

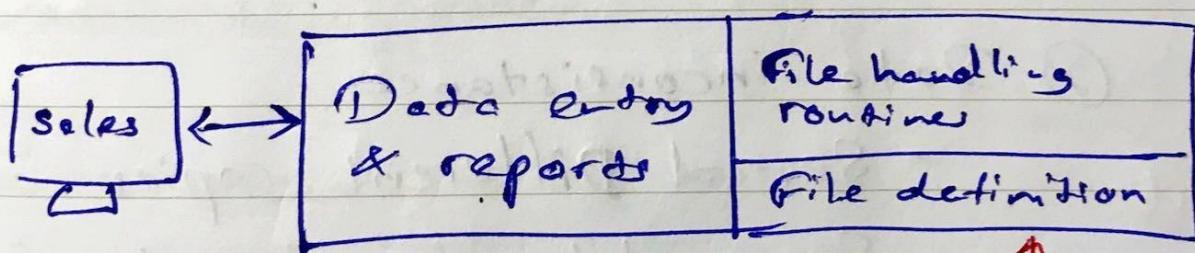
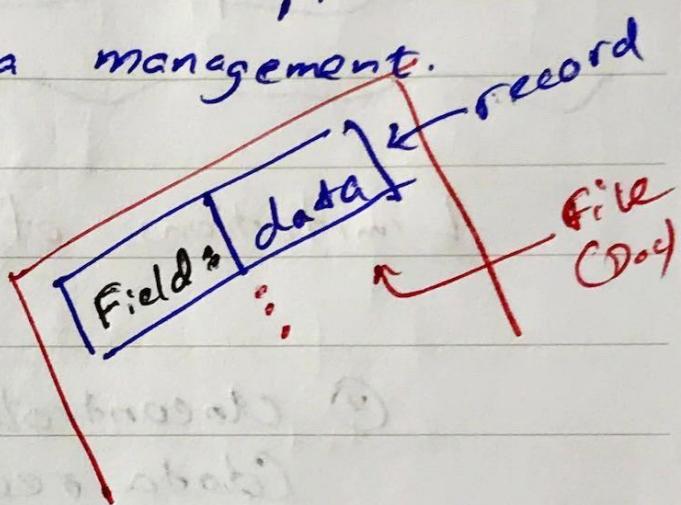
Lec 4Intro to  
Data Modeling> File based Approach

This is one of the obsolete approach

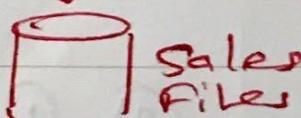
which used to data management.

Basic file terminologies

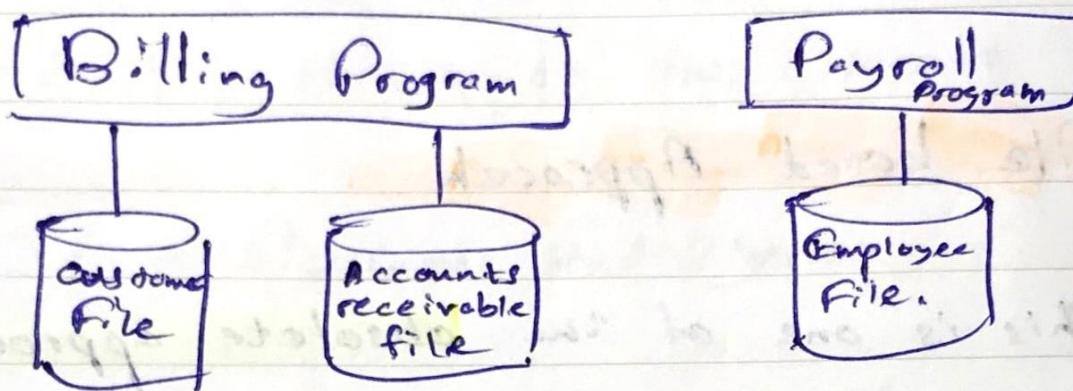
- > Data
- > Field
- > Record
- > File

Sales files

- ↳ Client (—, —, —)
- Transactions (—, —, —)



## File based Approach



## Limitations of File-based Approach

- ① Uncontrolled redundancy (data redundancy) - Duplicate same data
- ② Data inconsistency
  - Several different copies of the same data do not match (not updated)
- ③ Inflexibility
  - Can not change the (hard) structure / design of DB

#### ④ Limited Sharing

- Restricted ability to share or access data

#### ⑤ Poor enforcement standards

- Lack of consistent guidelines or rules.

