

Introduction to DBMS

Databases and Database Management System

Database is a collection of interrelated data that contains information relevant to an enterprise.

Database Management System (DBMS) is a collection of interrelated data and set of programs to store and retrieve those data.

Database Applications:

- Banking: transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases
- Online retailers: order tracking, customized recommendations

- **Drawbacks of using file processing systems**

- 1) Data redundancy and inconsistency

- Multiple file formats, duplication of information in different files

- 2) Difficulty in accessing data

- Need to write a new program to carry out each new task

- 3) Data isolation — multiple files and formats

- 4) Integrity problems

- Integrity constraints (e.g., account balance > 0) become “buried” in program code rather than being stated explicitly

◆ 5) Atomicity of updates

- ◆ Failures may leave database in an inconsistent state with partial updates carried out
- ◆ Example: Transfer of funds from one account to another should either complete or not happen at all

6) Concurrent access anomalies

- ◆ Concurrent access needed for performance
- ◆ Uncontrolled concurrent accesses can lead to inconsistencies
- ◆ Example: Two people reading a balance (say 10000) and updating it by withdrawing money (say 500 and 100 respectively) at the same time

◆ 7) Security problems

- ◆ Hard to provide user access to some, but not all, data

Department A

10000

9400

Clerk 1

Debit

500

Atmost exactly same time

Debit

Clerk 2

100

Begin

read(A) → 10000

A=10000-500 → 9500

write(A) → 9500

END

Begin

read(A) → 10000

A=10000-100 → 9900

write(A) → 9900

END

Concurrent access anomalies



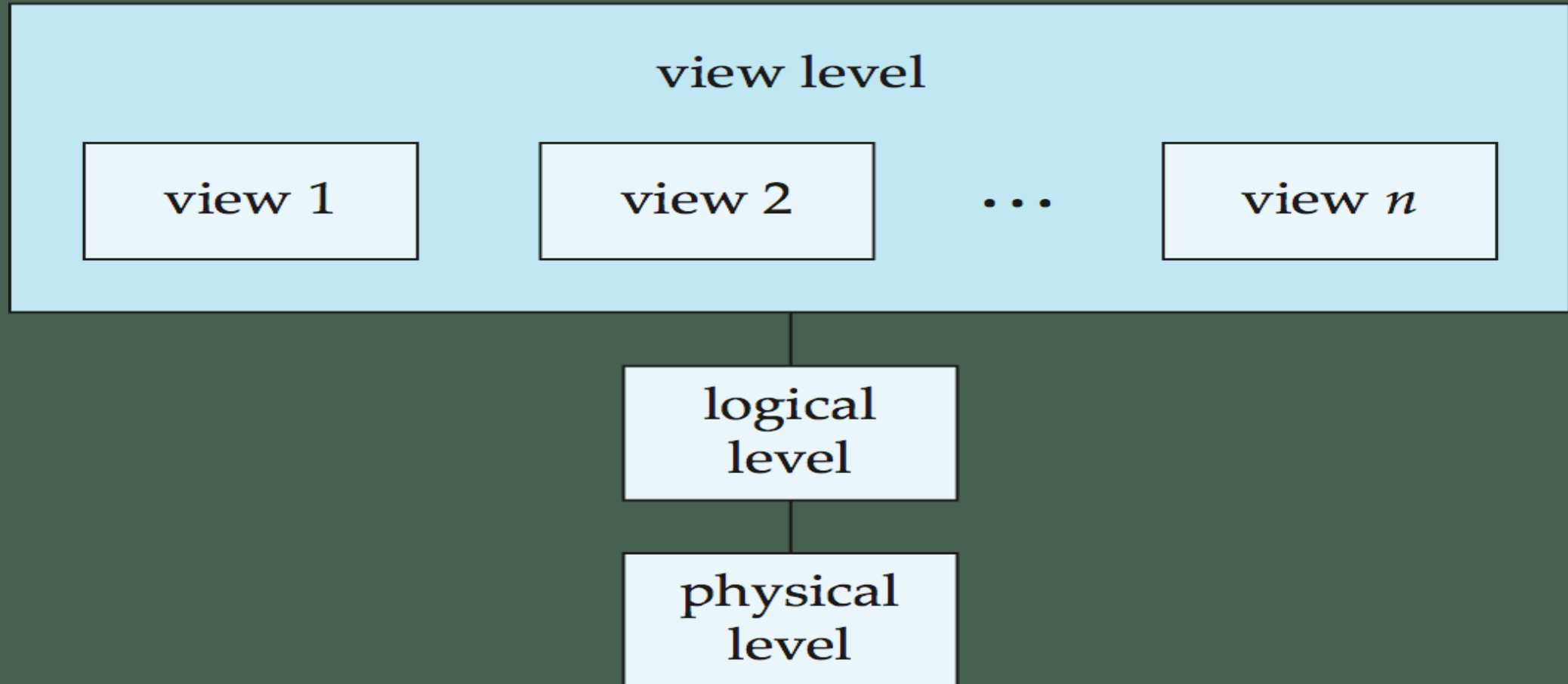
DATA MODEL AND DESIGN APPROACH

Objectives

- To know about the data model and types of data models
- To know about the design approach.

View of Data

An architecture for a database system



- **Instances and Schemas**

Schema – the logical structure of the database

Example: The database consists of information about a set of customers and accounts and the relationship between them.

Physical schema: database design at the physical level

Logical schema: database design at the logical level

Instance – the actual content of the database at a particular point in time

Analogous to the value of a variable

Data Independence – the ability to modify the lower level schema without affecting the higher level schema

In general, the interfaces between the various levels and components should be well defined so that changes in some parts do not seriously influence others.

