Database 2 Project

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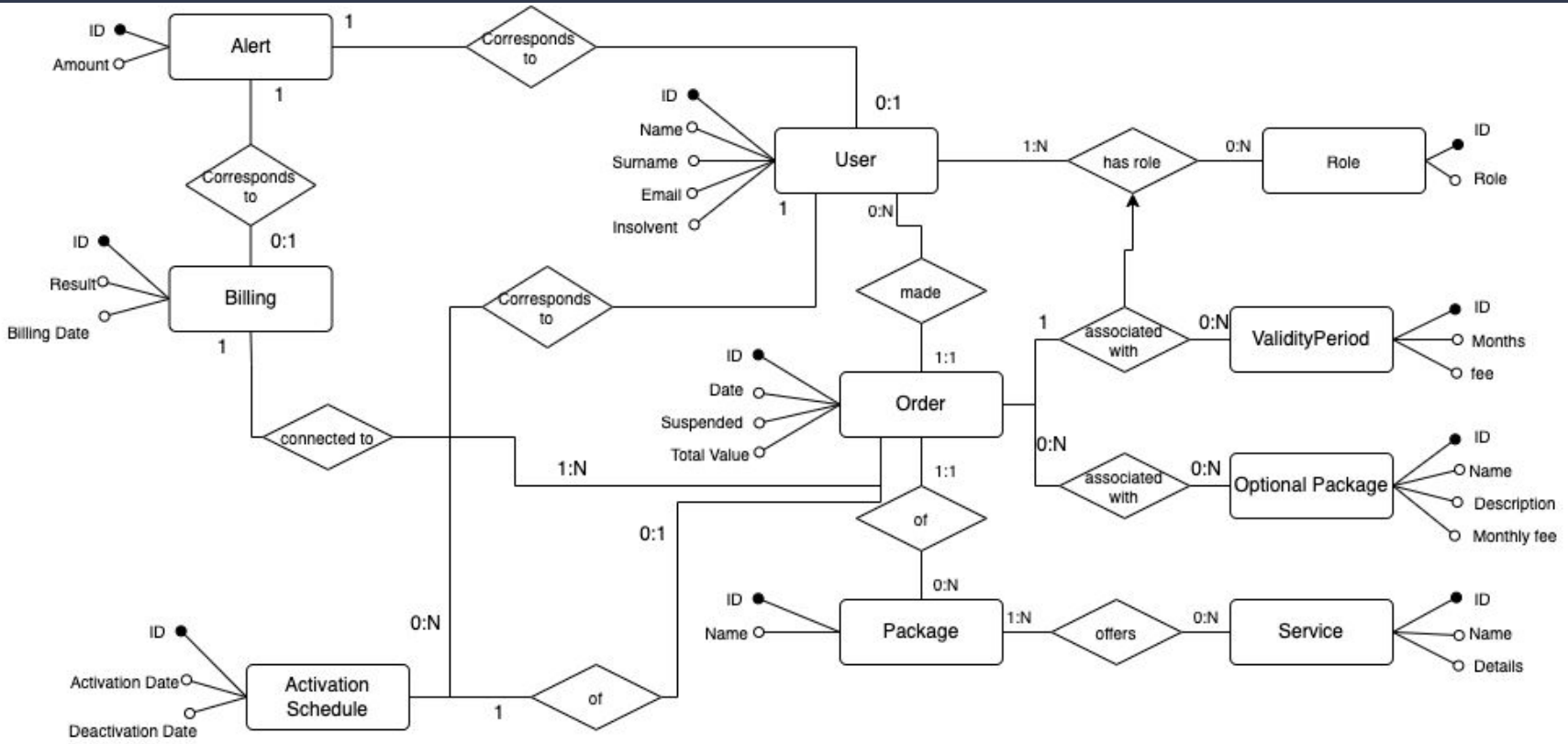
Specifications – Further assumptions

- The administrator, for testing purposes, have the ability to perform also all user actions and see all user pages.
- Products are not versioned for simplicity (this can cause some inconsistent data if current products are edited)

Diagrams

Conceptual and logical data models - ER Diagram



Relational Model Diagram

Tables code

Tables code – Tables

Activation schedule

```
create table activation_schedule
(
    id int auto_increment
        primary key,
    order_id          int          not null,
    username          varchar(255) not null,
    activation_date   date         not null,
    deactivation_date date         not null,
    constraint activation_schedule_id_uindex
        unique (id),
    constraint
activation_schedule_orders_order_id_fk
        foreign key (order_id) references
orders (order_id)
            on delete cascade,
    constraint
activation_schedule_users_username_fk
        foreign key (username) references
users (username) on delete cascade
);
```

Alerts

```
create table alerts
(
    id           int auto_increment
        primary key,
    username     varchar(255) not null,
    last_billing int          null,
    amount       double       null,
    constraint alerts_pk
        unique (id, username),
    constraint alerts_billings_id_fk
        foreign key (last_billing) references
billings (id) on delete cascade,
    constraint alerts_users_username_fk
        foreign key (username) references
users (username) on delete cascade
);
```

Billings

```
create table billings
(
    id                int auto_increment
        primary key,
    order_id          int        not null,
    result            tinyint(1) not null,
    billing_date_time datetime   not null,
    constraint billings_id_uindex
        unique (id),
    constraint billings_orders_order_id_fk
        foreign key (order_id) references
orders (order_id)
    on update cascade on delete cascade

);
```

Tables code – Tables

Optional Packages

```
create table optional_packages
(
    id          int auto_increment
        primary key,
    name        varchar(255) null,
    description varchar(255) null,
    monthly_fee double       null,
    constraint optional_packages__id_uindex
        unique (id)
);
```

Orders

```
create table orders
(
    order_id int auto_increment primary key,
    user               varchar(255) not null,
    order_date         datetime     null,
    package_id         int          not null,
    start_date         date         null,
    validity_period_id int          null,
    suspended          tinyint(1)   null,
    total_value        double       null,
    constraint orders_packages_id_fk
        foreign key (package_id) references
packages (package_id)
            on update cascade on delete
cascade,
    constraint orders_validity_periods_id_fk
        foreign key (validity_period_id)
references validity_periods (id)
            on update cascade on delete set
null,
    constraint purchases_users_username_fk
        foreign key (user) references users
 (username)on delete cascade

);
```

Packages

```
create table packages
(
    package_id   int auto_increment,
    package_name varchar(255) not null,
    constraint packages_id_uindex
        unique (package_id),
    constraint packages_package_name_uindex
        unique (package_name)
);
```

Tables code – Tables

Roles

```
create table roles
(
   id   int         not null
       primary key,
   role varchar(31) null
);
```

Validity Periods

```
create table validity_periods
(
   id     int auto_increment
       primary key,
   months int    not null,
   fee    double null
);
```

Users

```
create table users
(
   username  varchar(255) not null
       primary key,
   password  varchar(255) null,
   name      varchar(255) null,
   surname   varchar(255) null,
   email     varchar(255) not null,
   insolvent tinyint(1)   null,
   constraint users_email_uindex
       unique (email),
   constraint users_username_uindex
       unique (username)
);
```

Services

```
create table services
(
   service_id      int auto_increment
       primary key,
   service_name    varchar(255) null,
   service_details json         null,
   constraint services__service_id_uindex
       unique (service_id)
);
```

