

Topics

- What is a Database?
- What can it do?
- User views
- Layers of the Database
- Example MySQL

What is a Database?

- A collection of interrelated data items that are managed as a single unit
- Broad definition because there is so much variation across the software vendors that provide database systems, e.g. Microsoft, Oracle, Access etc...

Databases

- Databases allow people to store, organise, retrieve, communicate and manage information
- "Information at your fingertips" can make life easier and more efficient: instant cash, airline reservation, websearches, etc...
- Also handy device for Big Brother (referring to George Orwell's novel "1984" and not to Channel 4)

Electronic File Cabinet

- Database programs are applications
 - Programs for turning computers into productive tools
- If a word processor is a computerised typewriter and a spreadsheet is a computerised ledger, then a database is a computerised file cabinet

What can a Database do?

- Easier to store large quantities of information
- Easier to retrieve information quickly
- Easier to organise and reorganise information
- Easier to distribute

Database Taxonomy

- A database is a collection of information items managed as a single unit
- On the filing cabinet analogy, a database is composed of one or more files
- A file is a collection of related information
- Related in terms of some selected organizing principles

Files and Databases

- Term file could cause confusion because of its multiple meanings
- A disk can contain application programs, system programs, documents, etc. All of which are files from the computer's point of view
- But for database users the term means a file that's part of a database

Jargon Abuse



- For database users a file is part of a database
- But an entire database can be just one file, from the computer's point of view
- Even the term database has more then one use, e.g. various Unix vendors call their password file a database, even though experts would say that it isn't one.

Some Database Taxonomy

 In order to clarify the issue we need to look at characteristics that distinguish databases from "ordinary" files

....

- These include:
- Database Management System (DBMS) e.g. MySQL
- Layers of abstraction architecture

DBMS

- The Data Base Management System is software provided by the database vendor
- The DBMS provides the services required to organise and maintain your database

DBMS

- Moving data to and from the physical data files as needed
- Managing concurrent data access by multiple users
- Support for a query language: a system of commands that a database user employs to retrieve data
- Provisions for backing up the database and recovering from failures
- Security mechanisms

Different Views

- Databases have the unique capability of presenting multiple users with distinct views of the data while storing the underlying information only once
 - These are called user views
- A user in this context is any person or application that signs on to the database to store or retrieve data

User Views

- With a spreadsheet application such as Excel, all users must share a common view of the data
 - View must match way it is
- With database systems the view can be tailored or costumised to the needs of individual users

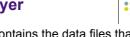
User Views

- For example managers, programmers and costumers can all have different views of a DVD rental website's database
 - Costumers can browse through listings
 - Managers has control over pricing policies, view of inventory history
 - Programmer has control over EVERYTHING

Layers of Abstraction

- Most DBMSs follow a layer of abstraction architecture
- Which makes different user views possible
- The three primary layers are:
 - The physical layer
 - The logical layer
 - The external layer

The Physical Layer



- The physical layer contains the data files that hold all the information for the database
- Most DBMSs allow the database to be stored in multiple files, usually spread over multiple disk drives

More Physical Layer

- The database user doesn't need to have any knowledge of how the data is actually stored in these files
- Doesn't need to refer to physical files when using the database
- This is in **contrast** to *spreadsheets* and *word processing* programs

The Logical Layer

- The logical layer is the first level of abstraction
- The physical layer has a concrete existence in the operating system file
- In contrast the logical layer exists only as abstract data structure assembled from the physical layer as needed

More Logical Layer

- The DBMS transforms the data in the data files into a common structure, sometimes called **schema**
- Depending on the particular DBMS this can be a set of 2-dimensional tables, a hierarchical structure, a networkmodel etc...

The External Layer



- The external layer is the second level of abstraction
- This is the layer where users and applications issue queries against the database obtain the resulting user views
- The DBMS transforms data structures in the logical layer to form each user view

Example for DMBS = MySQL



- MySQL is a (R)DMBS
- R = Relational
 It is written in C/C++
- It works on many different system platforms (Windows, Mac, Unix, etc)
- The libraries for accessing MySQL databases are available in all major programming languages with language specific APIs

Key Points

- What is a database and what can it do?
- What's the difference between a database and ordinary file?
- Layers of Abstractions architecture
 Allows different user views
- MySQL RDMBS

