Module - I

Lecture-05

- History of Database Systems
- Motivation

History of Database Systems

- 1950s and early 1960s:
  - ✓ Data processing using magnetic tapes for storage
    - Tapes provided only sequential access
  - ✓ Punched cards for input

History of Database Systems

- Late 1960s and 1970s:
  - ✓ Hard disks allowed direct access to data
  - ✓ Network and hierarchical data models in widespread use
  - ✓ Ted Codd defines the relational data model
    - Would win the ACM Turing Award for this work
    - IBM Research begins System R prototype
    - UC Berkeley (Michael Stonebraker) begins Ingres prototype
    - Oracle releases first commercial relational database
  - ✓ High-performance (for the era) transaction processing

History of Database Systems

- 1980s:
  - ✓ Research relational prototypes evolve into commercial systems
    - SQL becomes industrial standard
  - ✓ Parallel and distributed database systems
    - Wisconsin, IBM, Teradata
  - ✓ Object-oriented database systems

History of Database Systems

- 1990s:
  - ✓ Large decision support and data-mining applications
  - ✓ Large multi-terabyte data warehouses
  - ✓ Emergence of Web commerce

History of Database Systems

- 2000s:
  - ✓ Big data storage systems
    - Google BigTable, Yahoo PNuts, Amazon
    - "NoSQL" systems.
  - ✓ Big data analysis: beyond SQL
    - Map reduce and friends

History of Database Systems

- 2010s:
  - ✓ SQL reloaded
    - SQL front end to Map Reduce systems
    - Massively parallel database systems
    - Multi-core main-memory databases

Motivation

- The motivation behind Database Management Systems (DBMS) from the need to efficiently and effectively manage large volumes of data in various applications.
- Here are some *key motivations* for using DBMS:

- ✓ Data Organization and Storage
- ✓ Data Integrity and Consistency
- ✓ Data Security
- ✓ Concurrent Access and Transactions
- ✓ Data Retrieval and Manipulation
- ✓ Scalability

- ✓ Data Abstraction
- ✓ Data Redundancy and Duplication
- ✓ Data Backup and Recovery
- ✓ Data Analysis and Reporting
- ✓ Data Independence
- ✓ Regulatory Compliance

Motivation

- Data Organization and Storage: In many organizations and applications, there's a vast amount of data that needs to be stored and organized. DBMS provides a structured way to store data in tables, rows, and columns, making it easy to manage and retrieve information.
- Data Integrity and Consistency: DBMS enforces data integrity constraints, ensuring that data entered into the database follows predefined rules. This helps maintain the accuracy and consistency of the data, reducing the risk of errors.

Motivation

- Data Security: DBMS provides mechanisms for securing sensitive information. Access controls can be implemented to restrict unauthorized access to the data, ensuring that only authorized users can view and modify the data.
- Concurrent Access and Transactions: In multi-user environments, multiple users might need to access and modify the same data simultaneously. DBMS handles concurrency control to ensure that transactions are executed in an isolated and controlled manner, preventing conflicts and maintaining data integrity.

Motivation

- Data Retrieval and Manipulation: DBMS offers powerful querying capabilities that allow users to retrieve specific data based on various criteria. This querying ability simplifies complex data retrieval tasks.
- Scalability: As data volume grows, DBMS systems can be scaled to handle increased loads by adding more hardware resources or optimizing query performance. This scalability ensures that the system remains responsive even as data grows.

Motivation

- Data Abstraction: DBMS abstracts the physical data storage details from users and applications. This abstraction makes it easier to interact with and manipulate data without needing to worry about low-level storage intricacies.
- Data Redundancy and Duplication: DBMS helps reduce data redundancy by centralizing data storage and management. This reduces the chances of inconsistencies and duplication of data across different parts of an organization.
- Data Backup and Recovery: DBMS often includes backup and recovery mechanisms to protect against data loss due to hardware failures, accidents, or other unforeseen events.

Motivation

- Data Analysis and Reporting: DBMS can support complex analytical queries and reporting, allowing organizations to extract valuable insights from their data.
- Data Independence: DBMS offers both logical and physical data independence. This means that changes in the underlying database structure don't necessarily impact applications that use the data, enhancing system flexibility and maintainability.
- Regulatory Compliance: Many industries have regulatory requirements regarding data handling, storage, and security. DBMS features can help organizations meet these compliance requirements.

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Database System Concepts by *Avi Silberschatz, Henry F. Korth* and *S. Sudarshan.* 7th Edition

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