Enhanced Entity-Relationship Modelling

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Objectives

- Understand the limitations of basic concepts of the ER model and requirements to represent more complex applications using additional data modelling concepts.
- Be able to use EER diagram to model specialization/generalization relationships.

Enhanced Entity-Relationship Model

- Since 1980s there has been an increase in emergence of new database applications with more demanding requirements.
- Basic concepts of ER modelling are not sufficient to represent requirements of newer, more complex applications.
- Response is development of additional ‘semantic’ modelling concepts.

The Enhanced Entity-Relationship Model

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

- Most useful additional data modelling concept of Enhanced ER (EER) model is called specialization/generalization.

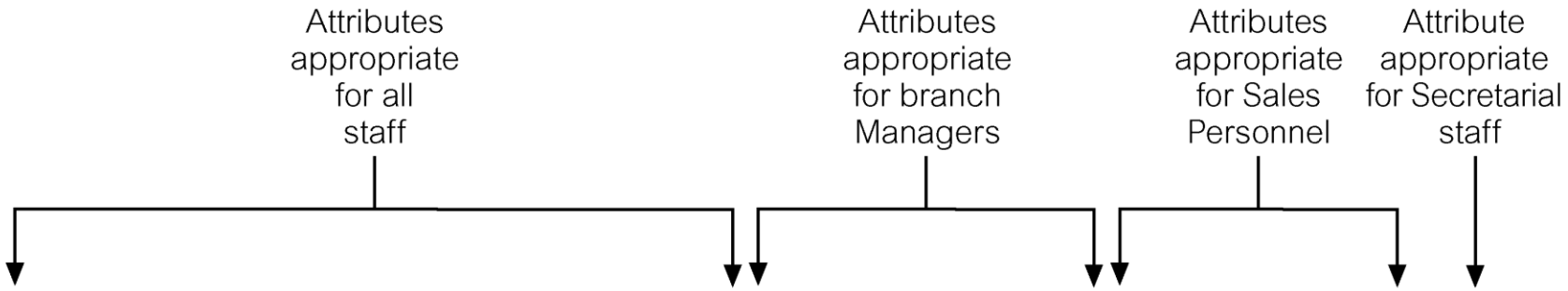
Specialization / Generalization

- Superclass
  - An entity type that includes one or more distinct subgroupings of its occurrences.
- Subclass
  - A distinct subgrouping of occurrences of an entity type.

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.

AllStaff relation holding details of all 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

