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

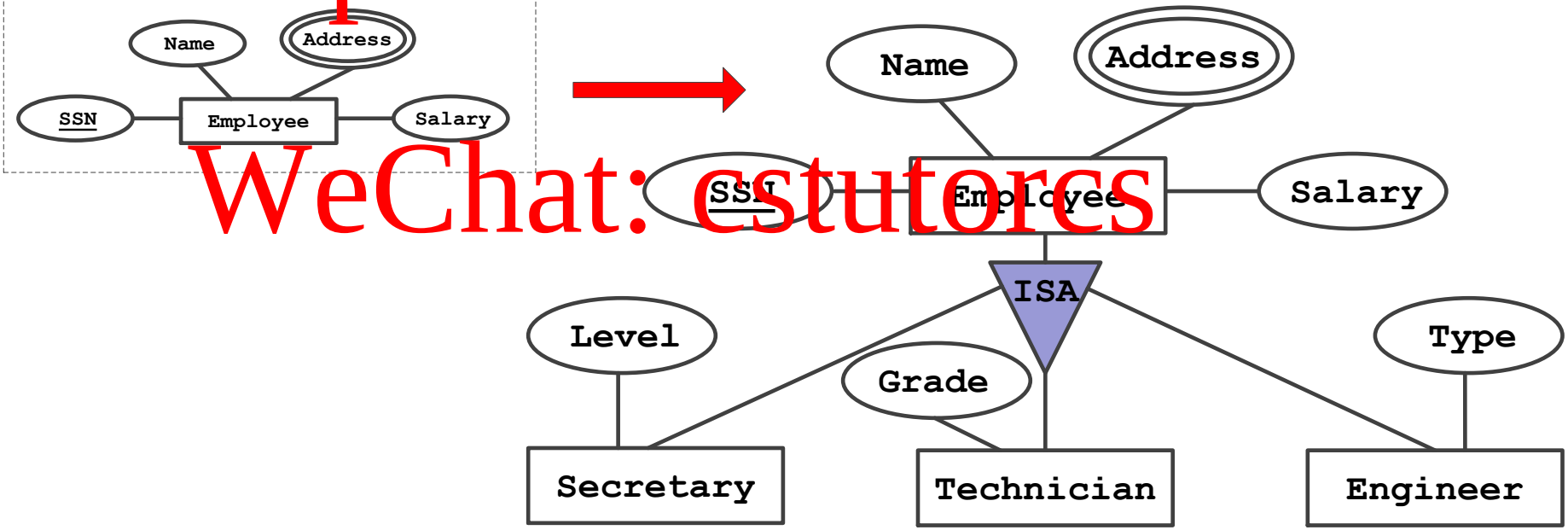
- **Subclass of an entity type:** subgrouping of entities.
  - In many cases subclasses need to be **represented explicitly** because of their application significance.

- 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**.

