W2: Database design exercises

Exercise 1.

Let us design a database for a bank, including information about customers and their accounts.

Information about a customer includes their name, address, phone, and SIN number. Accounts have numbers, types (e.g., savings, checking) and balances. We also need to record the customer(s) who own an account. Draw the E/R diagram for this database.

Modify your solution as follows:

a) Change your diagram so an account can have only one customer.

b) Change your diagram so that a customer can have a set of addresses (which are street-city-province triples) and a set of phones.

c) Further modify your diagram so that customers can have a set of addresses, and at each address there is a set of phones.

Exercise 2.

Give an E/R diagram for a database recording information about teams, players, and their fans, including:

- For each team, its name, its players, its team captain (one of its players), and the colors of its uniform.
- For each player, his/her name.
- For each fan, his/her name, favorite teams, favorite players, and favorite color.

Modification A:

Suppose we wish to add to the schema a relationship "Led-by" among two players and a team. The intention is that this relationship set consists of triples

(player1, player2, team)

such that player 1 played on the team at a time when some other player 2 was the team captain.

Draw the modification to the E/R diagram.

Modification B:

Record for each player the history of teams on which they have played, including the start date and ending date (if they were traded) for each such team.

Exercise 3

Suppose we wish to keep a genealogy. We shall have one entity set, *Person*. The information we wish to record about persons includes their name (an attribute) and the following relationships: mother, father, and children. Give an E/R diagram involving the Person entity set and all the relationships in which it is involved. Include relationships for mother, father, and children.

Modify your “people" database design to include the following special types of people:

a) Females.

b) Males.

c) People who are parents.

Exercise 4

Consider a database system for a baseball organization. The data requirements are summarized as follows:

- The personnel involved include players, coaches, managers, and umpires. Each is identified by a unique personnel id. They are also described by their first and last names along with the date and place of birth.
- Players are further described by other attributes such as their batting orientation (left, right, or switch) and have a lifetime batting average (BA).
- Within the players group is a subset of players called pitchers. Pitchers have a lifetime ERA (earned run average) associated with them.
- Teams are uniquely identified by their names. Teams are also described by the city in which they are located and the division and league in which they play.
- Teams have one manager, a number of coaches, and a number of players.
- Games are played between two teams with one designated as the home team and the other the visiting team on a particular date. The score (runs, hits, and errors) are recorded for each team. The team with the most runs is declared the winner of the game.
- With each finished game, a winning pitcher and a losing pitcher are recorded. In case there is a save awarded, the save pitcher is also recorded.
- With each finished game, the number of hits (singles, doubles, triples, and home runs) obtained by each player is also recorded.
- Design an Entity-Relationship diagram for the baseball database.