

Chapter 3 - Data Modeling using ER Model

2018-09-03

3.4.3 - Constraints on binary relationship types

Cardinality ratio: (for binary relation) maximum number of relationships that entity can participate in.

E.g. WORKS-FOR \Rightarrow Department: employee is 1:N

\hookrightarrow Possible cardinality ratios for binary relationship type: 1:1, 1:N, N:1, M:N

\hookrightarrow Represented by displaying 1, M, and N on the diamonds

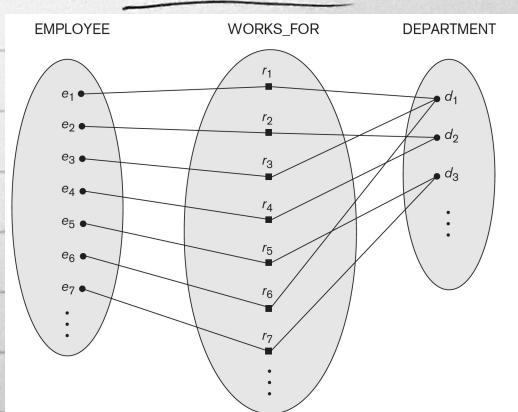
Participation constraint: Specifies if existence of entity depends on its being related to another entity via the relationship type

\hookrightarrow Two types: total and partial

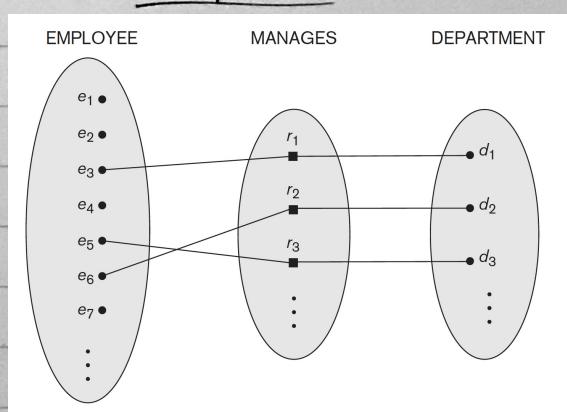
\hookrightarrow Example 1: Company policy is every employee must work for a department; therefore, EMPLOYEE only exists if participates in at least one WORKS-FOR relationship. EMPLOYEE in WORKS-FOR is a total participation.

\hookrightarrow Example 2: Not every employee will Manage a department; therefore EMPLOYEE in the MANAGES relationship is partial participation.

Example 1:

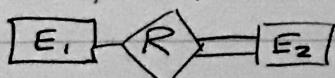


Example 2:



Structural constraints: cardinality ratios and participation constraints

Total participation is double-line



Partial is single-line



Summary: Cardinality ratios define ratios between binary relationships.

Total and partial participation define whether an entity can exist with or without another entity. Total participation is double-line, and partial is single-line.

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3.4.4. - Attributes of Relationship Types

- ↳ Relationship types can also have attributes
- ↳ Attributes of 1:1 or 1:N relationship types can be migrated to one of the participating entity types.
- ↳ For 1:N relationship type, relation attribute can only be migrated to entity on the N-side.

3.5 - Weak Entity Types

Key

Weak entity types: entity types that don't have [^] attributes of their own

Strong entity types: entity types which do have Key attributes.

Identifying owner entity type: entity which claims ownership to an entity attached to a weak entity.

- ↳ Weak entity type always has a total participation constraint because it cannot be identified without owner identity.

Partial Key: attribute that can uniquely identify weak entity that are related to the same owner identity.

- ↳ In ER diagram, both WE and identifying relationship are double-lines (boxes and diamonds). Partial Key attribute is underlined with dashed or dotted line.

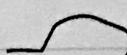
3.7.3 - Design Choices for ER Conceptual Design

 = Entity

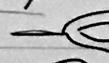
 = Weak Entity

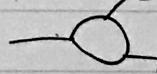
 = Relationship

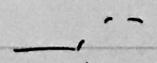
 = Identifying Relationship

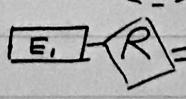
 = Attribute

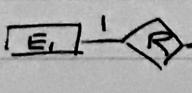
 = Key Attribute

 = Multivalue Attribute

 = Composite Attribute

 = Derived attribute

 = Total participation of E_2 in R

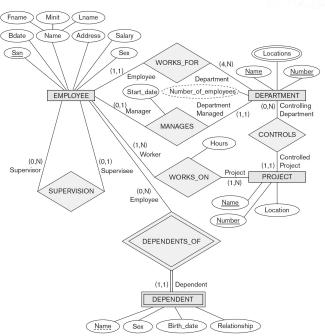
 1:N for $E_1 : E_2$ in R

Summary: Attributes can be migrated to one of participating types, but usually to the "many" side. Weak entity types don't have their own key attributes.

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- Concept may be first modeled as an attribute, and then refined into relation
- Attribute that exists in several entity types may be elevated or promoted to an independent entity type.

3.7.4. ⇒ Alternative Notations for ER diagrams



→ Other notation uses numbers instead of lines with different thickness

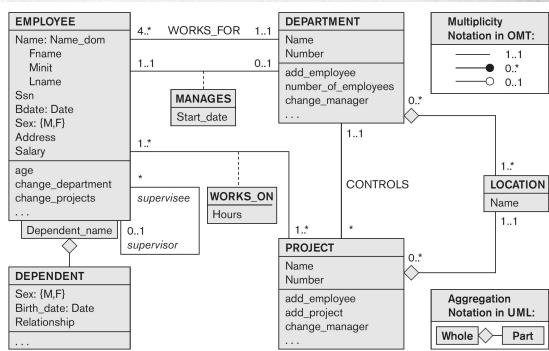
→ Numbers define participation constraints

→ Min = 0 is partial participation whereas min > 0 is total participation

→ Used for higher degree relationships

3.8 - UML Diagrams

- Used exclusively in software design; entity types are modeled as classes, and entities are modeled as objects



→ Top section gives class name

→ Middle section gives attributes

→ Last section includes operations given to individual objects

→ Relationship types = associations in UML

→ Relationship instances = links in UML