Conceptual Design

Table of Contents

[ ] Ch 2 R&G

Objectives of Conceptual design

- identify **entities** and **relationships**
- identify **information** to store about entities and relationships
- identify **integrity constraints**

Entities and Relationships

- **entity**: real-world object distinguishable from other objects
- **entity set**: collection of entities of the same type

    - need not be disjoint
    - set of n-tuples: $\{(e_1, \ldots, e_n) | e_1 \in E_1, \ldots, e_n \in E_n\}$
    - each n-tuple involves n entities e_i in entity set E_i

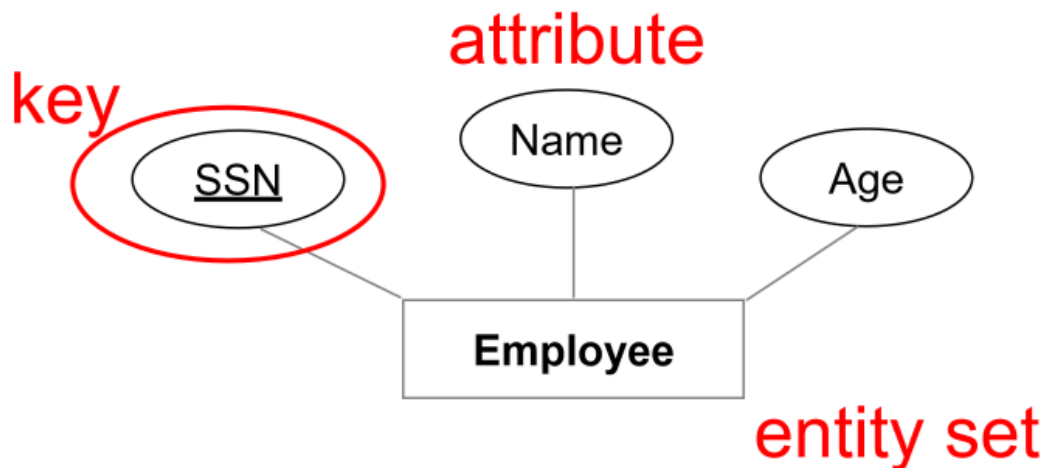- **attributes**: describe each entity in a given entity set

Figure 1: entity_set

- **relationship**: association among two or more entities

    - can have their own attributes
    - e.g. Fred *works* in pharmacy department

- **relationship set**: collection of relationships of the same type

    - e.g. employees *work in* departments
    - instance of relationship set: snapshot of relationship set in time
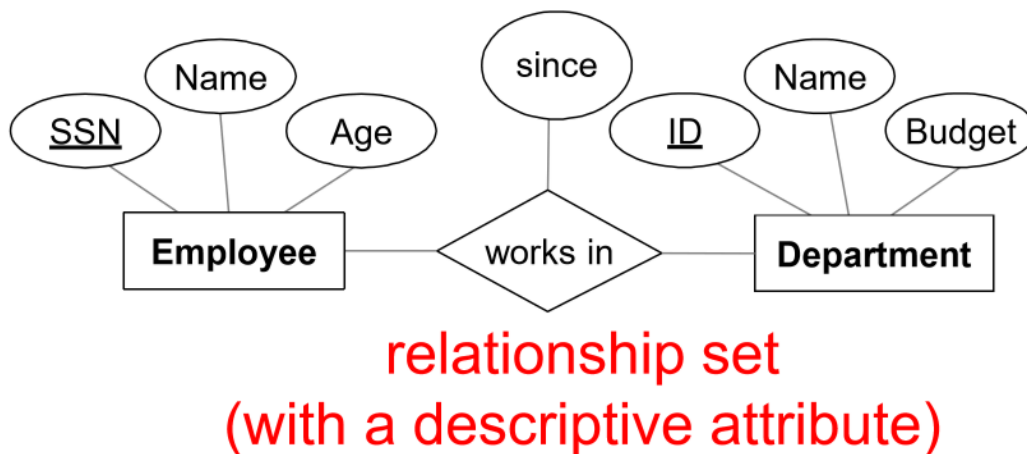

