

1)Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of \$3600/day).

- Each musician that records at Notown has an SSN, a name, an address, and a phone number. Poorly paid musicians do not have cell phones, often share the same address, and no address has more than one landline phone. Given their limited use, cell phones are not tracked.
- Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.
- Each song recorded at Notown has a title and an author. The author of a song is a musician. There is 1 and only 1 author per song.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Design a conceptual schema for Notown and draw an UML diagram for your schema. Be sure to indicate all key and multiplicity constraints and any assumptions you make. Identify any constraints you are unable to capture in the ER diagram and briefly explain why you could not express them. Once you have created the diagram, create the necessary SQL CREATE TABLE commands necessary to support it.

b) Update the solution for the 21st century. Change the requirements such that addresses are not guaranteed to have a land line; however, all musicians have one cell phone.

2)The Computer Science Department frequent fliers have been complaining to Dane County Airport officials about the poor organization at the airport. As a result, the officials decided that all information related to the airport should be organized using a DBMS, and you have been hired to design the database. Your first task is to organize the information about all the airplanes stationed and maintained at the airport. The relevant information is as follows:

- Every airplane has a registration number, and each airplane is of a specific model.
- The airport accommodates a number of airplane models, and each model is identified by a model number (e.g., DC-10, DC-747) and has a specific capacity and a weight.
- A number of technicians work at the airport. You need to store the name, SSN, address, phone number, and salary of each technician.

- Each technician is an expert on one or more plane model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded.
- Traffic controllers must have an annual medical examination. For each traffic controller, you must store the date of the most recent exam.
- All airport employees (including technicians) belong to one and only one union, however the unions may vary depending on the job performed by the employee. You must store the union membership number of each employee. You can assume that each employee is uniquely identified by a social security number.

Design a conceptual schema for the airport and draw an UML diagram for your schema. Be sure to indicate all key and multiplicity constraints and any assumptions you make. Once you have created the diagram, create the necessary SQL CREATE TABLE commands necessary to support it.

3. You are tracking courses taught by an instructor offered by a university. For the instructor you are tracking the instructor's ID, name, and salary. The ID is unique for each instructor. An instructor works in one department and many instructors may work in a department. A department contains a name, a budget and the building name where its offices are held. The department name is unique for each department at the university. Departments offer courses taught by an instructor. For each course the department tracks the course name, the course title and the number of credits a student earns in completing the course. A course section is a course offering in a specific time period, in particular a specific semester, and specific year. The values for semester are: 'fall', 'spring' and 'summer'. For each offering of a course there is a section id that is unique for the course. A course offering is assigned to a class room. A classroom is a room in one of the university's buildings, it has a room number that indicate the floor and the specific room in the building; it also has a person capacity. For each university building there is a building name. A Student is identified by his/her student Id. The database also tracks the student's name and email. Students register for specific course sections. A student may register for 0 to 6 different courses. A course section may have 1 to many students.

4 . You have been hired to create a database for a car insurance company. A customer of the insurance company may have multiple cars they insure with the company. Each car has had 0 to many accidents. The insurance company tracks the date, location and the cost of each accident. Each insurance policy covers one or more cars and has one premium payment associated with it. A policy is owned by 1 and only 1 customer. Each premium payment is for a particular time period and has an associated due date, and the date when the payment was received.