Persistence in Jakarta EE 10 with Hibernate

Introducing ORM and Its Concepts

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Overview

ORM (Object-Relational Mapping)

JPA (Jakarta Persistence API)

Advantages and drawbacks of Hibernate

Object-Relational Impedance Mismatch

Simple Hibernate application

What Is ORM?

Object-Relational Mapping

Storing the representation of the objects

JPA and Hibernate

Jakarta Persistence API

Hibernate

Mapping logic

Advantages of JPA and Hibernate

Write less code

Quicker development

Focusing on OOP

Consistent model to interact with the database

Independent of the database vendor

Drawbacks of JPA and Hibernate

Learning curve

Harder to debug

Performance may suffer

JDBC is closer to the database

Use specific features of a vendor database

Object-relational Impedance Mismatch

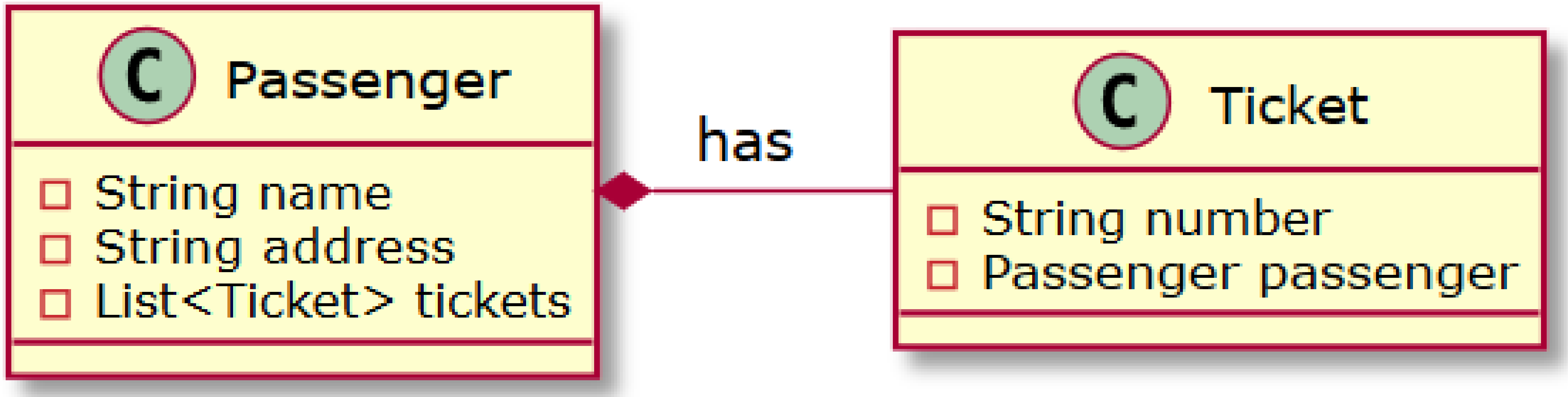
Object and relational models do not work fine together

Interconnected objects vs. related tables

Granularity, inheritance, identity, associations, and data navigation

The Granularity Problem

The Flights Management Application



The Flights Management Classes

```java
public class Passenger {
    private String name;
    private String address;
    private List<Ticket> tickets;
}

public class Ticket {
    private String number;
    private Passenger passenger;
}
```

