Lecture 2

- Data Model
  - hierarchical
  - network
  - relational
  - post-relational
  - multidimensional
  - object-oriented

Data Model

- The data model is a description of the organization of data in the database.
- The data model also describes the relationship between the data and restrictions applicable to the data.
- Data models can be divided into two categories:
  - Object - a logical model - focuses on the description of data, data relationships, and limiting.
  - Logical model based on the entries - focuses on the description of the data structures and access methods in the database management system.

Data Models

Classic models:

- hierarchical
- Network
- Relational

Current models:

-post-relational

-multidimensional

-object-oriented

Other data models that extend the known models

object-relational
deductive object-oriented,
semantic,
conceptual,
and others.

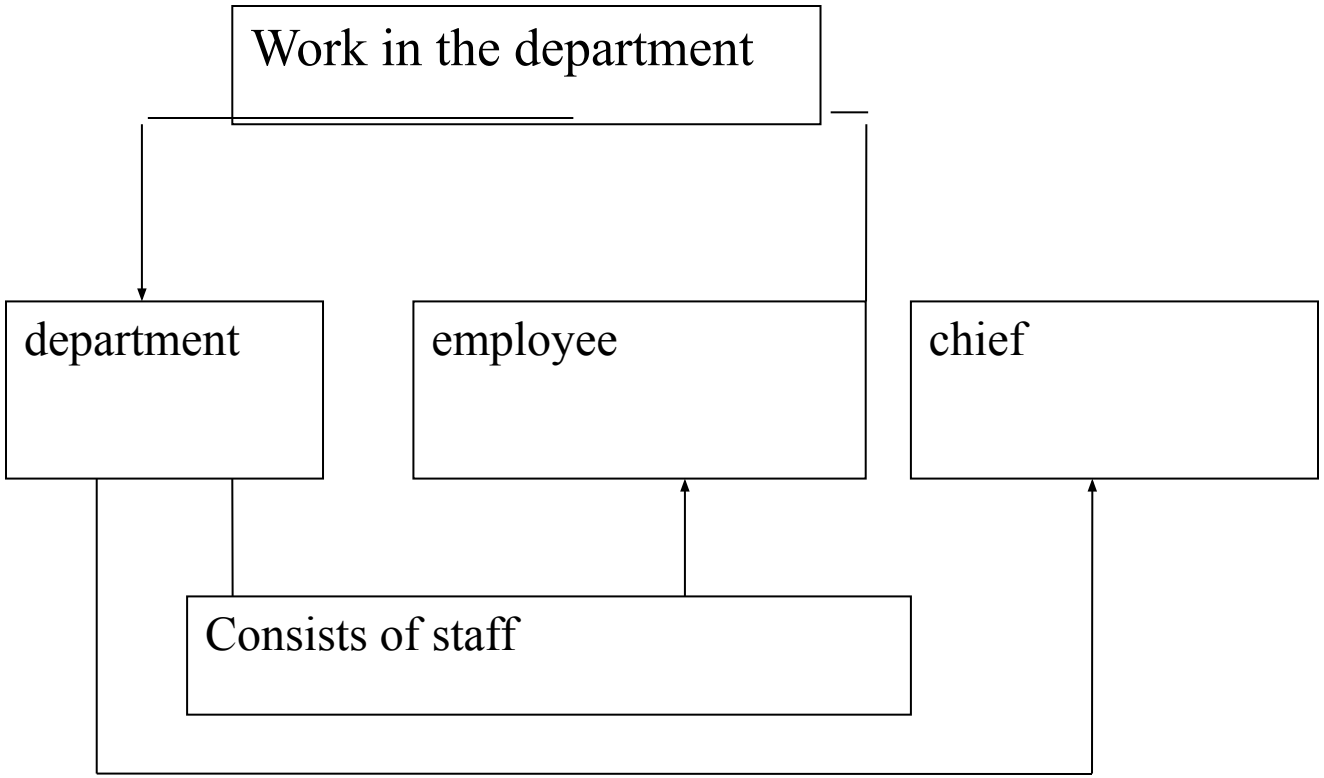
hierarchical model

- ADVANTAGES hierarchical model
  Effective use of computer memory
  Good performance of time to perform basic operations
  Model is convenient to work with hierarchically structured information
- DISADVANTAGES hierarchical model
  Cumbersome to process information with a fairly complex logical relationships
  Complexity of understanding for the average user
- Examples of database hierarchical model
  - IMS, PC / Focus, Team-Up and Data Edge,
    (from Russian): *Ока, ИНЭС и МИРИС*

network Model

- ADVANTAGES network model:
  The possibility of effective implementation in terms of memory consumption and speed
  (Compared to the hierarchical) great opportunities in terms of the admissibility of arbitrary relationships education
- DISADVANTAGES network model
  High complexity and rigidity of the database schema
  The difficulty for the understanding and implementation of information processing in the database as a regular user
- *Known network database:*
  - *IDMS, db_VistaIII,*
  - *СЕТЬ, СЕТОР и КОМПАС*

