

# Enhanced Entity Relationship Model (EERM)

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- **Complex applications**

DB for engineering and manufacturing

- Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Software Engineering (CASE)

telecommunications, images and graphics, data mining, data warehouse, multimedia applications

⇒ **require additional “semantic” modelling concepts**

- **Outline**

- subclasses, superclasses, inheritance
- Specialisation/Generalisation
- Lattice (multiple inheritance, shared subclass)
- Union type (categories, categorisation)

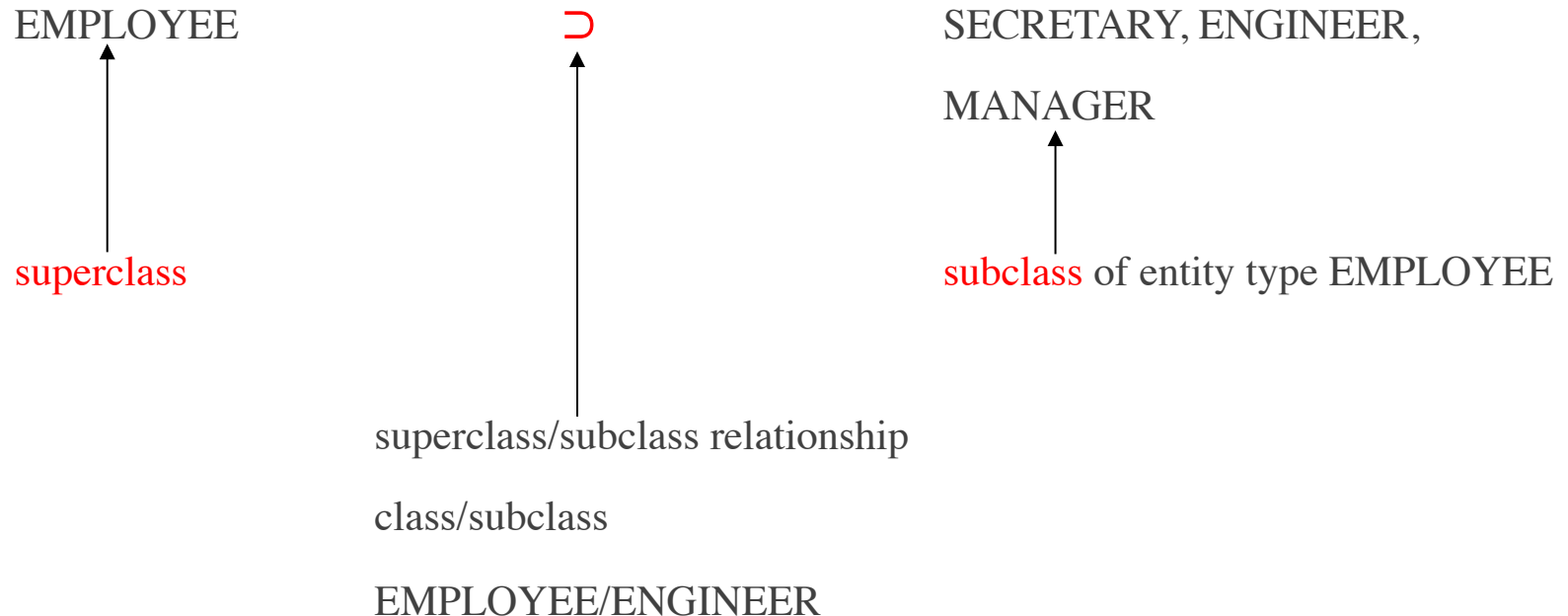
# EERM and Object-oriented Modelling

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- OOM:
  - Class hierarchy: inheritance
  - Types and classes
  - Methods
- EERM:
  - How to model the OOM concepts in ERM?
  - How to map EERM to relational (logical) model!?

