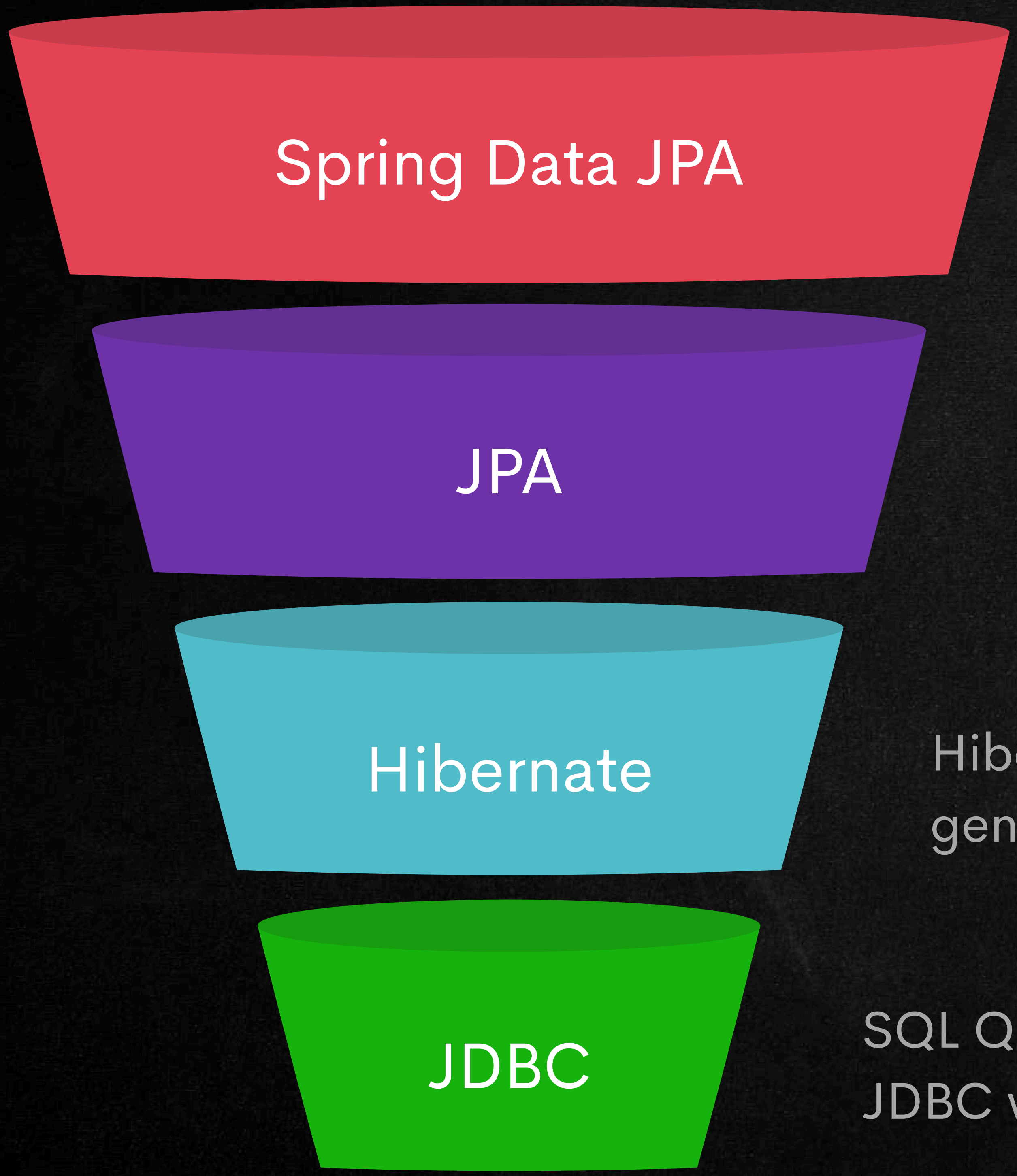
Spring Data JPA



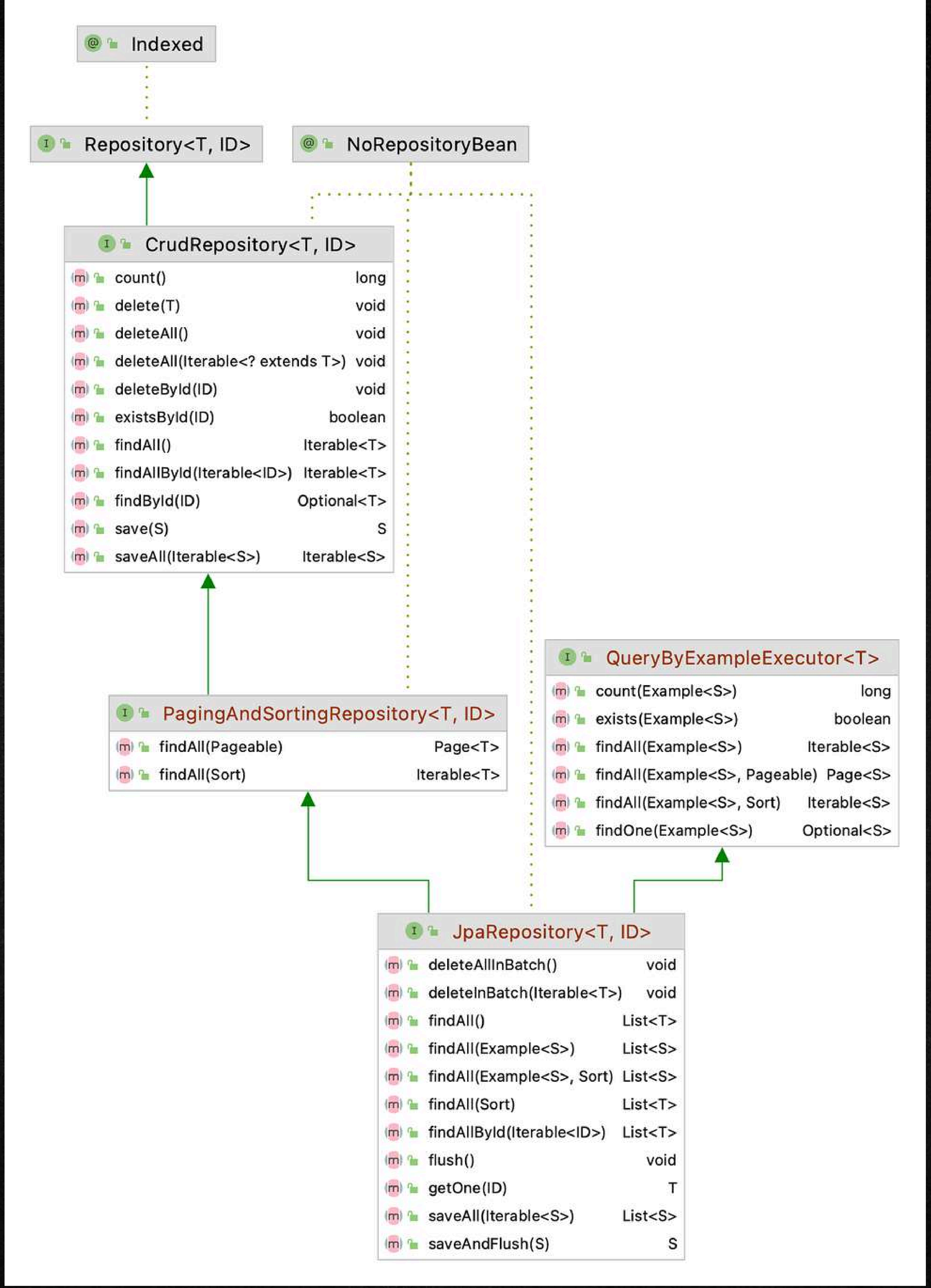
Spring Data JPA is an abstraction layer on top of JPA to reduce the boilerplate code required to implment Data Access Object

