Database Fundamentals

Mrihan Mohamed Ahmed

Teacher Assistant – ITI

mrihan.m.ahmed@gmail.com

File-based System

Delimited File

Mohamed,26,Minia|Ali,27,Minia|
Ramy,22,Cairo|Roaa,27,Aswan|
Sally,28,Alex|Nader,30,Cairo|

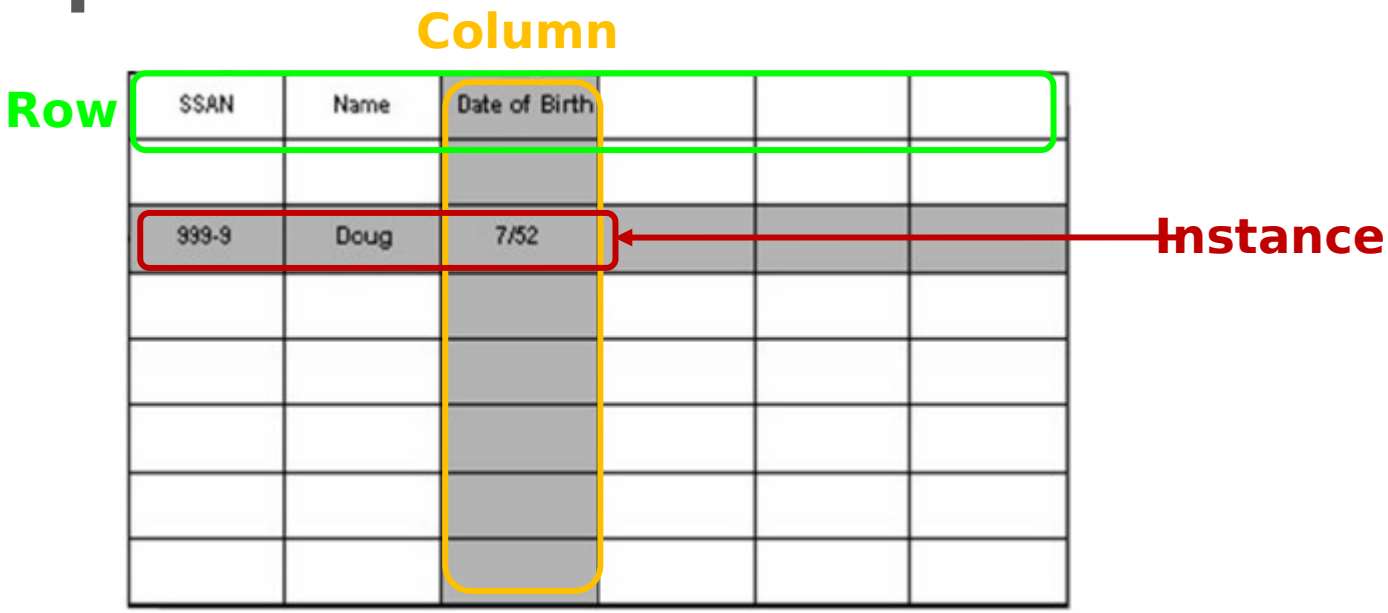
Fixed Width File

3 Bytes name, 2 Bytes age & 3 Bytes City

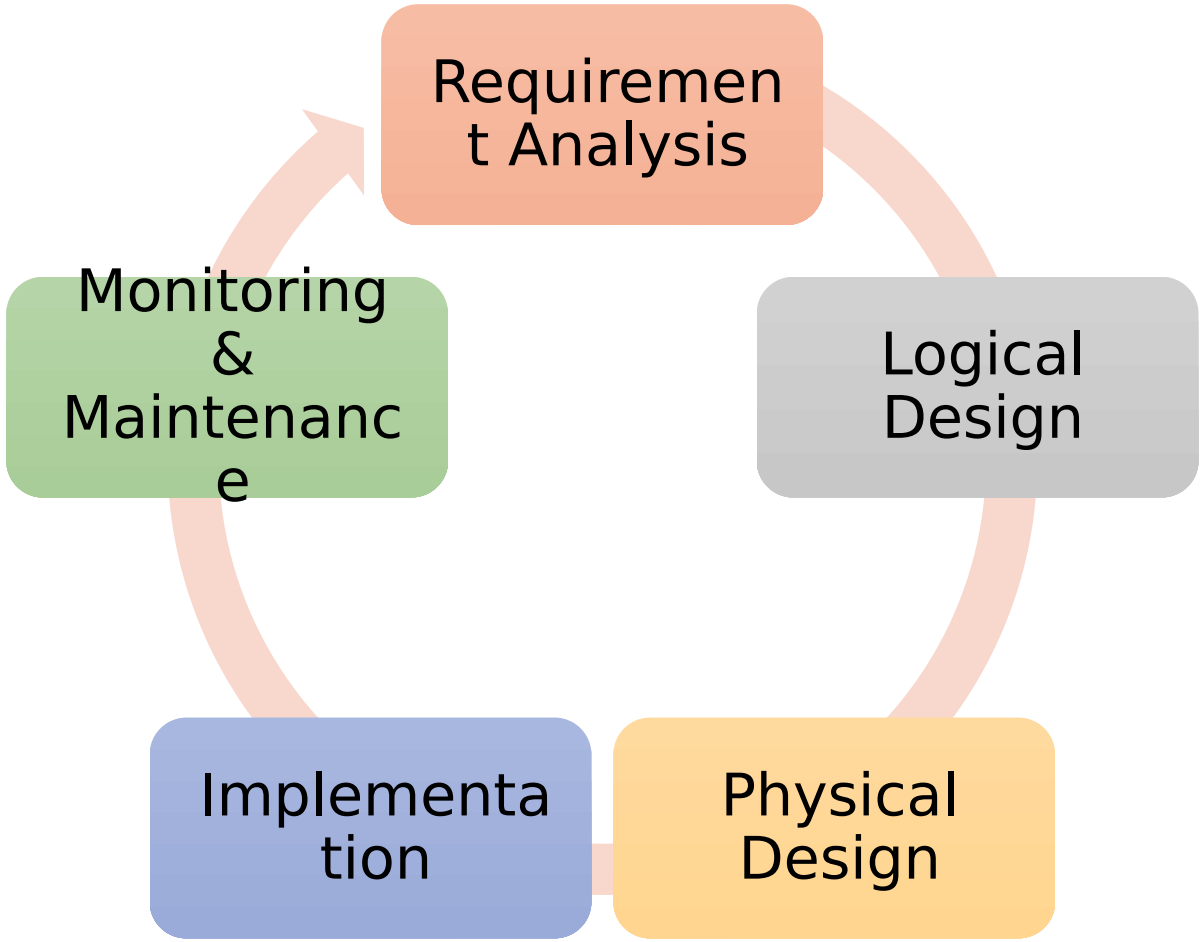
In your opinion, what are the problems of the previous two types?