# Subclasses and Superclasses of Entity Types

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- Each member of subclass is a member of its superclass
- Not all elements in superclass need to be in a subclass

# Type Inheritance

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- Subclass entities inherit attributes/relationships of superclass entity

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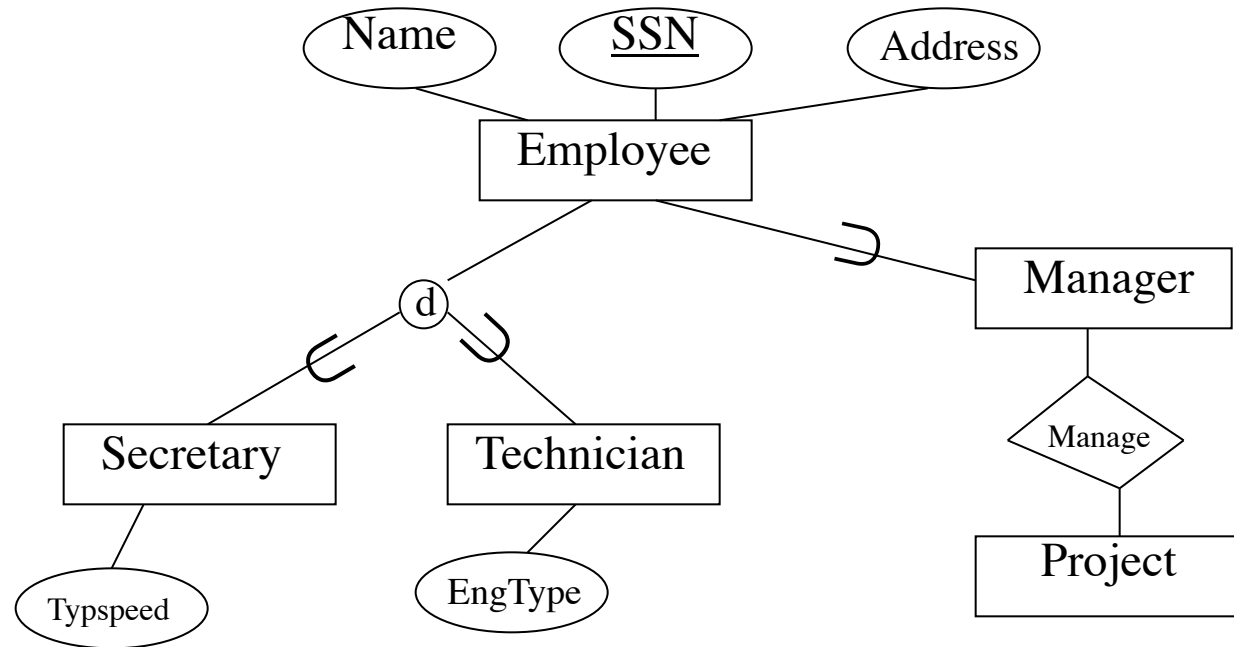
- Own specific (local) attributes/relationships
  - Avoid describing similar concepts more than once
  - Add more semantic information to design

# Specialisation [1]

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- Process of maximising the difference between members of an entity by identifying their distinguishing characteristics
- **Top-down approach**
  - Define a set of subclasses for an entity type (the superclass)
  - Establish attributes specific to subclasses
  - Establish additional relationships specific to subclasses

