CS422: Database Management Systems

Lesson 1 - Introduction To Database Systems

Purpose: - To outline the range of the course and introduce the vocabulary

Database approach arose from file-based systems because

- Definition of data was embedded in application programs, rather than being stored separately and independently.
- No control over access and manipulation of data beyond that imposed by application programs.

Result - the database and Database Management System (DBMS)

- Database: - A shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.
- Logically related data comprises entities, attributes, and relationships of an organization's information.
- System catalog (data dictionary or metadata) provides the description of the data to enable program-data independence.
- Data definition language (DDL):- Permits specification of data types, structures and any data constraints. All specifications are stored in the database.
- Data manipulation language (DML):- General inquiry facility (query language) of the data.
- Database Management System (DBMS):- A software system that enables users to define, create, and maintain the database and which provides controlled access to this database.

Purposes of a DBMS

- Access: provide one application to access many databases
- Layers: hide physical storage considerations from the user
- Views: to provide only the data a user needs
- Security: restrict access to the data
- Integrity: preserve data integrity while supporting change
- Recovery: return the database to a consistent state after a failure of any kind
- Concurrency: offer simultaneous access to many users
- Backup

Components of DBMS Environment

- Hardware: Can range from a PC to a network of computers.

- Software: DBMS, operating system, network software (if necessary) and also the application programs.
- Data used by the organization and a description of this data (a schema).
- Procedures: Instructions and rules that should be applied to the design and use of the database and DBMS.
- People.

Roles in the Database Environment

- Data Administrator (DA)
- Database Administrator (DBA)
- Application Programmers
- End Users (naive and sophisticated)

History of Database Systems

- First-generation: Hierarchical and Network
- Second generation: Relational
- Third generation: Extended Relational, Object-Oriented

Advantages of DBMS

- Control of data redundancy.
- Data consistency
- More information from the same amount of data.
- Sharing of data.
- Improved data integrity.
- Improved security.
- Enforcement of standards.
- Economy of scale.
- Balanced conflicting requirements
- Improved data accessibility and responsiveness
- Increased productivity
- Improved maintenance through data independence
- Increased concurrency
- Improved backup and recovery services

Disadvantages of DBMS

- Complexity
- Size
- Cost of DBMS

- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of a failure

World Wide Web

- Organizations are now rapidly building new database applications or reengineering existing ones to take full advantage of the web
- This increases the number of skills that are needed to be a DBA
- XML documents are used to pass data between different programs on the network
- XSLT programs are used to translate XML documents into different formats

Online Transaction Processing (OLTP)

- Retrieval, update, or insertion of isolated facts
- To serve day-to-day business needs
- Many users, small transactions, highly dynamic data reflecting current situation

Online Analytical Processing (OLAP)

- Exploration of multi-dimensional data
- To support decision-making and strategic planning
- Few users, large transactions, static historical data

Data Mining

- Search for trends in large amounts of data

Data Warehouse

- Data structure and management system designed to support OLAP and data mining

Lesson 1 - Introduction to Database Systems

A Database Management system is structured into the following layers: user interfaces, the query processor, the storage manager and the physical medium.

Nature organizes all of creation into layers from the grossest to the subtlest.

MAIN POINTS

1. DBMSs allow data to be treated at a high level of abstraction and use data models to present a unified view of the data. Like a data model, the Science of Creative Intelligence provides the framework that gives a unified understanding of manifest creation in all of its abundant diversity.

2. A database system provides two different types of languages: one to specify the database schema (DDL), and the other to express database queries and updates (DML). Every discipline has its own language to communicate the knowledge in the discipline. The language of nature is the language of the Vedas in which there is a perfect relationship between name and form.

3. Because databases are increasingly being ported to the World Wide Web, a DBA must have knowledge of computer networks and distributed programming and be concerned that their databases are scalable. It is the nature of life to grow and the wise person cultivates a non-changing basis in their life on which the change can happen, just as the Absolute is the non-changing basis of the Relative.

CONNECTING THE PARTS OF KNOWLEDGE WITH THE WHOLENESS OF KNOWLEDGE

1. A database is a computerized record keeping system.

2. A database contains both data and a description of the structure of the data (metadata).

3. **Transcendental consciousness:** contains the unmanifest structure of all creation.

4. **Wholeness moving within itself:** In unity consciousness the structure of experience is dominated by Wholeness, which is simply the pure field of consciousness, our own Self.