Database Management System – 13 (Constraints on Relationship Types, Weak Entity types, Higher degree relationships)

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Outline

- Structural Constraints
  - Cardinality Ratio
  - Participation constraints
- Weak entity types
- Structural constraints representation
- Relationship types of higher degree

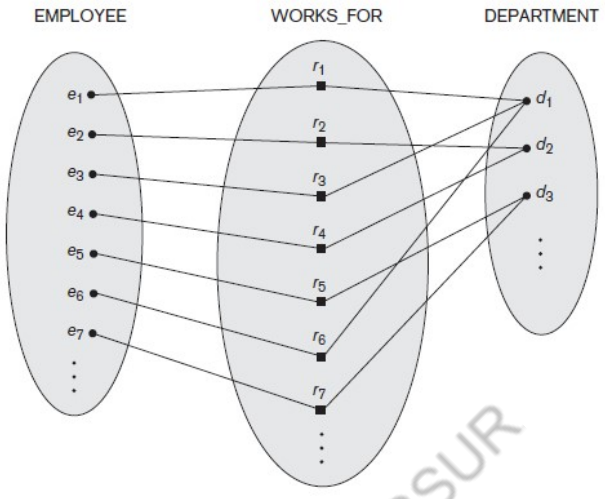
Constraints on Binary Relationship Types

- Relationship types usually have certain ***constraints*** that limit the possible combinations of entities that may participate in the corresponding relationship set
- Two Constraints
  - ***Cardinality ratio***
  - ***Participation***
- **Structural constraints**

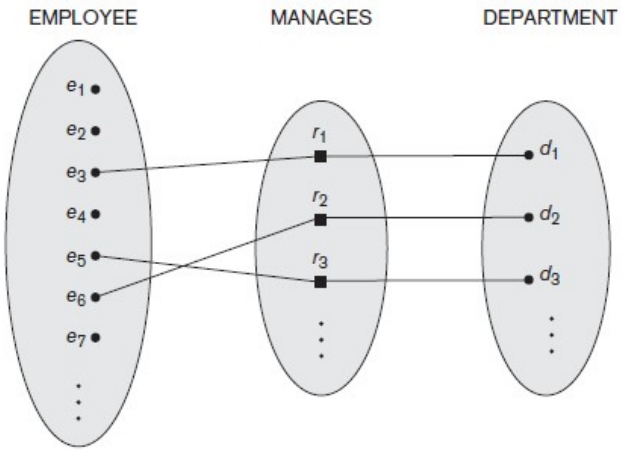
Cardinality Ratios

- Specifies the ***maximum*** number of relationship instances that an entity can participate in
- Example
  - WORKS_FOR , DEPARTMENT:EMPLOYEE is of cardinality ratio 1:N
- 1:1
- 1:N
- N:1
- M:N

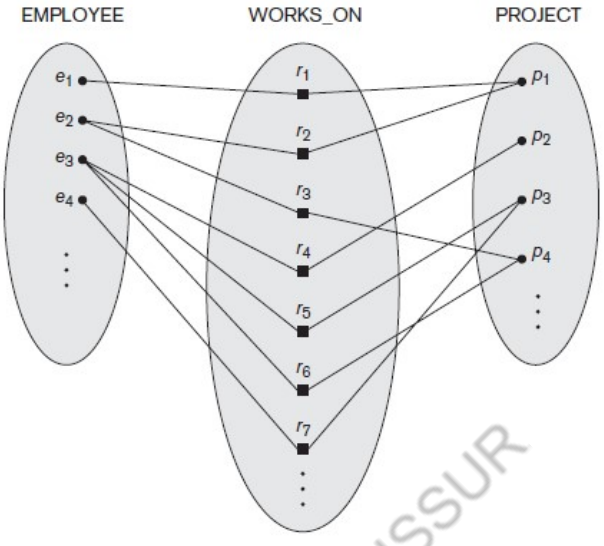
1:N Example



1:1 Example



M:N example



Participation Constraints and Existence Dependencies

- Specifies whether the existence of an entity depends on its being related to another entity
- Specifies the minimum number of relationship instances that each entity can participate in
- Also called the ***minimum cardinality constraint***
- ***Total*** and ***Partial***
- WORKS_FOR – Total (***existence dependency***)
- MANAGES – Partial

Attributes of Relationship types

- A relationship type can have attributes
- Example
  - *HoursPerWeek* of WORKS_ON
  - Number of hours per week that an EMPLOYEE works on a PROJECT

