



# Entity-Relationship Model – Part 3

## Enhanced Modeling Concepts



## Enhanced Entity-Relationship (EER) Model

- The basic modelling concepts are only sufficient for some database applications.
- To reflect data properties and constraints more precisely, a number of enhanced ER models (EERs) were proposed.
- Each EER model includes all the basic modeling concepts of the ER model we discussed before.
- We will further discuss the following concepts in EERs:
  - **Subclass/superclass**
  - **Specialisation/generalisation**
  - **Constraints on specialisation/generalisation**

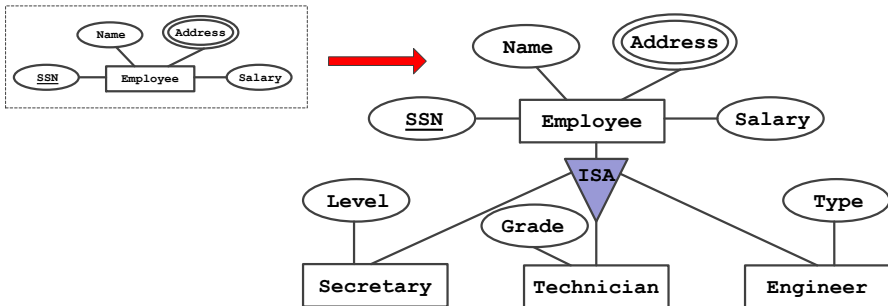


## Subclass and Superclass

- **Subclass of an entity type:** subgrouping of entities.
  - In many cases subclasses need to be **represented explicitly** because of their application significance.
- Superclass/subclass, Supertype/subtype and Class/subclass are different names for the same concept.
  - Subclass inherits attributes and relationships of superclass.
  - Subclass can have additional attributes and relationships.
- This type of relationship between subclass and superclass is often described as an **ISA relationship type**.

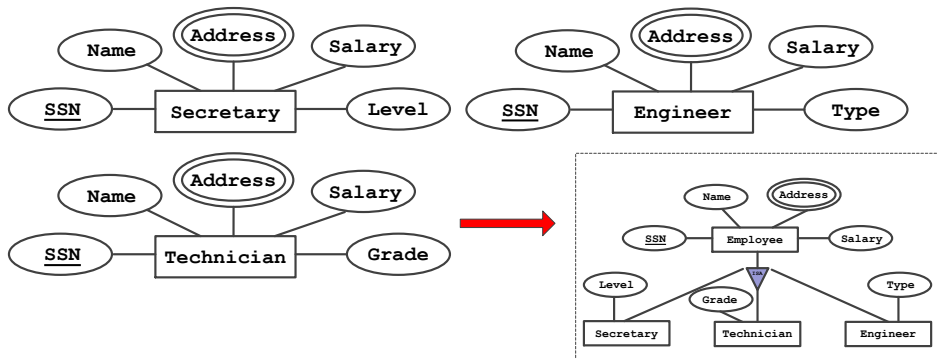
## Specialisation and Generalisation

- **Specialization** is the process of defining a set of subclasses of an entity type (top-down).
  - Defined on distinguishing features of entities in the superclass, e.g., based on the *job type* of each employee:



## Specialisation and Generalisation

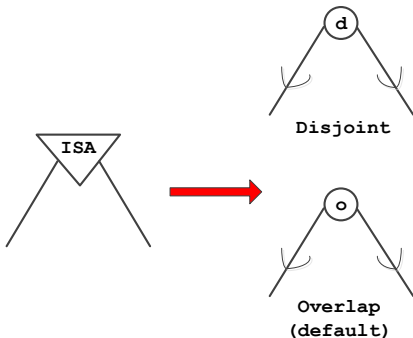
- **Generalization** is a reverse process of specialization (bottom-up).
  - Common features of entities in subclasses may be generalized into single superclass (including primary key).



## Constraints on Specialisation and Generalisation

### • Disjointness constraint

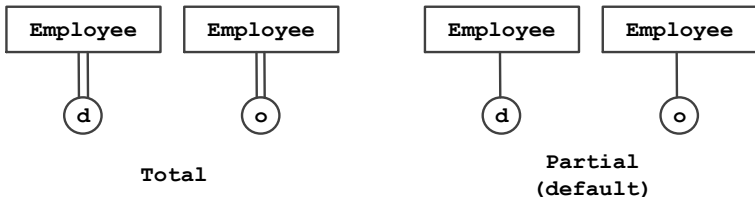
- Specifies that the subclasses of the specialization must be **disjoint**.
- If not constrained, then entities in the subclasses may **overlap**.



## Constraints on Specialisation and Generalisation

- **Completeness constraint**

- **total** – *every* entity in the superclass must be a member of at least one subclass.
- **partial** – an entity may not belong to any of the subclasses.





## Design Choices for the EER Model

- Specializations and generalisation can be defined to make the conceptual model accurate.
- If the subclasses has few specific attributes and no specific relationships, then
  - can be merged into the superclass,
  - replace with one or more type attributes specifying the subclass that each entity belongs to.
- Choices of disjoint/overlapping and total/partial constraints are driven by rules in the miniworld being modeled.



## Informal Method for Constructing an ER or EER Model

- Draw an ER or EER diagram to represent the following design:
  - (1) Identify the entity types (including weak entity types)
  - (2) Identify the relationship types (including ISA and identifying relationship types)
  - (3) Identify the attributes of entity and relationship types (and their underlying domains)
  - (4) Identify a primary key for each entity type
  - (5) Classify each binary relationship type identified in step 2 (i.e. one-to-one, many-to-one or many-to-many)
  - (6) Determine the participation constraints for each entity type in each binary relationship type
  - (7) Determine the disjointness and completeness constraints for each ISA

## Summary of Notation for ER and EER Diagrams

