

Entity Relationship Diagram

Exercise 5 – Baby parking

The non-profit organization BimbiGioco manages several baby parking facilities in the city of Turin and wants to create a database for the management of its activities.

- Each baby parking facility managed by the BimbiGioco non-profit is identified by its name and is characterized by the address and the presence of an equipped outdoor area. Several rooms are available at each baby parking facility. Each room is identified by a unique code within the baby parking facility where it is available and is characterized by the name and size of the room.
 - In each baby parking facilities several activities are organized to entertain children. Each activity is characterized by a unique code within the baby parking where it is organised. For each activity, the name of the activity and the age range (minimum and maximum age) of the children who can participate in it are also known. Among the possible activities there are thematic workshops. For each thematic workshop, the type is known (for example body expression, theater or animated story), the list of objects used during the workshop (for example musical instruments, paper and colours) and the information on where the workshop is held (i.e., whether inside the baby parking or outdoors).
 - Employees of the BimbiGioco non-profit are identified by their tax code. For each employee, the name, date of birth, mobile phone number and e-mail address (if available) are known. Employees are classified into educators, auxiliary and administrative staff. For administrative staff, the job is known, while for educators the educational qualification is known. For auxiliary staff, the database memorizes the days of the week in which they are on duty with the indication of the working time range (start time and end time). Consider that the same person can work on several days of the week, but at most in one time slot on each day.
 - Children who attend the baby parking facilities of the BimbiGioco non-profit are characterized by their tax code, name, date of birth and list of parents' telephone numbers. The database stores the annual registrations made for children in each facility. Each enrollment is identified by the reference school year and by a progressive code within the reference school year. For each registration, the child and the baby parking facility it refers to are also known. Each child can enroll in multiple facilities in different school years.
 - It is requested to keep track of the program of thematic workshops organized at the various baby parking facilities. For each scheduled workshop, the database stores the date, the start and end time, the educator who coordinates the workshop and the list of children participating in the workshop. It should be noted that the same workshop can be carried out on different dates and several times on the same date. An educator cannot coordinate two or more thematic workshops at the same time.
- a) Describe the Entity-Relationship diagram addressing the above requirements.
 - b) Provide a normalized relational logical schema for the same database

Exercise 6 – Electric company

We want to create a database for the management of some activities of a company that supplies electricity.

- The company's customers are uniquely identified by a customer code. Private customers are characterized by their name, surname, address and a telephone number. Business customers are characterized by the company name, address, telephone number, name and surname of the contact person.
 - Contracts are uniquely identified by a contract code and are characterized by the address of the premises for which the contract is stipulated, the date of the contract, the start date of service (if already known), the customers of the contract and the maximum kW available. For business contracts, the maximum intervention time following a breakdown is known.
 - Company operators are characterized by a unique registration number and by name, surname and mobile phone number.
 - The meters are uniquely identified by an alphanumeric code and are characterized by model, maximum kW output, date of installation and contract to which they refer. The meter readings are stored. Each reading is characterized by the meter to which it refers, by the operator who carried out the reading, by the value in kWh read on the meter, by the date and time it was carried out. It should be noted that during the same date a maximum of one reading is made for each meter.
 - Each bill is uniquely identified by a progressive number within the year and the contract for which it is issued, and is characterized by the time period to which it refers, the issue date, the payment due date, the amount to be to pay and the total amount of electricity consumed expressed in kWh.
 - The price per kWh of electricity depends on the time slot during which the electricity is supplied. The time slots are uniquely identified by an alphanumeric code and are characterized by a valid start time, a valid end time and the price per kWh. For each bill, memorize the total amount of electricity supplied, expressed in kWh, in relation to each time slot.
 - The geographical areas where the company supplies electricity are uniquely identified by an alphanumeric code and are characterized by a list of cities. Each city belongs to at most one geographical area. The periods of time (start date, end date) in which an operator works in an area are stored. In particular, each operator can work at different times in the same geographical areas, but also in different geographical areas in the same period of time.
- a) Describe the Entity-Relationship diagram addressing the above requirements.
 - b) Provide a normalized relational logical schema for the same database

Exercise 7 – Remote toll collection

It is requested to create the database for the management of remote toll collection devices (Telepass) on the Italian motorways.

