

IS 475/675 – HW #3

Bring two copies of your homework to class – one to turn in for grading, and one for notes during class. You will turn in the grading copy at the beginning of class and then use the other copy as a reference during class. This assignment should be turned in on paper.

Make sure that you bring a paper copy of your answer to question #2 for discussion during class. Students will exchange their answers to question #2 during class so that we can evaluate and analyze those answers during a class exercise.

Create a logical ERD for each of the problems below using the crow'sfoot format discussed in class. Be sure that each entity has the entity name at the top of the box, the primary key attribute or attributes in the middle of the box, and the non-key attributes in the bottom of the box. Lines should separate each part of the entity box. The ERD should not have any M:N relationships and all attributes should be placed within an entity. Each entity must have a primary key defined. A primary key may consist of one or more attributes. Please include all required foreign keys and denote the foreign key(s) with the notation (FK) on the ERD.

1. Design a database to help a large art museum keep track of its works of art. Each work of art is described by an item code (identifier), title, type (painting, sculpture, etc.), genre (abstract, photograph, etc.), height, width, and weight. A work of art may be of more than one genre, but it is of only one type. The museum wants to create a list of the types and genres of art work available at the museum. The museum has predefined the descriptions of types and genres and wants to standardize them for greater consistency of data. A work of art is developed by one and only one artist, but the artist for some works is unknown. An artist is described by an artist ID (identifier), name, date of birth, and date of death (will be null for artists who are still living). Only data about artists for works currently owned by the museum are kept in the database. It is quite possible that one artist can produce more than one work of art.

At any point in time, a work of art is: 1) on display at the museum, 2) in storage, 3) away as part of a traveling show, or 4) on loan to another museum. The museum wants to retain a complete history of the placement of works of art. They want to know when (beginning and ending dates) and where a work of art was located at any given point in time. They want to be able to tell where a work of art is right now, but they also want to be able to tell where a work of art was two years ago. They want to know how many works of art have been loaned to another museum. They want to know which works of art have been away in traveling shows.

If on display at the museum, the work of art is also described by its location within the museum. A traveling show is described by a showID (identifier), city in which the show is currently appearing, and the start and end dates of the show. Other museums are identified by a museumID, the name of the museum, and the location (city, state, country). There is no standard identifier for a location, since the museums could be anywhere around the world.

2. The purpose of this database is to keep track of vehicle reservations and actual use of vehicles in the motor pool of a university. The university owns a group of vehicles that are available to employees for officially sanctioned travel. The vehicles may be used for traveling to off-campus meetings and events. Every time an employee uses a vehicle, it is considered a “trip”. Here is some information about the application:

- Employees (uniquely identified by an employeeID) are encouraged to make reservation requests for vehicles. An example of the data required for a reservation request is provided in the spreadsheet on the next page as Figure 1. Figure 1 shows data for four different reservation requests. An employee may have multiple reservation requests for vehicles, but a given reservation request is filled out by one and only one employee.
- Assume for this application that the only pieces of data stored about an employee (other than the employee ID) are the employee name and phone number.
- Vehicles (uniquely identified by vehicle license #) in the university motor pool are of a particular type. Samples of vehicle types are shown in Figure 1. The university standardizes the type (description) of vehicles available. Each vehicle can be of only one type, but there are potentially many vehicles of the same type in the motor pool. For example, vehicle # WGN176 is a “Van – 8 Passenger” vehicle type. There are at least six other actual vehicles in the motor pool that are the type “Van – 8 Passenger”. Assume for this application that the only pieces of data stored about a vehicle (other than the vehicle #) are the vehicle type and vehicle year.
- It is possible for an employee to use a vehicle (make a trip) without making a reservation request; a trip is not always related to a reservation request.
- When an employee takes a vehicle from the motor pool, this is considered a “trip” and data must be recorded about the trip. A given “trip” is represented by one row in the spreadsheet shown in Figure 2. At the start of the trip, some of the data in Figure 2 is recorded: The vehicle license #, the name and ID of the employee who will be driving the vehicle for the trip, the date and time that the vehicle was checked out, the employee name of the employee who checked out the vehicle to the employee who was actually driving the vehicle, the intended destination of the trip, and the number of miles on the odometer at the start of the trip. It is safe to assume that a given vehicle can start only one trip at a given date and time. You can also assume that the date and time can be stored together in one attribute.
- When an employee returns a vehicle to the motor pool at the end of the trip, then the rest of the data in Figure 2 is recorded: The date and time that the vehicle was returned, the number of miles on the odometer when it was returned, and the employee who checked in the vehicle (may be different than the employee who checked out the vehicle, and will definitely be different than the employee who actually drove the vehicle).
- An employee is an employee - employees who take trips are no different than employees who check in or out vehicles.
- Each employee (except the president) is managed by a maximum of one other employee. Some employees are managers and some aren’t managers. The database should keep track of the manager of each employee.