# Specialisation [2]



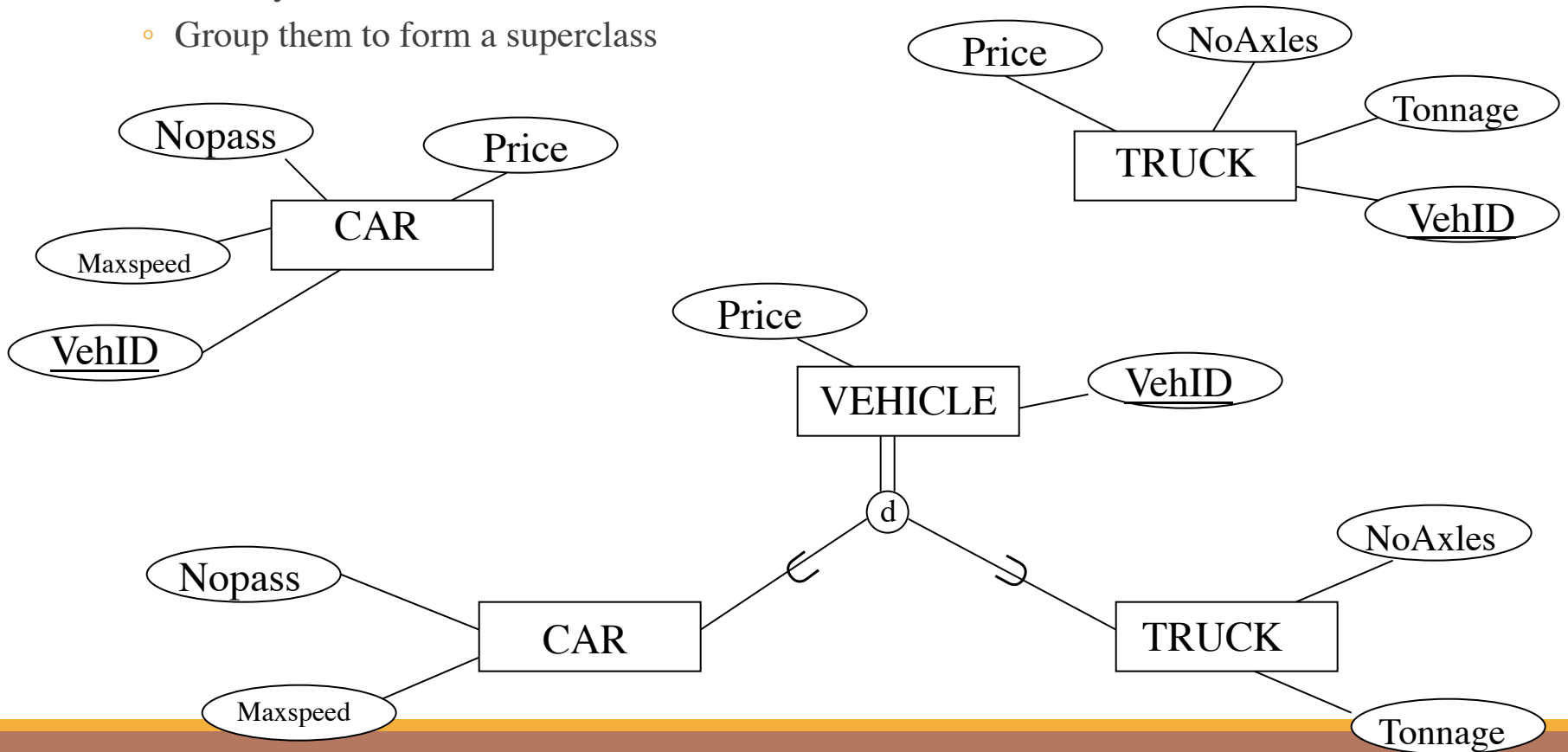
C: superclass/subclass relationship

EngType: specific or local attribute

Manage: specific relationship to “Manager”

# Generalisation

- Suppress difference among a number of entity types
  - Identify common features
  - Group them to form a superclass