Tables code – Join Tables

Orders - Optional Packages

```
create table orders_optional_packages
(
   id_order            int null,
   id_optional_package int null,
   constraint
orders_optional_packages_optional_packages_id
_fk
       foreign key (id_optional_package)
references optional_packages (id) on delete
cascade,
   constraint
orders_optional_packages_orders_order_id_fk
       foreign key (id_order) references
orders (order_id)
           on update cascade on delete
cascade
);
```

Packages - Optional Packages

```
create table packages_optional_packages
(
id_service_package  int not null,
id_optional_package int not null,
constraint packages_optional_packages_pk
   unique (id_service_package,
id_optional_package),
constraint
packages_optional_packages_optional_packages_
id_fk_2
   foreign key (id_optional_package)
references optional_packages (id)
       on delete cascade,
constraint
packages_optional_packages_optional_packages_
id_fk
   foreign key (id_optional_package)
references optional_packages (id)
       on delete cascade

);
```

Packages - Services

```
create table packages_services
(
package_id int null,
service_id int null,
constraint packages_services_pk
   unique (package_id, service_id),
constraint
packages_services_packages_package_id_fk
   foreign key (package_id) references
packages (package_id)
       on delete cascade,
constraint
packages_services_services_service_id_fk
   foreign key (service_id) references
services (service_id)
       on delete cascade
);
```

Tables code – Join Tables

User - Roles

```
create table user_roles
(
user_id varchar(255) not null,
role_id int          not null,
constraint user_roles_pk
   unique (user_id, role_id),
constraint user_roles_roles_id_fk
   foreign key (role_id) references roles
(id)
       on delete cascade,
constraint user_roles_users_username_fk
   foreign key (user_id) references users
(username)
       on update cascade on delete cascade

);
```

Validity Period - Package

```
create table validity_period_package
(
packageId        int not null,
validityPeriodId int not null,
primary key (packageId, validityPeriodId),
constraint
validity_period_package_packages_package_id_fk
   foreign key (packageId) references packages
(package_id)
       on delete cascade,
constraint
validity_period_package_validity_periods_id_fk
   foreign key (validityPeriodId) references
validity_periods (id)
       on update cascade on delete cascade

);
```

Tables code - Materialized Views

Sales optional report

```
create table sales_optional_report
(
   optional_package_id int    not null
       primary key,
   score               double not null,
   constraint
SalesOptionalReport_optional_package_id_uinde
x
       unique (optional_package_id),
   constraint
sales_optional_report_optional_packages_id_fk
       foreign key (optional_package_id)
references optional_packages (id) on delete
cascade
);
```

Sales Package Report

```
create table sales_package_report
(
   package_id        int    null,
   total_sold        int    null,
   total_w_optional  int    null,
   total_wo_optional int    null,
   average_optional  double null,
   constraint
package_statistics_packages_package_id_fk
       foreign key (package_id) references
packages (package_id)
           on update cascade on delete cascade
);
```

Sales Validity Report

```
create table sales_validity_report
(
   package_id         int not null,
   validity_period_id int not null,
   total              int null,
   primary key (package_id,
validity_period_id),
   constraint
SalesValidityReport_packages_package_id_fk
       foreign key (package_id) references
packages (package_id)
           on update cascade on delete
cascade,
   constraint
sales_validity_report_validity_periods_id_fk
       foreign key (validity_period_id)
references validity_periods (id)
           on update cascade on delete cascade
);
```

Tables code - Views

User Accumulative Services

```
select partial.*, (select sum(o2.total_value) from orders o2 where o2.user = o.user group by o2.user) as cost
from (select o.user,
      sum(json_extract(REPLACE(s.service_details, '@', ''), '$.minutes')) as minutes,
      sum(json_extract(REPLACE(s.service_details, '@', ''), '$.sms')) as sms,
      sum(json_extract(REPLACE(s.service_details, '@', ''), '$.gigabytes')) as gigabytes
from packages p join orders o on p.package_id = o.package_id join packages_services ps on o.package_id = ps.package_id join services s
on ps.service_id = s.service_id
   join activation_schedule activation on o.order_id = activation.order_id
where activation.activation_date <= CURDATE() and curdate() < activation.deactivation_date
group by user) partial join orders o on o.user = partial.user group by partial.user;
```

This view has been created only for testing purposes

Triggers

Triggers design

Triggers have been used to maintain materialized views, to maintain alert table, to update activation_schedule table and to mark/unmark insolvent users

There are 12 triggers in total:

- 1 for alert maintenance
- 1 for insolvent user maintenance
- 1 for activation schedule table maintenance
- 3 for sales package report table maintenance
- 3 for sales validity report table maintenance
- 3 for sales optional report table maintenance

Triggers Code - Alert Management

Alert Management

```
create trigger alert_management
   after insert
   on billings
   for each row
BEGIN
   declare failed_payments integer;
   declare _username varchar(255);
   SET _username = (select user from orders o  where o.order_id = new.order_id);

   SET failed_payments := (select count(*) from billings b where b.order_id in (select o.order_id from orders o where o.suspended =1
   and b.order_id = o.order_id and o.user = _username));

   IF (NEW.result = 0 and failed_payments >= 3
       and (select count(*) from alerts a where a.username = _username) = 0) THEN
       insert into alerts (username, last_billing, amount) values (_username, new.id, (select orders.total_value from orders where
orders.order_id = new.order_id));
   end if;

   # if a successful payment is added and there are previous failed payments
   # it deletes the old alert
   if (new.result = true and failed_payments > 0) THEN
       delete from alerts a where a.username = _username;
   end if;
end;
```

Triggers Code - Activation Schedule Insert

Activation Schedule Insert

```
create trigger activation_schedule_insert
   after insert
   on billings
   for each row
BEGIN
   declare _username varchar(255);
   declare _activation_date date;
   declare _deactivation_date date;

   if (new.result = 1) then
       set _username = (SELECT o.user from orders o where o.order_id = new.order_id);
       set _activation_date = (SELECT start_date from orders o where o.order_id = new.order_id);
       set _deactivation_date = DATE_ADD(_activation_date,
                                         INTERVAL (
                                             select months
                                             from validity_periods
                                                      join orders o2 on validity_periods.id = o2.validity_period_id
                                             where o2.order_id = NEW.order_id) MONTH);

       insert into activation_schedule (order_id, username, activation_date, deactivation_date)
           value (new.order_id, _username, _activation_date, _deactivation_date);
   end if;

end;
```

Triggers Code - Mark Insolvent Users

Mark Insolvent Users

```
create trigger mark_insolvent_users
   after insert
   on billings
   for each row
BEGIN
   IF (!new.result)
   THEN
       update users set insolvent = 1
       where username in (select distinct user
                  from orders
                  where order_id = NEW.order_id
              );
   ELSE
       update users set insolvent = 0
       where username in (select distinct user
                  from orders
                  where order_id = NEW.order_id
              );
   end if;
end;
```

