

Chapter 4: The Enhanced ER Model and Business Rules

Modern Database Management
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Supertypes and Subtypes

- **Subtype:** A subgrouping of the entities in an entity type which has attributes that are distinct from those in other subgroupings
- **Supertype:** An generic entity type that has a relationship with one or more subtypes
- **Attribute Inheritance:**
 - Subtype entities inherit values of all attributes of the supertype
 - An instance of a subtype is also an instance of the supertype

Figure 4-1a Basic notation for supertype/subtype relationships -
Traditional EER notation

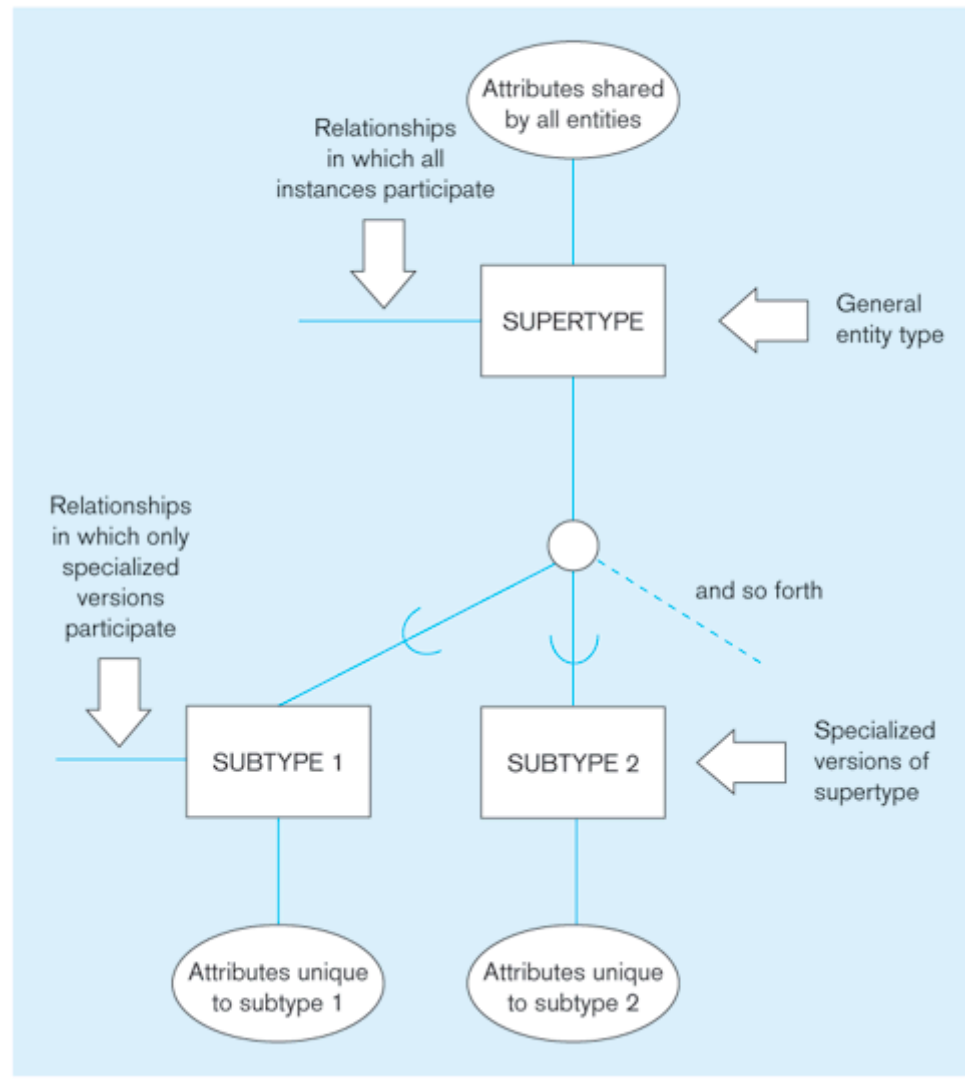
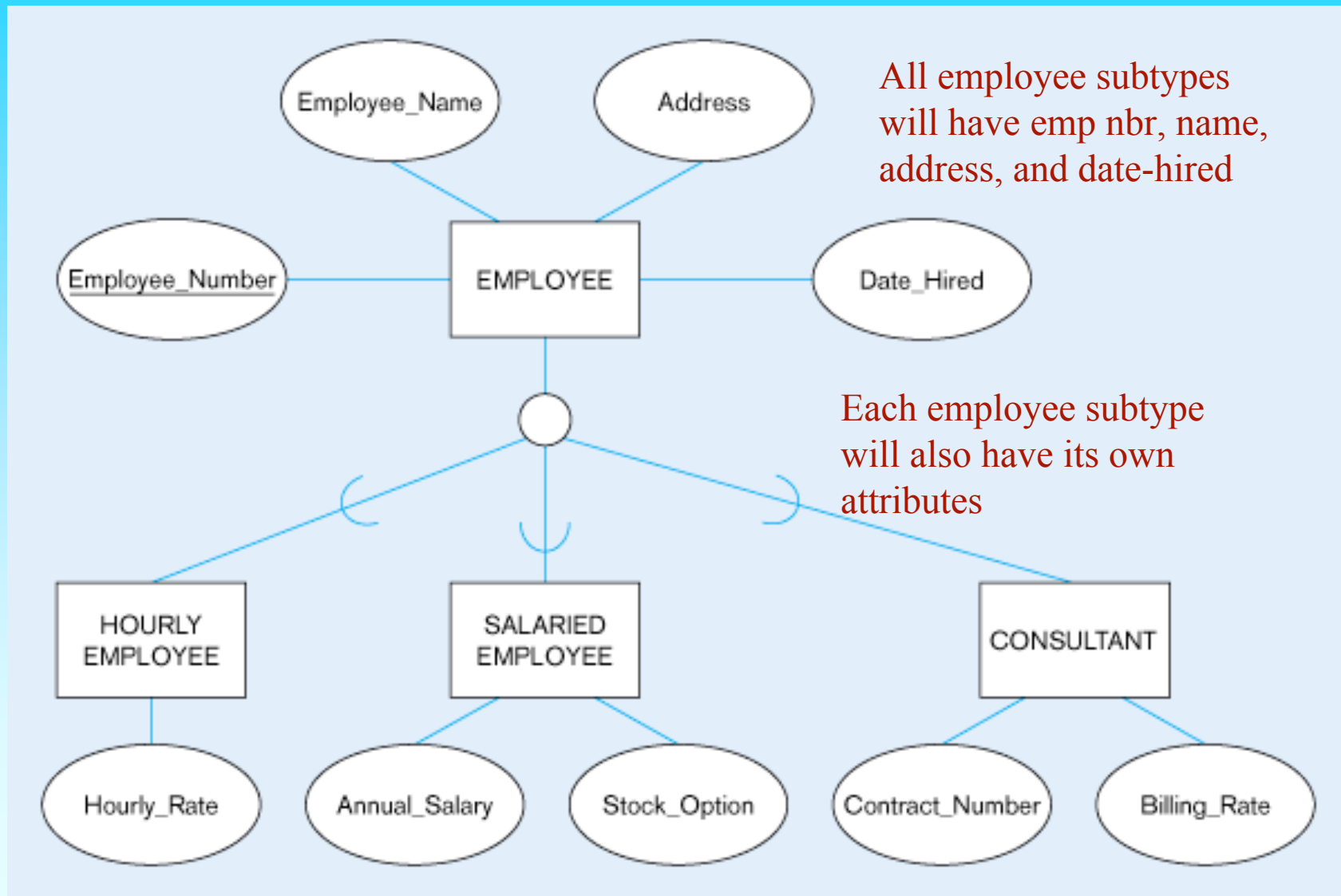