Database System

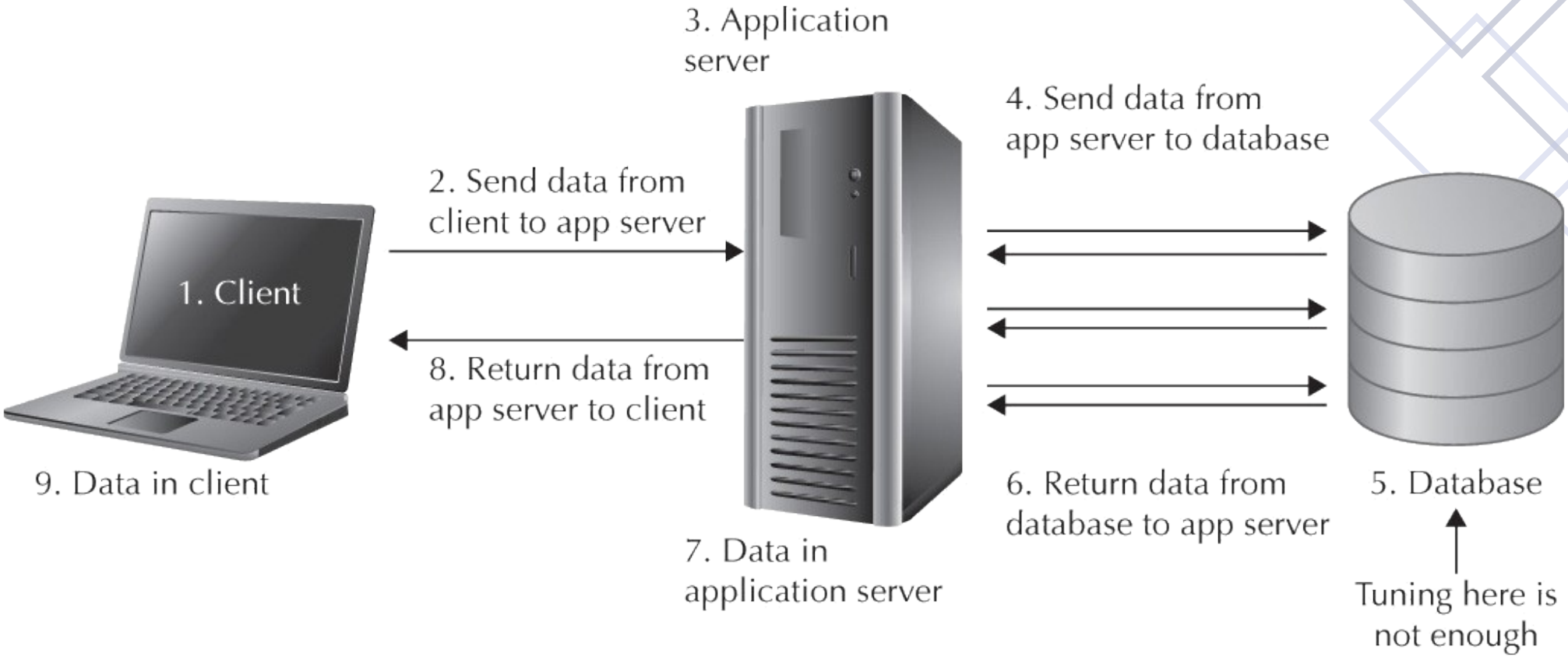
- A data structure through which data is stored in tables that are related to one another in some way.
- The way the tables are related is described through a **relationship.**



Database Life Cycle

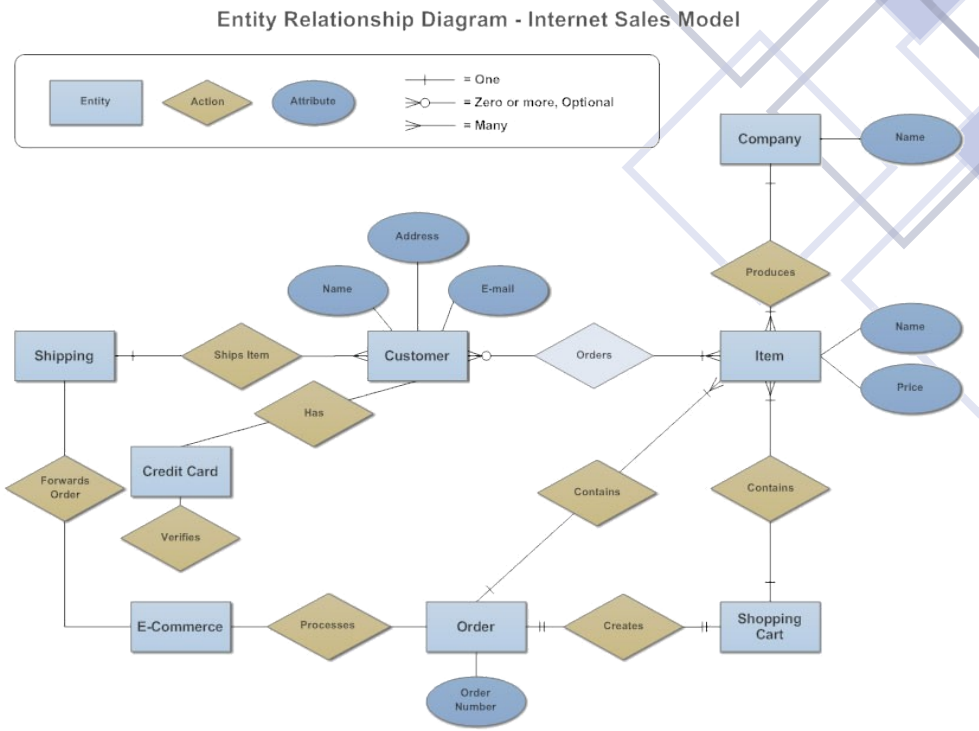


How Application Accesses DB?



