CITS1402 Relational Database Management Systems

Week 5—Enhanced Entity Relationship Modeling

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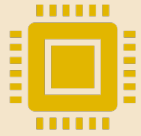
THE UNIVERSITY OF WESTERN AUSTRALIA

CITS1402 Week5

Limitations of basic concepts of the ER model

Specialization/Generalization

Aggregation and Composition

Enhanced Entity-Relationship Model

使用场景：一类实体中，只有部分个体实例需要这个属性

There has been an increase in emergence of new database applications with more demanding requirements.

Basic concepts of ER modeling are not sufficient to represent requirements of newer, more complex applications.

Response is development of additional 'semantic' modeling concepts.

The Enhanced Entity-Relationship Model

语义

Semantic concepts are incorporated into the original ER model and called the Enhanced Entity-Relationship (EER) model.

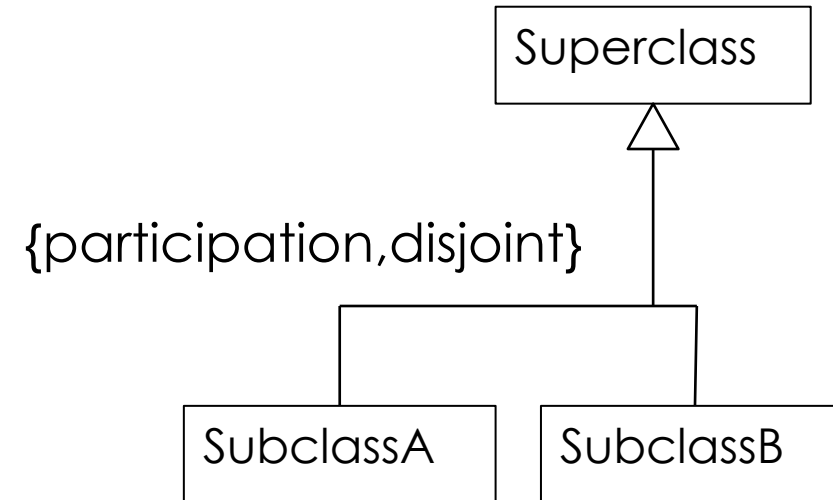**Examples of additional concept of EER model is called specialization / generalization.**

Specialization / Generalization

Superclass

An entity type that includes one or more distinct subgroupings of its occurrences.

Subclass

A distinct subgrouping of occurrences of an entity type.

```
                        ┌─────────────┐
                        │ Superclass  │
                        └─────────────┘
                               △
                               │
        {participation,disjoint}
                    ┌──────────┴──────────┐
              ┌───────────┐         ┌───────────┐
              │ SubclassA │         │ SubclassB │
              └───────────┘         └───────────┘
```

Specialization / Generalization

Superclass/subclass relationship is one-to-one (1:1).

Superclass may contain overlapping or distinct subclasses.

Not all members of a superclass need be a member of a subclass.

- Disjoint constraint

  AND or OR

- Participation constraint

  Mandatory or Optional

Specialization / Generalization

Attribute Inheritance

An entity in a subclass represents same 'real world' object as in superclass

May possess subclass-specific attributes, as well as those associated with the superclass.