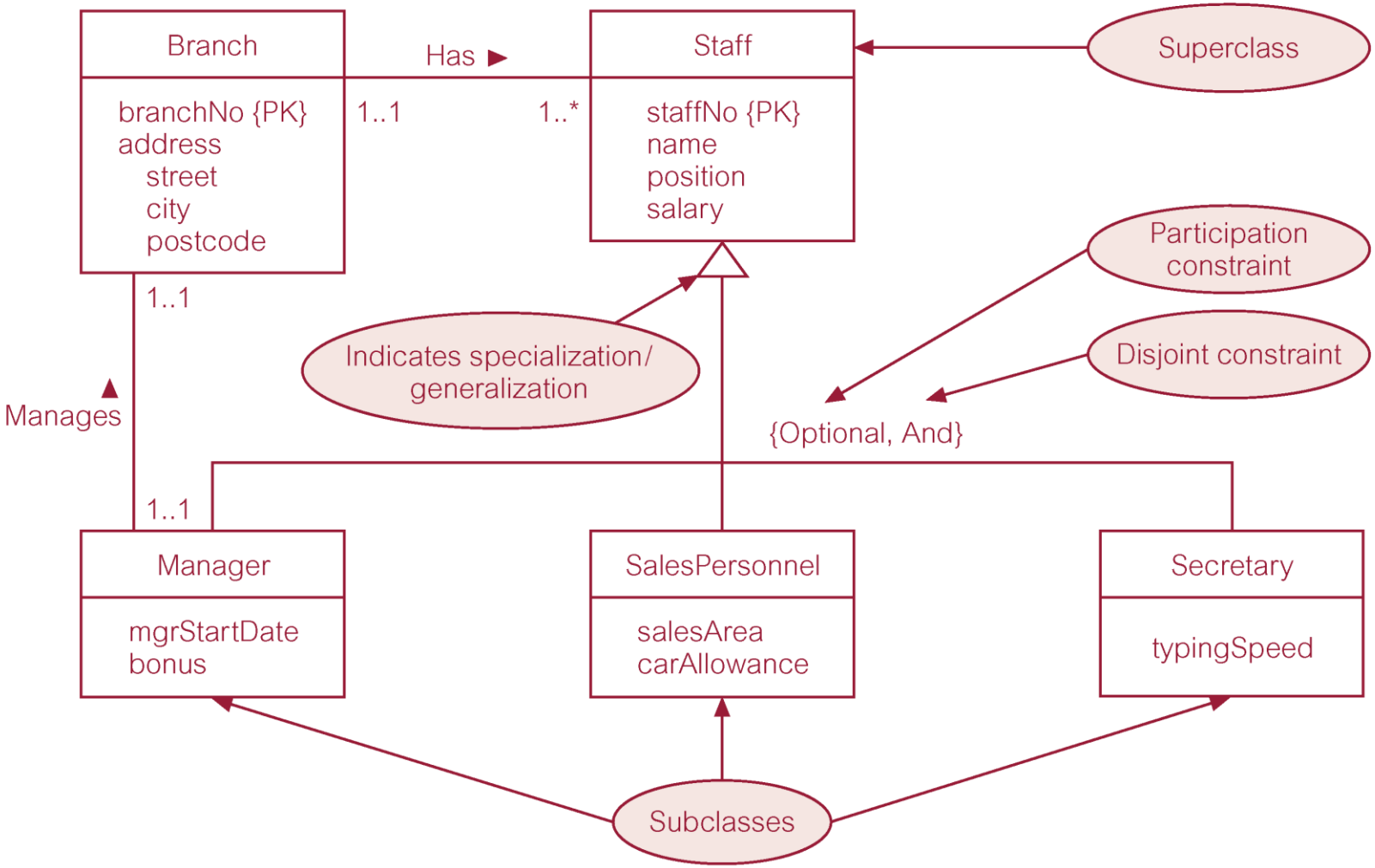
- Attribute Inheritance
  - An entity in a subclass represents same ‘real world’ object as in superclass, and may possess subclass-specific attributes, as well as those associated with the superclass.

Specialization / Generalization

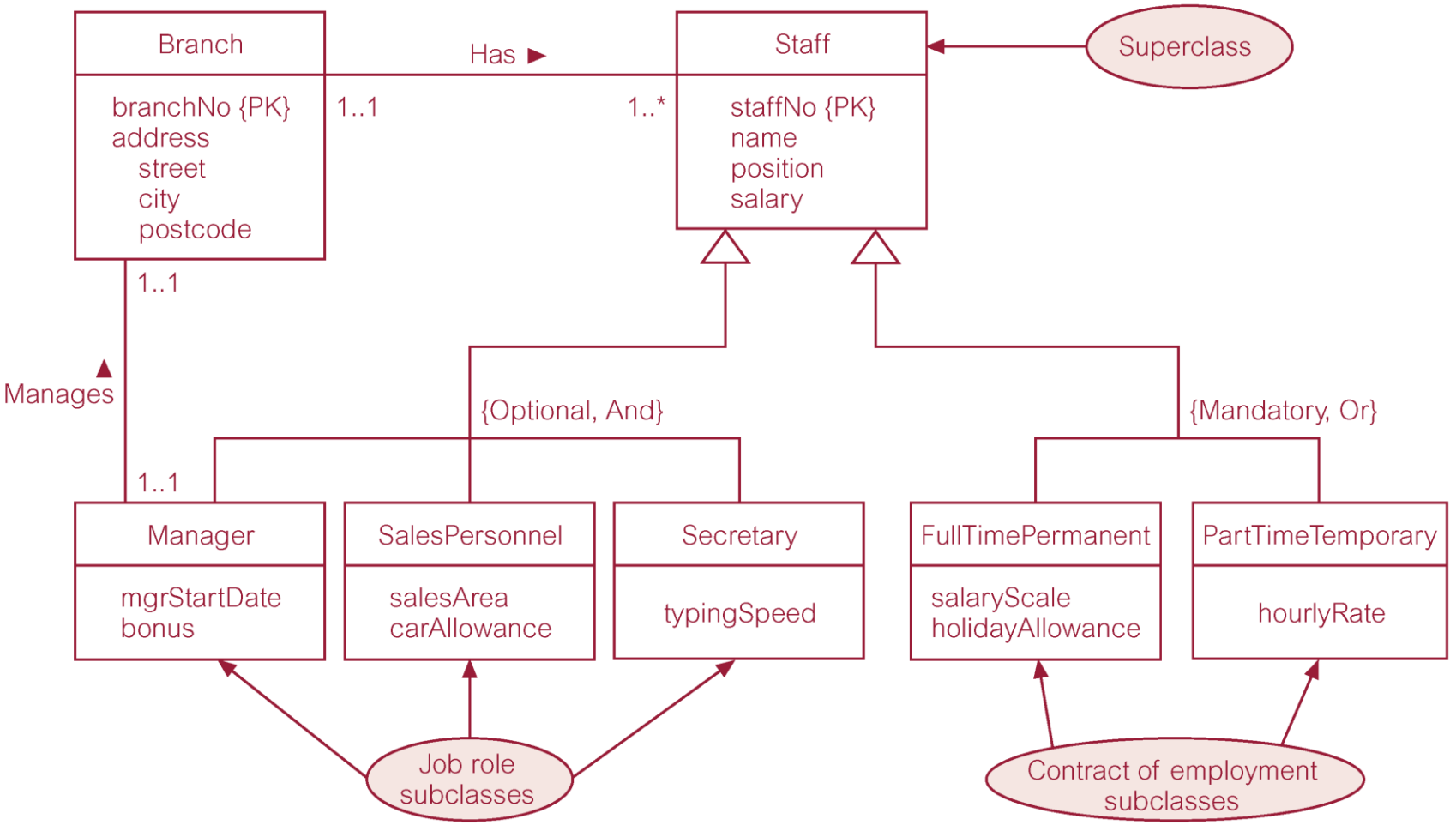
- Specialization
  - Process of maximizing differences between members of an entity by identifying their distinguishing characteristics.

