Lecture 1

Database Design and Data Modelling - an Overview

Week 1

This series of lectures introduces:

- Enhanced Entity Relationship (EER) Data Model
- Methods to describe a universe of discourse (a business area) using the EER Data Model
- The Relational Data Model
- Mapping of an EER design onto a Relational Database Implementation
- How to describe and manipulate a relational database using the Structured Query Language (SQL).
- Principles of good database design

Questions you should be able to answer after you studied this module

- How can information (e.g. about an enterprise) be represented ?
- What languages can be used for this task?
- How to manipulate this information (store and retrieve it) ?
- What standards exist?

Possible answers

- Use the (Enhanced) Entity Relationship Model to represent data (or IDEF1x, UML, EXPRESS,...)
- Use the Relational Data Model to represent data (or OO, XML,…)
- Use SQL (Structured Query Language) for describing and manipulating data (or OSQL,…)

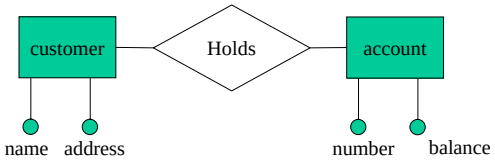
The Universe of Discourse (UoD)

- The UoD is that domain of the enterprise about which information is to be stored in the database (accounting, personnel, materials management, scheduling, product catalog, customers...etc)

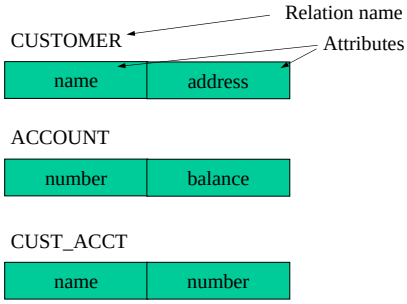
Information or Data?

- Data: facts
- Information: interpreted data (what element of news is carried by the data)
- Databases store data but users *interpret* the retrieved data and it becomes information (for them)

Example Entity Relationship Diagram



Relation schema



Relation instance

CUSTOMER

name	address
J smith	22 high st
M hari	77 danger st
G grant	33 low st

tuples

Attribute values

Databases can be queried using

- Relational calculus
- Relational algebra
- SQL

Relational calculus

The query

"Show names and addresses of customers with balances > $10,000"

can be expressed as:

Tuple variables — Conditions

$$\{ u, v \mid customer(u,v) \wedge account(x,w) \wedge cust\_acct(u,x) \wedge w > 10000 \}$$

Relational algebra

The query

"Show names and addresses of customers with balances > $10,000"

can be expressed as:

$$\Pi_{name,adress} (\sigma_{balance>10000} (customer * account * cust\_acct))$$

SQL

The query

"Show names and addresses of customers with balances > $10,000"

can be expressed as:

```
SELECT name, address
FROM customer c , account a, cust_acct ca
WHERE
   c.name = ca.name AND
   ca.number = a number AND
   a.balance >10000;
```


The End