SQL3 Assignment

Lab assignment nº 2

Integrated Master in Informatics and Computing Engineering

Database Technology

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1 Assignment goals

Think about the possibilities open by the object-relational schema, with respect to the relational schema, namely the use of user defined types, with objects combining data structures and the functions to manipulate them, inheritance, nested tables and vectors, object references and comparison and sorting methods. Develop a small illustrative database.[1]

2 Database proposal

The proposal is to define a DB to organize a fast food restaurant. To improve its management the owner ordered an IS, indicating the following business rules[1]:

- Upon arrival at the restaurant, clients pick up a ticket with a number and a time stamp. When his turn arrives, he starts to order and that moment is also recorded. The order happens at a specific POS (point of sales) where an employee is working. When the last item in the order is handed and the payment is finished the attendance is closed and that moment is also recorded.
- An order is composed by one or more products, in the wished quantities, chosen from a relatively short list. Some of these products are grouped into menus, stating the main dish and the sizes of the products but leaving the choice of the drink open. The total price to pay is the sum of the individual prices unless for the menus where the global menu price may be less than adding the components.
- The employees are described by the employee number, the name, the admission date, the category and the work timetable. Only the current timetable is needed, and it is repeated every week. On each day of the week there may be zero (holiday!) one or more work periods. A period, besides the initial and final instants, records the corresponding POS.

3 Creation of database

3.1 Database model schema

The following schema represents the relational model of the types used in our database.

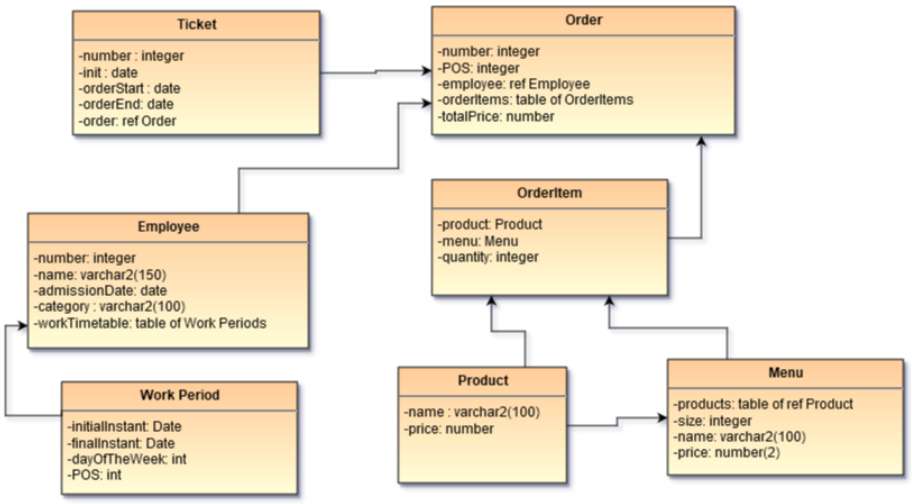

Figure 1: Database schema

3.2 Database creation SQL code

In order to create the database proposed in the section 2, we decided to create the following types:

- **WorkPeriod**: Represents a slot in time, used in the employee timetable.
- **Product**: Represents a product.
- **ProductsRef_tab**: Represents a table of references to products, used in the menu.
- **Menu**: Represents a menu, which is composed of products. The menu is supposed to be cheaper than the sum of all its' products prices.
- **OrderItem**: Represents an item which belongs to an Order. It can be a single product or a menu.
- **OrderItem_tab**: Represents a table of order items, used in an Order.
- **WorkPeriod_tab**: Represents a table of work periods, used in the employees' work timetable.
- **Employee**: Represents an employee, which has a work timetable.
- **Order**: Represents an order by a customer, it has a reference to an employee who managed the order and the order items (products or menus).
- **Ticket**: Represents a ticket, that refers to an order.

The following tables were created:

- Products
- Menus
- Employees
- Orders
- Tickets

The SQL code for the creation of the database, including the type definitions and the tables, is in the annexes (5.1).

3.3 Instance of database

Some objects were created in the database in order to test the schema, and also to test the queries that had to be written.

The SQL code for the creation of an instance of the database is in the annexes (5.2).

4 Database queries

4.1 Query 1

Get the daily total amount and number of sales for each employee, as well as the average transaction time

```
select t.order_.employee.name as employee, 24*60*avg(t.orderEnd -
    t.orderStart) as avgTransactionTime_min,
  sum(t.order_.totalPrice) as totalAmount, TRUNC(t.init) as day,
      count(*) as numberOfSales
from Tickets t
group by t.order_.employee.name, TRUNC(t.init)
order by day desc;
```

4.2 Query 2

Show the menu.

```
 -- show all menus, with a line for each product a menu includes
select name_ as menu_name, price, size_, value(p).name_ as menu_products
from Menus m, table(m.products_table) p;

 -- show all menus and products, and its prices
select *
from
  (
      (select name_ ItemName, price from Menus m)
      UNION ALL
      (select name_ ItemName, price from Products p)
  );
```

4.3 Query 3

Compute the weekly total number of work hours for the employees with the category of POS seller.

```
select e.name, sum(24*(w.finalInstant - w.initialInstant)) as totalHours
from Employees e, table(e.workTimetable) w
where e.category='POS seller'
group by e.name;
```

References

[1] Gabriel David. Sql3 assignment. Lab pdf, https://moodle.up.pt/pluginfile.php/117984/mod_resource/content/0/46-AssignSQL3-1.pdf, 2016.

