

# **Data Base Technologies**

# Day 1



# Agenda

- What is a database?
- Disadvantages of File Management Systems
- Data Management system
- Data Abstraction
- Data Independence
- Data Models
  - Hierarchical Model
  - Network Model
  - Relational Model
- Relational Data Base Management System Concepts

# Definitions

**Data** :- It is defined as an information that can be recorded and that has implicit meaning.

**Database** : Collection of related data, stored in a standardized format ,designed to be shared by multiple users.

**DBMS(Data Base Management System):-**

- It consists of collection of inter related data and a set of programs to access the data
- It provides a convenient & efficient environment for inserting, retrieving,modifying and storing database information.

# Database Applications

**Banking:**

all transactions

**Airlines:**

reservations, schedules

**Universities:**

registration, grades

**Sales:**

customers, products, purchases

**Manufacturing:**

production, inventory, orders, supply chain

**Human resources:** employee records, salaries, tax deductions

# FMS & Disadvantages

- Data redundancy and inconsistency
- Difficulty in accessing the data
- Data isolation
- Integrity problems
- Atomicity problems
- Concurrent access anomalies
- Security problems

# Database Management System

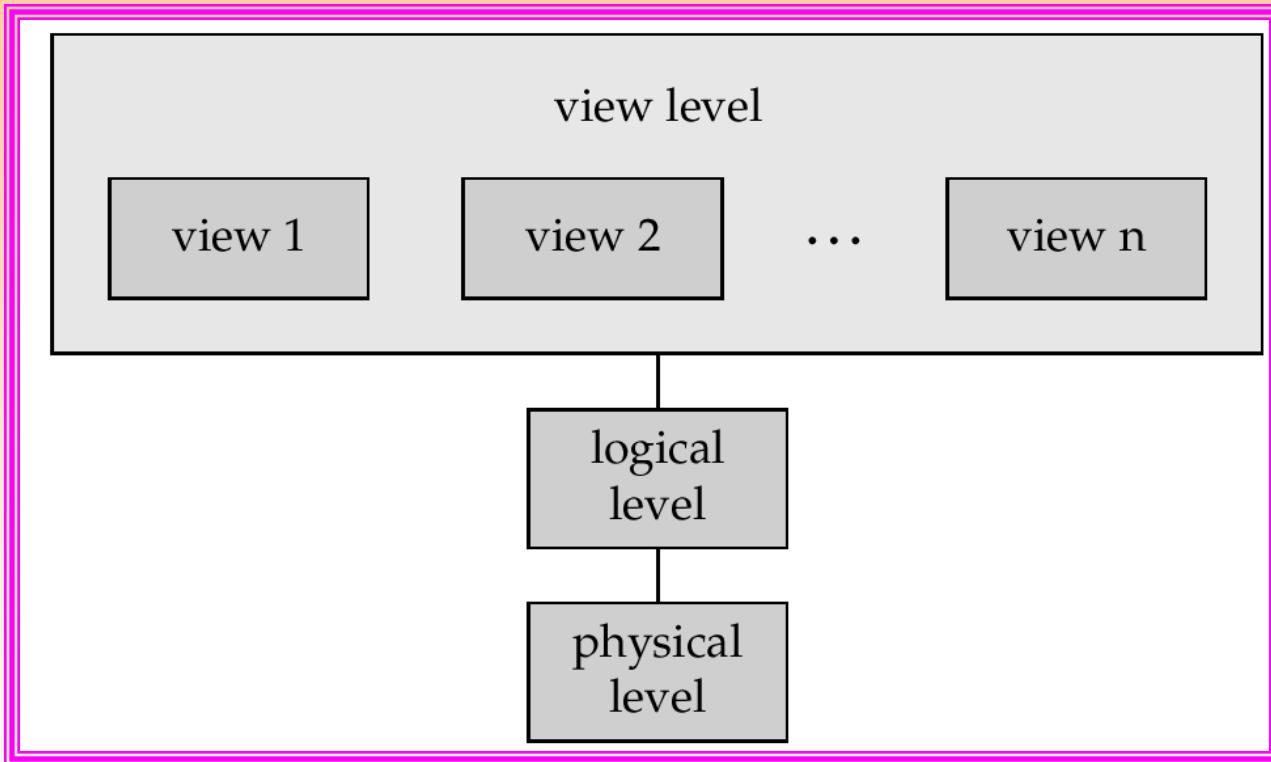
- Control of data redundancy
- Sharing of data
- Maintenance of Integrity
- Control over Security
- Data abstraction
- Data independence

# Data Abstraction

- DBMS provides users with an abstract view of data.
- It hides the complex data structures for the representation of data in database.

