

Data:-

Data are the raw fact which are collected from different source such as Books, newspaper, magazines from different activities etc. If we apply any rules and regulation of tools and technique to those data which are collected from different source, we may generate the pattern of knowledge or information.

Database:-

Data base is the collection of different data or record which is store in the computer system. It is the collection of logically related data. Data base store similar kinds of data in any organization, due to which we can retrieve information for that organization. The data or record which are collected are manage in the database managed by the DBMS. Some example of data base are :-

- 1) Dictionary
- 2) Railway time table
- 3) Telephone dictionary.

Database Management System (DBMS)

A database management system is the set of program that is used to store, retrieved and manipulate the data in convenient. The main goal of DBMS is to hide underlying complexities of data management from users and provide easy interface to them. The example of DBMS software Mysql, Oracle, Sybase etc.

Application of Database Management system.

1) Banking:

To store information about customer, their account numbers, balance etc.

2) Airlines:

For reservation and scheduling information.

3) Telecommunication:

To keep record of customer such as call made, balance left, generating monthly bills, storing customers information etc.

4. Universities:

To keep record of students, courses, marks obtained by student, information about exam schedule, information about course detail, administration section such as billing fees, University plan and records etc.

5. Sales:

To keep information about customer, product list purchases information.

File oriented Approach and Database Approach

File - oriented Approach / file management system:

It is also called flat file system. It stores data in plain text file such as note pad files, word files etc.

In earlier days file oriented approach are commonly used for storing data files. Each files in a file-oriented approach approach stores and maintains its own related data for example a student information system only stores information about the student such as student profiles, student courses, student result etc. There are no structural relationship in the file oriented approach data are flat as in the sheet of paper.

In this approach each application has data files related to it containing and the data record needed by the application. Thus an organization have to develop number of application program each with an associated application-specific data file.

Drawback of file-oriented approach:-

1) Data redundancy:-

It means duplicate of same data or data files in different location, file management system are suffered from the problem of high data redundancy. for example keeping record of same student in the different location such as account, administration library etc. If a library data file contain self phone number of a student as 9868--- but examination data file 98034--- is a cell phone number, then we can say that there exist a data inconsistency.

Data inconsistency:

Data is said to be inconsistent if various copies of the same data may no longer agree. Data inconsistency occurs if change data is reflected in data file in one place but not elsewhere in the system.

Data isolation:

Data are scattered in various files and file may be in different formats. Writing new application programme to rewrite the appropriate data is difficult in flat file system.

Integrity problem:

Integrity means correctness of data before and after execution of a transaction for e.g. if maximum salary in an organization is 150,000 then we have the integrity constraint "Salary $\leq 150,000$ ". Then integrity constant are important to maintain correctness data. If we mistakenly type 200000 in place of 20000 while transferring salary of an employee in his account, specified integrity constant is violated so that the system will display the message of error mistake.

Unfortunately file system do not allow us to specify integrity constant so it makes difficult to maintain data in file base system.

Advantage of Database Management system.

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Data inconsistency and redundancy:

Data redundancy means replication of data in multiple places. This wastes the storage space, but in database management system data redundancy is minimized. In database management system data redundancy can be removed with the help of primary key. In database management system data are integrated through logical structure with the help of primary key.

Data independence:

In database approach data description are stored in the center location called the data dictionary. This property allows an organization data to change or evolve without changing that application program that change the data.

Backup and recovery system:

Backup and recovery are the most important factor in the database management system. DBMS support backup property which make us entire contain of the database due to which we can recover if any disaster occurred.

Security :-

In database system we may create different user account and different ~~authorities~~ authorization of different user organization. In a banking system payroll personally need to see only that of the database that has information about the various bank employes. They do not need accessed information of customer's account.

Instance, schemas and Data Model

Instance

Database change overtime as information is inserted or deleted. The collection of information stored in the database at a particular moment of time is called an instant of database. Instances are the actual data contained in the database. It is also known as database state.