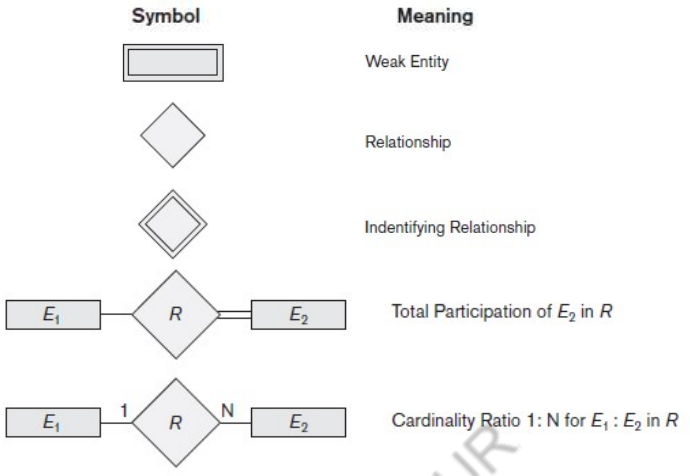
Weak Entity Types

- Entity that does not have a key attribute
- Weak entity must participate in an identifying relationship type with an owner or identifying entity type
- Entities are identified by the combination of:
  - A partial key of the weak entity type
  - Particular entity they are related to in the identifying entity type

Example:

A DEPENDENT entity is identified by the *dependent's first name and birthdate*, *and* the specific EMPLOYEE that the dependent is related to

ER Diagram



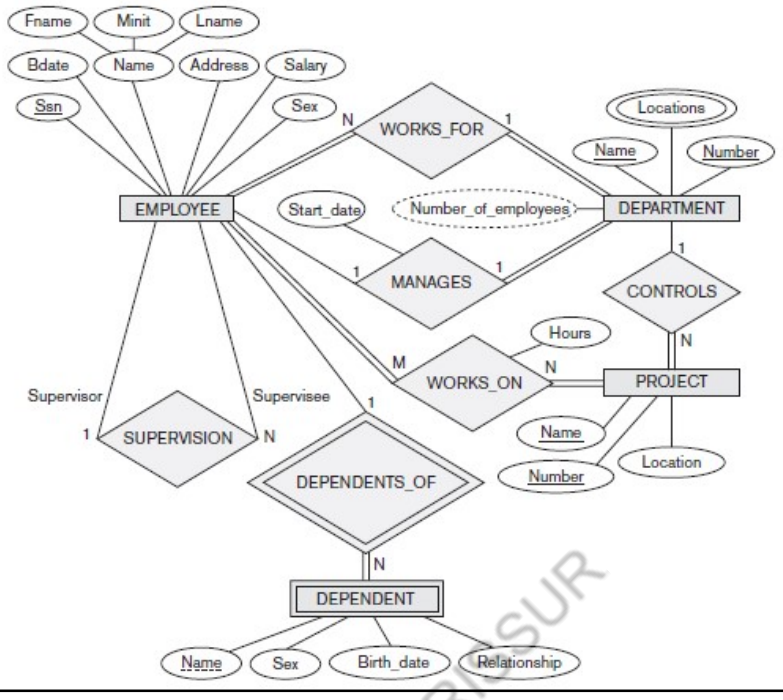
Structural Constraints

- **Cardinality ratio** (of a binary relationship): 1:1, 1:N, N:1, or M:N

  SHOWN BY PLACING APPROPRIATE NUMBER ON THE LINK

- **Participation constraint** (on each participating entity type): total (called *existence dependency*) or partial

