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A Comprehensive Study on Modern Database Management Systems

Punit[1], Dr. Vishal Shrivastava[2], Dr. Akhil Pandey[3]

[1]B.TECH. Scholar, [2,3]Professor, [4]Assistant Professor
Computer Science & Engineering, Arya College of Engineering & I.T. India, Jaipur
punitydv98@gmail.com,vishalshrivastav.cs@aryacollege.in,akhil@aryacollege.in, rahulsharma.cs@aryacollege.in

ABSTRACT

DBMS is computer software designed for simple and easy-to-use database management. Its main purpose is to store and store information for easy and efficient use.

This article provides an overview of the DBMS, including its components such as data structures that specify how data will be structured for a specific purpose.

The main purpose of information is to help users understand the information. Standardize the database development process. With the help of a DBMS, developers can retrieve data and create a process to evaluate all data. It allows organizations to easily set up and use databases for various database operations (DBA). Currently, traditional database operating systems (DBMS) cannot provide the same level of flexibility.

KEYWORDS: Relational Database, NoSQL Database, Query Optimization, Concurrency Control

INTRODUCTION

The database contains programs that allow users to perform a variety of tasks, includingadding, editing, modifying, deleting, managing, and accessing data. A DBMS eliminates theneed for users to understand physical data storage and the complex processes used to perform database operations. Some DBMS applications focus primarily on retrieving data from a database. Additionally, DBMS works as a framework to manage access rights, security, storage, and many other functions related to the database system. It completes thesetasks through computers.

DBMS APPLICATION:

Business and Finance**: DBMS manages customer accounts, transactions, loans and investments. Ensures data integrity, security, and compliance with** regulatory requirements such as Anti Money Laundering (AML) and Know Your Customer (KYC), without copying content to third parties.

Healthcare: DBMS stores patient information, medical history, and provides prescription and billing information. Helps you manage appointments, test results, and electronic health records (EHR) while protecting patient privacy and Health Insurance compliance. Health and Privacy Act (HIPAA) regulations.

Retail: DBMS supports inventory management, sales, customer relationship management (CRM) and e-commerce platforms. It supports automated marketing, sales forecasting, and supply chain optimization while protecting customer data and preventing privacy theft.

Education: DBMS manages student records, course schedules, grades and library records. Itsupports online learning platforms, student registration, and faculty management while ensuring academic integrity, plagiarism detection, and compliance with academic standards.

Manufacturing: DBMS manages inventory, production planning, quality control and delivery. It supports enterprise resource planning (ERP) systems, real-time manufacturing and logistics management (PLM) while protecting proprietary information and trade secrets.

Communication: DBMS stores user information, contact information, network configuration and billing information. It supports customer management, network development and fraud while maintaining data privacy and compliance with communications regulations.

Government: DBMS maintains government, tax, licensing and public security information. It supports administrative processes, administrative law databases and geographic information systems (GIS) while ensuring information security, transparency and accountability in management.

Transportation: DBMS manages ships, schedules, passengers and cargo tracking. It aids logistics management, real-time tracking and predictive maintenance while protecting sensitive information and ensuring compliance with shipping regulations.

Entertainment: DBMS stores multimedia content, user data, viewing history and license agreement. It supports streaming services, content recommen dation engines, and digital rightsmanagement (DRM) while preventing unauthorized access and copyright infringement.

Energy and Energy Management: DBMS manages measurements, data usage, maintenance and energy usage. It supports smart grid management, de mand forecasting, and renewable energy connectivity while protecting critical infrastructure and ensuring compliance.

