo* and the password is *demo*.



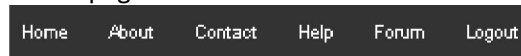
2.3.2 Main QOE screen with Building Plan



The screenshot above shows the main home page for the website. It displays all the different buildings the users can select in order to view the occupancy of the floors. The user can either pick a building from the list of buildings on the box on the left hand side or select on the picture of the building.

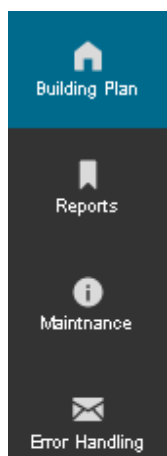
There are also two option bars on the page. :

- top navigation bar:



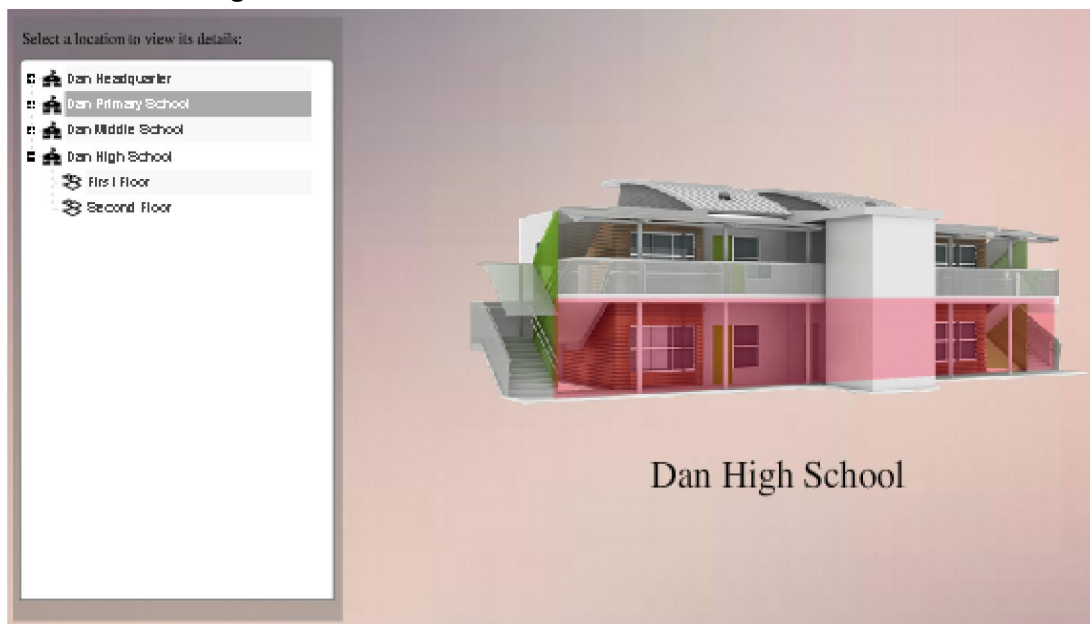
The top navigation bar allows the user to access the basic utility pages including About, which gives the information about this project, Contact, which gives contact information to the user, Help, which takes a user to a FAQ page where they can find help, Forum, which takes the user to the forum page where other users or admins have posted threads and lastly the logout button.

- left side menu bar:

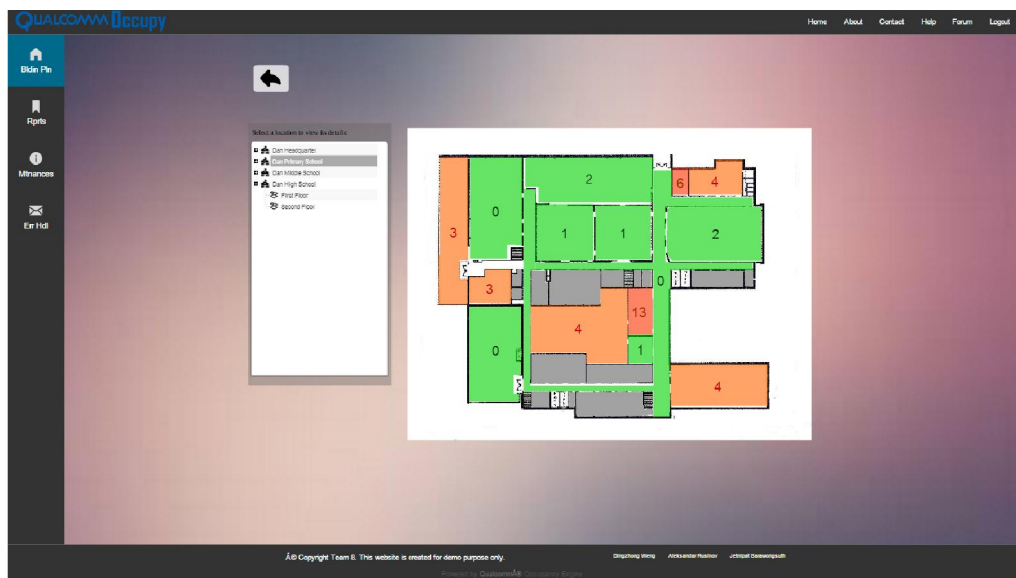


The left side menu bar gives the user the option to view the building plan, show the report, take the user to the maintenance and an error handling page.

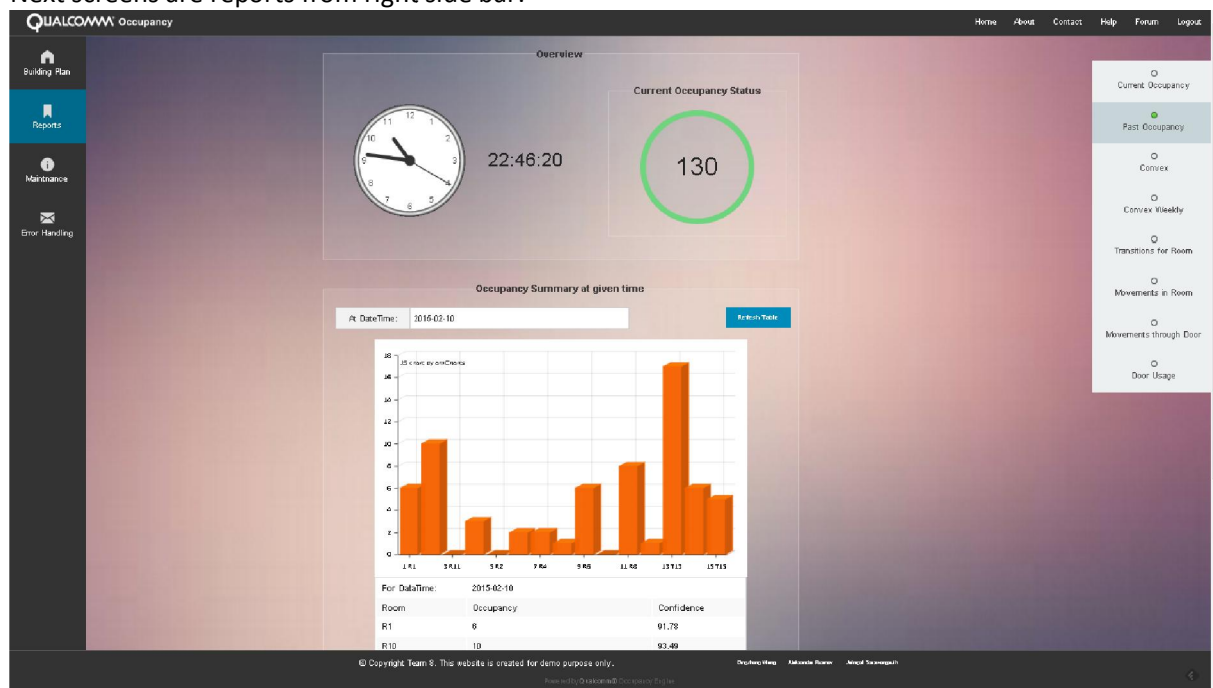
- floor from building:



Once the users have selected a building, they will be able to select the floor on which they want to see the occupancy. They can either select this from the left side box or they can click on the floor on the picture. Once selected, the screenshot below illustrates the page that the user will see. It shows the floor plan of the building. The numbers shown in the rooms and corridors are the number of people currently occupied in those rooms/corridors. There are colour codes as well to indicate how crowded each room or corridor is. Red indicates a crowded room while green indicates a less crowded or an empty room.



