

# Introduction to Database Design

Speakers

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## Agenda

- Theoretical foundation of databases
- DBMS
- System modeling
- SQL
- Multi user environment
- Transactions
- Administration of database
- Database tools - MS Access

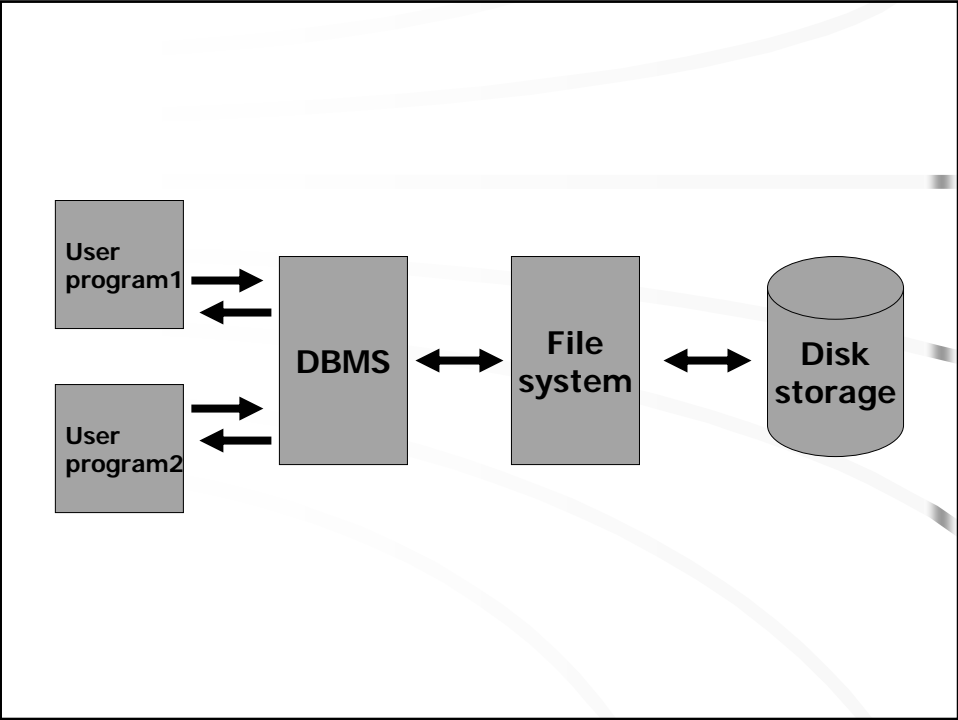
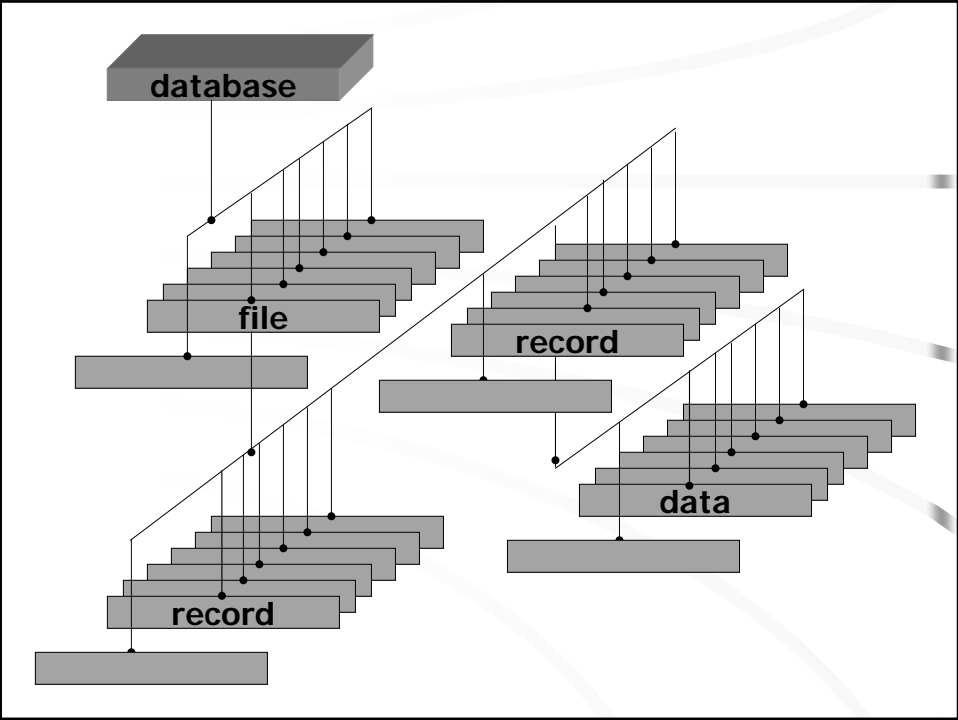
## Theoretical foundation of databases

- Data are the center of decision making in health care
- data should be reliable, complete and well structured
- a software shell around the data assists the user in storage, retrieval, control the access to the data and keeps a log file of all data transactions.

