



# **Data Base Technologies**



# Day 1



# Agenda

- What is a database?
- Disadvantages of File Management Systems
- Data Management system
- Data Abstraction
- Data Independence
- Data Models
  - Hierarchal 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



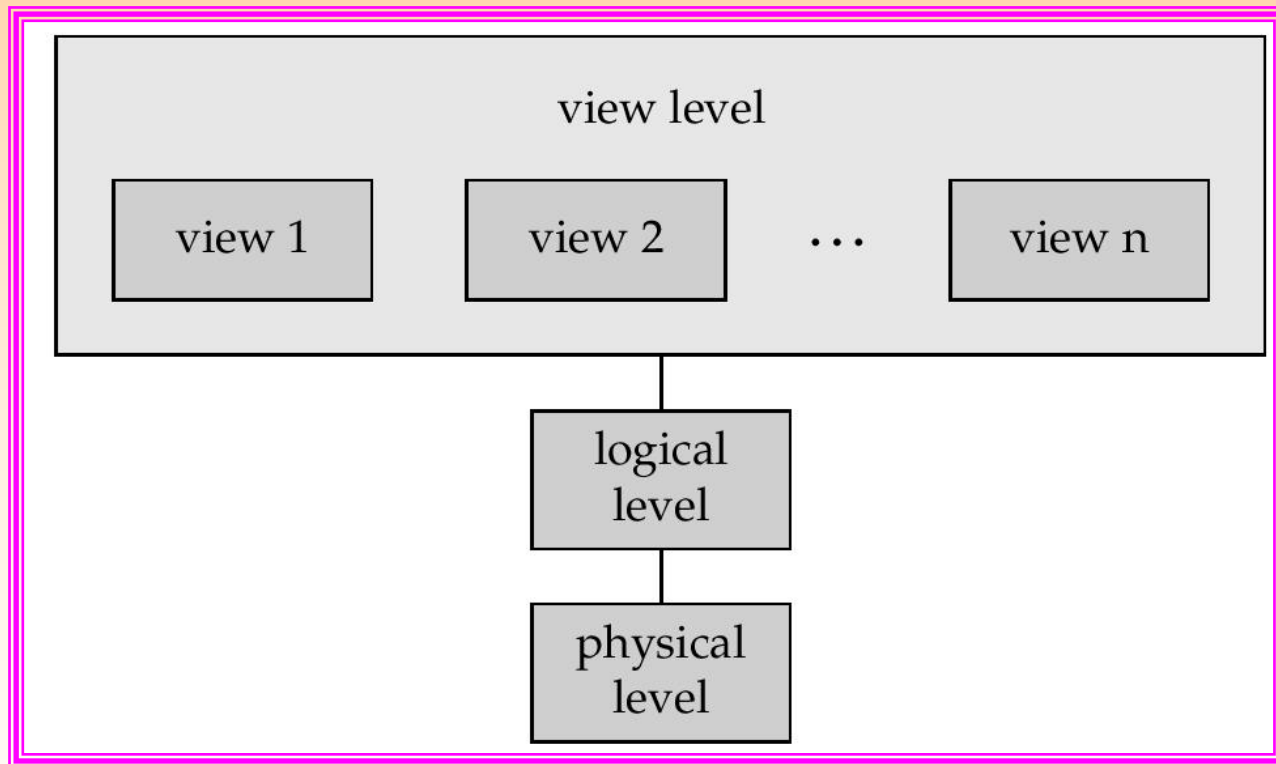
# Data Abstraction

- 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.