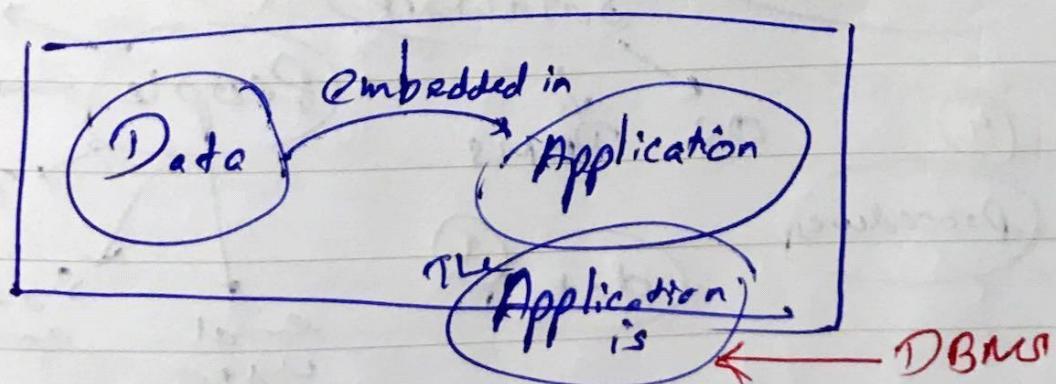
#### ⑥ Extensive program maintenance.

- Significant effort, time and resources to be maintained

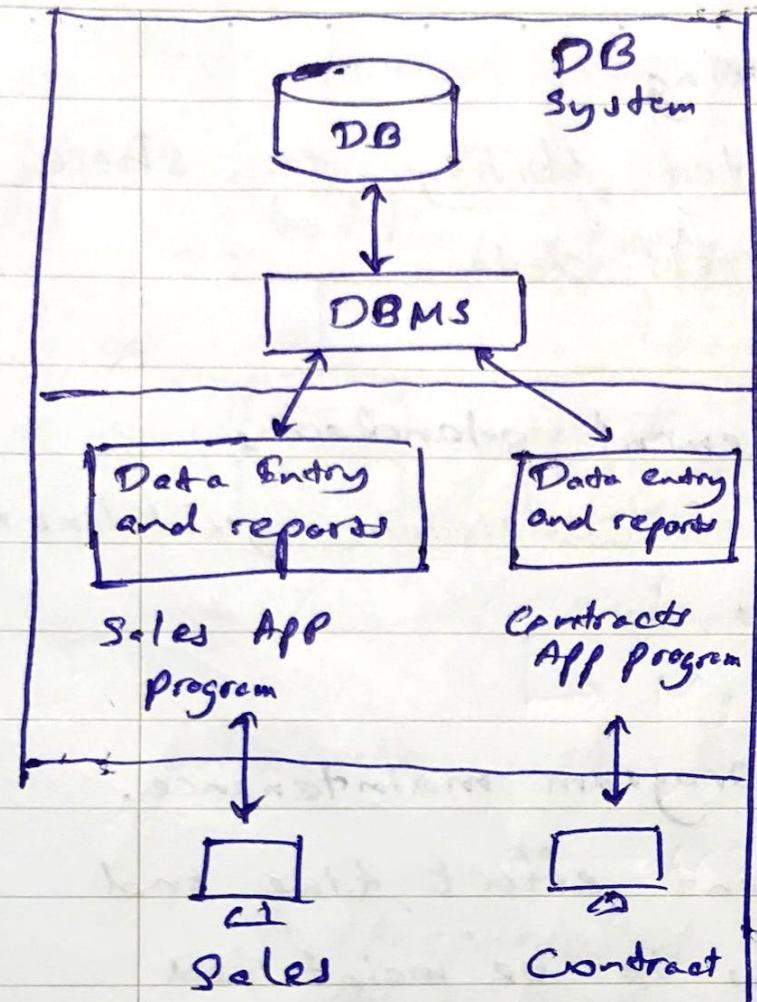
## Database Approach

Arose because:

\* Database approach is relational.



