Unit 1

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Database: collection of related data. Eg telephone directory. It is a logically coherent collection of data w/ some inherent meaning.

DBMS: a computerized system that enables users to create & maintain a database.
- It is a general purpose software system that facilitates the process of defining, constructing, manipulating & sharing databases among various users & applications
- Data can be retrieved using a query.

Goals:
- Electronic record keeping
- Fast & convenient access of info

Problems w/ file system:
→ Data redundancy & inconsistency
→ Sharing of data is either not allowed or too complex
→ Data concurrency can cause anomalies
→ Addl. program has to be written for every search.
→ Systems might crash
→ Data integrity is not maintained
→ Data is not very secure.

All of the above occur ~~due to~~: bec.
- file layout description is buried in C prog.
- concurrency not supported.

DBMS handles these problems

Advantages over file system
- Logical & physical data independence
- Concurrent access
- Transaction processing

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- Disadv over file systems:
  - Price
  - Require additional expertise
  - Overkill for small single-user data set

ADVANTAGES OF DBMS

- Redundancy problem is solved
- Has high level of security
- Presence of data integrity
- Supports multiple users
- Allows data sharing
- Avoids inconsistency
- Provides backup

DISADV

- Complexity
- Size
- cost
- Slow performance
- Higher impact of failure.

Unit 2

- describe data
- data relationships
- data semantics
- consistency constraints

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Data model: a collection of concepts that can be used to describe the structure of a DB. It provides necessary means to achieve data abstraction

Data abstraction: suppresses ~~of~~ details of data organization & storage & highlights essential features for improved understanding.

TYPES OF DATA MODELS

1. Relational Model:
   - → collection of tables to represent data & relationship b/w data
   - → Each table has multiple columns
   - → Each column has a unique name
   - → Tables are also called relations.

2. Entity-Relationship Model:
   - → Logical representation of data as objects & the relationship among them
   - → Objects are known as entities, & the relationship is an association among these entities.

. Object-Based Data Model:
→ Extension of ER w/ notions of functions, encapsulation & object identity.

Semi-structured Data Model:
combines description of the data w/ data values themselves.

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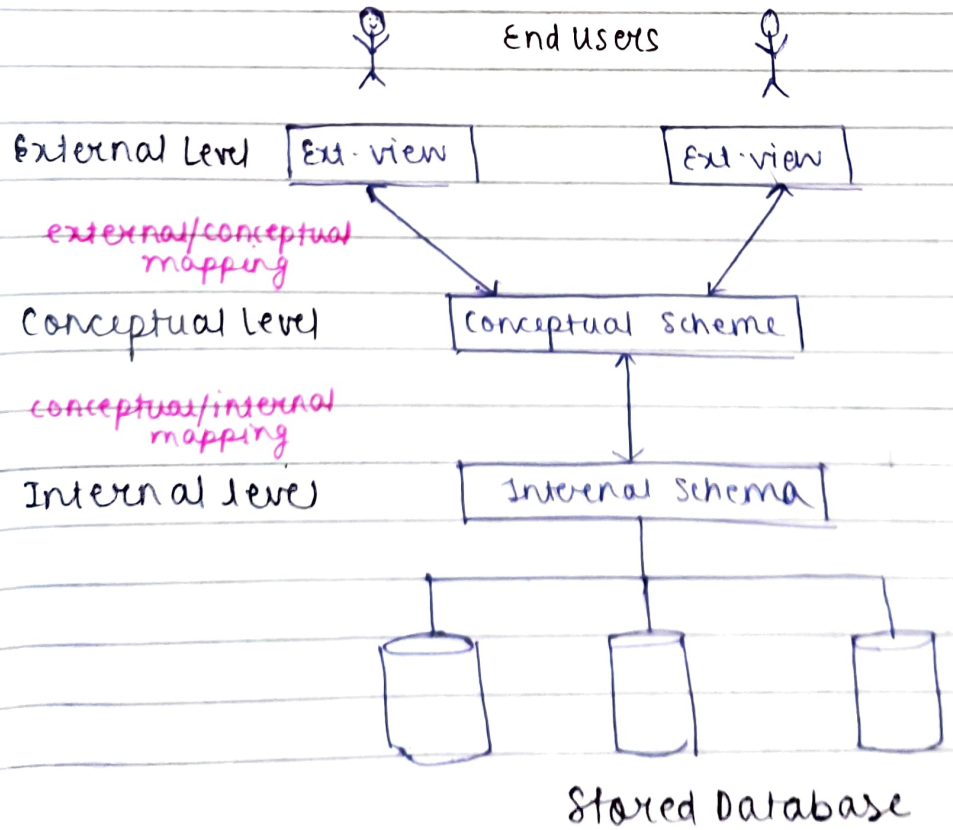
Database Schema: description of a DB
- specified during design
- does not change frequently

Instance: collection of info stored in DB at a particular moment.

* DB schema corresponds to variable declaration value in variables at a point of time correspond to an instance.

THREE SCHEMA ARCHITECTURE

Proposed to help achieve & visualize the following characteristics:
- use of a catalog to store the database description (schema) to make it self describing
- insulation of programs & data
- support of multiple user views.



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1. Internal level: has an internal schema which describes the physical storage structure of the DB.
- uses a physical data model
- describes complete details & access paths for the DB

2. Conceptual level: has a conceptual schema which describes the structure of a whole of DB ~~to~~ for a community of users.
- Hides the details of physical storage structure & concentrates on describing entities, data types, relationships etc.

3. External level: includes a number of external schemas
- each external schema describes the part of the DB that a particular user group is interested in & hides the rest of the DB from that user group.
- ~~each external schema is~~

DATA INPENDENCE : capacity to change the schema at one level of DB system w/o having to change it at another higher level.

→ Logical Data Independence:
- capacity to change conceptual schema w/o having to change external schemas.
- can add/drop column/table

→ Physical Data Independence
- capacity to change external schema conceptual schema
- can add index, change record order

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DBMS Languages

~~DDL, D~~

- DDL
- DML
- DQL
- DCL
- TCL

1. DATA DEFINITION LANGUAGE (DDL)

- Define the DB structure or schema.
- CREATE : create obj
- ALTER : alter DB structure
- DROP : delete obj
- TRUNCATE : remove all records from table, including space left by ~~incld~~ deleted records
- RENAME : rename an obj

2. DATA MANIPULATION (DML)

- Manage data within schema
- SELECT : retrieve data
- INSERT : insert data
- UPDATE : update existing data
- DELETE : TRUNCATE but space remains
- LOCK TABLE : controls concurrency

3. DATA QUERY (DQL)

- get some schema relation based on the query passed
- SELECT

4. DATA CONTROL (DCL)

- Controls rights, permissions & other controls of DBS
- GRANT : gives user's access privileges to DB
- REVOKE : withdraws

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5. TRANSACTION CONTROL (TCL)

- Allows statements to be grouped together into logical transactions
- COMMIT: save work done
- SAVEPOINT: transaction checkpoint
- ROLLBACK: restore DB to original since last COMMIT
- SET TRANSACTION: change transaction options

Database users

Naive users	Casual users	Application programmers	DBA

DBA (database administrators)

- authorizes access to DB
- coordinates & monitors DB use
- acquires HW & SW resources as needed.
- accountable for security breaches

DB architecture

centralized	client-server