

Advanced DataBase For Finance - Tutorial 2

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Entity-Relationship Modeling & The Relational Model.

Part I: Database Design for a Company Domain

Draw a single ER diagram that represents the specifications listed below. To help you do this, we break down the drawing for you into separate steps.

1. A company database needs to store information about employees (identified by ssn, with salary and phone as attributes), departments (identified by dno, with dname and budget as attributes), and children of employees (with name and age as attributes). Draw an ER diagram to represent these entities and their attributes.
2. Extend your ER diagram with relationships to represent the following information.
 - (a) Employees work in departments.
 - (b) Each department is managed by an employee (exactly one).
 - (c) A child must be identified uniquely by name when the parent (who is an employee) is known. We are not interested in information about a child once the parent leaves the company.
3. Write SQL statements that translate your ER model into the relational model (that is, the SQL statements should create tables corresponding to the entities and relationships in the ER model). You may want to first translate the ER model into a relational schema, then the relational schema into SQL commands.
4. SQL queries:
 - (a) Give the DSI department employees names.
 - (b) which department employs the maximum number of employees.
 - (c) List all department with the number of employees that each department employs.
 - (d) What is the name of STOWE's children.
 - (e) List all department that have a budget greater than 100k.
 - (f) Give the ssn, salary and department name of all employees that have more than 2 children.
 - (g) What is the average salary of each department.
 - (h) Give the name of each department manager, the manager salary, the number of children and the number of employees that this department contains.

Part II. Database Design for an Airport Domain

Draw a single ER diagram that represents the specifications listed below. To help you do this, we break down the drawing for you into separate steps.

1. Consider a model of an airport with planes, models of planes, test of planes, and technicians. Draw an ER diagram to represent these entities and the following attributes.

Planes have a unique registration number. Airplane **Models** are each identified by a model number (e.g. DC-80), and each have a capacity and a weight. A number of **technicians** work at the airport. You need to store for each the name, phone number, address, and salary. The airport has a number of tests that are used regularly to ensure that airplanes are safe. Each test has a unique FAA number, a name, and a maximum possible score. Extend your ER diagram with relationships to represent the following information.

- (a) Each airplane is of one specific model.
 - (b) Each technician is an expert on one or more plane models. His or her expertise may overlap with that of other technicians.
 - (c) France Transport requires the airport to keep track of each time a given airplane is tested using a given test. For each testing event, the information needed is the date, the number of hours spent doing the test, and the score that the airplane received on the test.
2. Write SQL statements that translate your ER model into the relational model (that is, the SQL statements should create tables corresponding to the entities and relationships in the ER model).
 3. SQL queries:
 - (a) What is the salary of each technicians.
 - (b) Give the registration number of each plane that obtain a test lower than 75 points the last year.
 - (c) How many test are conducted each month the last year.
 - (d) Give the number of airplanes in each airport.
 - (e) What are the technicians expertise that each airport have.
 - (f) What are the airplane models in all the airport sorted by their weight.
 - (g) Give the name of airplane model that have the maximum capacity.

Important Notes:

1. *You are not required to write down the relational schema in this format: Students(sid: string, name: string, login: string, age: integer, gpa: real). We won't grade you on the schema, only on the SQL commands. We just think the schema will help you.*
2. *Be sure to incorporate as many constraints mentioned in question 1 and 2 as possible. If there is a constraint mentioned in question that you cannot capture in SQL statements (using the basis SQL data description constructs, that is, no ASSERT or CHECK commands), describe what the constraint is and explain why it cannot be captured.*

Note on ER exercises: ER modelling is as much a science as an art, and not a rote procedure. The purpose of this assignment is to give you a bit of practice in capturing informal descriptions in an ER diagram. Just like in real life, if you feel that not all the details that you need to know have been completely specified, use your common sense. If in doubt, explain explicitly what assumptions you are making and how they are shaping your model.