

chapter 1 Introduction (Sugam Stationery Suppliers)

Database

- It is a repository for collection of related data and facts.
- It is an organized collection of data so that it can be easily accessed and Managed.

Data

- It is a raw, unorganized facts that need to be processed.
- It is Meaningless and Worthless.

Information

- When a data is processed, organized, structured or presented in a given context so as to make it useful, it is called information.
- It is the output of data processing operation.

DBMS

- It is a collection of programs that enables users to perform certain action on a particular database. eg:- ORACLE, MYSQL, SQL SERVER etc.

Database

DBMS

Application Programs

Application

Banking

Airlines

Human Resources

Education

Hospitals

Sales

Telecommunication

E-COMMERCE

Manufacturing

Objectives of DBMS.

- Providing Mass storage of relevant data.
- Making easy access to data for authorized user.
- Eliminating data redundancy.
- Providing data integrity.
- Providing security with user access privilege.
- Allowing Multiple users to be active at one time.
- Serving different types of users.
- Combining inter-related data to generate report.
- Allowing the growth of database system.

Advantages of DBMS

- Data sharing.
- Reduced data redundancy.
- Improved data integrity.
- Increased security.
- Time saving.
- Report generation.

Disadvantages of DBMS

- Costly
- Fast changing technology
- Requires trained Manpower
- chance of data leakage and hacking.

Needs of DBMS

- Data retrieval.
- Data redundancy.
- Data security.
- Data indexing.
- Data integrity.

Data Abstraction

The process of hiding details and showing only the essential information is called Data Abstraction.

The three levels of data abstraction are:-

i) Internal/physical level :-

- It is the lowest level of data abstraction that is close to physical storage.
- It describes:-
- How data are actually stored in storage device ?
- What will be the storage technique.

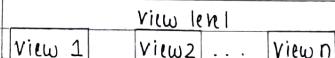
ii) Conceptual/Logical level :-

- It is the next higher level.
- It describes:-
- What data are actually stored in database?
- What are the relationships between data entities?

iii) External/View level :-

- It is close to the user.
- It describes:-

What are the way of viewing information to the concerned users?



logical level

Physical level

Fig:- Three levels of data abstraction.

Data Independence

- It is the ability to modify schema definition in one level without affecting a schema definition in next high level.
- Each higher level of data architecture is immune to the changes of next lower level of architecture.
- We can change the structure of a database without affecting data required by users and programs.
- Data independence is the type of data transparency that matters for a centralized DBMS.
- Data independence can be explained using the three-schema architecture.

⇒ Two types of Data independence are :-

i) Physical data independencies :-

- It refers to the ability to modify the physical schema without affecting conceptual schema.

ii) Logical data independencies :-

- It refers to the ability to modify conceptual schema without affecting view schema.

- It is more difficult to achieve than physical data independence because application programs are dependent on the logical structure of data that user access.

Schema

- It is the overall design of the database.

Physical Schema :- It is the database design at physical level of abstraction.

Logical Schema :- It is the database design at logical level of abstraction.

Subschemas :- Schemas at view level that describes different view of database.

e.g:-

ID	Name	Address	Faculty	Shift
----	------	---------	---------	-------

Fig:- Schemas

Instances

The collection of information stored in database at particular moment.

The instances can be changed by certain CRUD operations as like addition, deletion of data.

Any search query will not make any kind of changes in the instances.

e.g:-

ID	Name	Address	Faculty	Shift
101	Ram	Ktm	IT	Morning
102	Sita	Bhaktapur	SE	Day

Fig:- Instances

concepts of DDL, DML, DCL, DQL and TCL

i) DDL (Data Definition Language)

- used to define database structure or schema

eg:-

Create :- to create objects in database.

Alter :- to change the structure of database.

Drop :- To delete objects from database.

Truncate :- to remove all records from table, including allocated spaces.

ii) DML (Data Manipulation Language)

eg:-

Insert :- to insert data into table.

Update :- to update in existing data within table.

Delete :- to delete records from table.

- used for Managing data within schema object.

iii) DQL (Data Query Language)

The purpose of the DQL command is to get some schema relation based on the query passed to it.

eg:-

Select :- It is used to retrieve data from database.

iv) DCL (Data Control Language)

- used to control the database.

eg:-

Grant :- to give user's access privileges to database.

Revoke :- To withdraw access privileges.

v) TCL (Transaction Control Language)

- used to Manage the changes made by DML statements.

eg:-

Commit :- to save work done.

Rollback :- to restore db to original since last commit.

Database Manager and users.