Specialization / Generalization

Specialization
Process of maximizing differences between members of an entity by identifying their distinguishing characteristics.
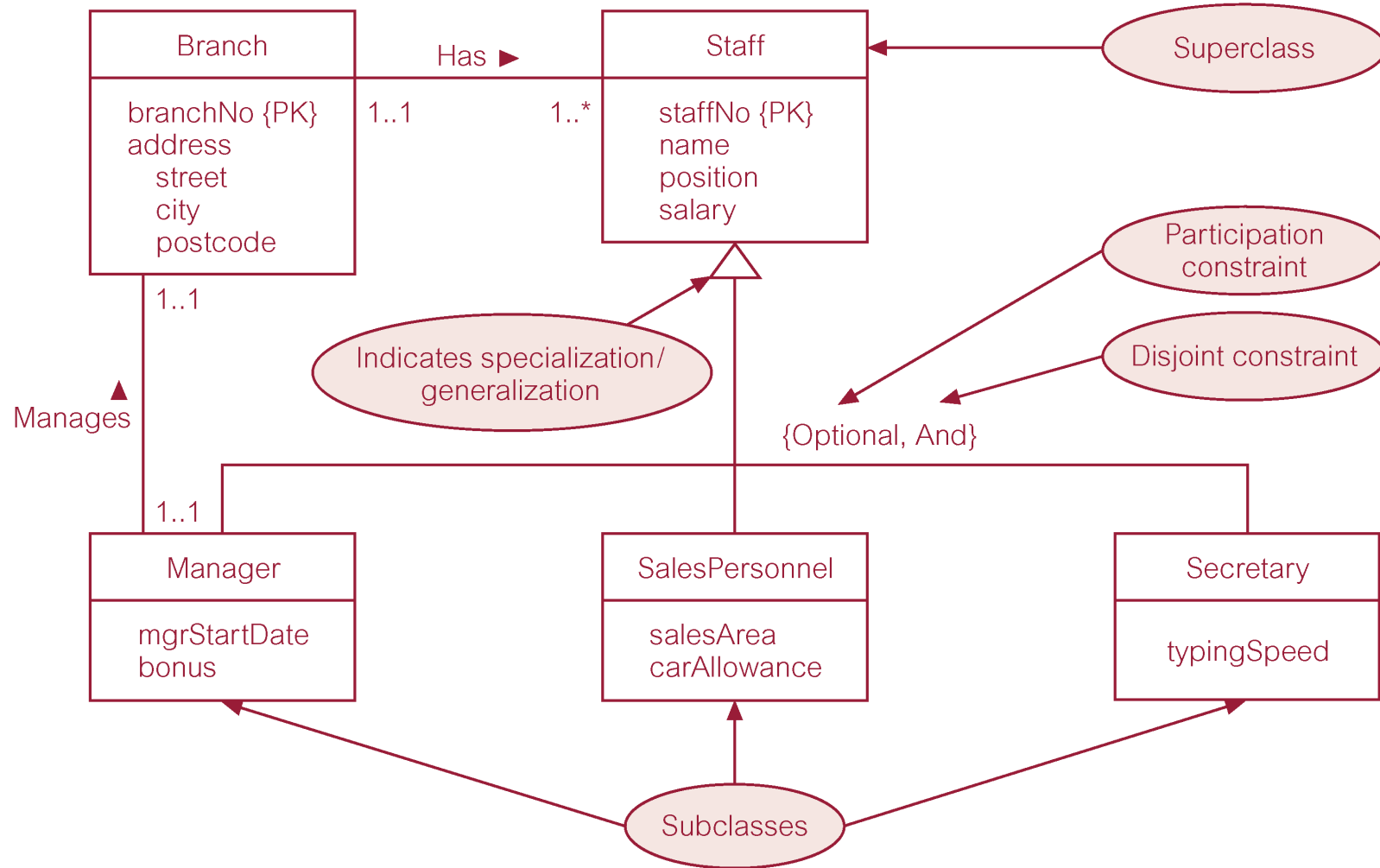
Generalization
Process of minimizing differences between entities by identifying their common characteristics.

AllStaff relation holding details of all staff

|	Attributes appropriate for all staff			Attributes appropriate for branch Managers		Attributes appropriate for Sales Personnel		Attribute appropriate for Secretarial staff
staffNo	name	position	salary	mgrStartDate	bonus	sales Area	car Allowance	typing Speed
SL21	John White	Manager	30000	01/02/95	2000			
SG37	Ann Beech	Assistant	12000					
SG66	Mary Martinez	Sales Manager	27000			SA1A	5000	
SA9	Mary Howe	Assistant	9000					
SL89	Stuart Stern	Secretary	8500					100
SL31	Robert Chin	Snr Sales Asst	17000			SA2B	3700	
SG5	Susan Brand	Manager	24000	01/06/91	2350			

Specialization/generalization of Staff entity into subclasses representing job roles