What is Database Model

Database Model: A collection of tools for describing

Data

Data relationships

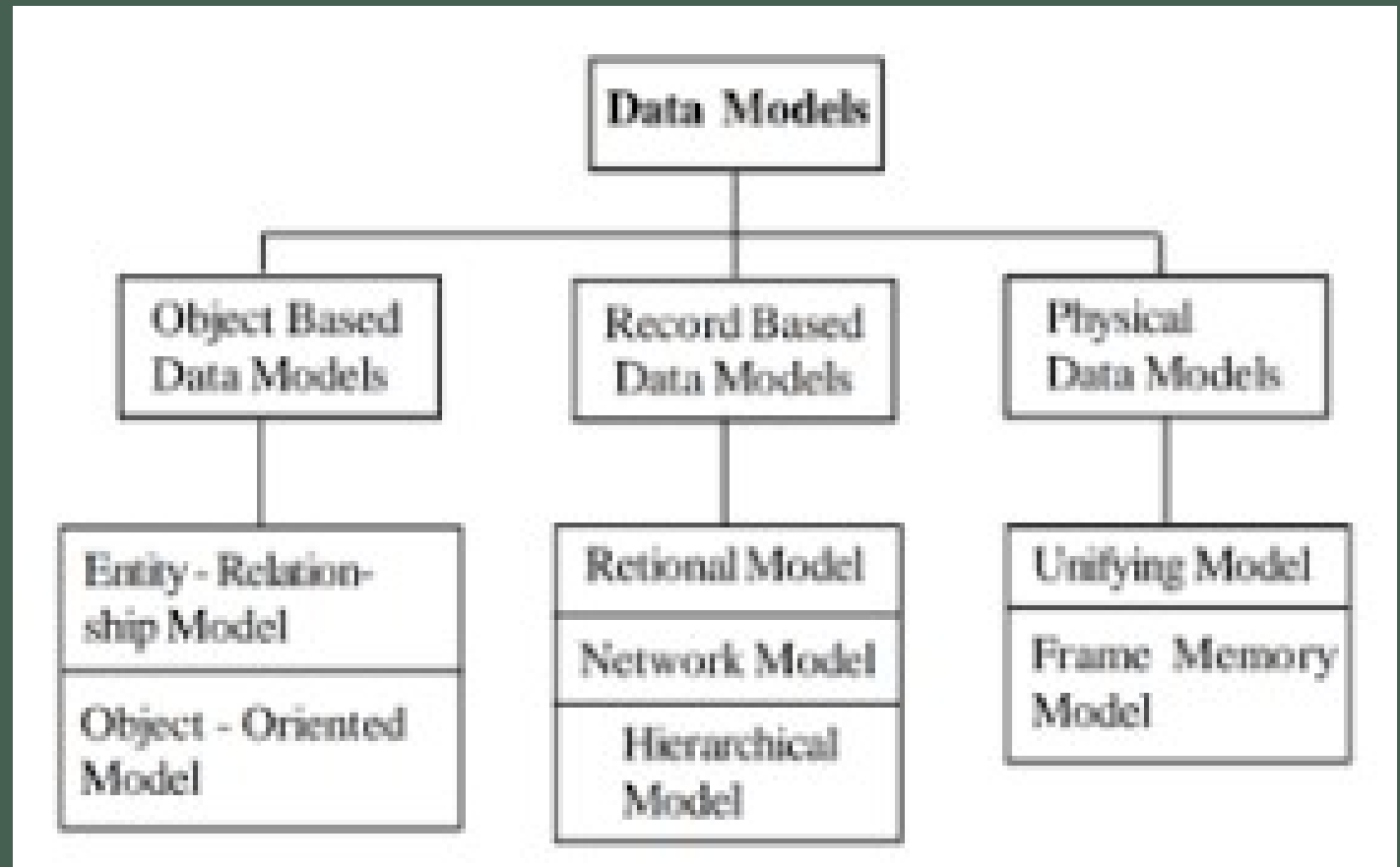
Data semantics

Data constraints

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Types of Data Model

- Relational model
- Hierarchical database model