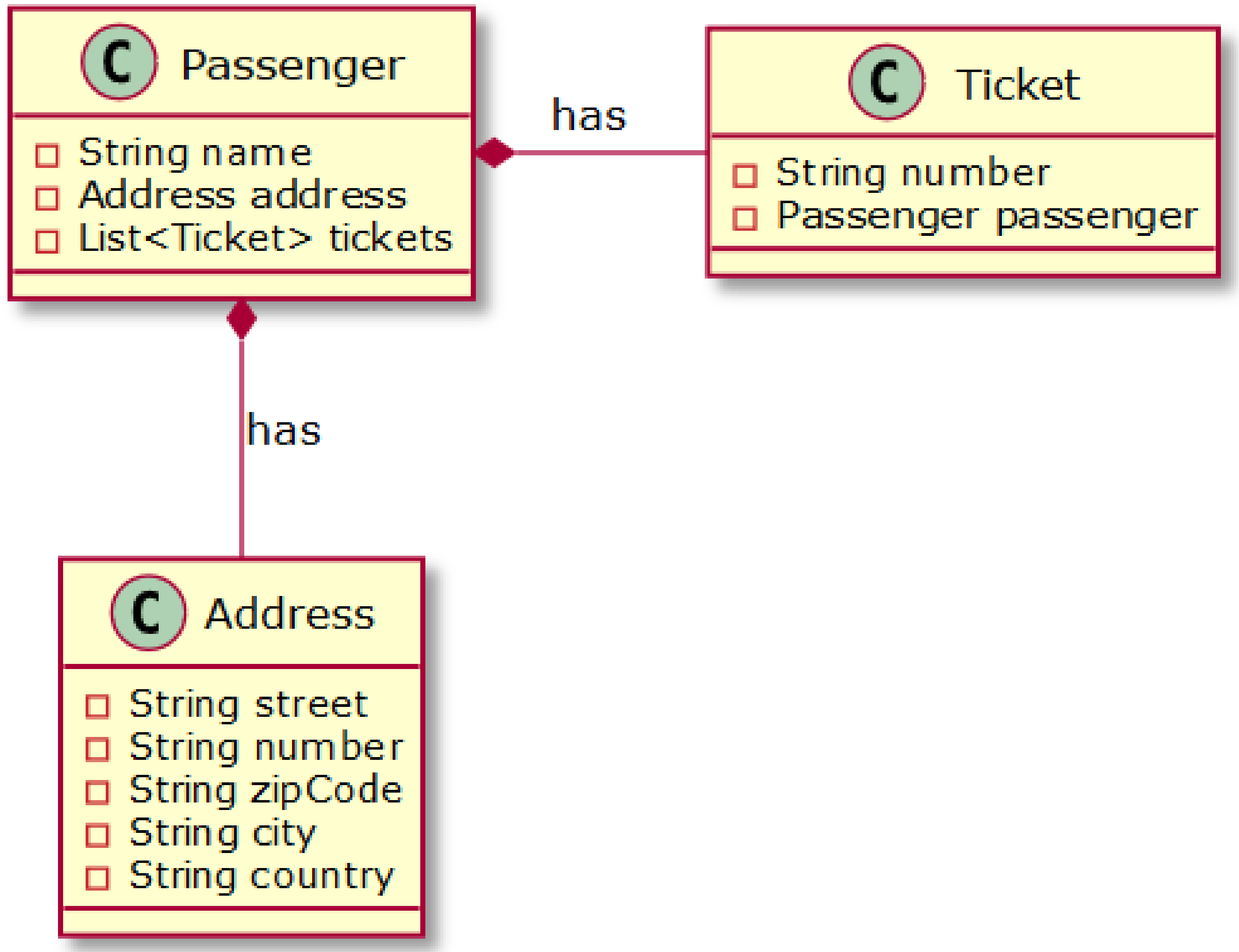
The Flights Management Tables

```
create table PASSENGERS (
        NAME varchar(255),
        ADDRESS varchar(255),
        primary key (NAME)
)

create table TICKETS (
        NUMBER varchar(255),
        PASSENGER_NAME varchar(255),
        primary key (NUMBER)
)

alter table TICKETS
       add constraint FK_PASSENGERS
       foreign key (PASSENGER_NAME)
       references PASSENGERS (NAME)
```

