Basics of information systems

Lecture 5: Databases - information storage of the information system. Relational database

management.

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The functioning of the information management system is based on an array (storage) of information called a database (DB).

A database is a collection of descriptions of real world objects and connections between them that are relevant for a specific application area.

The information stored in databases is a reflection of objects in the real world. In traditional terminology, objects of the real world, information about which are stored in the database, are called **entities**, and their actual signs are called **attributes**.

Objects of the real world are connected with each other by many complex dependencies that must be taken into account in information activities. The most important task of computer systems is data storage and processing.

So, a database is a shared set of logically related data (and a description of that data) designed to meet the information needs of an organization.



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Database (DB) is a named, integral, unified data system organized according to certain rules that provide general principles for describing, storing and processing data. Features of working with data are very specific for different subject areas.

Basic information processes: collection, storage, transmission, receipt, search, information processing.

A database is a single, large data store that is defined once and then remotely used by many users simultaneously. Instead of scattered files with redundant data, here all data is collected together with a minimal amount of redundancy. The database is a common corporate resource and stores not only data, but also their descriptions. For this reason, a database is also referred to as a self-describing integrated record set.

The description of data is called the system catalog, and the description elements themselves are usually called metadata. It is the presence of self-description of data in the database that ensures the independence between programs and data. The database only provides opportunities for storing information, being included as one of the components of the corresponding information system. Therefore, speaking of databases, we mean systems that include, in addition to information, and means of its processing - specialized software - *database management systems (DBMS)*

DBMS allow you to structure, organize and organize data for their computer storage and processing. It is impossible to imagine the activities of a modern organization without the use of professional DBMS, which form the foundation of information activities in all areas - from production to finance and telecommunications.

The central component of any DBMS is the database server. Its technical quality decisively determines the main characteristics of the system, such as performance, reliability, safety, etc. At the same time, the richness and variety of possibilities inherent in the mechanism of its functioning strongly affect the efficiency of application development.

The database server is an integral component of the client-server interaction model, which has become the de facto architecture standard of modern DBMS and one of the stages of their development from systems with a centralized architecture and systems with a file server. A DBMS is software with which users can define, create, maintain, and control access to a database.

The DBMS has the following capabilities:

Allows you to define a database, which is carried out using a data definition language (DDL - Data Definition Language). The DDL language provides users with a means of specifying the type of data and their structure, as well as a means of setting restrictions on the information stored in the database.

Allows you to insert, update and retrieve information from the database, which is carried out using the data management language (DML - Data Manipulation Language). Having a centralized repository of all data and their descriptions allows DML to be used as a general query organization tool, sometimes referred to as the query language.



Provides controlled access to a database using the following means: security systems to prevent unauthorized access to the database by users;

data integrity support systems, ensuring the consistent state of stored data;

control systems for parallel operation of applications, controlling the processes of their joint access to the database;

recovery system that allows you to restore the database to a previous consistent state, broken as a result of a hardware or software failure; a directory available to users that contains a description of the information stored in the database.

When designing a database, two main problems are solved:

mapping of domain objects to abstract data model objects in such a way that this mapping does not contradict the semantics of the domain and is the best possible (efficient, convenient, etc.). This problem is often referred to as the logical database design problem.

ensuring efficient execution of database queries, i.e. rational arrangement of data in external memory, creation of useful additional structures (for example, indexes), taking into account the peculiarities of a particular DBMS. This problem is called the physical database design problem. Requirements for the database:

The database must meet the actual information needs of the organization. The received information should correspond in structure and content to the tasks being solved;

The database must provide the required data for an acceptable time, that is, meet the specified performance requirements;

The database must meet the identified and emerging requirements of end users.





RELATIONAL VS. NON-RELATIONAL DATABASES



A non-relational database does not incorporate the table model. Instead, data can be stored in a single document file.

A relational database table organizes structured data fields into defined columns.



Thank you for watching!