Databases and Database Management Systems

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Topic 02

Database Definition

• Any collection of data stored in a computer system could be called a database
  – Data file
  – Document
  – Image
  – Audio
• In this class, we only call a collection of data with certain characteristics a database

Database Definition

• A database is a collection of data and relationships between the data stored in a computer system.
• Database = Data + Relationships
• Without relationships there is not database, only collections of unrelated data

Database Use

• Who has ordered item 2719?
  – Use Billing/order relationship
• What items has customer 12345 ordered?
  – Use Inventory/order relationship
• What are the names of the items ordered by Campus sport shop?
  – Use both relationships
• Can all items that are ordered be supplied?
  – Use Inventory/order relationship
• Update the Total due for all customers
  – Use both relationships
The Three-Level Database Model

- Logical view
- Physical view
- Internal view of data
- External view 1 of data
- External view 2 of data
- External view N of data

People Involved with Databases and Database Management Systems

- User (End-user)
  - Power (experienced) user
  - Naïve user
- Developer (Application Developer, Programmer)
- Systems Analyst
- Database Administrator (DBA)

Ways Users Use a Database

1. Use a query language directly (query language is language for querying and updating a database)
2. Use an application program written in a host language with embedded queries from a query language (Host language can be general purpose (Java), or special purpose (PL/SQL))
3. Use an application program produced by an application generator with embedded queries from a query language

Database Management System

- Database management system (DBMS): a software system that provides capabilities for managing the data in a database.
- Main functions:
  - Allows developer/DBA to define database
    - Conceptual view (schema)
    - External views (subschema)
  - Manages data in internal view
  - Provides link between external views and conceptual view
  - Provides link between conceptual view and internal view

Metadata

- Metadata: data stored in a database that describes the database (“data about data”)
- Metadata stored in data dictionary/system catalog
- Can be queried like other data
- Typical metadata:
  - Description of each field including
    - Field name
    - Type of data in field (character, number, date, etc.)
    - Length of field
    - Decimal position for numeric data
  - Description of each record including
    - Record name
    - Which fields are in record

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Metadata

- Typical metadata (cont.):
  - Descriptions of how records are grouped (files, tables) including
    - Group (file, table) name
    - Which records are in group
  - Descriptions of external views
  - Descriptions of elements used to enhance performance (e.g., indexes)
  - Descriptions of the metadata
  - Other
- Database: self-describing (i.e., contains metadata) collection of data and relationships between the data.

Client/Server Architecture

Two-tier:

Client → Server

Three-tier:

Client → Application/Web server → Database server

Computer System Configurations

- Personal computer system
- Multiple-user computer system
- Networked computer system