DB Module

NGEE ANN SCHOOL OF INFOCOMM TECHNOLOGY

Enhanced ER Modelling (Part 2)

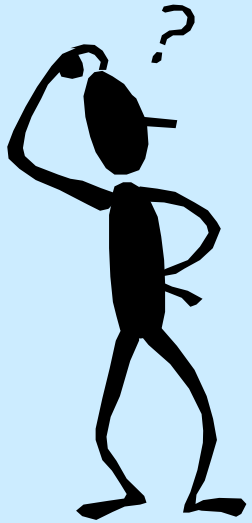
Databases

Day 3

Prepared by Staff of School of ICT

Topics

- Entity-Relationship Model
  - Subclass and Superclass
  - Specialisation and Generalisation



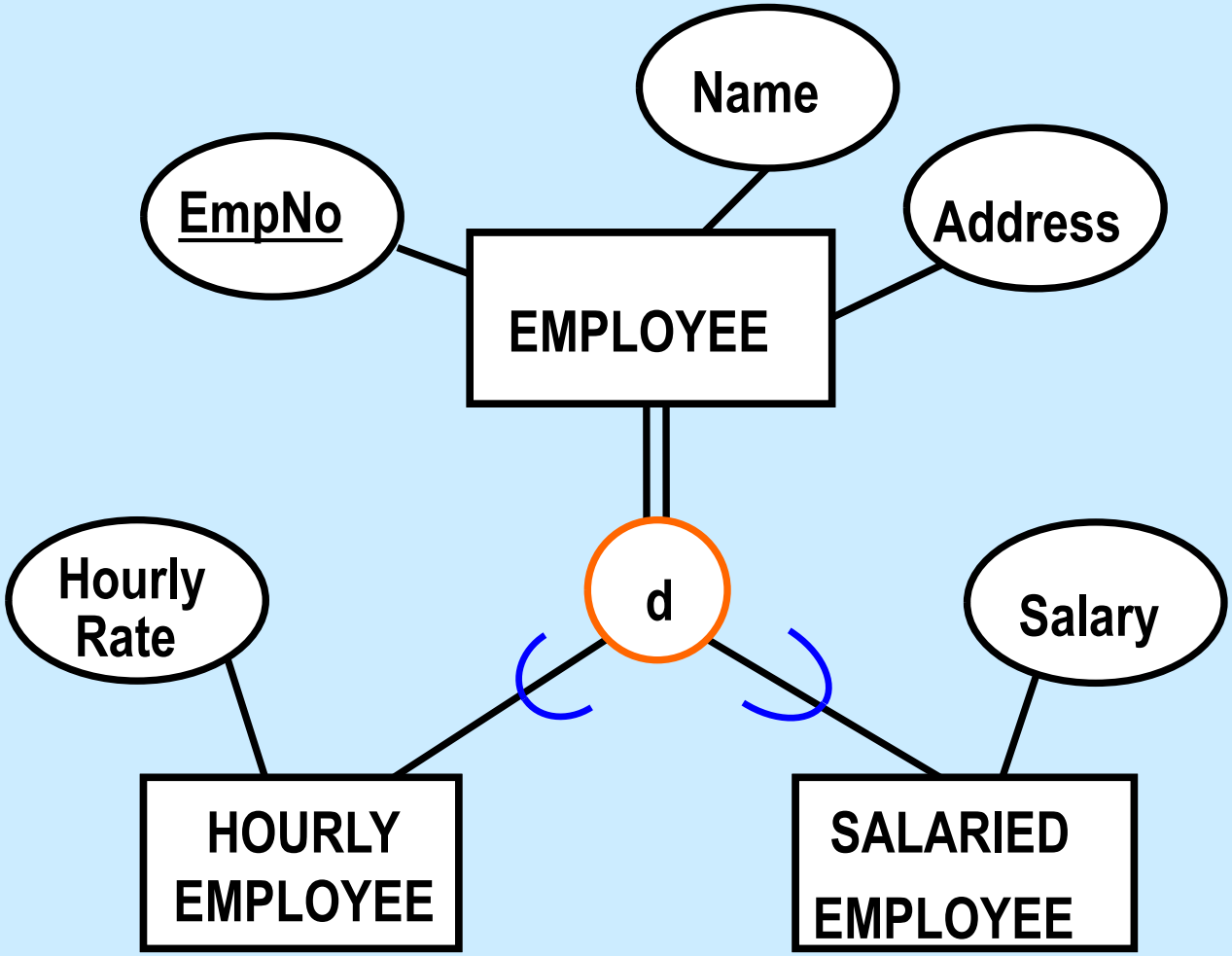
Enhanced

E-R Model

Enhanced E-R Model (EER Model)

- Enhanced E-R Model includes the concept of:
  - Subtype (or *subclass*) and Supertype (or *superclass*).
  - Specialisation.
  - Generalisation.
  - Inheritance.