The Extended Flights Management Application

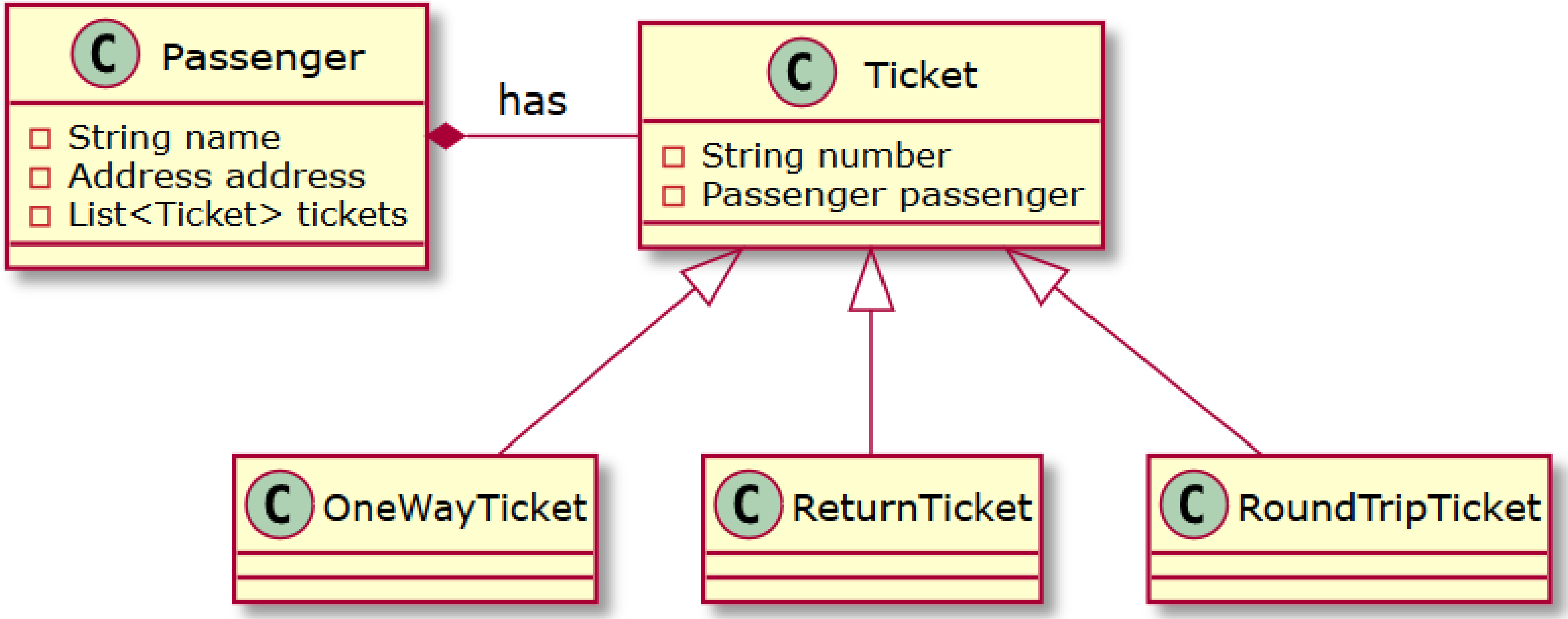


The Extended PASSENGERS Table

```
create table PASSENGERS (
        NAME varchar(255),
        ADDRESS_STREET varchar(30),
        ADDRESS_NUMBER varchar(6),
        ADDRESS_ZIPCODE varchar(10),
        ADDRESS_CITY varchar(25),
        ADDRESS_COUNTRY varchar(25),
        primary key (NAME)
)
```

The Inheritance Problem

Using Inheritance



The Identity Problem

The PK in the PASSENGERS Table

```
create table PASSENGERS (
        NAME varchar(255),
        ADDRESS_STREET varchar(30),
        ADDRESS_NUMBER varchar(6),
        ADDRESS_ZIPCODE varchar(10),
        ADDRESS_CITY varchar(25),
        ADDRESS_COUNTRY varchar(25),
        primary key (NAME)
)
```

Defining Uniqueness

Objects identity (the == operator)

Logical equality (the equals method)

