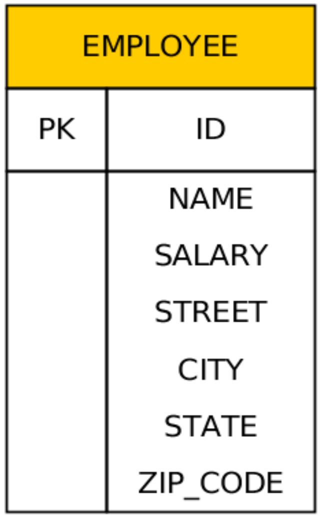
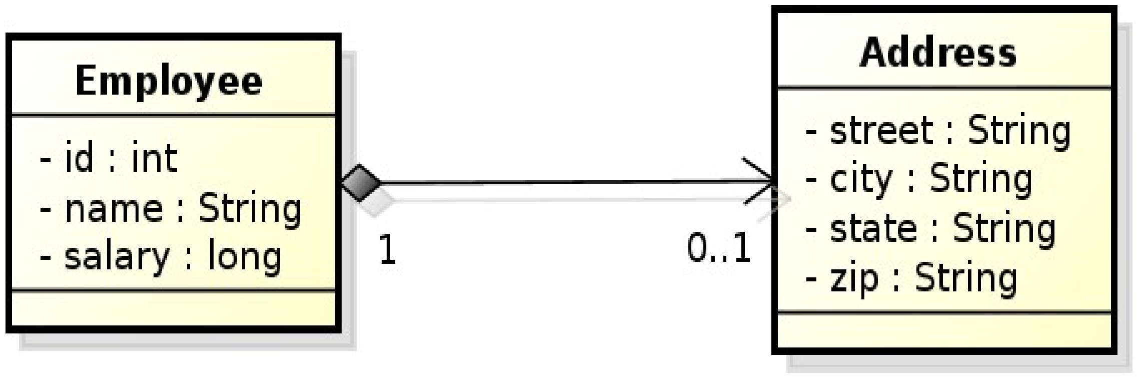
Embedded Objects

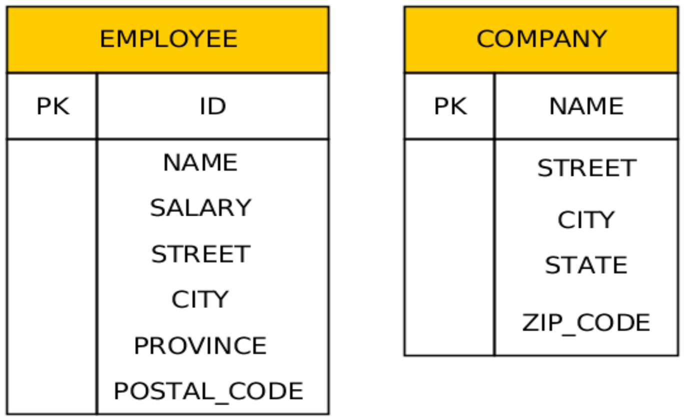


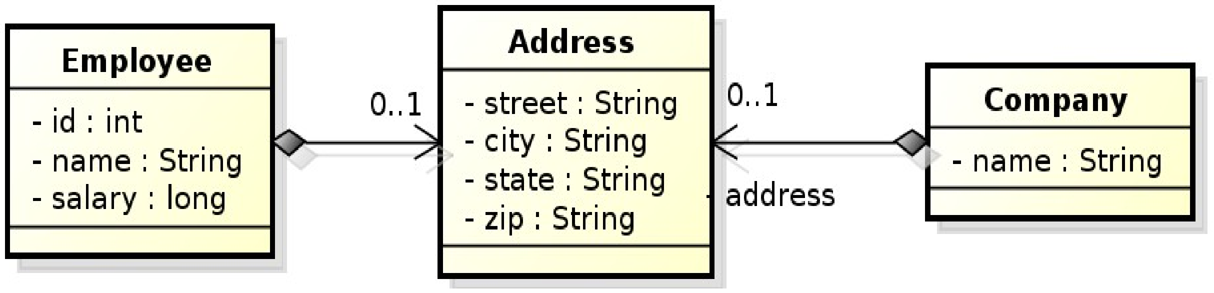


```
@Embeddable
@Access(AccessType.FIELD)
public class Address {
   private String street;
   private String city;
   private String state;
   @Column(name="ZIP_CODE")
   private String zip;
}
```

```
@Entity
public class Employee {
   @Id private int id;
   private String name;
   private long salary;
   @Embedded private Address
                              address;
}
```

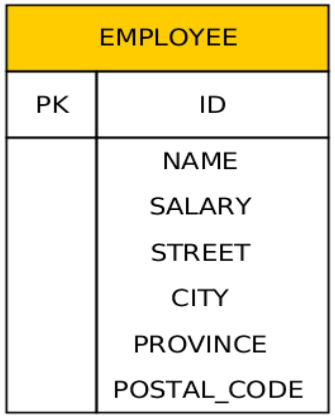
Embedded Objects



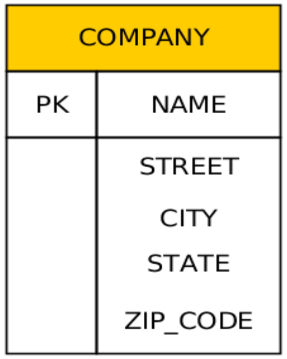


```
@Embeddable
@Access(AccessType.FIELD)
public class Address {
   private String street;
   private String city;
   private String state;
   @Column(name="ZIP_CODE")
   private String zip;
}
```

