

ASSIGNMENT - I

DATA BASE MANAGEMENT SYSTEMS

Ques:- Give the classification of DB Systems?

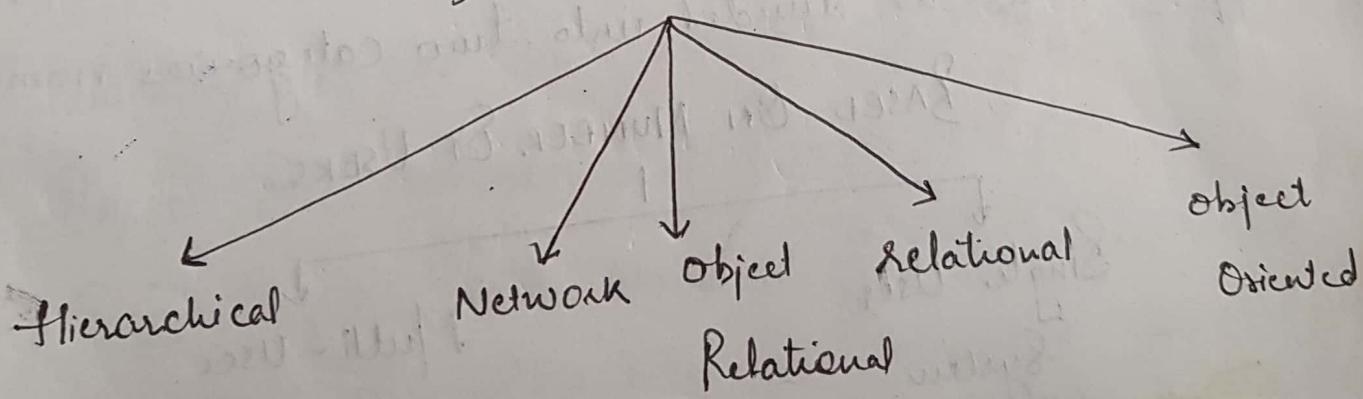
Ans:- The DBMSs can be classified into different categories on the basis of several criteria such as the data model they are using, number of users they support, number of sites over which the database is distributed, & the purpose they serve. Parallel database

systems, client-server.

BASED ON DATA MODELS

[The various data models have already been discussed. Depending upon the Data Models, DBMS can be classified as [Hierarchical] :-

BASED ON DATA MODELS



4) User

1. Among these, the hierarchical & Network data models are the older data models & now known as legacy data model. Some of the old applications still run on the DB Systems based on these models.
2. Most of the popular & current commercial DBMS are based on relational data model.
3. Object-based data models have been implemented in some DBMSs; however, have not become popular. Due to popularity of relational database, the object-oriented concepts have been introduced in these databases that led to the development of a new class of DBMSs called object relational DBMSs.

④) BASED ON NUMBER OF USERS.

Depending on the Number of users the DBMS supports, it is divided into two categories namely

BASED ON NUMBER OF USERS

Single-User
System

Multi-User
System.

Single User System, the DB resides on one computer and is only accessed by one user at a time. The user may design, maintain & write programs for accessing & manipulating the DB according to the requirements, as well as perform all user roles. The user may also hire DBS designers to design a System. In such a case the single user performs the role of end user only. However, in most enterprises the large amount of data is to be managed & accessed by multiple users & thus, requires multi-user System.

2. In Multiuser Systems, multiple users can access the DB simultaneously. In multi-user DBMS, the data is both integrated & shared. For eg:-, the Online Book database is a multi-user database system in which the data of books, authors, & publishers are stored centrally & can be accessed by many users.

III) BASED ON NUMBER OF SITES

Depending on the Number of sites over which the DB is distributed, it is divided into

two types, namely

BASED ON NUMBER OF SITES.

Centralized

distributed

↓

1. CENTRALIZED DATABASE SYSTEMS run on a single computer system. Both the DB & DBMS software reside at a single computer site. The user interacts with the centralized system through a dummy terminal connected to it for information retrieval.

2. IN DISTRIBUTED DB SYSTEMS, The DB and DBMS are distributed over several computers located at different sites. The computers communicate with each other through various communication media such as high speed N/w's or telephone lines. Distributed DBS can be classified as

Distributed DB System

Heterogeneous

Homogeneous

a) In Homogeneous distributed database systems, all sites have identical DBMS SW, whereas

↓
General

↓
Specific

3. DBMS is general purpose S/w System. It can, however, be designed for specific purposes such as airline or railway reservation. Such Systems cannot be used for other app's without major changes. These database systems fall under the category of online transaction processing (OLTP) Systems. Online transaction processing system is (Special) & Specifically used for data entry & retrieval. It supports large number of concurrent transactions without causing excessive delays. An Automatic Teller m/c (ATM) for a bank is an ex of Online Commercial Transaction.