Fig:- Application Of DBMS

DBMS COMPONENT

A database operation system environment comprises several key elements, each playing a crucial role:

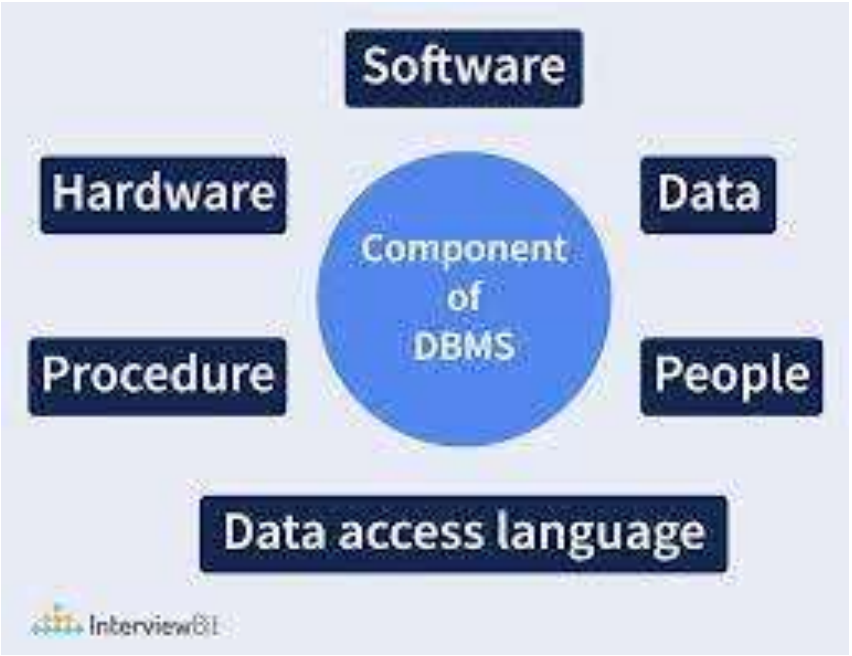


Fig: Components of DBMS

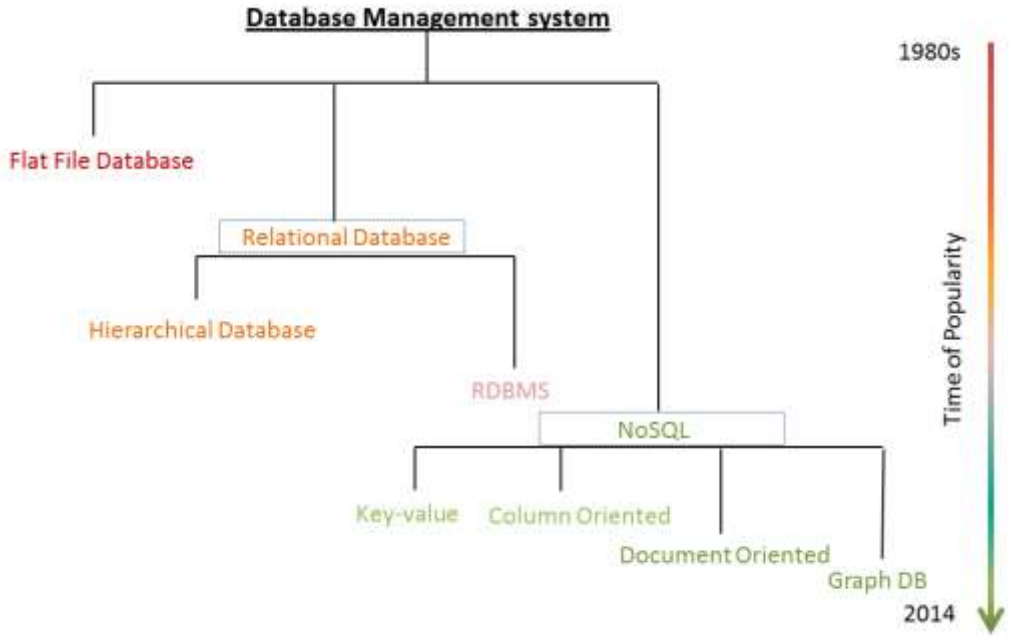
1.Software: This includes the code that is responsible for maintaining and controlling the entire database system.

2. Hardware: Equipment that includes physical electronics. It ensures efficient processing of the information environment by monitoring the interactio n between computers and the real world.

3. Data: The primary goal of a DBMS is to gather, store, process, and enable access to data. The DB contains current operational data and metadata, which provides essential information about the stored data.