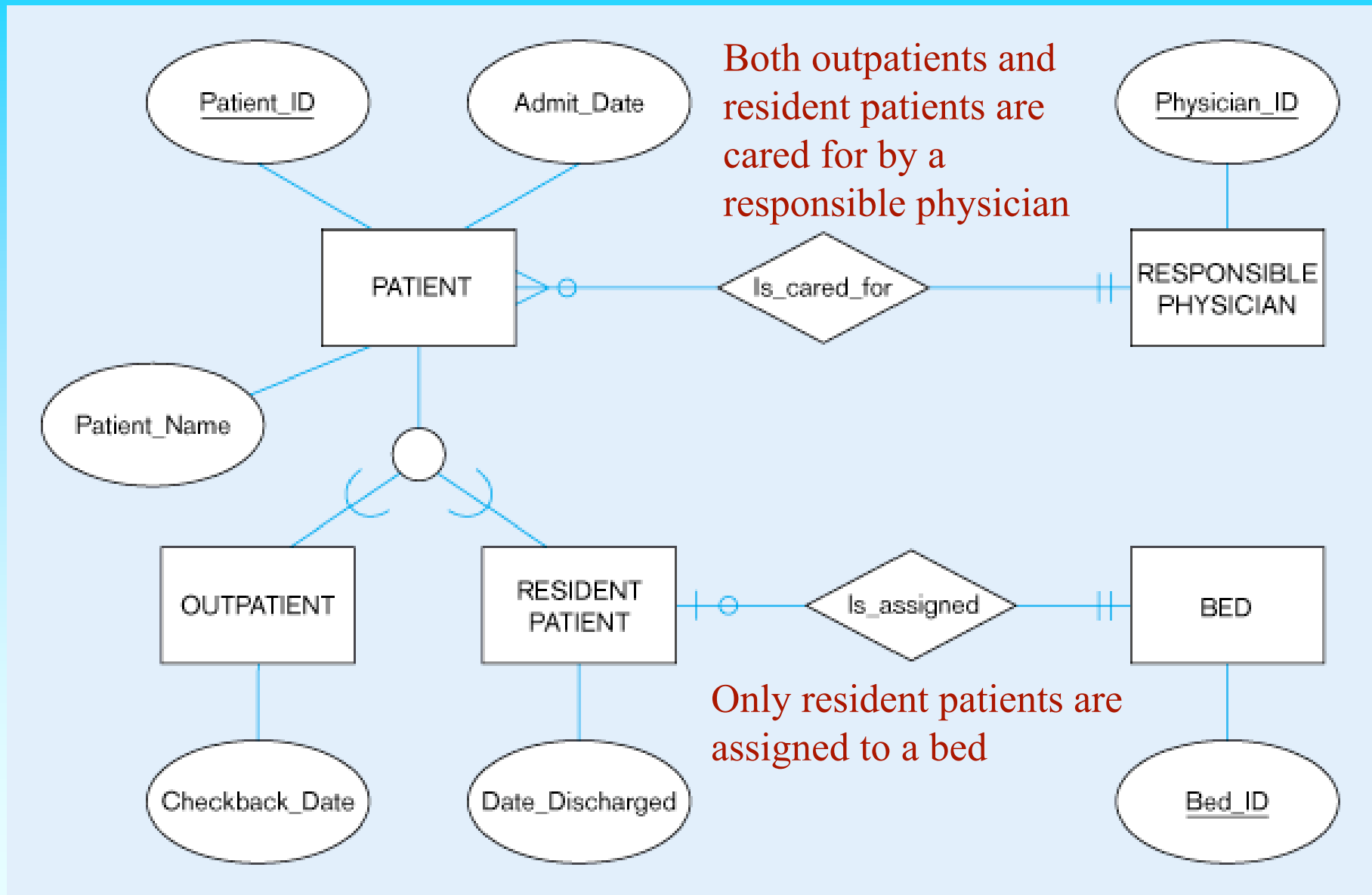
Figure 4-2 – Employee supertype with three subtypes