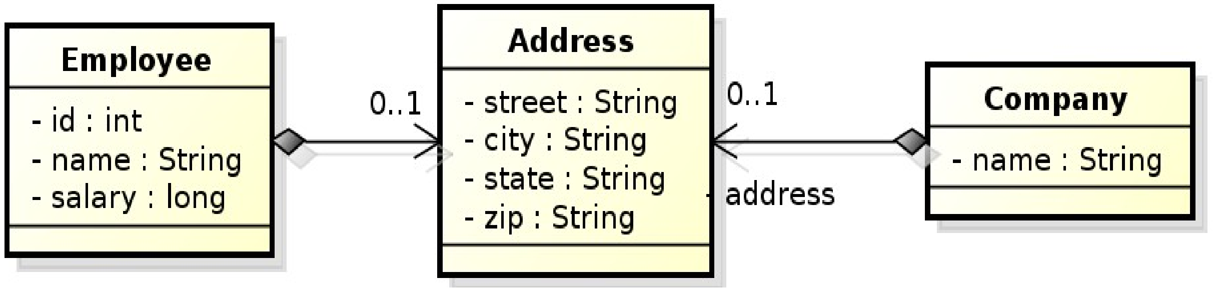
Embedded Objects



EMPLOYEE	
PK	ID
	NAME
	SALARY
	STREET
	CITY
	PROVINCE
	POSTAL_CODE

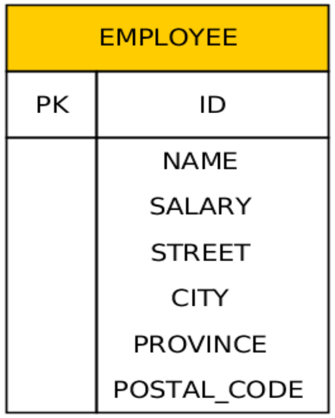


COMPANY	
PK	NAME
	STREET
	CITY
	STATE
	ZIP_CODE

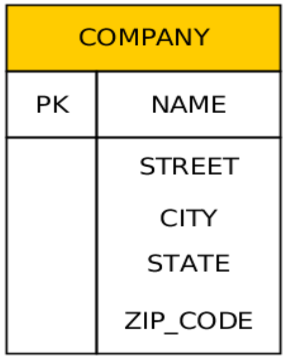


```
@Entity
public class Employee {
    @Id private int id;
    private String name;
    private long salary;
    @Embedded
    @AttributeOverrides({
        @AttributeOverride(name="state", column=@Column(name="PROVINCE")),
        @AttributeOverride(name="zip", column=@Column(name="POSTAL_CODE"))
    })
    private Address address;
}
```

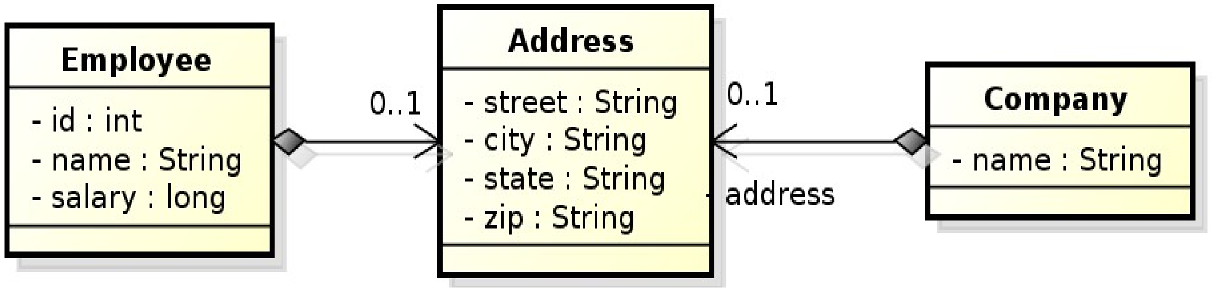
Embedded Objects



EMPLOYEE	
PK	ID
	NAME
	SALARY
	STREET
	CITY
	PROVINCE
	POSTAL_CODE



COMPANY	
PK	NAME
	STREET
	CITY
	STATE
	ZIP_CODE



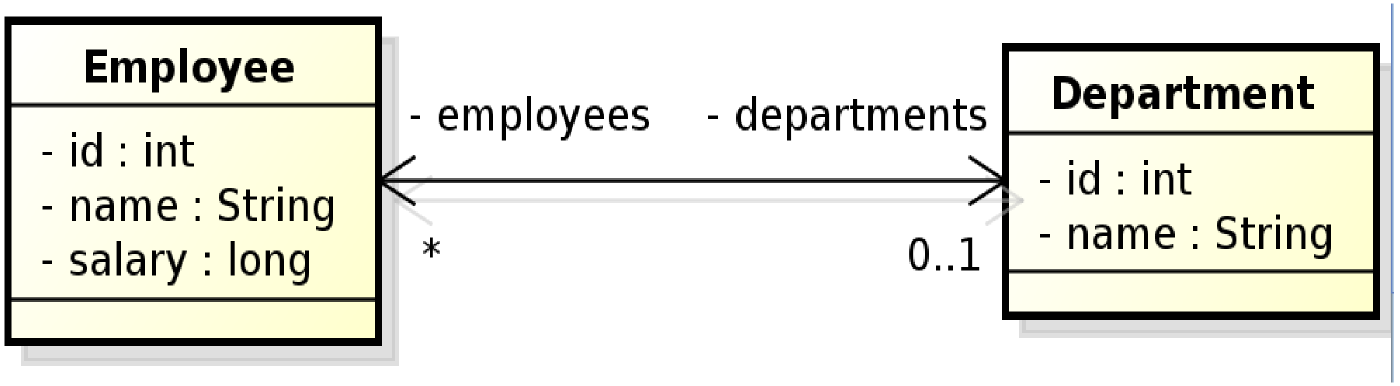
```
@Entity
public class Company {
   @Id private String name;
   @Embedded
   private Address address;
}
```

Cascade Persist

```
@Entity
public class Employee {
    // …
    @ManyToOne(cascade=cascadeType.PERSIST)
    Address address;
    // …
}


Employee emp = new Employee();
emp.setId(2);
emp.setName(“Rob“);
Address addr = new Address();
addr.setStreet(“164 Brown Deer Road“);
addr.steCity(“Milwaukee“);
addr.setState(“WI“);
emp.setAddress(addr);
~~em.persist(addr);~~
em.persist(emp);
```

Persisting bidirectional relationship



```
…
Department dept = em.find(Deprtment.class, 101);
Employee emp = new Employee();
emp.setId(2);
emp.setName("Rob");
emp.setSalary(25000);
dept.employees.add(emp);  // @ManyToOne(cascade=cascadeType.PERSIST)
em.persist(dept);
```

!!! emp.departments still doesn't contain dept !!!

```
em.refresh(dept);
```

!!! emp.departments does contain dept now !!!