Triggers Code – Sales Package Insert

Sales Package Insert

```
create trigger SalesPackage_insert
   after insert
   on orders
   for each row
BEGIN
   declare _package_id int;
   declare _total_sold int;
   declare _total_op_sold_with int;
   declare _total_sold_without int;
   declare _average_optional_sold double;

   set _package_id := (select package_id from orders where order_id = new.order_id);
   set _total_sold := (select count(*) from orders where package_id = _package_id);
   set _total_op_sold_with := (select count(*) from orders join orders_optional_packages oop on orders.order_id = oop.id_order
        where package_id = _package_id);

   set _total_sold_without := (select count(*) from (select o.order_id from orders o where o.package_id = _package_id) as orders
                               where order_id not in (select oop.id_order from orders_optional_packages oop));
   set _average_optional_sold := CAST(_total_op_sold_with as DOUBLE) / CAST(_total_sold as DOUBLE);

   if (_package_id in (select package_id from sales_package_report)) THEN
       update sales_package_report  set total_sold = _total_sold,  total_op_sold_w   = _total_op_sold_with, total_wo_optional = _total_sold_without,
average_optional  = _average_optional_sold where package_id = _package_id;
   else
       insert into sales_package_report (package_id, total_sold, total_op_sold_w, total_wo_optional, average_optional)
       values (_package_id, _total_sold, _total_op_sold_with, _total_sold_without, _average_optional_sold);
   end if;
end;
```

Triggers Code – Sales Package Update

Sales Package Update

```
create trigger SalesPackage_update
   after update
   on orders
   for each row
BEGIN
  declare _total_sold int;
  declare _total_op_sold_with int;
  declare _total_sold_without int;
  declare _average_optional_sold double;
  declare old [...]

  set _total_sold := (select count(*) from orders where package_id = new.package_id);
  set _total_op_sold_with := (select count(*) from (select o.order_id from orders o where o.package_id = new.package_id) as orders
                          where order_id in (select oop.id_order from orders_optional_packages oop));
  set _total_sold_without := (select count(*) from (select o.order_id from orders o where o.package_id = new.package_id) as orders
                             where order_id not in (select oop.id_order from orders_optional_packages oop));

  if (_total_sold != 0) then set _average_optional_sold := CAST(_total_op_sold_with as DOUBLE) / CAST(_total_sold as DOUBLE);
  else  set _average_optional_sold := 0; end if;

  if (new.package_id in (select package_id from sales_package_report)) THEN
   update sales_package_report
   set total_sold = _total_sold, total_op_sold_w = _total_op_sold_with, total_wo_optional = _total_sold_without, average_optional = _average_optional_sold
       where package_id = new.package_id;
   else
       insert into sales_package_report (package_id, total_sold, total_op_sold_w, total_wo_optional, average_optional)
       values (old.package_id, _total_sold, _total_op_sold_with, _total_sold_without, _average_optional_sold);
   end if;
*** same for old orders ***
```

Triggers Code – Sales Package Delete

Sales Package Delete

```
create trigger SalesPackage_delete
   after delete
   on orders
   for each row
BEGIN
   declare _total_sold int;
   declare _total_op_sold_with int;
   declare _total_sold_without int;
   declare _average_optional_sold double;

   set _total_sold := (select count(*) from orders where package_id = old.package_id);
   set _total_op_sold_with := (select count(*) from (select o.order_id from orders o where o.package_id = old.package_id) as orders
                          where order_id in (select oop.id_order from orders_optional_packages oop));
   set _total_sold_without := (select count(*) from (select o.order_id from orders o where o.package_id = old.package_id) as orders
                             where order_id not in (select oop.id_order from orders_optional_packages oop));
   if (_total_sold != 0) then set _average_optional_sold := CAST(_total_op_sold_with as DOUBLE) / CAST(_total_sold as DOUBLE);
   else  set _average_optional_sold := 0; end if;

   if (old.package_id in (select package_id from sales_package_report)) THEN
       update sales_package_report
       set total_sold        = _total_sold, total_op_sold_w  = _total_op_sold_with, total_wo_optional = _total_sold_without, average_optional  =
_average_optional_sold where package_id = old.package_id;
   else
       insert into sales_package_report (package_id, total_sold, total_op_sold_w, total_wo_optional, average_optional)
       values (old.package_id, _total_sold, _total_op_sold_with, _total_sold_without, _average_optional_sold);
   end if;
end;
```

Triggers Code - Sales Validity Insert

Sales Validity Insert

```
create trigger sales_validity_insert
   after insert
   on orders
   for each row
BEGIN
   declare _package_id int;
   declare _validity_id int;
   declare _total int;

   set _package_id := new.package_id;
   set _validity_id := new.validity_period_id;
   set _total := ( select count(*)  from orders
       where _package_id = package_id  and _validity_id = validity_period_id );

   if ((_package_id, _validity_id) in
       (select svr.package_id, svr.validity_period_id from sales_validity_report svr))
   then
       update sales_validity_report svr  set svr.package_id = _package_id, svr.total = _total
       where svr.package_id = _package_id and svr.validity_period_id = _validity_id;
   else
       insert into sales_validity_report (package_id, validity_period_id, total)
       values (_package_id, _validity_id, _total);
   end if;
end;
```

Triggers Code - Sales Validity Update

Sales Validity Update

```
drop trigger sales_validity_update;
create definer = asus@`%` trigger sales_validity_update
   after update
   on orders
   for each row
BEGIN
   declare _package_id int;
   declare _validity_id int;
   declare _total int;
   declare old_[...]

   if (new.validity_period_id is not null) then
       set _package_id := new.package_id;
       set _validity_id := new.validity_period_id;
       set _total := (select count(*) from orders o where _package_id = o.package_id and _validity_id = o.validity_period_id );

        if ((_package_id, _validity_id) in (select svr.package_id, svr.validity_period_id from sales_validity_report svr))
       then update sales_validity_report svr
           set svr.package_id = _package_id, svr.total = _total where svr.package_id = _package_id and svr.validity_period_id =
_validity_id;
      else insert into sales_validity_report (package_id, validity_period_id, total) values (_package_id, _validity_id, _total); end if;
   end if;
        [... old_ part ..]
end;
```

Triggers Code - Sales Validity Delete

Sales Validity Delete

```
create trigger sales_validity_delete
   after delete
   on orders
   for each row
BEGIN
   declare old_package_id int;
   declare old_validity_id int;
   declare old_total int;

   set old_package_id := old.package_id;
   set old_validity_id := old.validity_period_id;
   set old_total := ( select count(*)  from orders o where old_package_id = o.package_id and old_validity_id = o.validity_period_id );
   # update old line
   if ((old_package_id, old_validity_id) in
       (select svr.package_id, svr.validity_period_id from sales_validity_report svr))
   then
       update sales_validity_report svr
       set svr.package_id = old_package_id, svr.total = old_total where svr.package_id = old_package_id and svr.validity_period_id =
old_validity_id;
   else
       insert into sales_validity_report (package_id, validity_period_id, total)
       values (old_package_id, old_validity_id, old_total);
   end if;
end;
```

Triggers Code – Sales Optional Delete

Sales Optional Delete

```
create definer = asus@`%` trigger sales_optional_delete
   after delete
   on orders_optional_packages
   for each row
BEGIN
   if ((select count(*) from orders_optional_packages) > 0) then
       update sales_optional_report s
       set s.score =
               (CAST((select count(*)
                      from orders_optional_packages oop
                      where oop.id_optional_package = old.id_optional_package) as DOUBLE)
                   / CAST((select count(*) from orders_optional_packages) as DOUBLE))
       where s.optional_package_id = old.id_optional_package;

   else
       delete from sales_optional_report s where s.optional_package_id = old.id_optional_package;
   end if;
end;
```

Triggers Code - Sales Optional Insert

Sales Optional Insert

```
create trigger sales_optional_insert
   after insert
   on orders_optional_packages
   for each row
BEGIN

   if (new.id_optional_package not in (select s.optional_package_id from sales_optional_report s)) then
       insert into sales_optional_report (optional_package_id, score) value (new.id_optional_package, 0);
   end if;

   update sales_optional_report s
   set s.score = (CAST((select count(*)
                        from orders_optional_packages oop
                        where oop.id_optional_package = s.optional_package_id) as DOUBLE) /
                  CAST((select count(*) from orders_optional_packages) as DOUBLE));

end;
```

