Modeling with UML

You are responsible for developing a new location access system for ETHZ. Your client gives you the following description of the problem domain.

The system concerns persons, locations, and access cards. A person is a student, an assistant, or a professor. Each professor supervises some assistants. Each assistant is supervised by exactly one professor. Each professor and assistant has a special location which is called office. Each professor has its own office and no more than 3 assistants share an office. Professors and assistants never share an office. Every location has a special door with controlled access. Every door can provide information about its ID number and the current date. Every door has a light signal device and a card reading device. A light signal can turn red, yellow, or green. A card reader device is responsible for reading access cards. All operations with an access card are performed via the card reading devices. Every person has exactly one card, and each card is owned at most by one person. A card contains information about expiration date of the card and IDs of locations that can be accessed by the card. Each professor and assistant can access his office. Each professor can access his assistants' offices. A student can't access professor's or assistant's office.

Access to a location is initiated by the person who inserts his access card into the card reading device. After this, the card reader requests the access card about its expiration date and the door provides information about current date. If the card is expired then user is notified about it by the light signal device blinking yellow. After this the card is ejected by the card reading device. If the card is not expired then door provides information about its ID and the card reader requests the access card whether the door with the provided ID is accessible or not. If the door is not accessible then user is notified about it by the light signal device blinking red. After this the card is ejected by card reading device. If the door is accessible then user is notified about it by the light signal device blinking green. After this the card is ejected by card reading device, and the door opens for 30 seconds.

Your tasks:

- Create a UML class diagram that models the above description. You should identify classes, relations between them including arities, inheritance, aggregation, methods which you need for other diagrams, and stereotypes.
- Provide a UML sequence diagram for the access to a location.
- Draw a UML statechart diagrams of the door and control object you identified.
- Provide OCL invariants for the classes in your class diagrams. The invariants have to express the constraints in the above description which could not be expressed by the diagram. General well-formedness conditions of the data structures do not have to be specified.