

Introduction to Database Systems
Tutorial 2
Entity – Relationship Diagram

Introduction:

- Extracting Entities, entity attributes, relationships
- Defining relationship participation cardinalities
- Defining relationship participation conditions

Relationships Cardinalities:

- **One-to-one:** e.g. account ---Customer
- **one-to-many** e.g. bank ---branch
- **many-to-many** e.g. student --courses

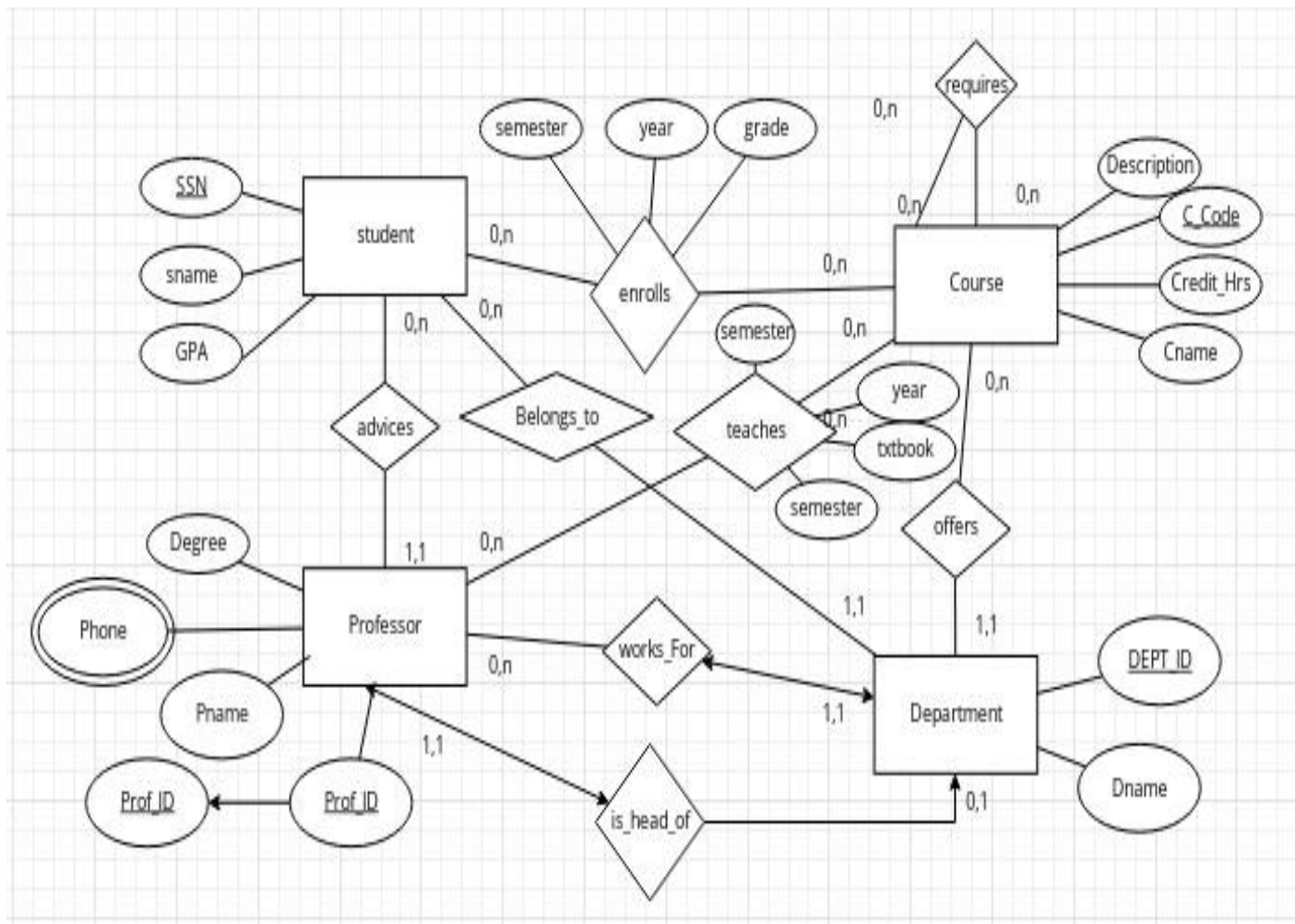
Participation conditions (mandatory and optional)

1. **Mandatory for both entities:** A member of staff must be assigned to a given department, and any department must have staff. There can be no unassigned staff, and it is not possible to have an 'empty' department.
2. **Mandatory for one entity, optional for the other:** Any member of staff must be attached to a department, but it is possible for a department to have no staff allocated.
3. **Optional for one entity, mandatory for the other:** A member of staff does not have to be placed in a department, but all departments must have at least one member of staff.
4. **Optional for both entities:** A member of staff might be assigned to work in a department, but this is not compulsory. A department might, or might not, have staff allocated to work within it.

