IT 775
Database Technology

ER Modeling

INTRODUCTION

- **Entity-relationship (ER) modeling** - conceptual database modeling technique

  - Enables the structuring and organizing of the requirements collection process

  - Provides a way to graphically represent the requirements

- **ER diagram (ERD)** - the result of ER modeling

  - Serves as a blueprint for the database

ENTITIES

- **Entities -** constructs that represent what the database keeps track of
  - The basic building blocks of an ER diagram
  - Represent various real world notions, such as people, places, objects, events, items, and other concepts
  - Within one ERD, each entity must have a different name

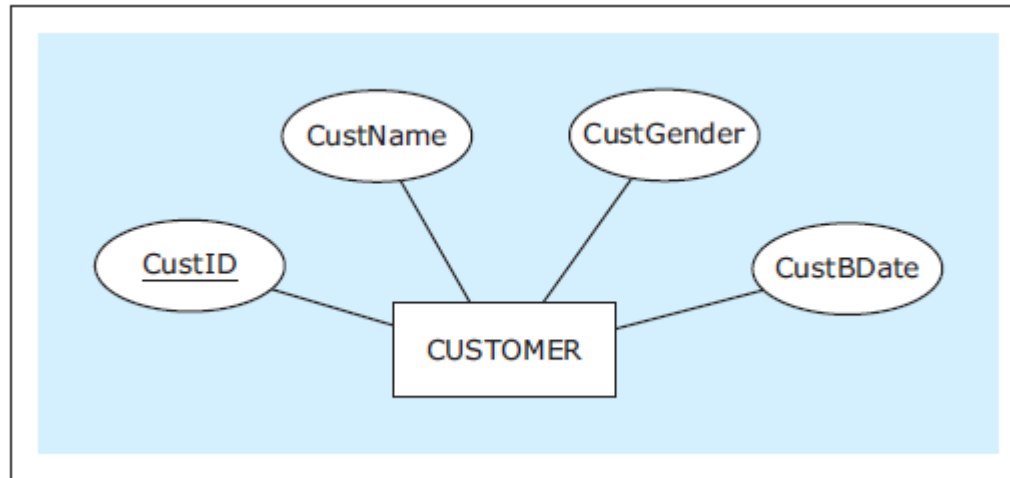# ENTITIES

Two entities
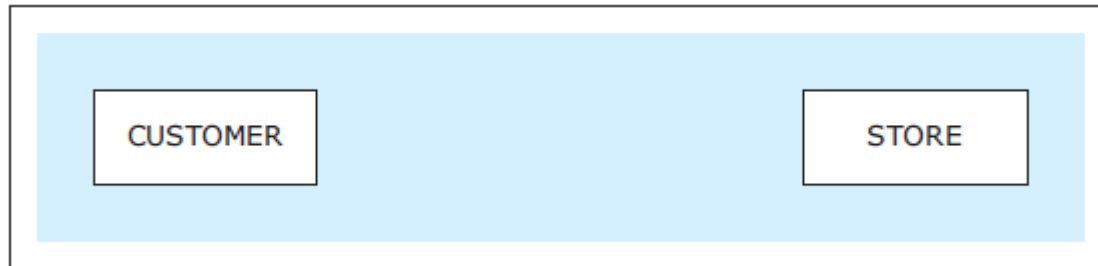
ENTITIES

- **Entity instances (entity members)** - occurrences of an entity

    - Entities themselves are depicted in the ER diagrams while entity instances are not

    - Entity instances are eventually recorded in the database that is created based on the ER diagram

ATTRIBUTES

- **Attribute -** depiction of a characteristic of an entity
    - Represents the details that will be recorded for each entity instance
    - Within one entity, each attribute must have a different name

- **Unique Attribute** - attribute whose value is different for each entity instance
    - Every regular entity must have at least one unique attribute

ATTRIBUTES

An entity with attributes

RELATIONSHIPS

- **Relationship -** ER modeling construct depicting how entities are related
  - Within an ER diagram, each entity must be related to at least one other entity via a relationship