Figure 2: relationship_set

- same entity set can participate in

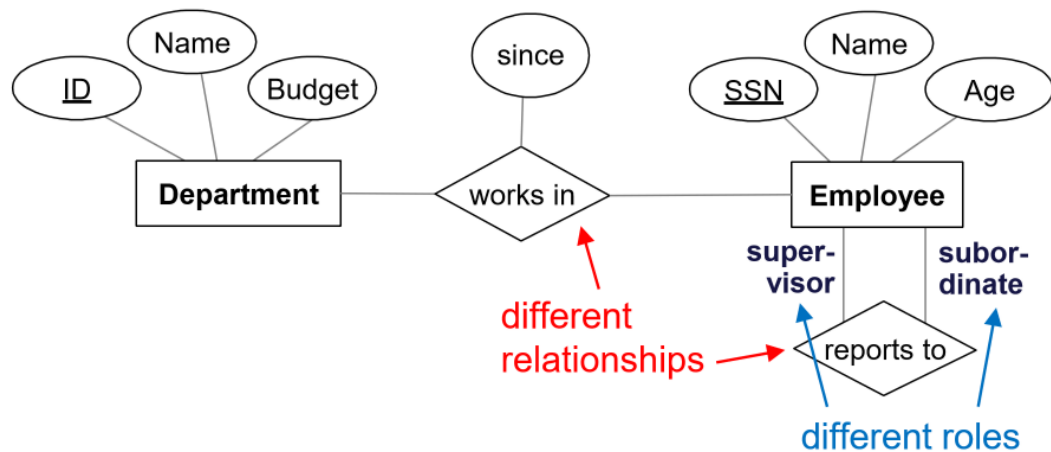- different relationship sets
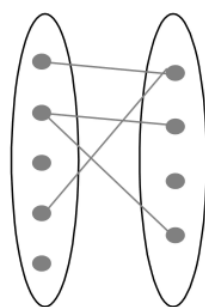- different roles in the same set
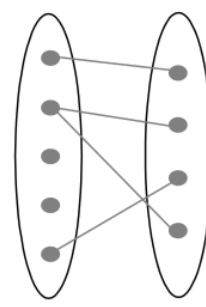

Figure 3: relationship_roles

- **entity-relationship (ER) data model**: tools to move from informal user needs to precise description that can be implemented
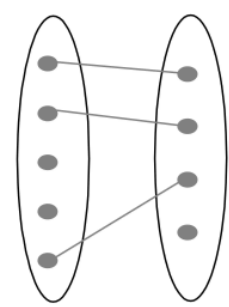
Constraints

- **key constraints**: determine number of objects taking part in relationship set
  - specifies *upper bound*, i.e. *many* implies you could have 0 relationships to more than 1

  - one of:

- **many-to-many**: employee can work in *many* departments; a department can have *many* employees
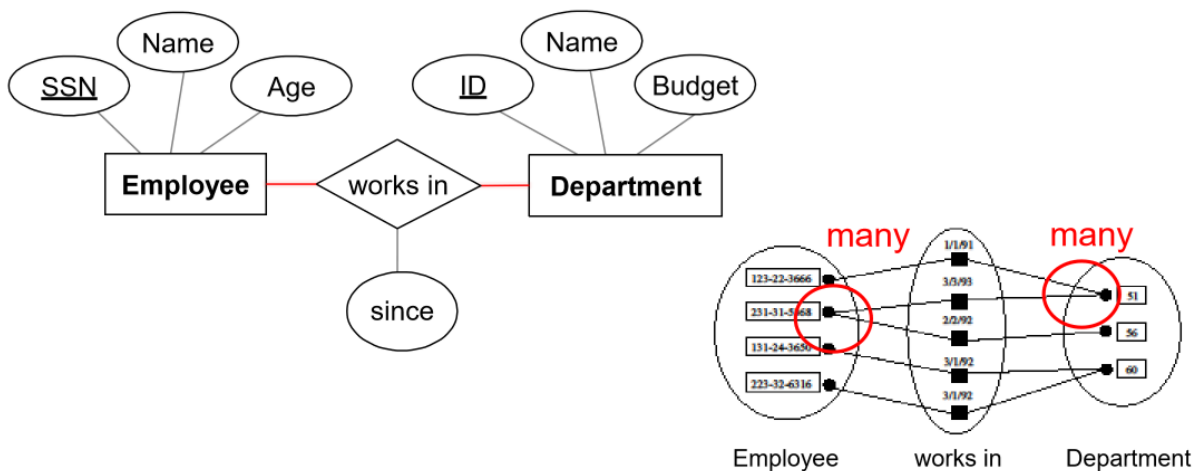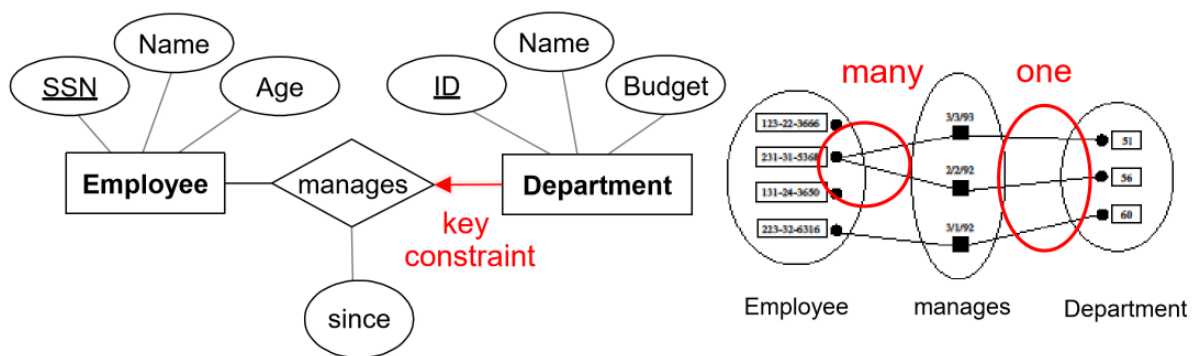
  – represented by a line

