THE ENHANCED ER (EER) MODEL

CHAPTER 8 (6/E)

CHAPTER 4 (5/E)

WHY EER?

- Extends the ER model
- Created to design more accurate database schemas
  - Reflect the data properties and constraints more precisely
  - Address more complex requirements

LECTURE OUTLINE

- Subclasses, Superclasses, and Inheritance
- Specialization and Generalization

SPECIALIZATION AND INHERITANCE

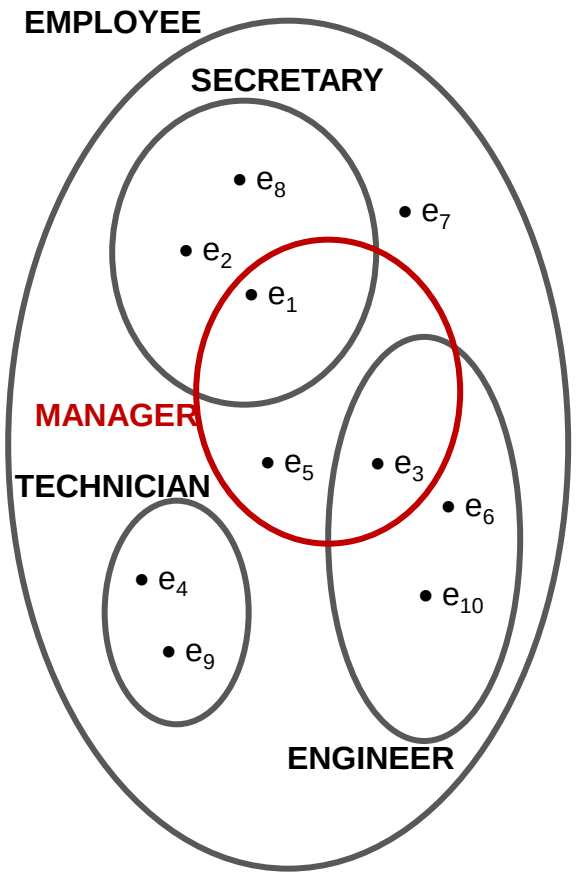
- **Specialization**
  - Process of defining a set of subclasses of an entity type
  - Defined on the basis of some distinguishing characteristic of the entities in the superclass
- Subclass can define:
  - Specific attributes
  - Specific relationship types
- Subclass can be a subclass w.r.t. more than one superclass

- **Type inheritance**
  - Subclass entity has all attributes and participates in all relationships of superclass
  - **Multiple inheritance** if more than one superclass

GENERALIZATION

- **Generalization**
  - Process of defining a more general entity type from given entity types
- Reverse process of specialization
- Generalize into a single superclass
  - Original entity types are specialized subclasses

SPECIALIZED ENTITIES



- Every technician/secretary/engineer is an employee
- Not every employee of superclass must be in a subclass
- All properties of employee (attributes *and* relationships) are inherited by specialized subclasses
- Specialized entities might have additional attributes and might be involved in additional relationships
- Subclasses may be **disjoint** or **overlapping**

CONSTRAINTS ON SUBCLASSES

- **Disjointness constraint**
  - Specifies that the subclasses of the specialization must be disjoint
- **Completeness constraint** (or **totalness constraint**)
  - Specifies that every superclass entity must be in a subclass

- Disjointness and completeness are *independent* constraints
  - i.e., four cases are possible
    - Disjoint and total
    - Disjoint and partial
    - Overlapping and total
    - Overlapping and partial