RELATIONSHIPS

- **Cardinality constraints -** depict how many instances of one entity can be associated with instances of another entity
  - **Maximum cardinality**
    - **One** (represented by a straight bar: I)
    - **Many** (represented by a crow's foot symbol)
  - **Minimum cardinality (participation)**
    - **Optional** (represented by a circular symbol: 0)
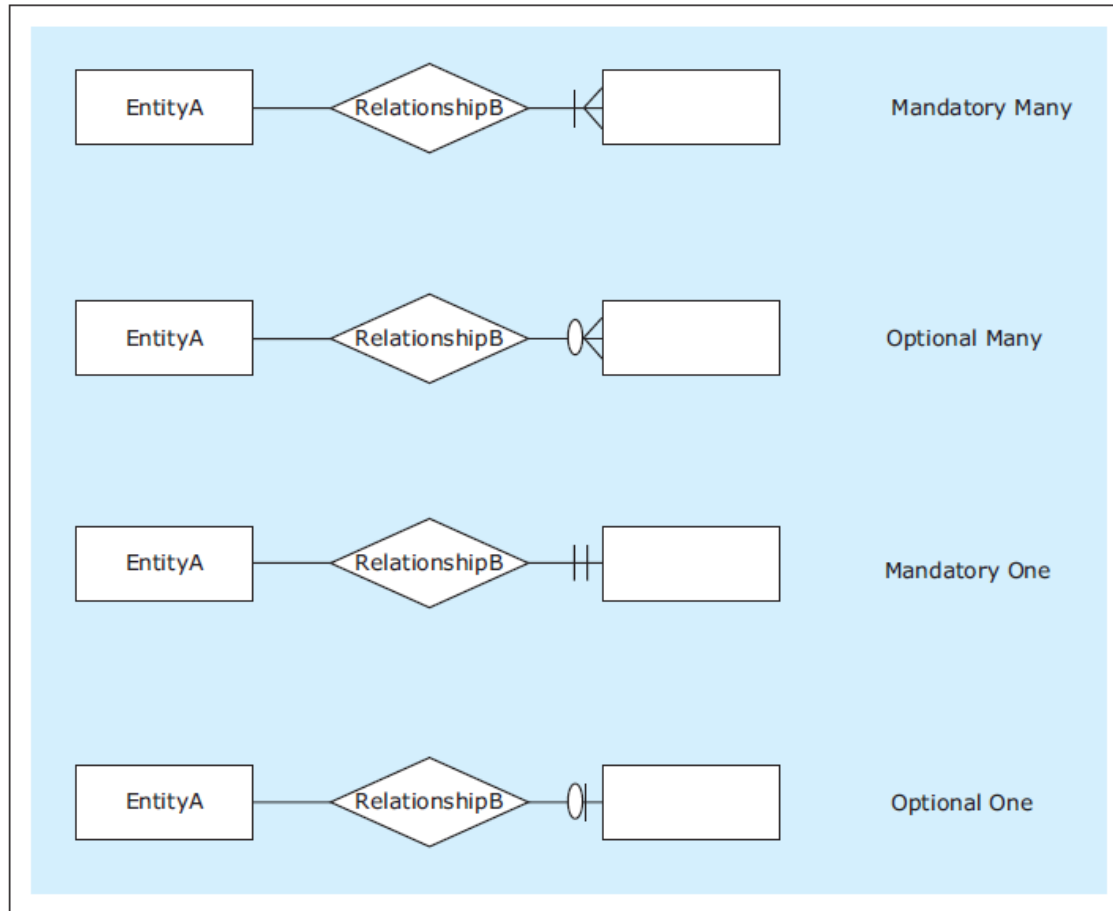   - **Mandatory** (represented by a straight bar: I)