- Generalization
  - Process of minimizing differences between entities by identifying their common characteristics.

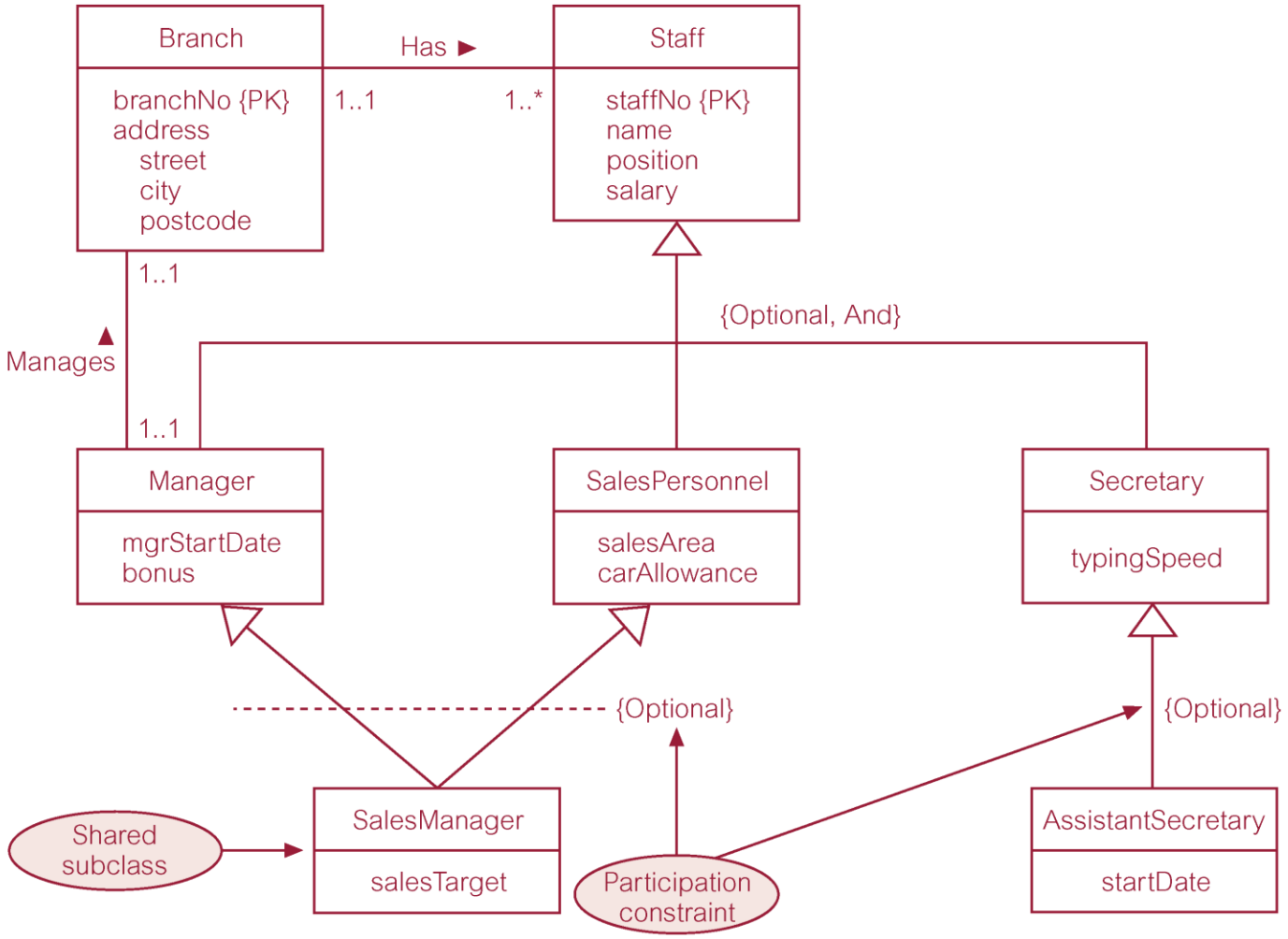
Specialization/generalization of Staff entity into subclasses representing job roles