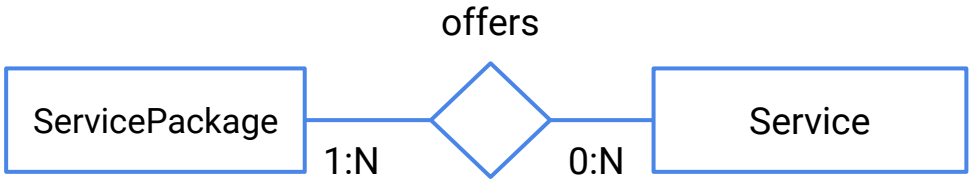
Triggers Code - Sales Optional Update

Sales Optional Update

```
create trigger sales_optional_update
   after update
   on orders_optional_packages
   for each row
BEGIN
   if (new.id_optional_package not in (select s.optional_package_id from sales_optional_report s)) then
       insert into sales_optional_report (optional_package_id, score) value (new.id_optional_package, 0);
   end if;

   update sales_optional_report s
   set s.score = (CAST((select count(*)
                        from orders_optional_packages oop
                        where oop.id_optional_package = s.optional_package_id) as DOUBLE) /
                  CAST((select count(*) from orders_optional_packages) as DOUBLE));
end;
```

ORM

Relationship



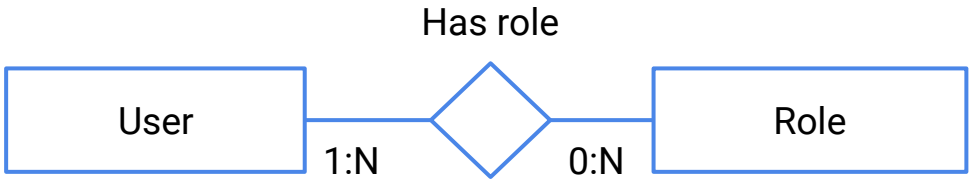
Package → Service

@ManyToMany
- Eager Fetch

Service → Package

Not mapped

Relationship



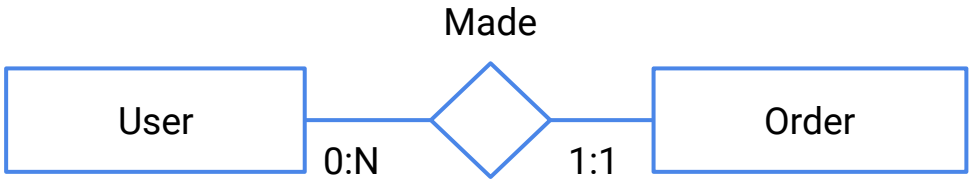
User → Role

@ManyToMany
- Eager Fetch

Role → User

Not mapped

Relationship



User → Order

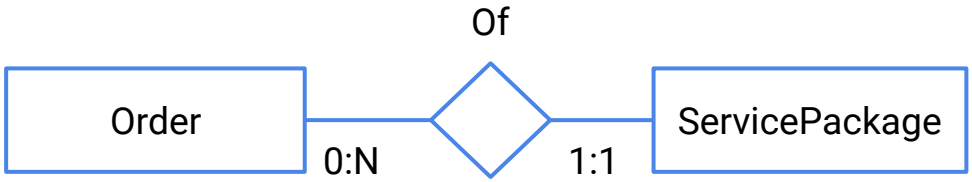
Not mapped

Order → User

@ManyToOne

- Eager Fetch (default)

Relationship



Order → Package

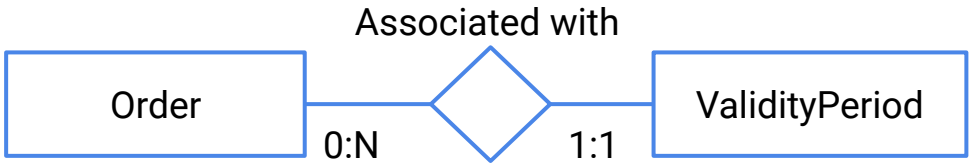
@ManyToOne

- Eager Fetch (default)

Package → Order

Not mapped

Relationship



Order → ValidityPeriod

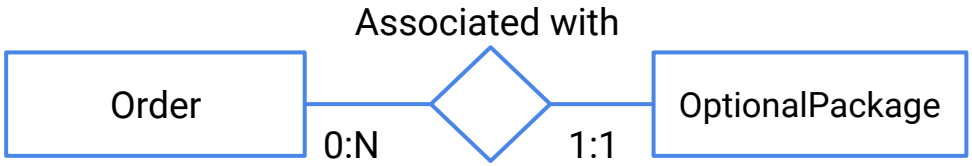
@OneToOne

- Lazy Fetch

ValidityPeriod → Order

Not mapped

Relationship



Order → OptionalPackage

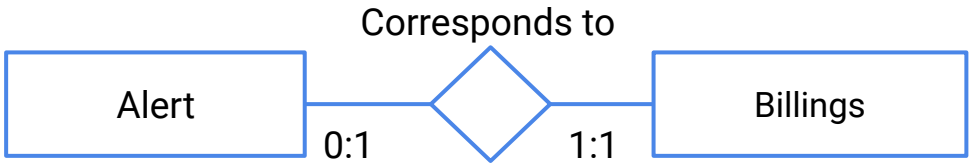
@ManyToOne

- Eager Fetch

OptionalPackage → Order

Not mapped

Relationship



Alert → Billings

@OneToOne

- Eager Fetch (default)

Billings → Alert

Not mapped

Entities Code

Service Entity

Service Entity

```
@Entity
@Table(name = "services")
public class ServiceEntity {
    @Id
    @Column(name = "service_id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long serviceId;

    @Column(name = "service_name")
    private String serviceName;

    @Column(name = "service_details")
    private String serviceDetails;
}
```

Alerts Entity

Alerts Entity

```java
@Entity
@EntityListeners(ReadOnlyEntity.class)
@Table(name = "alerts")
public class AlertEntity {
   @Id
   @Column(name = "id")
   @GeneratedValue(strategy = GenerationType.IDENTITY)
   private Long id;

   @Column(name = "username")
   private String username;

   @OneToOne
   @JoinColumn(name = "last_billing")
   BillingEntity billing;
}
```

Billings Entity

Billings Entity

```java
@Entity
@Table(name = "billings")
public class BillingEntity {
    @Id
    @Column(name = "id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Integer id;

    @Column(name = "order_id")
    private Integer orderId;

    @Column(name = "result")
    private Boolean result;

    @Column(name = "billing_date_time")
    private LocalDateTime billingDateTime;

}
```

OptionalPackages Entity

OptionalPackages Entity

```java
@Entity
@Table(name = "optional_packages")
public class OptionalPackageEntity {
    @Id
    @Column(name = "id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    @Column(name = "name")
    private String name;

    @Column(name = "description")
    private String description;

    @Column(name = "monthly_fee")
    private Double monthlyFee;
}
```