RELATIONSHIPS
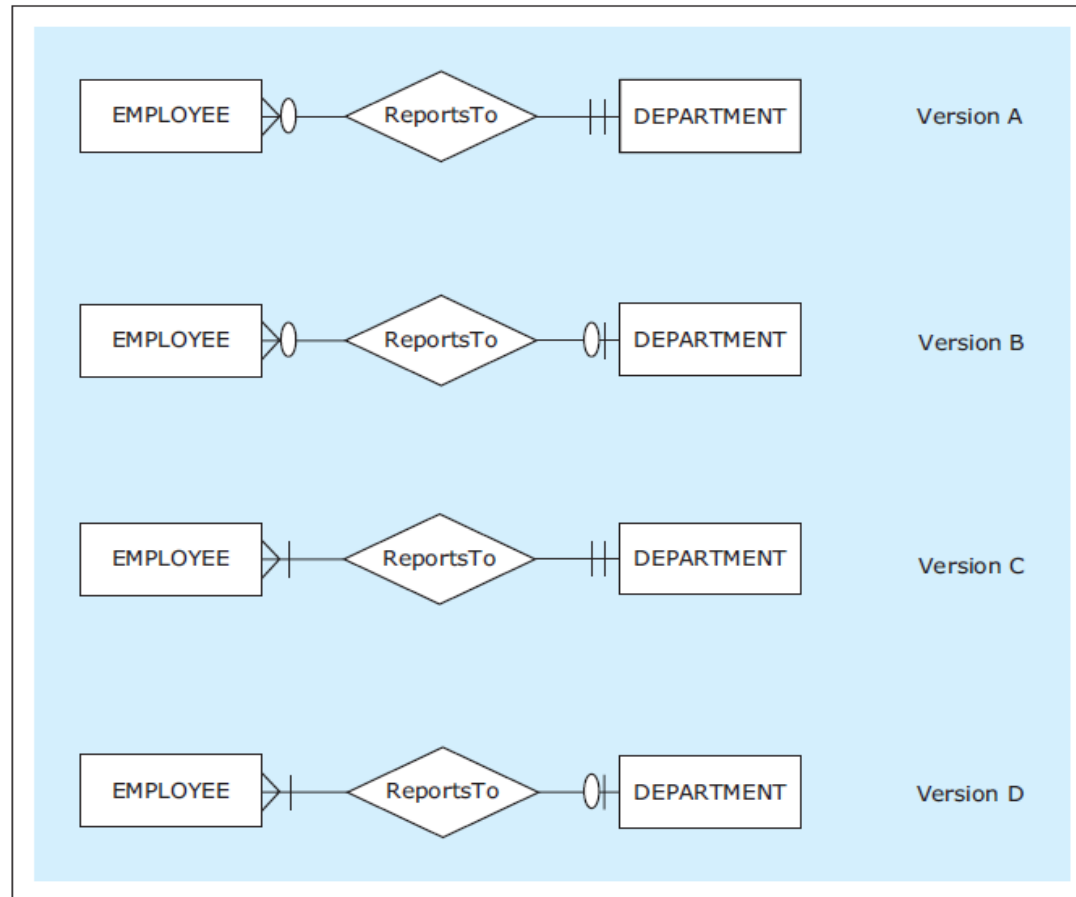
A relationship between two entities
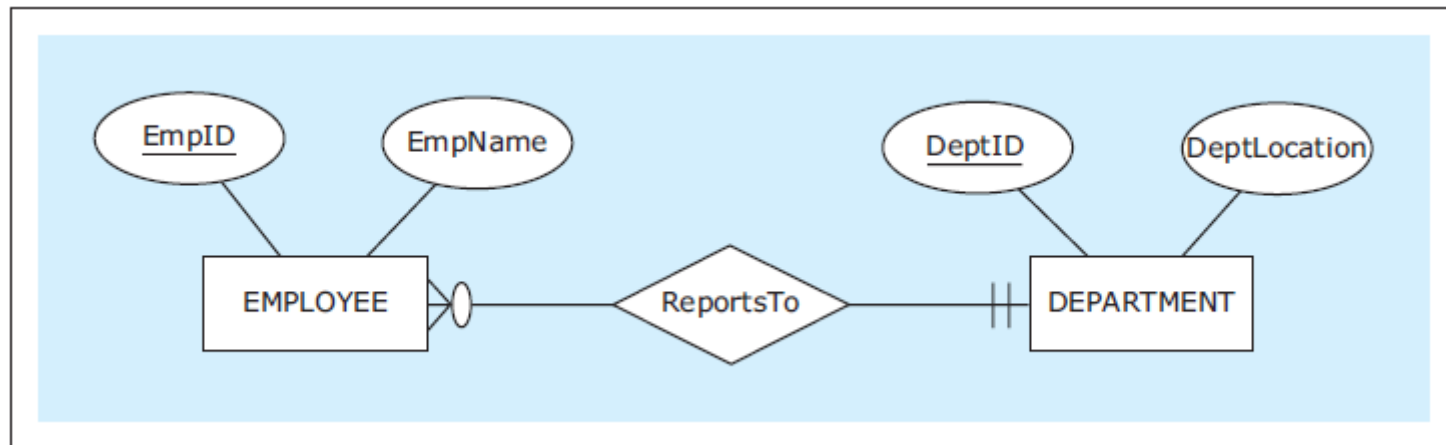
RELATIONSHIPS

