

MIDDLE EAST TECHNICAL UNIVERSITY
Department of Computer Engineering

CENG302 - Introduction to Database Management Systems
Term Project

Due date: May 29

NASA wants to restructure their organization therefore they decided to upgrade their software system. They have hired a major software company for this task. And you, as the lead database designer of this major company, have been assigned to design the database.

After the first meeting with the administrator, he granted you with full authorization and asked all the organization's workers to help you. So you start working and make some interviews with the stakeholders.

First you had an appointment with the CFO (Chief Financial Officer) of the organization, and the following conversation was made.

You: Generally what do you expect from the new software system?

CFO: I am mostly interested in the financial balance of the organization. Therefore I must be able to see the incomes and expenses of the organization.

You: What types of incomes do you have?

CFO: We have two types of incomes. The first one is the funds provided by the government. The second one is the income we gain from the patents we hold.

You: Can you explain these a little bit more?

CFO: Of course. You know that each year the government makes a budget plan and asks the congress to approve it. Some part of this budget is assigned to us but we cannot receive the money all at once. Government makes some payments to us whenever there is money in the treasury. So we cannot get regular payments. Keeping track of these payments is vital for us.

You: And the patents?

CFO: We have some number of patents. Whenever a company wants to use one of the products that we hold the patent of, the company has to pay us some money. We must be able to keep track of this money as well.

You: What about the expanses?

CFO: We have three basic types of expanses: Employee salaries, equipment, and mission special expanses.

You: Finally what kind of reports would you like the software to generate for you?

CFO: Just a minute, I've noted it somewhere prior of your arrival. OK, here it is. But note that I am only concerned with the current financial year so all these reports should contain only data of the year we are in.

- All the tracks regarding to the funding supplied by the government (date and amount of money, and the bank account money has been transferred to)

- All the tracks regarding to the funding supplied by the patents (for which patent, from whom, when the money was received and the amount and the bank account the money was transferred to)
- All the tracks regarding to the expenses (the date, amount, reason for the expense, and from which bank account the money was transferred from)
- All the track of expenses made for staff salaries (the date, amount, and from which bank account the money was transferred from)
- All the track of expenses made for equipment (the date, amount, the equipment money was spent for, and from which bank account the money was transferred from)
- All the track of expenses made for mission special cases (the date, amount, the mission money was spent for, and from which bank account the money was transferred from)
- For each of the bank accounts all the transactions (incoming or outgoing, date, amount, source or destination)
- Current balance of the bank accounts

You: Thank you Mr. CFO.

After your meeting with the CFO your next stop is the Jet Propulsion Laboratory. And the following conversation takes place.

You: Generally what do you expect from the new software system?

JPL Director: I am interested in managing the missions. Therefore system should store information about the missions.

You: What kind of information should be stored?

JPL Director: For each mission there is some basic information: Identification of the mission, staff working for the mission, if this is a manned mission the astronauts that will join the mission, and the equipment that will be used in the mission.

You: Equipment?

JPL Director: Equipment can be investigated under 4 headers: rockets, space shuttles, rovers and scientific experimenting equipment. We have many rockets (like Saturn I, II, III, etc., Jupiter A, B, C etc., Ariane, Proton etc.), a few space shuttles (Discovery, Atlantis, Endeavour, etc), some rovers (Lunar Rover Models, Mars Rover Models etc.) and different kind of scientific experimentation tool. We must be able to keep data about these.

You: How do you identify a mission?

JPL Director: Each mission has a unique identification code which is a 6 digit number. In addition to this we have a name, a director and an explanation of the mission.

You: Can anyone be a director?

JPL Director: No, only senior engineers can be a director of a mission.

You: Anything else?

JPL Director: You know that we are dealing with cutting-edge technology here. We have a brilliant R&D team and while they are working for some missions it is often the case that they invent something and we get the patent for these inventions. It would be good to know which missions yielded in which inventions.

You: While using this new software system what kinds of reports it should be able to generate for you?

JPL Director: Hmm, I guess the following would be fine.

- List of future (planning) missions, list of active missions and list of past missions.
- List of successful missions and the goals achieved.
- List of unsuccessful missions, and the reason(s) for failure.
- For a particular mission staff working for the mission (personnel id, name, major, department, duty on the mission) Because of the global crisis unfortunately we had to cut off expenses so sometimes a person may be working for one or more missions at the same time, where s/he has different duties on each mission. Please consider this while you are designing your software.
- For a particular mission the astronauts that will join the mission
- For a particular mission the list of equipment used
- For a particular mission the list of patents we got for our inventions
- For a particular staff the mission-history info (for each mission he worked for; duty on the mission, and the start-end dates s/he worked for the mission)
- For a particular equipment the mission-history info (the list of missions the equipment was used)
- For a particular astronaut the mission history info (the list of missions the astronaut has joined)

You: Thank you Mr. Director.

Finally you go to see the Staff Manager. And here is the conversation you had:

You: Generally what do you expect from the new software system?

SM: I am interested in managing the employees. Therefore system should store information about the employees.

You: What kind of information should be stored?

SM: We have some common information for each employee like the SSN of the employee, name, age, address, phone, marital status, salary and some other information depending on the type of the employee.

You: What are these types?

SM: Mainly we have 4 types of employees: engineers, administrative staff, astronauts and technicians. Engineers can be further classified as senior and other.

You: Depending on the type of employees what kind of extra information you'd like to store?

SM: For engineers we would like to store BS major. For senior engineers we would like to store years of experience. For administrative staff we would like to store the departments s/he is responsible for. For technicians we would like to store the expertise area and the list of certificates and trainings. And for astronauts we keep the results of medical examinations.

You: Do you keep any information about people other than the employees?

SM: Yes, we keep track of the people that depend on our employees under laws. We keep their names, ages, and their relationship information with the employee.

You: Finally what kind of reports would you like the software to generate for you?

SM: I would like to see:

- List of employees
- List of employees that are on vacation
- List of employees currently working for at least one mission
- List of employees currently working for no missions
- List of dependents and the employee s/he depends on

You: Thank you Mrs. Manager.

Dear team leader, after these interviews, you are asked to design a database schema that satisfies the requirements of the organization. You are supposed to:

- Draw the ER diagram of the database model,
- Transform the diagram into a relational model,
- If possible normalize your schema to BCNF, if not justify why.

You are required to use a free DBMS tool MySQL, which can be downloaded from the internet site <http://dev.mysql.com/downloads/> (you can also find some other useful stuff like manuals, GUI tools etc. from the same site.)

For test purposes you should insert enough (at least 5 records for each table) data into your database. Write batch files (including SQL statements) to generate the required reports. Write at most 2 pages long project paper explaining your design, difficulties you faced and the solutions you employed. You can also stick some notes next your ER model to further explain your design.

Form groups of two members for the project. At the end of the project you will have a demo. Also do not forget to submit your create table and insertion scripts.

GOOD LUCK!