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

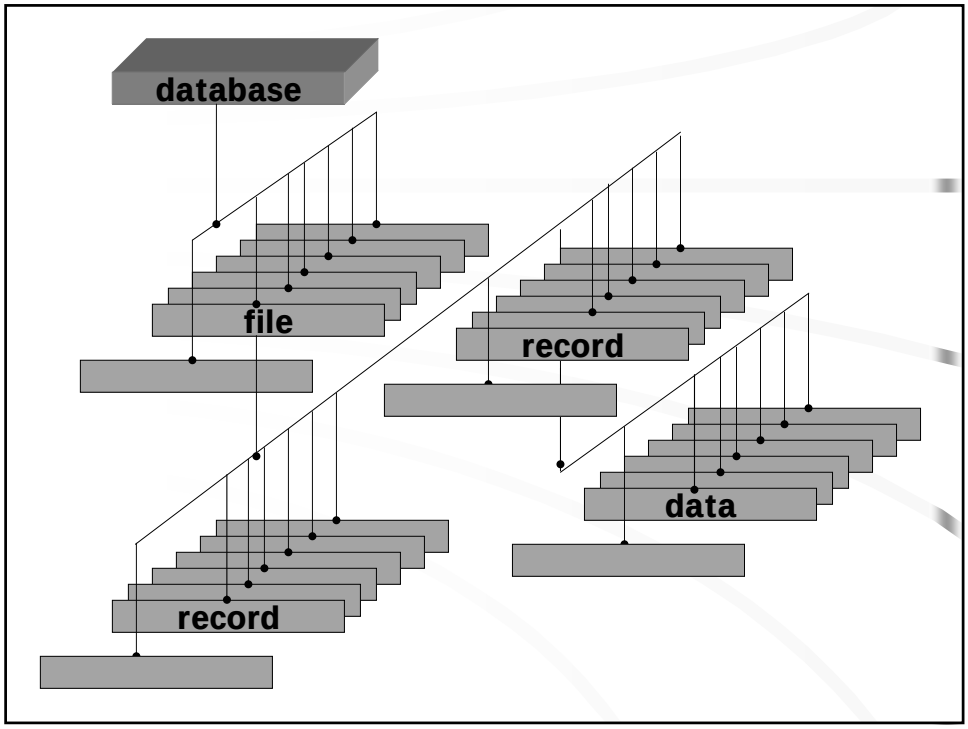
Theoretical foundation of databases

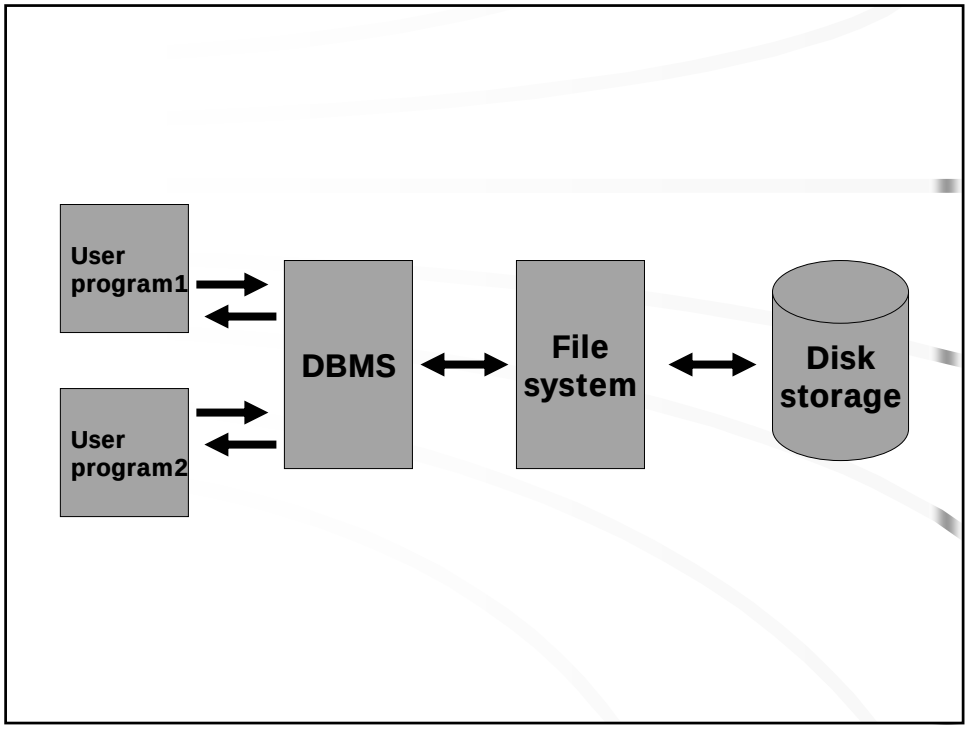
- Data are the center of decision making in health care
- data should be reliable, complete and well structured
- a software shell around the data assists the user in storage, retrieval, control the access to the data and keeps a log file of all data transactions.

  Database management system - DBMS

Structure

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


database
file
record
data
record


User program1
User program2
DBMS
File system
Disk storage

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 (concurency 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

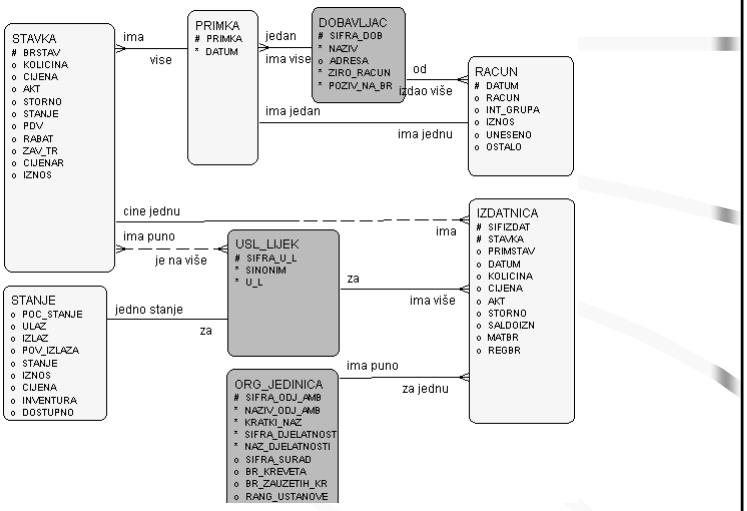
ENTITIES

- patient
- laboratory tests
- appointments
- admit-discharge of patient

relation

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

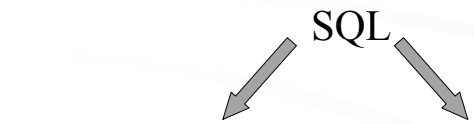
Pat.No.	Name	Gender	Birth date	Address	City	Phone No.
12	Johnson, M.	male	Aug 12-1934	4808 Main St	New York	(123) 456-789
66	Smith, A.F.	female	Mar 13-1950	12 Hill Lane	Baltimore	
45	Brown, M.	male	Dec 03-1960	234 New Rd.	Boston	(987)-654-321

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



DDL

data definition language

create table….

DML

data manipulation language

Select … from ...

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 omportant 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 tjat can be used in SQL are:

- numerics of various sizes (INTEGER or INT and SMALLINT),
- character-string (CHAR(n) of 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 deafult 1,
    Name char(40),
    Gendre 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 aplications

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