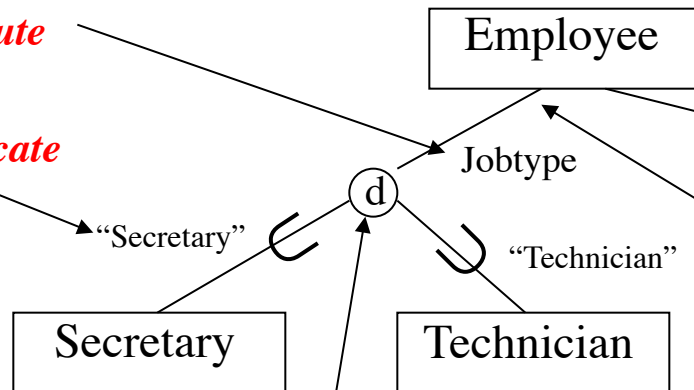


# Constraints and Characteristics of Specialisation [1]

## attribute-defining specialisation

*defining attribute*

*defining predicate*



## user-defined specialisation

*partial specialisation*

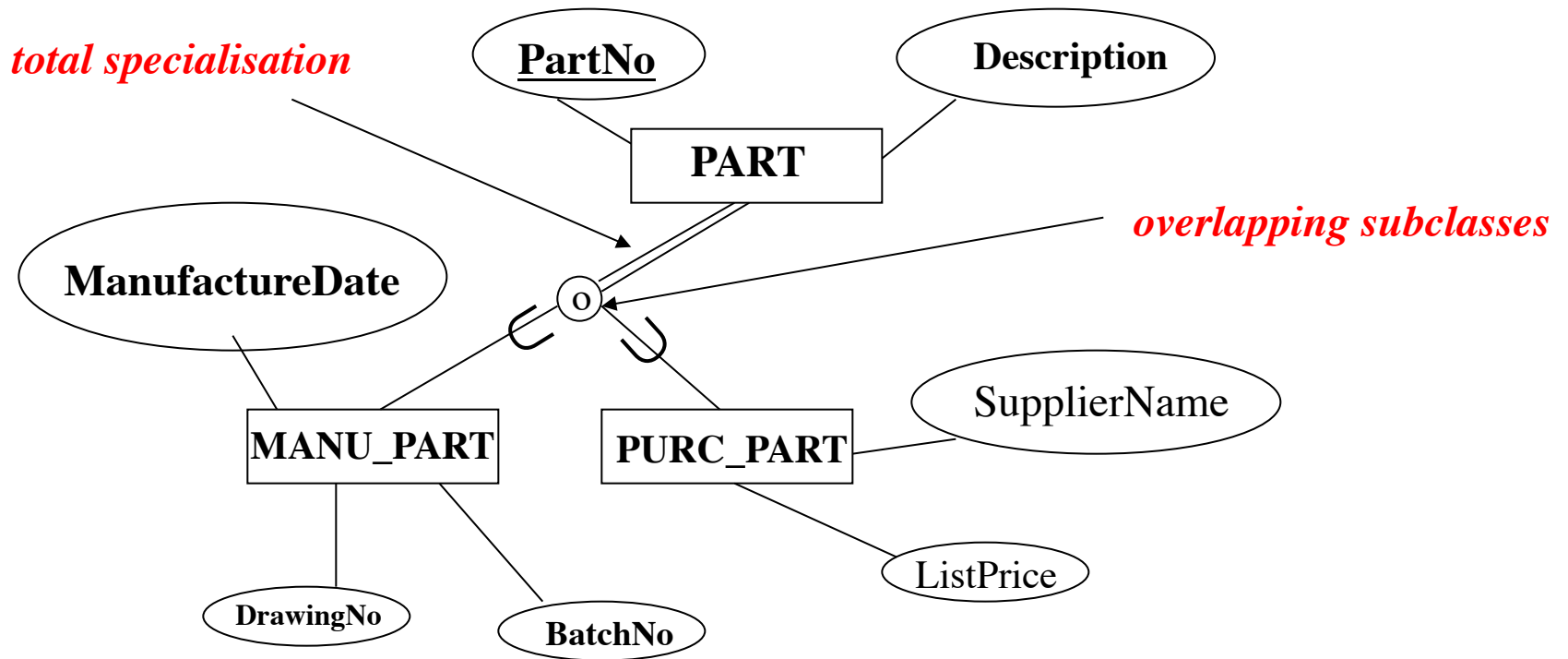
*disjointness constraint*

*predicate-defined (or condition-defined) subclass*



# Constraints and Characteristics of Specialisation [2]

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# Constraints and Characteristics of Specialisation [3]

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- **Four possible constraints**

