

Concordia University
Dept. of Computer Science & Software Engineering
Comp 353 - Databases
Winter 2025
Main Project

Title: A database application system for Montréal Youth Volleyball Club (MYVC)

Demos: on April 7th, 9th, and 10th.

Reports: Submission through Moodle is due by April 4, 2025

Maximum Mark: 12%

Project Description

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

Recall the description of the warm-up project in which your team built a database application system for Montréal Youth Volleyball Club (MYVC) to help manage and organize various professional activities and operations by keeping track of the club members. MYVC is an organization that develops, promotes, and enhances youth Volleyball in different areas. It provides long-term services to its members to become professional volleyball players. The desired Volleyball program is offered by the club to the members in the age range 11 to 18 years old. The club can have one main location as the Head location and several other branches that are spread and located over different areas. The players are joined by either Boys teams or Girls teams. Every club member can be associated with only one location at any given time, however, a member may move to a different branch if/when desired.

To become a member, at least a family member should be already registered into the system. A registered family member can help any number of his/her child(ren) register as a club member.

The system should record and maintain all the information related to the club, including the General head of the club, the head and branch locations, the manager and other personnel working at each location, the members and other possible family members at each location, and information about the different teams and types (boys/girls) registered at each location.

The information maintained by the system is used to monitor and keep track of the members' progress made since they joined, and the skills acquired.

A location could be the head of the club or a branch of the club. The information for each location could include type (Head, Branch), name, address, city, province, postal code, phone number(s), web address, and the maximum capacity of active club members that the location can handle at any time. At any time, a location can have a manager and any number of other personnel working at the location. The head location has the following personnel: the General manager, deputy

manager, treasurer, secretary, and one or more administrators. The general manager of the head location is the president of the club.

The application must maintain information about every personnel working at each location. The information includes first-name, last-name, birth date, Social Insurance Number (SIN), Medicare card number, telephone number, address including city, province, postal code, email address, role and mandate.

There are some constraints to be considered: No two people may have the same Medicare card number. SIN is unique and cannot be null. The role of every personnel must be recorded and maintained by the system. The role could be an administrator, Captain, Coach, Assistant Coach, or other (including all other tasks). A general manager is an administrator. The mandate could be either volunteer or salaried (paid). Personnel can have one or more roles at any given time.

Personnel can operate at one or more locations at any time. 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 is still active in his/her role at the location. Personnel can operate at the same location at different time periods. For example, Roger Smith, who is a trainer, could have worked at location Montréal from Jan. 15th, 2022 to June 30th, 2022, then worked at location Laval from July 5th, 2022 to Dec. 15th, 2022, and then returned to location Montréal again 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, birth date, SIN, Medicare card number, telephone-number, address, city, province, postal code, email address, and the location. **The family member can be associated with one or multiple locations at a given time.** A family member can have one or more 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, Uncle, Ant, 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 (Father, Mother, Grandfather, Grandmother, Uncle, Ant, Tutor, Partner, Friend, and Other).

The application must maintain information about every club member. The application assigns a global unique auto increment Club Member Number (CMN) for every new club member registered. This number cannot be null and is unique globally, that is at all locations and not just at a single location. A new club member must be between 11 and 18 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 recorded and 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, birth date, height, weight, SIN, , Medicare card number, telephone number, address, city, province,

postal code, and the family member with whom s/he is associated. A club member is active if her/his age is between 11 and 18 years.

The application must maintain information about every club member's financial status. The annual membership fee is \$100 for each club member. A club member cannot participate in any game or activity if his/her membership is not yet renewed and the membership fees to date are not paid. Details of every payment by every club member must be maintained by the system. Payment details include club member number (CMN), payment amount and date, and method of payment (Cash, Debit or Credit Card), date of the membership payment (for example, payment could be done by Dec. 31, 2024, for the membership in 2025). Payments can be made in a maximum of 4 installments. If total payments of a member within a year exceed \$100, then the excess will be considered as donations to the club. A club member whose membership fees are not paid is considered to be Inactive.

The application must maintain information about 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. Information for each team includes: the team's name, the captain of the team, and the players in the team with the role of each player. The role could be one of the following seven positions: outside hitter, opposite, setter, middle blocker, libero, defensive specialist, and serving specialist. 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: "Montréal 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 (outside hitter, opposite, setter, middle blocker, libero, defensive specialist, or serving specialist), the first-name, last-name and email address of the captain of the session, whether the session is a training session or a game session, and finally the address of the session.

On the first day of every month, the system should check for any club member who became 18 years old in the previous month, and deactivate the membership. The system should also send an email notification to the member about his/her membership status being deactivated.

A log table in the database contains information on every email generated by the system. The log includes the following information: email date, sender, recipient, possibly email copy list, subject ("Deactivation Notification"), and the first 100 characters of the mail body.

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 based on the relationships among the attributes (as captured by Functional dependencies). Identify various integrity constraints such as primary keys, foreign keys, functional dependencies, and referential constraints. Make sure that each relation in 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, show that it is in 3NF.
6. Create and use 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 all the locations that she/he was/is associated with, the secondary family member and all the club members associated 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 location name, 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 week, 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 day then by the start time of the session.
10. Get details of club members who are currently active and have been associated with at least three different locations and are members for at most three 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 on 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 two 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, 2025 to Mar. 31st, 2025.
12. Get a report on 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, date of joining the club, 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 on all active club members who have only been assigned as outside hitter in all the formation team sessions they have been assigned to. They must be assigned to at least one formation session as an outside hitter. They should have never been assigned to any formation session with a role different than outside hitter. 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 on all active club members who have 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 an outside hitter, opposite, setter, middle blocker, libero, defensive specialist, and serving specialist. 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 the given location, get the list of all family members who have currently active club members associated with them and are also captains 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 captain if she/he is assigned as a captain 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. A club member is considered to win a game if she/he has been assigned to a game session and is 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 personnel who were treasurer of the club at least once or is currently a treasurer of the club. The report should include the treasurer's first name, last name, start date as a treasurer and last date as treasurer. If last date as treasurer is null means that the personnel is the current treasurer of the club. Results should be displayed sorted in ascending order by first name then by last name then by start date as a treasurer.
18. Get a report on all club members who were deactivated by the system because they became over 18 years old. Results should include the club member's first name, last name, telephone number, email address, deactivation date, last location name and last role when deactivated. 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 in your system. Explain such trigger(s) 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 (at least one email for team formation, and one email for club member deactivation).

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 database relations, the implementation code, relation instances, and your 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 included in your report, a few snapshots of the user interface you developed.

A schedule of time slots for the demos of the main projects will be posted on the course Moodle in early April, and assigned on a first come first served basis. All members of your team must be present during your project demo.