Four possible cardinality constraints

RELATIONSHIPS

Several possible versions of the relationship ReportsTo
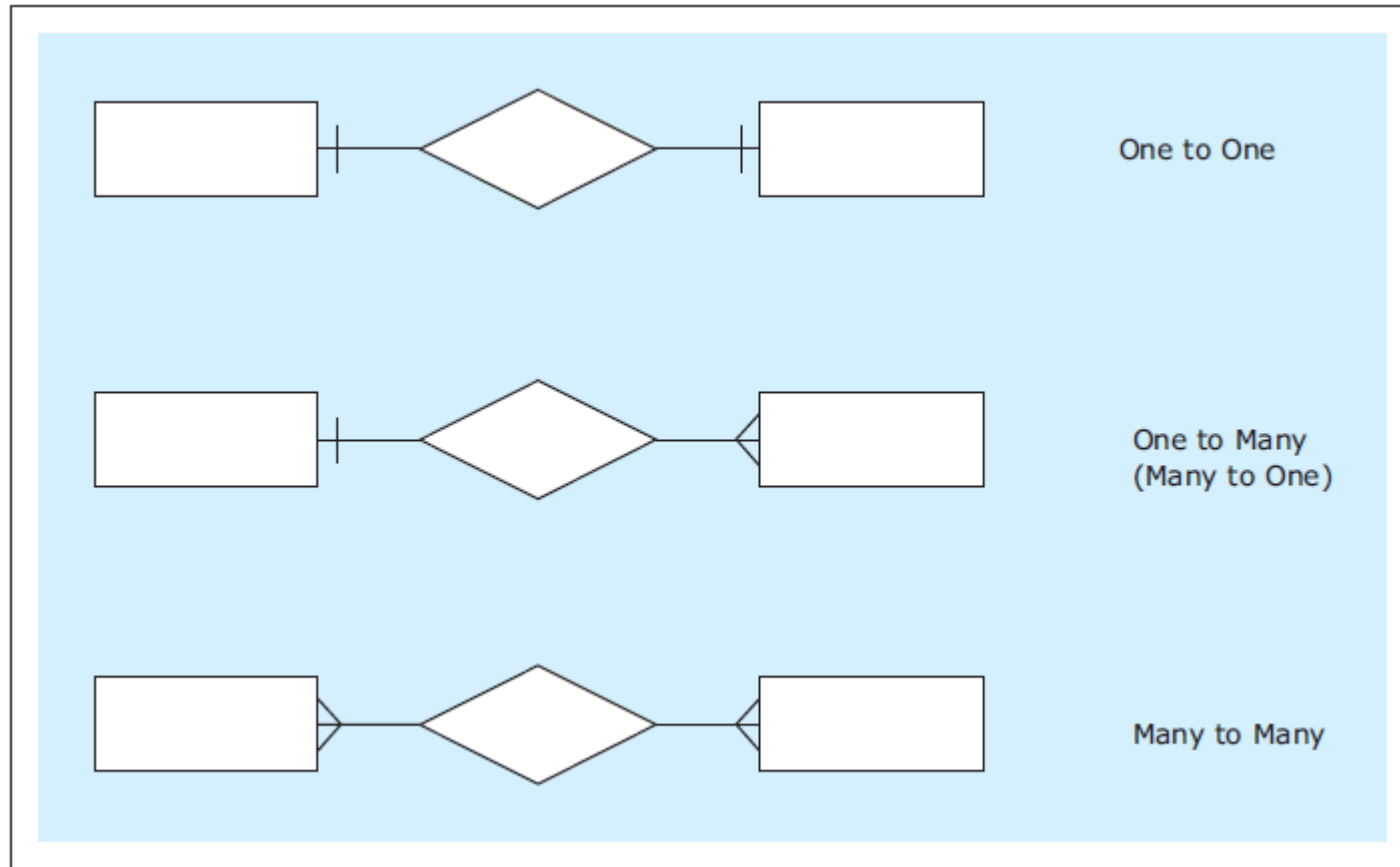
RELATIONSHIPS