Relationships and Subtypes

- Relationships at the **supertype** level indicate that all subtypes will participate in the relationship
- The instances of a **subtype** may participate in a relationship unique to that subtype. In this situation, the relationship is shown at the subtype level

Figure 4-3 – Supertype/subtype relationships in a hospital



Constraints in Supertype/ Completeness Constraint

- **Completeness Constraints:**

Whether an instance of a supertype **must** also be a member of at least one subtype

- Total Specialization Rule: Yes (double line)
- Partial Specialization Rule: No (single line)

Figure 4-6a – Examples of completeness constraints
Total specialization rule

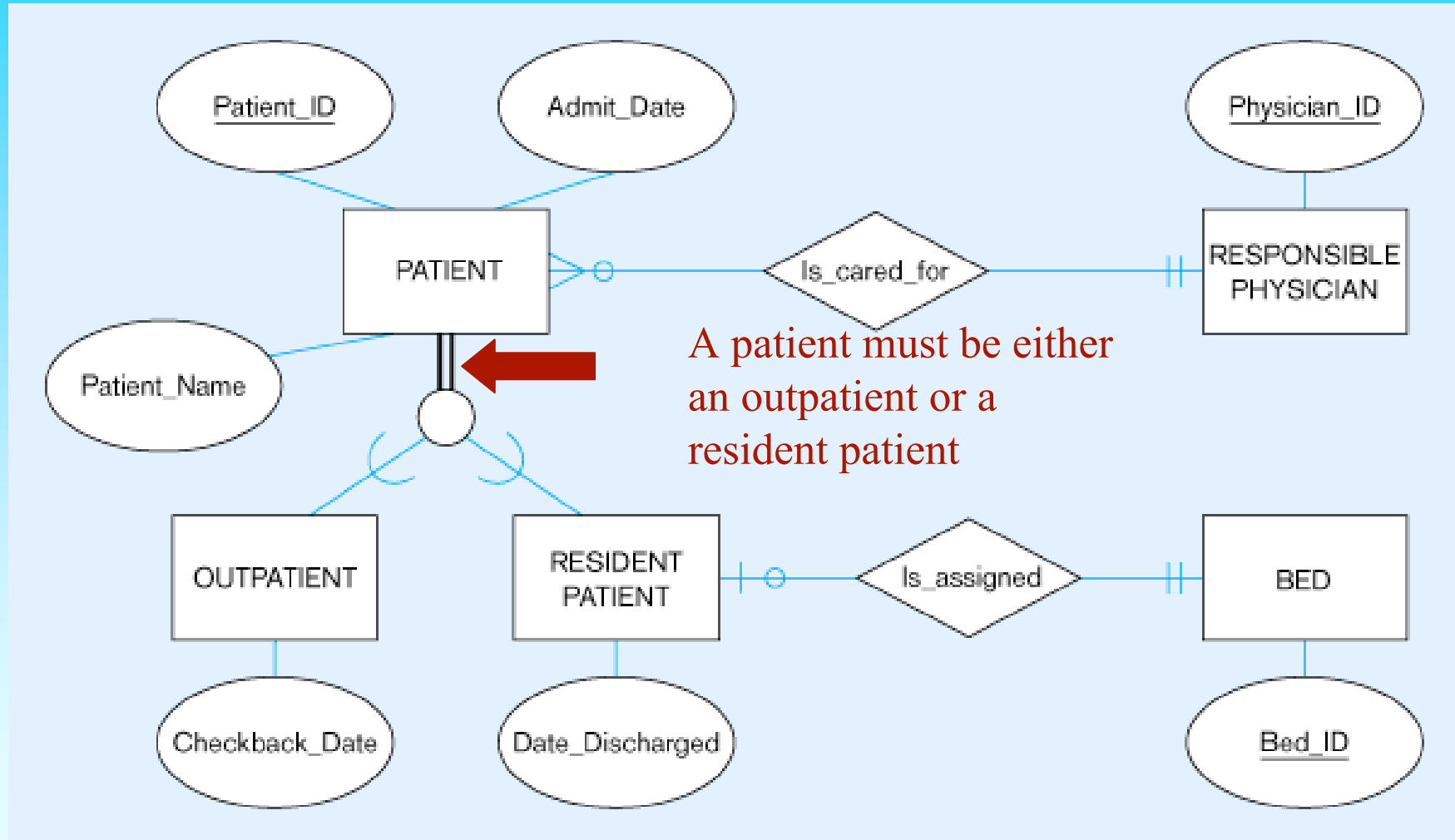
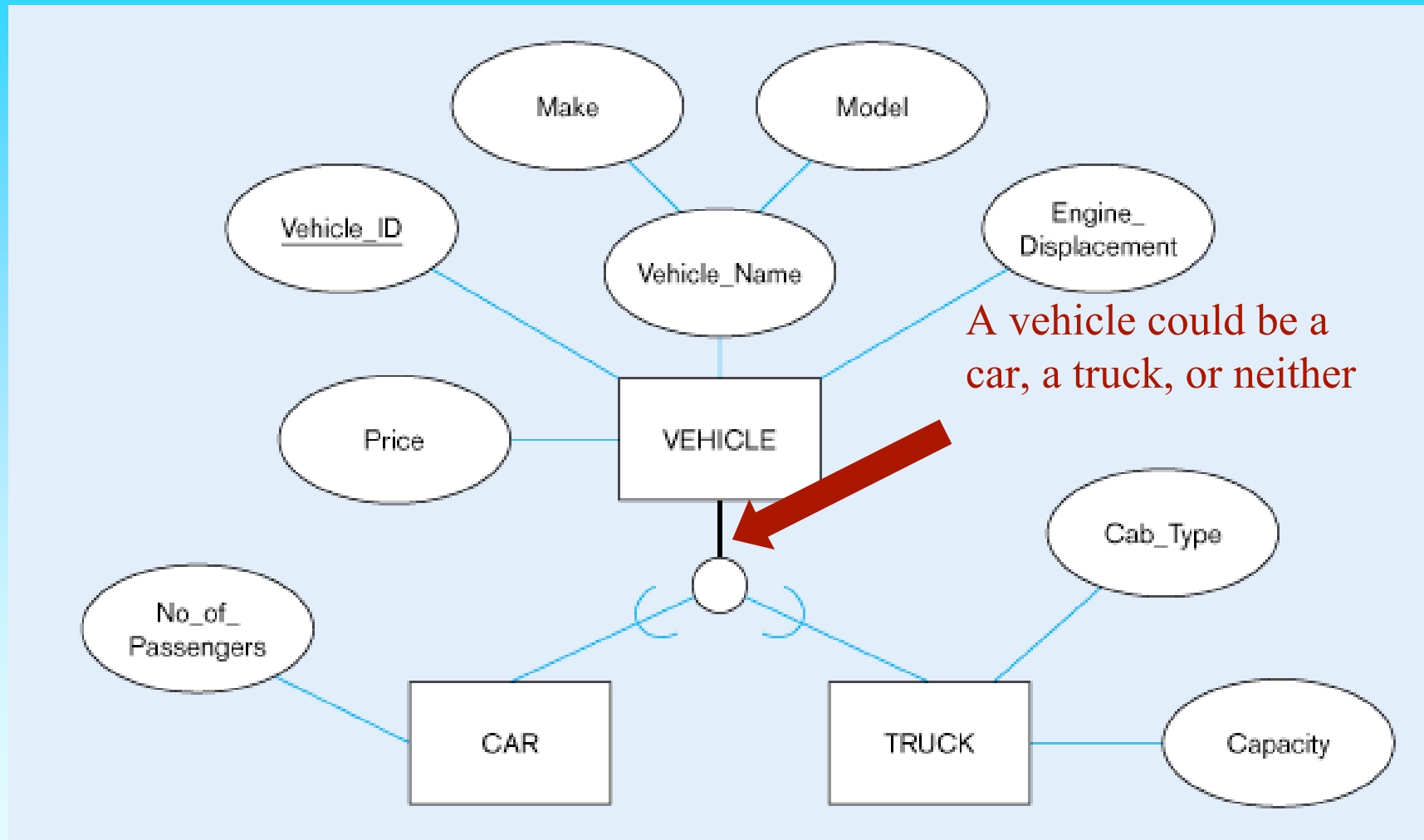