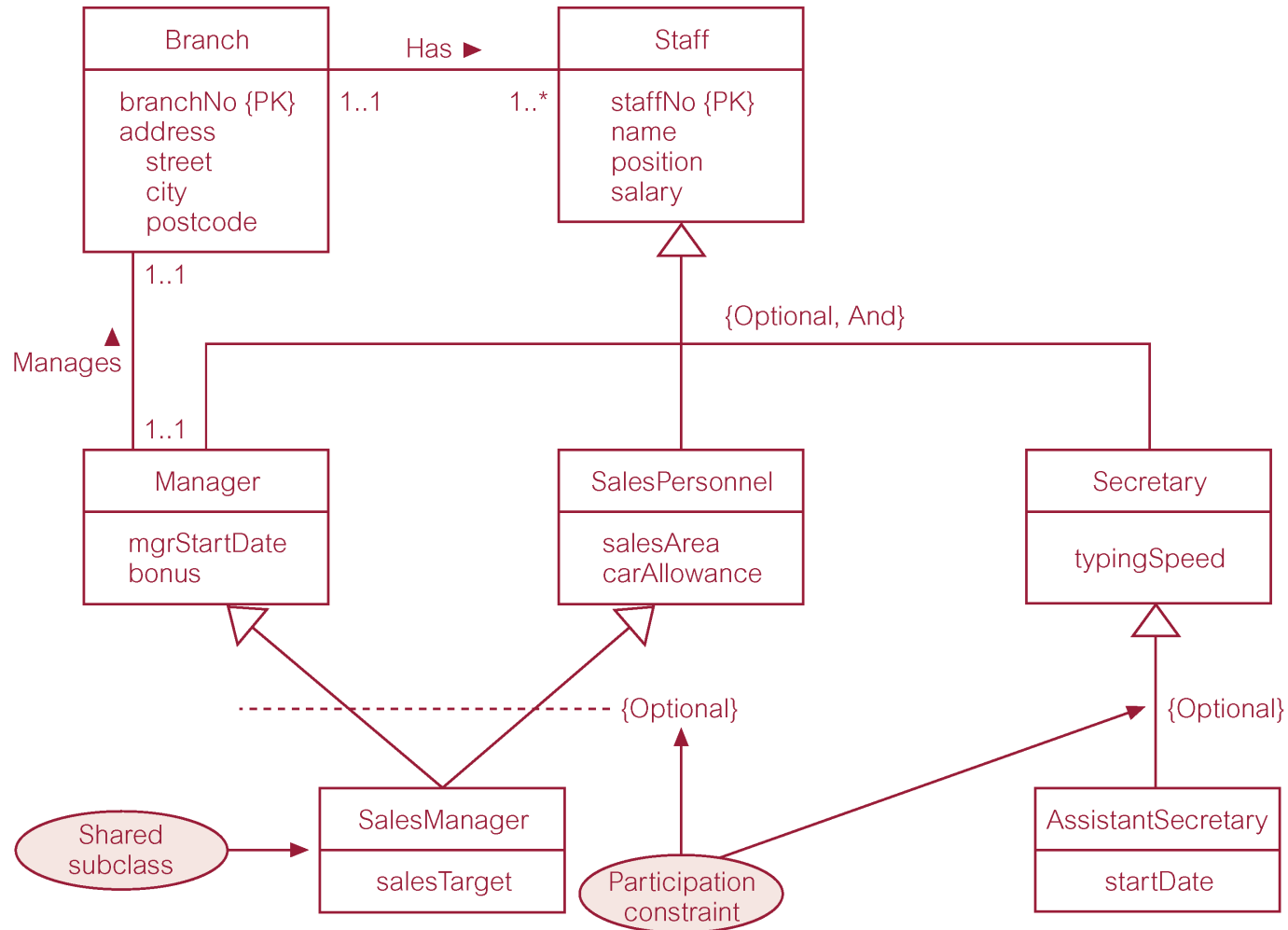# Specialization/generalization of Staff entity into subclasses representing job roles

Specialization/generalization of Staff entity into job roles and contracts of employment