EER Model: Supertype and Subtype

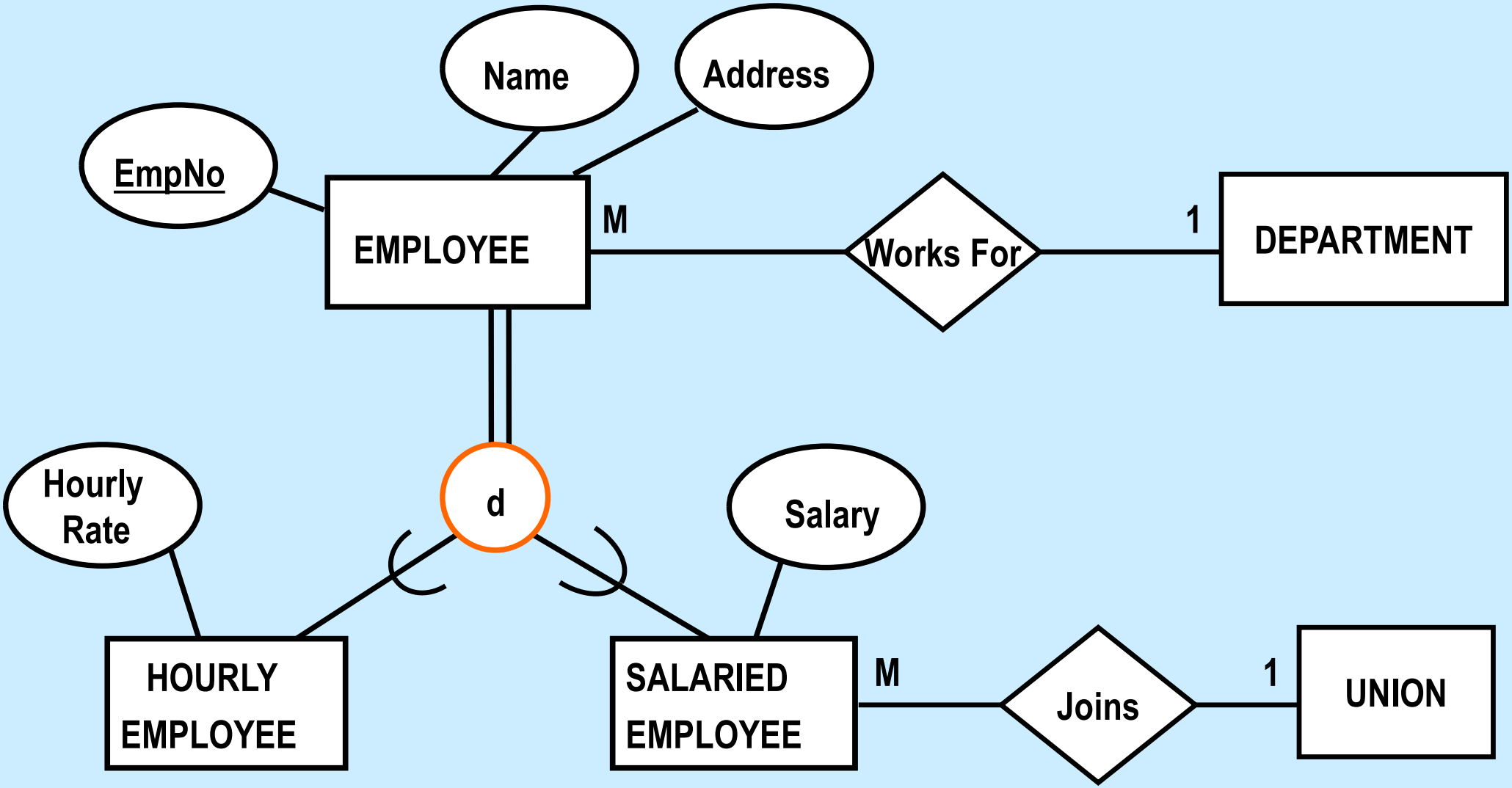


SUPERTYPE is a generic entity that can be subdivided into subtypes.
EMPLOYEE is the supertype for each of the subtypes.

