

Chapter 3

DATABASE MANAGEMENT SYSTEMS

~~Data Base~~

Database Concept

A database is an integrated collection of logically related records and files. It is designed to ~~meet~~ minimise duplication of data within that system to satisfy user needs. A centrally controlled and integrated collection of data is called a database. A database allows the user to add, modify and retrieval of data according to his info. needs. Eg.: A college database organises the data about students, faculty and office staffs etc. which helps in efficient retrieval, insertion and deletion of data from it.

A database is either a flat file or relational.

In a flat file system all data is arranged in a single table. Eg: a telephone directory. The

disadvantages of flat file systems is redundancy, which is duplication of data. Relational

databases split the data into several tables, each with each table holding some portion of

total data.

Different tables can have the same columns in common.

Customer Table

Eg:

Customer ID	Name	Address	City	State	PIN
1001	RAM	1/234	Calicut	Kerala	674533
1002	JYOTHI	DAVE AVE	Kochi	Kerala	671997
1003	JOSEPH	Parker rd.	Kannur	Kerala	671534

ACCOUNT TABLE

Customer ID	Acc No	Acc type	Date opened	Balance
1001	998789	Current	10/12/2002	75000
1002	998795	Saving	15/8/2000	84500
1003	998765	current	25/12/1993	28000

All tables in a relational database contains a special field (column) called "key field" which links all the tables together. Here customer ID is key field. The relational system saves storage space because there is no duplication of data or duplication is minimum compared to flat files.

Database Management System - DBMS

The software which is used to manage database is called DBMS. Eg: MySQL, Oracle etc are popular commercial DBMS used in

different applications. DBMS software allows creation, definition and manipulation of database, allows users to store, process and analyse data easily. The ultimate aim of DBMS is to provide facility to store and retrieve data in the database.

DBMS allows users the following tasks;

1. Data Definition : It helps in creation, modification and removal of definitions that define the organisation of data in database.

2. Data updation : It helps in insertion, modification and deletion of the actual data in the database.

3. Data retrieval : It helps in retrieval of data from the database which can be used by applications for various purpose.

4. User administration : It helps in registering and monitoring users, enforcing data security, monitoring performance, maintaining data integrity, dealing with concurrency control and recovering info. corrupted by unexpected failure.

NECESSITY OR BENEFITS OF A DATABASE

1. Controlling redundancy and inconsistency

One of the basic problems in traditional file mgt is redundancy which refers to duplication of data. It results not only in the wastage of storage spaces but also it increases time taken to access and store data. Moreover, it also creates the problem of inconsistency of the same info. stored at different places of an org. A DBMS uses data normalisation to avoid redundancy and duplication.

2. Reduced programming Effort

Database systems are designed with a view to perform many standard activities such as database searching, creation of reports and addition of data. Here, users can specify exactly what they want to extract out of the data (with the help of 'queries')

thus, separate programming is not required for different applications.

3. Faster response time

Users will get the required info. very quickly because no programming is needed here for processing files. The user himself can make interactive queries without the help of a middleman or programmer.

4. Data independence

Users and programmers need not worry about the actual physical details of data storage in the database. Since the database system undertakes this task, the users can concentrate on the logical content of the data. DBMS arranges data properly in the computer memory.

5. The ability to change

It is also possible to make changes in the

database with minimum effort.

6. Cost reductions

Data and info. processing and its easy access will increase the overall efficiency of the business resulting cost benefit to org.

7. Information protection

Data must be protected against any type of damage, whether from system failure, human error or deliberate mischief. Different types of DBMS's offer different methods of information protection. Logging is offered by some DBMS's. Password is also used for protecting the data.

8. Multi user support and Distributed processing

Larger database systems are designed to interact simultaneously with several users.
Eg: Airline reservation.

Characteristics of Database System

1. Data Stored into tables

Data is never directly stored into the database. Data is stored into tables, created inside the database. DBMS also allows establish relationships b/w tables which make the data more meaningful and connected.

2. Less redundancy

DBMS follows normalisation which divide the data in such a way to minimise repetition.

Normalisation is a scientific process that reduces data redundancy.

3. Consistency

DBMS can provide greater consistency as compared to earlier forms of data storing applications like file processing systems.

4. Multiuser and concurrent access

DBMS supports multi user environment and allows them to access and manipulate data in parallel. Eg: Concurrent use is the database of a big travel agency. The employees of different branches can access the database concurrently and book journeys for their clients.

5. Multiple views

DBMS offers multiple views for different users. This feature enables the users to have a concentrated view of the database according to their requirements.

