Database Systems



What is a database?

- Collection of data items
- Stored on cards, paper or computer
- We prefer storage in a computer in a systematic way by a Database Management System (DBMS)

Examples Database System User Data of a ■ Ware House Database Application program System ■ University Software to process queries DBMS Organism in biology Software Software to access stored data Bank Hospital Data-Common attribute: very large amount Stored Data Stored DB base definition of similar data

Why Use DB Systems?

- Data independence
- Efficient and concurrent access
- Reduced application development time
- Data integrity and security
- Recovery from crashes
- Multiple views



3-Schema-Architecture

- External level (views)
 = user-dependant view on data
- Conceptional level
 - = logical database schema
- Internal level
 - = physical storage of data

External Views

Example: Hospital Information System

- Managing data about patients, doctors, medication etc.
- Doctors must be able to read the diagnostics
- Administration must not read the results, but which kind of diagnostics has been performed
- \rightarrow Two user groups with different views

Requirement Analysis	DB designer
	Application programmer
Conceptual Design	DB designer
	Application programmer
Logical Schema Design	Application programmer
	DB administrator
Physical Schema Design	DB administrator

DB Lifecycle Requirement Analysis Text Conceptual Design ER-Model student Understand DB-Schema DB-Schema Difference Physical Schema Design Access paths

Example Requirement Analysis

"I'm the owner of a medium size video store. We have over 10.000 video tapes that we need to keep track of.

Each of our video tapes has a **tape number**. For each **movie**, we need to know its **title** and **category** (e.g. comedy, suspense, drama, action, or SciFi), **director** and **year**.

We have **multiple copies** of many of our movies. We give each movie a specific **id**, and then track which movie a tape contains.

A tape may be either Beta or VHS **format**. We always have at leastone tape for each movie we track, and each tape is always a copy of a single, specific movie. Our tapes are adapted to the movie lengths, so we don't have any movies which require multiple tapes. The movies are stored on shelf according to their category sorted by movie title.

We are frequently asked for movies starring specific **actors**. John Wayne and Katherine Hepburn are always popular. So we'd like to keep track of the star actors appearing in each movie ..."

http://www.inf.fu-berlin.de/lehre/SS06/19513-V/unterlagen.html (7.2.2007

Example Requirement Analysis

\rightarrow important

- Tapes (title, category, ...), movies, format, actors
- Movies have many copies
- Tape contains exactly one copy
- ...
- \rightarrow unimportant
- ... John Wayne ... popular

 http://www.inffu.berlin.de/lehre/S806/19513-V/unterlagen.html (7.2.2007)



Data Model

= set of concepts to describe the *structure* of a database, and certain *constraints* that the database should obey.

Categories of data models

- Conceptual (high-level, semantic): Provide concepts that are close to the way many users *perceive* data. (Also called **entitybased** or **object-based** data models.)
- Physical (low-level, internal): Provide concepts that describe details of how data is stored in the computer.

History of Physical Data Models

Hierarchical	~ 1965, by IBM and
	North American Rockwell
Network	~ 1964, by Honeywell, IDS System
Relational	Proposed 1970 by E. F. Codd (IBM),
	DB2, ORACLE, ACCESS
Object-oriented	Several models proposed, OOP & Database (C++ & OBJECSTORE)
Object-	Most recent trend
Relational	Started with Informix Universal Server

Literature

- http://cs.gmu.edu/~aobaidi/fall_05/index_files/ Lectures/ENCh01.ppt (7.2.2007)
- <u>http://www.inf.fu-berlin.de/lehre/SS06/19513-</u> <u>V/unterlagen.html</u> (7.2.2007)