- Types of Relationships (maximum cardinality-wise)
  - One-to-one relationship (1:1)
  - One-to-many relationship (1:M)
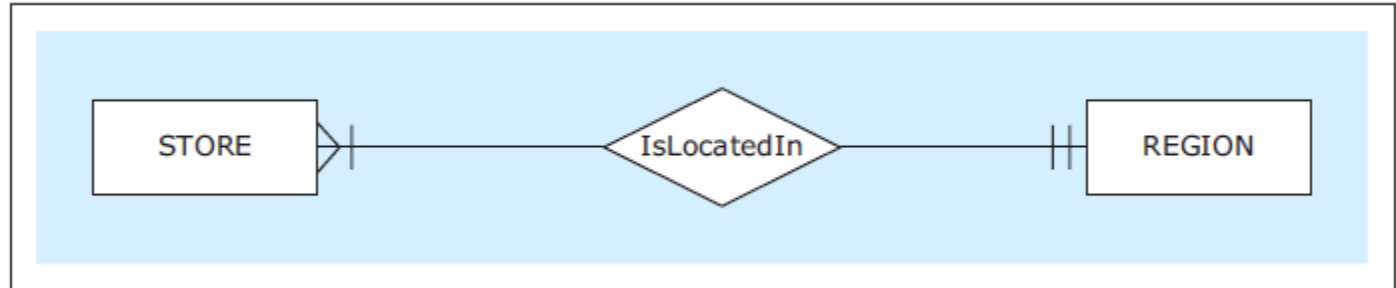 - Many-to-many relationship (M:N)

RELATIONSHIPS

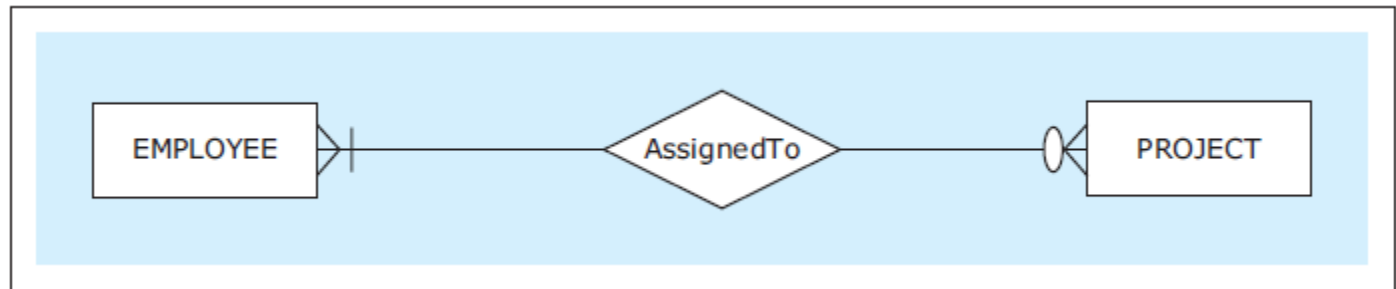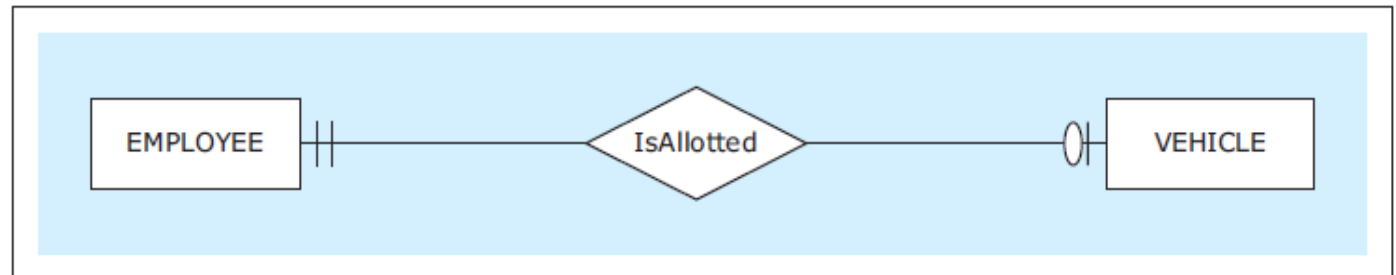Three types of relationships (maximum cardinality-wise)

One to One

One to Many
(Many to One)

Many to Many

RELATIONSHIPS

A 1:M Relationship

STORE ⊰⊦ IsLocatedIn ⊦⊦ REGION

A M:N Relationship

EMPLOYEE ⊰⊦ AssignedTo ⊸⊰ PROJECT

A 1:1 Relationship

EMPLOYEE ⊦⊦ IsAllotted ⊸⊦ VEHICLE

RELATIONSHIPS

- **Relationship instances** - occurrences of a relationship
    - Occur when an instance of one entity is related to an instance of another entity via a relationship
    - Relationship themselves are depicted in the ER diagrams while relationship instances are not
    - Relationship instances are eventually recorded in the database that is created based on the ER diagram

RELATIONSHIPS

A relationship and its instances