JPA (Jakarta Persistence API) is a specification that facilitates Object-Relationship mapping in JPA

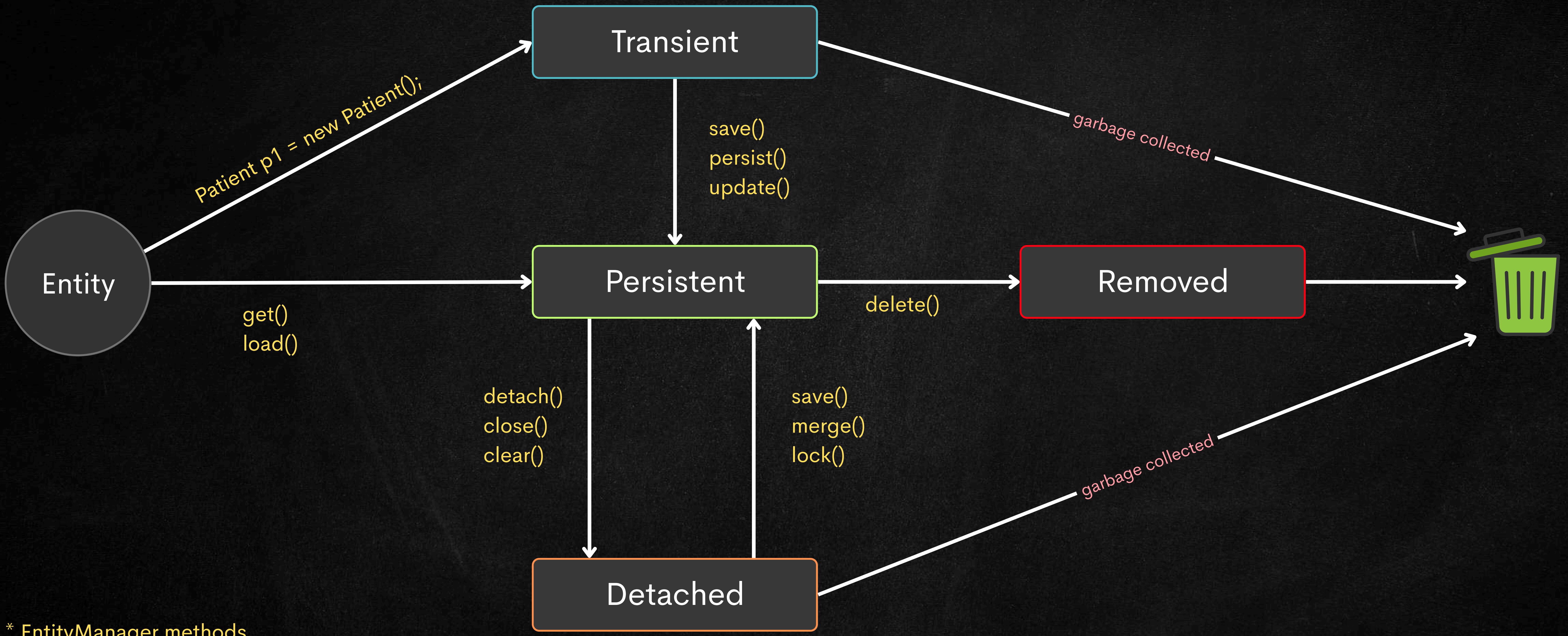
Hibernate is an implementation of JPA, and it generates SQL queries