- Network model
- Entity-relationship model
- Object oriented database model



Relational Model

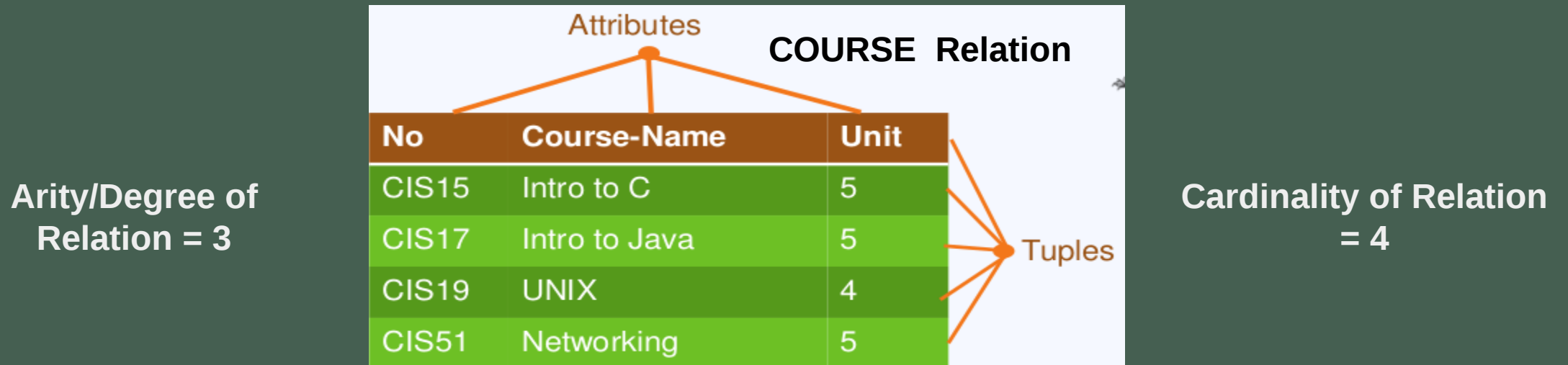
- Organizes data in tabular form.
- Based on relational data structures.

- **Attributes.**

Each column in a relation is called an attribute.