## Levels of abstraction

- **Physical level** : Lowest level of abstraction describes how data is stored.
- **Logical level** : Next higher level of abstraction describes what data is stored and the relationships among the data
- **View level** : Highest level of abstraction describes only part of database.



# Data Independence

Physical data  
independence

- Ability to modify the physical schema without causing application programs to be rewritten

Logical data  
Independence

- Ability to modify logical schema without causing application programs to be rewritten

# Data Model

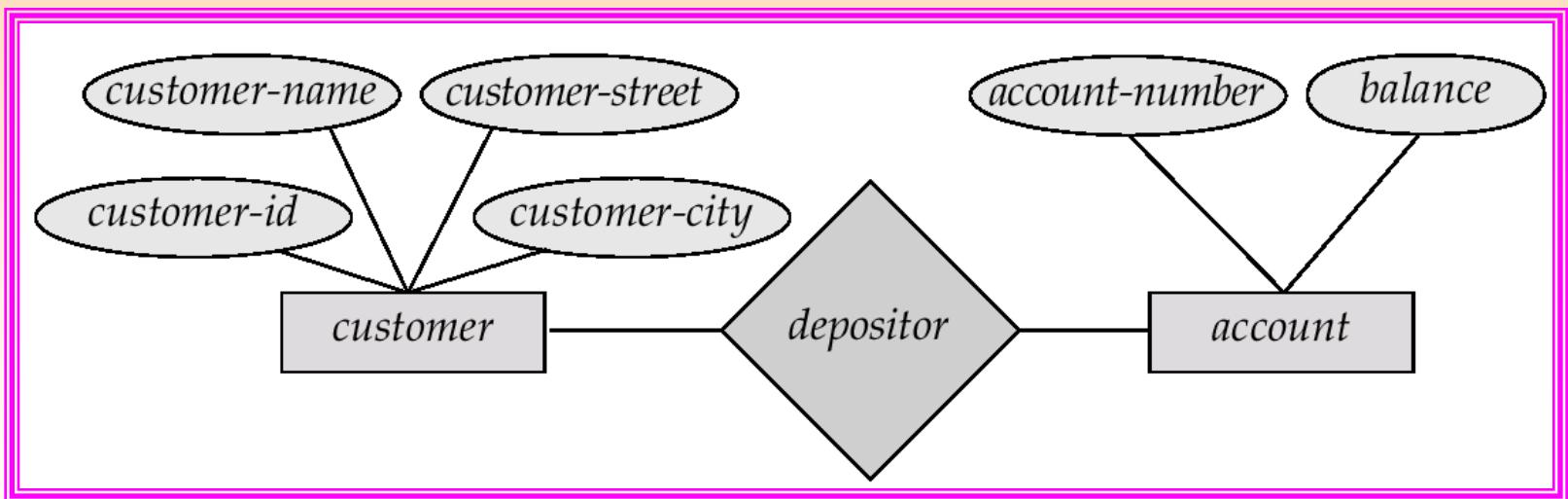
- An integrated collection of concepts for describing data, relationships between data and constraints on the data.
- A data model comprises three components:
  - a **structural part** (a set of rules describing how the database is to be constructed)
  - a **manipulative part** (defines the types of operations allowed on the data)
  - a **set of integrity rules** (ensures data accuracy)

# Types of data models

- Object-based logical models: Based on collection of objects.  
ER-model,object-oriented model
- Record-based logical model: Database is structured in fixed format record.  
Hierarchical,Network,relational models