SQL Queries are executed by JDBC which connects to the Database

JPA Repository

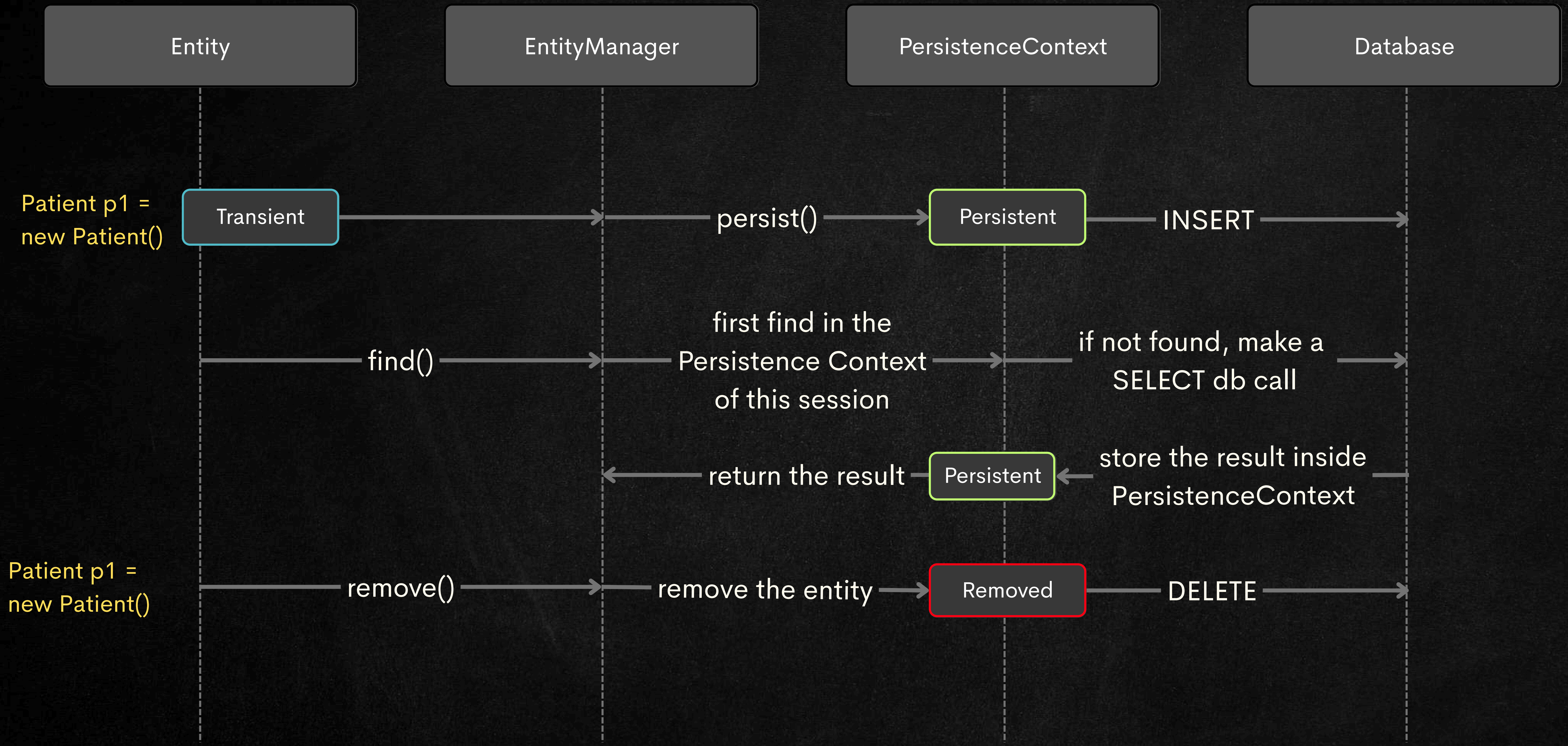

Indexed
Repository<T, ID>
NoRepositoryBean
CrudRepository<T, ID>
count() long
delete(T) void
deleteAll() void
deleteAll(Iterable<? extends T>) void
deleteById(ID) void
existsById(ID) boolean
findAll() Iterable<T>
findAllById(Iterable<ID>) Iterable<T>
findById(ID) Optional<T>
save(S) S
saveAll(Iterable<S>) Iterable<S>
QueryByExampleExecutor<T>
count(Example<S>) long
exists(Example<S>) boolean
findAll(Example<S>) Iterable<S>
findAll(Example<S>, Pageable) Page<S>
findAll(Example<S>, Sort) Iterable<S>
findOne(Example<S>) Optional<S>
PagingAndSortingRepository<T, ID>
findAll(Pageable) Page<T>
findAll(Sort) Iterable<T>
JpaRepository<T, ID>
deleteAllInBatch() void
deleteInBatch(Iterable<T>) void
findAll() List<T>
findAll(Example<S>) List<S>
findAll(Example<S>, Sort) List<S>
findAll(Sort) List<T>
findAllById(Iterable<ID>) List<T>
flush() void
getOne(ID) T
saveAll(Iterable<S>) List<S>
saveAndFlush(S) S