Next screens are reports from right side bar:



This screenshot shows the Past Occupancy report page which is used to give an overview and some analytics on how the occupancy of each room changes over time. The users will be able to select the date interval on the period of which the data should be displayed. This has been implemented in a way that it is quick and easy to use.

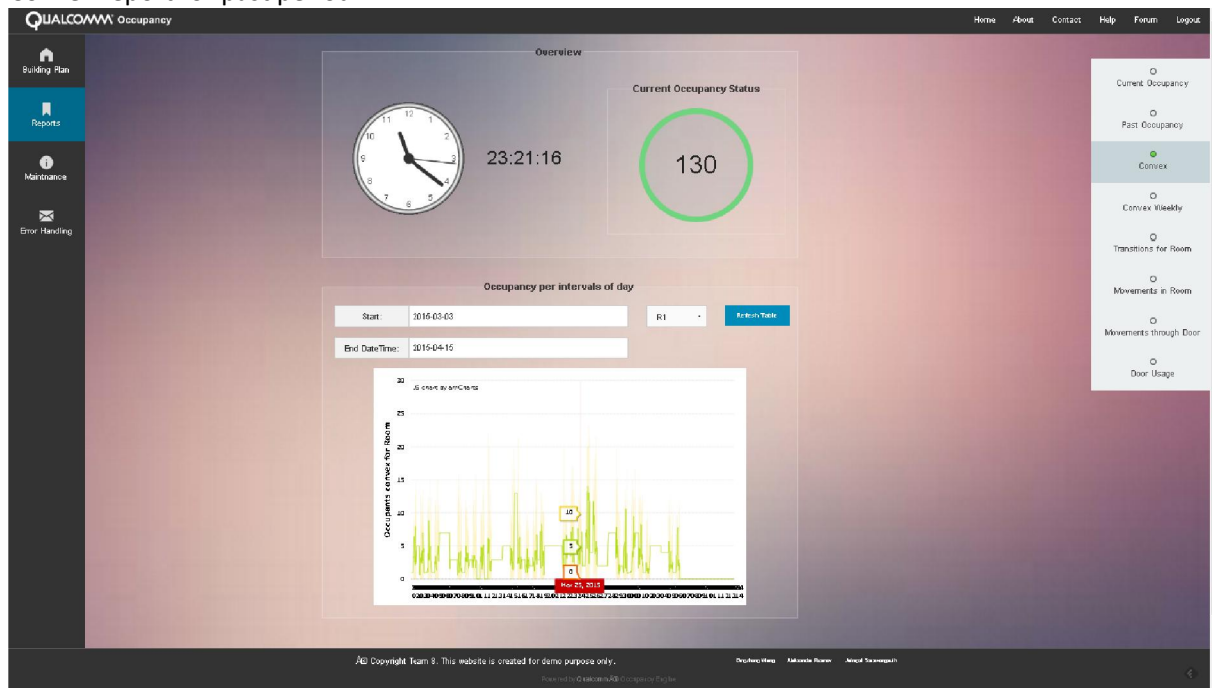
Start: 2015-03-03

End DateTime: 2015

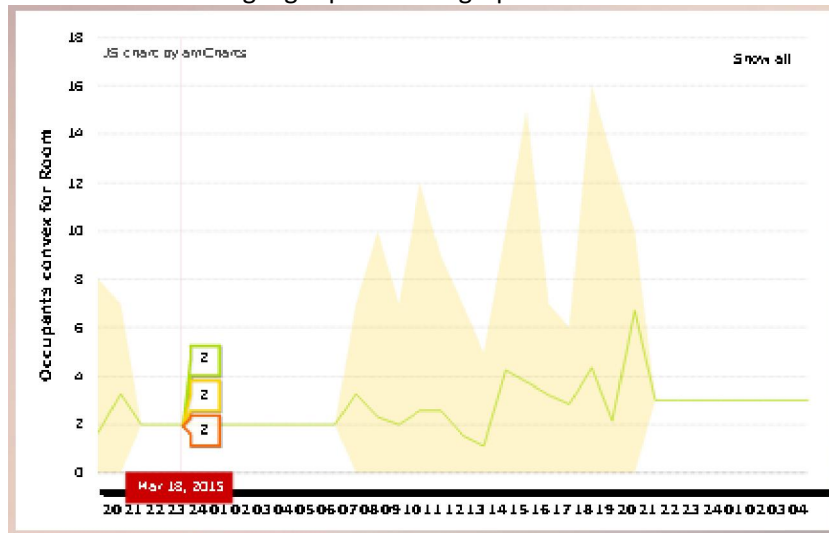
JS chart of:

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

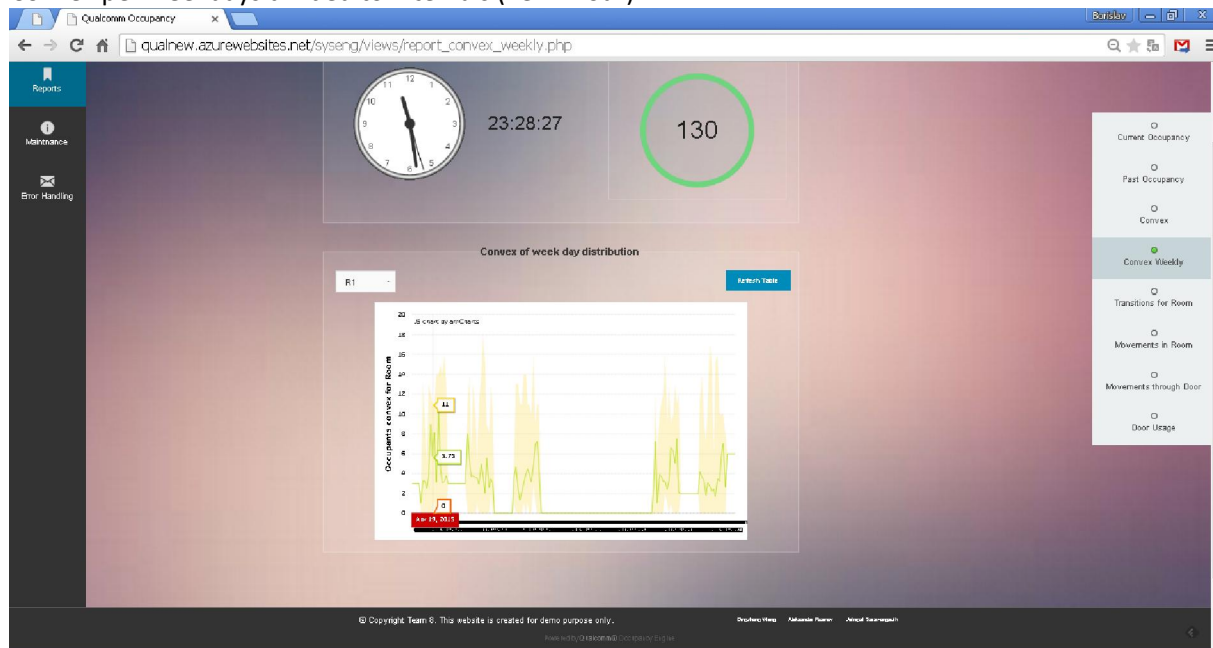
Convex report for past period:



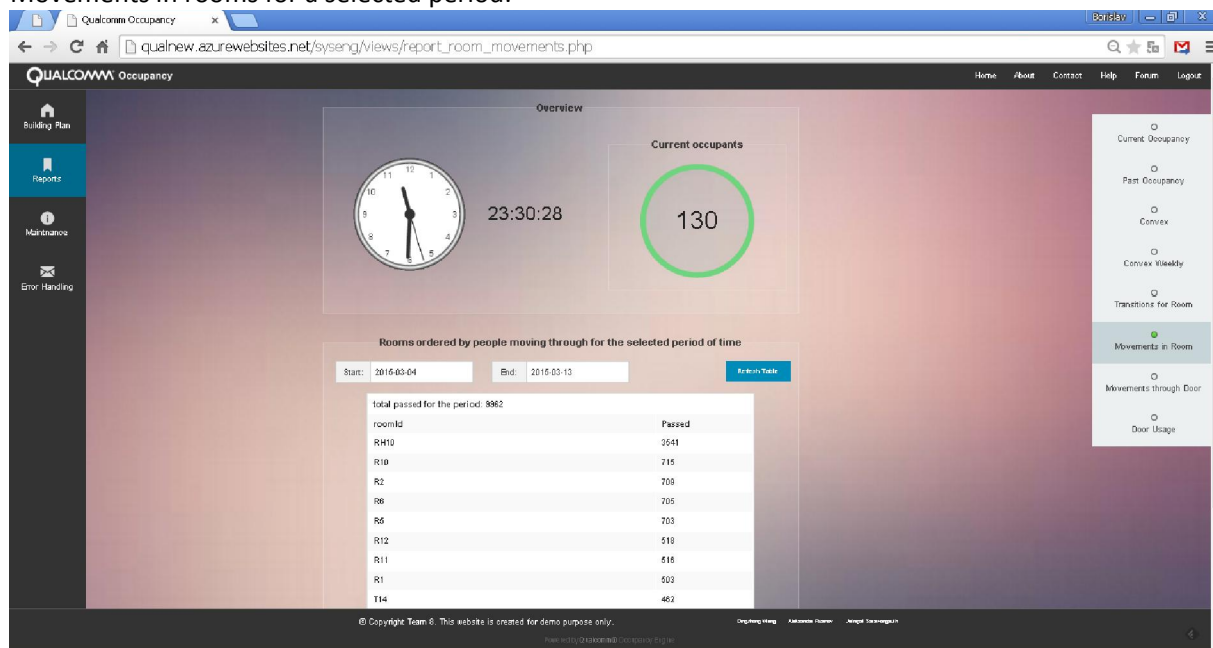
Here the user can highlight part of the graph in order to zoom in and focus on a certain period of time.



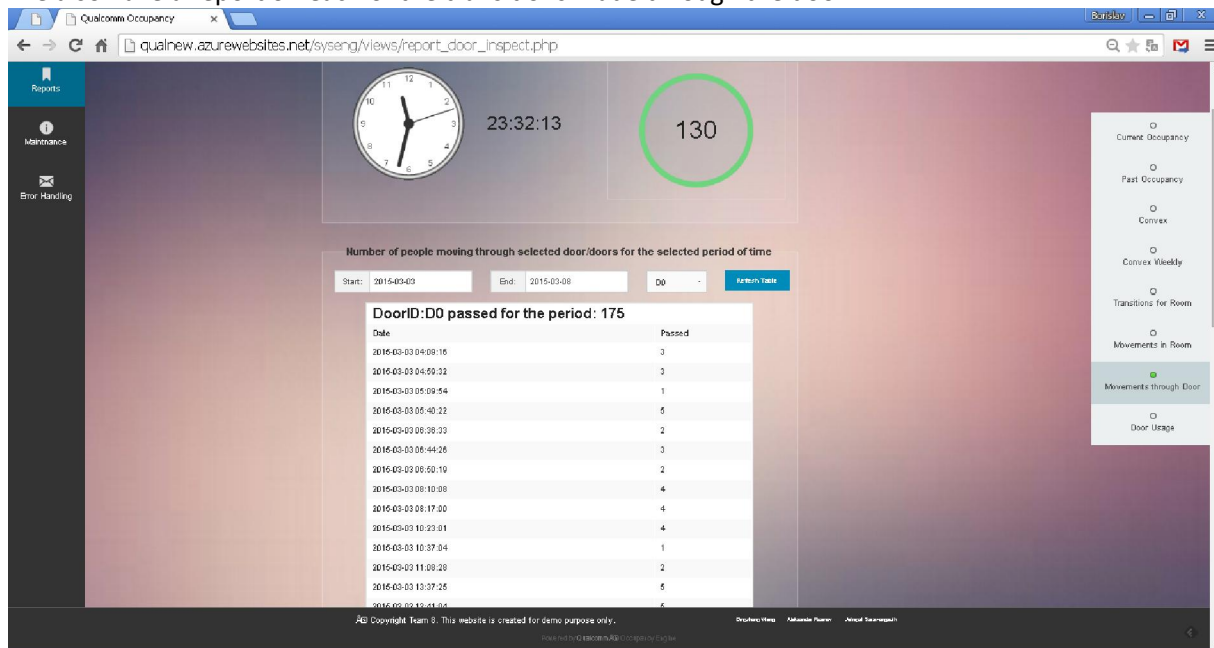
Convex per weekdays divided to intervals (i.e. 1 Hour):