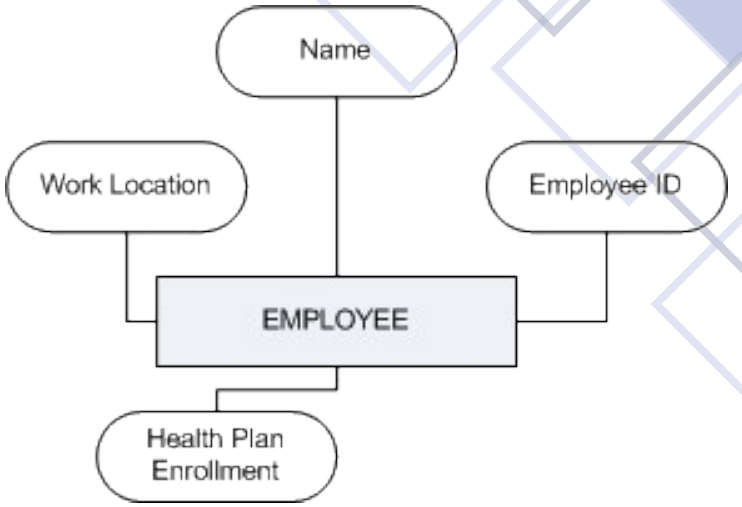
Entity Relationship Diagram (ERD)

- It works around real-world entities and the associations among them.
- It identifies information required by the business by displaying the relevant entities and the relationships between them.



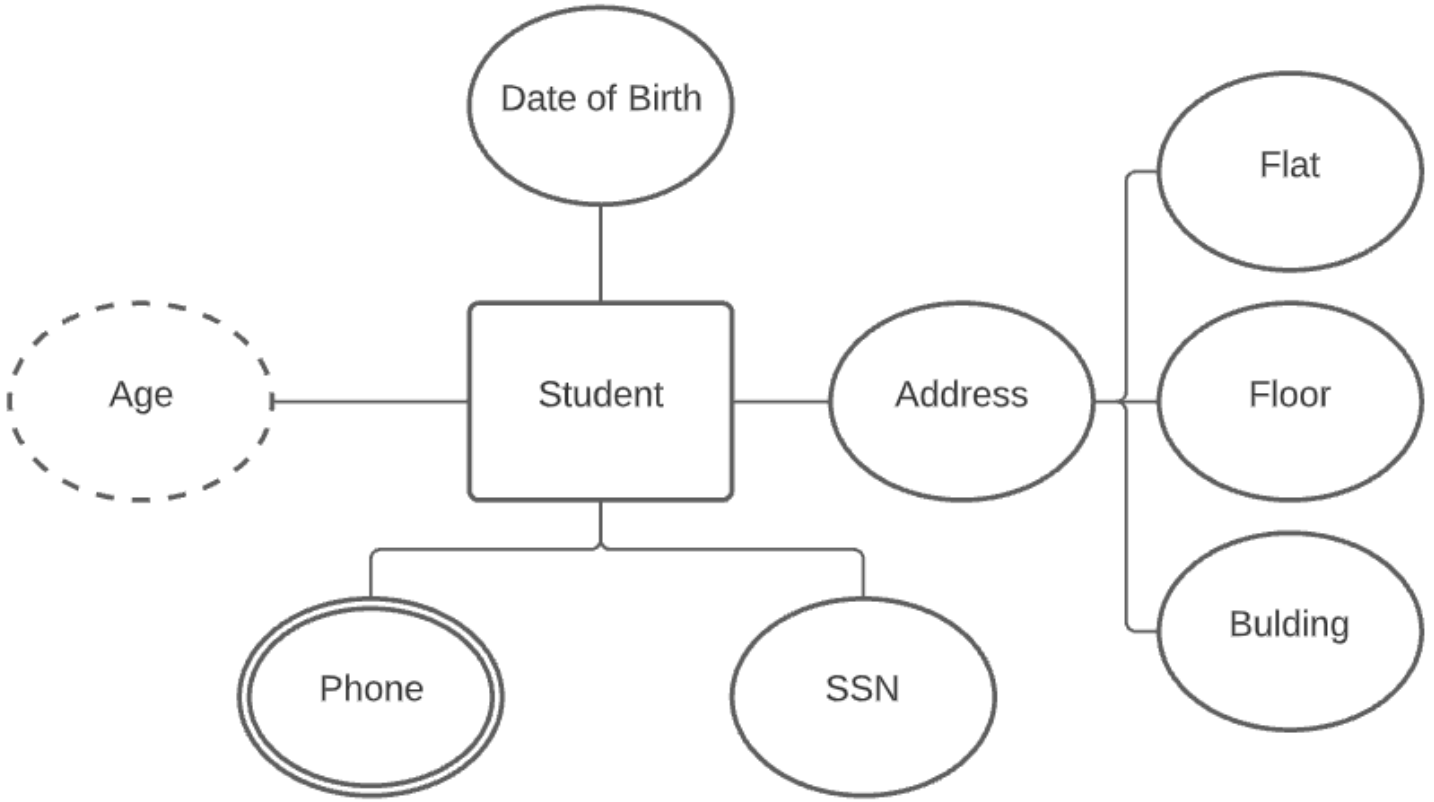
Entity Relationship Diagram (ERD)