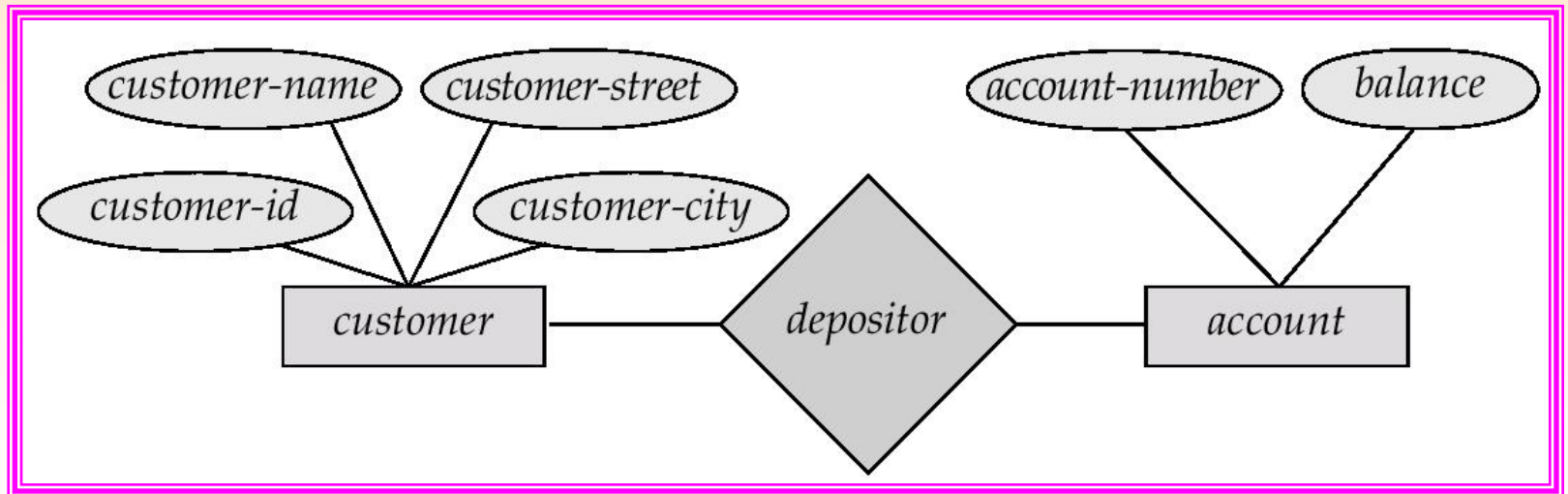
ER-model, object-oriented model

- 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

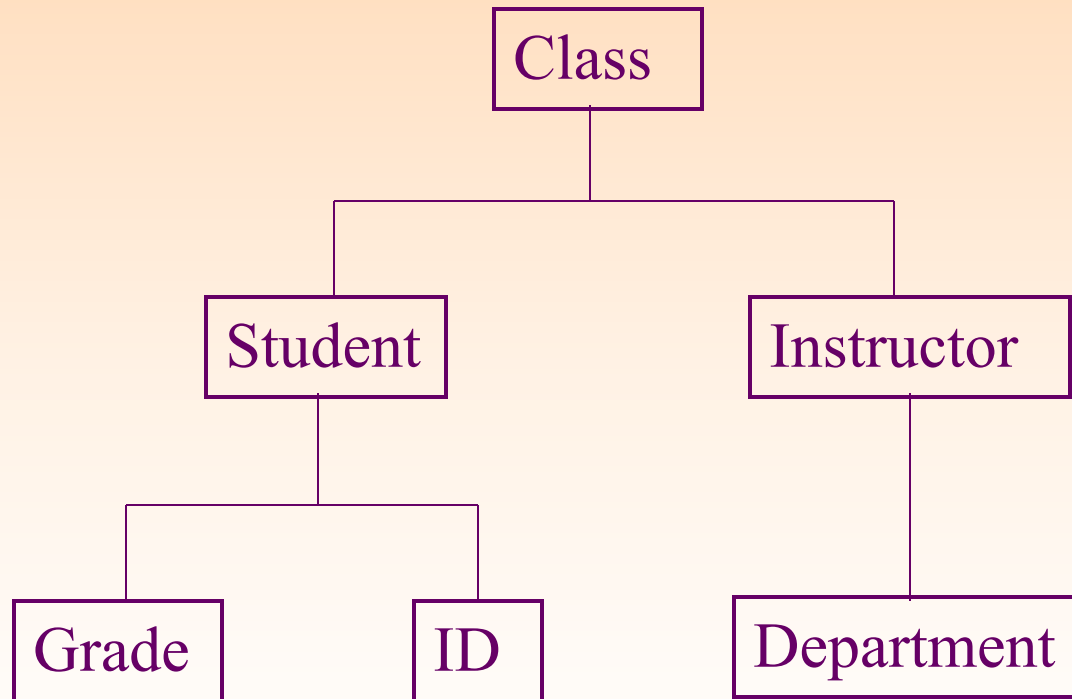




# Hierarchical model

- 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

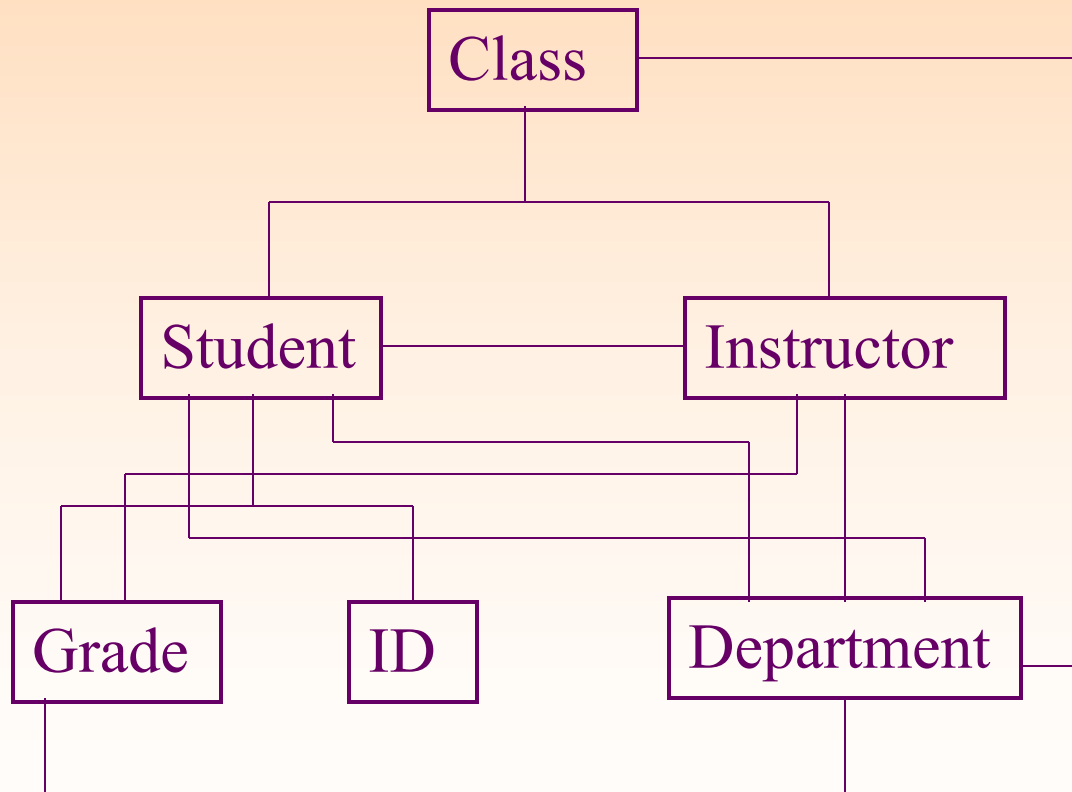
- All child records are lost with the deletion of parent record.



# 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

Columns/  
Attributes/  
Fields

<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

Rows/  
Tuples/  
Records

# 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**