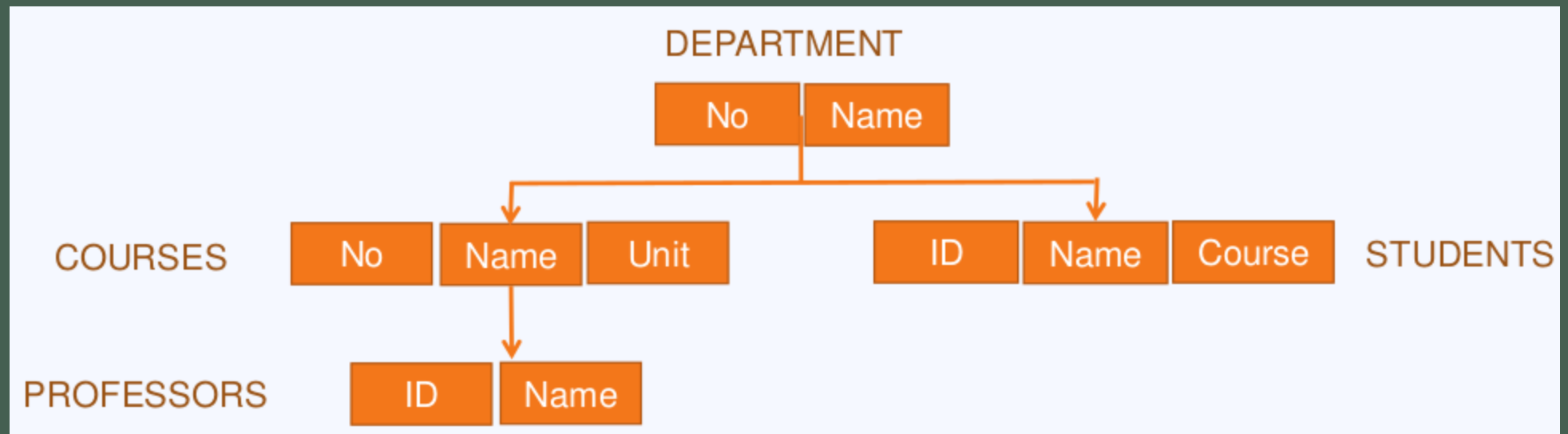
- **Tuples**

Each row in a relation is called a tuple. A tuple defines collection of attribute values.



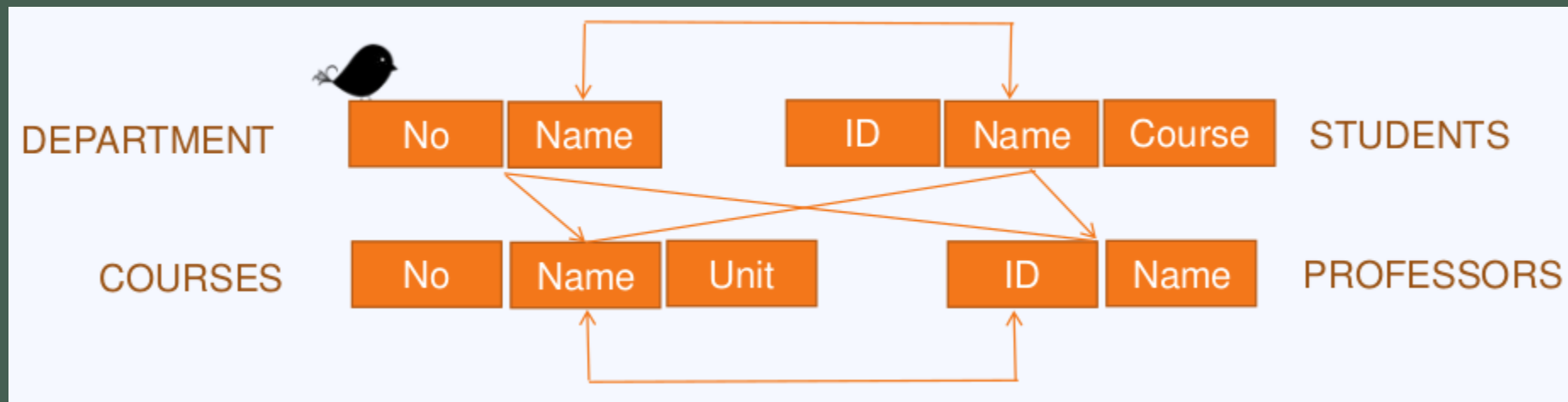
•Hierarchical Database Model

- Organizes data into tree like structure.
- Based on parent – child relationship.