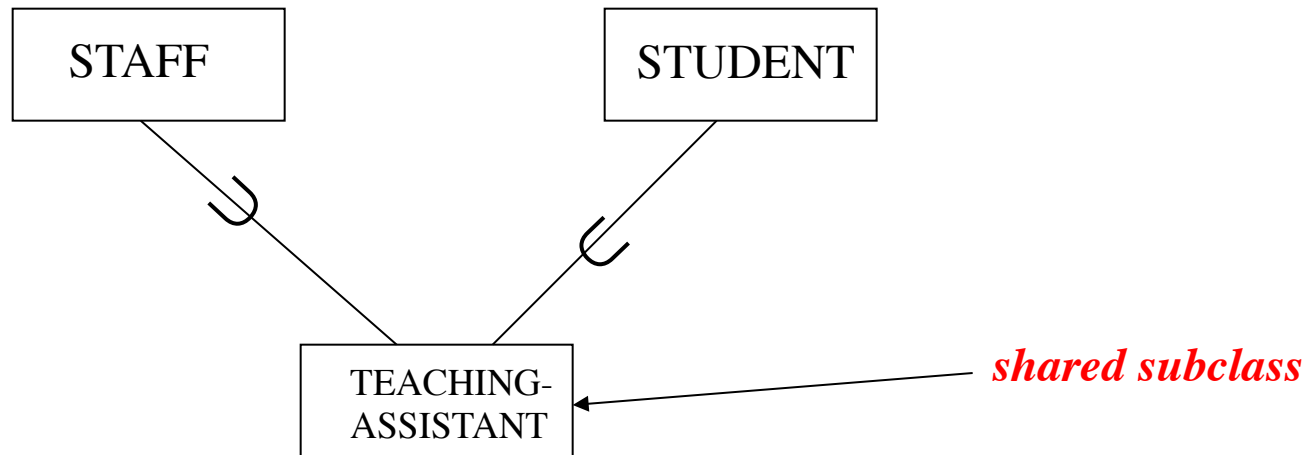
- Disjoint total: must be in exactly one of the subclasses
- Disjoint partial: ...
- Overlapping total: ...
- Overlapping partial: ...

- **Implications**

- delete entity in a superclass  $\Rightarrow$  must be deleted in all subclasses
- insert entity in superclass  $\Rightarrow$  automatic insertion for predicate-defined subclasses
- insert entity in superclass of total specialisation  $\Rightarrow$  entity must be inserted in at least one subclass
- ...

# Specialisation/Generalisation Lattice

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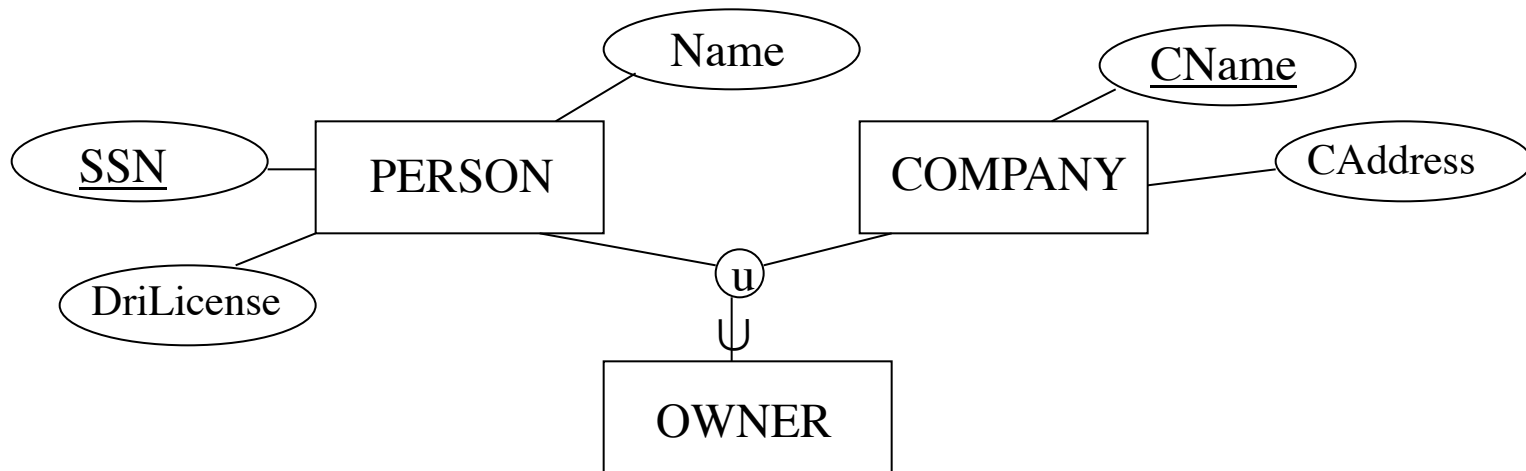