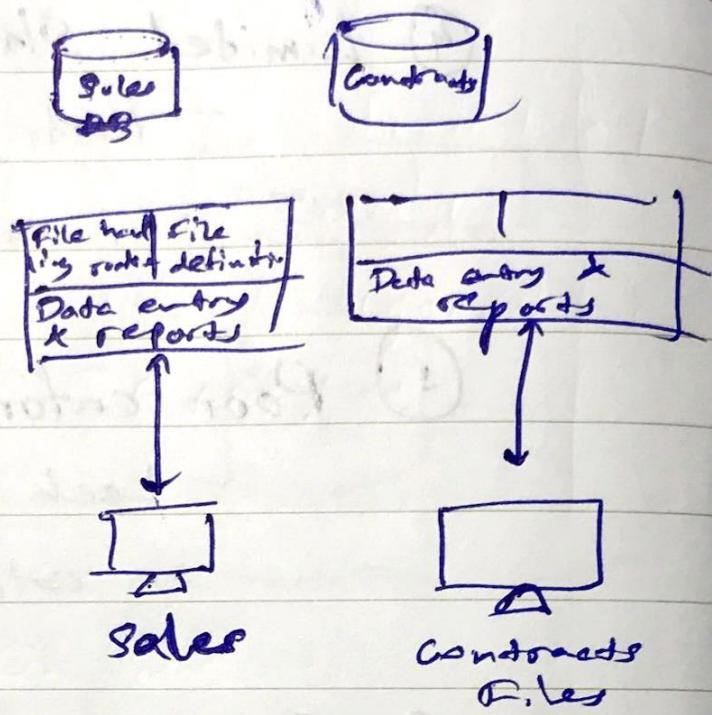
① DB



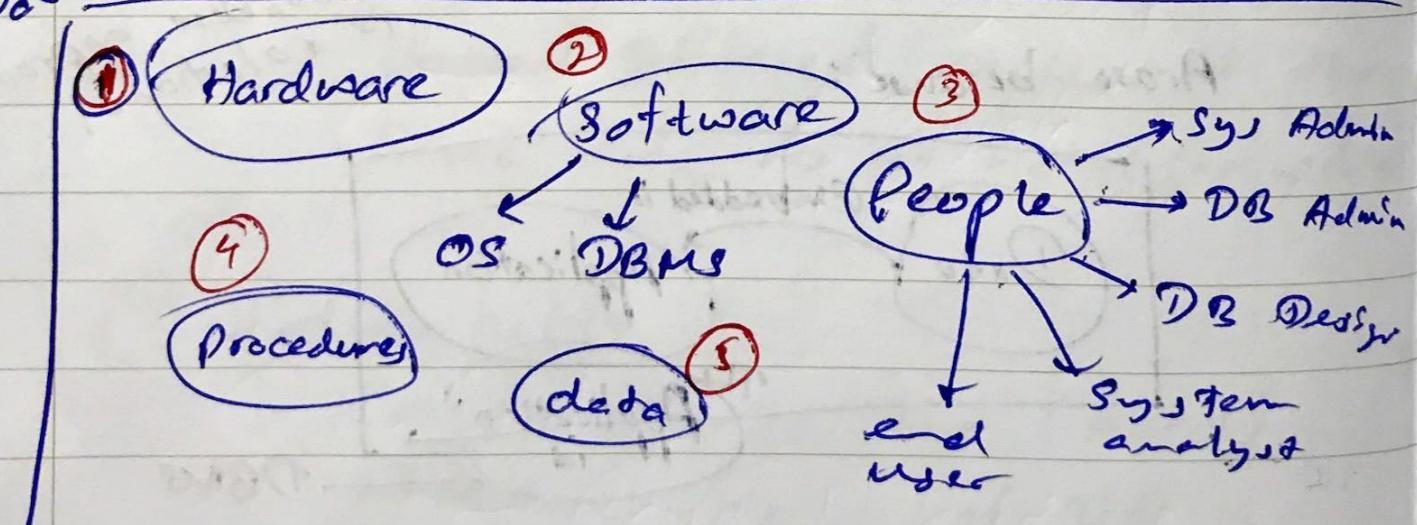
FB

Date

No



Database system environment

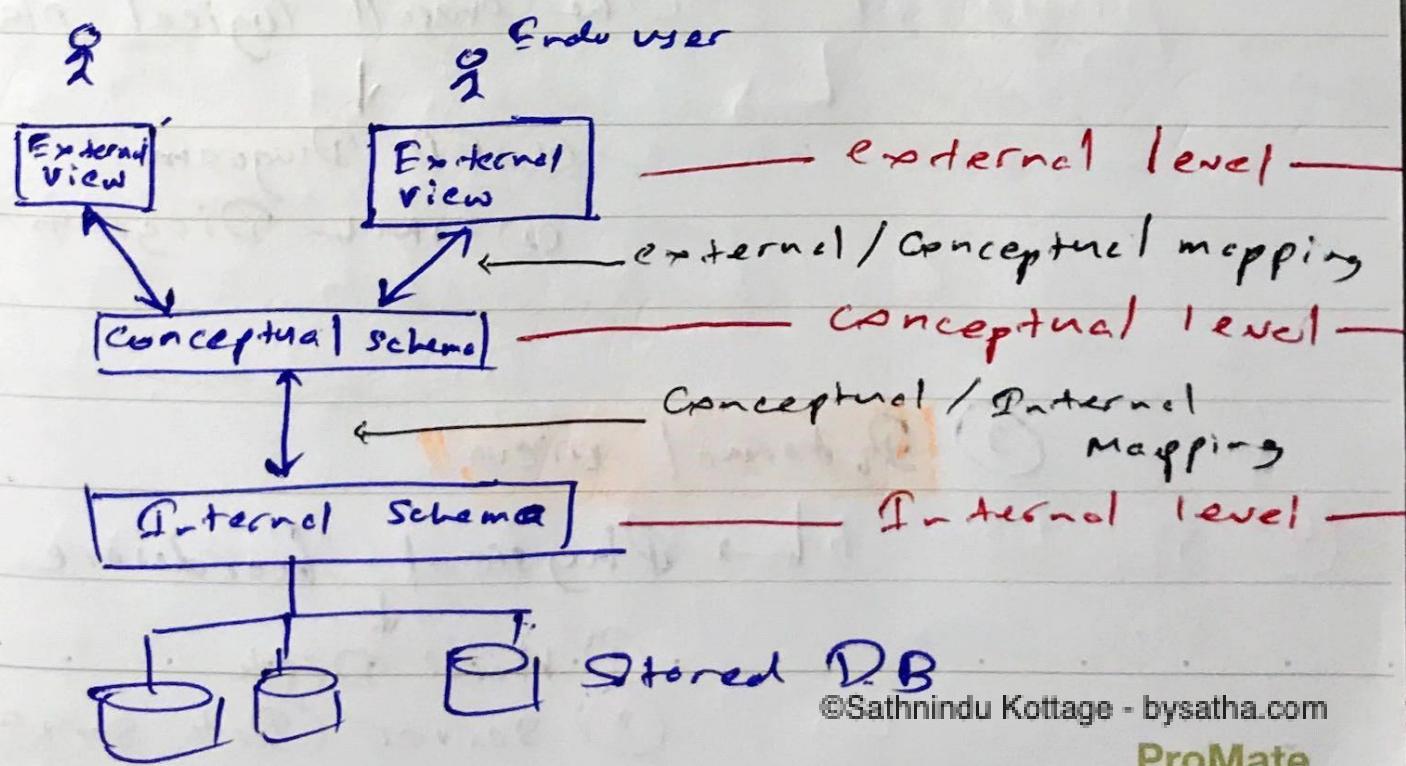


"Database is a logically coherent collection of data with some inherent meaning".

DBMS is a collection of programs that enables users to create and maintain a database.

DBMS is a general purpose software system that facilitates the process of defining, constructing, manipulating & sharing databases among various users & applications.

### Three-tier Architecture of a DBMS



## ① Three-tier architecture

→ This is the traditional architecture used to the internal organization of a DBMS.

This is  
a conceptual  
architecture

### ① External view

↳ MySQL | CLI

workbench GUI

MS SQL Server GUI

### ② Conceptual view

↳ The logical schema  
(The overall logical plan)

↓  
① EER Diagram

② UML Diagram

### ③ Internal view

↳ Physical hardware

① Hard Disk

② Server (Data Service)

The main objective of the

Data pool

Three-tier arch!