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



EER diagram with shared subclass and subclass with its own subclass



Discussion

- A rental car agency classifies the vehicles it rents into ***four*** *categories*: **compact, midsize, full size,** and **sport utility**. The agency wants to record the following data for all vehicles: Vehicle ID, Make, Model, Year and Colour.
- There are **no** unique attributes for any of the four classes of vehicle. The entity type vehicle has a relationship (named Rents) with a customer entity type. **None** of the four vehicle classes has a unique relationship with an entity type.
- Would you consider creating a superclass/subclass relationship for this problem? Why?

Constraints on Specialization / Generalization

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

- Participation constraint
  - Determines whether every member in superclass must participate as a member of a subclass.
  - May be *mandatory* or *optional*.

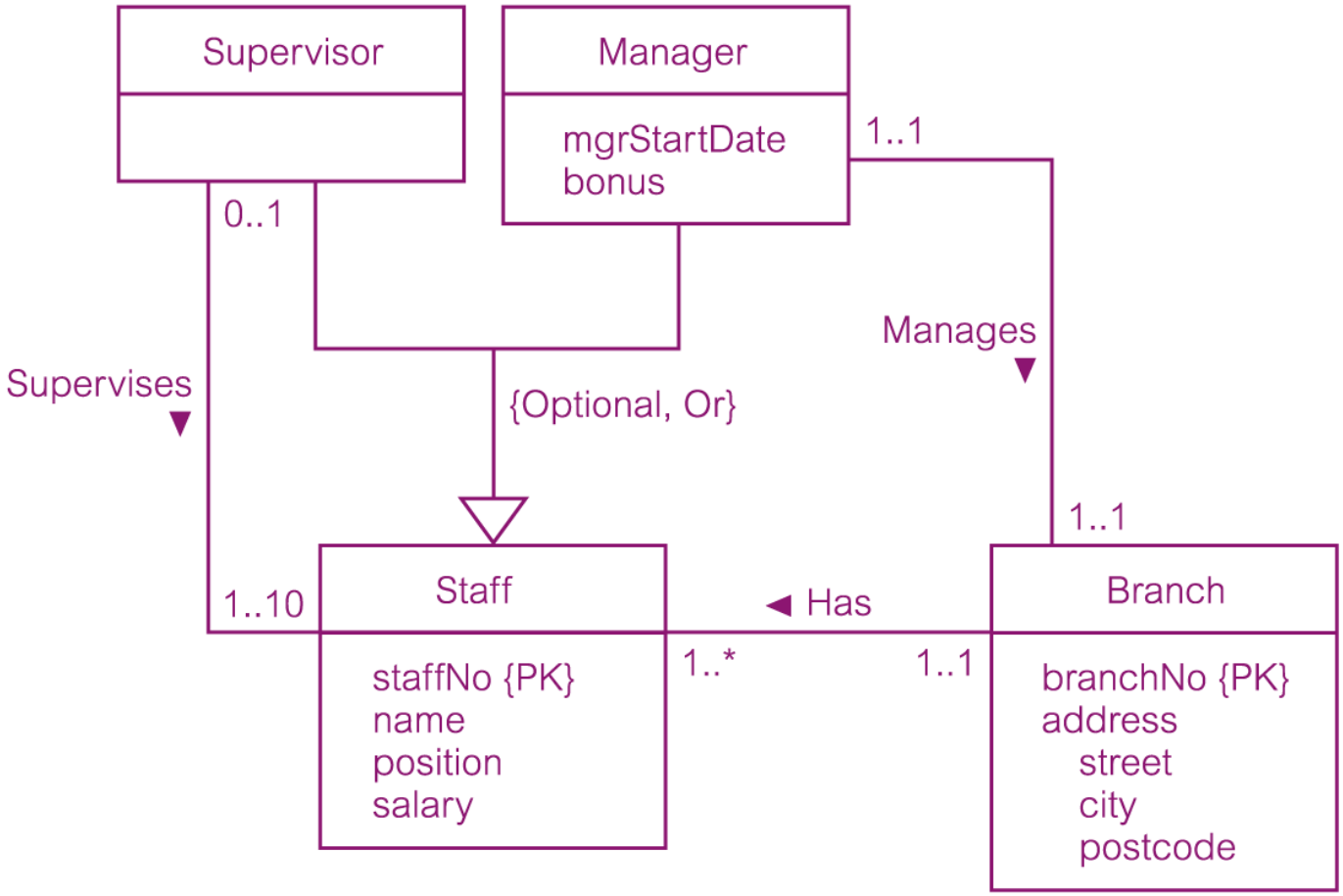
Constraints on Specialization / Generalization