SUBTYPE is a subset of a supertype that shares common attributes or relationships distinct from the other subsets.
HOURLY EMPLOYEE and SALARIED EMPLOYEE are subtypes of EMPLOYEE.

Take note of the HORSE-SHOE symbols used on subtypes.

EER Model: Supertype and Subtype



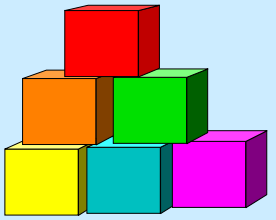
EER Model: Subtype

- Subtype is useful because certain specific *attributes* may apply to some, but not to all entities of the supertype.
  - Salary attribute is associated with SALARIED EMPLOYEE only.
- Also, some specific *relationships* may be associated only with the subtype.
  - Only SALARIED EMPLOYEE entity participates in the relationship Joins.

EER Model: Subtype

- An entity of a subtype inherits all the attributes of the entity of the supertype. This is known as Attribute Inheritance.
  - HOURLY EMPLOYEE and SALARIED EMPLOYEE Entities inherit the primary key EmpNo as well as other attributes Name and Address of its supertype, EMPLOYEE.
- The entity of a subtype also inherits all the relationships in which the supertype participates.
  - HOURLY EMPLOYEE and SALARIED EMPLOYEE Entities also inherit the relationship Works For with DEPARTMENT Entity.

EER Model: Specialisation



- **Specialisation is the process of defining a set of subtypes of an entity; this entity is known as the supertype of the specialisation.**
  - **HOURLY EMPLOYEE and SALARIED EMPLOYEE entity are defined as subtypes of the EMPLOYEE entity.**
- **The set of subtypes is defined on the basis of some distinguishing characteristics or relationships.**

EER Model: Specialisation

- Additional specific attributes are usually associated with the subtypes to distinguish it from the supertype entity and other subtype entity.
  - HOURLY EMPLOYEE entity has an attribute HourlyRate.
  - SALARIED EMPLOYEE entity has an attribute Salary.
- Additional specific relationships may be established between each subtype and other entities or other subtypes.
  - SALARIED EMPLOYEE has additional relationship Joins.

EER Model: Generalisation

- Generalisation is the *reverse* process of abstraction in which we suppress the differences among several entities, identify their common features, and generalise them into a single supertype of which the original entities are special subtypes.
  - Functionally, it is the reverse of specialisation.
- It is the process of defining a generalised entity by identify common characteristics from the given entities.

EER Model: Constraints on Specialisation and Generalisation

- Constraints impose additional conditions on the process of specialisation or generalisation.
- We shall consider 2 types of constraints:

1. Disjoint Constraint
2. Participation Constraint

Disjoint Constraint: Subtypes Are Disjoint

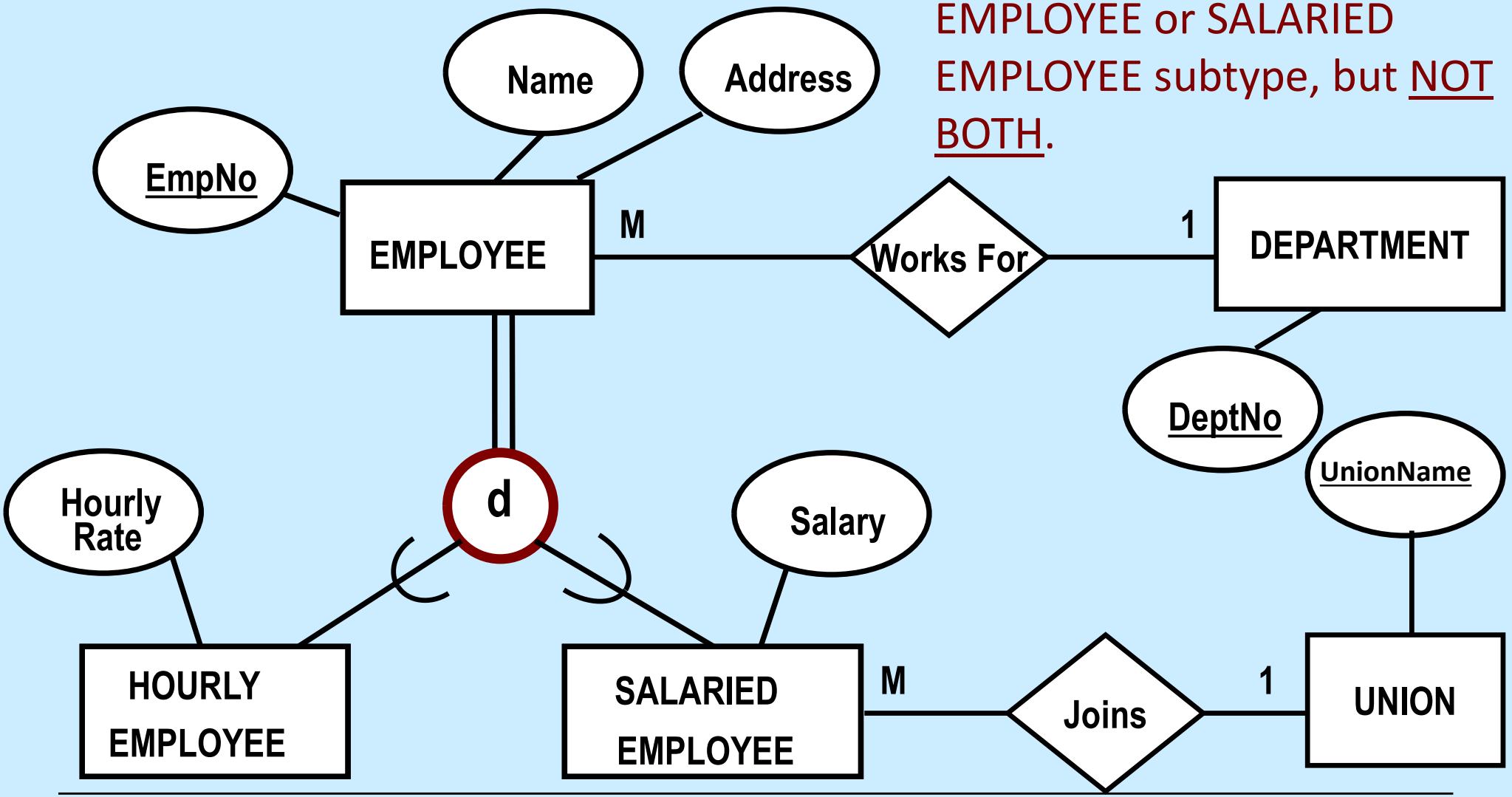
- If subtypes of a specialisation are disjoint, an entity can be a member of at most one of the subtypes of the specialisation.

Notation

The d in the circle is used to represent specialisation with disjoint constraint.

Disjoint Constraint: Subtypes Are Disjoint

An entity is either an HOURLY EMPLOYEE or SALARIED EMPLOYEE subtype, but NOT BOTH.