Internal

Physical  
\* All data

Conceptual

Conceptual  
\* constraints

External

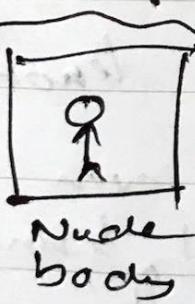
Selected data (1)  
\* Filtered data

Selected data (2)  
\* Filtered data

Separate a user's views  
of the database from the  
way that physically  
represented

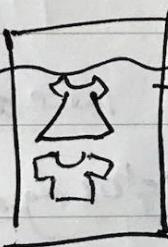
view

end user (1)



Nude body

(physical)  
\* Internal



Clothes

↓ constraint  
wear clothes

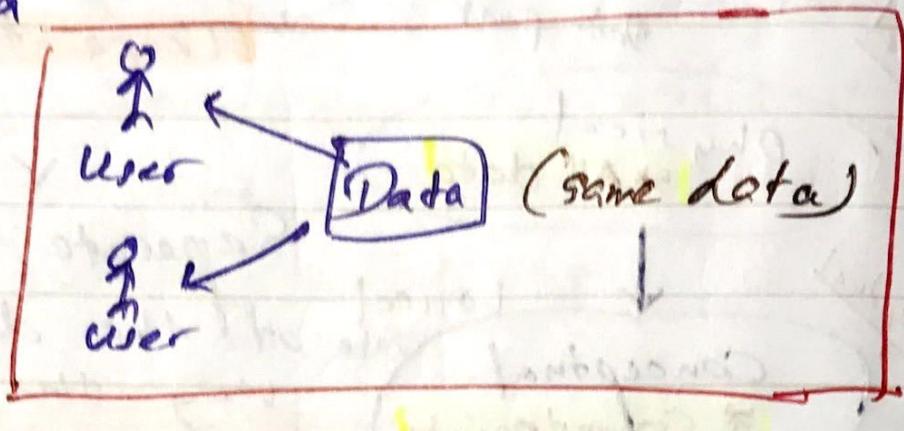
\* Conceptual

\* External

view

end user (2)

- ① All user should be able to access same data



- ② A user's view is immune to change made in other views.

↳ Logical Data Independence

- ③ Users should not need to know physical DB storage

↳ ex: You don't know even what your database servers look like.

- ④ Should able to change DB storage structure without affecting the user view

↳ Physical Data Independence

## Data Independence

**Logical Data Independence:** Change conceptual schema without

\* change schema <sup>logical</sup> having to change external schemas and their application programs.