Figure 4-6b – Partial specialization rule



Constraints in Supertype/ Disjointness constraint

- **Disjointness Constraints:** Whether an instance of a supertype may *simultaneously* be a member of two (or more) subtypes
 - Disjoint Rule: An instance of the supertype can be only ONE of the subtypes
 - Overlap Rule: An instance of the supertype could be more than one of the subtypes

Figure 4-7a – Examples of disjointness constraints

Disjoint rule

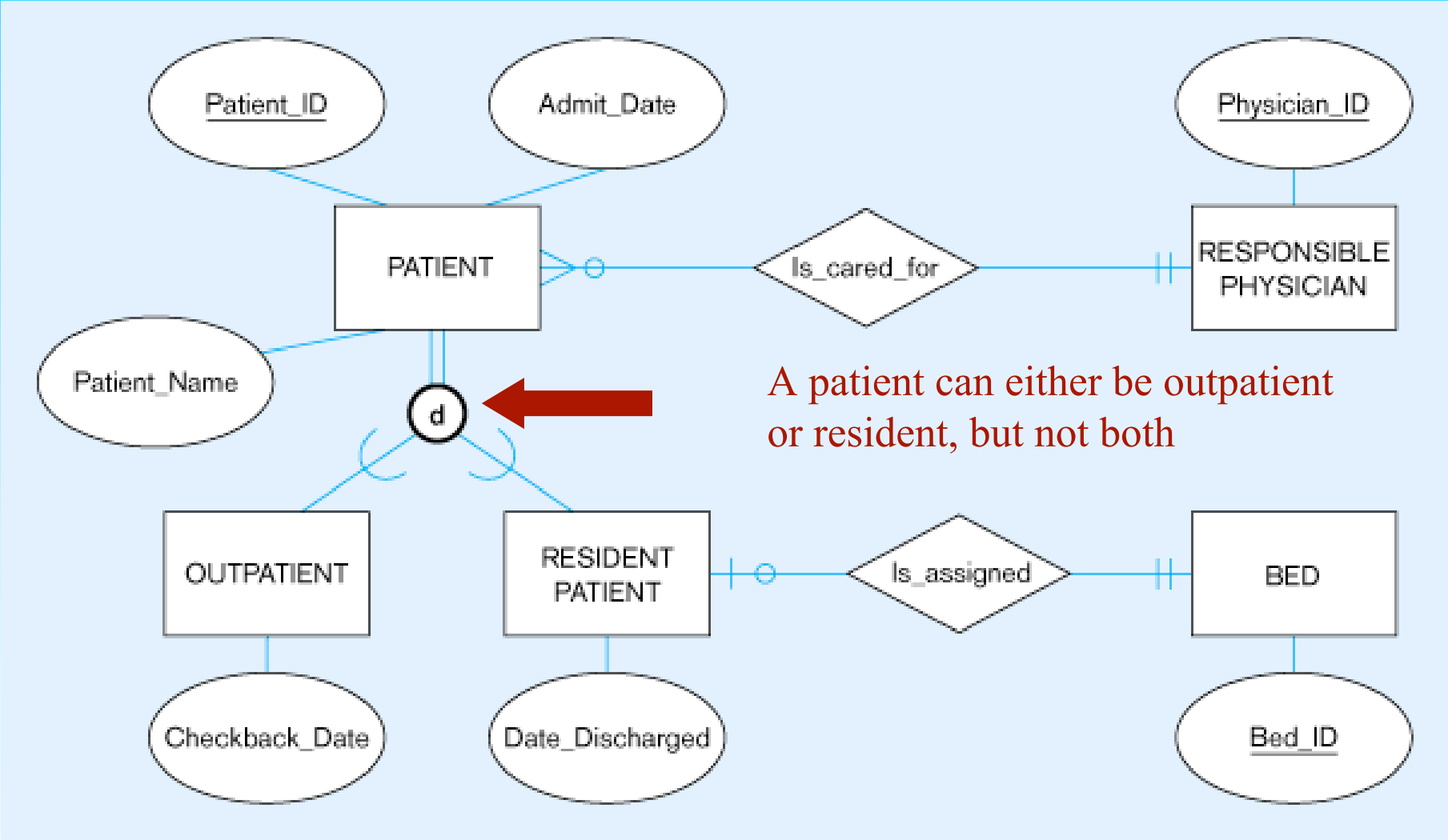
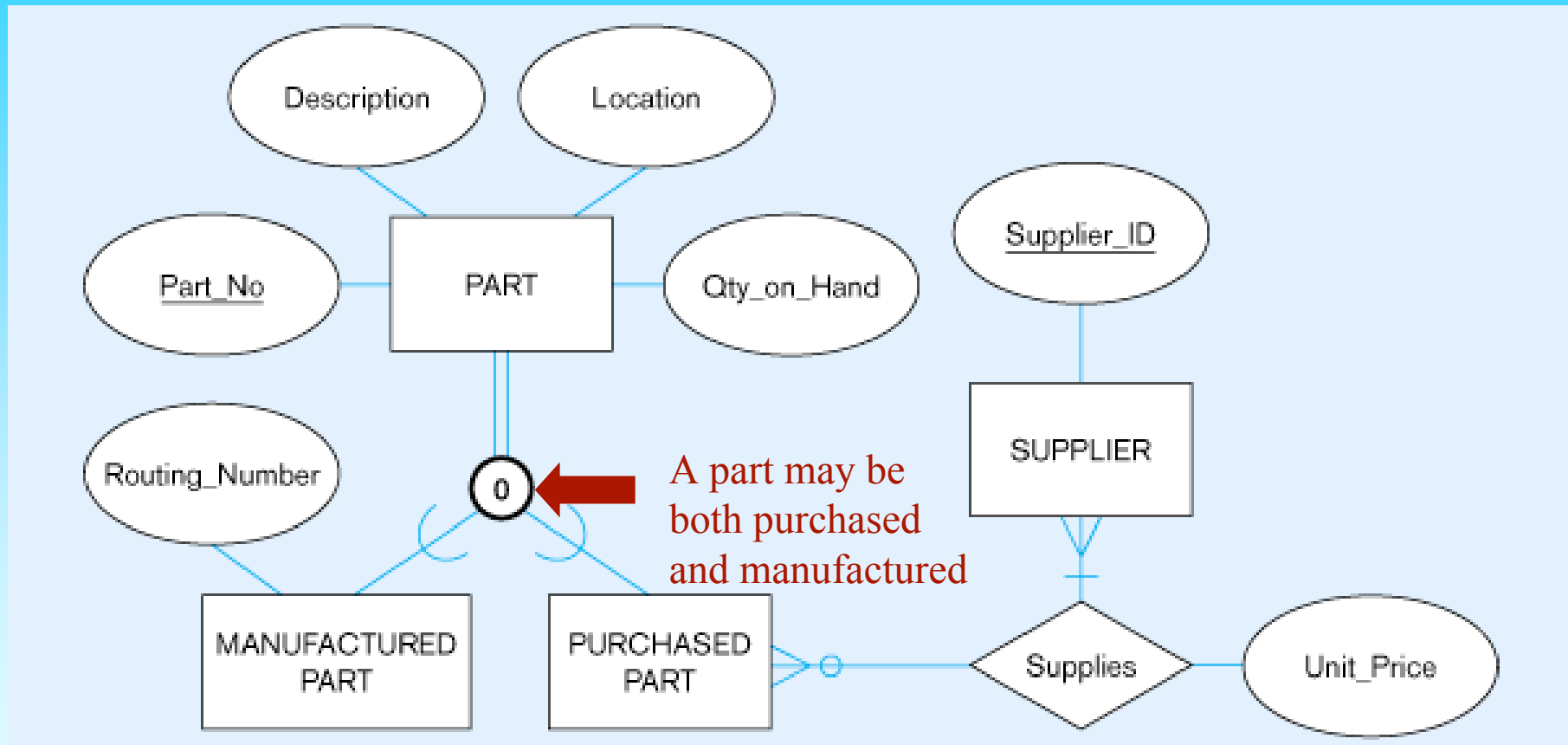