Case Study1: University System

Every year at start of each semester a student enrolls in different courses which may have prerequisites, also student should have grade for each course kept separately for each time he/she takes the course. Every student has a unique id, name and GPA, and department to which he/she belongs to. For each course there a unique Id, name and description and credit hours.

Each course must be related to only one department. Each semester one or more professors may teach the course and choose its relevant textbook and edition. The textbook used and its edition should be kept as well. Every Professor has an id, name, email, address and multiple telephone numbers. He/she belongs to a specific department. And each department has one department head. Each student has his/her own advisor “Professor” to help in identifying path of interest, but some advisors mayn't advise any students.

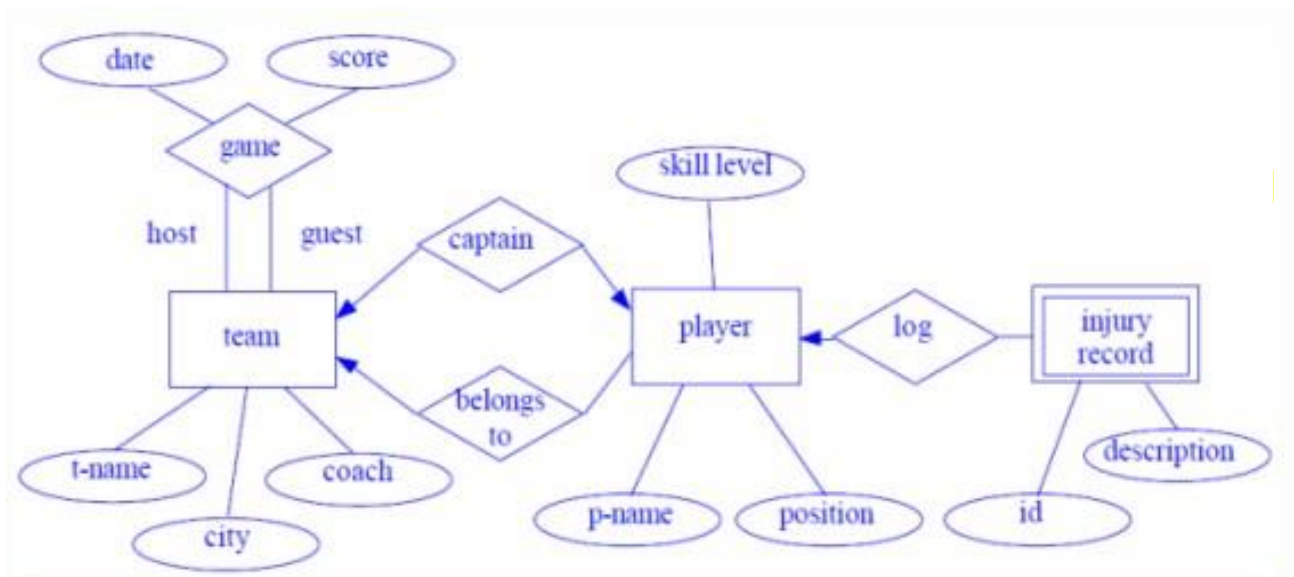


Case Study 2: National Hockey League

Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

- the NHL has many **teams**,
- each team has a name, a city, a coach, a captain, and a set of players,
- each **player** belongs to only one team,
- each player has a name, a position (such as left wing or goalie), a skill level, and a **set of injury records consists of id and description**,
- a team captain is also a player,
- a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

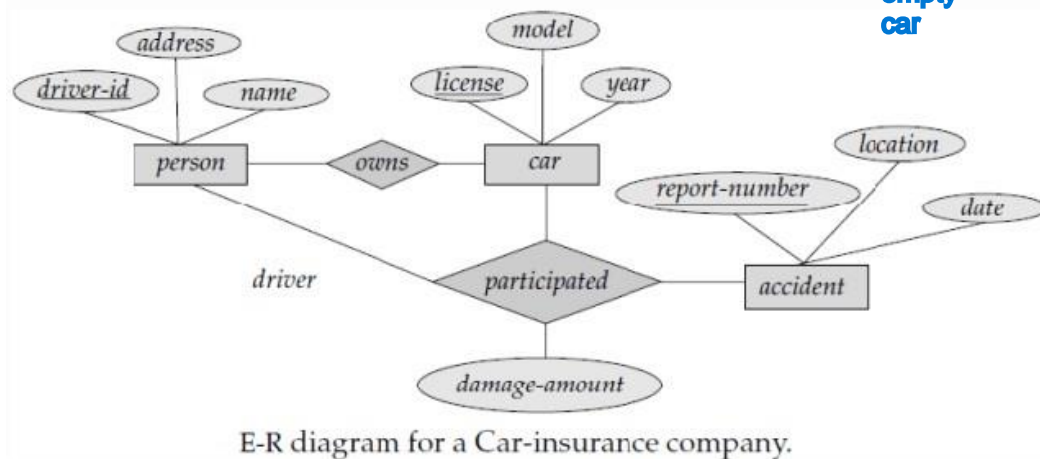
Construct an ER diagram for the NHL database.



