CS 6360 Fall 2012
Database Design Term Project

Project Description

ABC City Library benefits much to people living in the cities around it, which depends on abundant reading resources, a great number of volunteers and employees.

Reading resources can be mainly divided into three types: Book, Video and Mag-Pap (including magazines and papers published periodically). All the reading resources share some common attributes: Call_Number (like "QA123456", unique), Name, Borrow_Status (can only be "available" or "unavailable"), Reading_Status (can only be "for borrow" or "in library reading only"). For every book, there is a summary to describe the main idea of the book. For each video, the system will record its type (VCD, DVD, cassette, etc.). Publish cycle (bi-weekly, monthly etc.) and subjects (fashion, cooking, business etc.) are recorded for every kind of magazine and paper. One magazine or paper may include several subjects.

For convenience, the library will record the information of the publishers who supply reading materials and the information of the authors. The library will record the publishers' Name, Webpage, E-mail, and Phone Number. The name should be unique for each publisher because of name patent right. Several reading resources may share the same publisher. However, one reading resource can only be published by one publisher. For the authors, the library will record their Author_ID (unique) and Name (including first name and last name), Phone_Number. The value of Author_ID is between "00001"and "99999". One book may have several authors, while different volumes of magazine or paper may have different author sets. Meanwhile, one author may have many works.

To organize the library better, the library record information in details for those people who serve or use the library. The library needs to record each person's name (including first name and last name), address (APT, RD, CITY, STATE, and ZIPCODE), and age. The system will assign a unique id to each person generated by picking out the first letter of the first name and the last name with a randomly generated letter in the middle, then, putting a randomly generated

integer with six digits at the end. For example, for the person named Mary Lee, the id can be “mxl000001”, where x and 000001 are randomly generated. There are mainly three roles of people involved in the library --- Reader, Employee, and Volunteer. One employee can also be a volunteer. For the employees, their responsibility should be recorded, while for the volunteers, their available weekday and time-slots should be recorded. For safety, the age of each volunteer cannot be over 75. For each reader, he/she can sponsor at most five friends or relatives to use the resources in the library and only needs to offer the sponsored person’s name. The sponsored person enjoys all rights that one reader has. In the library, only reader and his/her sponsored person(s) can borrow readings. The system needs to record every time’s check out --- borrow date, due date, and return date, where return date can be earlier or later than due date. And one reader and his/her sponsored person(s) together cannot keep more than 10 readings at the same time. In addition, one person can make a reservation if the resources are unavailable. The policy is that if one reading is reserved, the person keeping it must return it within one week no matter what the due day should be. Thus, the due time of last check out will be updated correspondingly.

The library is a non-profit institution and it needs investments from the government. Since the resources of the library are limited, it cannot be open to all people. The policy of the library is that a qualified reader must be a resident living in the city whose government invests on the library, however, there is no constraint on his/her sponsored person. There is no constraint on volunteers, either. For each city, the system will record whether the city invests on the library or not (can only be ‘YES’ or ‘NO’).

The library often holds special events of different themes for its readers, like health lecture, tutor etc. The event id (unique), held time and rough introduction of each event will be recorded. The event holders can be employees or volunteers. These events may be held in different cities. Thus, the system needs to record the holders, city for each event. Every reader and his/her sponsored person can attend every event alone or together. And attendees need evaluate the events they attend. The evaluation score varies from 0 to 100.

Project Questions

a) Can you think 5 more rules (other than the one explicitly described above) that are likely to be used in a library.
b) Is the ability to model super-class/subclass relationships likely to be important in such environment? Why or why not?
c) Justify using a Relational DBMS like Oracle for this project.

Project Phases

I. Draw an EER to accurately represent this set of requirement. This will be your Conceptual Design. Clearly specify any assumption that you are making. You can use any tools (software) to draw the EER. You don't need describe the value constraints of the attributions in the EER diagram. (20%) (Due: 10/01/12)

II. Use a relational DBMS to implement the database. Perform the following steps. (20%) (Due: 10/29/12)
- **a)** Convert your Conceptual model to a Logical model that can be implemented in a relational DBMS like Oracle. During this process you replace M-N relationships and multi-valued attributes with constructs that can be implemented in the relational DBMS. Draw EER for the logical model after your modifications. Feel free to change your conceptual model (first delivery) if needed.
- **b)** Convert the EER to a database design. Document your design in Database Schema format like the one we discussed in the class.

III. Use appropriate naming conventions for all of your tables and attributes. (45%) (Due:11/26/12)
- **a)** Normalize all of your tables to third normal form. Make any necessary changes to the EER. Explain why these changes needed to be made.
- **b)** Draw a dependency diagram for each table.
- **c)** Write SQL statements to create database, tables and all other structures. Primary keys and foreign keys must be defined appropriately. The quantity constraints of the relation between the entities, which should be described in EER diagram, are not required.
- **d)** Use the Create View statement to create the following views:

1. View1: This view returns all call_numbers checked out by each person's id, no matter borrowed by authorized reader or the sponsored person.
2. View2: This view returns the id and theme of the event which has more grades above or equal to 60 than those below 60.
3. View3: This view returns the readings kept by each reader id on 20-Nov-10.

e) Answer the following Queries. Feel free to use any of the views that you created in part (d).

1. Add Helen Liou as a volunteer to the system.
2. Return the call_numbers having more than 10 checking out history records.
3. Retrieve each volunteer's id and belonging city which does not invest on the library.
4. Retrieve the call_number of the reading and the id of the person who keeps the reading due on 29-Sep-10.
5. Retrieve the theme having the most "satisfying" events, where "a satisfying event" means that the event has more grades above or equal to 60 than those below 60.
6. Retrieve the id and name of the volunteer available on Saturday.
7. Retrieve the call_number which isn't returned on time and the person's name who keeps it.
8. Retrieve the name of the publisher who offers most reading materials to the library.
9. Add a check out record to "mxl123456" on 20-Nov-10.
10. Retrieve the author who has smallest works in the library.
11. Place an order of call_number (QA0001) by a person id "cld089000".
12. Retrieve all readings' call_numbers which belong to fashion.
13. Retrieve the id of the event, the id of the holders hosting the events and the id of the attendees participating the events on 10-Oct-10.
14. Retrieve the id and last name of the person who does not sponsor anyone.
15. Retrieve the people's ids who only attend the events with his/her sponsored person, that is, the people never attend any events alone.

16. Retrieve the attendees' first names and last names who participate events of all themes.

I. Document the final term project report and demo. (15%)(Due: 12/10/12)

- **a)** Problem description (Copy it from Web Site).
- **b)** Project questions (Answer questions listed in this project).
- **c)** EER diagram with all assumptions.
- **d)** Relation schema after normalization. All relations must be in 3NF. The relation schema should include primary keys as well as foreign keys (if any) for all relations.
- **e)** All requested SQL statements.
- **f)** Dependency diagram.
- **g)** Demo.