Order Entity

Order Entity

```java
@Entity
@Table(name = "orders")
public class OrderEntity {
    @Id
    @Column(name = "order_id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    @Column(name = "order_date")
    private LocalDateTime orderDate;

    @ManyToOne
    @JoinColumn(name = "user")
    private UserEntity user;

    @ManyToOne
    @JoinColumn(name = "package_id")
    private ServicePackageEntity servicePackageEntity;

    @Column(name = "start_date")
    private LocalDate startDate;

    @ManyToOne
    @JoinColumn(name = "validity_period_id")
    private ValidityPeriodEntity validityPeriod;


    @Column(name = "suspended")
    private Boolean suspended;

    @Column(name = "total_value")
    private Double totalValue;

    @ManyToMany(fetch = FetchType.EAGER)
    @ToString.Exclude
    @JoinTable(
            name = "orders_optional_packages",
            joinColumns = {@JoinColumn(name = "id_order")},
            inverseJoinColumns = {@JoinColumn(name =
            "id_optional_package")})
    private List<OptionalPackageEntity> optionalPackages;
}
```

Role Entity

Role Entity

```java
@Entity
@Table(name = "roles")
public class RoleEntity {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    Long id;

    @Enumerated(EnumType.STRING)
    @Column(name = "role")
    private Role role;
}
```

SalesOptionalReport Entity

SalesOptionalReport Entity

```java
@Entity
@EntityListeners(ReadOnlyEntity.class)
@Table(name = "sales_optional_report")
public class SalesOptionalReportEntity {
    @Id
    @Column(name = "optional_package_id")
    private Long id;

    @OneToOne
    @JoinColumn(name = "optional_package_id", insertable = false, updatable = false)
    private OptionalPackageEntity optionalPackage;

    @Column(name = "score")
    private Double score;
}
```

SalesPackageReport Entity

SalesPackageReport Entity

```java
@Entity
@EntityListeners(ReadOnlyEntity.class)
@Table(name = "sales_package_report")
public class SalesPackageReportEntity {
    @Id
    @Column(name = "package_id")
    private Long id;

    @ManyToOne
    @JoinColumn(name = "package_id", insertable = false,
                updatable = false)
    private ServicePackageEntity servicePackage;

    @Column(name = "total_sold")
    private Integer totalSold;

    @Column(name = "total_w_optional")
    private Integer totalWOptional;

    @Column(name = "total_wo_optional")
    private Integer totalWoOptional;

    @Column(name = "average_optional")
    private Double averageOptional;
}
```

SalesValidityReport Entity

SalesValidityReport Entity

```java
@Entity
@EntityListeners(ReadOnlyEntity.class)
@Table(name = "sales_validity_report")
public class SalesValidityReportEntity {
    @EmbeddedId
    private SalesValidityId salesValidityId;

    @Column(name = "total")
    private Integer total;
}
```

```java
@Embeddable
public class SalesValidityId implements Serializable {
    @ManyToOne
    @JoinColumn(name = "validity_period_id", nullable =
false)
    private ValidityPeriodEntity validityPeriod;

    @ManyToOne
    @JoinColumn(name = "package_id", nullable = false)
    private ServicePackageEntity servicePackage;
}
```

ServicePackage Entity

ServicePackage Entity

```
@Entity
@Table(name = "packages")
public class ServicePackageEntity {
   @Id
   @Column(name = "package_id")
   @GeneratedValue(strategy = GenerationType.IDENTITY)
   private Long id;

   @Column(name = "package_name")
   private String name;

   @ManyToMany(fetch = FetchType.EAGER)
   @ToString.Exclude
   @JoinTable(
           name = "packages_services", schema = "db2_pdb",
           joinColumns = {@JoinColumn(name = "package_id", referencedColumnName = "package_id")},
           inverseJoinColumns = {@JoinColumn(name = "service_id", referencedColumnName = "service_id")})
   private Set<ServiceEntity> services;
}
```

User Entity

User Entity

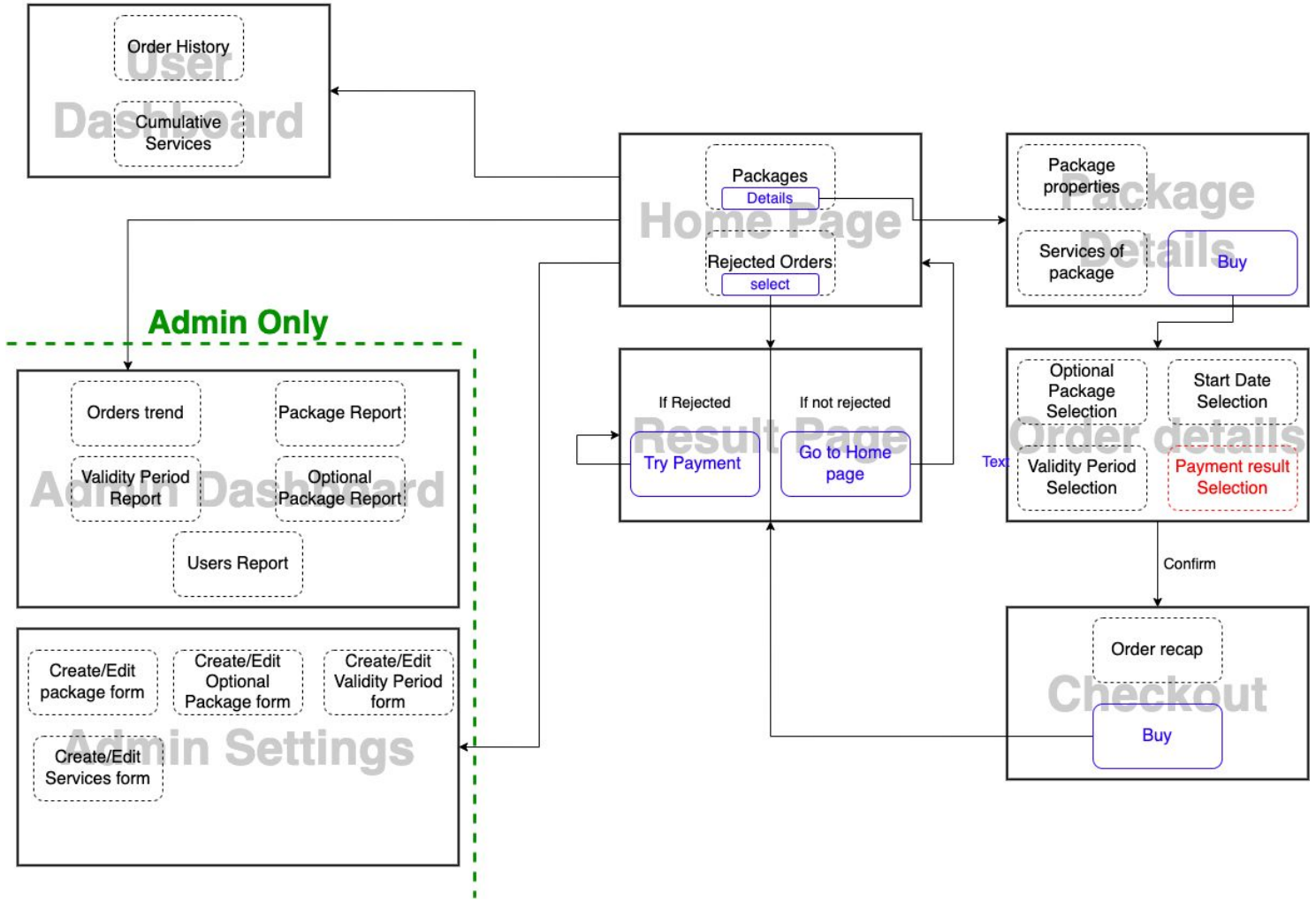
```
@Entity
@Table(name = "users", uniqueConstraints = {
        @UniqueConstraint(name = "users_username_uindex",
                          columnNames = {"username"}),
        @UniqueConstraint(name = "users_email_uindex",
                          columnNames = {"email"})
})
public class UserEntity {
    @Id
    @Column(name = "username", nullable = false)
    private String username;

    @Column(name = "name")
    private String name;

    @Column(name = "password")
    private String password;

    @Column(name = "surname")
    private String surname;

    @Column(name = "email")
    private String email;

    @ManyToMany(fetch = FetchType.EAGER)
    @JoinTable(name = "user_roles",
            joinColumns = @JoinColumn(name = "user_id"),
            inverseJoinColumns = @JoinColumn(name =
                                             "role_id"))
    @ToString.Exclude
    private Set<RoleEntity> roles;

    @Column(name = "insolvent")
    private Boolean insolvent;

}
```