Primary Keys

Tables with Surrogate Keys

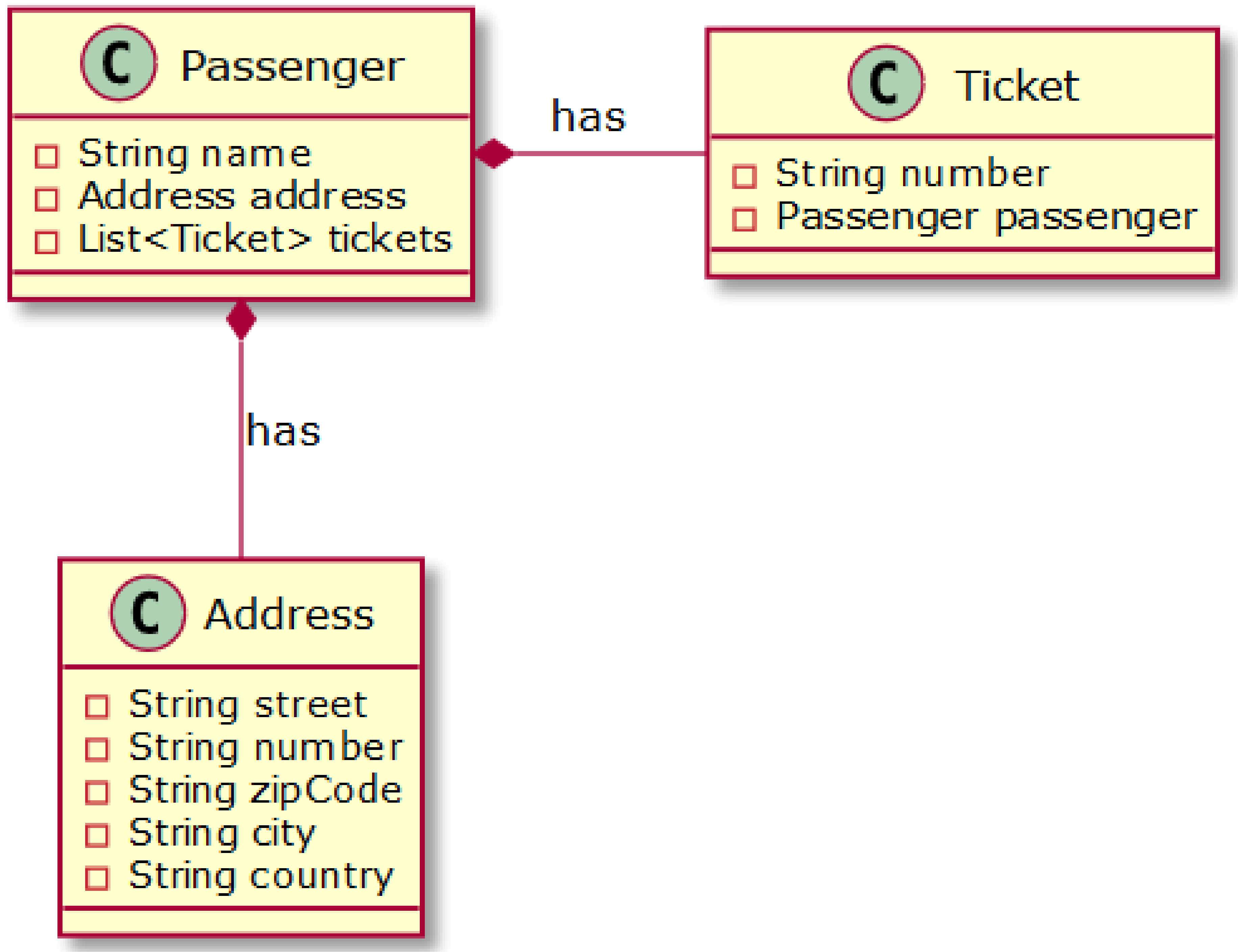
```
create table PASSENGERS (
       ID integer not null,
       NAME varchar(255),
       primary key (ID)
)

create table TICKETS (
       ID integer not null,
       NUMBER varchar(255),
       PASSENGER_ID integer,
       primary key (ID)
)

alter table TICKETS
       add constraint FK_PASSENGERS
       foreign key (PASSENGER_ID)
       references PASSENGERS (ID)
```