6. Definition and description of data

A fundamental feature of the database approach is that the database systems do not only contain the data but also the complete

definitions and descriptions of data. These descriptions are basically details about the extent, the structure, the type and the format of all data and, additionally, the relationship between the data. This kind of stored data is called 'metadata' which means data about data.

7. Security

DBMS, also takes care of the security of data, protecting the data from unauthorised access.

8. Query language

DBMS provided with query language, which makes it more efficient to retrieve and manipulate data. Users can easily retrieve, insert, ~~the~~ delete and update data in a database.

9. Data persistence

which means that in a DBMS, all data is maintained as long as it is not deleted

explicitly. Data once stored in a database must not be lost.

Advantages of a DBMS

1. Data Independence : Application Programs

are independent from details of data representation and storage in DBMS.

2. Efficient data access : A DBMS utilises a variety of complex techniques to store and retrieve data efficiently.

3. Data integrity and security : The DBMS can

enforce integrity constraints on the data if data is always accessed through the DBMS.

4. Data administration : Database can organise

the data representation to minimise redundancy and the storage of the data to make retrieval efficient.

5. Concurrent access and crash recovery

A DBMS also provide the facility of concurrent accesses to the data, further, the DBMS protects users from the effects of systems failures.

6. Reduced application development time

The DBMS supports many important functions that are common to many applications for accessing data stored in the DBMS.

Disadvantages of a DBMS

1. Not Suitable for Simple applications

A database system is often not advisable for small and simple applications for single users.

2. Complexity : It creates additional complexity and requirements. The supply and operation of a database mgt system with several users and databases is quite costly and complex.

3. Qualified personnel : A database cannot operational without the service of a qualified database administrator.

4. Costly : Implementation of DBMS is costly because it requires not only financial investments for the system itself but also for additional hardware and the more complex handling of the system.

5. Lower Efficiency : A database system is a multi use software which is often less efficient than specialised software which is developed to accomplish a single task.

Components of DBMS

1. The Database files : these files have data

elements stored in database file organisation formats. The database is created in such a way so as to store, modify and retrieve data easily.

2. The users : users interact with the database mgt system indirectly through application programs or directly through a simple query language.

3. A Host language interface system

The host language interface system interprets instructions in high level applications

programs such as COBOL, BASIC, etc and make request for data from the files so that data needed by users can be retrieved.

4. The Application programmes

These programmes perform almost all the

Same functions that they perform in conventional file systems. But here they are independent of the data files and use standard definitions.

5. Natural language interface systems.

The natural language is very simple English like language. It uses simple commands. It is English consisting of symbols and equations.

6. The data Dictionary

It is called data directory. It is a tool for arranging and storing info. about the data maintained in the database. It contains the name of each data item, a description of the data item, definition of its attributes along with the name of the program that use them and the names of the person who are authorised to access database.

7. Online access and update terminals

These terminals may be located either very near to the computer system or may be located far away from the database.

8. The output system or report generator

This part of the database provides various routine and special reports to the users. The users can design their own report format easily without writing an application program in a programming language.

Database Languages

DBMS contains two languages namely

Data Definition Language (DDL) and Data Manipulation Language (~~DDL~~) (DML)

DDL and DML are not two separate languages, instead they simply form parts of a single database language, such as SQL language.

Data Definition Language - DDL

It is used to define the structure of the database. Structure of the database also called Schema of the database. In the Schema, there are several fields:

DDL establishes the connection between logical and physical structures of the database.

Here, logical refers to the way the user views data. physical refers to the way the data is physically data stored. The logical structure of database is called Schema.

The DDL is used to define the physical characteristics of each record such as field name in the record, the length of each field and its data type.

The following are the important functions of data definition language.

1. Description of the Schema and sub-schemas.
2. Description of fields in each record and the logical name of the record.
3. Description of the data-type and name of the each field.
4. Description of the keys of each record.
5. provide protection to the data.
6. provide physical and logical data independence.

Data Manipulation Language - DML

DML is used to manipulate data in the database. It includes all the commands that enable the users to manipulate the data and the users can view the data, add new data, delete existing data and modify selected fields in a record.

The functions of DML;

1. provide the techniques of data manipulation such as deletion, addition, retrieval of data records.
2. It permits the users and application programs to process data on a symbolic logical basis rather than on physical location basis.
3. provides for independence of programming languages. DML provide support for several high level languages such as COBOL, C++ etc.
4. provide the relationship b/w different records.
5. It also allows the user and application programs to be independent of physical data structure and database structure maintenance.