Hibernate - Entity Lifecycle



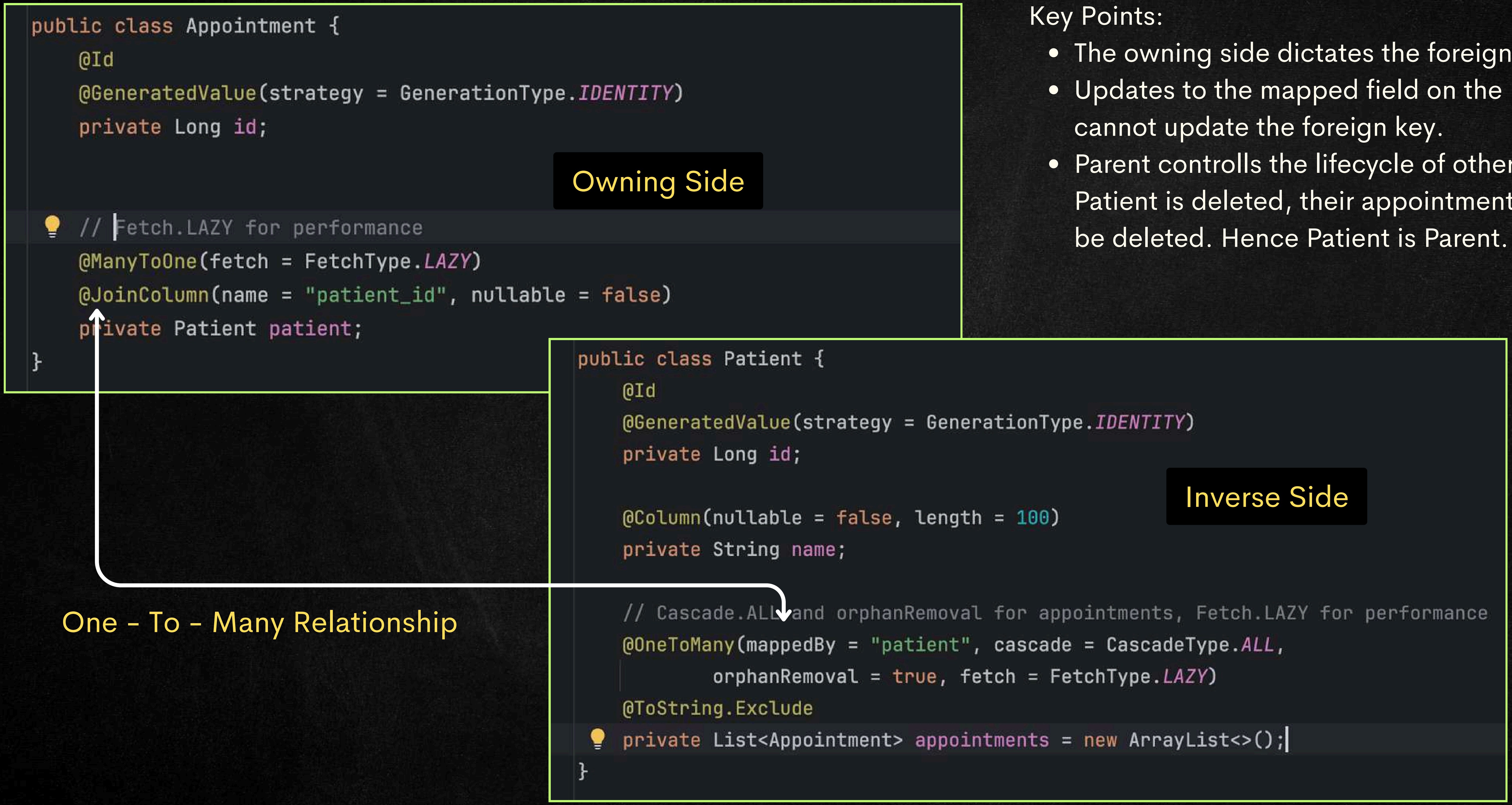
* EntityManager methods

EntityManager and PersistenceContext



Entity
EntityManager
PersistenceContext
Database
Patient p1 = new Patient()
Transient
persist()
Persistent
INSERT
find()
first find in the Persistence Context of this session
if not found, make a SELECT db call
return the result
Persistent
store the result inside PersistenceContext
Patient p1 = new Patient()
remove()
remove the entity
Removed
DELETE

Relationship Owning side and Inverse Side



```java
public class Appointment {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;