Figure 4-7b Overlap rule



Constraints in Supertype/ Subtype Discriminators

- **Subtype Discriminator**: An attribute of the supertype whose values determine the target subtype(s)
 - **Disjoint** – a *simple* attribute with alternative values to indicate the possible subtypes
 - **Overlapping** – a *composite* attribute whose subparts pertain to different subtypes. Each subpart contains a boolean value to indicate whether or not the instance belongs to the associated subtype

Figure 4-8 – Introducing a subtype discriminator (*disjoint* rule)

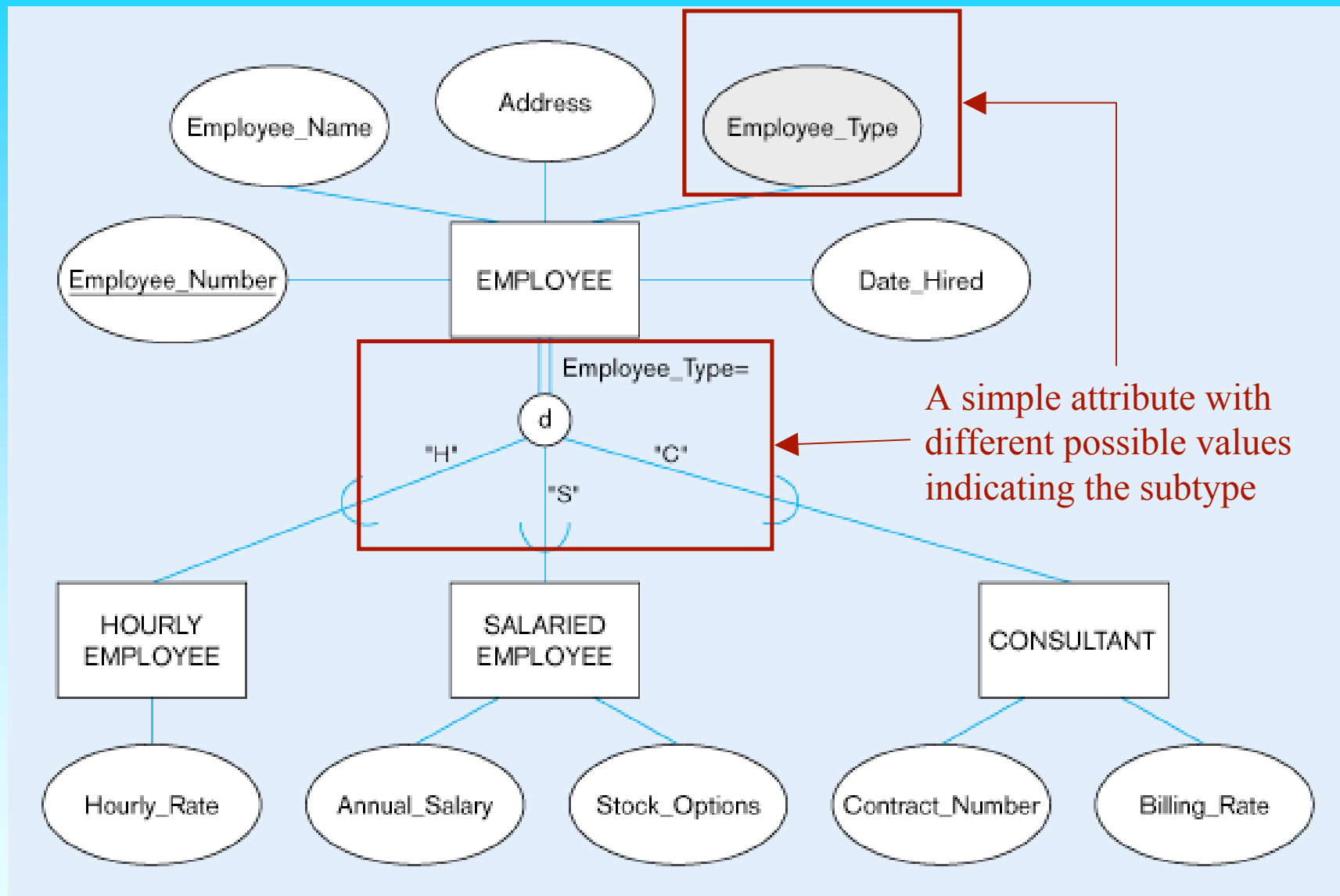


Figure 4-9 – Subtype discriminator (**overlap** rule)

