

ECM2419: Database Theory and Design

Week04: Entity-Relationship Diagrams

Exercise 1.

Consider an online auction database system in which members (buyers and sellers) participate in the sale of items. The data requirements for this system are summarized as follows:

- The online site has **members** who are identified by a **unique member id** and are described by an **email address**, their **name**, a **password**, their **home address**, and a **phone number**.
- A member may be a **buyer** or a **seller**. A buyer has a **shipping address** recorded in the database. A seller has a **bank account number** and **routing number** recorded in the database.
- **Items** are placed by a seller for sale and are identified by a **unique item number** assigned by the system. Items are also described by an item **title**, an item **description**, a **starting bid price**, **bidding increment**, the **start date** of the auction, and the **end date** of the auction.
- Items are also categorized based on a **fixed classification hierarchy** (for example a modem may be classified as /COMPUTER/HARDWARE/MODEM).
- **Buyers** make **bids** for items they are interested in. A **bidding price** and **time of bid placement** is recorded. The person at the end of the auction with the highest bid price is declared the **winner** and a **transaction** between the buyer and the seller may proceed soon after.
- Buyers and sellers may place **feedback** ratings on the purchase or sale of an item. The feedback contains a **rating** between 1 and 10 and a **comment**. Note that the ratings are placed on a completed transaction by the buyer or seller of the item in the transaction.

Design an *Entity-Relationship diagram* with *specialization/generalization* concepts for the auction database.

Exercise 2.

A university registrar's office maintains data about the following entities:

- (a) courses, including number, title, credits, syllabus, and prerequisites;
- (b) course offerings, including course number, year, semester, instructor(s);
- (c) students, including student-id, name, and program;
- (d) instructors, including identification number, name, department, and title.

For a particular course offering, maximum two instructors teach it. For each course, it may **require a few prerequisite courses**.

Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled.

Construct an *ER diagram* for the registrar's office. Document all assumptions that you think appropriate.

Exercise 3.

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

- The **personnel** involved in the league 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 life time 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 (such as Central division of the American league).
- Each team consists of one manager, one or two 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 more number of runs is declared the winner of the game.
- With each finished game, a winning pitcher and a losing pitcher are 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* with *specialization/generalization* concepts for the baseball database.