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"Database Management System"

"Data Vs Information"

① Data is the raw fact that have not been processed to reveal their meaning whereas info is is the processed ~~raw~~ data to reveal meaning to end user.

② Data is what you store in database whereas information is what you retrieve from a database.

Metadata: Data about the data. Describes the characteristics and relationships of data

DBMS:
- Collection of programs
- Manages the db structure
- Control acess to data stored in db

Database: A collection of related data.

Data: known facts that can be recorded and have an implicit meaning.

Min-World: Some part of real-world about which data is stored in DB. For example in student ~~db~~ database a uni is a mini world.

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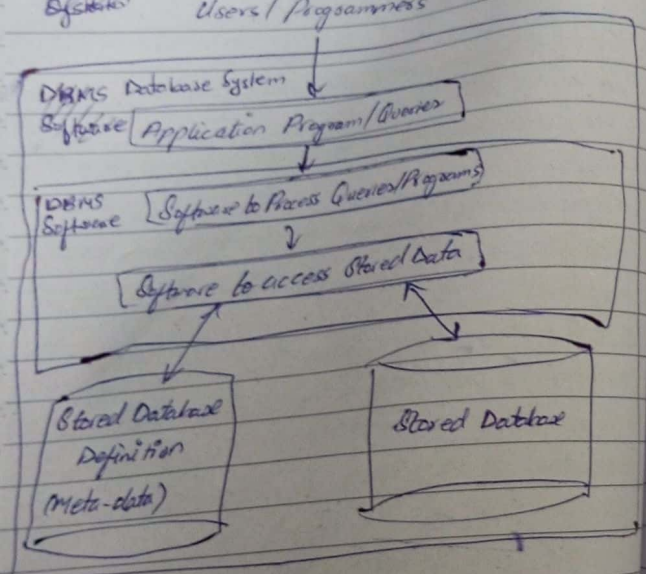
• Database System Environment:



• Characteristics of DB Approach:

① Self Describing Nature of Database System:
A DBMS catalog stores the description of a p
database.
The description is called meta data.

② Insulation b/w Programs & Data:
Called program-data independence.

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Allow changing data structure & store organization without having to change the DBMS access program.

④ Data Abstraction:
A data model is used to hide storage details & presents user with a conceptual view of the database.

⑤ Support of Multiple Views of Data
Each user may see a different view of the database, which only describes the data of the interest to that user.

⑥ Sharing of data & multi-user transaction processing:
Allowing a set of concurrent users to retrieve & update the database.
Concurrency control within the DBMS guarantees that each transaction is correctly executed or executed or aborted.
OLTP (Online Transaction Processing) is a major part of DBMS. Allows hundreds of concurrent transaction to execute per second.

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- Actors - On the Scence: Those who actually use and control database content.
- Workers - behind the Scence: Those who design & develop the DBMS software and related tools and the computer sys operators.

"ACTORS- ON THE SCENE"

- Database Administrator: Responsible of authorizing access to database, for coordinating and monitoring its use, and also monitoring efficiency of operations.
- Database Designess: Responsible to define the content, structure, constraints and funct or transactions again the DB.
- End- Users: They use the data for queries, reports and some of them update the DB content.
  - ↳ Casual: Access DB occassionally when needed
  - ↳ Naive or Parametric: The make up the large se of the end-user population.
    - ↳ Users of mobile apps, Bank tellers or reservation clerks are parametric users, Social media us post & read info from website.
  - ↳ Sophisticated: These include business analyst, scie engineers,
  - ↳ Stand Alone: Mostly maintain personal DB using ready to use packaged applications.

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A user that maintains a dB of personal photos & videos

- System Analyst and Application Developers:
  - ↳ System Analyst: The understand the req of naive & sophisticated users and design applications
  - ↳ Application Programmes: Implement the specifications developed by analyst and test & debug them before deployment.

"ACTORS- BEHIND THE SCENE"

- System Designers and Implementors: Design & Implement DBMS packages in the form of modules and interfaces and test & debug them.
- Tool Developers: Design & implement software systems called tools for modelling & designing databases.
- Operators & Maintenance Personnel: The manage the actual running & maintenance of DB system hardware & software env.

"ADVANTAGES OF DBMS"

1. Controlling reclundancy in data storage and in development and maintenance efforts.
2. Sharing of data among multiple users.
3. Restricting unauthorize access

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(4) Providing storage structure (eg: indexes) for efficient query processing.
(5) Providing backup & recovery services.
(6) Representing complex relationship among data.

"When Not To Use DBMS"

(1) If database and applications are simple, well defined and not expected to change
(2) If access to data by multiple users is not req.
(3) In embedded systems where a general purpose DBMS may not fit in available storage.
(4) If there are strict real-time req that may not be fulfil bcz of DBMS.
(5) If database users need special operation not supported by DBMS.

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"Chapter #02"

Database System Concepts & Arche.

- Data Model: A set of concepts to describe the structure of a database, the operations of manipulating these structures and certain constraints that the database should obey.
- Structure: Constructs are used to define DB structure.
  - ↳ Includes element & their datatypes and relationships.
- Constraints: Restrictions on valid data.
- Database Schema: The description of a database.
  - ↳ Includes description of database structure, datatypes, ~~operations~~ and constraints.
- Schema Diagram: An illustrative display of DB schema.

STUDENT

Name	Stud_No	Class	Major

COURSE

Course_Name	Course_No	Dep

SECTION

Section_ID	Course_No	Semester	Year

● Schema Diagram

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- Database State: The actual data stored in DB at a particular time. This includes collection of all data in DB. Also called DB instance.
- Valid State: A state that satisfies the structure & constraints. Also called intension
→ Schema changes infrequently. Also called intension
→ State changes whenever DB is updated. Also called extension

" CATEGORIES OF DATA MODEL "

- Conceptual (high-level, semantic) data models:
Provide concepts that are close to the way many users perceive data. (is mein class diagram wagherah bnaate hai)
Also called entity based or object based model)
These include concepts such as entities, attributes, relation.