Specialization/generalization of Staff entity into job roles and contracts of employment
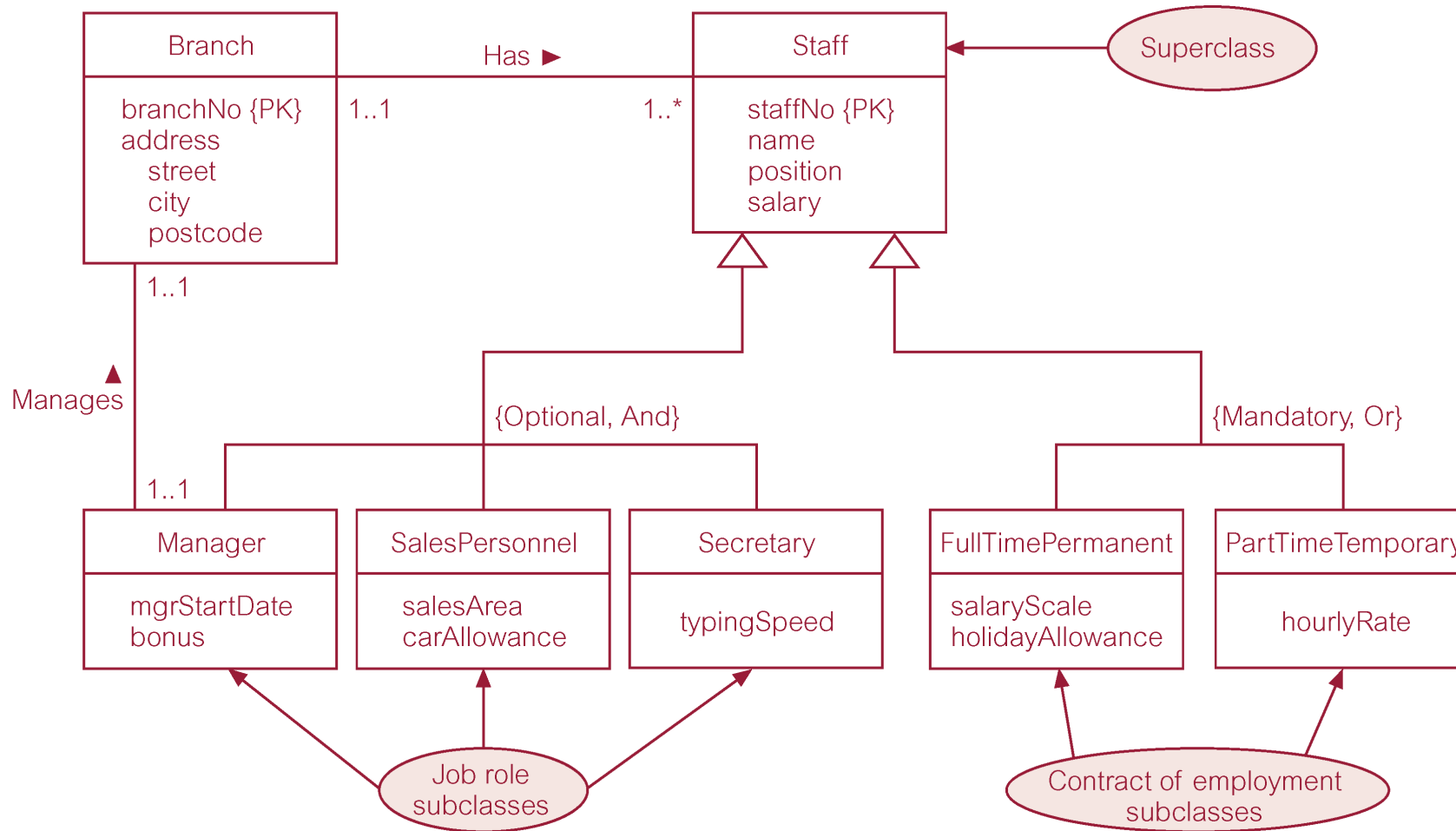
EER diagram with shared subclass and subclass with its own subclass
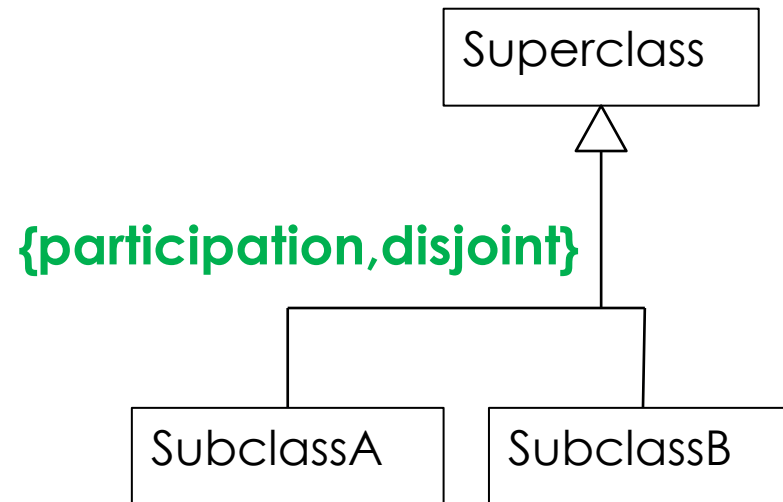
EER diagram with shared subclass and subclass with its own subclass

