

# A Smart Room

Intelligent Building development is becoming an essential topic in the building domain. Using smart technology, we can transform a standard building into intuitive, self-restoring, and sustainable. Information technology shapes the development of intelligent buildings influencing the way we work and the space in which we do it. The building behaves by its occupants' needs. However, to cope with the complexity of designing such an intelligent building, we need to use models to represent the structure and behavior (the services) of an intelligent building.

A model is a representation of one or more concepts that may be realized in the physical world. The model describes a domain of interest where a field may correspond to an application area. A model is an abstraction that does not contain all the details of the modeled entities within the domain of interest and the features needed to address the model's intended use.

## Assignment

Using the Systems Engineering approach based on a Model-Driven methodology (SYSMOD), design, implement and verify a SysML model of a Smart Room System (SRS).

The Smart Room contains:

1. *Intelligent lamps, HVAC, fire sensors and movement detection sensors, CO2 sensors, and occupancy sensors.*
2. *A communication system, an audio-video system.*
3. *A security and access system.*
4. *At least two touch panels for interaction with the users.*

The SRS provides services as:

1. *Monitors and controls the air quality in the room.*
2. *Weather prediction to monitor and control the temperature in the room in an intelligent way. The temperature and the lighting in the room are based on the human presence in the room.*
3. *The user can remotely access all the services provided.*
4. *Secure the room 24/07.*
5. *Communication session between different teams.*
6. *Presentations facilities.*

7. *Automatically implement lighting scenarios for different activities as: communication, presentations,...etc.*

## Methodology

Create a SysML model of SRS, which contains the main structural characteristics of DTSR and its services. Test and validate the SRS by executing the behavior of the SysML models.

To successfully implement the SRS system, you have to follow the following approach:

1. Understand the problem and project contexts
2. Gather and model the requirements of the SRS using SysML Requirement Diagrams. Group the requirements in different packages.
3. Create a System Context Diagram of the SRS; decide which actors (systems) interact with the SRS (ex. Electricity, users) and use a SysML Block Definition Diagram of Internal Block Diagram to represent the context of the system.
4. Create a structural model of the SRS - the architecture of the SRS, using SysML structured diagrams.
5. Model the services of the SRS using Use Case Diagrams. Create an essential description for every Use Case.
6. Model the behavior to the SRS using: Activity Diagrams, Sequence Diagrams, or State Machine Diagrams
7. Populate the SRS structure (the architecture) block components with values, operations, and relationships.
8. Create a GUI in SRS Rhapsody, which emulates a touch panel, presenting how a user can interact with the SRS.
9. Execute and test the model in IBM Rhapsody (use your Visual Studio tool) and integrate it with Unity Game Engine Environment, which is provided to you.
10. Create a short presentation in PowerPoint presenting your results. Don't forget to add your group's number and group members, including ids.
11. Upload the IBM Rhapsody project (Zip it) together with the video(s), PowerPoint presentation, and Canvas report.