Cascade

List of operations supporting cascading:

- cascadeType.ALL
- cascadeType.DETACH
- cascadeType.MERGE
- cascadeType.PERSIST
- cascadeType.REFRESH
- cascadeType.REMOVE

Collection Mapping

- Collection-valued relationship (above)
  - @OneToMany
  - @ManyToMany
- Element collections
  - @ElementCollection
  - Collections of Embeddable (new in JPA 2.0)
  - Collections of basic types   (new in JPA 2.0)

- Specific types of Collections are supported
  - Lists
  - Maps

Collection Mapping

```
@Entity
public class Employee {
   @Id private int id;
   private String name;
   private long salary;
   // …
   @ElementCollection(targetClass=VacationEntry.class);
   private Collection vacationBookings;

   @ElementCollection
   private Set<String> nickName;
   // …
}
```

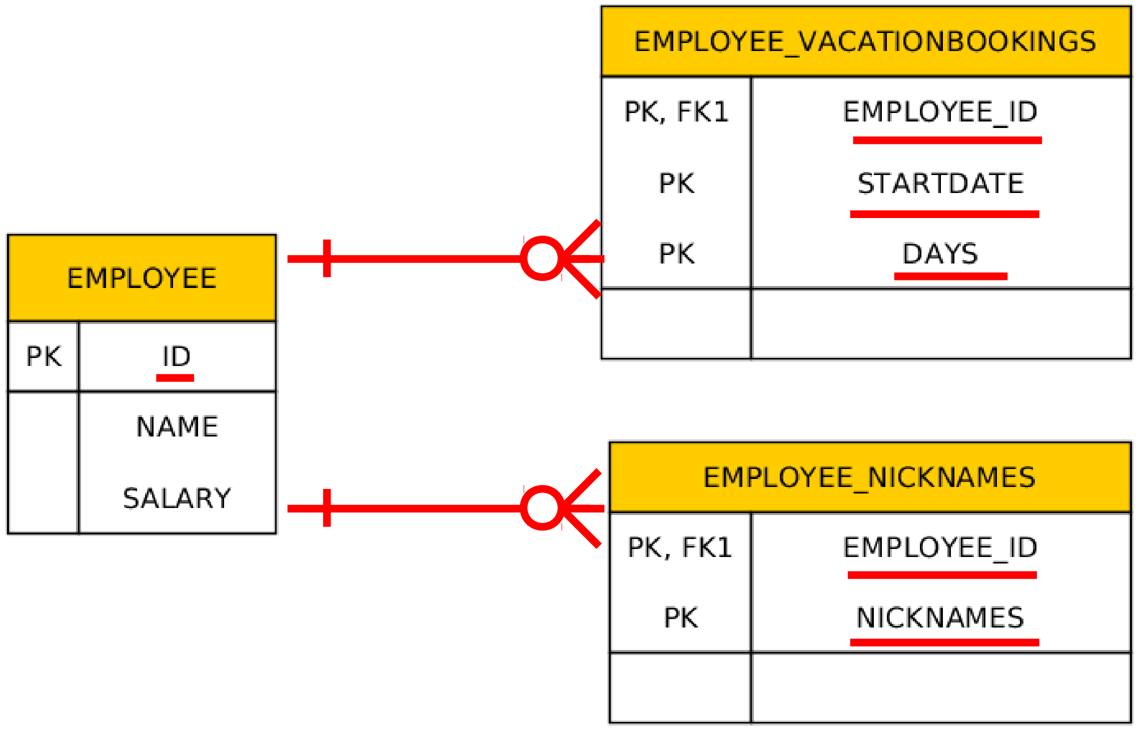
```
@Embeddable
public class VacationEntry {
   @Temporal(TemporalType.DATE)
   private Calendar startDate;

   @Column(name=“DAYS“)
   private int daysTaken;
   // …
}
```

Collection Mapping

```
@Entity
public class Employee {
   @Id private int id;
   private String name;
   private long salary;
   // …
   @ElementCollection(targetClass=VacationEntry.class);
   private Collection vacationBookings;

   @ElementCollection
   private Set<String> nickName;
   // …
}
```



Collection Mapping

```
@Entity
public class Employee {
   @Id private int id;
   private String name;
   private long salary;
   // …
   @ElementCollection(targetClass=VacationEntry.class);
   @CollectionTable(
      name=“VACATION“,
      joinColumn=@JoinColumns(name=“EMP_ID“);
   @AttributeOverride(name=“daysTaken“, column=“DAYS_ABS“))
   private Collection vacationBookings;

   @ElementCollection
   @Column(name=“NICKNAME“)
   private Set<String> nickName;
   // …
}
```

```
@Embeddable
public class VacationEntry {
   @Temporal(TemporalType.DATE)
   private Calendar startDate;

   @Column(name=“DAYS“)
   private int daysTaken;
   // …
}
```