    // Fetch.LAZY for performance
    @ManyToOne(fetch = FetchType.LAZY)
    @JoinColumn(name = "patient_id", nullable = false)
    private Patient patient;
}
```

```java
public class Patient {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

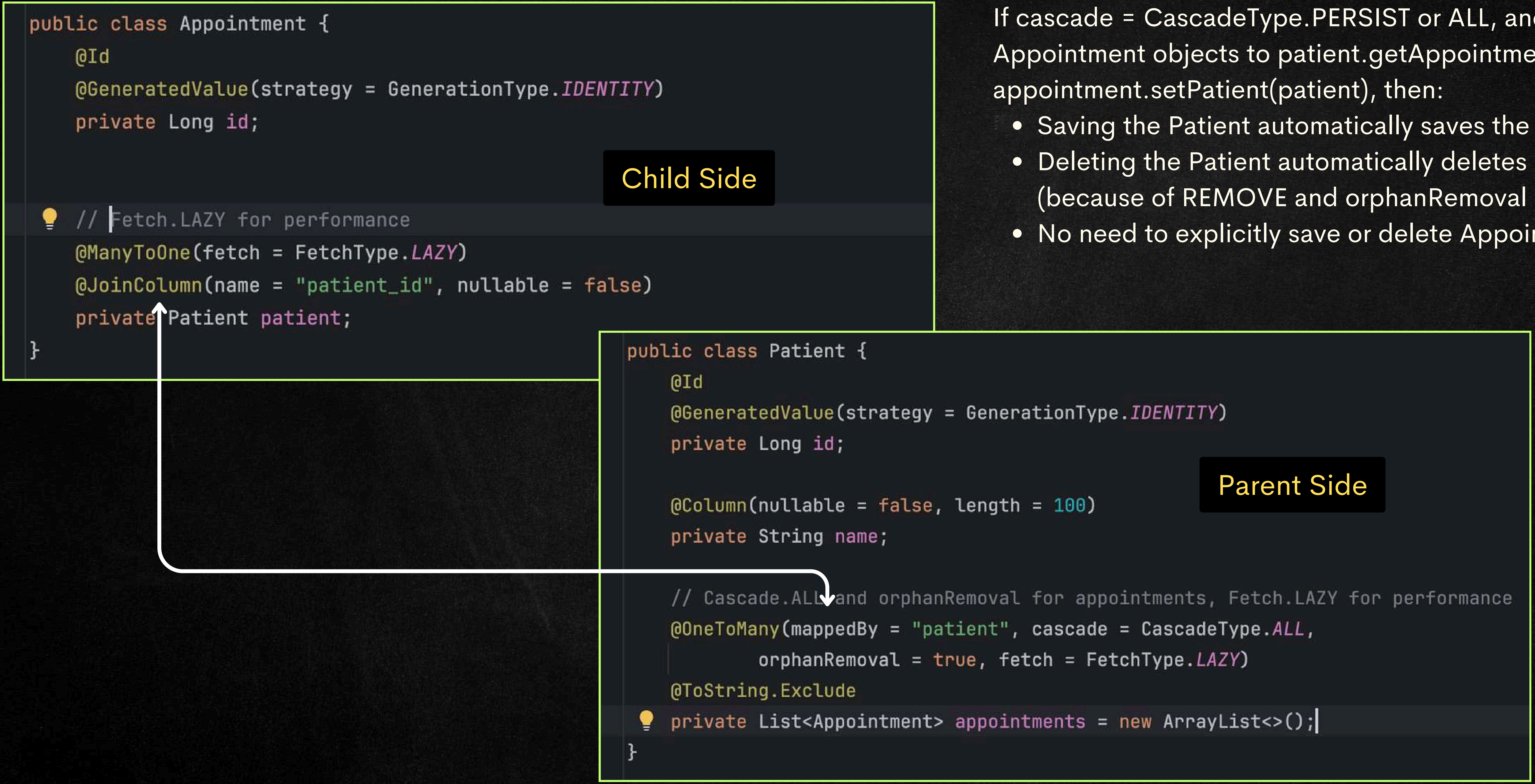
    @Column(nullable = false, length = 100)
    private String name;

    // Cascade.ALL and orphanRemoval for appointments, Fetch.LAZY for performance
    @OneToMany(mappedBy = "patient", cascade = CascadeType.ALL,
            orphanRemoval = true, fetch = FetchType.LAZY)
    @ToString.Exclude
    private List<Appointment> appointments = new ArrayList<>();
}
```