- Entity:
  - An entity can be a real-world object, either animate or inanimate.
  - For example, in a school database, students.
  - An entity set is a collection of similar types of entities.
- Attribute:
  - Entities are represented by means of their properties.
  - All attributes have values.
  - There exists a domain or range of values that can be assigned to attributes.



Entity Relationship Diagram (ERD)

- Attribute Types:



Entity Relationship Diagram (ERD)

- **Key:** it is an attribute or collection of attributes that uniquely identifies an entity among entity set.
  - **Candidate Key** − A minimal super key is called a candidate key. An entity set may have more than one candidate key.
  - **Primary Key** − A primary key is one of the candidate keys chosen by the database designer to uniquely identify the entity set.
  - **Foreign Keys :** Foreign keys reference a related table through the primary key of that related table.
  - **Referential Integrity Constraint**: For every value of a foreign key there is a primary key with that value in the referenced table.

Relationships

- The association among entities is called a relationship. For example, an employee **works_at** a department, a student **enrolls** in a course.
- A set of relationships of similar type is called a relationship set. Like entities, a relationship too can have attributes. These attributes are called **descriptive attributes**

Relationships

- **One to One:**

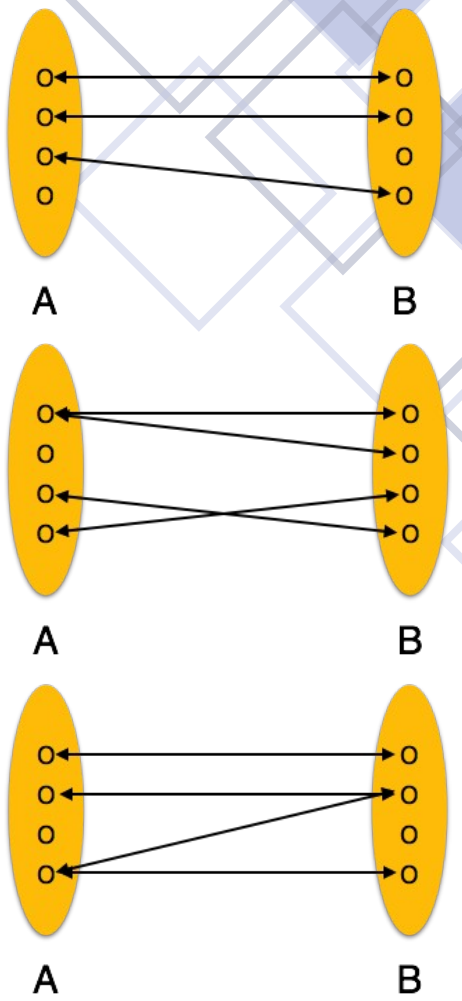
  One entity from entity set A can be associated with at most one entity of entity set B and vice versa.

- **One-to-many:**

  One entity from entity set A can be associated with more than one entities of entity set B however an entity from entity set B, can be associated with at most one entity.

