

Database Management Systems

Database Design Example

Topics

- ▶ Hospital Database
- ▶ E-R Design
 - ▶ Entities
 - ▶ Relationships
- ▶ Converting E-R Model to Relational Model
 - ▶ Tables
 - ▶ Queries
- ▶ Summary

Hospital Database (1)

- ▶ The database for a hospital or a clinic.
- ▶ It contains information about people who have been admitted at least once in the hospital. A person can be admitted several times to the same or different wards. People are identified by a Code.
- ▶ The database should describes all the hospital's wards, showing for each ward the name and the respective consultant.

Hospital Database (2)

- ▶ The database should contains information about all doctors in the hospital, giving their surnames, first names, wards, and so on.
- ▶ For each patient the given treatment at any date is stored in the database.

E-R Model

▶ Entities:

- ▶ Patient
- ▶ Doctor
- ▶ Ward

▶ Relationships:

- ▶ A doctor works in a ward
- ▶ A patient is admitted to a ward at a given date.
- ▶ A doctor gives a treatment to a patient at a given date.
- ▶ A ward has a consultant who is a doctor

Patient Entity and its Attributes

- ▶ A patient is identified by a Patient Code. The attributes are:
 - ▶ PatientCode
 - ▶ Name
 - ▶ Surname
 - ▶ Date of Birth
 - ▶ Place of Birth
 - ▶ Sex
 - ▶ Address
 - ▶ Phone

Doctor Entity and its Attributes

- ▶ For each doctor a code is used. The attributes are:
 - ▶ DoctorID
 - ▶ Name
 - ▶ Surname
 - ▶ Expertise
 - ▶ Address
 - ▶ Phone

Ward Entity

- ▶ Ward has the following attributes:
 - ▶ WardID
 - ▶ Name
 - ▶ Building
 - ▶ Phone

Relationships(1)

- ▶ Each doctor works in a ward
- ▶ A ward has many doctors
- ▶ The relationship between ward and doctor is a one to many relationship. This relationship is defined as a foreign key.

Relationships(2)

- ▶ Admission:
 - ▶ A patient is admitted to a ward.
 - ▶ A patient may be admitted to different wards at different dates
 - ▶ A ward admits many patients
 - ▶ Admission is a many to many relationship

Relationships(3)

▶ Treatment

- ▶ A doctor gives a treatment to a patient
- ▶ A doctor can give treatment to many patients
- ▶ A patient gets treatment from many doctors (at different dates)
- ▶ The treatment is a many to many relationship between doctor and patient.

Relationships(4)

- ▶ Each ward has a consultant who is a doctor.
 - ▶ A doctor can be a consultant in only one ward
 - ▶ Each ward has only one consultant
 - ▶ The relationship is a one to one relationship

Relational Model for the Hospital Database

The following tables are created:

1. Patient table (patientCode primary key)
2. Doctor table (doctorID primary key, wardID foreign key)
3. Ward table (wardID primary key, Consultant is foreign key to doctor table)

Converting Relationships

- ▶ Admission is converted to a table as
 - ▶ Admission < PatientCode, WardCode, DateAdmitted, DateDischarged >
 - ▶ PatientCode and WardCode are foreign keys
 - ▶ **Primary Key:**
PatientCode+WardCode+DateAdmitted
 - ▶ Treatment <PatientCode, DoctorID, Date, Treatment>
 - ▶ PatientCode and DoctorID are foreign keys.
Treatment is a string.
 - ▶ **Primary Key : PatientCode+DoctorID+Date**

Some Queries

- ▶ The following queries are given as example:
 - ▶ Create table for ward entity
 - ▶ Insert data into Patient table
 - ▶ Select all patients admitted on May 10, 2010
 - ▶ Select all patients treated by doctor 'Hasan'

Create Ward Table

Create Table Ward

```
(  
    WardID char(10) Primary Key,  
    WardName varchar,  
    Building char(5),  
    Phone char(13)  
)
```


Insert Data into Patient Table

► Insert Into Patient

(PatientCode, Name, Surname,
DateOfBirth, PlaceOfBirth, Sex,
Address, Phone)

values (100, 'Ali' , 'Velioglu', 1980,
'Ankara', 'Male', '100 Yil' , '123456')

List Patients Admitted on May 10, 2010

Select Name, Surname

```
FROM Patient JOIN Admission ON Patient.PatientCode =  
Admission.PatientCode
```

```
WHERE DateAdmitted = '2010-5-10'
```

List Patients Treated by Doctor 'Hasan'

```
SELECT Patient.Name, Patient.Surname  
FROM Patient, Treatment, Doctor  
WHERE  
    Patient.PatientCode = Treatment.PateintCode  
AND  
    Treatment.DoctorID = Doctor.DoctorID  
AND  
    Doctor.Name = 'Hasan'
```

Company Example

- ▶ A company has several projects.
- ▶ Each project is carried out in a different city, has a start date, period and budget.
- ▶ For each project some products are needed.
- ▶ These products are supplied by different suppliers.