Key Points:

- The owning side dictates the foreign key updates.
- Updates to the mapped field on the Inverse side cannot update the foreign key.
- Parent controlls the lifecycle of other, here if a Patient is deleted, their appointments should also be deleted. Hence Patient is Parent.

Cascading in JPA Mappings



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    private String name;

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    @OneToMany(mappedBy = "patient", cascade = CascadeType.ALL,
            orphanRemoval = true, fetch = FetchType.LAZY)
    @ToString.Exclude
    private List<Appointment> appointments = new ArrayList<>();
}
```

If cascade = CascadeType.PERSIST or ALL, and you've added Appointment objects to patient.getAppointments() and set appointment.setPatient(patient), then:

- Saving the Patient automatically saves the Appointments.
- Deleting the Patient automatically deletes all Appointments (because of REMOVE and orphanRemoval = true).
- No need to explicitly save or delete Appointment.

CODING SHUTTLE

Cascading in JPA Mappings

In JPA, cascading tells the persistence provider (like Hibernate) what operations to propagate from a parent entity to its related child entities automatically.

- CascadeType.PERSIST: Propagate persist (save) operation.
- CascadeType.MERGE: Propagate merge (update) operation.
- CascadeType.REMOVE: Propagate remove (delete) operation.
- CascadeType.REFRESH: Propagate refresh operation.
- CascadeType.DETACH: Propagate detach operation.
- CascadeType.ALL: Propagate all operations (PERSIST, MERGE, REMOVE, REFRESH, DETACH).

Key Points About orphanRemoval

- When It Triggers:
  - For @OneToMany: When an entity is removed from the collection (e.g., List.remove(), clear(), or reassigning a new collection).
  - For @OneToOne: When the reference is set to null or replaced with a new entity.
- Automatic Deletion:
  - Orphaned entities are deleted automatically during the JPA flush or commit operation, without needing explicit calls to entity.remove()
- Difference from CascadeType.REMOVE:
  - CascadeType.REMOVE deletes child entities only when the parent is deleted.
  - orphanRemoval = true deletes child entities when they are no longer referenced by the parent, even if the parent remains in the database.
- Use Case:
  - Ideal for relationships where the child entity has no meaning without the parent (e.g., an Appointment without a Doctor or Patient, or an Insurance without a Patient).