Figure 4: many_to_many

- **one-to-many**: single entity per relationship

  – represented by an arrow
  – e.g. each department has *at most one* manager

- **one-to-one**: e.g. each employee can manage at most one department

  - **participation constraint**: do all entities of an entity set take part in a particular relationship?

    – **total participation**: every entity must take part in *at least 1* relationship

      * represented by a *bold line*

    – **partial participation**: otherwise

– e.g. every employee must work in a department. each department has at least one employee each department has to have a manager (but not everyone is a manager)
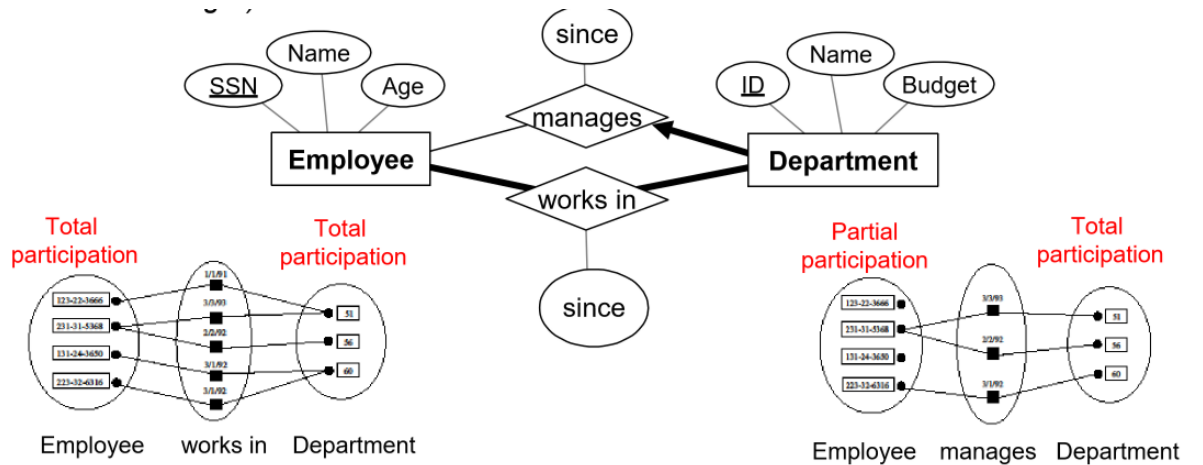

Figure 5: participation_constraints

- **weak entity**: uniquely identified by considering primary key of an owner entity

    – represented as *bold rectangle*
    – owner entity set and weak entity set must participate in a relationship where each weak entity has exactly one strong entity to depend on

- **partial key** uniquely identifies weak entity when considering primary key of owner entity

    – represented with *dashed underline*

- **ternary relationships** [TODO]

Special attribute

- **multi-valued attributed**: multiple values of same type

    – e.g. employee home phone and work phone numbers
    – represented with *oval with double border*

- **composite attributes**: hidden structure, each element having different type

    – e.g. employee address composed of postcode, street name, street number

Conceptual Design [todo]

-