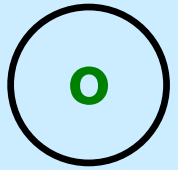


Disjoint Constraint: Subtypes Are Not Disjoint

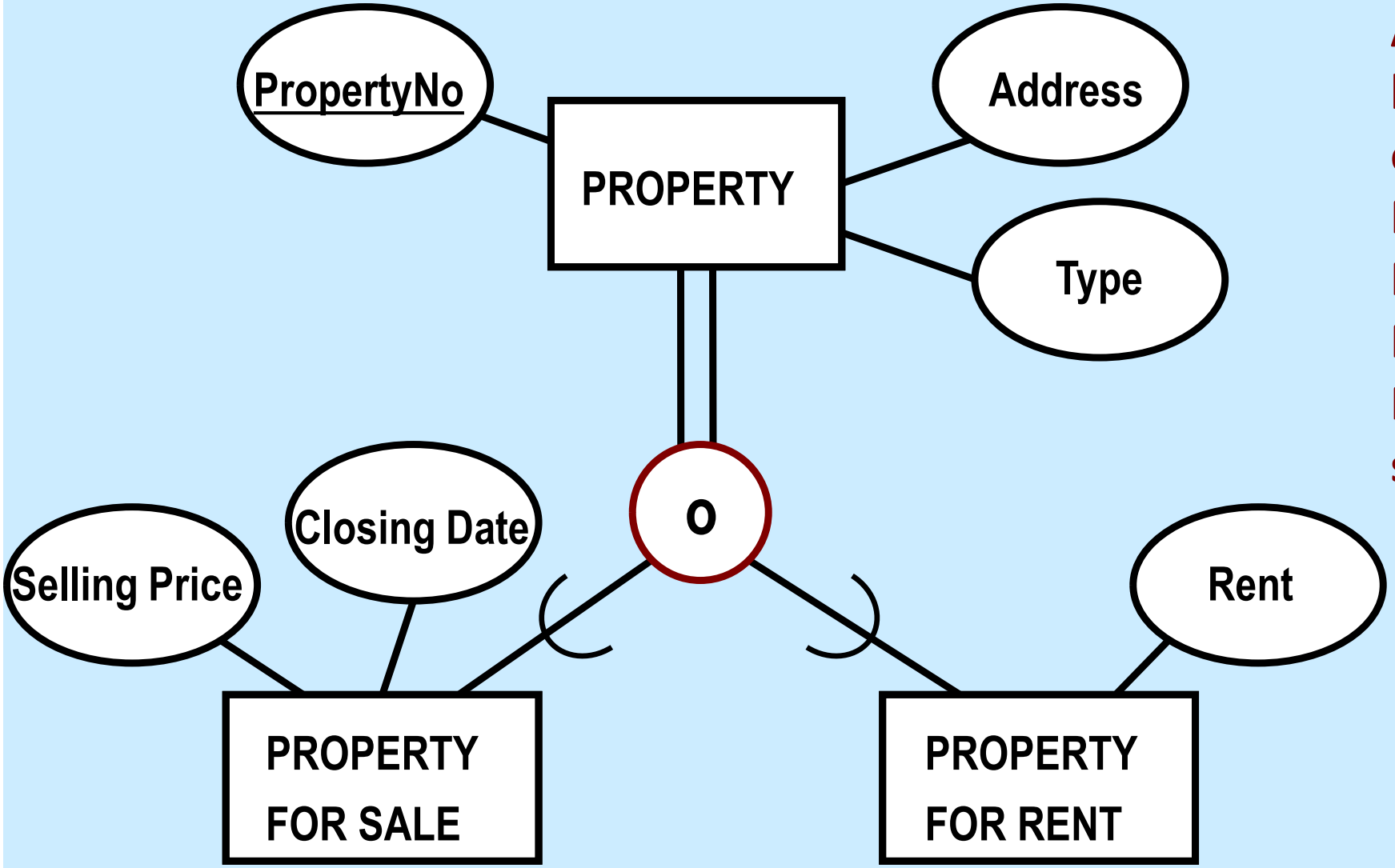
- If the subtypes of a specialisation are not disjoint (OVERLAP), then an entity can be a member of more than one subclass of a specialisation.

Notation

The o in the circle is used to represent specialisation with overlap constraint.