Schemas:

The overall design of the database which is not expected to change frequently is called a the database schemas. Schema is the logical structure of the database. A schema contains information about the description of the database like the name of the record type and constant. A schema does not show the data in the database. There are three schema.

1) Physical schema:

Physical schema describe the data

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base design at physical level

logical level: schema

logical schema describe the data base design at logical level.

View level:

The schema at the view level is sometimes called subschema and describe the view of the data base. For eg., employ information in a company data base may be stored in a relation with the following schema:

Employee (Eid : string, Ename : string, EAddress : string , Esalary : integer , Eage : integer)

Data model:

Eid	Ename	EAddress	Esalary	Eage
A 1	Hari	Ktm	20,000	24
B 2	Shyam	Mahendranagar	25,000	27
C 3	Gita	Nepalgunj	27,000	28
D 4	Rita	Dhangadi	24,000	26

Data model:

The basic structure or design of the data base is the data model. A data model is a collection of conceptual tools for designing describing data and data relationships. It also describes the data semantics and consistency constraints.

Some data base are given below:

- i) Entity - Relationship (E-R) model
- ii) Relational Database model
- iii) Hierarchical model
- iv) Network model
- v) Entity - Relationship (E-R) model

An entity is the basic unit for model building. An entity is a thing or object in the real world that is distinguishable from other object. Entities are describe in a database by a set of attributes.

Attributes:

An attributes describe some properties or characteristics of the entity. For eg, the entity student may have student name, student address, age and rollno as an attributes.

Relationship:

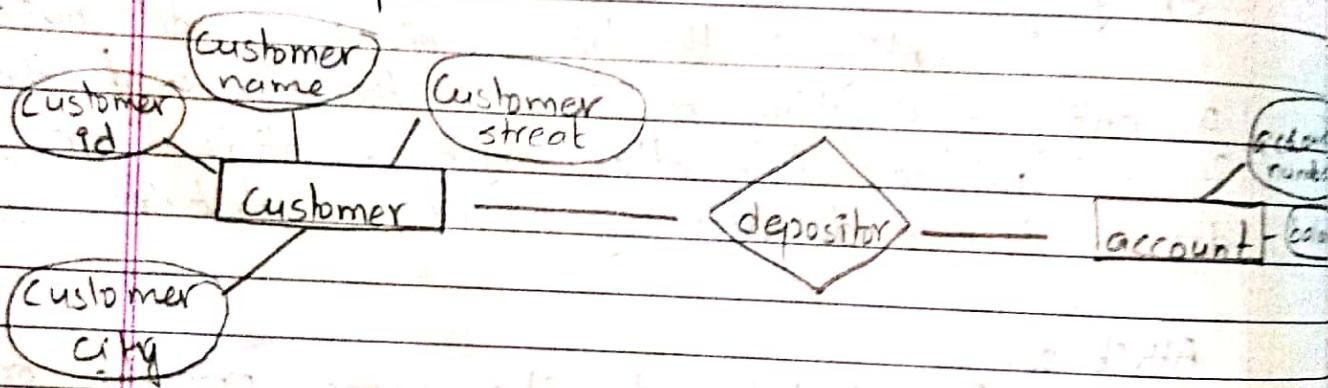
A relationship is an association among several entities. There are different type of relation among the entities.

- 1) One - to - one
- 2) One - to - many
- 3) Many - to - one
- 4) Many - to - many

Overall logical structure of database can be expressed graphically by E-R diagram. The basic

- component of this diagram are
- I) Rectangle (represent entity set)
 - II) Ellipses (represent attributes)
 - III) Diamond (represent relationship set) among entity sets
 - IV) lines (link attributes to entity sets and entity sets to relationship set)

For example



Relational Model

It is the current favourite model:
 The relational model is a lower level model that uses a collection of tables to represent both data and relationship among those data. Each table has multiple columns and each column has a unique name. Each table corresponds to an entity set or relationship set and each row represents an instance of that entity set or relationship set. Relationship links two tables by embedding by row keys from 1 table at attribute in the other table. Sql is used to manipulate data stored into table.