- Disjoint constraint
  - Describes relationship between members of the subclasses and indicates whether member of a superclass can be a member of one, or more than one, subclass.
  - May be *disjoint* or *nondisjoint*.

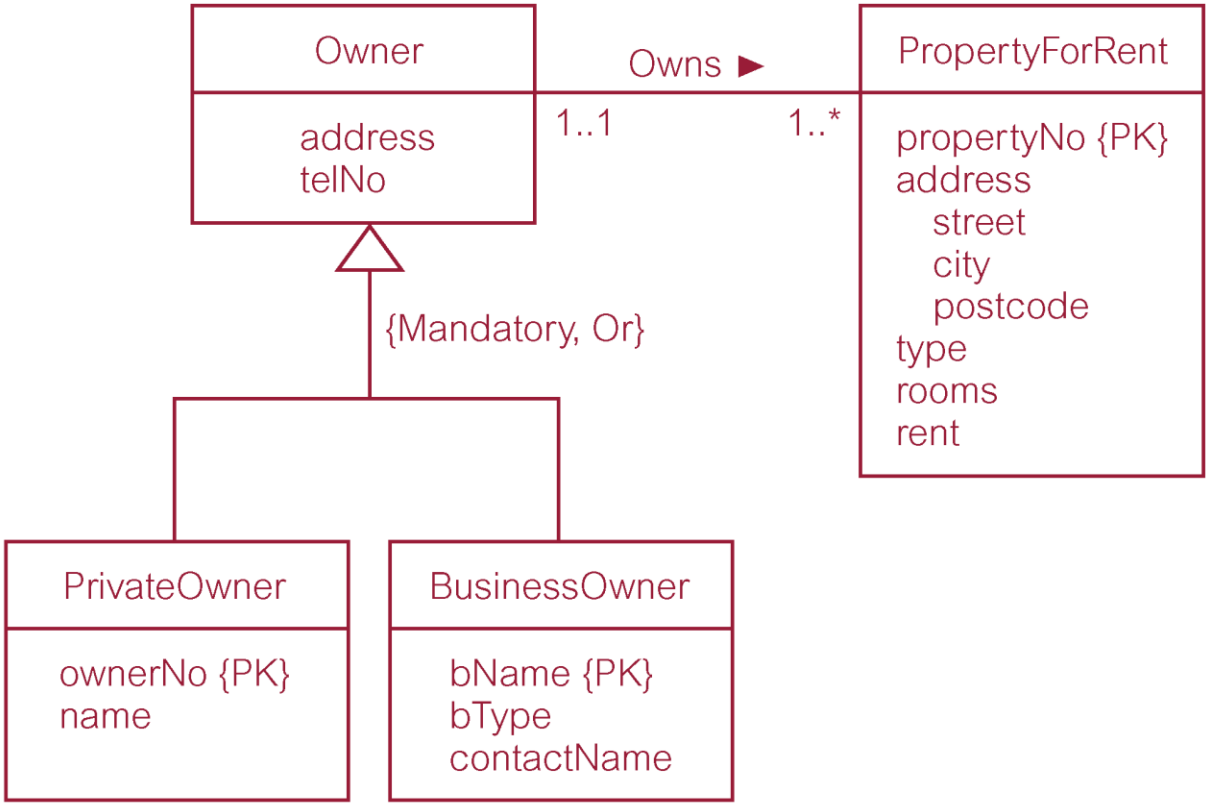
Constraints on Specialization / Generalization

