Concordia University
Dept. of Computer Science & Software Engineering

Comp 353/CC - Databases
Summer 2024
Main Project

Title: A database application system for Montréal Youth Soccer Club
Demos: on August 7 and 8.
Reports: Submission through Moodle is due by August 2, 2024
Maximum Mark: 12%

Project Description

This system builds on and extends the application developed in the warm-up project. It adds new functionalities and also requires development of a Graphical User Interface (GUI) to facilitate interactions of the end-users with the system.

Recall from the description of the warm-up project that the system helps the Youth Soccer Club manage and organize their operations by keeping track of the members of the club. The Youth Soccer Club (YSC) is a nonprofit organization that develop, promote and enhance youth soccer in different areas. The club provides its members services adapted to the long-term development to become a professional soccer player. The optimal soccer program is offered by the club to members of ages between 4 and 10 years old. The club can have one main location as Head location and many other locations or branches spread around different areas. The players are joined by either Boys teams or Girls teams. Every club member can be associated with one location at any single moment in time. At different moments in time the club members can move from one location to another location.

To become a member, at least one family member should be registered into the system, and then the family member can add one child as a club member or many children as club members.

The system should maintain all the information that is related to the club about the head of the club, the locations of the club, the club personnels that are associated with each location, the club members along with their family members that are associated with each location, and the formation of teams within each location.

The information maintained by the system is used to help the club to keep track of their members' progress throughout the years of their development and skills. The system is called Youth Soccer Club System (YSCS).

A location could be a head of the club location or a branch of the club. Each location could include name, address, city, province, postal-code, phone number, web address, type (Head, Branch), capacity (Maximum number of active club members at any instance in time that the location can handle). At any moment in time, a location can have one general manager and many other

personnels operating the location. The general manager of the head location is the president of the club.

The application must maintain information about every personnel operating in each location. The information includes first-name, last-name, date of birth, Social Security Number, Medicare card number, telephone-number, address, city, province, postal-code, email address, role and mandate.

No two personnels can have the same Medicare card number. Social Security Number cannot have null value for any personnel. Also, no two people can have the same Social Security Number. The role of every personnel must be maintained by the system. The role could be either an administrator, trainer, or another (including all other tasks). A general manager is considered to be administrative personnel. The mandate could be either volunteer or salaries. Personnel can have only one role at a time.

Personnel can operate at only one location at the same time. Personnel can operate at different locations at different times. For every personnel, the start date and end date operating at each location must be maintained. If the end date is null, it indicates that the personnel are still operating at the location. Personnel can operate at the same location at different intervals of times. For example, Roger Smith who is a trainer could have operated at location Montréal from Jan 15th, 2022, to June 30th, 2022, then operated at location Laval from July 5th, 2022, to Dec 15th, 2022, and then operated at location Montréal from Dec 20th 2022 till now.

The application must maintain information about every family member registering her/his child into the system. The information includes first-name, last-name, date of birth, Social Security Number, Medicare card number, telephone-number, address, city, province, postal-code, email address, and location. The family member can be associated with only one location at a given moment in time. The family member can be associated with different locations at different moments in time. A family member can have one or many children as members of the club. The relationship between the family member and each child must be maintained. The relationship could be one of the following: Father, Mother, GrandFather, GrandMother, Tutor, Partner, Friend, and Other.

A family member who is considered the primary family member can designate a secondary family member to be added to the system. The secondary family member is used as an alternative for emergency contact where the primary family member is not reachable. The information about the secondary family member includes first-name, last-name, telephone-number and the relationship with each club member.

The application must maintain information about every club member. The application assigns a global unique auto increment club member number for every new club member. This unique number is for the whole club locations and not for a single location. No two club members should have the same membership number in the whole system. A new club member must be between 4 and 10 years old at the time of registration. Every club member must be associated with one family member and the relationship with the family member must be maintained. A club member can be associated with different family members at different times. The application must maintain information about every club member in the system. The information includes club membership

number, first-name, last-name, date of birth, Social Security Number, Medicare card number, telephone-number, address, city, province, postal-code, associated family member. A club member is active if her/his age ranges between 4 years and 10 years old.

The application must maintain information about every team formation for every game or training session. Every game or training session consists of two teams. Every team is associated with one location. The two teams can be either from the same location or from different locations. Every team includes the team's name, the head coach of the team, one or many goalkeepers, zero, one or many defenders, zero, one or many midfielders, and zero, one or many forwards. All players in the same team must be club members associated with the same location. The team formation must also include the date and time of the game or training session for the formation as well as the score for every team in the session. Also, the address of the training session or game must also be maintained by the system. All players in the same team formation must be either boys or girls and cannot be mixed. If a player is to be assigned to two team formations on the same day, then at least three hours of difference should be set between the start time of the two formations, otherwise the assignment should be rejected.

Every week on Sunday, for every training session or game that is scheduled in the coming week, the system should automatically send an email to every club member indicating the schedule of the session including date, time, address, name of the head coach and email of the head coach.

The subject of the email should include the team's name, the date and time of the session. A subject example: "Montreal Youth Group 6 Monday 20-Feb-2024 6:00 PM training session". The email body should include the club member's first name, last name and role in the game (goalkeeper, defender, etc.), the first-name, last-name and email address of the head coach of the session, whether the session is a training session or a game session, and finally the address of the session.

A log table in the database contains information on every email generated by the system. The log includes date of the email, the sender of the email (name of the location), the receiver of the email, the subject of the email, and the first 100 characters of the body of the email.