  SHOWN BY DOUBLE LINING THE LINK

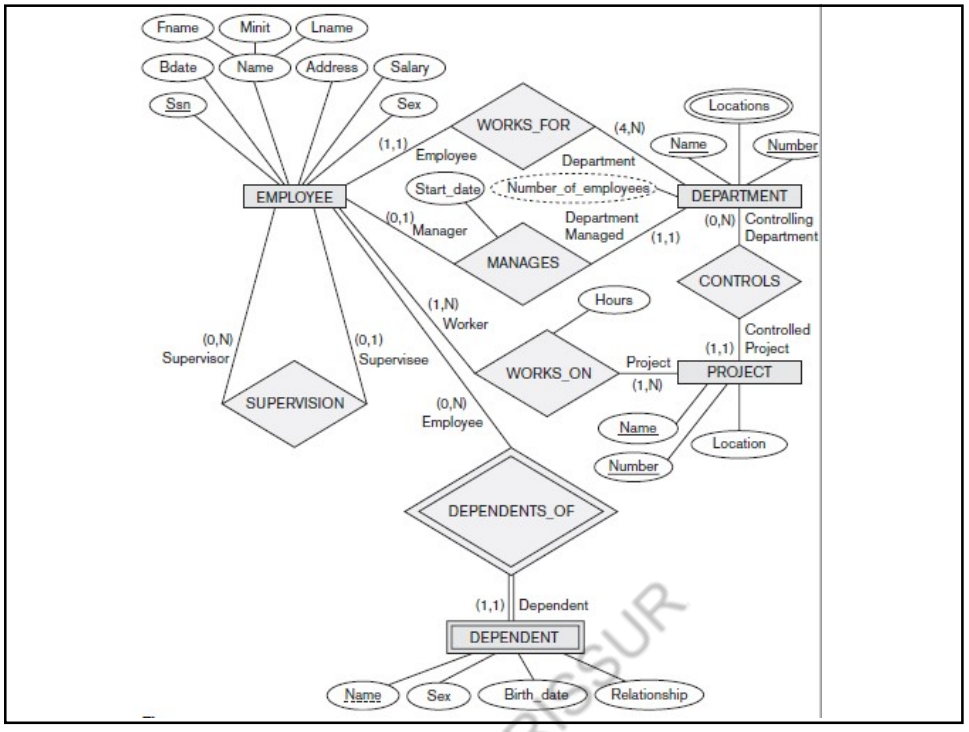


Alternative (min, max) notation for relationship structural constraints

- Specified on *each participation* of an entity type E in a relationship type R
- Specifies that each entity e in E participates in *at least* min and *at most* max relationship instances in R
- Default(no constraint): min=0, max=n

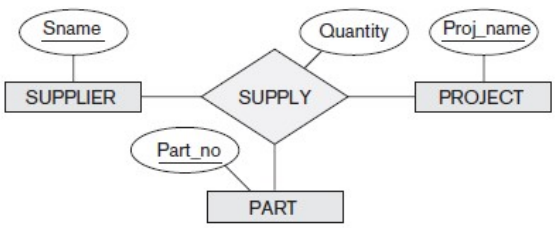
Examples:

- A department has *exactly one* manager and an employee can manage *at most one* department.
  - Specify (0,1) for participation of EMPLOYEE in MANAGES
  - Specify (1,1) for participation of DEPARTMENT in MANAGES
- An employee can work for *exactly one* department but a department can have *any number of employees*.
  - Specify (1,1) for participation of EMPLOYEE in WORKS_FOR
  - Specify (0,n) for participation of DEPARTMENT in WORKS_FOR



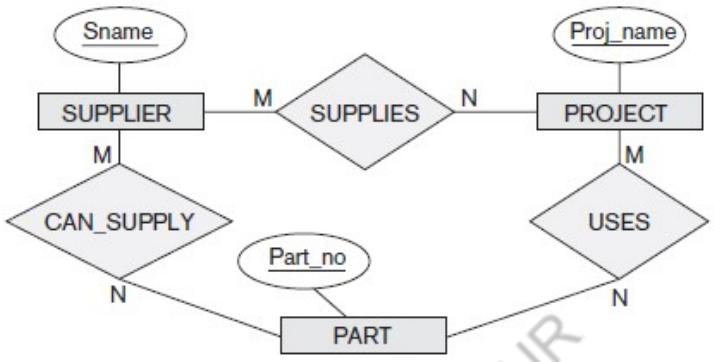
Relationship Types of Degree Higher than Two

- Relationship types of degree 3 are called **ternary** and of degree n are called **n-ary**
- An n-ary relationship *is not* equivalent to n binary relationships

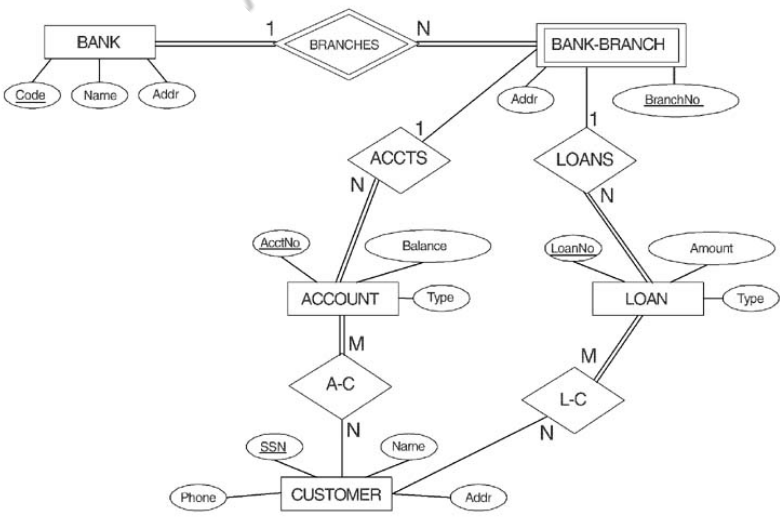


Ternary to Binary – Not equivalent

- Ternary is ***not equivalent*** to binary



ER diagram of a Bank Database



Reference

- Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education 6th edition and 7th edition

Thank you