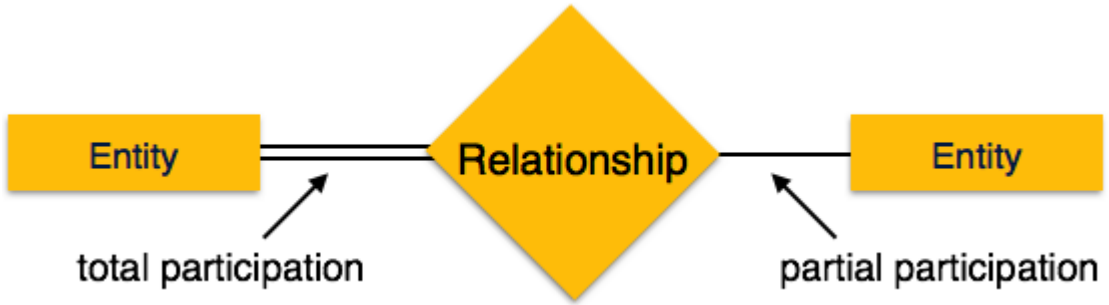
- **Many-to-many:**

  One entity from A can be associated with more than one entity from B and vice versa.



Relationships

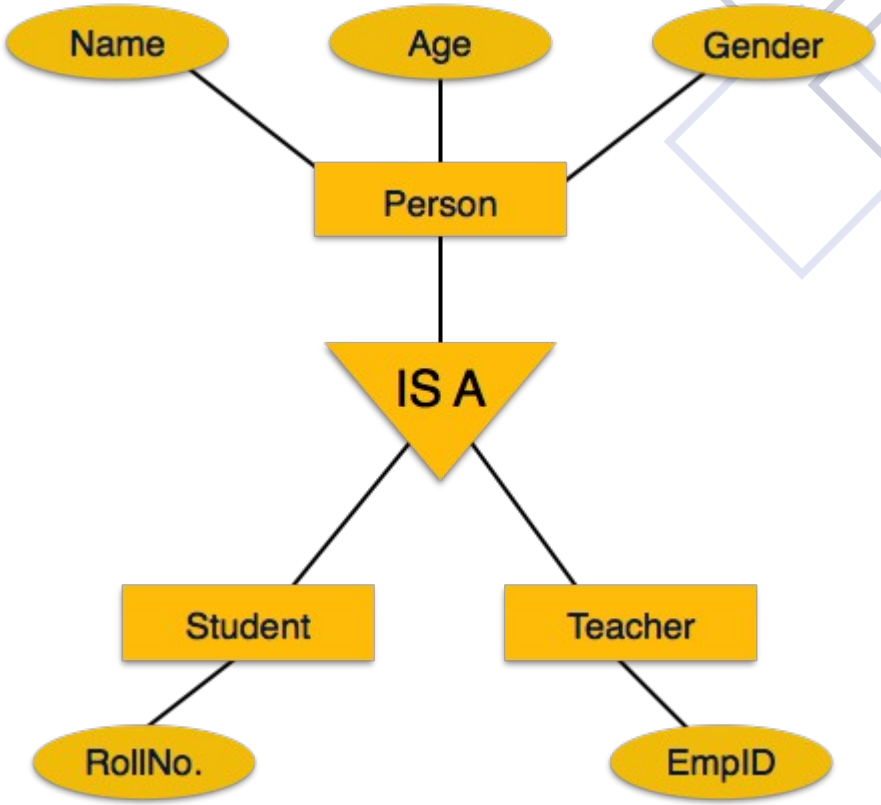
- Participation Constraints
  - **Total Participation**: Each entity is involved in the relationship. Total participation is represented by double lines.
  - **Partial participation**: Not all entities are involved in the relationship. Partial participation is represented by single lines.