Processing appn. The OLTP technology
various industries, such as banks,
supermarkets, manufacturing, etc.

a. Discuss 3 level architecture
STANDARDIZATION OF DBMS
ARCHITECTURE OF

b. Differentiate b/w file System & DB Sys.

Ans:- FILE MANAGEMENT

e.g. COBOL PROGRAM

- 1. Small Systems
- 2. Relatively cheap
- 3. Few 'files'
- 4. files are files
- 5. Simple Structure
- 6. Redundant data
- 7. Chances of inconsistency
- 8. Isolated data
- 9. Little preliminary design
- 10. Integrity left to appn
Programmer
- 11. No Security
- 12. Simple, primitive Backup & Recovery
- 13. often Single User
- 14. DATABASE MANAGEMENT SYSTEM
- 15. Oracle or Sybase
- 16. Large Systems
- 17. Relatively expensive
- 18. Many 'files'
- 19. Files are Tables
- 20. Complex Structure
- 21. Reduced Redundancy
- 22. Consistent.
- 23. Data can be Shared
- 24. Vast preliminary design
- 25. Rigorous Subroutine integrity
Checking.
- 26. Rigorous Security
- 27. Complex & Sophisticated
Backup & Recovery.
- 28. Multiple Users

Discuss 3-level Architecture

- STANDARDIZATION OF DBMS - THREE LEVEL

ARCHITECTURE OF DBMS.

An early proposal for a std terminology & general architecture for database systems was produced in 1971 by the DBTG (Database Task Group) appointed by the Conference on Data Systems and Languages (CODASYL, 1971). The DBTG recognized the need for a two level approach with a System view called Schema & User views (called Subschema). The American National Std's Institute (ANSI) Stand's Planning & Requirements Committee (SPARC) produced a similar technology & architecture in 1975 (ANSI 1975). ANSI-SPARC recognized the Need for a 3-level approach with a System - Catalog.

There are following three levels or layers of DBMS architecture:

1. External level
2. Conceptual level
3. Internal level

OBJECTIVE OF 3-LEVEL ARCHITECTURE.

The objective of the 3-level architecture is to provide each user's view of the DB from the DBA should be able to change at

data base as physically represented.

Several reasons why this separation is done:

1. Each user should be able to access the data, but have a different customized view of data. Each user should be able to change the way he or she views the data, & this change should not affect other users.

2. Users should not have to deal directly with physical database storage details, such as indexing or hashing. In other words a user's interaction with the database should be independent of storage considerations.

3. The DBA should be able to change the DB storage structures without affecting user's view

4. The internal structure of the DB should be unaffected by changes to the physical aspects of storage, such as the change over a new storage device.

RE
R
EXTERNAL LEVEL OR VIEW
It is the user's view
of the DB without any
internal details.
Deals with individual
users view
5. Individual
6. etc
7.
8.

the DBA should be able to change the conceptual structure of the DB without affecting all users.

EXTERNAL LEVEL OR View level

It is the user's view of the database

This level describes that part of the DB that is relevant to each user.

3. Closest to End users.
4. Deals with the way in which individual users view data.
5. Individual users are given diff views according to user's requirement.
6. It insulates users from the details of the internal & conceptual levels.
7. Also known as View level.
8. Diff views may have diff representations of data
9. For e.g. one user may view dates in the form (day, month, year), while another may view dates as (year, month, day)

CONCEPTUAL LEVEL OR LOGICAL LEVEL

1. It is the Community view of the db.
2. This level describes what data is stored.
3. The db & the relationships among the data.
4. It is the middle level.
5. Contains the logical structure of the entire db as seen by DBA.
6. Complete View of the data requirements of the Organisation that is independent of any storage considerations.

a) It represents:

All entities ; their attributes , & their relationships.

ENTITY :- An object whose info is stored in the db.

For ex:- in student db the entity is Student.

ATTRIBUTE :- A characteristic of interest about an entity .

For ex:- in case of student db. Roll no., Name, class, address etc. are attributes of entity Student.

Field or Column or attribute.

Field Name	Roll no	Name	Class	Address	% age
	1234	Hitesh	ABC	Agra	74
	1256	Anand	DEF	Delhi	82
	1278	Dimple	GHI	Maw road	70

3. There are constraints on the data;
semantic info about the data;
security & integrity info.

6. This level must not contain any storage (considerations) dependent details. for eg:- the description of an entity should contain only data types of attributes (for eg.; integer, real, character) & their length (such as the max number of digits or characters), but not any storage considerations such as number of bytes occupied.

7. It supports each external view, in that any data available to a user must be contained in, or derivable from, the Conceptual Level.

