Exercises on database design

Air quality monitoring

The AirQ company monitors and analyzes the quality of air in cities and wants to design a database to manage its activities.

- AirQ analyzes the concentration of various pollutants such as carbon monoxide and nitrogen dioxide. Each pollutant is identified by a code and it is characterized by its name, a brief description, the measurement unit and the main cause of production of the pollutant (e.g., vehicular traffic or heating systems).
- A network of fixed stations is exploited to monitor the concentration of pollutants. Each station is characterized by a unique code and its geographical position, expressed in terms of latitude and longitude.
- Each station includes different sensors. Each sensor is identified by a unique code and it is characterized by the station where it is placed and the monitored pollutant.

Furniture Store

A furniture store wants to build a database to handle some of its activities.

- The customers of the furniture store are identified by the tax code. In addition, the customer name, address, and email address (if available) are known. Customers are classified as private and company. For companies, a list of telephone numbers are recorded.
- The furniture store sells different models of furniture. Each model of furniture is identified by an alphanumeric code and it is characterized by the price and the size (height, width, depth).
- For each model the reference supplier is recorded. Suppliers are identified by the VAT number and they are characterized by the name and the telephone number.
- Sale contracts for furniture are identified by a unique alphanumeric code. Each sale contract is characterized by the customer who signed the contract, the date on which the contract has been signed, the total sale price and the list of models of furniture purchased.
- The database keeps track of the scheduling of furniture delivery through vans. Each van is characterized by the plate number, the model and the registration year. Each delivery is characterized by the contract to which it is associated, the date and time of delivery, and the used van.

Research activity

A research organization wishes to design a database to manage activities related to funded research projects.

- Each funded project is identified by a code, and it is characterized by the title, the total budget, and the start and end dates of the project.
- Each project consists of many activities. Each activity is characterized by a unique code, a name, and the project to which it refers. For each activity the list of released software components is stored. Each software component is identified by a code and it is characterized by a brief description, its name and the list of hardware requirement needed to use the component.
- The employees of the research institution are identified by their Social Security Numbers (SSN). For each employee, the name, the hiring date, and the URL of the personal webpage (if available) are stored. For each project the employee who is currently the coordinator is known. The same employee can be the coordinator of more than one project. In addition, the database stores the activities in which each employee has been involved indicating the time period (start and end dates) and the total number of working hours.