Goal

In this first step of the project, you will create an entity-relationship model (E-R diagram) to describe the data for the application domain described below. The description includes all the main concepts that you will need to model.

ARC is a recreation center with a variety of spaces and equipment. It has a front desk, a cardio room, a weight room, a pool, a yoga studio, and a basketball court. All the spaces have a maximum capacity listed. The cardio room has treadmills, ellipticals, and stair climbers. The weight room has weight machines and free weights. The pool has a lap pool and a leisure pool. The yoga studio has mats and blocks.Each of the above equipment -- weight machine, weights, hoop, blackboard, treadmill, elliptical, stair climber has a unique equipment id, which is an integer. Also, each equipment can be either in-use or is available. If the equipment is in use, it has one person listed as a user. Besides the above spaces listed, all other spaces in ARC are known as “other”.

People in ARC can either be members or employees. Members can be either students, faculty, alumni, or staff, or family of another member. Students, themselves can be either graduate or undergraduate students. Associated with each member is a name, and an address, department, designation, payment information and list of enrollments. Employees can either be student employees or staff. Each employee has an employee id number, and a schedule when they are at ARC. The employees are designated as trainers or desk employees.

All visitors to the ARC (both members and employees) swipe in to enter the ARC premises. The entry times are logged into a timekeeping system. The exit times of all the employees are also logged.

ARC has a variety of sensors that monitor the facility. Location sensors track the location of people within ARC. Occupancy sensors track the occupancy of spaces within ARC. Equipment usage sensors track when people are using equipment. Only members of ARC can use equipment at ARC.

To illustrate how the sensor system in ARC work, consider the following example of a day at the ARC. A graduate student named John enters ARC at 2pm - his original location observed by sensor is “front-desk” at 2pm.. He then moves through corridors after checking in at 2:01pm. Since corridor is not explicitly identified by a name, the system marks John at the location “other” at 2:01. He enters the “weight room” at say 2:03pm for a workout. This causes the location sensor to trigger an event that John entered weight room at 2:03 . Let us assume that John uses a weight machine sometime after entering

the weight room. The equipment usage sensor will detect then John starts using the weight machine W and sends a signal to the ARC's computer system. Assume that a little later John stops using the weight machine. This will trigger the equipment usage sensor to send a signal that the specific weight machine W is now free. Likewise, when John starts using a free weight, the equipment sensing system will raise a trigger about the weight being used by John. When John leaves the weight room, the location sensor will update his location to the new location where he moved to. Finally, when John leaves ARC, the location sensor will determine that John is now outside the building.

ARC organizes events such as yoga classes. Event occur at a given location in ARC and has a maximum capacity, a starting time and an end time. The capacity of the event must be less than or equal to the maximum occupancy of the location where the event is organized. Example of an event is a Yoga class which may occur at the yoga studio. Members of ARC can register for ARC events. For instance, an undergraduate student named Mary may be taking a yoga class in the yoga studio. Same as with the case of John, when Mary enters the yoga room for her yoga class, the system will send a signal to the ARC's computer system, which records her location and the time.

In another part of the facility, a faculty member named Professor Smith is swimming laps in the pool. She is using a lap lane to avoid distractions. Each lane has an associated lane sensor which will detect Prof. Smith in the lane she is at. It will send a signal to the ARC's computer system, which updates the lane as occupied.

At the front desk, a staff member named Jane checks the membership status of people when they enter the ARC. Jane has an associated schedule when she arrives and when she leaves. Her location will be detected similar to that of members as she goes through different parts of ARC. Note that Jane, in the example, is a non-member but she is an employee of ARC. In general, employees can also be members.

Mr. Jones visits ARC to play basketball. He is a member who is also an alumni. The location sensor detects him and sends a signal to the ARC's computer system, which records his location and the time.

These are just a few examples of the many people who could be at ARC on any given day. The sensor readings from ARC can be used to track the usage of the facility, the activities of its members and workers, and the attendance at its events. The data can be used to determine who uses what facilities/equipment, when and how often. Such information is

vital for several purposes such as determining an maintenance schedule for equipment, increasing/decreasing frequency of events, understanding who uses ARC at what times of the day, and how well are different areas of ARC utilized, etc.

