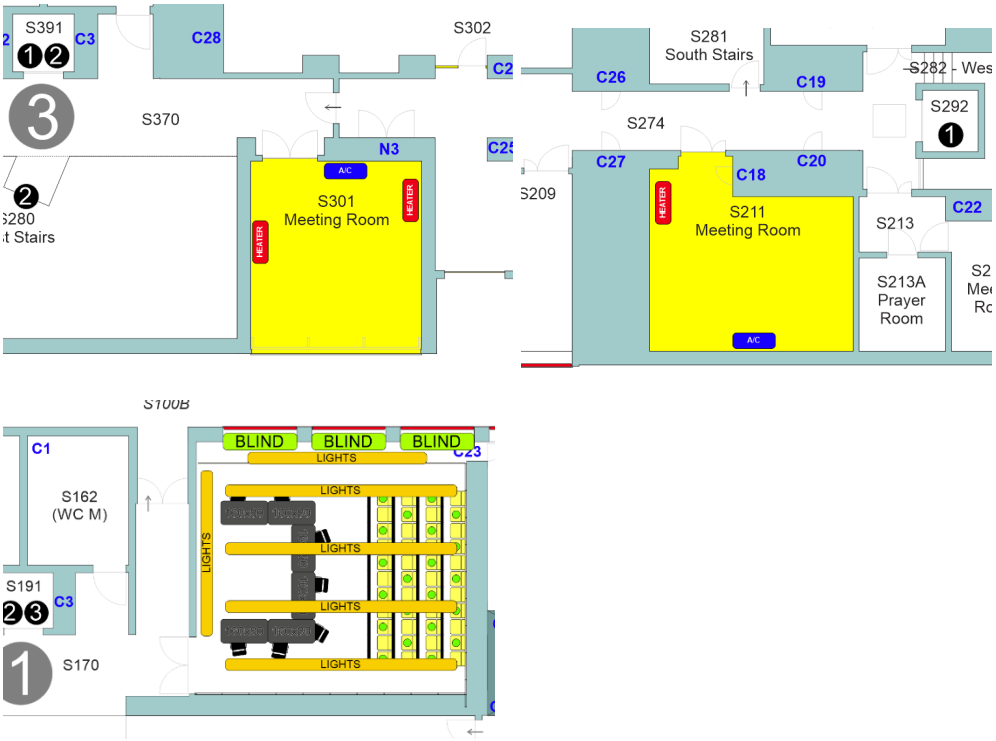
Smart Meeting Manager

Context

A crucial aspect of the daily operation of any research organization is the realization of meetings of diverse purposes, ranging from typical project meetings, student supervision meetings, and management meetings. The effective management of the occupancy of these meeting rooms is fundamental to ensure that the lab can ensure presential (or mixed) meetings.

The CISTER building has several spaces to hold meetings. On the ground floor stands the auditorium which has space for 29 participants. In the middle and upper floors, two other meeting rooms exist, of smaller dimension, being that the meeting room on the middle floor has space for 6 participants and the meeting room in the upper floor has space for 10 participants. The number of participants is the one dictated by the current pandemic situation. Location of Auditorium S101 and Meeting Rooms S211, S301 including systems at each room (Heater(s) + A/C for meeting rooms, Blinds + lights + central HVAC for Auditorium)



Each meeting room has also its own independent, smart air conditioner and one or more smart heaters, which can be used to regulate the temperature for meetings that are scheduled with sufficient time in advance. Regarding the auditorium, it has its own climate control system (HVAC - heating, ventilating and air conditioning) and has 3 smart blinds that can be controlled; the same applies to the lighting system which can be remotely controlled by an authorized user.

Objective

The objective of this project is to design and implement a prototype of a Smart Meeting manager (SMM) for the CISTER building. The SMM shall consider the three meeting rooms previously introduced: the auditorium, and the meeting rooms of the middle and upper floors. Besides the lighting and temperature

control facilities in each room, you can assume that it is possible to add to the rooms extra smart sensors/actuators that you see as necessary to implement the functionality required[1].

SMM User Functionalities

The SMM must allow CISTER researchers to schedule meetings in the available rooms, enforcing the established maximum capacity. During the meeting registration process, the SMM must also allow the user (typically a CISTER researcher or someone from one of the support teams) to configure temperature and lighting settings. By default, i.e., if the user does not enforce specific lighting and temperature conditions, the system will adapt the room to suited lighting and temperature conditions (based on local sensors and external weather information), starting, whenever possible, in advance to the actual time of the meeting to ensure that the conditions are in place when the meeting starts.

Apart from planned meetings, the system should also offer the functionality of arranging spontaneous meetings. For instance, two researchers may start discussing an interesting topic during a coffee break and decide to keep up with the discussion for some time more in one of the meeting rooms. Starting one of these types of meetings requires one of the attendees to have his NFC card read by the card reader associated at the entry of each of the rooms (auditorium room included, although the door can be opened without reading the card). To associate the other participants, the door must be kept open, and the next attendee must pass her/his card within the next 1 minute.

Spontaneous meetings can have a standard duration, and a simple way to extend them must be devised.

SMM Administrator Functionalities

The SMM administrator must be able to make changes to any of the schedule meetings, eventually in communication with the organizer, and with automated messages to the involved parties. The implementation of a dashboard is optional, but highly encouraged.

Tasks

The goal of this project is to implement the above functionalities. Furthermore, being a critical system, the system should be enriched with measures to prevent or mitigate failures. More concretely, the core tasks of this project are:

- **T1: Hazard analysis.** A list of potential hazards should be produced, indicating how each of these could be mitigated. This list could include hazards that are only identified but not addressed by your implementation. An initial list is included in the next subsection.
- **T2: Embedded components.** There should be embedded components to (1) read the sensor data, and (2) the control specific devices (the component's software should use code written in assembly).
- **T3: WSN network.** WSNs should be used whenever possible.
- **T4: Hazard mitigations:** Extra components used to mitigate hazards, e.g., use two temperature sensor nodes, should be properly implemented and validated.

These 4 tasks may be carried in parallel, could have intersection points, and are not meant to be carried sequentially.

[1] which will need to be simulated in this project due to limited availability of such sensors/actuators and the inherent dangers of damaging the building facilities during testing or someone getting hurt.

Initial Hazard Analysis

An initial list of hazards and mitigations can be found in the table below. All the listed hazards should be addressed in this project. You should complete this table and extend it with new hazards and mitigations, even if you do not plan to address these.

Hazards	Mitigations
A temperature sensor may be giving wrong data due to local interference (e.g. sensor is isolated by some material).	Use 2 sensors per area, provide some way to identify faulty data and act to sort the situation in the long term (e.g. message to maintenance department).