Network Model

- In the network model, the entities are organized in a graph, in which some entities can be accessed through several paths.
- Allows more connections between nodes.



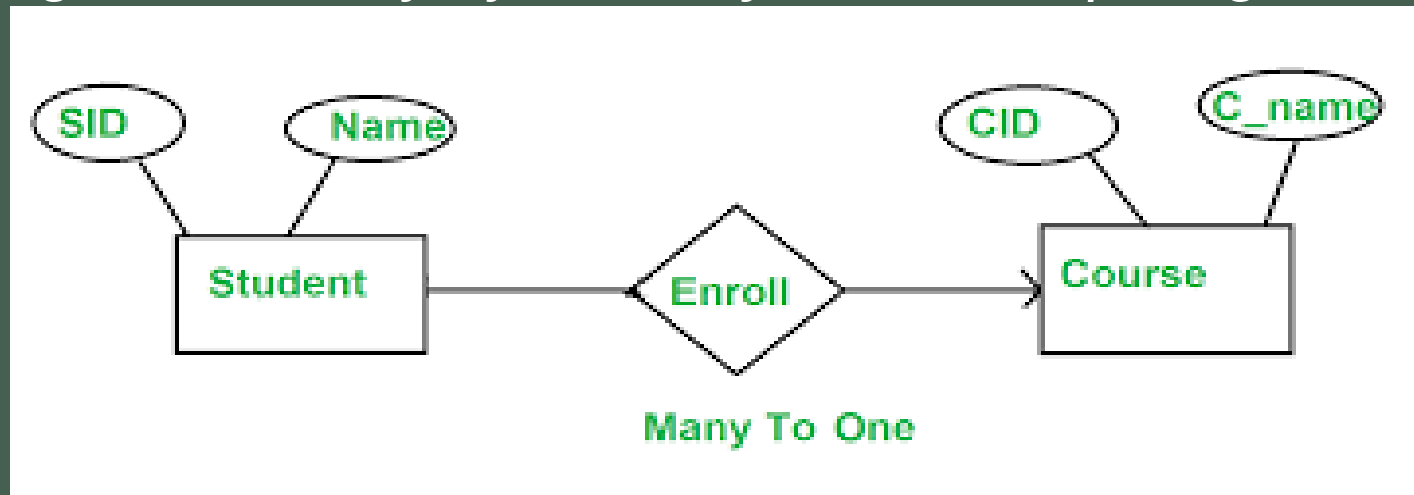
Entity-relationship model

→ graphical representation of entities and their relationships.

Entity: a “thing” or “object” in the enterprise that is distinguishable from other objects. Described by a **set of attributes**.