8. abstract representation of db

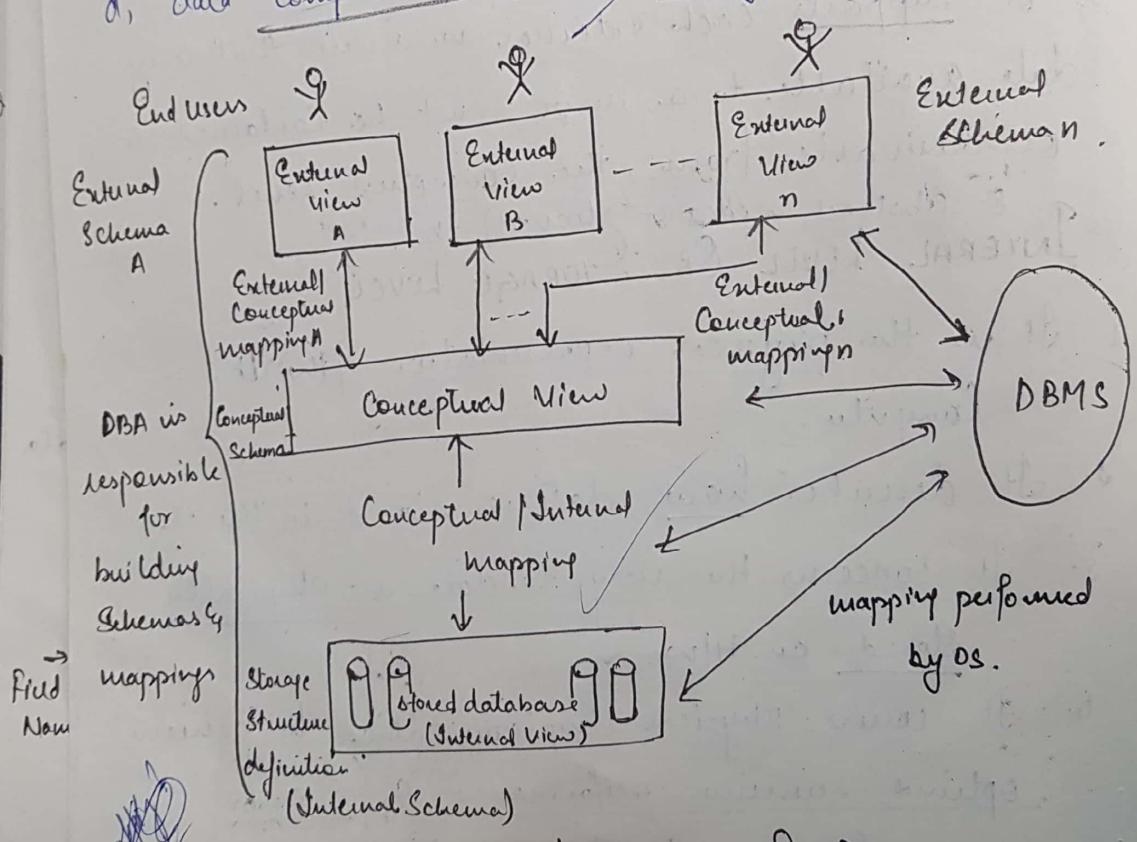
INTERNAL LEVEL OR STORAGE LEVEL

1. It is the physical representation of the db on Computer.
2. It describes how data is stored in the db.
3. It concerns the way the data are physically stored on H/w.
4. It covers physical implementation to achieve optimal running performance. E.g. Storage Space Utilization.

5. It owns the data structures & file organization used to store data on storage devices.
6. It interfaces with the OS access methods to place the data on the storage devices, build indexes, retrieve the data & so on.

The Internal level considers:

- Storage Space allocation for data & indexes
- Record descriptions for storage
- Record placement;
- data compression & data encryption techniques.



3-TIER ARCHITECTURE Of DBMS

SCHEMA: An outline or a plan that describes the record & relationship existing at a particular level
The data views at the three levels are described by Schema.

Types Of Schema

EXTERNAL SCHEMA: The External View (Corresponds) is described by means of a schema. Called external Schema that corresponds to diff views of the data.

CONCEPTUAL SCHEMA: Conceptual view is defined by Conceptual Schema, which describes all the entities, attributes, & relationship together with integrity Constraints.

INTERNAL SCHEMA: Internal View is defined by internal Schema which is complete description of the internal model, containing definition of stored records, the method of representation, the data fields, & the indexes used.

MAPPING B/w Views.

Two Mapping are required in database system with three different Views

EXTERNAL | CONCEPTUAL MAPPING :- Each external schema is related to Conceptual Schema by the external | conceptual mapping. A mapping b/w the external & Conceptual view gives the correspondence among the records & the relationships of the external & Conceptual views.