Customer-id

customer name

customer street

customer
city

51

Ram

3 main set

KTM

52

Hari

100 main set

Pokhara

53

Gopal

101 main set

DHN

54

Dinesh

200 main set

MNR

55

Bikash

300 main set

NPJ

a) Customer table

account - number

balance

A - 101

2000

A - 102

3000

A - 103

4000

A = 104

5000

A = 105

6000

b) account table

Customer - id

account - number

51

A - 101

54

A - 104

55

A - 1075

53

A - 103

(c) deposit table

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Database

Hierarchical Model:

The hierarchical database helps to establish a logical relationship among various data elements of multiple files and arranged the elements in a hierarchy and structure is like tree structure. Hierarchical model also represent data by a set of records but records are organized in hierarchical order structure. The nodes of the tree in the hierarchical structure represent record types. Hierarchical tree consist one root record type along with 0 or more occurrence of its dependents of tree and each dependents sub is again hierarchical

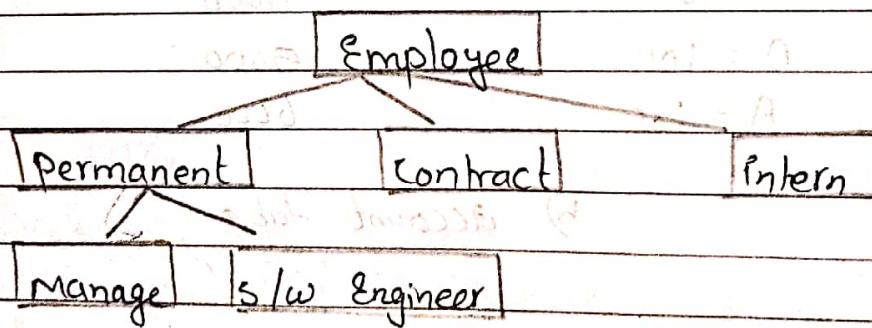


fig: A Hierarchical database model

Network database model

In Network model, data are represented by the set of record relationship among data are represented by links. It is modifier version of hierarchical model. In this model each record in the data base can have multiple parents. Data element can have many to many relationship

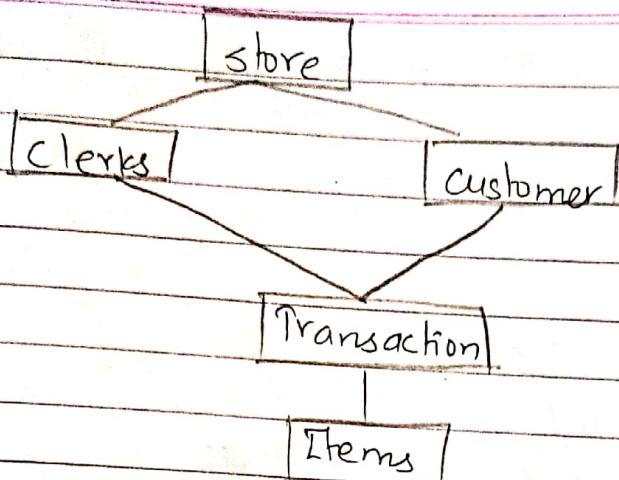


Fig: Network database model

Database language:-

Database language are those language which are used to create database and manipulate its contain. There are mainly two types of database language.

- i) Data definition language (DDL)
- ii) Data manipulation language (DML)

i) Data definition language.

DDL used to specify database schema. For eg following DDL in SQL defines accounts relation and about student table

`Create table account`

`Create table account` `Create table student`

`(`

`account_no char(2), student-roll no char(10),`

`balance integral student-name char(20),`

`) student-age integer`

The execution of above DDL statement create table student and create table account creates a table. The command create a table name student have 3 fields (student_rollno, student_name, student_cg). The database management system has a DDL compiler which processes DDL statement and set of tables which are then stored in a data dictionary. Data dictionary contains meta data, i.e. data about data.