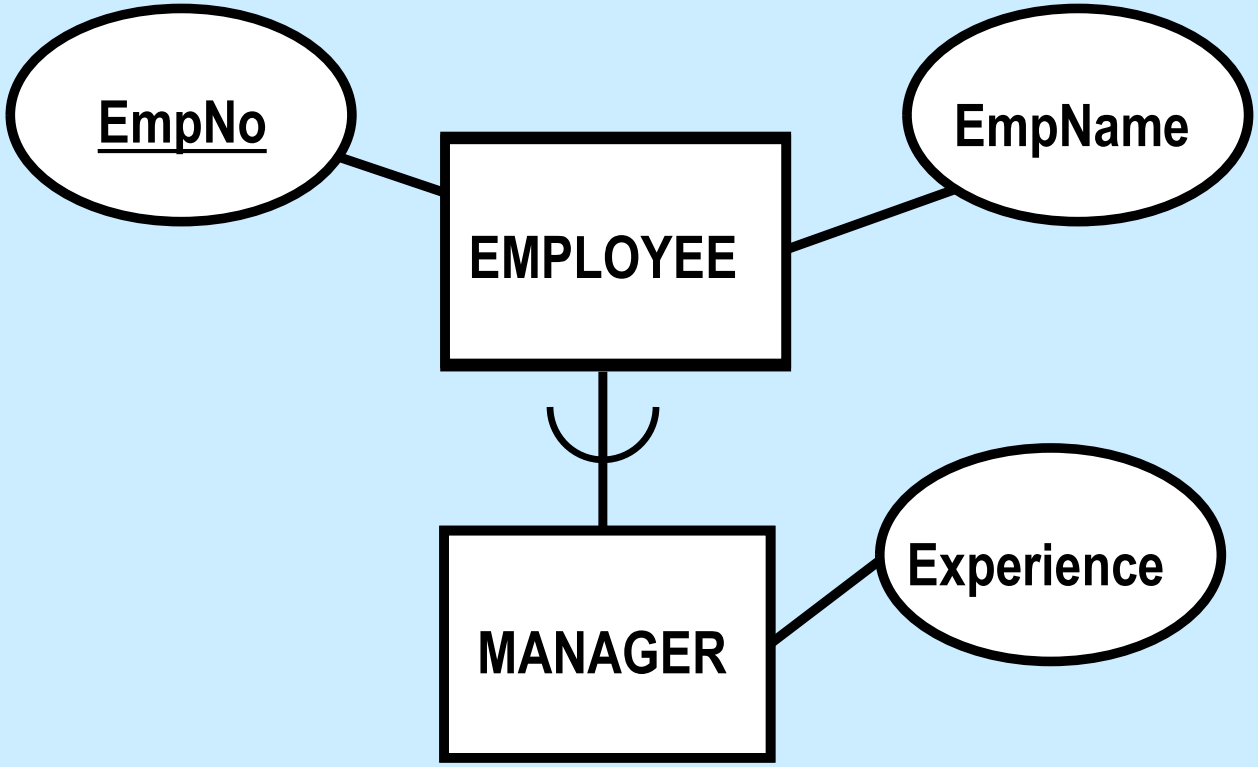


Disjoint Constraint: Subtypes Are Not Disjoint



An entity can be a member of both PROPERTY FOR SALE and PROPERTY FOR RENT subtypes.

Specialisation with one subtype only



Notation

If a specialisation consists of one subtype only, then we do not need to use the d or o in the circle notation. Only the "horse-shoe" symbol is needed to show the specialisation.

Participation Constraint

- Similar in concept to constraint on relationships
- Participation Constraint specifies whether an entity of a supertype must be a member of some subtypes in a particular specialisation.
- There are two types of participation constraints:

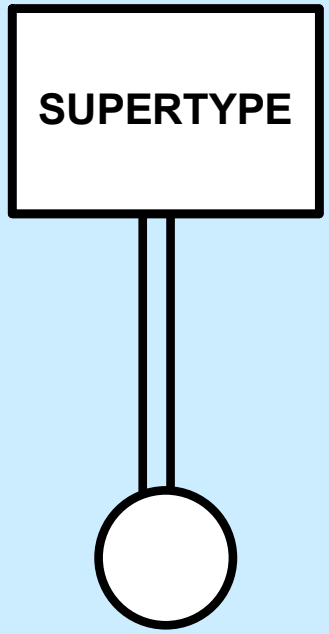
1. Partial Participation
2. Total Participation