- * The external View is an abstraction of the Conceptual View, which in its turn is abstraction of the internal View.

CONCEPTUAL | INTERNAL MAPPING :- Conceptual Schema is related to the internal Schema by the Conceptual | Internal Mapping. This enables the DBMS to find the actual record or combination of records in physical storage that constitutes a logical record in conceptual Schema.

Mapping b/w the Conceptual & the internal levels specifies the method of deriving the Conceptual record from the Physical database.

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DATA INDEPENDENCE.

A major objective for three level architecture is to provide data independence, which means that upper levels are unaffected by changes in lower levels.

There are Two kinds of Data Independence.

1. Logical data Independence
2. Physical data Independence

LOGICAL DATA INDEPENDENCE:- It indicates that the Conceptual schema can be changed without affecting the existing external schemas. The change would be absorbed by the mapping b/w the external & Conceptual levels. Logical data independence also isolates app" pgms from op"s such as combining two records into one or splitting an existing record into two or more records. This would require a change in the external / Conceptual mapping so as to leave the external view unchanged.

Physical DATA INDEPENDENCE. It indicates that the physical storage structures or devices could be changed without affecting Conceptual schema.

Physical data independence is achieved by mapping presence of the internal level of db & the mapping or transformation from the conceptual level of the db to the internal level.

* The logical data independence is difficult to achieve than physical data independence as it requires the flexibility in the design of db & pgmr has to foresee the future requirement or modifications in the design.

b. Name different types of users in Database System.

Ans:- The users of a database system can be classified in the following groups, depending on their degrees of expertise or the mode of their interaction with the DBMS. The users can be

NAIVE USERS: Naive Users are those who need not be aware of the presence of the database system or any other system supporting their usage. Naive Users are end users of the DB, who work through a menu driven appⁿ pgm where the type & range of response is always indicated to the user. Eg:- ATM user

as of expertise with
permitted with a db.

3. SOPHISTICATED USERS:- Such users interact with the system without writing programs. Instead, they form their requests in db query language. Each such query is submitted to a query processor whose function is to breakdown DML statement into units that storage manager understands.

4. SPECIALIZED USERS:- Such users are those who write specialized db appn that do not fit into the functional data - processing framework. For eg: Computer Aided design Systems, KB Systems and ES, Systems that store data with complex data types (for example, graphics data & audio data).

5. APPLICATION PROGRAMMERS : Professional programmers are those who are responsible for developing application programs or User Interface. The appn pgms could be written using general purpose programming languages or the commands available to manipulate a db.

6. DATABASE ADMINISTRATOR : [Professional pgmr's are those who are responsible for developing appn pgms. or user interface. The appn pgms could be written using general purpose programming language or the commands available to manipulate a db.] * The DBA is the person or group in charge for implementing the db within an org. The DBA has all the System privileges allowed by the DBMS and can assign (grant) and remove (revoke) levels of access (privileges) to and from other users. DBA is also responsible for the evaluation, selection & implementation of DBMS package. (the detailed role.) *

explain the role of DBA.

DBA is a person or group in charge for implementing DBMS in an Organization.

DBA consist of team of people rather than just one person.

The Main Responsibilities of DBA are:-

1. MAKES DECISIONS CONCERNING THE CONTENT OF THE DATABASE - It is the DBA's job to decide exactly what info is to be held in the db.

2. PLANS STORAGE STRUCTURES AND ACCESS STRATEGIES - The DBA must also decide how the data is to be represented in the db, and must specify the representation by writing the storage structure definition.

The associated mapping b/w the storage structure definition & the conceptual (mapping) schema must also be specified.

3. PROVIDES SUPPORT TO USERS - It is the responsibility of the DBA to provide support to the users, to ensure that the data they require is available, and to write the necessary external schemas.

The mapping b/w any given external schema & the conceptual schema must also be specified.

4. DEFINES SECURITY AND INTEGRITY CHECKS - DBA is responsible for providing the authorization and authentication checks such that no malicious users can access db and it must remain protected. DBA must also ensure the integrity of db.

5. INTERPRETS BACKUP AND RECOVERY STRATEGIES:

In the event of damage to any portion of the db - caused by human error, say, or a failure in the hw or supporting OS - it is essential to be able to repair the data concerned to the minimum delay & with as little effect as possible on the rest of the system. The DBA must delay & with as little effect as possible on the rest of the system. The DBA must define & implement an appropriate recovery strategy to recover the db from all types of failure.

6. MONITORING PERFORMANCE AND RESPONDING TO CHANGES IN REQUIREMENTS - The DBA is responsible (fao) for so organizing the system as to get the performance that is "best for enterprise".