ValidityPeriod Entity

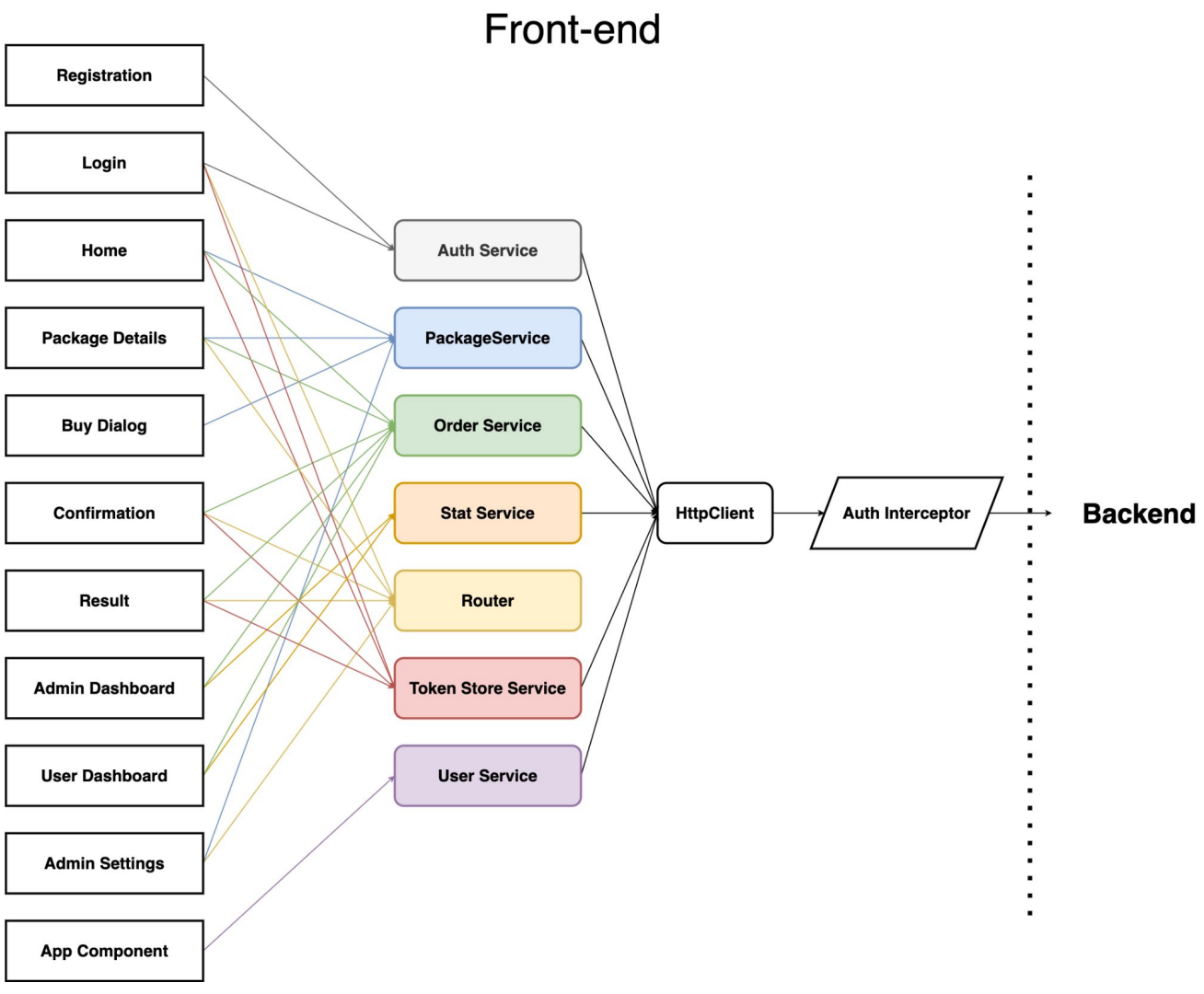
ValidityPeriod Entity

```java
@Entity
@Table(name = "validity_periods")
public class ValidityPeriodEntity {
    @Id
    @Column(name = "id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    @Column(name = "months")
    private Integer months;

    @Column(name = "fee")
    private Double fee;
}
```