Constraints on Specialization/Generalization

Two constraints that may apply to a specialization/generalization:
participation constraints
disjoint constraints

Constraints on Specialization/Generalization

Participation constraint

- Determines whether every member in superclass must participate as a member of a subclass (mandatory) or not (optional)

Disjoint constraint

- Describes relationship between members of the subclasses and indicates whether member of a superclass can be a member of one (OR), or more than one (AND), subclass.
- May be disjoint (OR) or nondisjoint (AND).

Constraints on Specialization/Generalization

约束

There are four categories of constraints of specialization and generalization:

- **mandatory and disjoint (OR)**

  Must be one, but only one type

- **optional and disjoint (OR)**

  Does not need to be one, but only one type

- **mandatory and nondisjoint (AND)**

  Must be one and can be more than one subtype
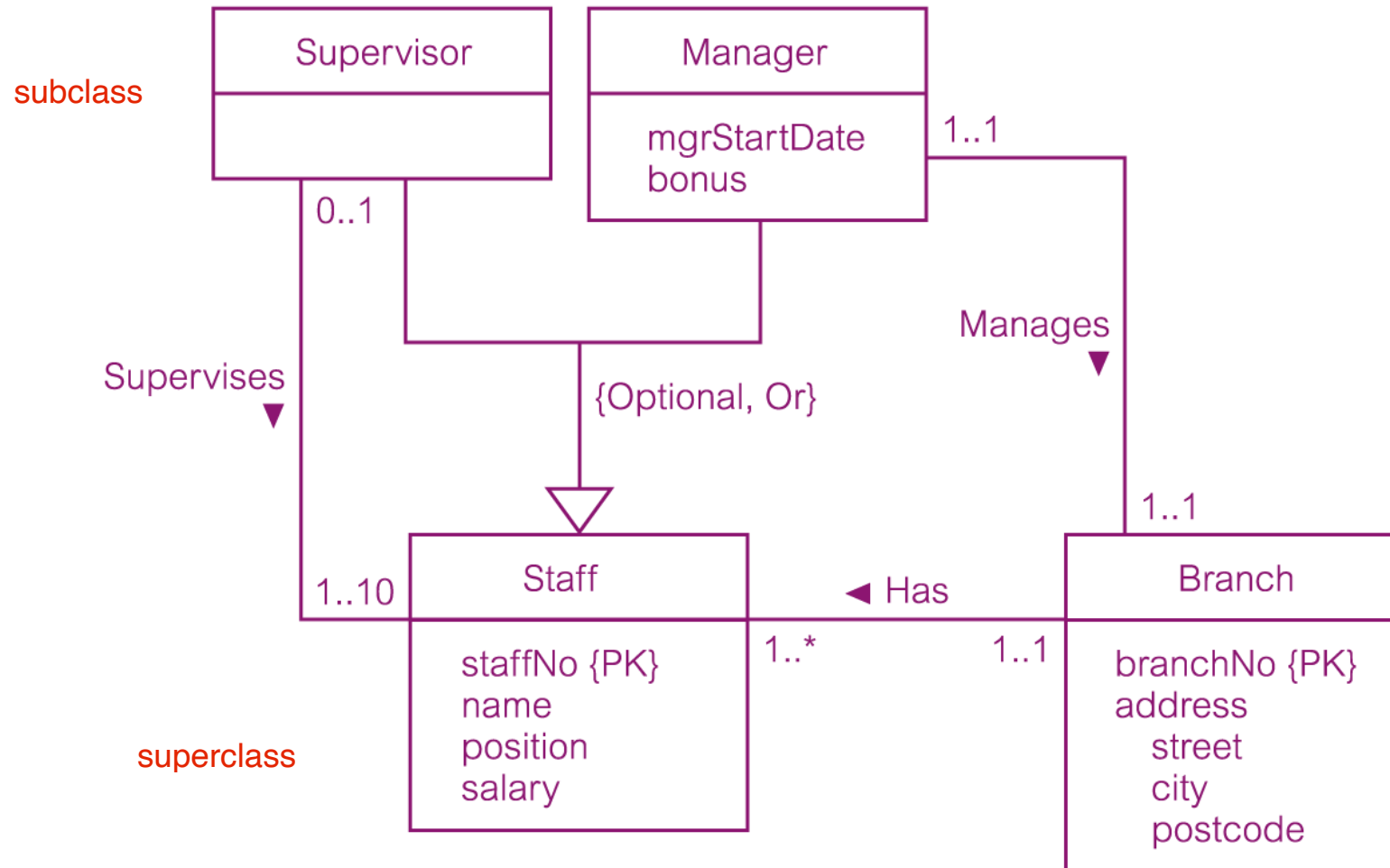
- **optional and nondisjoint (AND)**