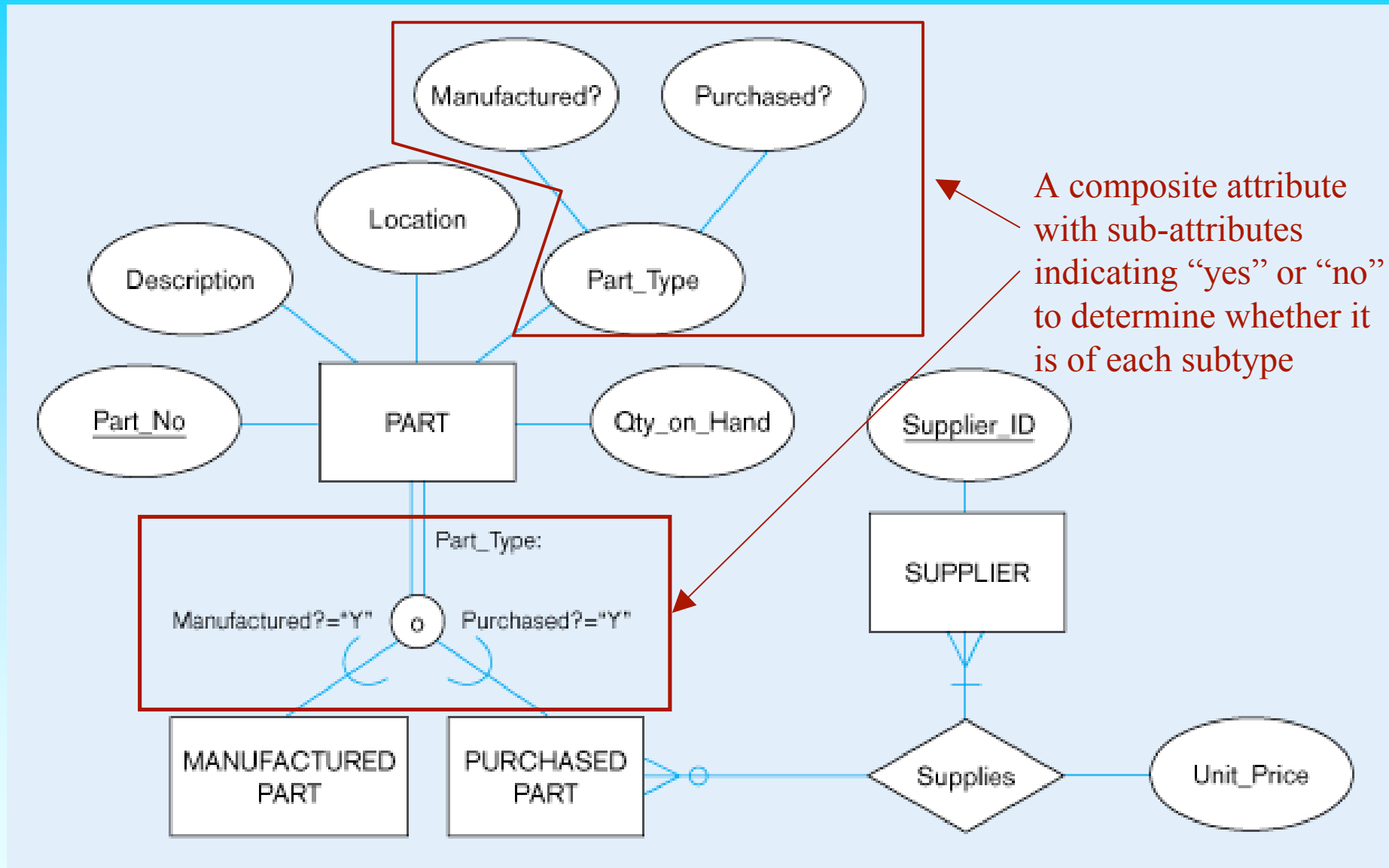
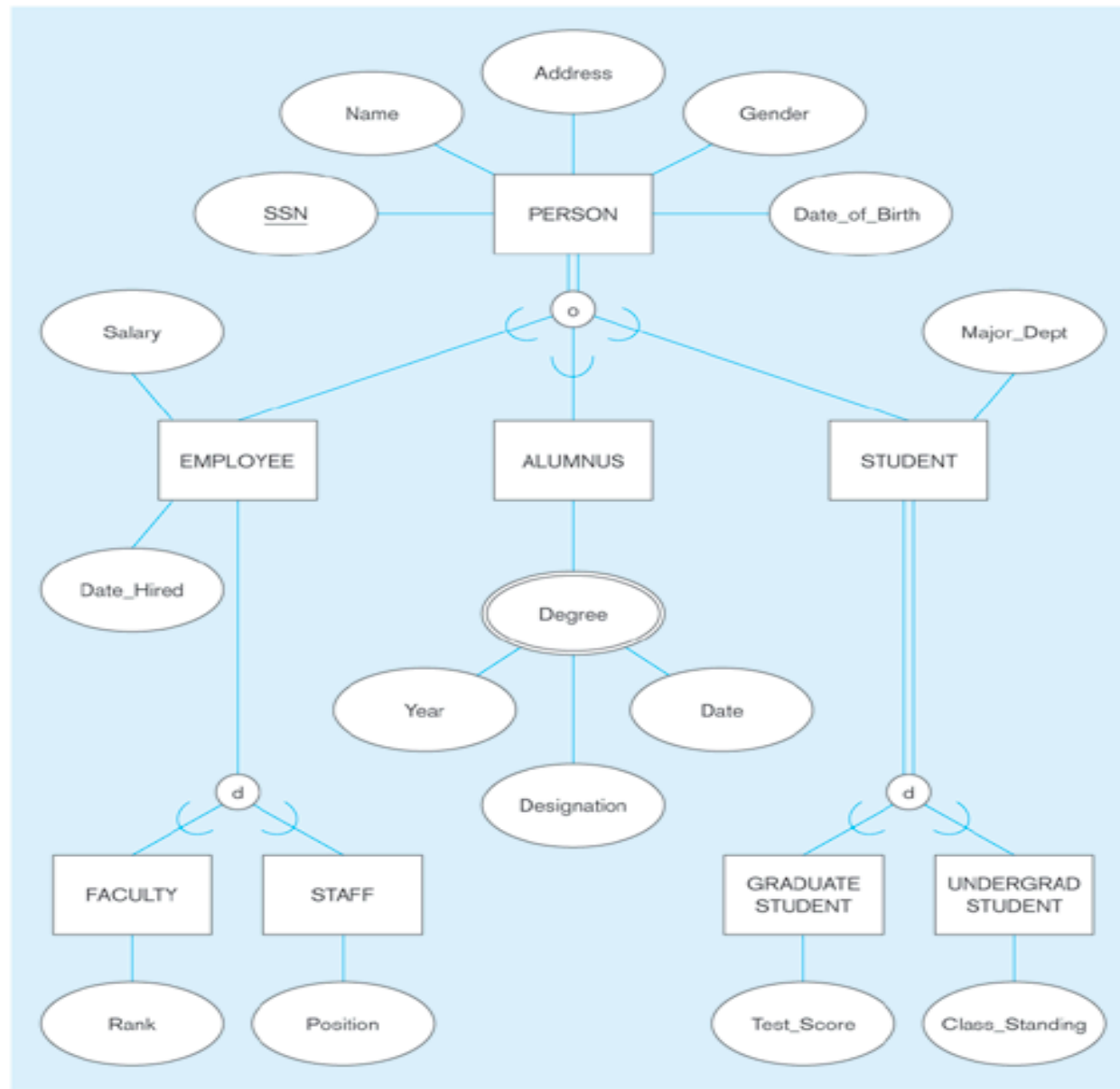