5 Annexes

5.1 Database creation

```
create or replace type WorkPeriod_t as object(
  initialInstant date,
  finalInstant date,
  dayOfTheWeek number,
  POS number
);

create or replace type Product_t as object(
  name_ varchar2(100),
  price number
);

create or replace type ProductsRef_tab_t as table of ref Product_t;

create or replace type Menu_t as object(
  products_table ProductsRef_tab_t,
  size_ integer,
  price number,
  name_ varchar2(100)
);


create or replace type OrderItem_t as object(
  product ref Product_t,
  menu ref Menu_t,
  quantity integer
);


create or replace type OrderItem_tab_t as table of OrderItem_t;

create or replace type WorkPeriod_tab_t as table of WorkPeriod_t;


create or replace type Employee_t as object(
  number_ integer,
  name VARCHAR2(150),
  admissionDate date,
  category varchar2(100),
  workTimetable WorkPeriod_tab_t
);


create or replace type Order_t as object(
  number_ integer,
  POS integer,
  employee ref Employee_t,
  orderItems OrderItem_tab_t,
  totalPrice number
);
```

```
create or replace type Ticket_t as object(
  number_ integer,
  init date,
  orderStart date,
  orderEnd date,
  order_ ref Order_t
);

------------------------------

create table Products of Product_t;

create table Menus of Menu_t
  nested table products_table store as Products_tab;


create table Employees of Employee_t
   nested table workTimetable store as workPeriods_tab;

create table Orders of Order_t
  nested table orderItems store as orderItems_tab;

create table Tickets of Ticket_t;
```

