**INTRODUCTION**

* İlişkili veriler
* Veriye ulaşacak programlar
* Uygun ve etkili bir environment

Database amaç (eskiden databae uygulamaları direkt dosya sisteminin üzerine build edilirdi):

* veri uyumsuzluğu ve duplication
* veriye ulaşma zorluğu
* çok dosya olması
* integrity constraints
* atomicity of updates
  + transaction ya tam olmalı ya hiç
* concurrent access problem

A database system is a collection of interrelated data and a set of programs that allow users to access and modify these data.

A major purpose of a database system is to provide users with an abstract view of the data.

Data models

* A collection of conceptual tools for describing:
  + data
  + data relationships
  + data semantics
  + data constraints
* relational model, er model, object-based data model, semi-structured model
* relational ---> all the data is stored in various tables
  + A screenshot of a table

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Data abstraction

* Hide the complexity of data structures to represent data in the database from users through several levels of data abstraction.
* LEVELS OF ABSTRACTION:
  + Physical level
    - describes how a record (e.g., instructor) is stored.
  + Logical level
    - describes data stored in database and relationships among the data

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* + View level
    - application programs hide details of data types

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Instances and schemas:

* programlama dillerindeki type’lara ve variable’lara benzer
* Logical schema: overall logical structure of db
  + Example: The database consists of information about a set of customers and accounts in a bank and the relationship between them
    - Analogous to type information of a variable in a program
* Physical schema: the overall physical structure of db
* Instance: actual content of the db
  + analogous to value of a variable

Physical data independence

* ability to modify the physical schema without changing the logical schema
* applications depend on the logical schema

Data Definition Language (DDL)

* specification notation for defining the db schema

A close up of a name

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* generates a set of table templates stored in data dictionary
* data dictionary contains metadata
  + database schema
  + integrity constraints
  + primary key (ID uniquely identifies instructors)
  + authorization

Data Manipulation Language (DML)

* query language
* procedural dml
  + require a user to specify what data are needed and how to get those data
* declarative dml (SQL)
  + require a user the specify what data are needed without specifying how to get those data

SQL 🡪 always returns a single table

Database Design

* The process of designing the general structure of the db
  + logical design
    - deciding the db schema
    - db design requires that we find a “good” collection of relation schemas
      * business decision: what attributes should we record in db?
      * c.s. decision: what relation schemas should we have and how should the attributes be distributed among the various relation schemas?
  + physical design
    - deciding on the physical layout of the db

Functional components of a database system can be divided into:

* storage manager
  + interface between low-level data stored in db and application programs and queries submitted to the system
  + responsible:
    - interaction with os file manager
    - efficient storing, retrieving, updating
  + include:
    - authorization and integrity manager
    - transaction manager
    - file manager
    - buffer manager
  + implements:
    - data files: store the db itself
    - data dictionary: store metadata about the structure of db, schema of db
    - indices: provide fast access to data items. provide pointers to those data items that hold a particular value
* query processor component
  + ddl interpreter: interprets ddl statements, records the definitions in data dictionary
  + dml compiler: translates dml statements in a query language into an evaluation plan
  + query evaluation engine: executes low-level instructions generated by dml compiler

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* transaction management component
  + transaction: collection of operations that performs a single logical function in a db application
  + ensures that db remains in a consistent state after failures
  + concurrency control manager controls the interaction among the concurrent transactions, to ensure consistency of the db

A diagram of a computer server

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A diagram of a computer system

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There is no direct database call in three-tier.

A diagram of a database

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DBA:

* Schema definition
* Storage structure and access-method definition
* Schema and physical-organization modification
* Granting of authorization for data access
* Routine maintenance
* Periodically backing up the database
* Ensuring that enough free disk space is available for normal operations, and upgrading disk space as required
* Monitoring jobs running on the database