Participation Constraint: Total Participation

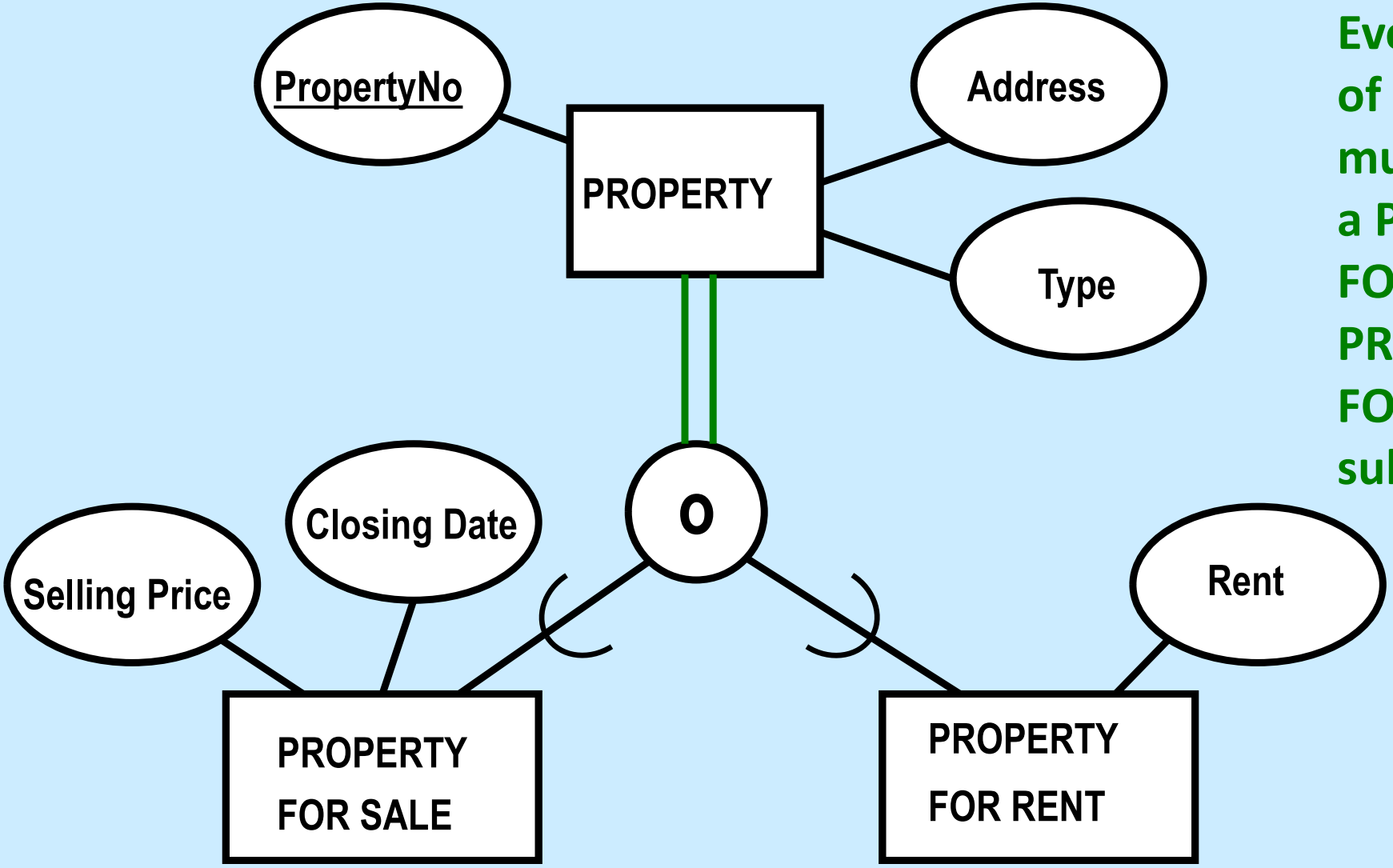
- A specialisation with a Total Participation specifies that every entity in the supertype must be a member of a subtype in the specialisation.

Notation

TOTAL Participation is represented by a double line connecting the supertype to the circle.



Participation Constraint: Total Participation



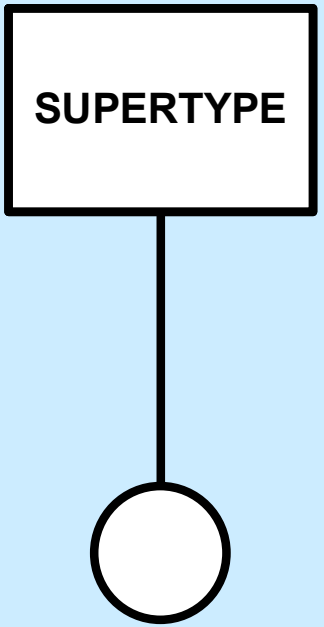
Every member of PROPERTY must be either a PROPERTY FOR SALE or a PROPERTY FOR RENT subtype.

