3.19. Consider the ER diagram in Figure 3.21, which shows a simplified schema for an airline reservations system. Extract from the ER diagram the requirements and constraints that produced this schema. Try to be as precise as possible in your requirements and constraints specification.
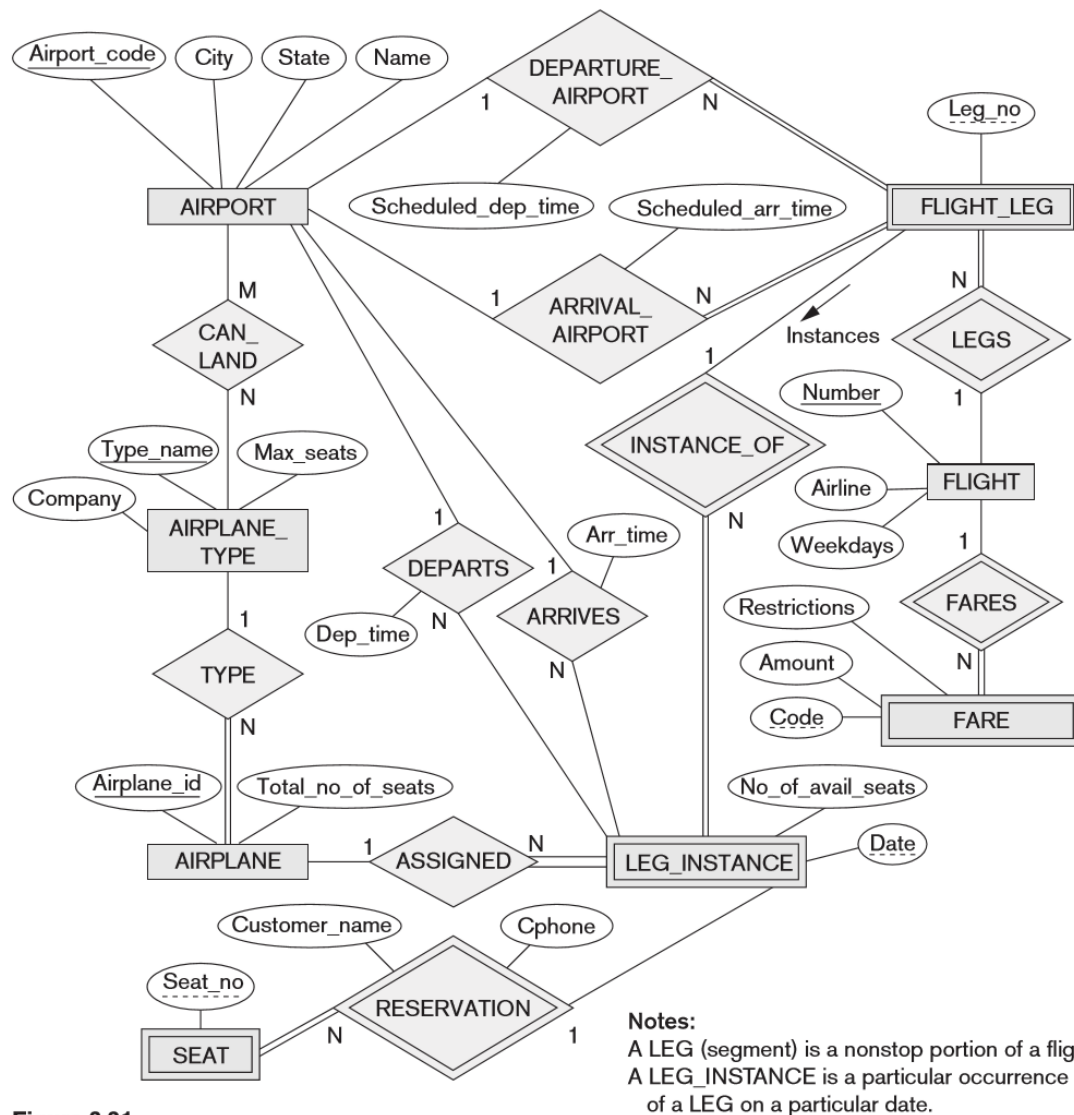

Figure 3.21
An ER diagram for an AIRLINE database schema.

Notes:
A LEG (segment) is a nonstop portion of a flight.
A LEG_INSTANCE is a particular occurrence of a LEG on a particular date.

Exercise 3.21.

Design an ER schema for keeping track of information about votes taken in the U.S. House of Representatives during the current two-year congressional session. The database needs to keep track of each U.S. STATE's Name (e.g., 'Texas', 'New York', 'California') and include the Region of the state (whose domain is {'Northeast', 'Midwest', 'Southeast', 'Southwest', 'West'}). Each CONGRESS_PERSON in the House of Representatives is described by his or her Name, plus the District represented, the Start_date when the congressperson was first elected, and the political Party to which he or she belongs (whose domain is {'Republican', 'Democrat', 'Independent', 'Other'}). The database keeps track of each BILL (i.e., proposed law), including the Bill_name, the Date_of_vote on the bill, whether the bill Passed_or_failed (whose domain is {'Yes', 'No'}), and the Sponsor (the congressperson(s) who sponsored—that is, proposed—the bill). The database also keeps track of how each congressperson voted on each bill (domain of Vote attribute is {'Yes', 'No', 'Abstain', 'Absent'}). Draw an ER schema diagram for this application. State clearly any assumptions you make.

Exercise 3.22. A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite sport (e.g., soccer, baseball, football).

3.19 - Consider the ER diagram of Figure 7.20, which shows a simplified schema for an airline reservations system. Extract from the ER diagram the requirements and constraints that resulted in this schema. Try to be as precise as possible in your requirements and constraints specification.