Figure 1. Reservation Request Data

Employee Name	Employee ID	Expected Departure Date	Expected Return Date	Vehicle Type Required	Destination	Reason for Trip
Janice Springer	17	1/12/2016	1/14/2016	Van – 8 passenger	Berkeley, CA	Debate Tournament
Marty Brown	34	2/05/2016	2/05/2016	Van – 12 passenger	Sacramento, CA	Tour of Intel Manufacturing
Janice Springer	17	2/29/2016	3/04/2016	Van – 12 passenger	Bellingham, WA	Debate Tournament
Fred Martinez	98	3/2/2016	3/2/2016	Sedan	Carson City, NV	Attend NV State Finance Committee meeting

Figure 2. Vehicle Trip Data

Vehicle License #	Driver Employee Name	Employee ID	Date/Time Checked Out	Employee Check Out	Destination	Odometer Start	Date/Time Returned	Odometer Return	Employee check In
WGN176	Janice Springer	17	1/12/2016 8AM	Ken Blanchett	Berkeley, CA	65,128	1/14/2016 5PM	66,099	Ken Blanchett
899ULX	Marty Brown	34	2/05/2016 6AM	Ken Blanchett	Sacramento, CA	14,887	2/05/2016 9PM	15,008	Jason Blackman
172AAX	Cora Masters	30	1/09/2016 9:30AM	Ken Blanchett	Elko, NV	45,515	1/09/2016 2:30PM	46,667	Jason Blackman

3. The database will support the placement office of a leading graduate school of business. The primary purpose of the database is to schedule interviews and facilitate searches for jobs by students. Here is additional information about the data to be stored:

- Student data include a unique student identifier, a name, a phone number, an email address, a major, and a minor.
- The placement office maintains a standard list of positions based on the Department of Labor's list of occupations. Position data include a unique position identifier and a position description. Examples of position descriptions are: "Systems analyst," "network systems administrator," "sales – computer equipment," "marketing analyst," and "entry-level accountant." These are standard descriptions that could be downloaded from the Department of Labor into the database for the placement office.
- Data about companies who interview students through the placement office include a unique company identifier, and a company name. Each company must relate its open positions into the standard list of positions maintained by the placement office (downloaded from the Department of Labor). For each open position, the company lists the city, state (or province/region) and country as well as the quantity of a specific type of position open in that city, state and country. For example, IBM might have the position of "sales – computer equipment" available in Dallas, Nashville, Washington DC, Paris, Perth, and Atlanta. In Dallas, IBM has a quantity of 2 of that position, while in Perth IBM has a quantity of 3 of that particular position available.
- The database must be able to generate a list of open positions for a given company and for all companies as well as a list of interviewers
- Interviewer data include a unique interviewer identifier, a name, a phone and an email address. Each interviewer works for only one company, but a company could have multiple interviewers. An interviewer may interview more than one student during a given day, but will only interview one student during a given interview.
- An interview includes a unique interview identifier, a date, a time, a location (building and room), one student and one or more interviewers. More than one interviewer may participate in the interview with the one student and the business school wants to keep track of however many interviewers are participating in the interview. The length of an interview may vary in time.
- **An interview is not for a particular job.** It is possible that an interviewer may interview a student for more than one job at the same time, so it is not necessary to relate a specific job to a given interview.
- The data will be used to create schedules for rooms, interviewers, companies, and students.

Keep in mind during your design that an entity almost always consists of more than one entity instance (in other words, it would be odd to have a table with only one row). For example, if you find yourself tempted to create an entity for the "placement office" then think about what data you will be storing in that entity. This organization has only one "placement office" so there would be only one instance of that entity. An entity with only one instance isn't really an entity. Also keep in mind that an ERD is not a process diagram. It doesn't really matter who does what, such as how a student will be matched with an interviewer, or where the data comes from – you should focus on creating a blueprint of all data necessary to support the application. Finally, think about what the application is supposed to accomplish when designing the required data. Think about what output information (reports and queries) might need to be generated from the system to ensure that your entities are related in such a way that the output could be produced.