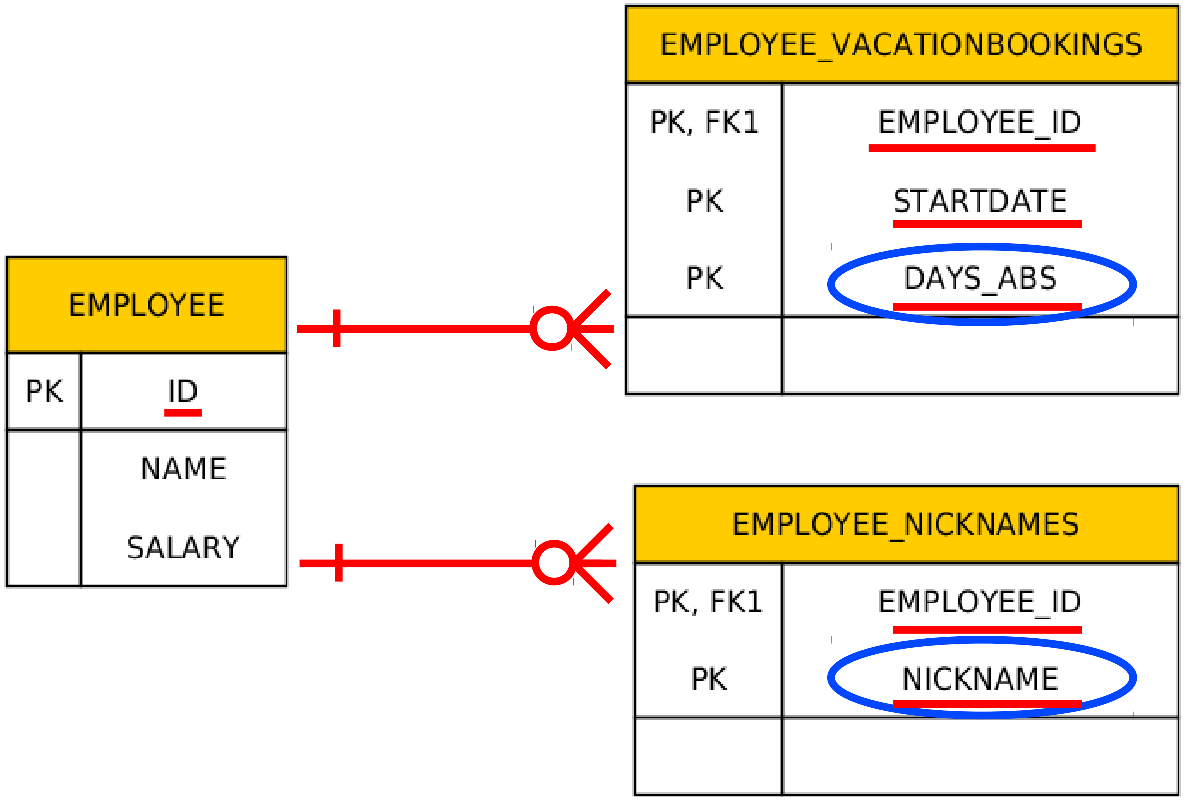
Collection Mapping

```
@Entity
public class Employee {
   @Id private int id;
   private String name;
   private long salary;
   // …
   @ElementCollection(targetClass=VacationEntry.class);
   @CollectionTable(
      name="VACATION",
      joinColumn=@JoinColumns(name="EMP_ID");
   @AttributeOverride(name="daysTaken", column="DAYS_ABS"))
   private Collection vacationBookings;

   @ElementCollection
    @Column(name="NICKNAME")
    private Set<String> nickName;
   // …
}


@Embeddable
public class VacationEntry {
   @Temporal(TemporalType.DATE)
   private Calendar startDate;

   @Column(name="DAYS")
   private int daysTaken;
   // …
}
```



Collection Mapping

Interfaces:

- Collection
- Set
- List
- Map

may be used for mapping purposes.

An instance of an appropriate implementation class (HashSet, OrderedList, etc.) will be used to implement the respective property initially (the entity will be unmanaged).

As soon as such an Entity becomes managed (by calling em.persist(...)), we can expect to get an instance of the respective interface, not an instance of that particular implementation class.

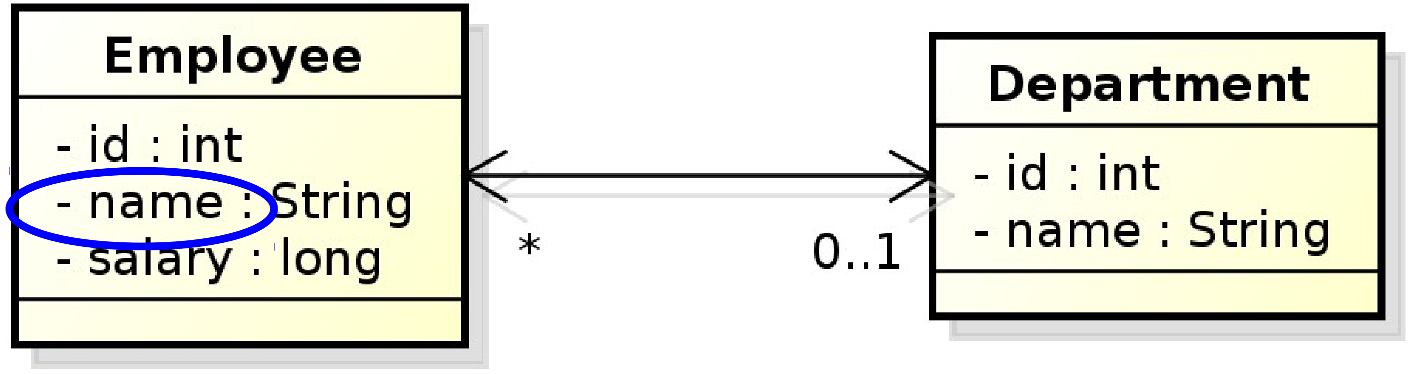
When we get it back (em.find(..)) to the persistence context. The reason is that the JPA provider may replace the initial concrete instance with an alternate instance of the respective interface (Collection, Set, List, Map).

Collection Mapping – ordered List

- Ordering by Entity or Element Attribute
  ordering according to the state that exists in each entity or element in the List

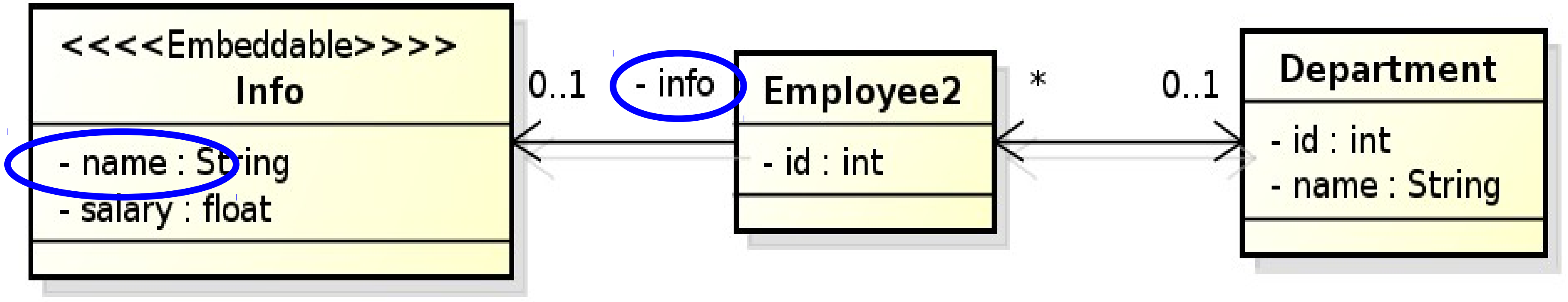
- Persistently ordered lists
  the ordering is persisted by means of an additional database column(s)
  typical example – ordering = the order in which the entities were persisted