Figure 4-10 Example of supertype/subtype hierarchy



Entity Clusters

- EER diagrams are difficult to read when there are too many entities and relationships
- Solution: group entities and relationships into ***entity clusters***
- **Entity cluster**: set of one or more entity types and associated relationships grouped into a single abstract entity type

Figure 4-13a – Possible entity clusters for Pine Valley Furniture

Related groups of entities could become clusters

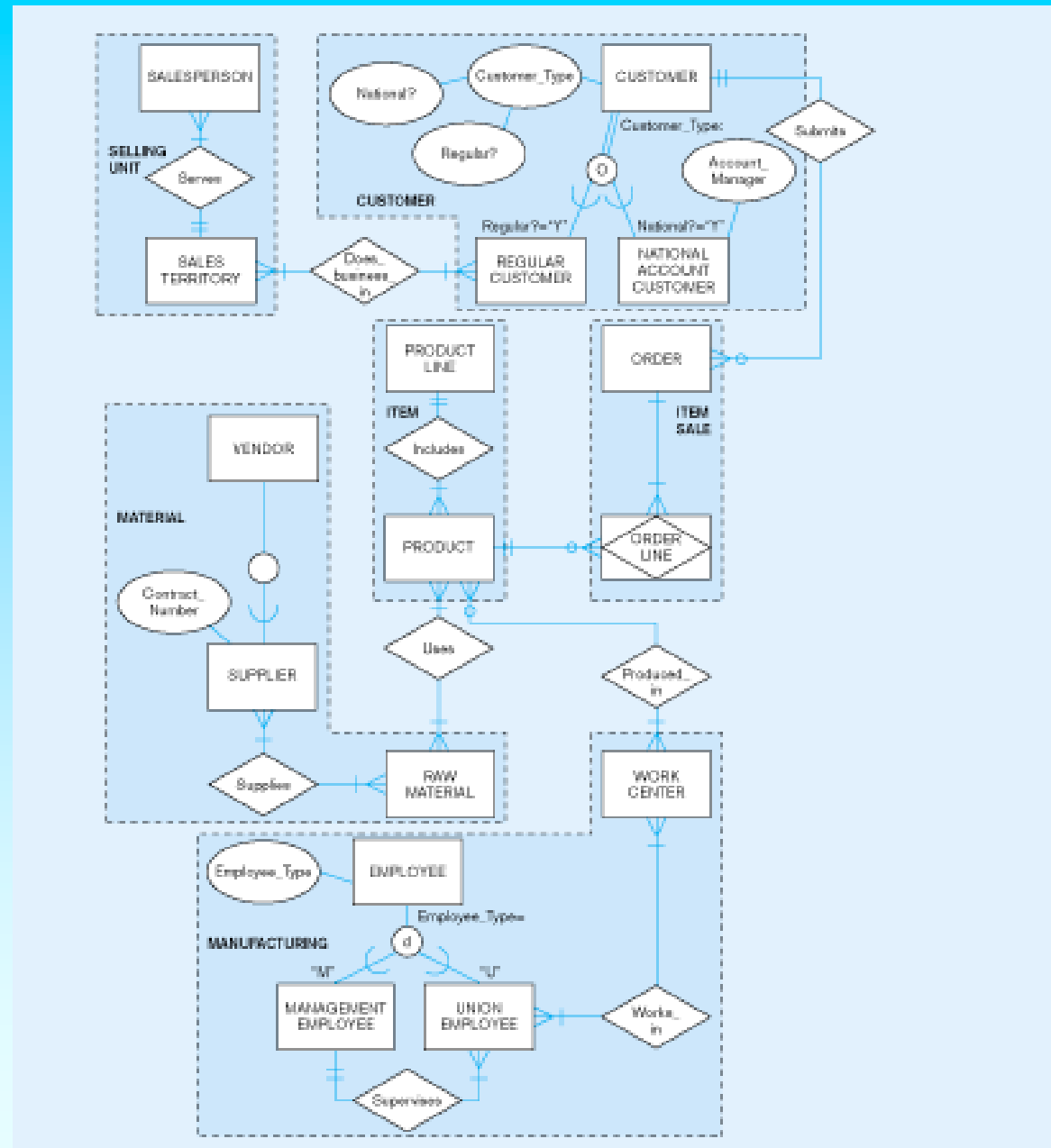


Figure 4-13b – EER diagram of PVF entity clusters