Entities

▶ Project:

- ▶ Attributes: Project Code, Project Name, Project Start Date, Project Duration, Project Budget

▶ Product:

- ▶ Attributes: Product Code, Product Name, Price

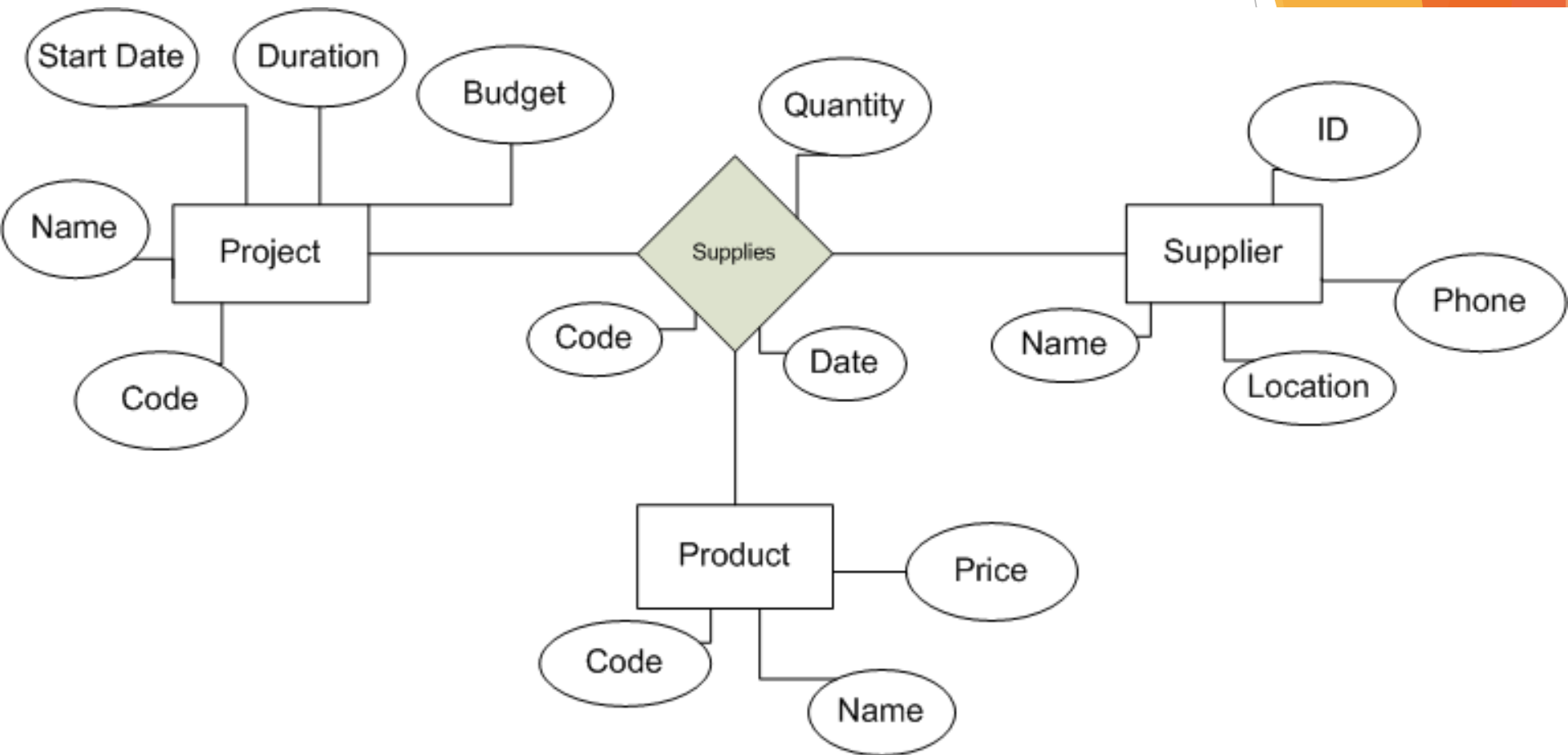
▶ Supplier:

- ▶ Attributes: Supplier ID, Supplier Name, Location, Telephone

Relationships

- ▶ A supplier SUPPLIES some products for a project
- ▶ A project may get products from different suppliers
- ▶ A supplier may supply a product for different projects
 - ▶ There is a ternary relationship between supplier, product, and project

E-R Model



Create Table for Relationship

Create table supplies

```
(  
  supplyCode Integer Primary key,  
  sID Integer References supplier(ID),  
  pcode Integer References product(code),  
  pID Integer References project(code),  
  quantity Integer,  
  supplyDate Date  
)
```


Summary

- ▶ Read the problem requirements very carefully
- ▶ Find entities and relationships
- ▶ Create E-R model for the database
- ▶ Convert E-R model to Relational model
- ▶ Create tables
- ▶ Insert data into the tables
- ▶ Write some queries to use the database (depends on the requirements)

Questions?