The Associations Problem

Associations in the Object-oriented Model

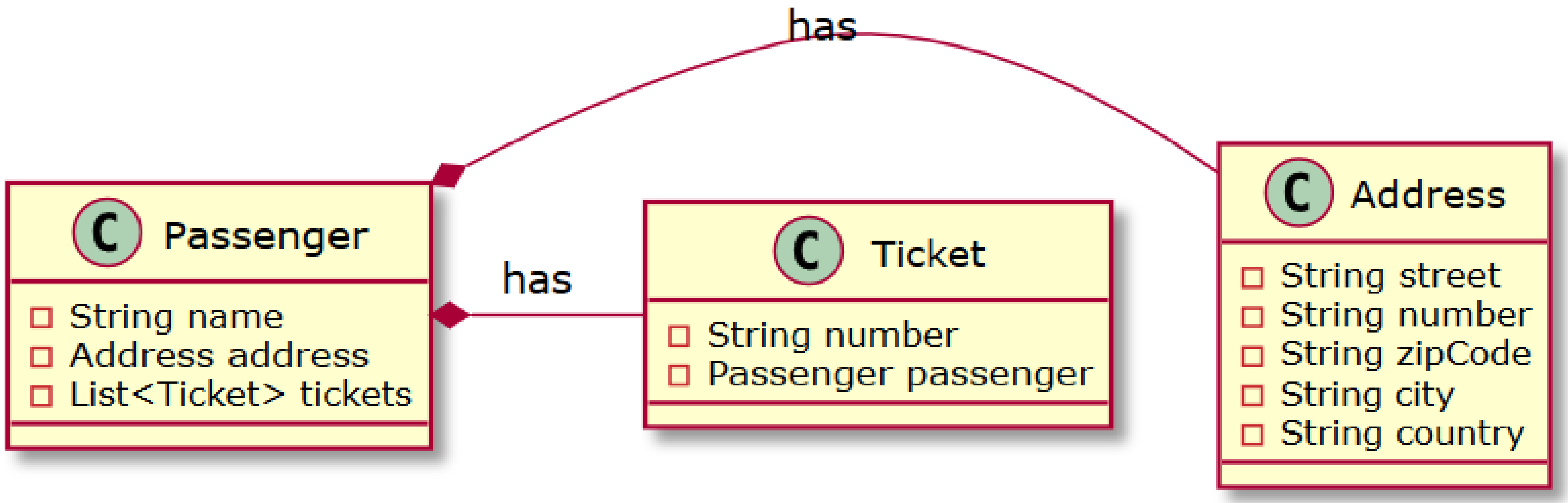


Associations in the Relational Model

```
create table PASSENGERS (
       ID integer not null,
       NAME varchar(255),
       ADDRESS_STREET varchar(30),
       ADDRESS_NUMBER varchar(6),
       ADDRESS_ZIPCODE varchar(10),
       ADDRESS_CITY varchar(25),
       ADDRESS_COUNTRY varchar(25),
       primary key (ID)
)

create table TICKETS (
       ID integer not null,
       NUMBER varchar(255),
       PASSENGER_ID integer,
       primary key (ID)
)
```