EER DIAGRAM WITH SUBCLASSES

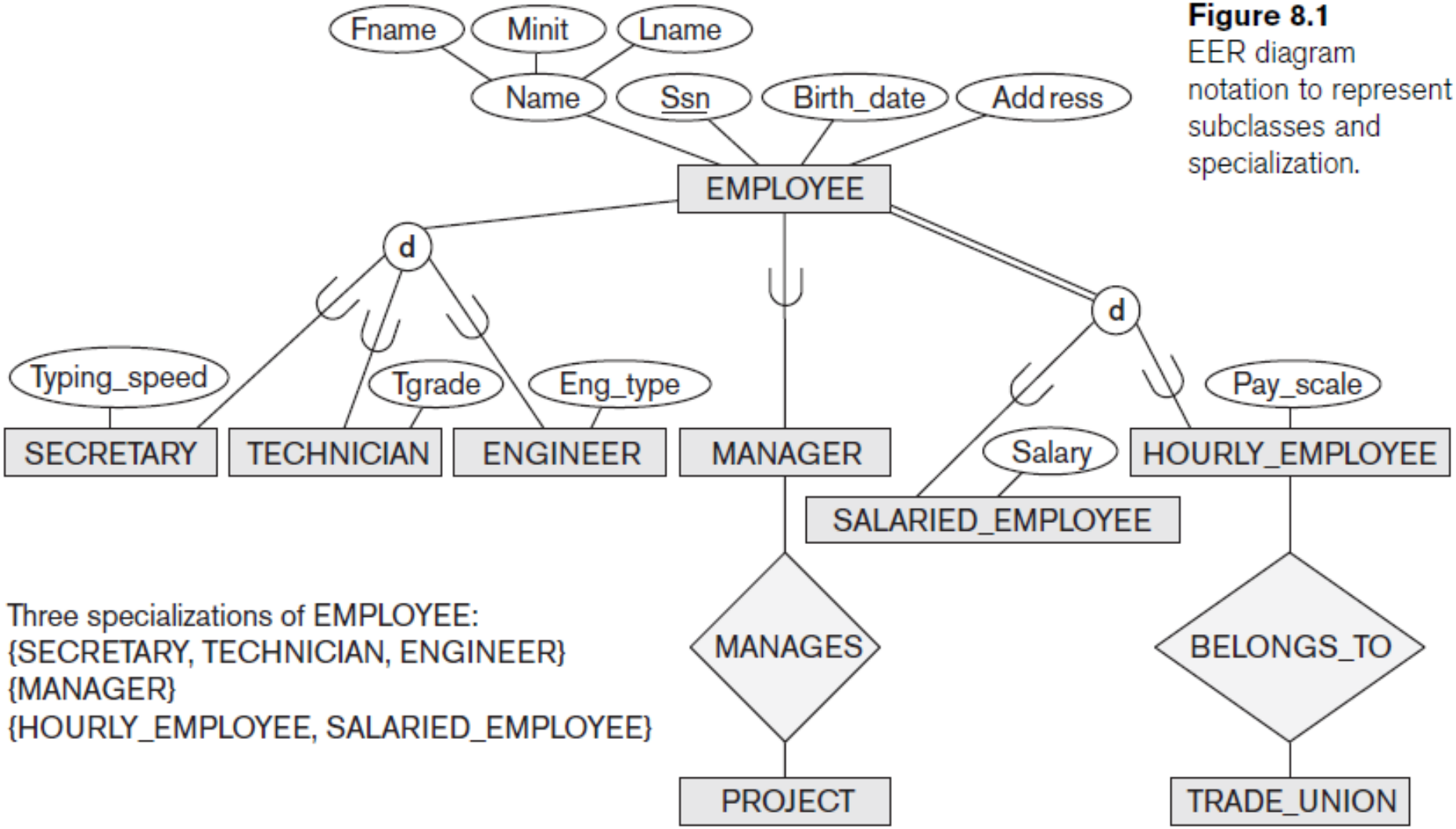


Figure 8.1
EER diagram notation to represent subclasses and specialization.

Three specializations of EMPLOYEE:
{SECRETARY, TECHNICIAN, ENGINEER}
{MANAGER}
{HOURLY_EMPLOYEE, SALARIED_EMPLOYEE}

REFINING CONCEPTUAL SCHEMAS

- Using specialization
  - Starting with entity type, define subclasses by successive specialization
  - **Top-down conceptual refinement**

- Using generalization
  - Starting with entity type, define superclasses by successive generalization
  - **Bottom-up conceptual synthesis**

DESIGN CHOICES

- Many specializations/generalizations can be defined to make the conceptual model more accurate
  - Constrain as disjoint/overlapping or total/partial as needed
  - Driven by rules in mini-world being modeled
- If all the subclasses of a specialization/generalization have few specific attributes and no specific relationships
  - Can be merged into the superclass *C*
  - Include in *C* one or more “type” attributes that specify the (virtual) subclasses to which each entity belongs

LECTURE SUMMARY

- Enhanced ER or EER model
  - Extensions to ER model that improve its representational capabilities
  - Subclass and its superclass