Participation Constraint: Partial Participation

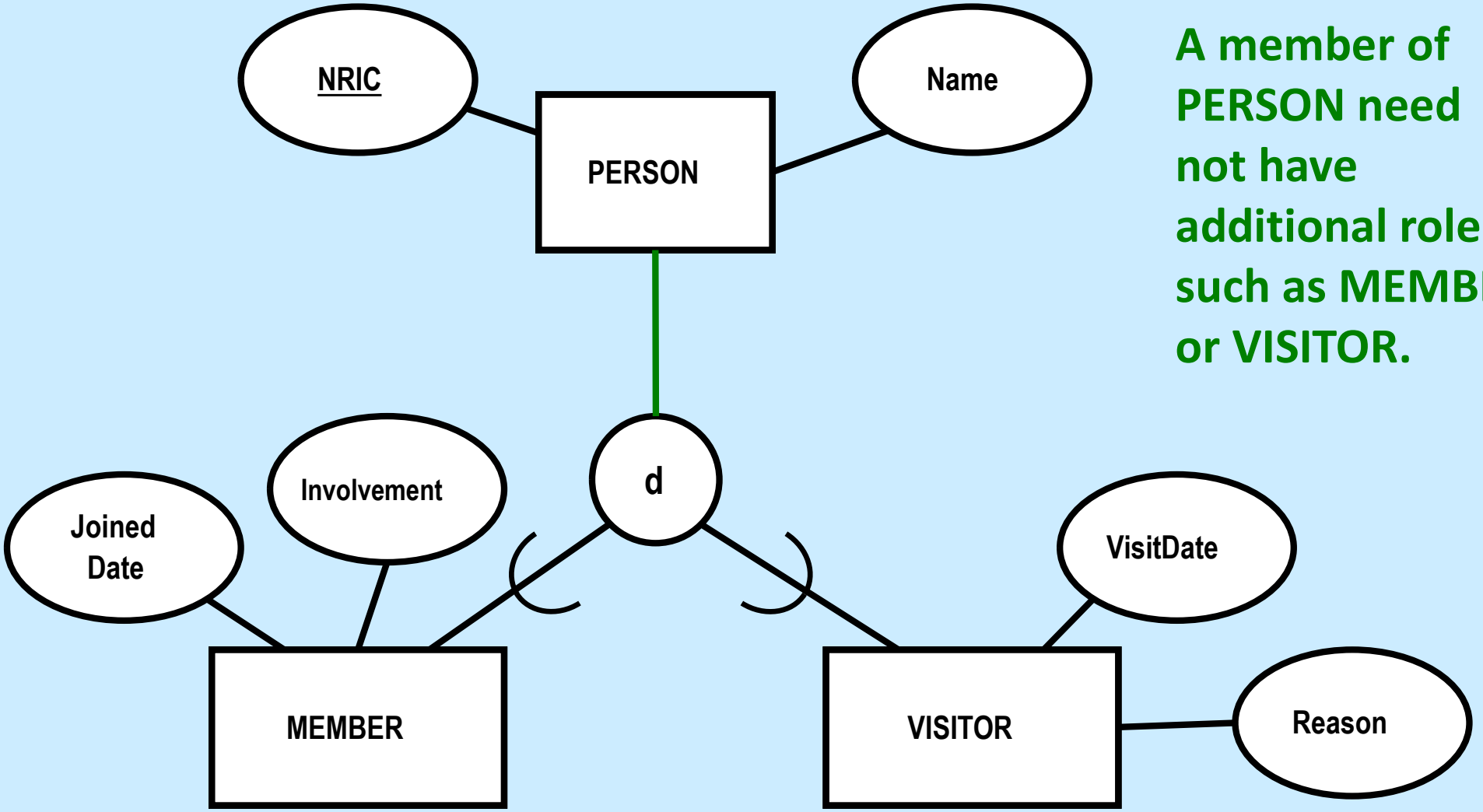
- A specialisation with Partial Participation specifies that an entity needs not belong to any of the subtypes of a specialisation.

Notation

Partial specialisation is represented by a single line connecting the supertype to the circle.



Participation Constraint: Partial Participation



A member of PERSON need not have additional role such as MEMBER or VISITOR.

Constraints on Specialisation and Generalisation

- Based on disjoint and participation constraints, we can have 4 types of specialisation:-
  1. Disjoint, Total
  2. Disjoint, Partial
  3. Overlapping, Total
  4. Overlapping, Partial

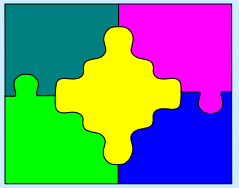
Steps in Building Conceptual Data Model

1) Identify the MAIN ENTITIES in the user's view of the enterprise.
2) Identify the important RELATIONSHIPS that exist between the entities that are already identified.
3) Associate the attributes with the appropriate entity or relationship.
4) Identify the candidate key(s) for each entity. If there is more than on candidate key, choose one to be the primary key.

Steps in Building Conceptual Data Model (Cont...)

5) Identify SUPERTYPE and SUBTYPE, where appropriate.
6) Draw the E-R Model.
7) Review.
8) Iterate.

Summary



- Enhanced E-R Model includes the concept of supertype (or superclass) and subtypes (or subclasses).