Example of a network model



relational Model

- ADVANTAGES relational model
  Simplicity, ease the physical implementation on a computer
  Processing efficiency

- DISADVANTAGES relational model
  Lack of standard means of identification of individual records
  Complexity of the description of hierarchical and network links

- Examples of relational database model:
  - *dBaseIIIPlus и dBaseIY (фирма Ashton-Tate), DB2(IBM), R: BASE (Microrim), FoxPro ранних версий и FoxBase (Fox Software), Paradox и dBASE for Windows (Borland), FoxPro б.поздних версий, Visual FoxPro и Access (Microsoft), Clarion (Clarion Software), Ingres (ASK Computer Systems)и Oracle (Oracle)*
  - (from Russian): *ПАЛЬМА (ИК АН УССР), НуТech (МИФИ)*
  - Object-relational: *Oracle 8.x*

post-relational model

- ADVANTAGES post-relational model
  The possibility of representing the aggregate related relational tables with a single post-relational table, so - clear presentation of information and increase the effectiveness of its treatment

- DISADVANTAGES post-relational model
  The difficulty in solving the problem of ensuring the integrity and consistency of data stored
- *Examples of post-relational database model:*
  - *uniVers, Bubba u Dasdb*

Example of relational Model

INVOICES (накладные)

INVNO	CUSTNO
0373	8723
8374	8232
7364	8723

INVOICE.ITEMS (накладные-товары)

INVNO	GOODS	QTY
0373	cheese	3
0373	fish	2
8374	lemonade	1
8374	juice	6
8374	cookies	2
7364	yogurt	1

Example of post-relational model

б) INVOICES

INVNO	CUSTNO	GOODS	QTY
0373	8723	cheese	3
		fish	2
8374	8232	lemonade	1
		juice	6
		cookies	2
7364	8723	yogurt	1

а) SELECT INVOICES.INVNO, CUSTNO, GOODS, QTY
FROM INVOICES, INVOICE.ITEMS
WHERE
INVOICES.INVNO=INVOICE.ITEMS.INVNO;

б) SELECT * FROM INVOICES;

multivariate Model

- ADVANTAGES multivariate model
  Convenience and efficiency analysis of large amounts of data related to the time (in rel.m. - nonlinear increase complexity of operations)

- DISADVANTAGES multivariate model
  Cumbersome for the simplest of tasks common operational processing

- EXAMPLES database multidimensional model
  - *Essbase (Arbor Software), Media Multi-matrix (Speedware), Oracle Express Server (Oracle) u Cache (InterSystems)*
  - *Relational-dimensional model: Media/MR (Speedware)*
  - *Multidimensional object-relational model: Cache*

An example of a relational view of car sales

model	month	volume
BMW	June	12
BMW	July	24
BMW	August	5
Audi	June	2
Audi	July	18
Mazda	July	19

multi-dimensional view

model	June	July	August
BMW	12	24	5
Audi	2	18	NULL
Mazda	NULL	19	NULL

Object-oriented model

- ADVANTAGES OOM (versus relational)
  The ability to display information about the complex relationships of objects
  OOM can identify individual records database and the responsibilities of their treatment

- DISADVANTAGES OOM
  High conceptual complexity
  The disadvantage of the data and the low speed of queries

- EXAMPLES database OOM
  - *POET (POET Software), Jasmine (Computer Associates), Versant (Versant Technologies), 02 (Ardent Software), ODB-Jupiter (науч.произв. центр «ИнтеллекПлюс»), Iris, Orion и Postgres.*

Model "Entity-Relationship"

- There are a variety of object-oriented models. The most widely used model is the "entity - relationship" (ER model).
- Model "entity - relationship" is based on a realistic view which encompasses a set of objects or entities and their relationships.
- Schema components of ER are:
  - entity ;
  - connection;
  - attributes.

entity

- The entity is any object, place, person, or action, details of which are recorded.
- Entities are represented as rectangles, on which are written the names assigned to them.
- There are two types of entities:
  - dependent;
  - independent.
- Affiliated entities are also referred to as weak entities, and independent - regular entities.
- Weak entity represented by a rectangle outlined by the double line.

connection

- Combining entities are called connection.
- Relationship is depicted in the form of diamond with the name of the link.
- can attach an entity to itself.
- Between the same entities may also be multiple connections.
- Connections are of three types:
  - one-to-one;
  - one-to-many;
  - many-to-many.

attributes

- Attribute called property of this entity.
- Attributes are represented as ellipses, equipped name properties. Key attributes are underlined.
- Connection can also have attributes.

review

- Data Model, examples of models:
  - hierarchical
  - network
  - relational
  - post-relational model
  - multi-dimensional
  - object-oriented