Movements in rooms for a selected period:



We also have a report on each of the transitions made through the door:



Movements through all doors per selected period:

Doors ordered by people moving through for the selected period of time

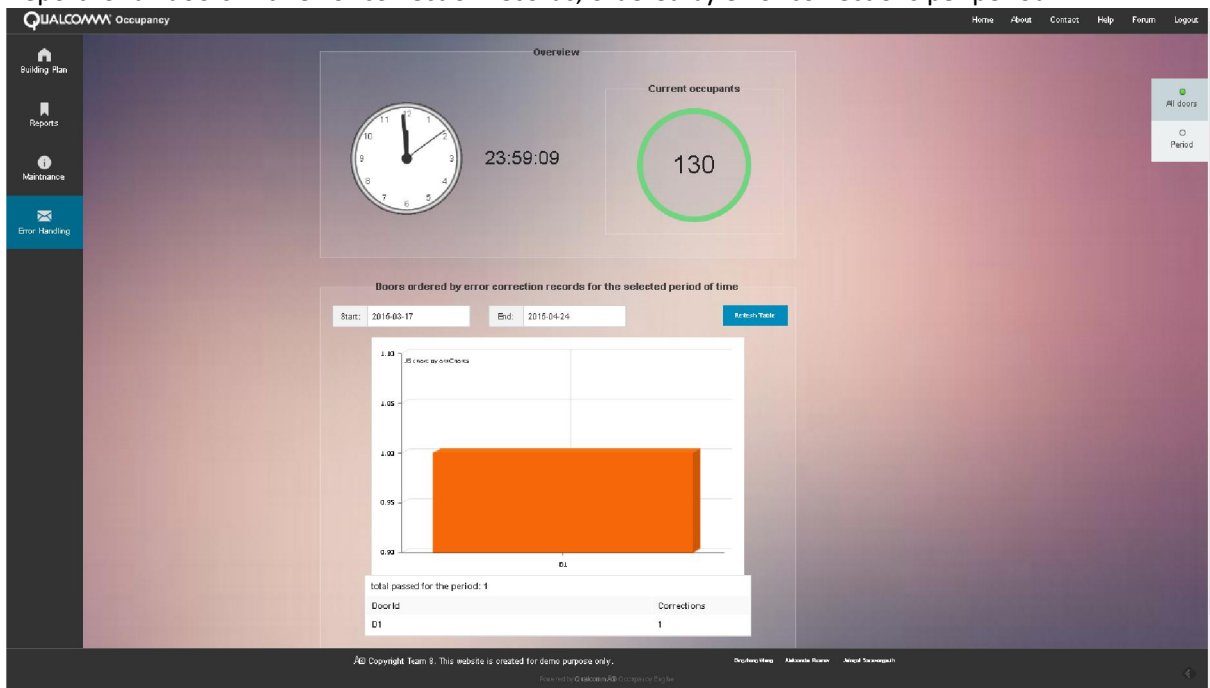
Start: 2015-03-09 End: 2015-03-16 [Refresh Table](#)

