

Practical 1

EXERCISES

For the problems described below identify entities and their attributes, describe relationships among entities making the necessary assumptions (whenever needed) and draw the global EAR schema.

- 1 Corporation for Rescuing Automobile Stake Holders (CRASH) provides repair services for its members whenever they are in trouble with their cars. While the costs of all repairs are registered, the services are not charged to the members except for surcharges on replacement of some parts (e.g. windscreens). Anybody may become a life-member of CRASH upon recommendation of another member of the corporation and payment of a rather high fee. A member may request a service at any time and for any car (whether owned or not). The cars are of such a good quality that they do not break down more than once per day. The engineers employed by CRASH are excellent and have all the necessary tools, parts and skills to repair any car at any time.

The operations of the corporation are supported by an information system whose underlying database stores the details of members, engineers, cars that have ever been dealt with by CRASH and all repairs undertaken by the Corporation.

- 2 A relational database is to be designed for a company that deals with industrial applications of computers. The company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software.

The company employs various experts, consultants and supporting staff. All personnel are employed on a long-term basis, i.e. there are no short-term or temporary staff. Although the company is somehow structured for administrative purposes (that is, it is divided into departments headed by department managers) all projects are carried out in an inter-disciplinary way.

For each project a project team is selected, grouping employees from different departments, and a Project Manager (also an employee of the company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the company's hierarchy. The following is a brief statement of some facts and policies adopted by the company.

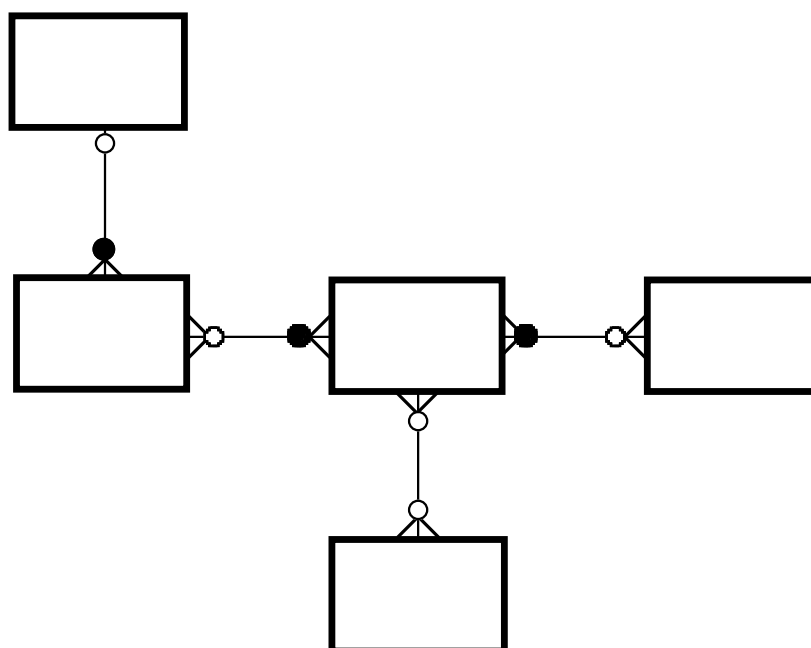
- Each employee works in some department.
- An employee may possess a number of skills.
- Every manager (including the MD) is an employee.
- A department may participate in none/one/many projects.
- At least one department participates in a project.
- An employee may be engaged in none/one/many projects.
- Project teams consist of at least one member.

- 3 Car Rental Co. (CRC) requires an information system whose content would include a description of cars, subcontractors (i.e. franchised garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year.

All major repairs and maintenance are done by subcontractors CRC has long term agreements with. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance, etc. Similarly the cash inflow coming from all sources - car hire, car sales, insurance claims - must be kept on file.

CRC maintains a reasonably stable client base. For this privileged category of customers special credit facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by a credit card. All major credit cards are accepted. Personal details (such as name, address, telephone number, driving licence number) about each customer are kept in the database.

- 4 A General Hospital consists of a number of specialized wards (such as Maternity, Paediatrics, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. Separate registers need to be held to store information of the tests undertaken, diagnosis and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward.
- 5 Describe a situation for which the following EAR schema might feasibly constitute an appropriate data model.



- 6 A Bus Information System is based on the representation of the street network through **nodes** (junctions, roundabouts, pedestrian crossings, etc.) and **street sections** (fragments of streets between any two nodes) to which various details held in the underlying database are (spatially) referenced. Many bus lines meet the transportation needs of the city inhabitants so they can move from virtually every location on the street network to any other by using buses (not necessarily one bus line). However, one or more bus-lines may provide a service between any two nodes. No street in the city is one-way so it is assumed that if there is a connection (*node1*, *node2*) then so is the opposite one (*node2*, *node1*). Originally it was assumed that all bus stops were all located near junctions. However, further analysis showed that this assumption was too restrictive; for longer street-sections more than one bus stop was clearly required.

To measure the safety of the city transportation system, information about traffic accidents also needs to be held in the database. Each accident being described by its location on the street section, its date and time, vehicles and people involved, etc.