Associations in the Object-oriented Model

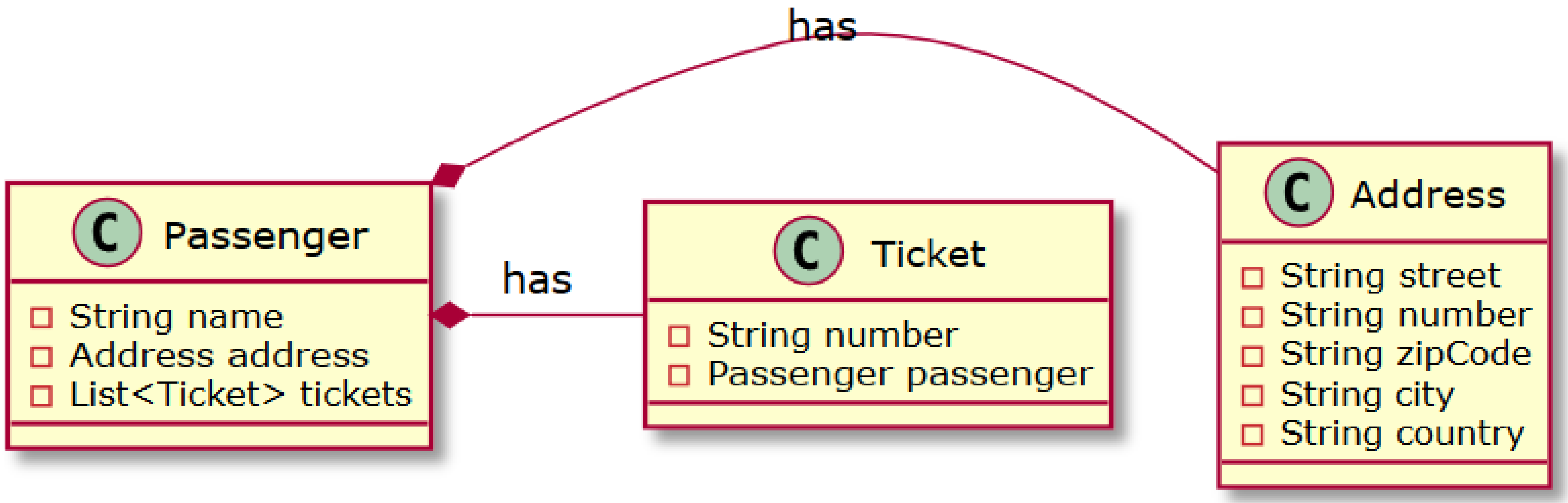


Associations in the Relational Model

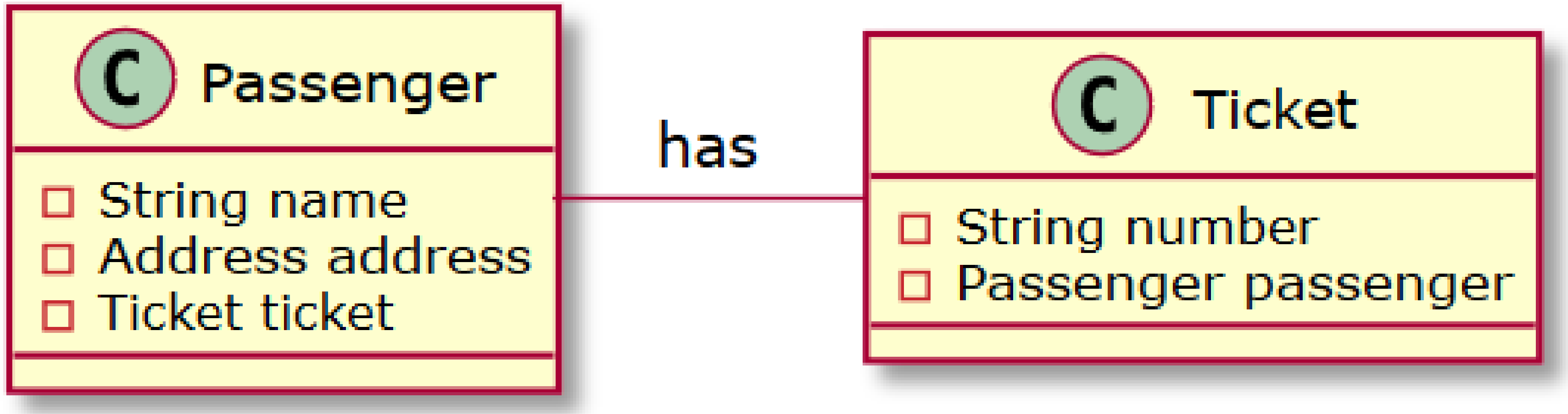
```
create table PASSENGERS (
       ID integer not null,
       NAME varchar(255),
       ADDRESS_STREET varchar(30),
       ADDRESS_NUMBER varchar(6),
       ADDRESS_ZIPCODE varchar(10),
       ADDRESS_CITY varchar(25),
       ADDRESS_COUNTRY varchar(25),
       primary key (ID)
)

create table TICKETS (
       ID integer not null,
       NUMBER varchar(255),
       PASSENGER_ID integer,
       primary key (ID)
)
```

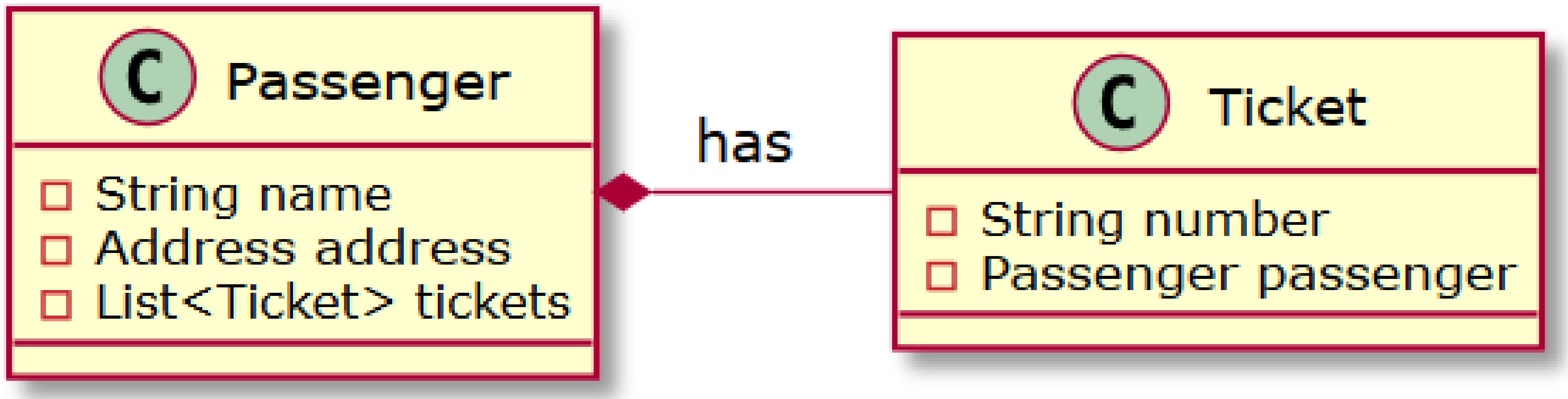
Associations in the Object-oriented Model