Data manipulation language:

Data manipulation language allow database user to access and manipulate data. That is, DML is responsible for:

- 1) Create new information in the database.
- 2) Read information from the database.
- 3) Update information ~~from~~ⁱⁿ the database.
- 4) Delete information from the database.

Data manipulation language establish between communication and data base and user. There are two types of DML.

Procedural DML

Non-procedural (declarative) DML

Procedural DML:

User required to specify what data are needed and how they get that those data.

Non-procedural

User only required to what data needs without specifying how to get those data.

SQL is the most widely used non procedural Query language. For example the SQL query to find the name of the student having roll-no A121 in table student is

~~Student rollno~~ ~~stud-name~~ ~~stud-age~~

i) Create table student (
 stud-rollno char(20),
 stud-name char(20),
 stud-age integer)

stud-rollno	stud-name	stud-age
A121	Saru	20
A122	Roshana	21
A123	Kamal	22
A124	MJ	23

ii) Select student . stud-name
 from student
 where student . stud-rollno = 'A121'

Saru

Database Users:

There are four different types of database user, they are differentiated acc. to their interaction with the system. Moreover, there are different types of user interfaces for different types of user.

a) Native user

Nag.

a) Native user:

Native user are unsophisticated user who interact with the system by invoking one of the application programme that are already written for example, Banks, teller who need to transfer one account to another invoking teller a program called transfer. This programme ask the teller for the amount of money to be transfer and account to which the money which is to be transfer.

b) Application programmer:

Application programmers are computer professional who write application programme. Application programmers may choose many any programming tool choose to develop user interface.

c) Sophisticated users:

Sophisticated user interact with system without writing programs but they request by writing queries in database using DML queries language. Database This query goes to query

processor and it converted into instruction for the database manager modules

Specialized user :

Specialized user are responsible to write special database application program, it could be computer aided design system, knowledge base and expert system that store data with complex data type such as graphics data, audio-video data etc.

Architecture of database system:

The architecture provides general framework of database system. The propose of the architecture is to make database more independent of the application that is using the database. The architecture is defined and divided 3 level which are as follows:

1. Internal (physical) level:

The internal schema describe the physical storage structure of the database. It is a lower level of abstraction. Abstraction means the mechanism to hide complexity of database. It is concerned about how data is stored physically. It describe the organization of files, the access part to the database etc.

2. Conceptual level:

It describes the structure of whole database for the user. It is also called logical

level. It describes what data are stored in database and what relationship exist among them.

3) External level or view level

It is the highest level of abstraction abstraction in which it provides a users and applications view of the data. It includes one or more external schema i.e. the external schema describe the structure of database relevant to it. It allows users / application to get different ~~propective~~ perspective.

Example:-

Physical level:-

- how tables are stored , have many bits if required etc.

logical / conceptual level:

- Course (course No , corse name, credit , Dept)
- Student (student id , name , fname , level , major)

View level :