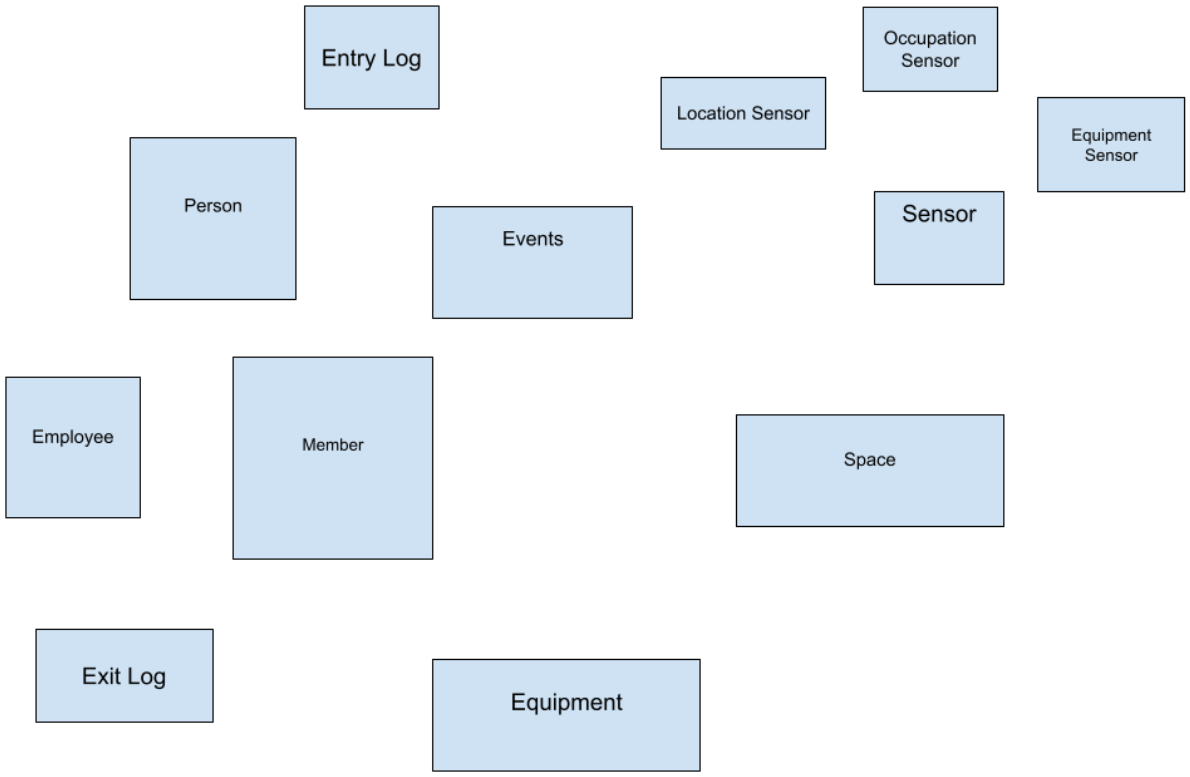
Create an ER diagram modeling the concepts in the above description. To help you with the task, we have provided a template below. All the entities listed in the template should be in your design. Also, none of the entities in the template are marked as weak; if you wish to change that, you may.

You will need to specify two things:

(a) for each entity set identified, you will need to specify all the attributes, including their keys

(b) define all relationships, and make sure to mark all constraints on entities and relationships (key constraints for entities, and cardinality and participation constraints for relationships).

Note that the description above specifies several constraints. Your ER design should try to model all the constraints specified in the description above. Please note that the constraints in the ER model are limited and it is possible that not every constraint specified in the description can be modeled in the ER diagram. If you find some constraint that you cannot model, please specify as a comment.



Submission

Please submit an appended pdf file with your answers to (a) and (b). The name of the pdf file should be the last names of each team member placed together. For example if Edgar Codd, Donald Chamberlin were teammates, they would submit: *codd_chamberlin_assignment1.pdf.* Be sure to also identify all the team members in the pdf file (**name** and **student ID**).

Upload the pdf to **Gradescope**. Only one submission is required per team - make sure to associate the submission with both members of the group on Gradescope. Instructions for this are specified below.

Instructions to submit as a group on Gradescope:

Submit the assignment on gradescope as a solo submission.

Open the submission, click “View or edit group” near your name at the top right of the webpage.

Type in the other group member’s name or email under “Add Student”.

Click on your teammate’s name and click “Add”.

Once the other member has been added, they should also be able to view the same submission on Gradescope.