Relationships

- Is-A Relation:

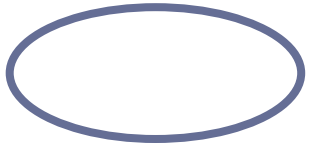
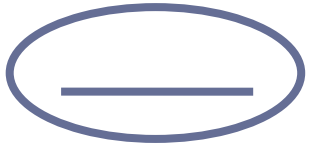
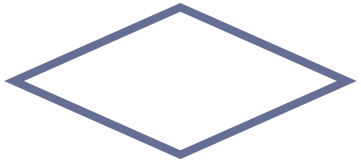
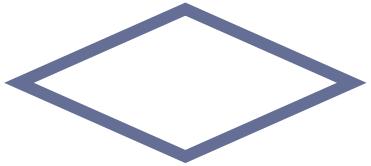
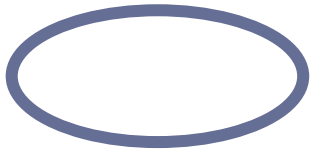
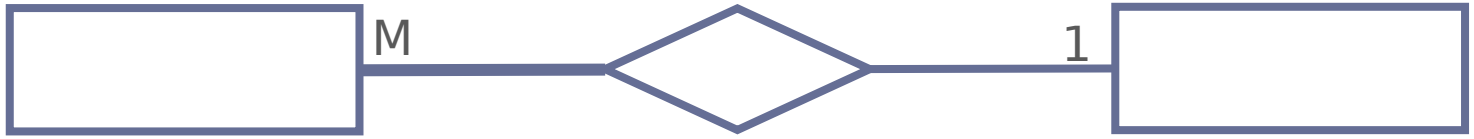
  Inheritance is an important feature of Generalization and Specialization. It allows lower-level entities to inherit the attributes of higher-level entities.



Weak Entity

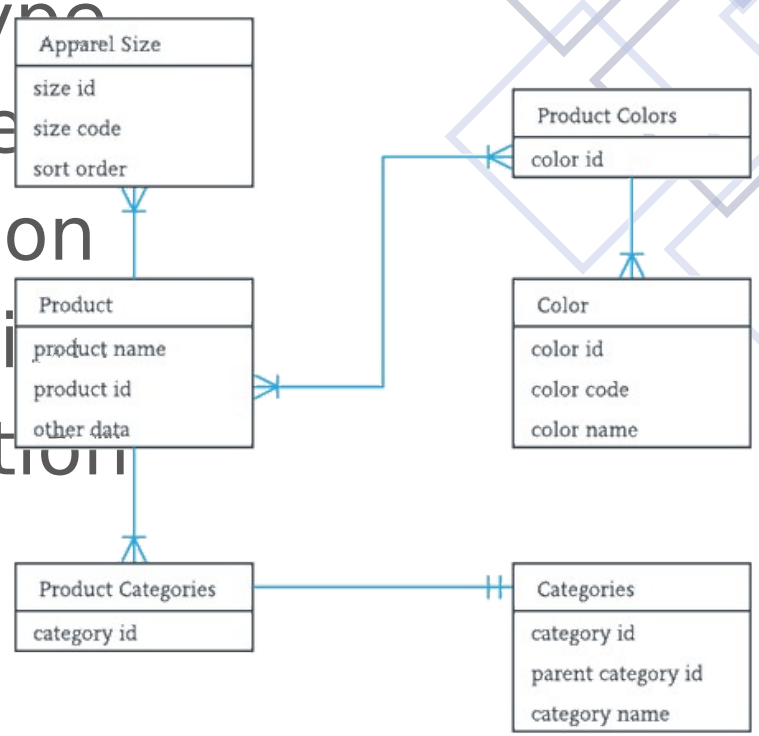
	Strong Entity	Weak Entity
1	Strong entity has a primary key.	Weak entity has a partial key.
2	Strong entity is independent	Weak entity is dependent on a strong entity
3	Strong entity indicated by a single rectangle.	Strong entity indicated by a double rectangle.
4	Two strong entity's relationship is indicated by a single diamond.	One strong and one weak entity is indicated by a double diamond.
5	Strong entity may be or may not be participate relationships.	Weak entity always participates relationships.
6	In strong entity connecting line is a single line	In weak entity connecting line is a double line

ERD Notations

	**Entity**		**Attribute**
	**Weak Entity**		**Key Attribute**
	**Relation**		**Derived Attribute**
	**Weak Relation**		**Multi-Valued Attribute**
			**Relationships**

Mapping

- Step 1: Mapping of Regular Entity Type
- Step 2: Mapping of Weak Entity Type
- Step 3: Mapping of Binary 1:1 Relation
- Step 4: Mapping of Binary 1:M Relati
- Step 5: Mapping of Binary M:M Relation
- Step 6: Mapping of Trinary Relation
- Step 7: Mapping of Unary Relation



Thanks