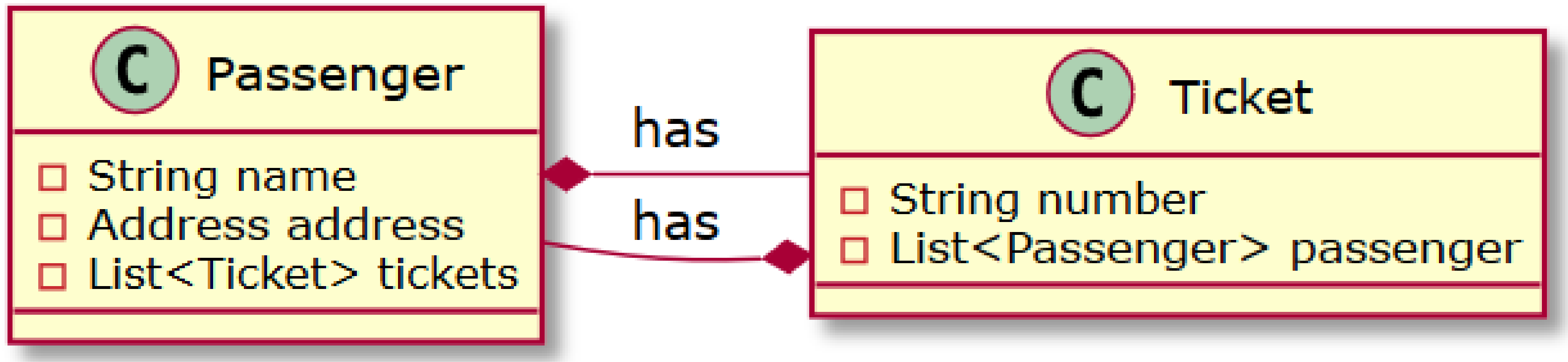
One-to-One Association



One-to-Many Association



Many-to-Many Association



Associations in the Relational Model

```
create table PASSENGERS (
       ID integer not null,
       NAME varchar(255),
       ADDRESS_STREET varchar(30),
       ADDRESS_NUMBER varchar(6),
       ADDRESS_ZIPCODE varchar(10),
       ADDRESS_CITY varchar(25),
       ADDRESS_COUNTRY varchar(25),
       primary key (ID)
)

create table TICKETS (
       ID integer not null,
       NUMBER varchar(255),
       PASSENGER_ID integer,
       primary key (ID)
)
```