# Entity-Relationship Model

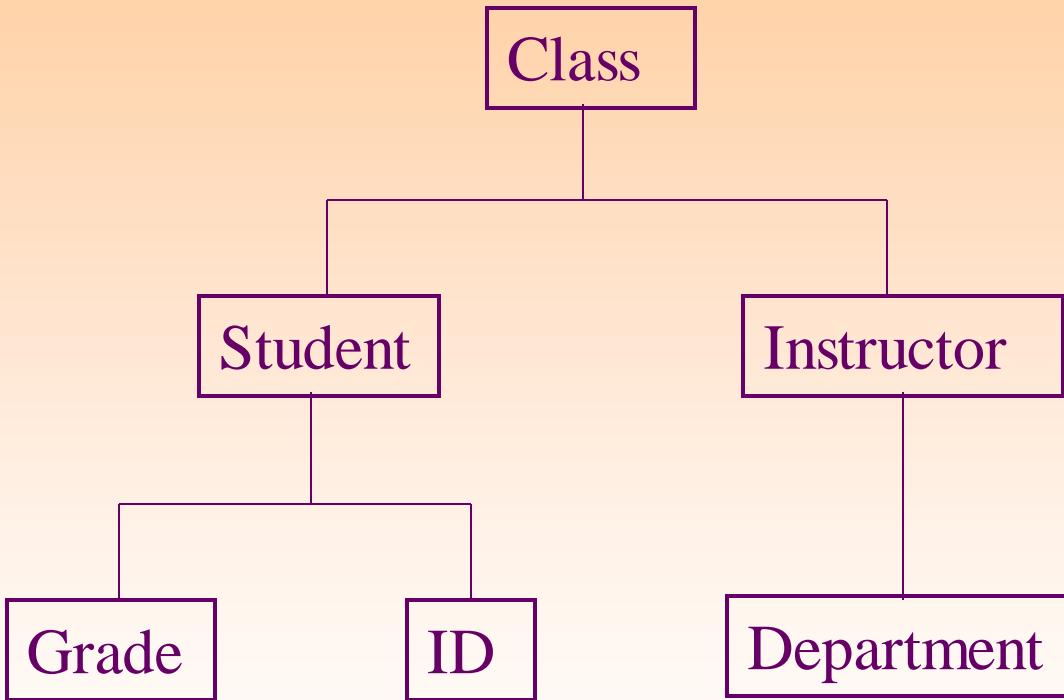
**Example of schema in the entity-relationship model**



# Hierarchical model

- A Hierarchical database consists of a collection of records that are connected to each other through links.
- The hierarchical data model organizes data in a tree structure
- Parent-child relationship (one-to-one or one-to-many) among data