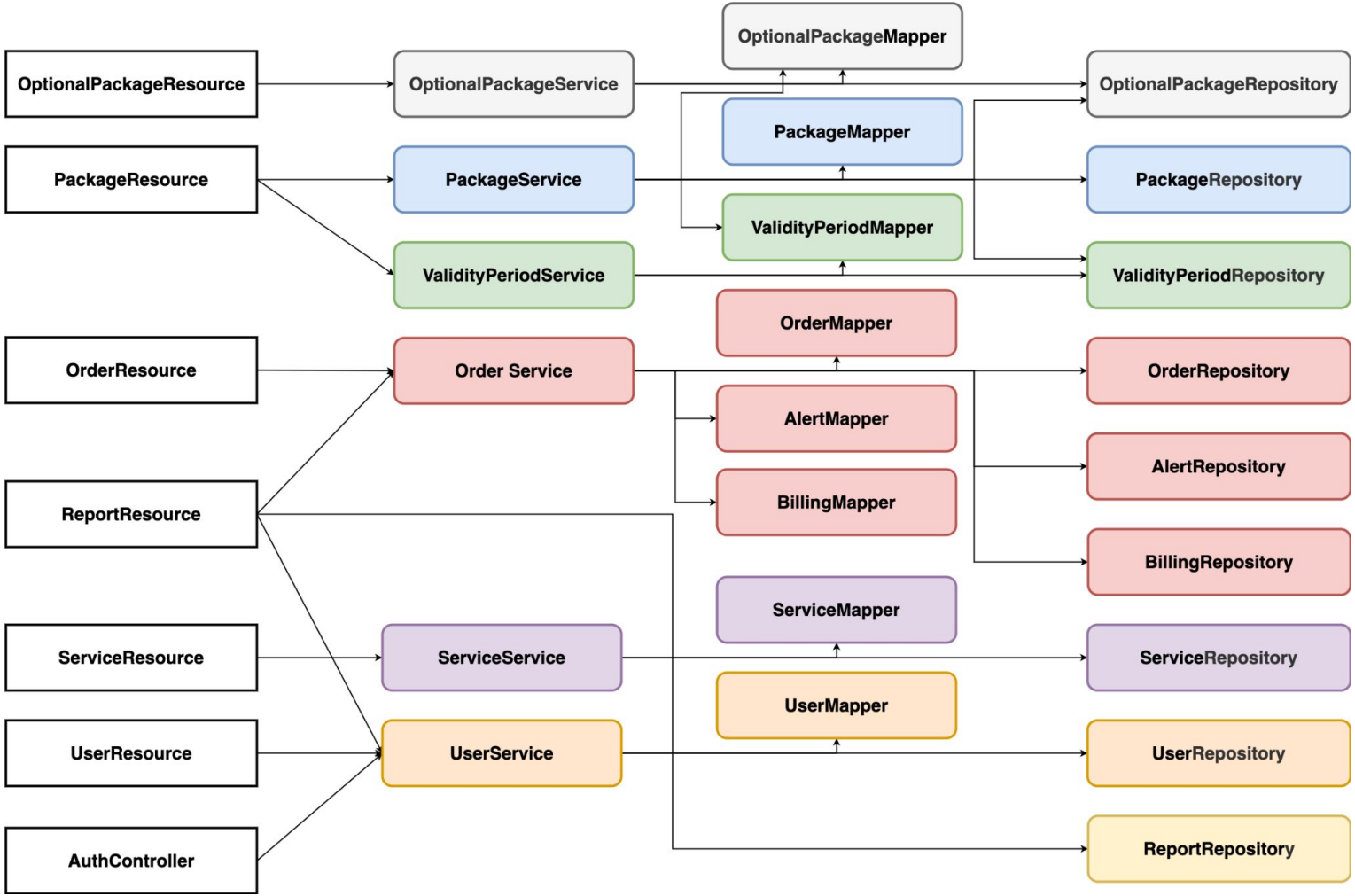
Interaction Diagram


Order History
User Dashboard
Cumulative Services
Packages
Details
Home Page
Rejected Orders
select
Package properties
Package Details
Services of package
Buy
Admin Only
Orders trend
Package Report
Validity Period Report
Optional Package Report
Admin Dashboard
Users Report
If Rejected
If not rejected
Result Page
Try Payment
Go to Home page
Optional Package Selection
Start Date Selection
Validity Period Selection
Payment result Selection
Order details
Confirm
Create/Edit package form
Create/Edit Optional Package form
Create/Edit Validity Period form
Create/Edit Services form
Admin Settings
Order recap
Checkout
Buy

Components Diagram

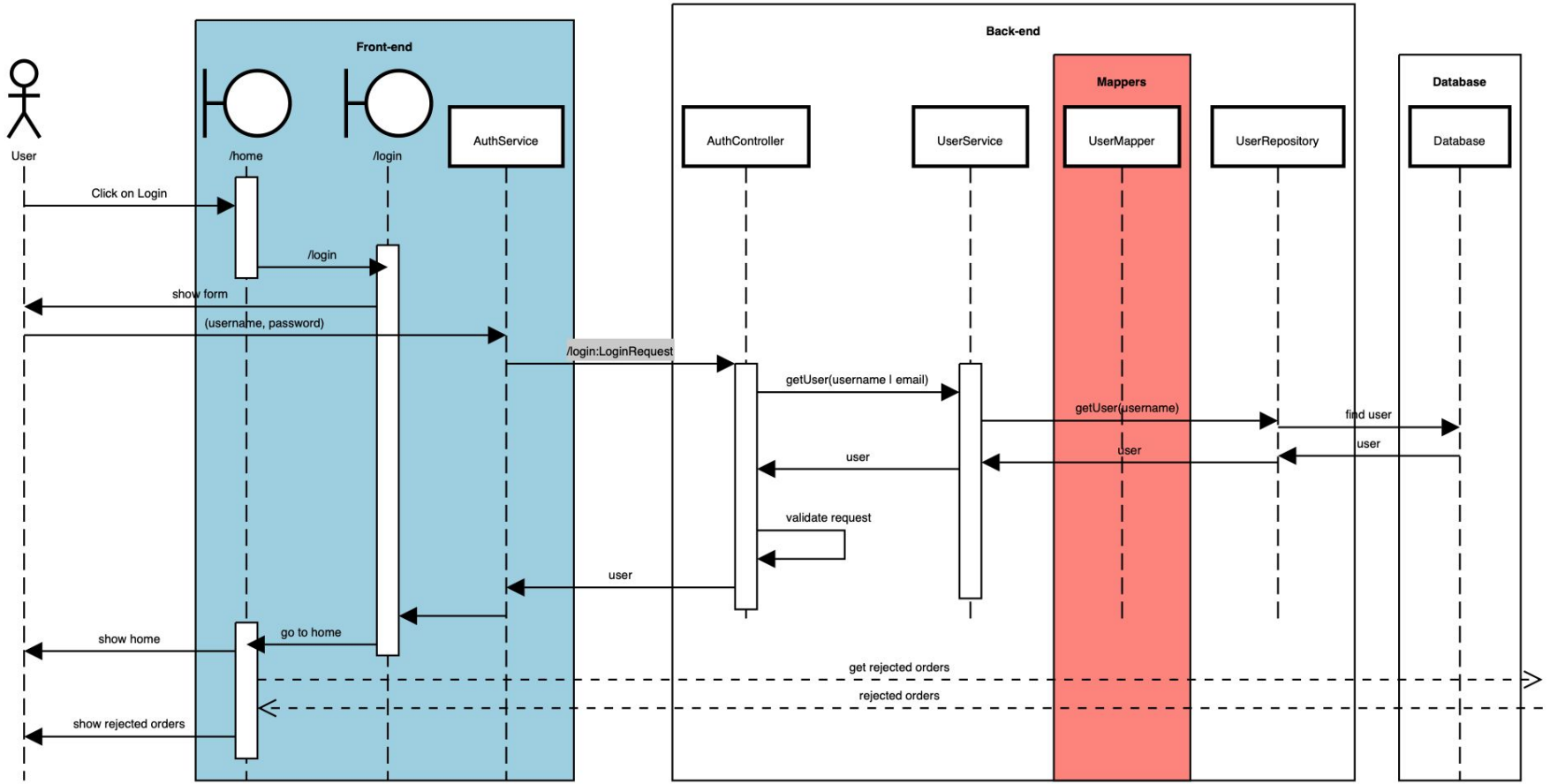

Front-end
Registration
Login
Home
Package Details
Buy Dialog
Confirmation
Result
Admin Dashboard
User Dashboard
Admin Settings
App Component
Auth Service
PackageService
Order Service
Stat Service
Router
Token Store Service
User Service
HttpClient
Auth Interceptor
Backend

