DATABASE SYSTEMS
(E)ERD EXERCISES

Create an (enhanced) entity relationship diagram - (E)ERD for the following business rules:

Exercise 1. Journal information

Each journal has a journal identification number and name. Each journal may have any number of issues (for example, monthly issues or quarterly, etc). Each issue is identified by its number and date issued. Each issue contains a number of articles. The length in terms of number of words is kept for each article, together with the number of diagrams in the article. Each article may be written by one or more writers. The writer's name and address as well as fee paid to a writer for an article in also recorded. A writer may contribute as many articles to any journal.

Exercise 2. Video rental store

Customer of the video store are assigned a unique customer number when they make their first rental. In addition to the customer number, other information such as name (first name, last name), address (street address, city, state, zip), phone number, email, birthdate are also recorded.

Each videotape that the store owns is identified by a unique code. Other information about the video includes the date of purchase, rental fee/day.

When a customer selects a video to rent, the store needs to record the rent date, rent time, return date and total charges. A customer can rent several videos at a time.

The store owns several videos with the same movie title. Unique identifier will be assigned to each movie title. Other information on movies includes a title and year produced.

Each movie title is associated with a list of actors and one or more directors. The store has a unique code to identify each actor and director. In addition to the actor and director record, other basic information on actors and directors are stored. By using this information, the store can easily find movies according to the actor or director.

Exercise 3. Hospital management system

There are 3 types of employees in this hospital which are the physician (medical doctor), nurse and administrator. Unlike administrative staff, a physician and a nurse staff have special attributes.

A physician has a qualification and an expert area. A nurse has a position and a ward_id where he or she is placed. A physician treats many patients and a patient can be treated by more than one physician. Each treatment has prescriptions. The prescription has a prescription_id, date, product_code, dosage and amount. A patient can be placed in a ward. A ward is serviced by several nurse staff. The ward information includes ward number, building, ward_type and number of beds.

Exercise 4. Baseball organization

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 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 (such as Central division of the American League). 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 scores (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.

Exercise 5. ABC Airlines

ABC Airlines wants to keep information on its airplanes. They want to record the airports that they fly into and out of. Airport information should include the airport's code (such as 'RIC' for the Richmond-Williamsburg International Airport), the name of the airport, the primary city it serves, and in which state or province it is. The database should keep track of the types of airplanes that

the Airline owns, capturing the information of the number of seats, the manufacturer, and the model name.

The database should model the fact that only certain types of airplane can land at certain airports. For instance, jumbo jets can land at RIC, but not at the Newport News-Williamsburg International Airport (PHF). Every airplane is of a given airplane type.

The database needs to keep track of flights. A leg of a trip is denoted by its departure information (from airport X, departure time) and its arrival information (to airport Y, arrival time). A particular airplane is assigned to a given flight leg on a given day. Each flight leg has a number of seats available to be reserved. Each seat on the airplane is reserved for a given customer, recording his or her name and telephone number.

A flight is made up of a sequence of legs, for which they want to record the flight number, the flight fare, and whether the flight flies on weekdays or not.

Exercise 6. Private airport

Private airport database that is used to keep track of airplanes, their owners, airport technicians and pilots.

- Every airplane has a registration number, and each airplane is of a specific model.
- The airport accommodates a number of airplane models, and each model is identified by a model number (e.g., DC-10) and has a capacity and a weight.
- Each pilot has license number, SSN, name, address, phone number. The database also keeps track of the types of planes each pilot is authorized to fly.
- A number of technicians work at the airport. You need to store the name, SSN, address, phone number, salary and shift worked of each technician.
- Each technician is an expert on one or more plane model(s), and his or her expertise may overlap with that of other technicians. This information about technicians must also be recorded.
- The airport has a number of tests that are used periodically to ensure that airplanes are still airworthy. Each test has a test number, a name, and a maximum possible score.
- The airport needs to keep track of each time that a given airplane is tested by a given technician using a given test. For each testing event, the information needed is the date, the number of hours the technician spent doing the test, and the score that the airplane received on the test.

- The database also keeps track of the owners of each plane. An owner is either a person or a corporation. Information of a person is SSN, address, and telephone number. For corporation owner, the data kept includes corporation number, name, address, and telephone number.

Exercise 7. Group survival reality show

A group survival reality show has many seasons which are identified by year along with its location. Each season introduces a number of trainees from different companies. The information of trainees includes SSN, name (first name, last name), address, phone number, date of birth and one portrait photo. Each company has a unique company number, company name, address, phone number and establish date. At any one time, a trainee belongs to one company. But he/she can move to another one. Hence, the system keeps track the start date that trainee join a company. Every year, a company can register for some trainees with the show. However, there are some independent trainees who do not work for any company at that time. A trainees must be in 18-25 years old and can participate 3 seasons at most. If he/she success to join in a debut night, then he/she cannot register as a trainee of later seasons.

There is one MC and four mentors in a season. The information of MC includes: SSN, name (first name, last name), address, phone number. The information of mentors includes: SSN, name (first name, last name), address, phone number. Only producers, singers, songwriters are invited to the show as mentors. For producers, we have to store name of popular programs they produce. Signature song(s) of singers need to be recorded. The system also keeps track list of songs composed by songwriters. A mentor can be a singer, songwriter and producer.

A season of the show has 5 episodes. All episodes are live broadcast. We need to record the date and time each episode held on and its duration. Number of songs are performed in an episode. Information of a song includes a unique number, name of the song, year of release, name of original singer (if it's not a new song) and composer(s). The system has to keep track which song performed by a specified trainee or group and the result of each trainee in an episode. Note that the result of an episode does not take into account the next one. Detail of episodes are described as follows:

Episode 1 - Theme song stage

Theme song is a new song composed for a season. Trainees perform individually and are evaluated by mentors. The system needs to keep tracks the score of each trainee given by a specified mentor. Top 30 trainees with the highest average score enter to the next stage.

Episode 2 - Professional direction stage

From this episode, trainees have to perform on stage and get votes from studio audience. The information of an audience member includes: SSN, name (first name, last name), address, phone number and occupation. In a season, a person can join studio audience of only one episode. Assume that voting system is a third-party, our system only records the result of voting, means number of votes for each trainee.

There are 6 songs divided into 3 professional directions: Dance, Vocal and Rap. Each song is performed by a group. Each group has 5 trainees, one of them is leader and another one is center (chosen by all member of the group). After the performance of a group, the studio audience can vote for their one favorite trainee. Top 20 trainees with the highest votes enter to the next stage.

Episode 3 - Group battle stage

5 trainees gather into a group, one of them is leader and another one is center. Two group performing the same song will battle with each other. After the performance of each pair of groups, the studio audience is given the opportunity to vote for their one favorite trainee out of both of the competing groups. The group has higher total number of all trainee's votes is winner. 2 trainees with fewest votes of each losing group (there are 2 losing groups) will be eliminated.

Episode 4 - Cooperation stage

Again, 16 remained trainees form into 4 groups. Each group is supported in rehearsal and performing on stage by an invited guest. Guest can be a singer or a group. Information of a group includes a unique name, number of members and signature song(s). Note that invited guests can not be leader and center of their groups. Top 10 trainees with the highest votes enter to the final episode – debut night.

Episode 5 – Debut night

Each trainee has two stages in debut night:

- Group performance: 10 remained trainees form into 2 groups. Each group performs a song with one member is center and another one is leader.
- Individual performance: trainees can choose any favorite song to sing or dance.

Top 5 trainees with the highest votes will debut in a group which named by the show.