Collection Mapping – ordered List
(Ordering by Entity or Element Attribute)



```
@Entity
public class Department {
    // …
    @OneToMany(mappedBy="department")
    @OrderBy("name ASC")
    private List<Employee> employees;
    // …
}
```

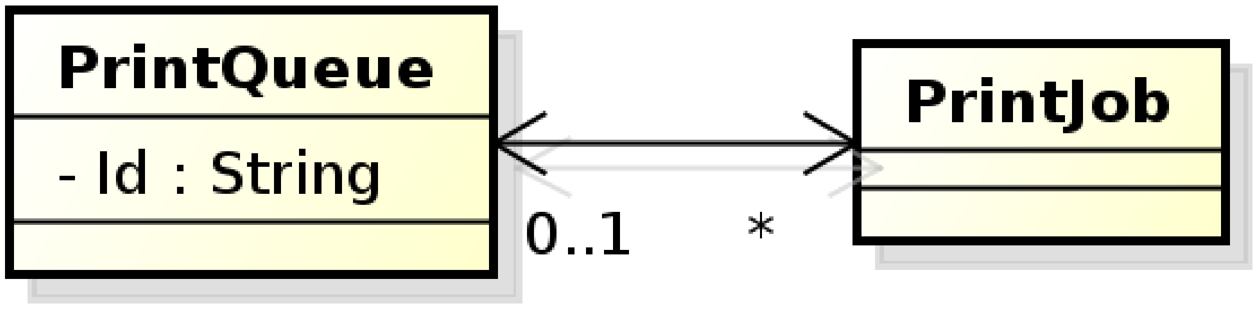
Collection Mapping – ordered List
(Ordering by Entity or Element Attribute)



```
@Entity
public class Department {
    // …
    @OneToMany(mappedBy="department")
    @OrderBy("info.name ASC")
    private List<Employee2> employees;
    // …
}
```

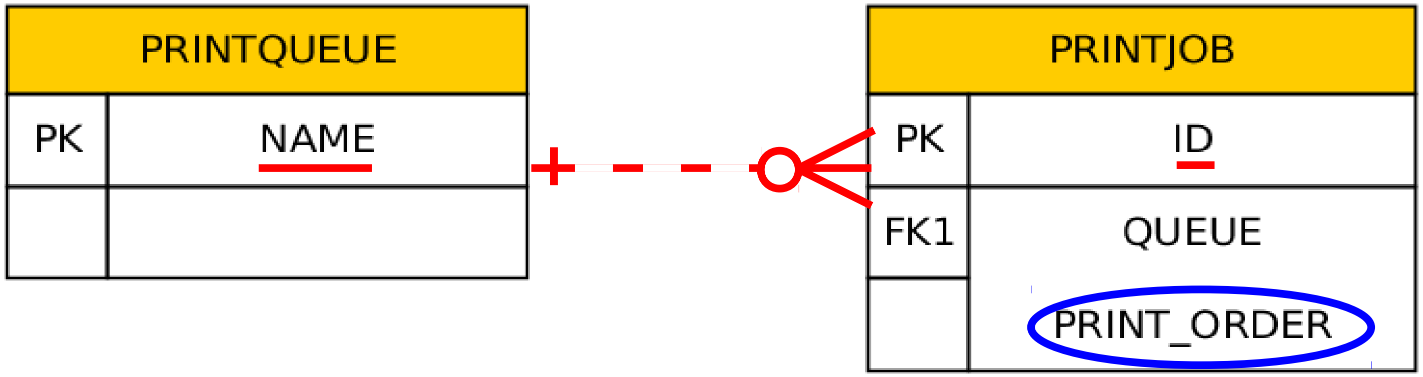
Collection Mapping – ordered List

(Persistently ordered lists)



```
@Entity
public class PrintQueue {
    @Id private String name;
    // …
    @OneToMany(mappedBy=“queue“)
    @OrderColumn(name=“PRINT_ORDER“)
    private List<PrintJob> jobs;
    // …
}
```

Collection Mapping – ordered List
(Persistently ordered lists)



```
@Entity
public class PrintQueue {
   @Id private String name;
   // …
   @OneToMany(mappedBy=“queue“)
   @OrderColumn(name=“PRINT_ORDER“)
   private List<PrintJob> jobs;
   // …
}
```

This annotation need not be necessarily on the owning side

Collection Mapping – Maps

Map is an object that maps keys to values.
A map cannot contain duplicate keys;
each key can map to at most one value.

Keys:

- Basic types (stored directly in the table being referred to)
  - Target entity table
  - Join table
  - Collection table
- Embeddable types (- “ -)
- Entities (only foreign key is stored in the table)

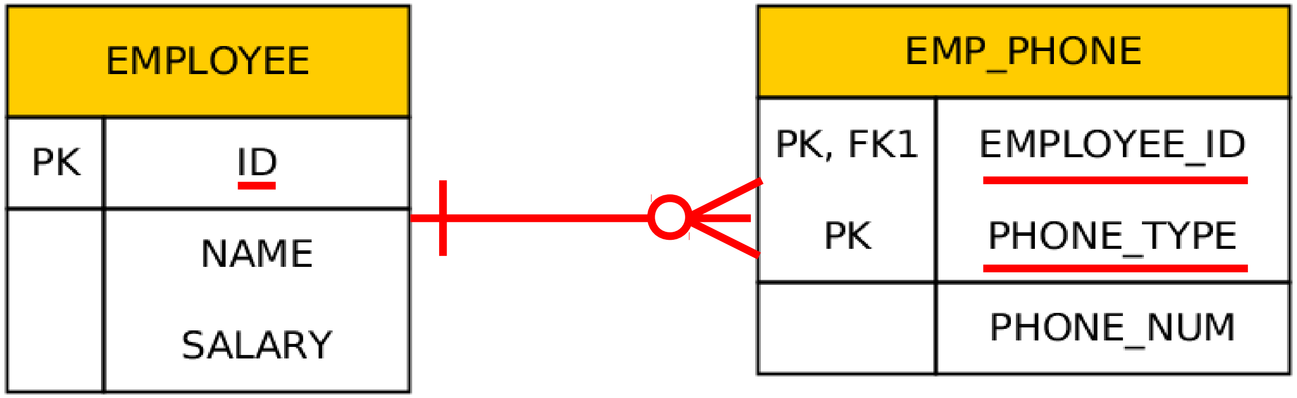
Values:

- Values are entities => Map must be mapped as a one-to-many or many-to-many relationship
- Values are basic types ot embeddable types => Map is mapped as an element collection

Collection Mapping – Maps
(keying by basic type – key is String)

```
@Entity
public class Employee {
    @Id private int id;
    private String name;
    private long salary;

    @ElementCollection
    @CollectionTable(name="EMP_PHONE")
    @MapKeyColumn(name="PHONE_TYPE")
    @Column(name="PHONE_NUM")
    private Map<String, String> phoneNumbers;
    // …
}
```

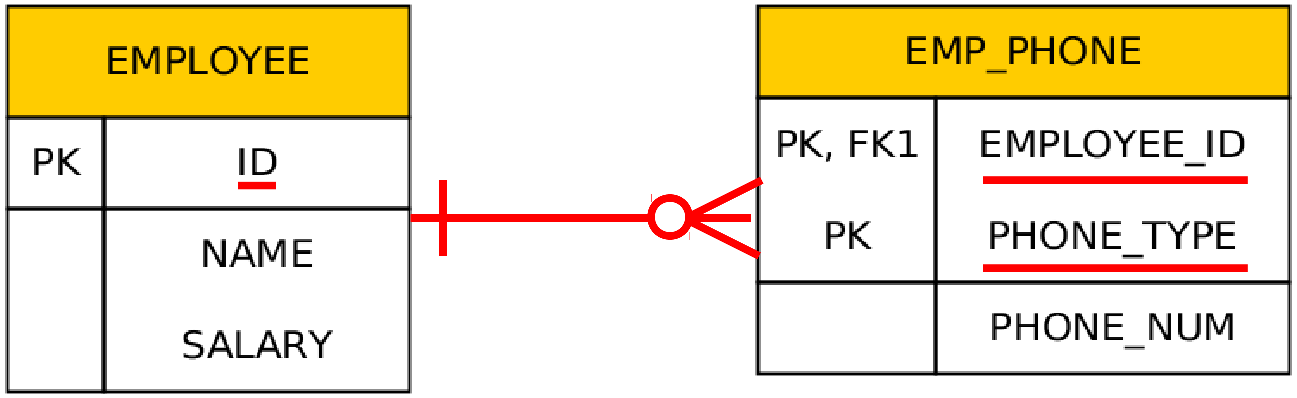


Collection Mapping – Maps
(keying by basic type – key is an enumeration)

```
@Entity
public class Employee {
    @Id private int id;
    private String name;
    private long salary;

    @ElementCollection
    @CollectionTable(name="EMP_PHONE")
    @MapKeyEnumerated(EnumType.String)
    @MapKeyColumn(name="PHONE_TYPE")
    @Column(name="PHONE_NUM")
    private Map<PhoneType, String> phoneNumbers;
    // …
}
```

```
Public enum PhoneType {
        Home,
        Mobile,
        Work
}
```

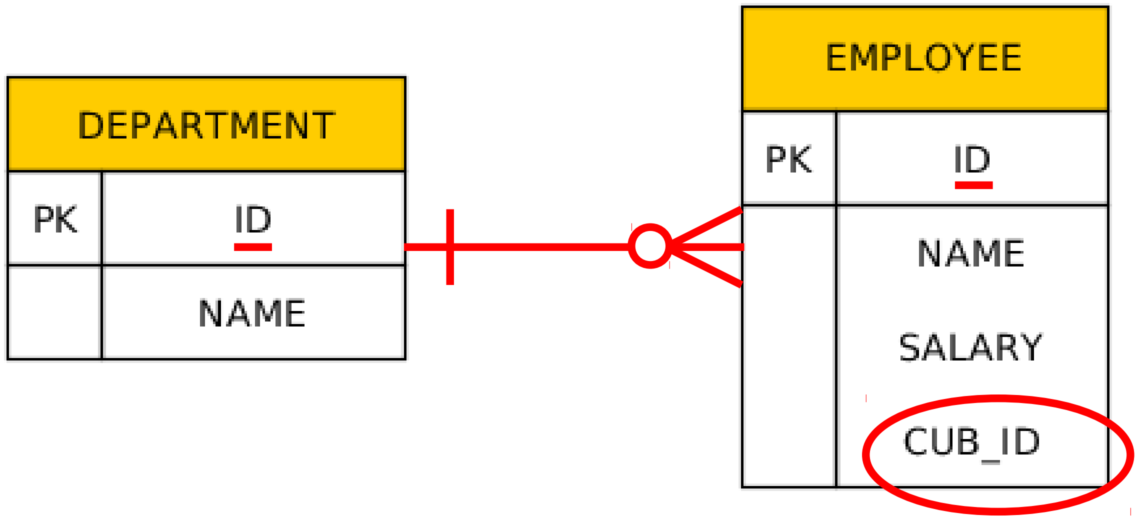


Collection Mapping – Maps

(keying by basic type – 1:N relationship using a Map with String key)

```
@Entity
public class Department {
   @Id private int id;
   private String name;

   @OneToMany(mappedBy="department")
   @MapKeyColumn(name="CUB_ID")
   private Map<String, Employee> employeesByCubicle;
   // …
}
```