“A teaching assistant is both a staff member and a student”

- Multiple inheritance: subclass with more than one superclass
- Same attributes inherited from several superclasses appear only once in subclass

# Union Type (Category)

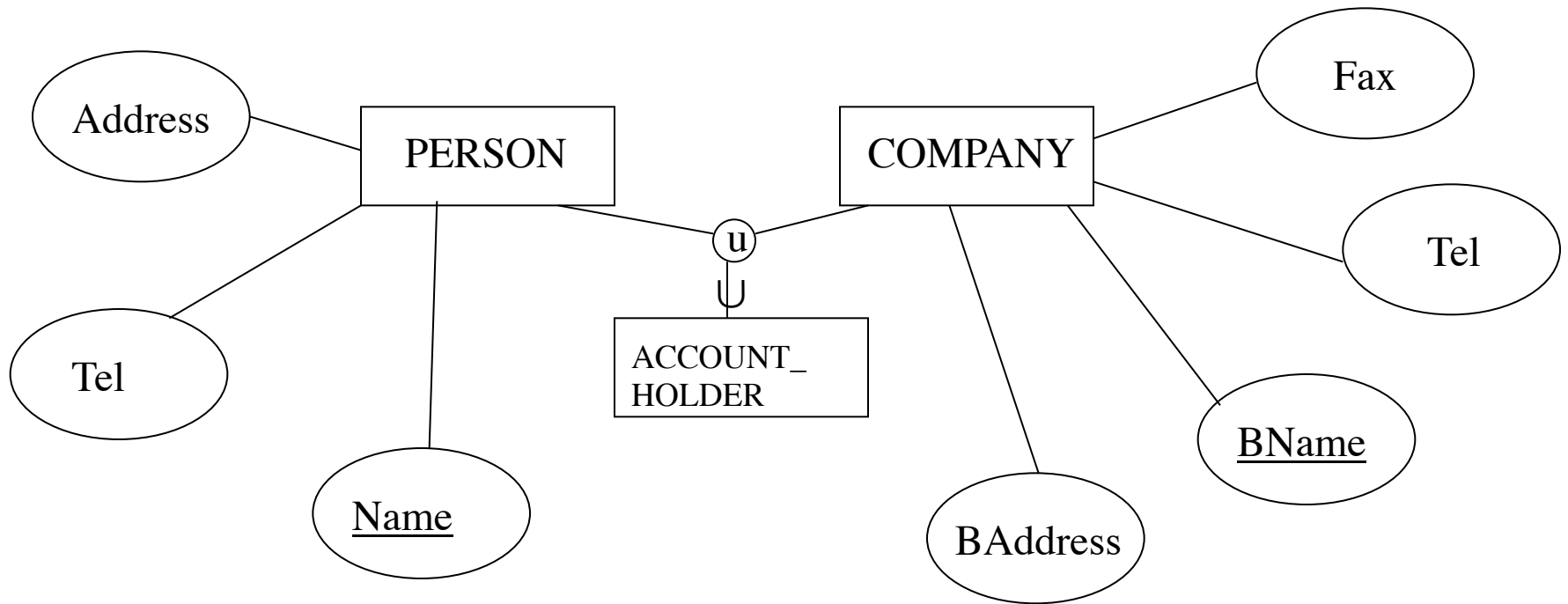
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- Class/subclass relationship with more than one superclass
- OWNER is a category
  - An entity OWNER belongs to PERSON or COMPANY ( $\Rightarrow$  union)
- OWNER is not a shared subclass ( $\Rightarrow$  intersection)
- **Selective inheritance:**
  - OWNER inherits attributes of PERSON or COMPANY