Database

Administrator(DBA)

Application
Program

Database

designers

DBMS designers
and Implementation

End users

System

Analyst

Tool Developers

Operator and
Maintenance personal

Types of database :-

i) Relational databases :- It uses a structure that allows us to identify and access data in relation to another piece of data in the database. often, data in a relational database is organized into tables.

ii) Object-oriented databases :- Information in object oriented database is represented in the form of objects, as in object-oriented programming.

- iii) **Distributed databases** :- A distributed database consists of two or more files located in different sites. The database may be stored on multiple computers, located in different sites or located in the same physical location, or scattered over different networks.
- iv) **Data Warehouses** :- A central repository for data, a data warehouse is a type of database specifically designed for fast query and analysis.
- v) **NoSQL databases** :- NoSQL database provides a mechanism for storage and retrieval of data that is modeled in means other than the tabular relations used in relational databases. NoSQL databases grew popular as web applications became more common and more complex.
- vi) **Graph databases** :- A graph database stores data in terms of entities and the relationships between entities.
- vii) **OLTP (online transaction processing) databases** :- An OLTP database is a speedy, analytic database designed for large numbers of transactions performed by multiple users.
- viii) **Document/JSON database** :- It is designed for storing, retrieving and managing document-oriented information. Document databases are a modern way to store data in JSON format rather than rows and columns.

DBMS Statement. Explain the differences between file oriented system and Database oriented system.

The database Management System is a software tool that is used for creating and managing databases in organized way.

It is a software system that uses standard methods of cataloging, retrieving and running queries on data.

File oriented system

File System is a collection of data. In this system, the user has to write the procedures for managing the database.

It is a computer software that helps us to manage data files in the computer system.

File system doesn't have a crash mechanism. i.e., if the system crashes while entering some data, then the content of the file will get lost.

We are not able to update and manipulate data of the file based oriented system.

File system can't efficiently store and retrieve the data.

It helps to store the collection of data in the hard disk.

There is more redundant data.

It has data inconsistency.

- It provides more security to the data.
- We can easily handle the file oriented system.
- NTFS and EXT are some examples of file systems.

Database oriented system.

- Database oriented system is a software that makes it easier to store, manipulate and retrieve data in a database.
- A database stores data in tables. The user is not required to write the procedures.
- Database oriented system provides a crash recovery mechanism, i.e. DBMS protects the user from the system failure.
- It helps to easily store, retrieve and manipulate data in a database.
- It gives the abstract view to hide details of the data. It is a software to create and manage database.

In database operations like updating, selecting and searching the data is easier.

- It has less data security than file based oriented system.
- It provides higher data consistency using Normalization.
- There is low data redundancy.
- Handling of the data in this system is complex.
- MySQL, Oracle are some examples of database oriented systems.

What is DBA? List out various responsibilities of DBA. What qualities should the DBA have to manage a very large database? Explain the statement "DBA has central control over database system." The DBA controls the security aspects of the DBMS implementation. Discuss the software and hardware controls available to the DBA, and how this could fit into a commercial environment. Example of data and information.

Ans:-

DBA

- Database Administrator (DBA) is the information technician responsible for directing or performing all activities related to maintaining a successful database environment.
- A DBA makes sure an organization's database and its related operations and applications operate functionally and efficiently.

Various responsibilities of DBA or Role of DBA.

- Data Backup and recovery.
- Authentication.
- Security.
- Capacity planning
- Performance monitoring
- Troubleshooting
- Configuration
- Database design
- Software installations and maintenance
- Data Extraction, Transformation and Loading

GENIUS

The qualities that DBA must have to manage large databases are:-

i) Productive under pressure

Let us assume that SQL Server goes down. IO issues are occurring on the SQL Server. Emergency code is needed to fix it. How do you handle pressure? We have to think being productive under pressure and solve it very calmly.

ii) Problem solver

Identifying issues is generally no problem for us. DBAs does not mean the best solution to every problem in the form of stored procedure. Truly understanding the issue and implementing the correct solution in a rapid manner is easier said than done.

iii) Understand both the Business Needs and Technology landscape

Understanding the data and processes are just as critical with more of a focus on business intelligence to identify opportunities for the organization. By understanding the business needs and technology options you can remedy the situations with an automated process.

iv) Willingness to Learn and open Minded

As technology professionals, there is a need to continuously learn to keep our technical skills sharp and be sure to offer the proper recommendations. By continuously learning, hopefully this will give us an open mind to consider alternative ideas and experiments with other technology that will help round off your knowledge.

GENIUS

v) Experience to know when to be Firm and when to be Flexible. We can't get experience out of a book. Working seriously and handling different problems as time passes makes us experience. Experience on the work matters, therefore leverage it.

vi) Trust, Honesty and Integrity

As should be the case in all professional positions, trust, honesty and integrity are major things that should be at the core of all business relationships.

vii) Communication

We should have communications among the group. If there is not, the correct communications that can cause frustration among team members. Both in writing and speaking communication is a critical quality that not every professional has mastered.