What you should do:

In the above, we provided the minimum/basic requirements for this application. You could add more details if you find suitable and useful. Considering the information so far, do the following steps in your database design process:

1. Develop an E/R diagram to represent the conceptual database design for the above application.

2. In the diagram, mark or express various constraints (keys, functional dependencies, cardinalities of the relationships, etc.). Identify any constraints that are not captured by the E/R diagram.

3. Convert your E/R diagram into a relational database schema. Make refinements to the DB schema if necessary. Identify various integrity constraints such as primary keys, foreign keys, functional dependencies, and referential constraints. Make sure that your database schema is at least in 3NF.

4. Are all your relations in the database in BCNF? (Explain which ones and why not)

5. For any relation in your database, if it is not in BCNF, then show that it is in 3NF.

6. Create at least one trigger to execute some of the requirements specified in the description above.

Express and evaluate the following DDL and DML types of SQL commands against your database in which every relation is populated with 'sufficient' representative tuples:

1. Create/Delete/Edit/Display a Location.
2. Create/Delete/Edit/Display a Personnel.
3. Create/Delete/Edit/Display a FamilyMember (Primary/Secondary).
4. Create/Delete/Edit/Display a ClubMember.
5. Create/Delete/Edit/Display a TeamFormation.
6. Assign/Delete/Edit a club member to a team formation. (Attempt to assign a conflicting assignment for a club member in two team formations on the same day).

7. Get complete details for every location in the system. Details include address, city, province, postal-code, phone number, web address, type (Head, Branch), capacity, general manager name, and the number of club members associated with that location. The results should be displayed sorted in ascending order by Province, then by city.

8. For a given family member, get details of the secondary family member and all the associated club members with the primary family member. Information includes first name, last name and phone number of the secondary family member, and for every associated club member, the club membership number, first-name, last-name, date of birth, Social Security Number, Medicare card number, telephone-number, address, city, province, postal-code, and relationship with the secondary family member.

9. For a given location and day, get details of all the teams formations recorded in the system. Details include, head coach first name and last name, start time of the training or game session, address of the session, nature of the session (training or game), the teams name, the score (if the session is in the future, then score will be null), and the first name, last name and role (goalkeeper, defender, etc.) of every player in the team. Results should be displayed sorted in ascending order by the start time of the session.

10. Get details of club members who are currently active and have been associated with at least four different locations and are members for at most two years. Details include Club membership number, first name and last name. Results should be displayed sorted in ascending order by club membership number.

11. For a given period of time, give a report of the teams' formations for all the locations. For each location, the report should include the location name, the total number of training sessions, the total number of players in the training sessions, the total number of game sessions, the total number of players in the game sessions. Results should only include locations that have at least three game sessions. Results should be displayed sorted in descending order by the total number of game sessions. For example, the period of time could be from Jan 1st, 2024, to March 31st, 2024.

12. Get a report of all active club members who have never been assigned to any formation team session. The list should include the club member's membership number, first name, last name, age, phone number, email and current location name. The results should be displayed sorted in ascending order by location name then by club membership number.

13. Get a report of all active club members who have only been assigned as goalkeepers in all the formation team sessions they have been assigned to. They must be assigned to at least one formation session as a goalkeeper. They should have never been assigned to any formation session with a role different than goalkeeper. The list should include the club member's membership number, first name, last name, age, phone number, email and current location name. The results should be displayed sorted in ascending order by location name then by club membership number.

14. Get a report of all active club members who have only been assigned at least once to every role throughout all the formation team game sessions. The club member must be assigned to at least one formation game session as a goalkeeper, one as a defender, one as a midfielder, and one as a forward. The list should include the club member's membership number, first name, last name, age, phone number, email and current location name. The results should be displayed sorted in ascending order by location name then by club membership number.

15. For a given location, get the list of all family members who have currently active club members associated with them and are also head coaches for the same location. Information includes first name, last name, and phone number of the family member. A family member is considered to be a head coach if she/he is assigned as a head coach to at least one team formation session in the same location.

16. Get a report of all active club members who have never lost a game in which they played in. A club member is considered to win a game if she/he has been assigned to a game session and was assigned to the team that has a score higher than the score of the other team. The club member must be assigned to at least one formation game session. The list should include the club member's membership number, first name, last name, age, phone number, email and current location name. The results should be displayed sorted in ascending order by location name then by club membership number.

17. Get a report of all the personnels who were president of the club at least once or is currently president of the club. The report should include the president's first name, last name, start date as a president and last date as president. If last date as president is null means that the personnel is the current president of the club. Results should be displayed sorted in ascending order by first name then by last name then by start date as a president.

18. Get a report of all volunteer personnels who are not family members of any club member. Results should include the volunteer's first name, last name, telephone number, email address, current location name and current role. Results should be displayed sorted in ascending order by location name, then by role, then by first name then by last name.

19. You should show the trigger(s) used by your system. Explain the trigger(s) used and their benefits.

20. You need to demonstrate the integrity of all the requirements provided in the description. Example, the system should not allow a user to assign a player on two different formation sessions at the same time or on a conflicting time (less than three hours difference).

21. You need to demonstrate the generation of emails and the logs of the emails produced by the system.

What you should submit:

Your project report should include the E/R diagram, the DB-design, and its normalization (including the analysis of 3NF and BCNF), the SQL declarations of the relations, the implementation code, relation instances, and the SQL scripts for the queries and transactions, and at least 5 tuples of each query result. Build a useful web interface to facilitate interactions with the database application system. Also include in your report, a few snapshots of the user interface you developed. A schedule of time slots for the demos of your main project will be posted through the course Moodle in August which is assigned on a first come first served basis. All members of your team must be present during your project demo.