Back-end

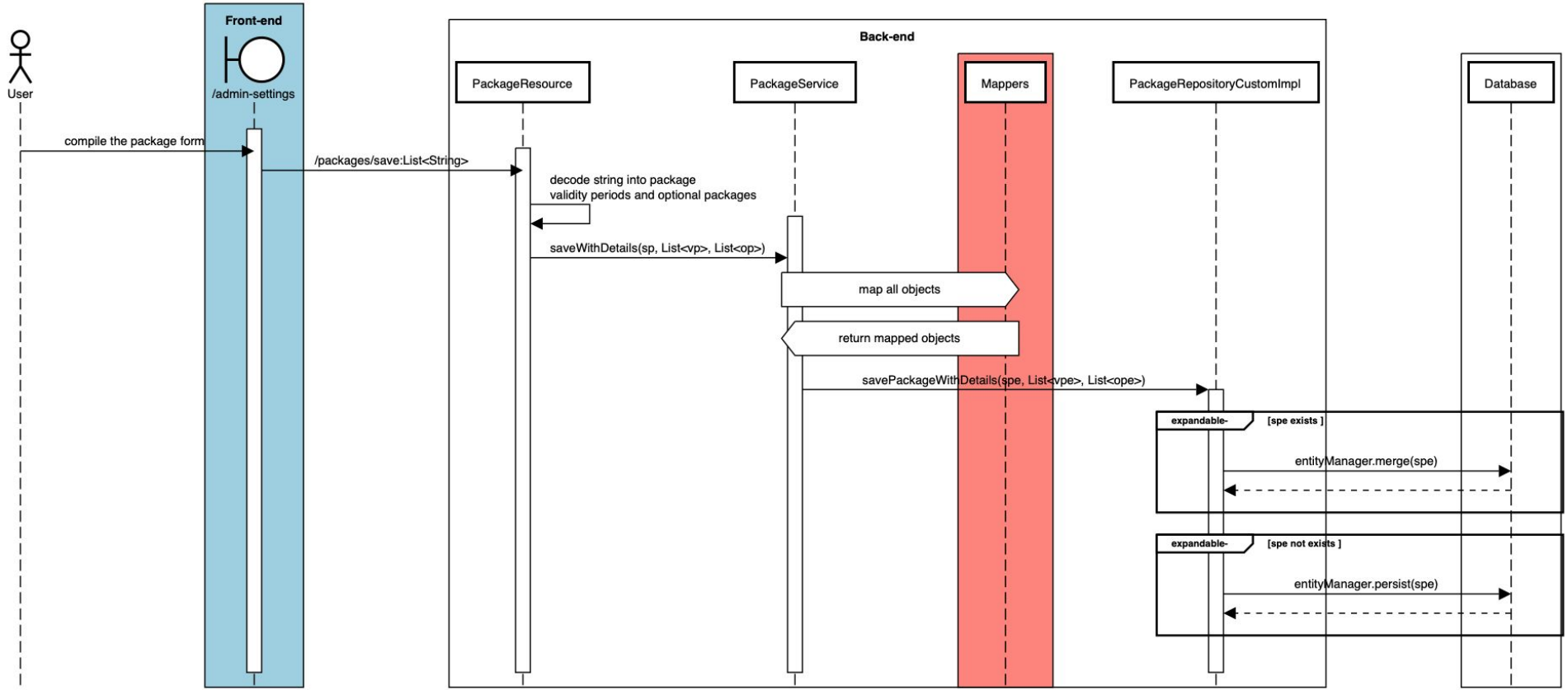

OptionalPackageMapper
OptionalPackageResource
OptionalPackageService
OptionalPackageRepository
PackageMapper
PackageResource
PackageService
PackageRepository
ValidityPeriodMapper
ValidityPeriodService
ValidityPeriodRepository
OrderMapper
OrderResource
Order Service
OrderRepository
AlertMapper
AlertRepository
ReportResource
BillingMapper
BillingRepository
ServiceMapper
ServiceResource
ServiceService
ServiceRepository
UserMapper
UserResource
UserService
UserRepository
AuthController
ReportRepository

Sequence Diagram

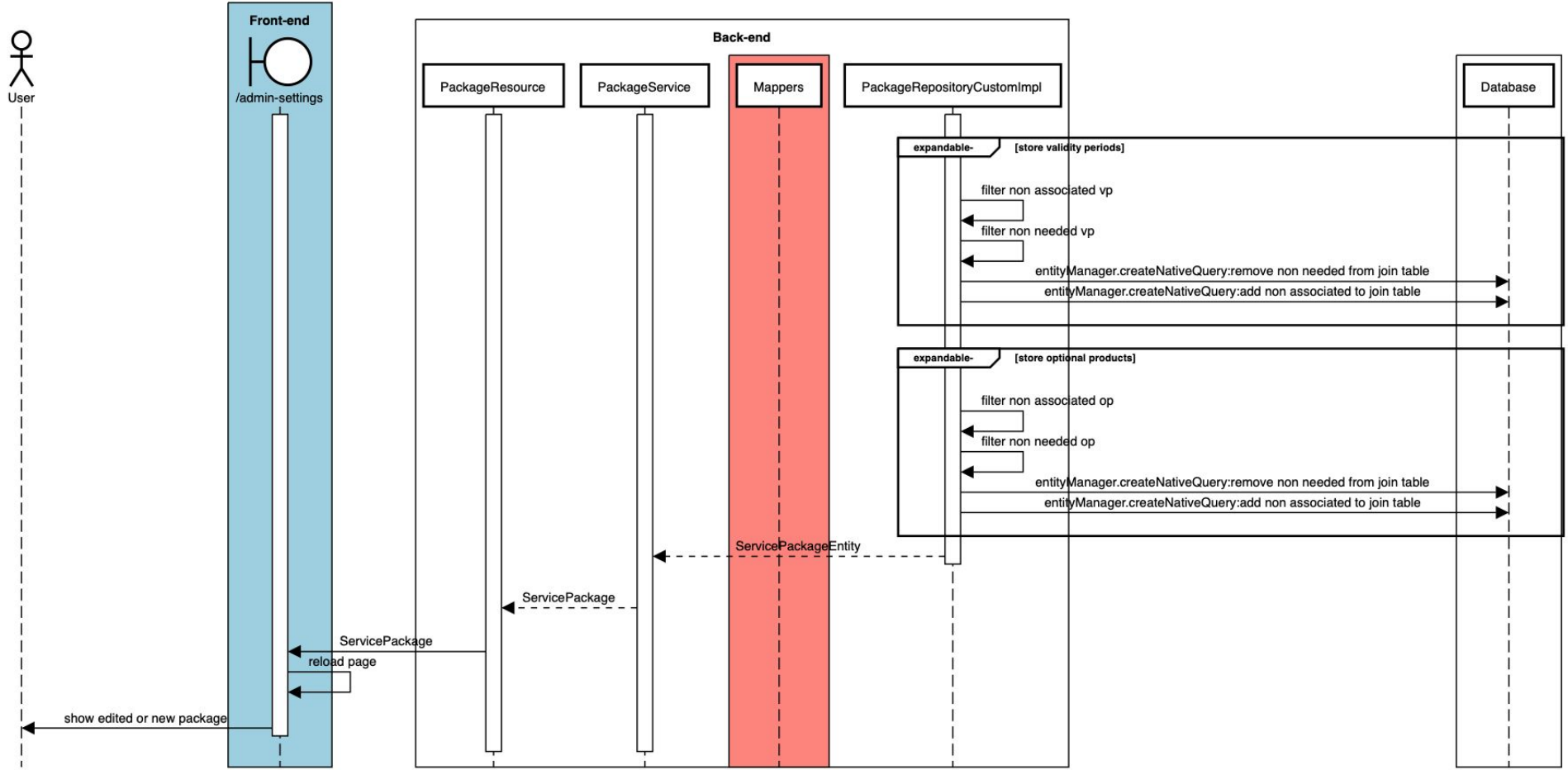
Login


Front-end
Back-end
Mappers
Database
User
/home
/login
AuthService
AuthController
UserService
UserMapper
UserRepository
Database
Click on Login
/login
show form
(username, password)
/login:LoginRequest
getUser(username I email)
getUser(username)
find user
user
user
validate request
user
show home
go to home
get rejected orders
rejected orders
show rejected orders

Edit/Create Package



Edit/Create Package



Thank You