# Hierarchical data model





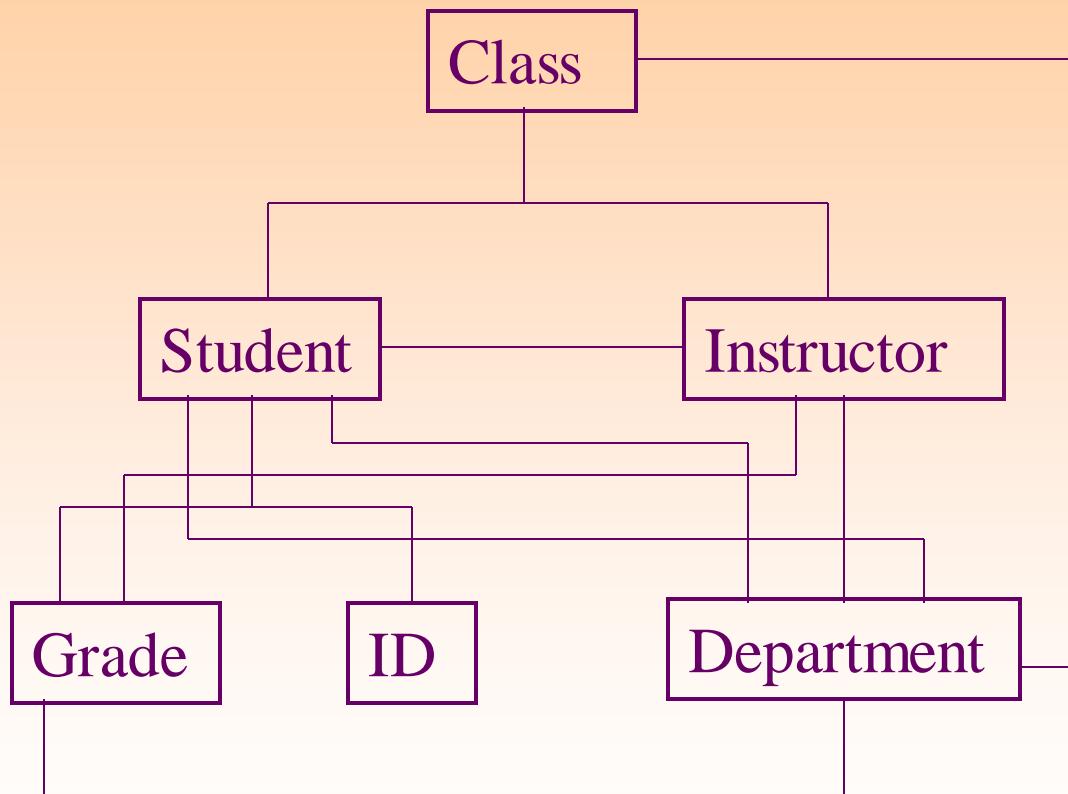
# Hierarchical data model

- Advantages
  - easy to search
  - can add new branches easily
- Disadvantages
  - All child records are lost with the deletion of parent record.

# Network Model

- A Network database consists of a collection of records connected to one another through links, which can be viewed as pointers.
- The records in the database are organized as collections of arbitrary graphs.
- One-to-one, one-to-many, many-to-one, or many-to-many relationships possible
-

# Network data model



# Network data model

Advantages

flexible, fast, efficient

Disadvantages

complex

restructuring can be difficult because of  
changing all the pointers

# Relational Model

- A relational model consists of relations which represents data and the relationships among data..
- A relation is a two dimensional table with special properties.
- A relational table is a collection of columns and rows
- columns are called attributes and rows are called tuples.

# Properties of Relational Tables

- Table name is distinct from all other table names in the database.
- Each cell of table contains exactly one atomic (single) value.
- Each column has a distinct name.
- Values of a column are all from the same domain.
- Each record is distinct; there are no duplicate records.
- Order of columns has no significance.
- Order of records has no significance.

# Relational Model

The diagram illustrates a relational database table with five columns and six rows. The columns are labeled: *Customer-id*, *customer-name*, *customer-street*, *customer-city*, and *account-number*. The rows represent individual customer records.

<i>Customer-id</i>	<i>customer-name</i>	<i>customer-street</i>	<i>customer-city</i>	<i>account-number</i>
192-83-7465	Johnson	Alma	Palo Alto	A-101
019-28-3746	Smith	North	Rye	A-215
192-83-7465	Johnson	Alma	Palo Alto	A-201
321-12-3123	Jones	Main	Harrison	A-217
019-28-3746	Smith	North	Rye	A-201

Annotations:

- An arrow points from the text "Rows/Tuples/Records" to the second row of the table.
- An arrow points from the text "Columns/Attributes/Fields" to the header row of the table.
- Two arrows point from the text "Customer-id" to the first two entries in the *Customer-id* column.

# Relational Keys

Each record in a table must be unique

- A super key is a column, or a set of columns, that uniquely identifies a record in a table.
- A minimal super key , with no proper subset that is also a super key, is called a candidate key.
- A key consisting of more than one column is called a composite key.
- A primary key is the candidate key that is selected by the database designer, to uniquely identify records within the table.
  - the candidate keys not selected are called alternate keys.
- A foreign key is a column or set of columns within a table that is the candidate key of another table.

# Relational Integrity

A set of integrity rules ensure that the data is accurate.

- Domain Integrity:Defines the domain constraint for each column that restrict the set of values allowed for each column
- Entity Integrity:In a table, no column of primary key can be null or duplicate.
- Foreign key and Referential Integrity:If a foreign key exists in a table its value must
  - either match with candidate key value of some record in the home table
  - or be wholly null



# **Thank you**