DBA has central control over the database system

Explaining responsibilities of DBA in database.

i) Software installation and Maintenance

A DBA often collaborates on the initial installation and configuration of a new Oracle, SQL Server etc database. And if new server is needed, the DBA handles the transfer of data from the existing system to the new platform. The DBA handles the on-going maintenance as, updates and patches are required. The DBA installs the database software and configures it for use. DBA handles the software installation and maintenance.

ii) Data Extraction, Transformation and Loading

- Data Extraction, transformation, and Loading refers to efficiently importing large volumes of data that have been extracted from multiple systems into a data warehouse environment.
- The external data is cleaned up and transformed to fit the desired format so that it can be imported into a central repository.

iii) Database Backup and recovery

- DBA creates data backup and recovery plans and procedures based on industry best practices, then make sure that the necessary steps are followed. In the case of a server failure or other form of data loss, the DBA will use existing backups and restore lost information to the system.

iv) Security.

- DBA has to minimize the risk of stealing the data. No any system is 100% immune to attacks, but implementing best practices can minimize risks. In the case of security breach or irregularity, the DBA can consult audit logs to see who has done what to the data. Audit trials are also important when working with regulated data.

v) Authentication

- Setting up employee access is an important aspect of database security. DBAs control who has access and what type of access they are allowed. For instance, a user may have permission to see only certain pieces of information or they may be denied the ability to make changes to the system.

vi) capacity planning...

The DBA needs to know how large the database currently is and how fast it is growing in order to make predictions about future needs. If the company grows quickly and adding many new users, the DBA will have to create the capacity to handle the extra workload.

vii) performance Monitoring

Monitoring databases for performance issues is the part of on-going system maintenance a DBA performs. If some part of the system is slowing down processing, the DBA may need to make configuration changes to the software or add additional hardware capacity.

viii) Troubleshooting

DBAs are on call for troubleshooting in case of any problems. Whether they need to quickly restore lost data or correct an issue to minimize damage, a DBA needs quickly understand and respond to problems when they occur.

So the above details concludes that the DBA has the central control over the database.

Examples of data and information.

Ques:- Ticket sales on a band on tour.

Information:- Sales report by region and venue. It gives the information which venue is profitable for that business.

software and Hardware controls available to DBA.

⇒ Hardware controls available to DBA

- When we say Hardware, we mean computer hard disks, I/O channels for data, and any other physical component involved before any data is successfully stored into the memory.

- When we run Oracle or MySQL on our personal computer, then our keyboard using which we type in all the commands, our computer's RAM, ROM all become a part of the DBMS hardware.

⇒ Software controls available to DBA

- This is the main component, as this is the program which controls everything. The DBMS software is more like a wrapper around the physical database, which provides us with an easy-to-use interface to store, access and update data.

- The DBMS software is capable of understanding the Database Access Language and interpret it into actual database commands to execute them on the DB.

- We use the different software like Database in MySQL, SQL SERVER, Oracle etc.

Old is gold solutions.

2011 - Fall	2011 - Spring	2012 - Fall	2012 - Spring
1a) Repeated	1a) Repeated	1a) Repeated	1a) Repeated
2013 - Fall			
1a) Repeated	2013 Spring 1a) Repeated	2014 Fall Repeated	
2014 - Spring	2015 - Fall	2015 - Spring	2016 - Fall
1a) Repeated	1a) Repeated	1a) Repeated	1a) Repeated
2016 - Spring	2017 - Fall	2017 - Spring	
1a) Repeated	1a) Repeated	1a) Repeated	
2019 - Fall	Repeated		

2018 - Fall

- 1a) Explain the differences between logical and physical data independence. List the major steps that you would take in setting up a database for a particular enterprise.

Ans:-

Physical data independence

Logical data independence

- It mainly concern about how the data is stored into the system.
- It mainly concerned about the structure or the changing data definition.

- It is easy to retrieve.

- It is difficult to retrieve because the data is mainly dependent on the logical structure of data.

- It is concerned with the internal schema.

- It is concerned with the conceptual schema.

- The modifications made at the internal level may or may not be needed to improve the performance of the structure.
- The modification made at the logical level is significant whenever the logical structure of the database is to be changed.

Example:
Change in compression techniques, Hashing algorithms and storage device.

Example:
Add/Modify or Delete a new attribute.

⇒ Particular Setups that you would make database to a particular enterprise are:-

• Interaction with the file Manager.

• Integrity enforcement.

• Security enforcement.

• Backup and Recovery.

• Concurrency control.

• Create/initialize the database.

• Define the physical level.