- Motorways are identified by a unique code at European level and are characterized by a name and total length in km. The toll booths of the motorway network are identified by a unique code within the motorway to which they belong and are characterized by the name and the position along the motorway (in km) where they are located. Furthermore, the current state (open, closed, work in progress, etc.) is known.
- Each Telepass is identified by a unique alphanumeric code. The version and model are known for each Telepass. Each Telepass has a user who owns it, who is identified by the tax code and his name, surname, address, city and zip code are known. In addition, we want to store the user's bank account number or credit card number to which tolls will be charged. A user can be the owner of several Telepasses.

- A Telepass is valid for one or more vehicles. Each vehicle is identified by its license plate and is characterized by toll class and type. Vehicles can be of four types: cars, motorcycles, vans and trucks. Cars are characterized by the maximum number of passengers they can carry, by the engine capacity and power. Motorcycles are characterized by engine power and size. Vans are characterized by their length and empty weight. Trucks are characterized by their length, empty weight and capacity in cubic metres.
- It is requested to record Telepass passages at toll booths on the motorway network. Each Telepass pass at the same toll booth at different times, but cannot pass through different toll booths at the same time. Each passage can be an entrance to or exit from the highway. The toll amount is also known for exit passes. Each pass is associated with the vehicle that carried it out.
 - a) Describe the Entity-Relationship diagram addressing the above requirements.
 - b) Provide a normalized relational logical schema for the same database

Exercise 8 – Pharmacy management

It is requested to design a database for the management of the products available at a pharmacy taking into account the following information:

- Each product is uniquely characterized by the name of the product itself and by the information related to the company supplying the product. The products present in the pharmacy can be medicines or perfumery products. For each product, however, the list of possible uses of the product itself is known (for example, colds, bone ache, or a cleanser for the face or body). The supplying company, on the other hand, **has a contact address, the name** used to identify the company itself, and possibly the fax number if available.
- In the case of medicinal products, the database contains information relating to whether a medicinal product can be paid by the National Health Service or not, and whether it can be sold only upon presentation of a medical prescription. Furthermore, the pharmacotherapeutic category to which the medicinal product belongs is known (for example antibiotic or anti-inflammatory), and whether there are interactions between that pharmacotherapeutic category and other pharmacotherapeutic categories.
- Medicines are contained in drawers, which are themselves contained in shelves. The shelves are identified by a unique numerical code for each pharmacotherapeutic category and the drawers by a unique numerical code for each shelf.
- Finally, in the case of medicines that require a medical prescription, we want to keep track of each sale made.
 - a) Describe the Entity-Relationship diagram addressing the above requirements.
 - b) Provide a normalized relational logical schema for the same database

Exercise 9 – European Football (soccer) League

We want to represent a database for the management of football matches held in the context of the European Championship, taking into account the following information:

- The teams participating in the European football championships are uniquely identified by the name of the nation they belong to (Italy, Romania, England, etc.). For each team, the name of the current coach is known

and the list of previous editions of the European Championships won by the team itself. In addition, the name of a fan club is known for each team if available.

- The European Championships are organized in rounds. Each round is uniquely identified by the name of the round itself (example: "qualification", "quarters", "semifinal" and "final"). The database contains the list of teams that take part in each round of the championship.
 - Football matches are identified by a unique order number within each round. For each match, you are requested to store the names of the two teams involved, the stadium in which the match is being played (stadium name, city, country) and at what time.
 - Players are uniquely identified by the name. For each player, it is also known which team he plays for in the European Championships, and with which shirt number. A contact address is known for each player. For each of the players who scored, we want to memorize in the database, for each game played, the minute of the game in which that player scored a goal, and whether it was a penalty.
 - Finally, the database contains information about which referee has been assigned to each match. For each referee, the name is known, which uniquely identifies him, a contact address, and the total number of games refereed at the European Championships.
- a) Describe the Entity-Relationship diagram addressing the above requirements.
 - b) Provide a normalized relational logical schema for the same database