*Database management system - DBMS*

## Structure

- Database
- File (data storage entity)
- Records (smallest units of data storage in database)



## Main tasks of DBMS

- taking care of all database storage, modifications and retrieval operations
- checking the data integrity and consistency rules
- access control
- multi-user access ( concurrency control)
- facilities for data protection (transactional logging)

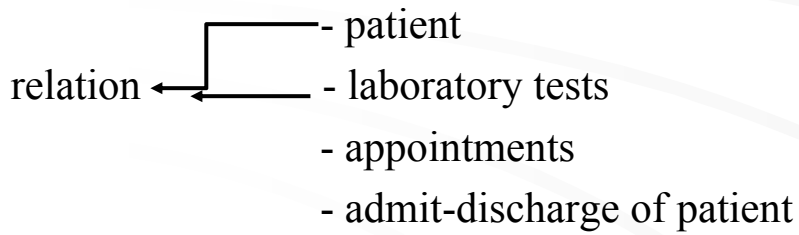
## Transactions

- Set of tasks DBMS has to do on DB objects
- What if something goes wrong?
  - Rollback
  - Commit
  - Redo logs
  - backup

# System modeling

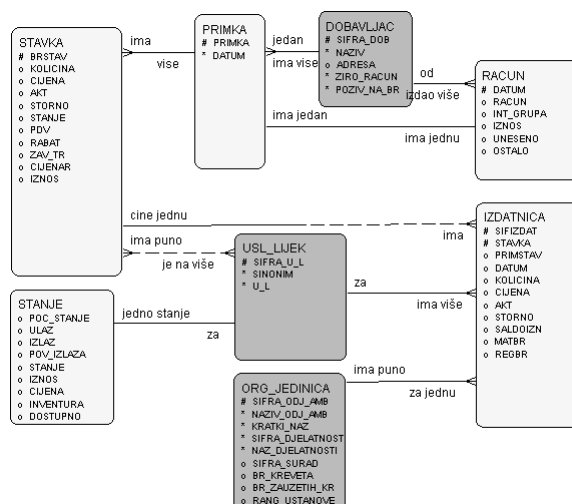
- Conceptual data model
  - data groups that have similar properties

## ENTITIES



entity-relation diagram (ERD)

## Example of ERD



## Implementation data model

Conceptual data model → implementation data model

Entity

Table

Physical data model

- organization of data files on disk

## Relational data model

- Wide used and adopted
- series of tables
  - rows        records
  - columns    fields

### Demographic Data

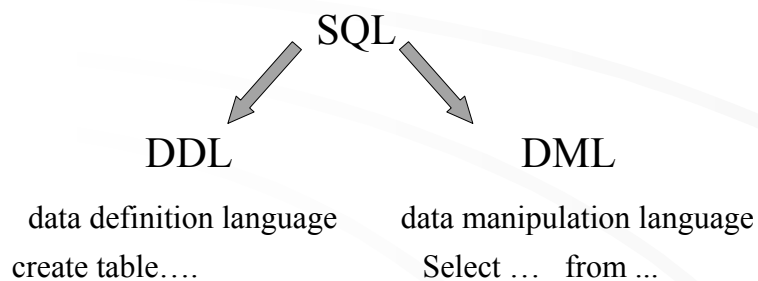
Pat.No.	Name	Gender	Birth date	Address	City	Phone No.
12	Johnson, M.	male	Aug 12-1934	4808 Main St	New York	(123) 456-789
66	Smith, A.F.	female	Mar 13-1950	12 Hill Lane	Baltimore	
45	Brown, M.	male	Dec 03-1960	234 New Rd.	Boston	(987)-654-321

### Physical Examination

Pat No.	Date	Height (cm)	Blood Pressure	Smoking	Chest Pain	
12	May 15-1996	185	80	120/80	Yes	Never
66	Feb 07-1996	180	75	117/85	No	Often
45	Apr 18-1996	175	90		Yes	Seldom

## SQL (Structured Query Language)

- One of the best known data definition and query languages for relational databases



## SQL

One of the best known data definition and query languages for relation databases is SQL. SQL contains statements for database definition (DDL) and data manipulation (DML).

## DDL

The most important operation of DDL is the create table operation. With create table, a new table can be defined by specifying a name for the table and its data fields with their types.

Examples of data types that can be used in SQL are:

- numerics of various sizes (INTEGER or INT and SMALLINT),
- character-string (CHAR(n) or CHARACTER(n), and varying-length, with n being the maximum number of characters VARCHAR(n), CHAR VARYING(n), or CHARACTER VARYING(n)), and
- real numbers of various precisions (FLOAT, REAL, DOUBLE PRECISION) and DATE and TIME.

Below is an example of a create table statement that creates the table DemoGraphics and that also specifies per data field a name and data type. Note that PatNo is defined as an integer with restriction that this field cannot be null (it cannot be left blank).

```
CREATE TABLE (DemoGraphics (  
  PatNo Integer NOT NULL default 1,  
  Name char(40),  
  Genre char(1),  
  Bdate, date,  
  Address char(50),  
  City char(30),  
  PhoneNo char(10)  
);
```

## System modeling cont.

- Process modeler  
graphical tool for design of processes
- Data modeler  
graphical tool for design of data flow

## MS Access 97

- Application designed for developing databases
- useful tools for data input/output
- ability to check correctness of data
- data integrity
- data protection

## MS Access 97 cont.

- Easy of use for non-professionals
- ability to work with other databases using ODBC
- integration with other MS Office applications

## Components of Access database

- Tables
- reations between tables
- forms
- reports
- queries for searching necessary data
- procedures written in VB module

## Tables

- Set of rows called records
- each record consist of fields
  - text
  - MEMO
  - numeric
  - date/time
  - logical
  - OLE
- index - structure that enable faster searching

## Relationships among tables

- One-to-one relationship ( 1:1)
- One-to-many relationship ( 1:M )
- Many-to-many ( M:M )
- Enforcing data integrity

## Forms

- Main function is data input/output control
- elements: fields, lists, switches, buttons...
- types of elements: attached, free, calculated

## Reports

- Is flexible data organization tool for printing
- output necessary data in the required form
- Based on tables and query output

## Query

- Searching data matching specified criteria
- Based on SQL
- has graphical interface
- possibility for insert, update and delete data from tables
- very powerful tool

## VBA modules

- Set of declarations and procedures written in Visual Basic for applications integrated into a single program unit
- modules are associated with certain form or report
- contain event processing procedures
- event processing procedures are used to control the behavior of form or report