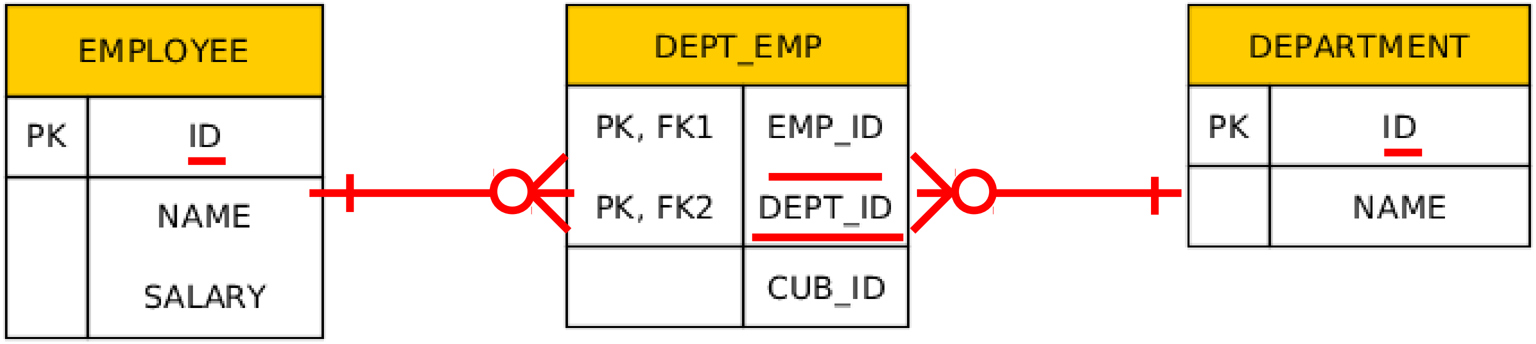


Collection Mapping – Maps

(keying by basic type – N:M relationship using a Map with String key)

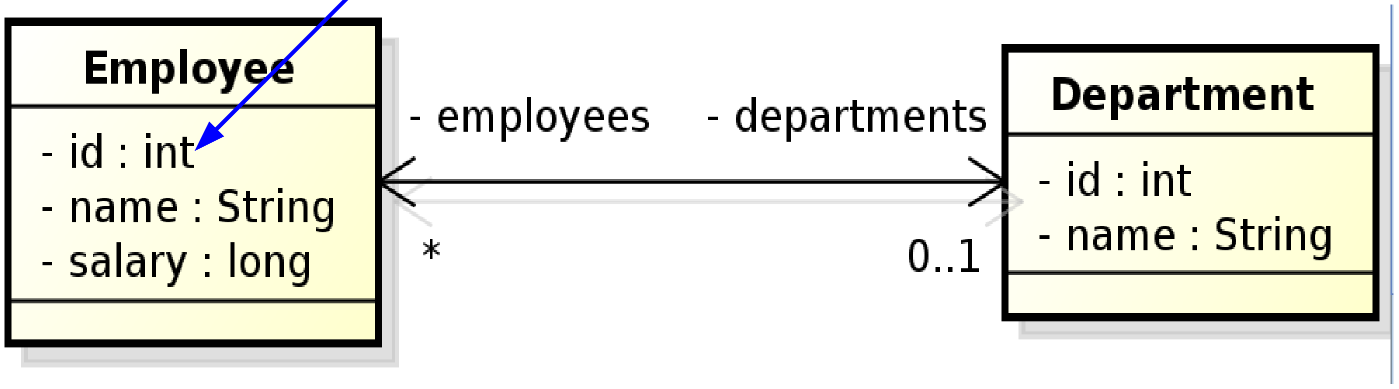
```
@Entity
public class Department {
    @Id private int id;
    private String name;

    @ManyToMany
    @JoinTable(name="DEPT_EMP",
        joinColumns=@JoinColumn(name="DEPT_ID"),
        inverseJoinColumns=@JoinColumn(name="EMP_ID"))
    @MapKeyColumn(name="CUB_ID")
    private Map<String, Employee> employeesByCubicle;
    // …
}
```



Collection Mapping – Maps
(keying by entity attribute)

```
@Entity
public class Department {
    // ...
    @OneToMany(mappedBy="department")
    @MapKey(name="id")
    private Map<Integer, Employee> employees;
    // …
}
```



Collection Mapping – Maps
(keying by embeddable type)

```
@Entity
Public class Employee {
    @Id private int id;
    @Column(name=“F_NAME“);
    private String firstName;
    @Column(name=“L_NAME“);
    private String lastName;
    private long salary;
    //...
}
```

Sharing columns => insertable=false and updatable = false

```
@Embeddable
public class EmployeeName {
    @Column(name=“F_NAME“, insertable=false,
                               updateble=false)
    private String first_Name;
    @Column(name=“L_NAME“, insertable=false,
                                updateble=false)
    private String last_Name;
    // …
}
```

```
@Entity
public class Department {
    // ...
    @OneToMany(mappedBy=“department“)
    @MapKey(name=“id“)
    private Map<EmployeeName, Employee> employees;
    // …
}
```

Collection Mapping – Maps
(keying by embeddable type)

```
@Entity
Public class Employee {
    @Id private int id;

    @Embedded
    private EmployeeName name;
    private long salary;
    //...
}
```

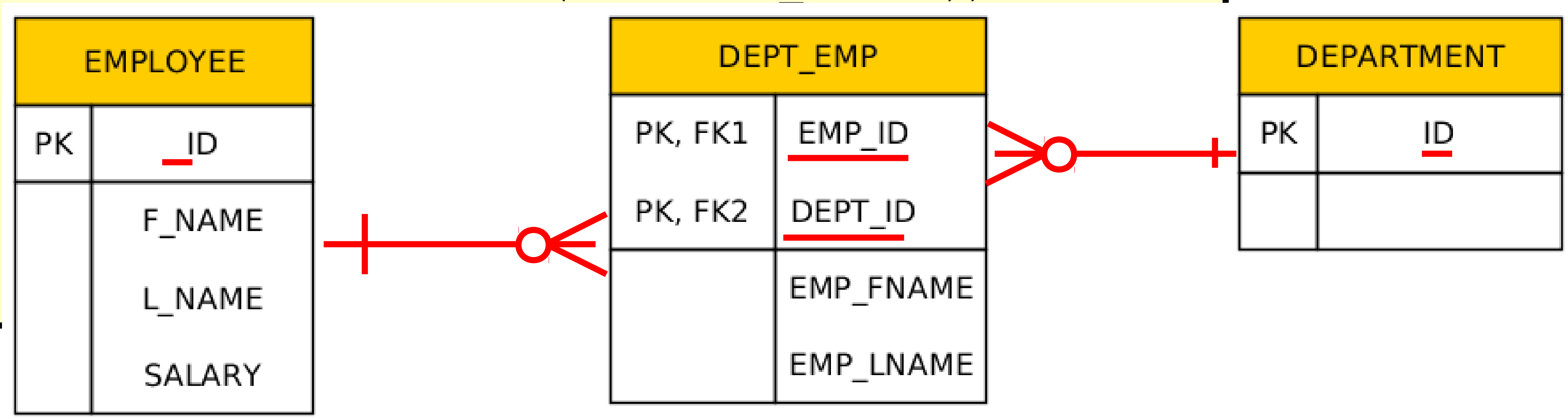
Columns are not shared

```
@Embeddable
Public class EmployeeName {
    @Column(name=“F_NAME“~~, insertable=false,
                     updateble=false~~)
    Private String first_Name;
    @Column(name=“L_NAME“~~, insertable=false,
                      updateble=false~~)
    Private String last_Name;
    // …
}
```

```
@Entity
public class Department {
    // ...
    @OneToMany(mappedBy=“department“)
    @MapKey(name=“id“)
    private Map<EmployeeName, Employee> employees;
    // …
}
```