- Cs Majors
- Math majors

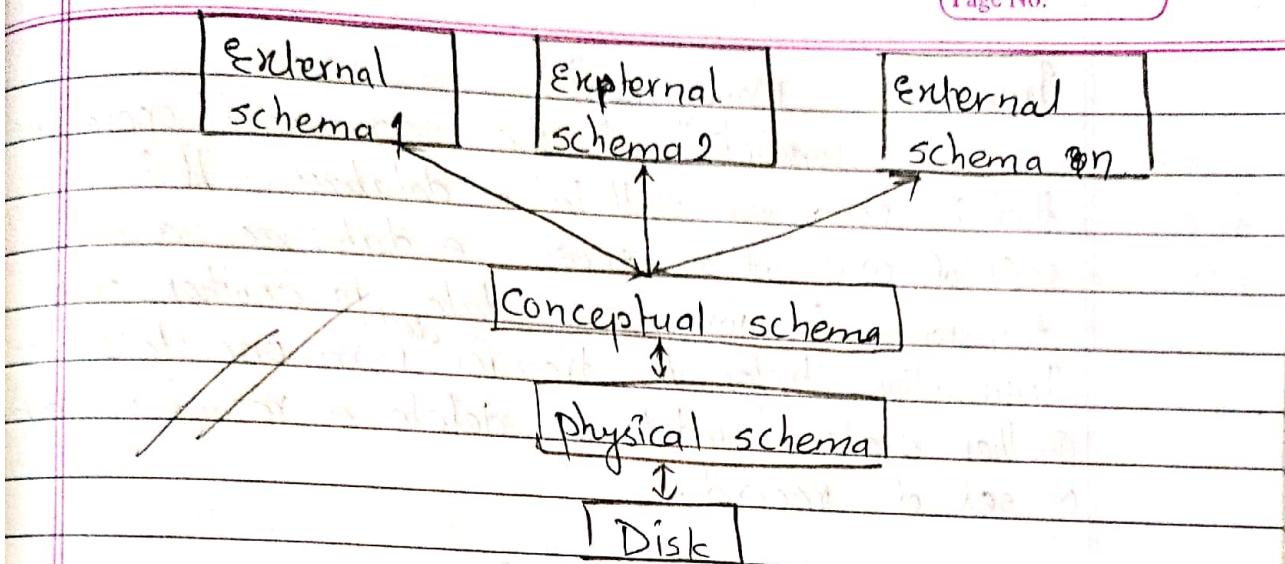


Fig : Three schema architecture

function of database management system:

There are different type of function in DBMS

- 1) Data catalog management
- 2) Transaction management
- 3) Concurrency management
- 4) Security management
- 5) Recovery management
- 6) Language interface

Data catalog Management :

Data catalog is also called a data dictionary that contains the description of the data in database such as no. of record in each files, names and types of each field etc. Database management system hides the complexity of data dictionary from the user. Catalog contains information about a relationship among data, constraints and the entire schema.

Transaction Management:

Transaction is the sequence of operations that is performed within a database. It is a unit of work that access a database and transform it from one state to another state.

Transaction helps to transfer ^{data} from one state to another state, update or delete a record, modified or set of record.

Concurrency Management:

Concurrency control coordinates the action of database manipulation process that operate concurrently and access the shared data. Ex: To people reading a balance and updating ^{it} each at the same time.

Security Management:

Security should be maintained by the database management system. Security means on authorized access of data in DBMS and security of DBMS should ensures that only authorized user can access to the database.

Recovery management:

Data independence

It is the ability to change the schema at one level without affecting the schema at another level. There are two types of data independence.

1. Logical data independence
2. Physical data independence

Logical data independence

Logical data independence is the modification of conceptual schema without resulting in a change in the external schema. Modification of conceptual schema may include adding a record, adding a data item, updating etc. At the external level the user is interested in the portion of the database that represents its external view, in which the database system provides a mapping from external view to conceptual view. We may have different external view but should have only one conceptual view.

Physical data independence

Data base Administrator:-

Data base Administrator is a person who manages all the database of an organization. He /she has the ability to change a schema of the database. Data base Administrator determines the internal content, structure and access mechanism for a database. DBA define the security mechanism, integrity and monitors the performance of the DBA. DBA is responsible for creating, maintaining and modifying all the three level of database management architecture. DBA should have good knowledge of database and database management system.

The function of DBA includes:-

A Database system Architecture:

The architecture of database can be defined in various ways. There are mainly three kinds of the centralized architecture of database.

1. DBMS architecture
2. Client server architecture.
3. Distributed architecture.

1. Centralized DBMS architecture.

It is a traditional kind of database architecture where all the database functionality, data, application program etc are located on a single machine at the center. To access the database we should have a communication link to the center from the remote location. Mainframe computers are usually used in the centralized system and all the processing ^{well} performed on this computer. DBMS was centralized and stored on the mainframe. Centralized database is easy to manage and administer. Some of the example of centralized database are as follows:

i) Personal database

Database of any organization / where data base is located at the center computer of an organization / company.