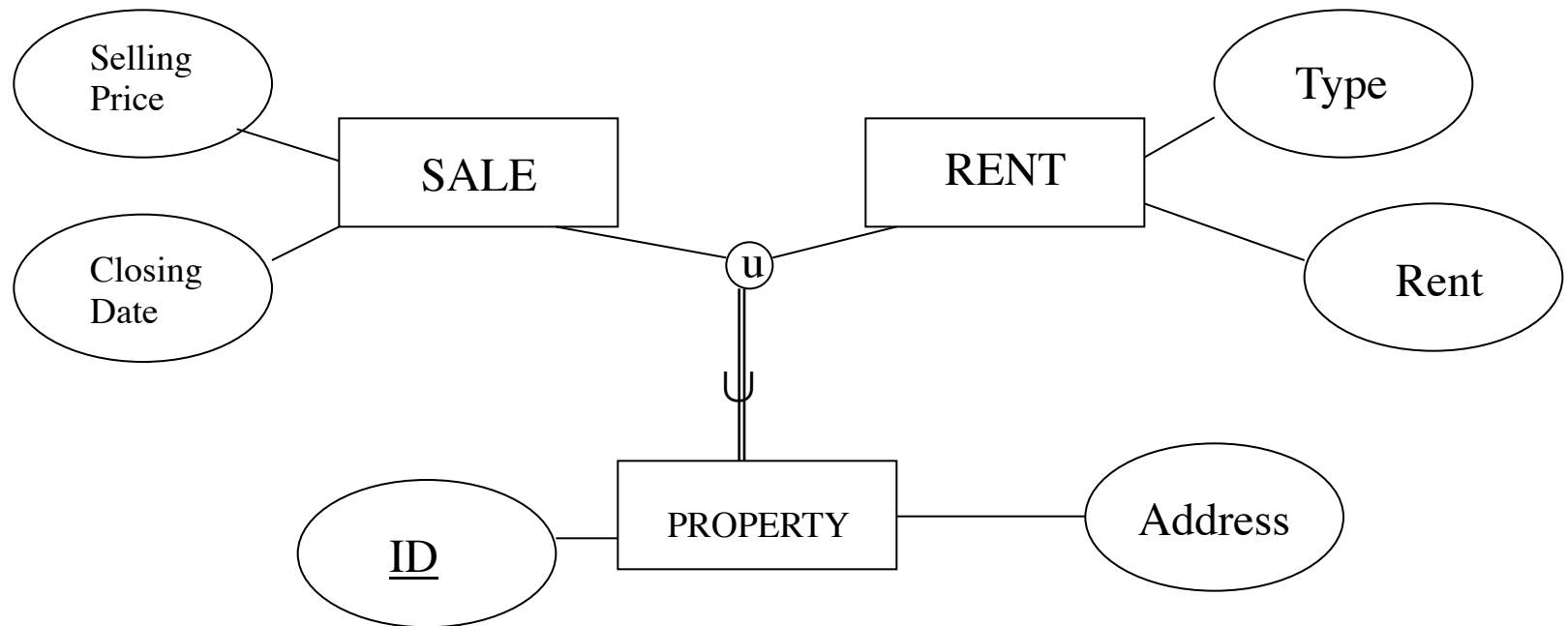
# Partial Category

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# Total Category

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- Every occurrence of superclass must appear in the category
- Better represented as specialisation (share many attributes and keys)

# Summary

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- Specialisation and Generalisation: relationship between entity types
- Constraints
  - disjoint total
  - disjoint partial
  - overlapping total
  - overlapping partial
- Multiple inheritance: shared subclass (intersection)
  - inherits from all of the superclasses
- Union type (Category)
  - subclass with more than one superclass
  - inherits from one of the superclasses
  - total and partial