total passed for the period: 3631

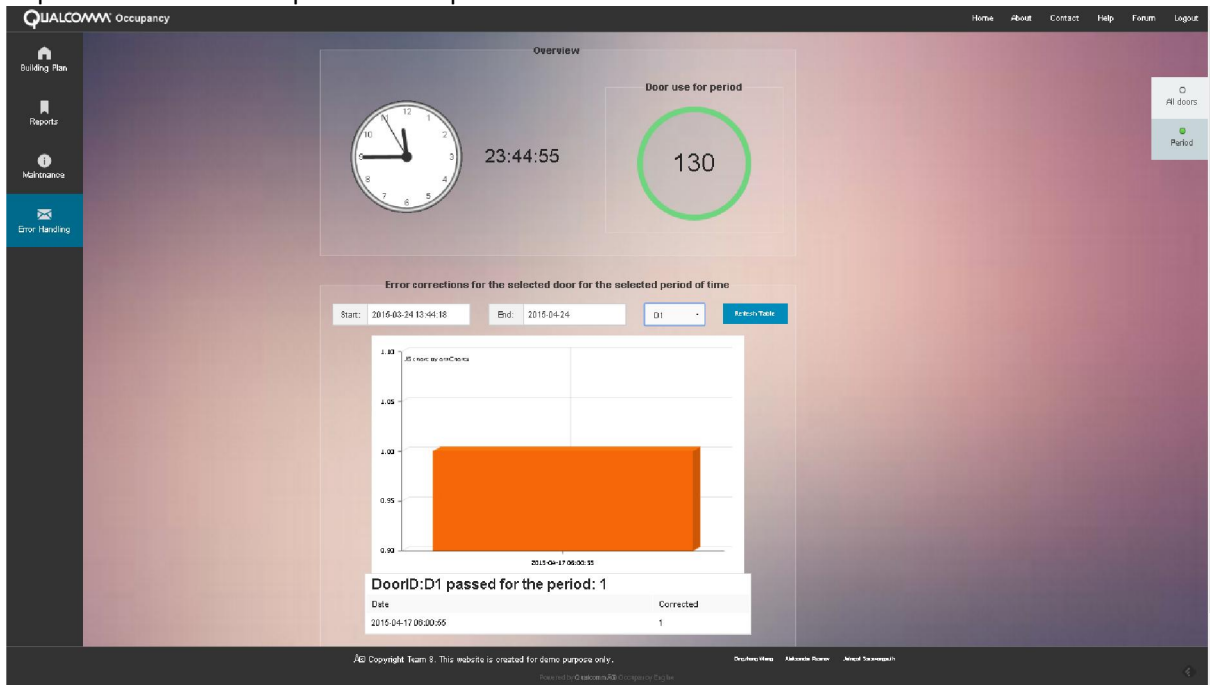
DoorId	Passed
D15	224
D1	218
D11	215
D12	201
D0	195
D5	194
D16	191
D2	186
D7	185
D10	177
D8	176
D6	171
D14	169
D13	168
D19	163
D18	152
D4	150
D9	149
D17	142
D20	133
D3	132

2.3.4 Error handling section

Report for all doors with error correction records, ordered by error corrections per period:



Report for error records per door and period:



3.0 SYSTEM FUNCTIONALITY

- The system receives online data sent from different sensors that after format and logical validation is stored in the database.
 - from door sensors
 - from infrared room devices
 - from Wi-Fi devices
- It can accurately quantify the number of people in each room of a selected building, after each transition based on the information coming from different sensors.
- It calculates the confidence level of the number of people in every room, based on the confidence level received from the door sensors. When the system has aggregated enough historical data, the system could calculate the room confidence level from the collected historical data.
- Error Handling Module - according to our client requirements, the system makes automatic correction of the errors.
 - The error checking and correction procedures are executed after every transmission of the data to ensure that we pick up any inconsistencies and errors on time. After checking the data recently received, the system automatically makes all necessary error corrections.
 - Another checking procedure is scheduled at night. On the base of information from door sensors and room devices. This procedure checks and compares occupancy in the rooms with the pre-defined set of rules. Using these rules, the system will be able to determine any unusual activities in a room and correct them, tracing them back to the entrance/exit of the building using breath first search algorithm. Later on, when there is enough data for an alyses, the system can create its own set of rules.
 - Checking procedure between the room sensor data and the door sensors data – making corrections where inconsistencies are found.
 - All automatic error corrections, made by the system, are stored in the correct error log table.
- The room occupancy pattern – the occupancy convex procedure is used to find the pattern of the room occupancy - people presence in each room at certain times. We calculate the minimum, maximum and the average (mean) number of people in each room at a certain period of time (based on data stored for 10 weeks). Results are stored in a table and may be used for a smart error correction and reports base.
- Responsive design User interface with:

- Building plan displays the real time data from the database – current number of people in every room.
- Reports for:
 - Current and past occupancy along with presence confidence level, with possibility for the user to select room, door, past period time interval.
 - Reports for occupancy convex (pattern)
 - Movement for a past period
 - Occupancy pattern for day of week. Graphical report allows drill down for periods.
- Java Simulator for sending data from hardware sensors.
- PHP module to create and load test samples of historical data.