Case Study 3: Car Insurance Company

(a) Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Answer :



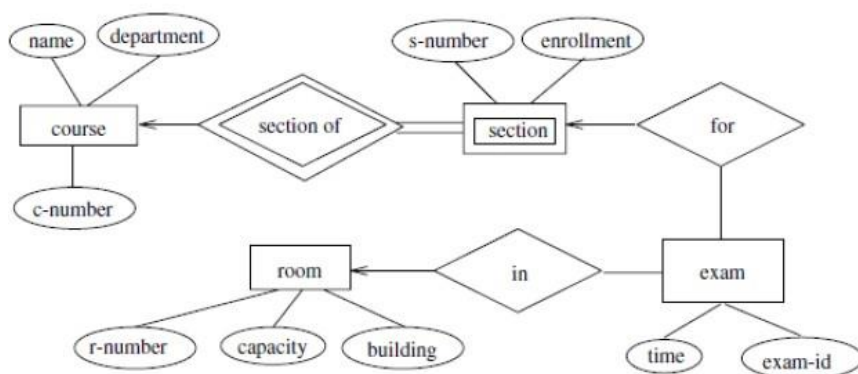
Case Study 4: Exam Scheduling

9 : Consider a university database for the scheduling of classrooms for -final exams. This database could be modeled as the single entity set exam, with attributes course-name, section-number, room-number, and time. Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the exam entity set, as

course with attributes name, department, and c-number

section with attributes s-number and enrollment, and dependent as a weak entity set on course

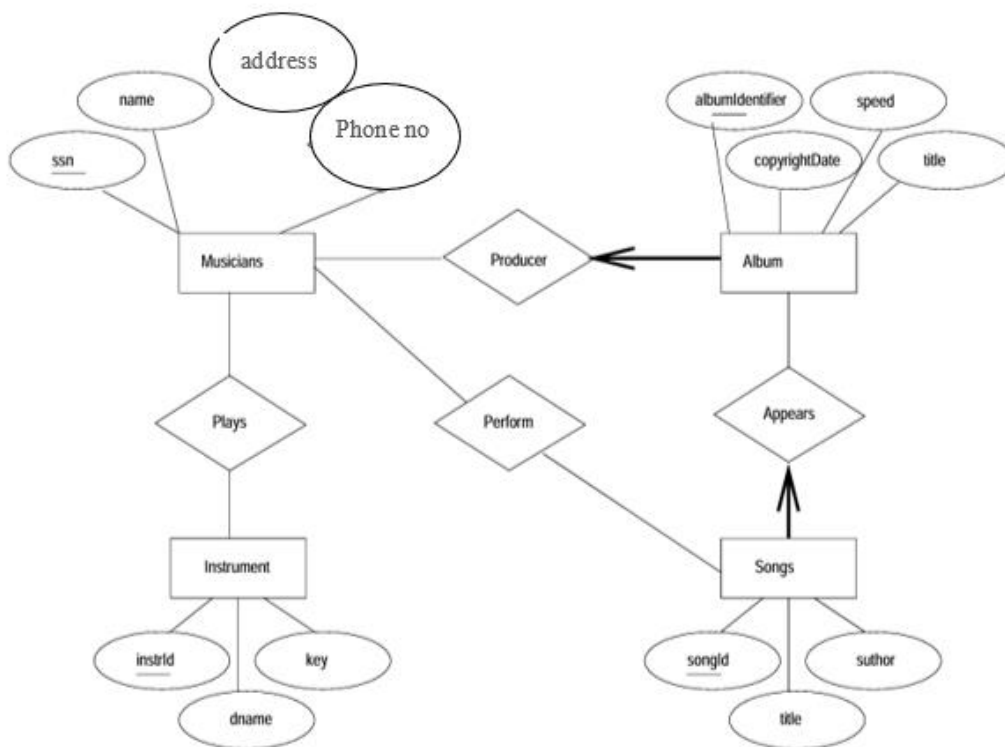
room with attributes r-number, capacity, and building



Case Study 5: Music Record Storing

Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of \$2500/day).

- Each musician that records at Notown has an SSN, a name, an address, and a phone number.
- Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.
- Each song recorded at Notown has a title and an author.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.



Case Study 6: Chain of Pharmacies Database

The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:

- Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Every patient has a primary physician. Every doctor has at least one patient.
- Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that if a doctor prescribes the same drug for the same patient more than once, only the last prescription needs to be stored.
- Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
- Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