Collection Mapping – Maps
(keying by embeddable type)

```
@Entity
public class Department {
    @Id private int id;
    @ManyToMany
    @JoinTable(name="DEPT_EMP",
        joinColumns=@JoinColumn(name="DEPT_ID"),
        inverseJoinColumns=@JoinColumn(name="EMP_ID"))
    @AttributeOverrides({
        @AttributeOverride(
            name="first_Name",
            column=@Column(name="EMP_FNAME")),
```



Collection Mapping – Maps
(keying by embeddable type)

```
@Entity
public class Department {
    @Id private int id;
    @ManyToMany
    @JoinTable(name="DEPT_EMP",
        joinColumns=@JoinColumn(name="DEPT_ID"),
        inverseJoinColumns=@JoinColumn(name="EMP_ID"))
    @AttributeOverrides({
        @AttributeOverride(
            name="first_Name",
            column=@Column(name="EMP_FNAME")),
        @AttributeOverride(
            name="last_Name",
            column=@Column(name="EMP_LNAME"))
    })
    private Map<EmployeeName, Employee> employees;
    // …
}
```

Collection Mapping – Maps
(keying by embeddable type)

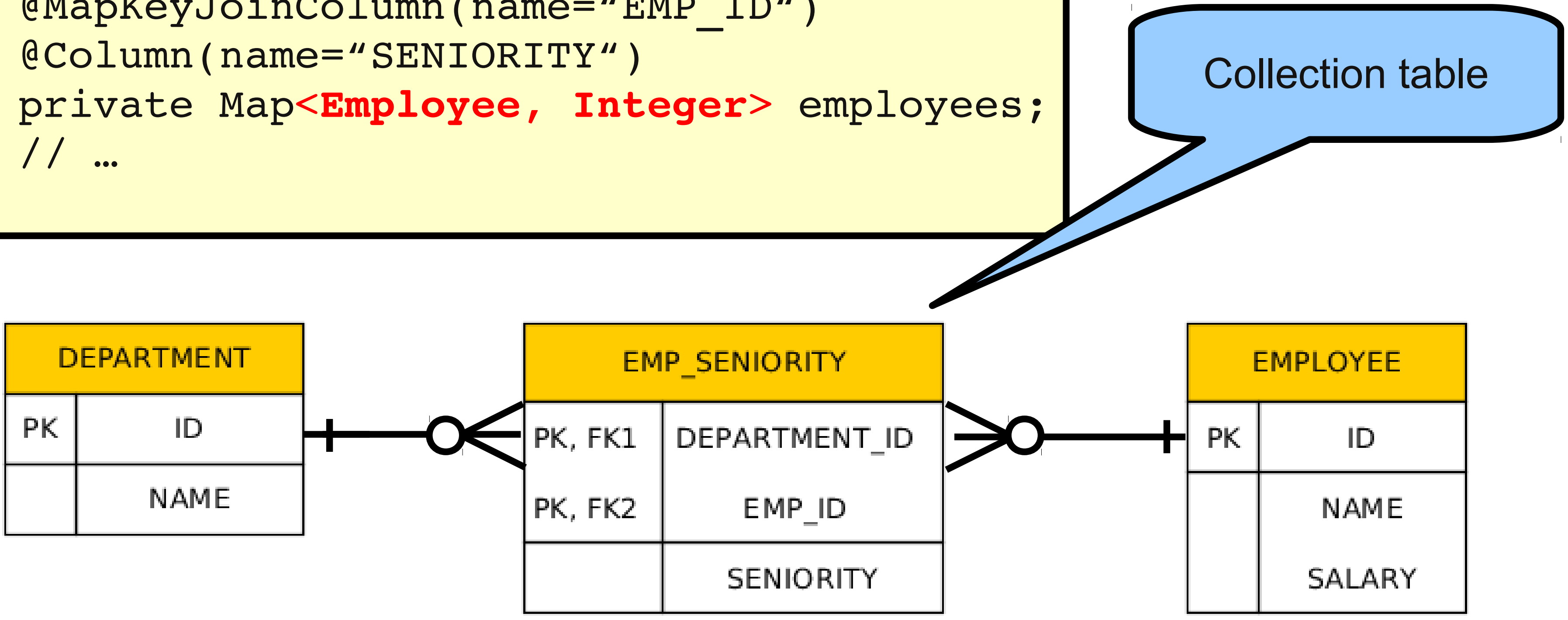
We have to distinguish, if we are overriding embeddable attributes of the key or the value.

```
@Entity
public class Department {
    @Id private int id;
    @AttributeOverrides({
        @AttributeOverride(name=“key.first_Name“,
                                column=@Column(name=“EMP_FNAME“)),
        @AttributeOverride(name=“key.last_Name“,
                                column=@Column(name=“EMP_LNAME“))
    })
    private Map<EmployeeName, EmployeeInfo> employees;
    // …
}
```

The embeddable attributes will be stored in the collection table (rather than in a join table
As it was on the previous slide).

Collection Mapping – Maps
(keying by entity)

```
@Entity
public class Department {
    @Id private int id;
    private String name;
    // …
    @ElementCollection
    @CollectionTable(name="EMP_SENIORITY")
    @MapKeyJoinColumn(name="EMP_ID")
    @Column(name="SENIORITY")
    private Map<Employee, Integer> employees;
    // …
}
```



Collection table
DEPARTMENT
PK
ID
NAME
EMP_SENIORITY
PK, FK1
DEPARTMENT_ID
PK, FK2
EMP_ID
SENIORITY
EMPLOYEE
PK
ID
NAME
SALARY