Many-to-Many Associations in Relational Model

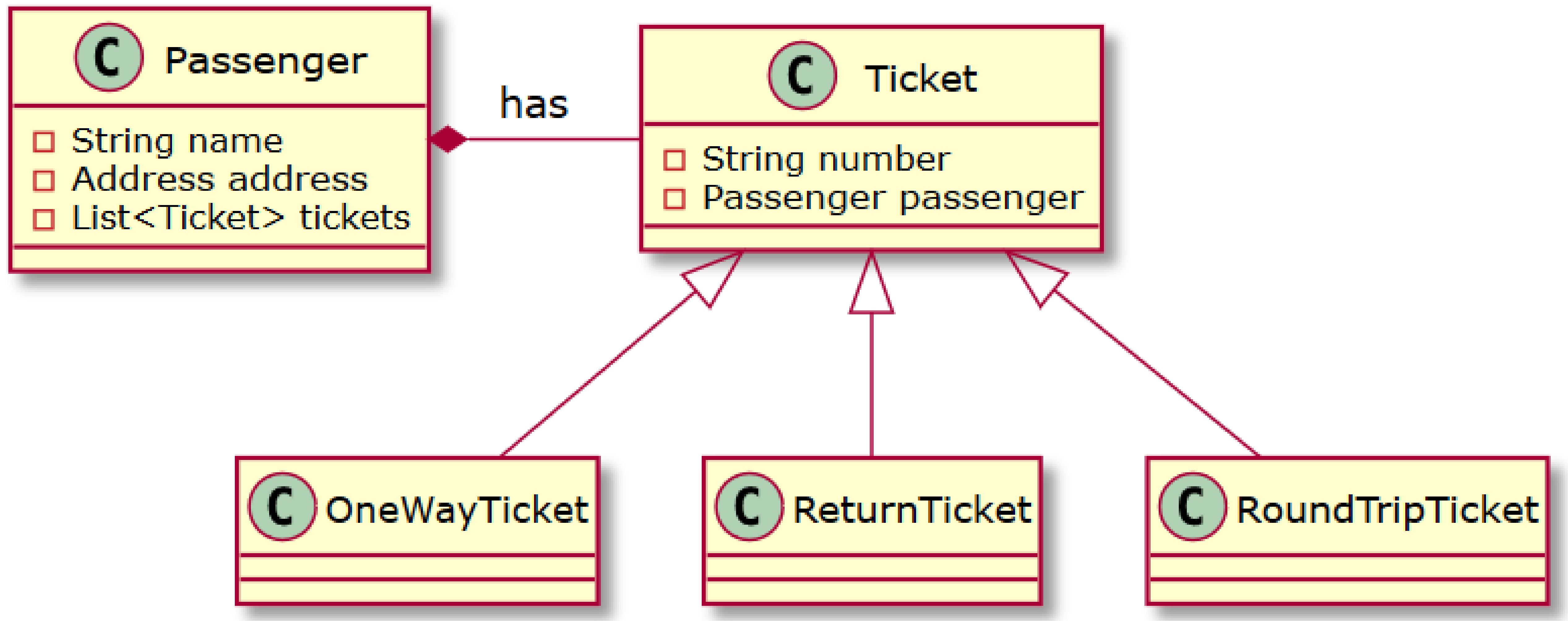
```
create table PASSENGERS_TICKETS (
       PASSENGER_ID integer not null,
       TICKET_ID integer not null,
       primary key (PASSENGER_ID, TICKET_ID)
)

alter table PASSENGERS_TICKETS
       add constraint FK_PASSENGERS
       foreign key (PASSENGER_ID)
       references PASSENGERS (ID)

alter table PASSENGERS_TICKETS
       add constraint FK_TICKETS
       foreign key (TICKET_ID)
       references TICKETS (ID)
```

The Data Navigation Problem

Data Navigation in the Object-Oriented Model



Data Navigation in the Relational Model

```
create table PASSENGERS (
       ID integer not null,
       NAME varchar(255),
       ADDRESS_STREET varchar(30),
       ADDRESS_NUMBER varchar(6),
       ADDRESS_ZIPCODE varchar(10),
       ADDRESS_CITY varchar(25),
       ADDRESS_COUNTRY varchar(25),
       primary key (ID)
)

create table TICKETS (
       ID integer not null,
       NUMBER varchar(255),
       PASSENGER_ID integer,
       primary key (ID)
)
```

Data Navigation Approaches

```
for(Ticket ticket: passenger.getTickets())

SELECT * FROM PASSENGERS WHERE ID = 727423

SELECT * FROM PASSENGERS, TICKETS
WHERE PASSENGERS.ID = 727423 AND
PASSENGERS.ID = TICKETS.PASSENGER_ID
```

Demo

Create a Jakarta EE 10 with Hibernate project

Create the entity classes

Persist objects to the database

Summary

Object-Relational Mapping (ORM)

Jakarta Persistence API (JPA)

Hibernate:

- Advantages
- Drawbacks

Problems of Object-Relational Impedance Mismatch

Simple Jakarta EE 10 with Hibernate application