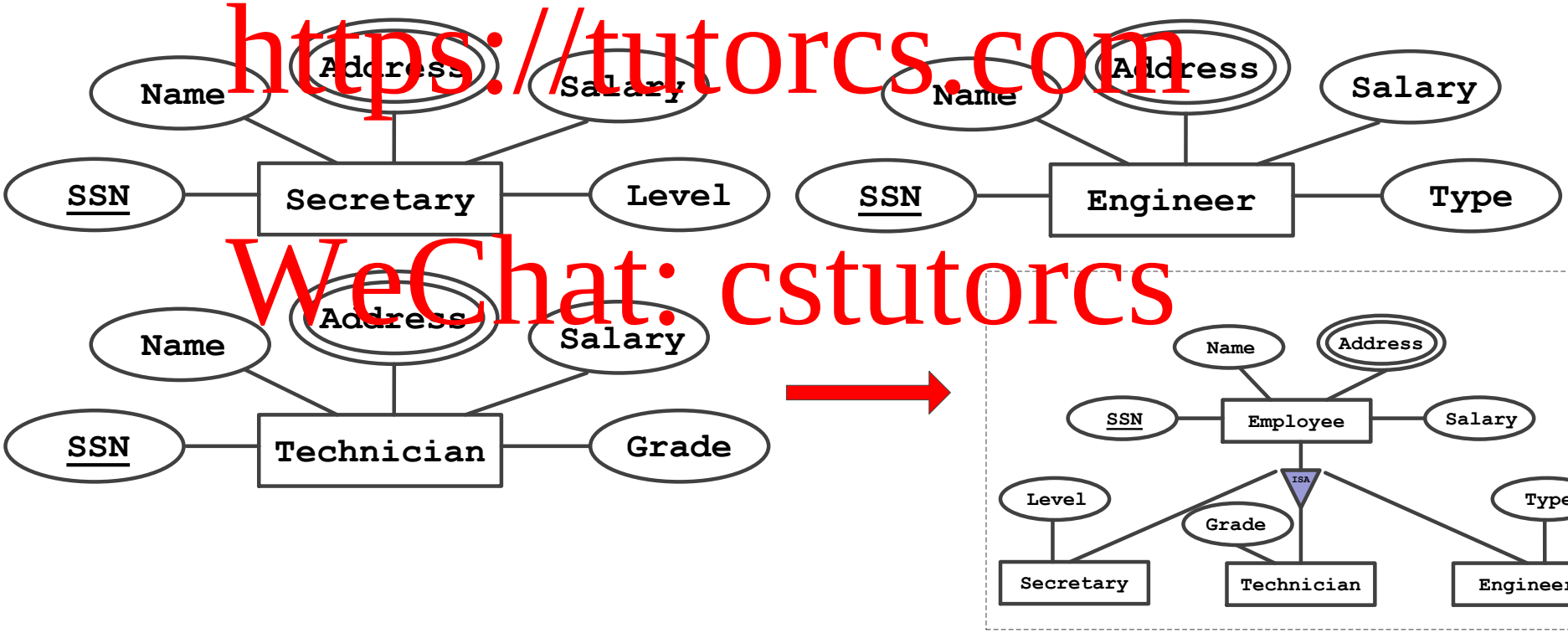
Specialisation and Generalisation

- **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:



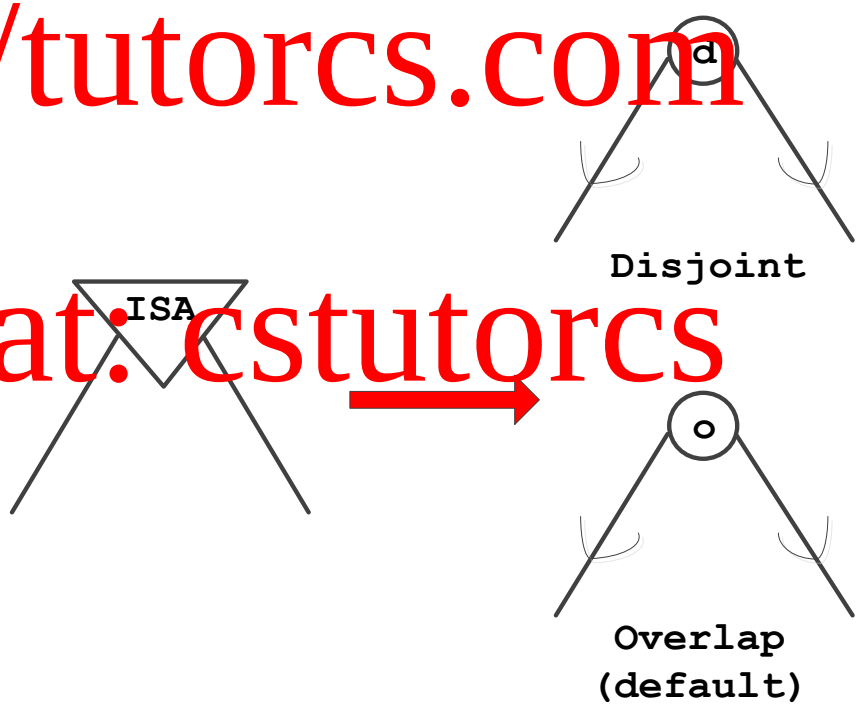
Specialisation and Generalisation

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



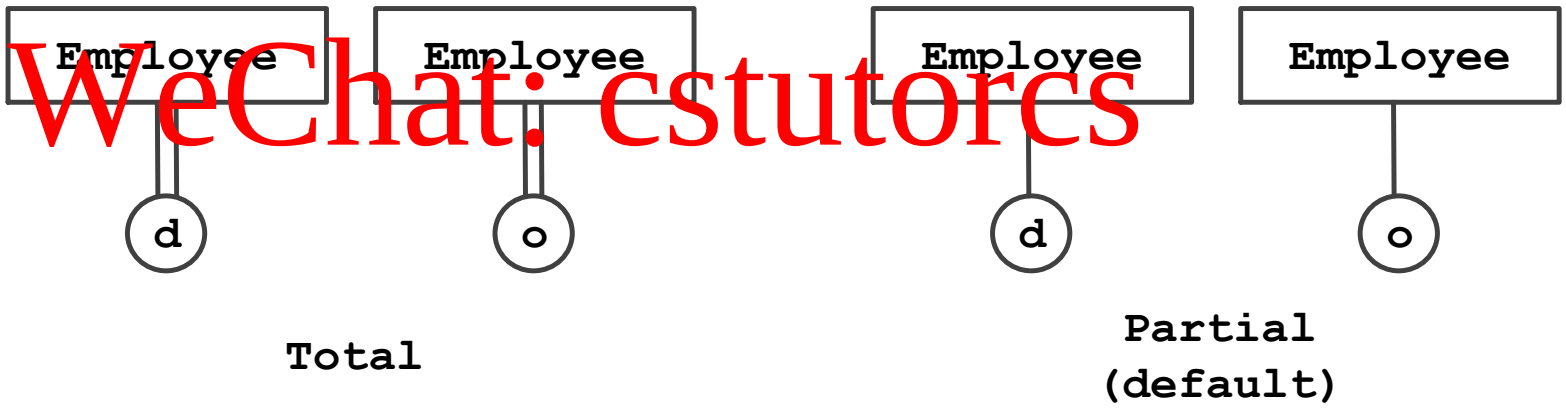
Constraints on Specialisation and Generalisation

- **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