Answer:

(1) The database represents each AIRPORT, keeping its unique AirportCode, the AIRPORT Name, and the City and State in which the AIRPORT is located.

(2) Each airline FLIGHT has a unique number, the Airline for the FLIGHT, and the Weekdays on which the FLIGHT is scheduled (for example, every day of the week except Sunday can be coded as X7).

(3) A FLIGHT is composed of one or more FLIGHT LEGs (for example, flight number

CO1223 from New York to Los Angeles may have two FLIGHT LEGs: leg 1 from New York to Houston and leg 2 from Houston to Los Angeles). Each FLIGHT LEG has a DEPARTURE AIRPORT and Scheduled Departure Time, and an ARRIVAL AIRPORT and Scheduled Arrival Time.

(4) A LEG INSTANCE is an instance of a FLIGHT LEG on a specific Date (for example, CO1223 leg 1 on July 30, 1989). The actual Departure and Arrival AIRPORTs and

Times are recorded for each flight leg after the flight leg has been concluded. The

Number of available seats and the AIRPLANE used in the LEG INSTANCE are also kept.

(5) The customer RESERVATIONs on each LEG INSTANCE include the Customer Name, Phone, and Seat Number(s) for each reservation.

(6) Information on AIRPLANEs and AIRPLANE TYPEs are also kept. For each AIRPLANE

TYPE (for example, DC-10), the TypeName, manufacturing Company, and

Maximum Number of Seats are kept. The AIRPORTs in which planes of this type

CAN LAND are kept in the database. For each AIRPLANE, the AirplaneId, Total number of seats, and TYPE are kept.

3.21 -

Additional information:

- There are 435 congresspersons in the U.S. House of Representatives.

- States have between one (AK, DE, MT, ND, SD, VT, and WY) and 52 (CA) representatives.

- M represents number of bills during the 2-year session.

The resulting ER Diagram is shown in Figure A.
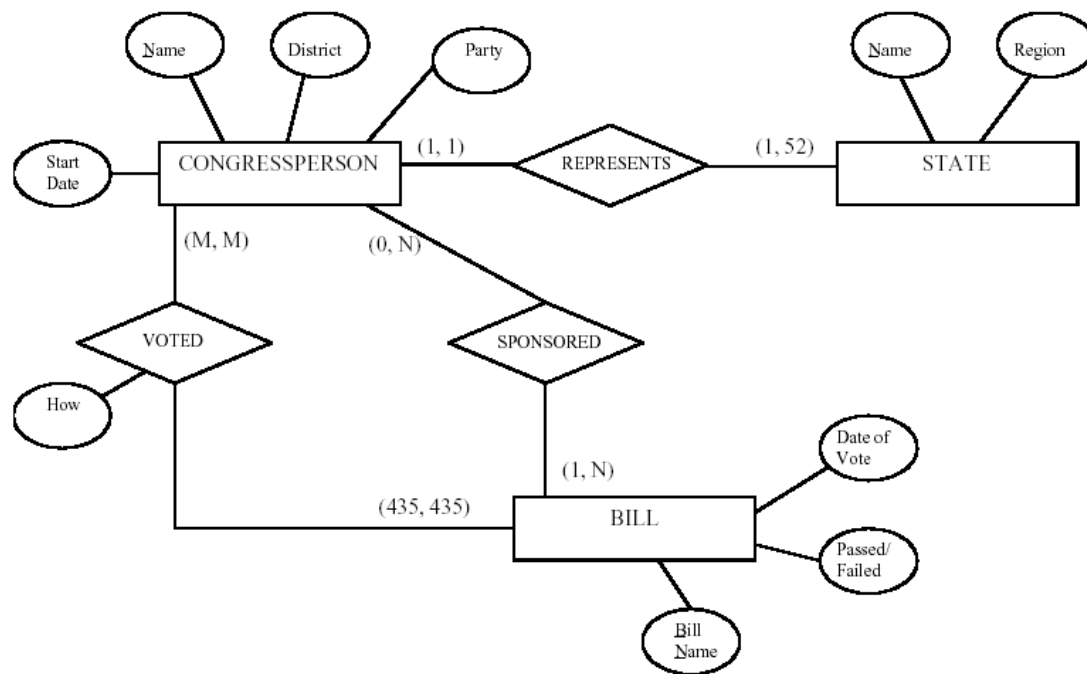
3.22 - A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game.

It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Try to design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite sport (soccer, football, baseball ...).

Answer:

The following design may be used for a baseball league. Here, we assumed that each game in the schedule is identified by a unique Game#, and a game is also identified uniquely by the combination of Date, starting Time, and Field where it is played. The Performance attribute of PARTICIPATE is used to store information on the individual performance of each player in a game. This attribute can be designed to keep the information needed for statistics, and may be quite complex. One possible design for the Performance attribute may be the following (using the notation of Figure 7.8):

Performance({Hitting(AtBat#, Inning#, HitType, Runs, RunsBattedIn, StolenBases)},

{Pitching(Inning#, Hits, Runs, EarnedRuns, StrikeOuts, Walks, Outs,

Balks, WildPitches)},

{Defense(Inning#, {FieldingRecord(Position, PutOuts, Assists, Errors)})})

Here, performance is a composite attribute made up of three multivalued components:

Hitting, Pitching, and Defense. Hitting has a value for each AtBat of a player, and records the HitType (suitable coded; for example, 1 for single, 2 for double, 3 for triple, 4 for home run, 0 for walk, -1 for strikeout, -2 for fly out, ...) and other information concerning the AtBat. Pitching has a value for each inning during which the player pitched. Defense has a value for each inning a player played a fielding position. We can have a less detailed or a more detailed design for the performance of a player in each game, depending on how much information we need to keep in the database. Suitable variations of the ER diagram shown below can be used for other sports.