4. User: Users are integral to the management of the database, and they carry out a diverse range of database operations within the database system. Their interactions are vital to the functionality of the system.

TYPES OF DATABASES



1) Centralized Database: A centralized database reserves data within a intermediary database network. It allows consumer to access data from distinct places through different operations, frequently with assembled- in authentication for secure access. An illustration is council or university.

2) Distributed Database: In distributed systems, data is spread across different DB systems within an association, connected by communication links. This infrastructure enables end- users to access data seamlessly.

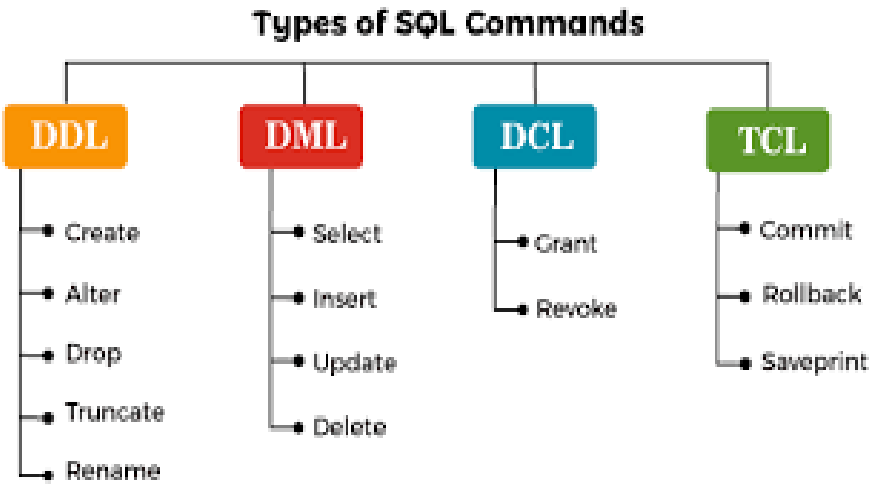
3) Relational Database: Relational DB follows the relational data model, organizing data in tuples and attributes to produce tables. SQL is the primary language for storing, manipulating, and maintaining data in these databases.

4) NoSQL Database: NoSQL, databases are designed to handle different data sets, frequently departing from the irregular format used in relational databases. They've evolved to meet the conditions of current operations, offering various database technologies.

5) Cloud Databases: Cloud databases store data in virtual surroundings and operate on cloud computing platforms. Users can access the database through varied cloud services similar as Software as a service, Platform as a service, Infrastructure as a service etc.

Database Management System Language

DBMS provides languages and interfaces that allow users to express queries and updates, facilitating data reading, storage, and insertion into the database.[2]



1. Data Definition Language(DDL):-

It is employed to define the structure and design of the database, as well as to produce schema, tables, indexes, constraints, and other database components. DDL plays a critical role in shaping the database's structure.[6]

2. Data Manipulation Language(DML):-

DML is a specific component of SQL that focuses on the querying and manipulation of data within a database. It encompasses essential commands such as SELECT for retrieval, INSERT for insertion, UPDATE for modification, and DELETE for removal of data, providing users with the means to interact with and modify database content.

3. Data Control Language(DCL):-

DCL is employed for retrieving stored or saved data. It operates transactionally and includes features for handling rollbacks and managing data retrieval operations.

4. Transaction Control Language(TCL):-

TCL is a set of statements that enables users to govern the behaviour of database transactions. It includes commands such as COMMIT, ROLLBACK, and SAVEPOINT, which empower users to regulate the way transaction are handled within the database.

CONCLUSION

A DBMS is computer software specifically design for the productive and effective repository, recovery, and updating of large data. Users depend on a DBMS to manage databases. It has its own set of advantages and disadvantages varied operations and systems work in convergence with DBMS.

For instance, biometric attendance records are automatically stored in the database.

DBMS plays a crucial task in debarring data redundancy and guaranteeing data consistence. Without the use of DBMS, both programmers and those responsible for the database would face significantly lesser workloads. Tasks like data association, inserting data into the database, and reclaiming data from the database come more tricky when DBMS isn't employed.

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