- Implementation (representational) data models:
These are used most frequently in traditional commercial DBMs. These include the widely used relational data model, as well as so called legacy data model.
The network and hierarchical models.
↳ uses tables & rows to represent data such as "Students" table

- Physical (Low-level, Internal) data models:
Provide concepts that describe details of how data is stored in the computer.

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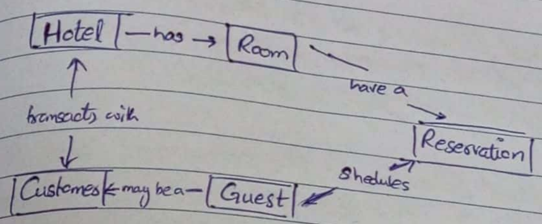
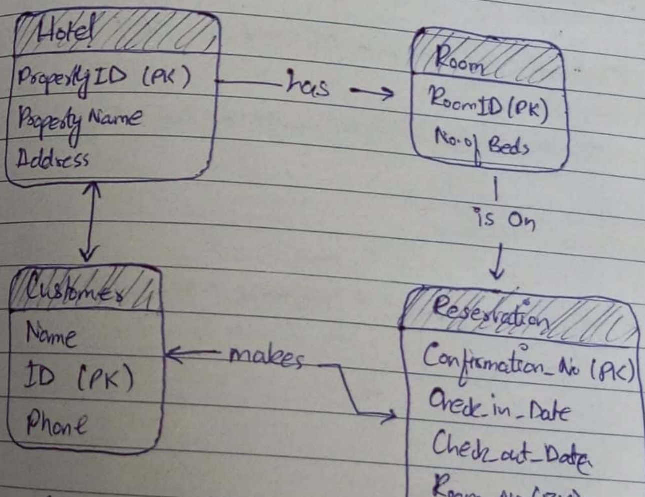
- Self describing Model:
Combine the description of data with the data values.
Example: NOSQL systems. (MongoDB).



- Conceptual Data Model



- Implementational Data Model

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→ Physical table mein datatypes bhi add hojayegi

"THREE SCHEMA ARCHI."

- Internal Schema: at the internal level to describe physical storage structures and access paths.
  ↳ Typically uses physical data model.

- Conceptual Schema: at the conceptual level to describe the structure and constraints for the whole database for a community of users.
  ↳ Uses conceptual or an implementational data model

- External Schema: a the external level to describe various users views.
  ↳ Usually uses same data model as the conceptual sch

- External Model:
  End user's view of data environment
  ER diagrams are used to represent external views.

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Logical Data Independence:
→ It is the capacity to change the conceptual schema without having to change external schemas or app programs.
→ It is difficult to achieve logical data independence
Eg: Adding a new attribute "Email" to a Student table without affecting queries or applications that use the "Student" table.

Physical Data Independence:
→ It is the capacity to modify physical storage of data (eg: changing indexing) with affecting logical schema or applications.
It is easier to achieve.
Eg: Changing the storage structure of "Students" table to use indexing for faster retrival.

"DBMS LANGUAGES"

- DATA DEFINITION LANGUAGE:
Used to define or modify the structure of database objects such as table, schemas, indexes.
In some DBMSs seperate Storage Definition Language (SDL) & View definition Language (VDL) are used to define internal & external schemas (views).

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DDL Commands: CREATE, ALTER, DROP, TRUNCATE

- DATA MANIPULATION LANGUAGE (DML):
- Used to manipulate data within DB.

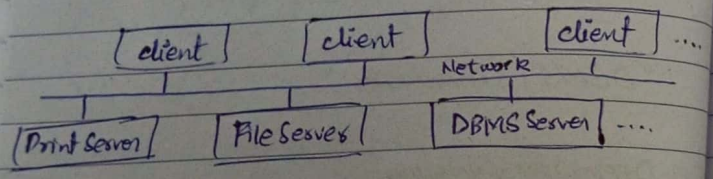
Commands: SELECT, INSERT, UPDATE, DELETE

TYPES OF DML

① High Level or Non-procedural Languages
These focus more on "what" rather than "how".
Also called declarative lang.
Ex: SQL, HTML, Prolog.

② Low Level or Procedural Languages:
Focuses more on how.
Example: C, Assembly, FORTAN

- Logical 2-tier client server Archi:



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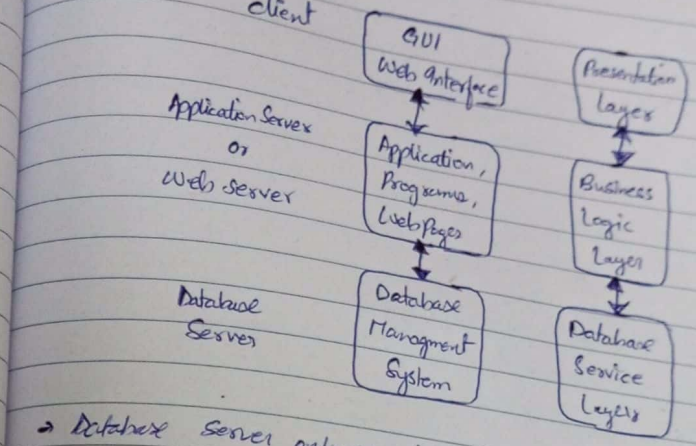
- 3-tier client server Archi:



→ Database server only accesible thru middle tier.
→ Clients cannot directly acces DB server.
→ Client contain UI & web browsers.
→ Client is typically a PC or a mobile device connected to web.

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