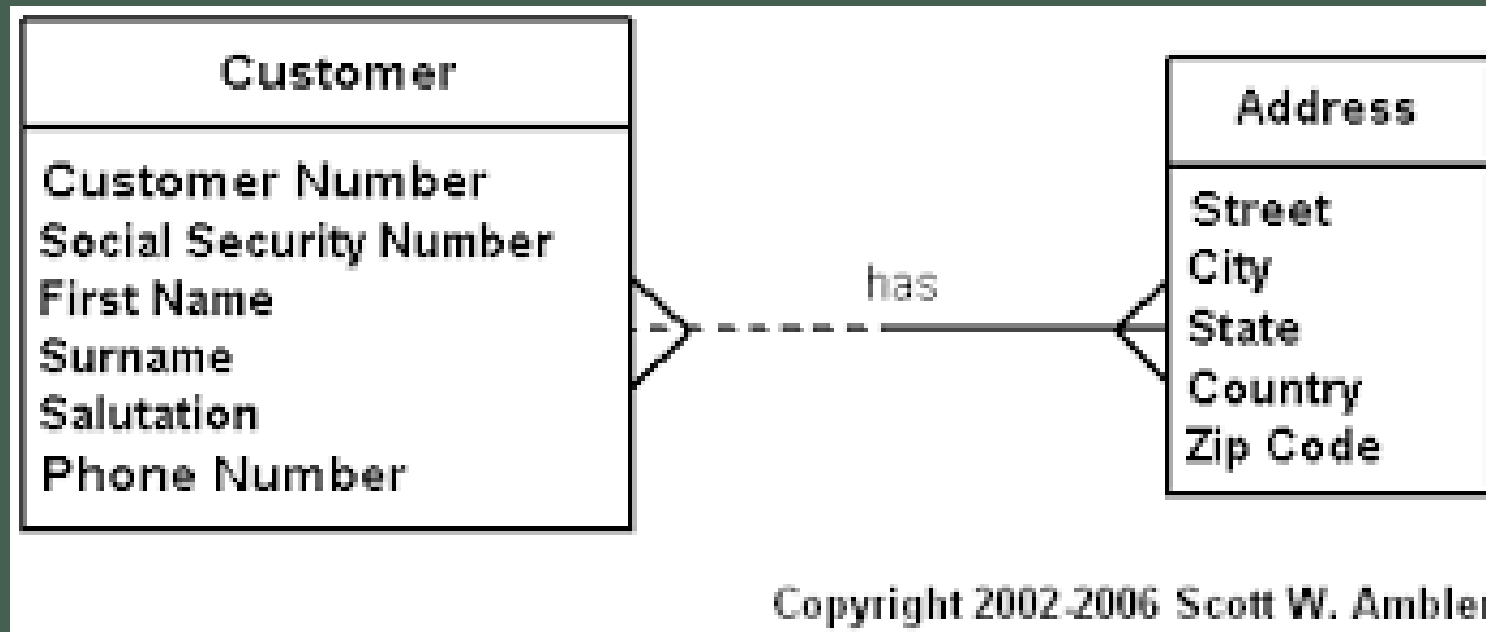
Relationship: an association among several entities

Represented diagrammatically by an *entity-relationship diagram*:



Object oriented database model

- use concepts like entities, attributes and relationships.
- Data and their relationship are contained in a single structure known as object.

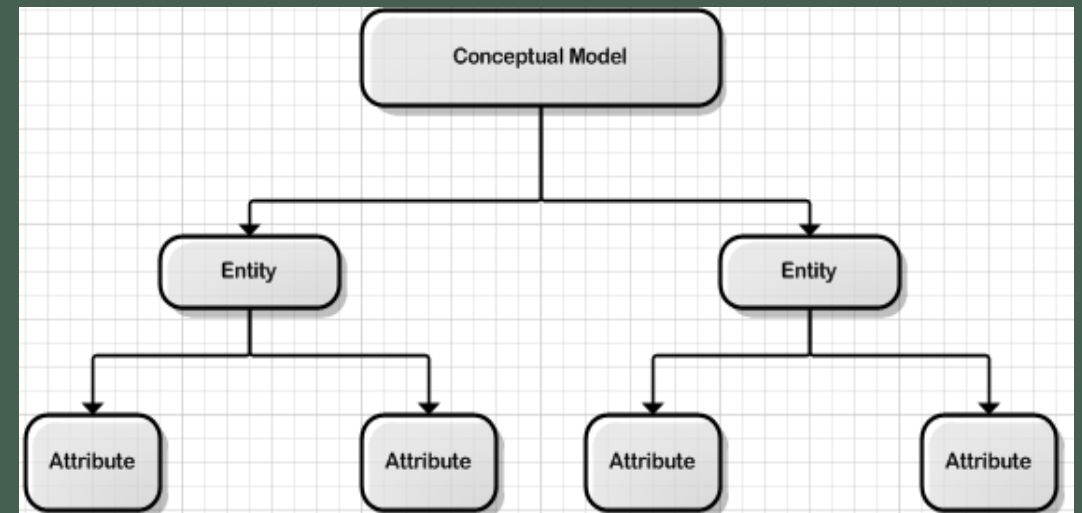


Design approach

- There are two approaches for developing database.
- Top-down method & Bottom-up method.

Top down design Method

- Starts from the general and move to the specific.
- Involves the identification of different entity types and the definition of each entity's attributes.
- For Example: You start with a general idea of what is needed for the system and then work your way down to the more specific details of how the system will interact.



Bottom – up design method

- Begins with the specific details and moves up to the general.
- Done by first identifying the data elements (items) and then grouping them together in data sets.
- This method first identifies the attributes, and then groups them to form entities.