- There are four categories of constraints of specialization and generalization:
  - mandatory and disjoint
  - optional and disjoint
  - mandatory and nondisjoint
  - optional and nondisjoint.

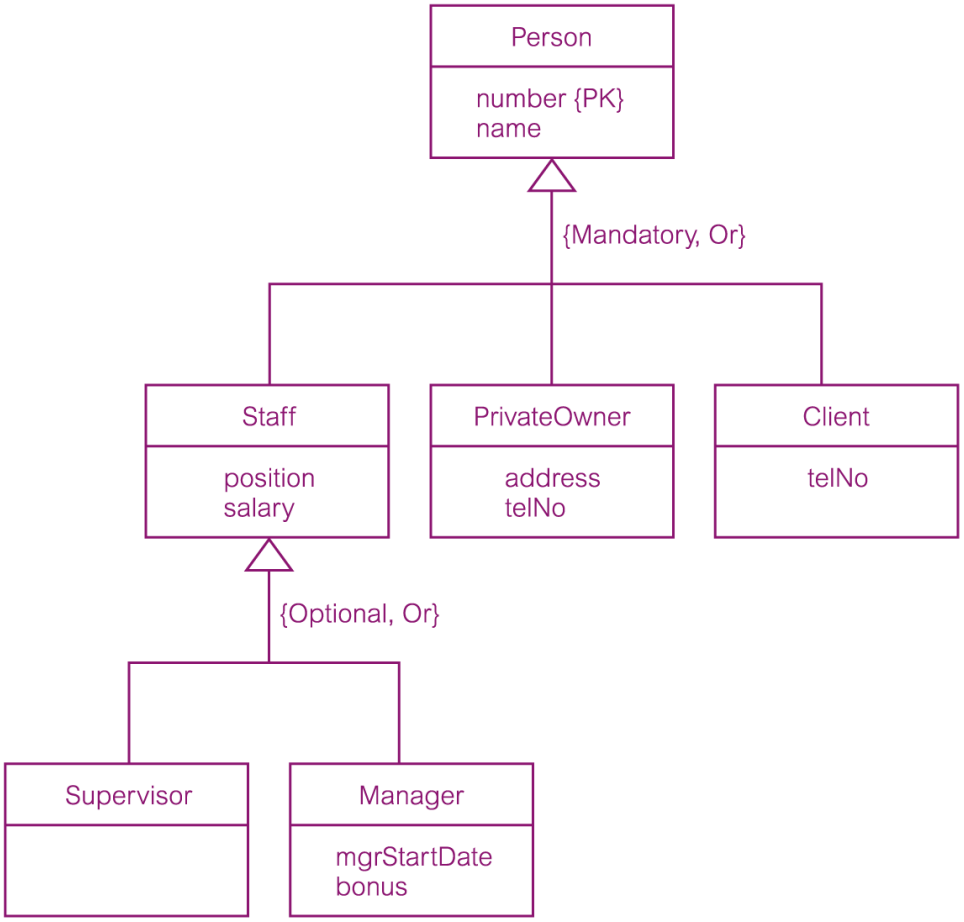
DreamHome worked example - Staff Superclass with Supervisor and Manager subclasses



DreamHome worked example - Owner Superclass with PrivateOwner and BusinessOwner subclasses



DreamHome worked example - Person superclass with Staff, PrivateOwner, and Client subclasses



Exercise

Create an EER model for each of the following descriptions:

a) A large organization has many parking spaces, which can be used by staff. Each parking space are uniquely identified using a space number.

b) Each member of staff has a unique number, name, telephone extension number, and vehicle license number.

c) Members of staff can request the sole use of a single parking space. Some parking spaces are under cover and each can be booked for use by a member of staff for a monthly rate. Staff need to book how long a parking space is required.

d) Parking spaces that are not under cover are free to use and each can be booked for use by a member of staff. Staff can only book uncovered parking space for maximum a week.

State any assumptions clearly if you make any.