  Does not need to be one and can be more than one subtype

DreamHome example:

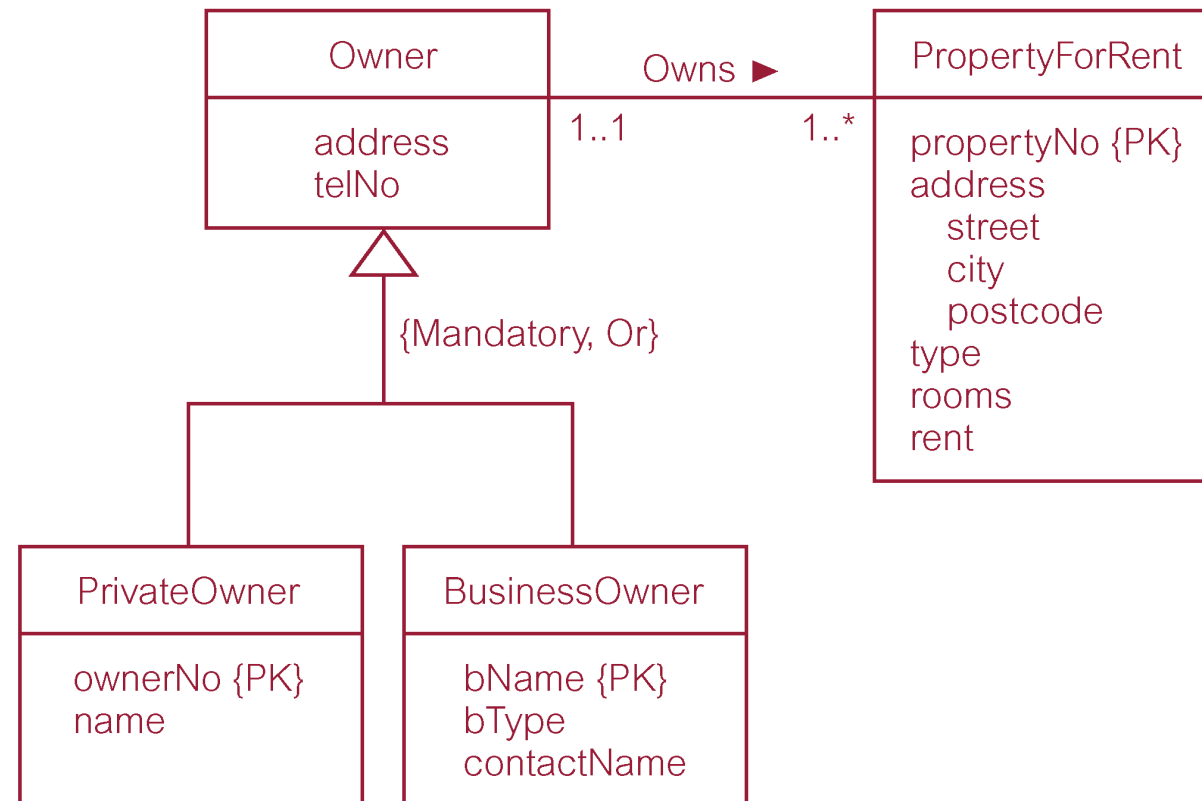**Staff Superclass with Supervisor and Manager subclasses**

DreamHome example:

Staff Superclass with Supervisor and Manager subclasses

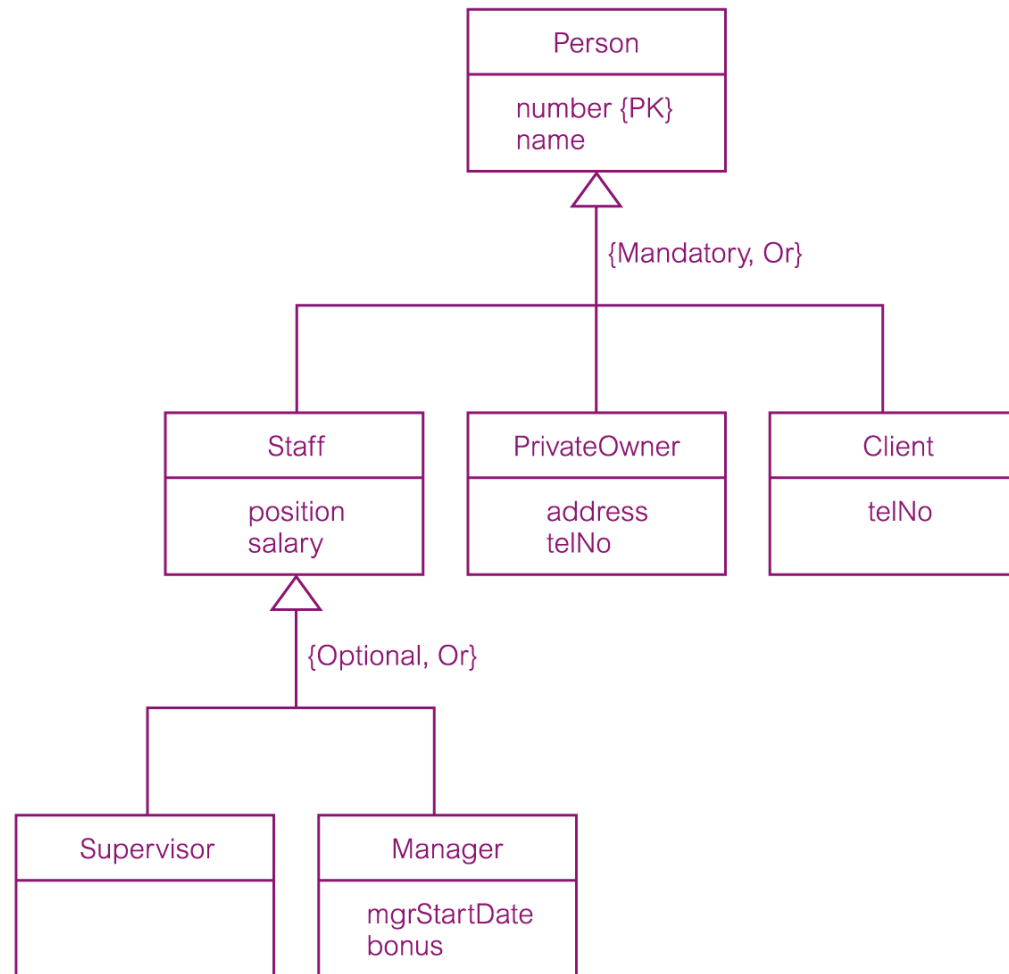subclass

superclass

***DreamHome* example:**
Owner Superclass with PrivateOwner and BusinessOwner subclasses

DreamHome example:
Owner Superclass with PrivateOwner and BusinessOwner subclasses

DreamHome example:

Person superclass with Staff, PrivateOwner, and Client subclasses

Aggregation and Composition
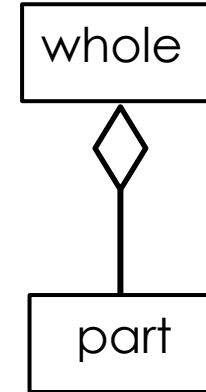
Aggregation represents a "has-a" or "is-part-of" relationship between entity types
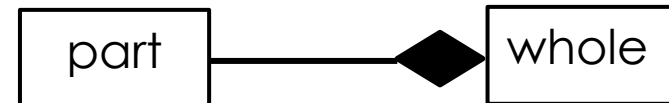
    one represents the "whole"

    one represents the "part"

    life times are not linked

    Branch (whole) has Staff (part)

Composition where there is a **strong** ownership and **coincidental lifetime** between the whole and part

Aggregation and Composition

Should be used only when there is a requirement to emphasize special relationship between entity types

Implications on creation, update, and deletion

Should only use enhanced concepts when the enterprise data is too complex to use only the basic ER model

Review

Limitations of basic concepts of the ER model

Specialization/Generalization

Aggregation and Composition