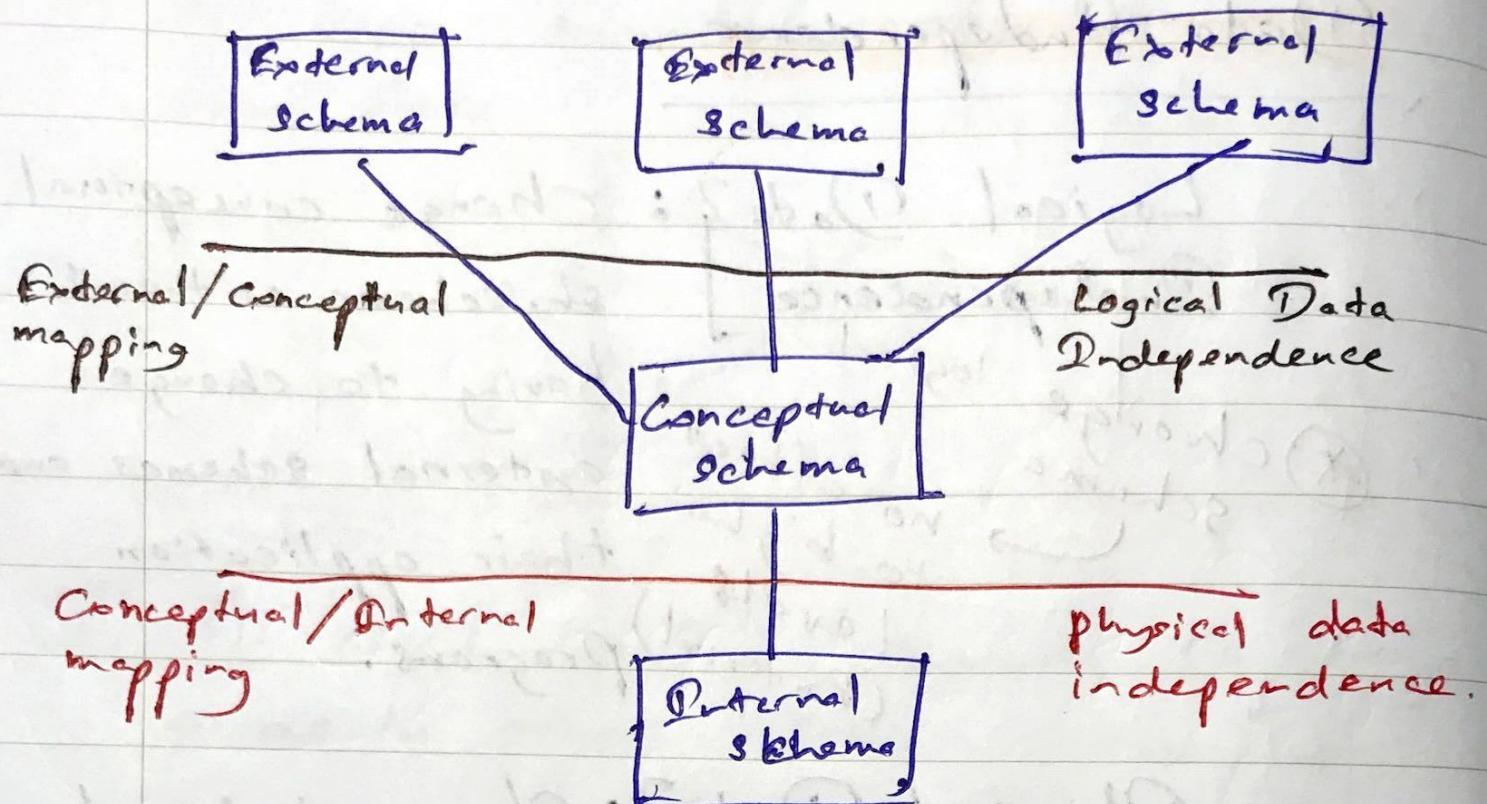
**Physical Data Independence:** Change internal schema without

\* change storage schema having to change conceptual schema.

→ no affect  
no higher level  
(conceptual)

## Data Independence

No



## Database Design Process

Conceptual  
structure  
(Graphical)

① Requirement Analysis

what want?

② Conceptual database design

→ ER model

Logical  
structure  
(Logical)

③ Logical Database Design

Relational  
model → Data

④ Schema Refinement

→ Fine tune the result

## ⑤ Physical database design

↳ DBMS

→ implement the design

## ⑥ Security design

↳ Implement controls to ensure  
→ security.

# Data Modeling

A data model can be considered as similar to an architect's building plan.

## Data models

### ① High level conceptual data models

↳ ER Diagrams

### ② Record-based Logical Data models.

Hierarchical Model

Network Model

Relational Model

## Step ①

### - Requirements Analysis

- > Review of existing documents
- > Interview with end users.
- > Review of existing automated systems.

## Step ②

### Conceptual Database Design

\* ER model

Information gathered



High-level description  
of the data

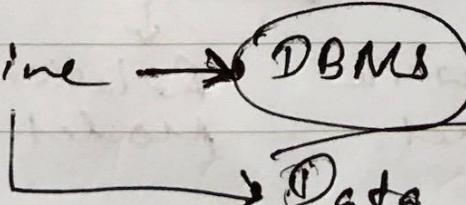


Conceptual data model  
or  
(Semantic Data model)

## Step ③

### - Logical Database Design

① Determine → DBMS



Data Model

②

Conceptual  
Schema

ER

schema of a  
Particular Data model

Step 4

### Schema Refinement

Further refined

→ redundancies.

Step 5

### Physical Database Design

> Performance criteria

taken into consideration

> Further enhancements to the schema.

> Creation of indexes are considered.

Step 6

### Security Design

Different user groups

Their Roles

Identity

Appropriate level of access

↓  
to only the necessary data