5.2 Intance of database

```
-- PRODUCTS
insert into Products(name_, price)
  values('Big Mac Sandwich', 3.00);

insert into Products(name_, price)
  values('Double Cheeseburger Sandwich', 2.00);

insert into Products(name_, price)
  values('Cheeseburger Sandwich', 1.25);

insert into Products(name_, price)
  values('Hamburger Sandwich', 1.00);

insert into Products(name_, price)
  values('4 Chicken Nuggets', 1.00);

insert into Products(name_, price)
  values('Batata Pequena', 1.00);

insert into Products(name_, price)
  values('Batata Media', 1.00);

insert into Products(name_, price)
  values('Batata Grande', 1.80);

insert into Products(name_, price)
  values('McChicken Sandwich', 2.00);
```

```
insert into Products(name_, price)
  values('Bebida Pequena', 1.10);

insert into Products(name_, price)
  values('Bebida Media', 1.40);

insert into Products(name_, price)
  values('Bebida Grande', 1.80);

insert into Products(name_, price)
  values('Sundae Chocolate', 1.60);

insert into Products(name_, price)
  values('Sundae Morango', 1.60);

insert into Products(name_, price)
  values('Filet-O-Fish', 2.00);

-- MENUS
insert into Menus (products_table, size_, price, name_)
  values(
    ProductsRef_tab_t(
      (SELECT ref(p) FROM Products p WHERE name_ = 'Big Mac Sandwich'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Batata Media'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Bebida Media')
    ),
    2,
    5.00,
    'Menu BigMac Medio'
  );

insert into Menus (products_table, size_, price, name_)
  values(
    ProductsRef_tab_t(
      (SELECT ref(p) FROM Products p WHERE name_ = 'Big Mac Sandwich'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Batata Grande'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Bebida Grande')
    ),
    3,
    6.00,
    'Menu BigMac Grande'
  );


insert into Menus (products_table, size_, price, name_)
  values(
    ProductsRef_tab_t(
      (SELECT ref(p) FROM Products p WHERE name_ = 'McChicken Sandwich'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Batata Media'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Bebida Media')
    ),
    2,
    5.00,
    'Menu McChicken Medio'
  );
```

```
insert into Menus (products_table, size_, price, name_)
  values(
    ProductsRef_tab_t(
      (SELECT ref(p) FROM Products p WHERE name_ = 'McChicken Sandwich'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Batata Grande'),
      (SELECT ref(p) FROM Products p WHERE name_ = 'Bebida Grande')
    ),
    3,
    6.00,
    'Menu McChicken Grande'
  );

-- EMPLOYEES
insert into Employees (number_, name, admissionDate, category,
    workTimetable)
  values(
    1,
    'Marcio Tiago',
    to_date('29/10/2012 12:00 AM', 'dd/mm/yyyy hh:mi AM'),
    'POS seller',
    WorkPeriod_tab_t(
      WorkPeriod_t(to_date('01/01/2000 10:00 AM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi AM'), 2,
          3),
      WorkPeriod_t(to_date('01/01/2000 10:00 AM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi AM'), 3,
          3),
      WorkPeriod_t(to_date('01/01/2000 10:00 AM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi AM'), 4,
          2),
      WorkPeriod_t(to_date('01/01/2000 10:00 AM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi AM'), 5,
          3),
      WorkPeriod_t(to_date('01/01/2000 10:00 AM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi AM'), 6,
          3)
    )
  );

insert into Employees (number_, name, admissionDate, category,
    workTimetable)
  values(
    2,
    'Pedro Teiga',
    to_date('01/10/2010 12:00 AM', 'dd/mm/yyyy hh:mi AM'),
    'POS seller',
    WorkPeriod_tab_t(
      WorkPeriod_t(to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 06:00 PM', 'dd/mm/yyyy hh:mi AM'), 2,
          3),
      WorkPeriod_t(to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 06:00 PM', 'dd/mm/yyyy hh:mi AM'), 3,
          3),
      WorkPeriod_t(to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 06:00 PM', 'dd/mm/yyyy hh:mi AM'), 4,
          2),
```

```
      WorkPeriod_t(to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 06:00 PM', 'dd/mm/yyyy hh:mi AM'), 5,
          3),
      WorkPeriod_t(to_date('01/01/2000 02:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 06:00 PM', 'dd/mm/yyyy hh:mi AM'), 6,
          3)
    )
  );

insert into Employees (number_, name, admissionDate, category,
     workTimetable)
  values(
    3,
    'Jorge Macedo',
    to_date('29/10/2012 12:00 AM', 'dd/mm/yyyy hh:mi AM'),
    'POS seller',
    WorkPeriod_tab_t(
      WorkPeriod_t(to_date('01/01/2000 12:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 04:00 PM', 'dd/mm/yyyy hh:mi AM'), 2,
          4),
      WorkPeriod_t(to_date('01/01/2000 12:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 04:00 PM', 'dd/mm/yyyy hh:mi AM'), 3,
          4),
      WorkPeriod_t(to_date('01/01/2000 12:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 04:00 PM', 'dd/mm/yyyy hh:mi AM'), 4,
          4),
      WorkPeriod_t(to_date('01/01/2000 12:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 04:00 PM', 'dd/mm/yyyy hh:mi AM'), 5,
          4),
      WorkPeriod_t(to_date('01/01/2000 12:00 PM', 'dd/mm/yyyy hh:mi
          AM'),to_date('01/01/2000 04:00 PM', 'dd/mm/yyyy hh:mi AM'), 6,
          4)
    )
  );

-- ORDERS
insert into Orders (number_, POS, employee, orderItems, totalPrice)
  values(
    1,
    2,
    (select ref(e) from Employees e where number_ = 1),
    OrderItem_tab_t(
      OrderItem_t((SELECT ref(p) FROM Products p WHERE name_ = '4
          Chicken Nuggets'), null, 1),
      OrderItem_t((SELECT ref(p) FROM Products p WHERE name_ = 'Bebida
          Media'), null, 1)
    ),
    2.40
  );


insert into Orders (number_, POS, employee, orderItems, totalPrice)
  values(
    2,
    2,
    (select ref(e) from Employees e where number_ = 1),
```

```
    OrderItem_tab_t(
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ = 'Menu
          BigMac Medio'), 1)
    ),
    5.00
  );

insert into Orders (number_, POS, employee, orderItems, totalPrice)
  values(
    3,
    2,
    (select ref(e) from Employees e where number_ = 2),
    OrderItem_tab_t(
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ = 'Menu
          BigMac Medio'), 1)
    ),
    5.00
  );


insert into Orders (number_, POS, employee, orderItems, totalPrice)
  values(
    4,
    4,
    (select ref(e) from Employees e where number_ = 3),
    OrderItem_tab_t(
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ = 'Menu
          BigMac Medio'), 1),
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ = 'Menu
          McChicken Medio'), 1),
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ =
          'Hamburger Sandwich'), 1),
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ =
          'Sundae Chocolate'), 2)
    ),
    14.20
  );

insert into Orders (number_, POS, employee, orderItems, totalPrice)
  values(
    5,
    3,
    (select ref(e) from Employees e where number_ = 2),
    OrderItem_tab_t(
      OrderItem_t(null, (SELECT ref(p) FROM Menus p WHERE name_ =
          'Filet-O-Fish'), 1)
    ),
    2.00
  );

-- TICKETS
insert into Tickets (number_ , init, orderStart, orderEnd, order_)
  values(
    1,
    to_date('04/05/2016 11:03 AM', 'dd/mm/yyyy hh:mi AM'),
    to_date('04/05/2016 11:05 AM', 'dd/mm/yyyy hh:mi AM'),
```

```
    to_date('04/05/2016 11:07 AM', 'dd/mm/yyyy hh:mi AM'),
    (select ref(o) from Orders o where number_ = 1)
  );


insert into Tickets (number_ , init, orderStart, orderEnd, order_)
  values(
    2,
    to_date('04/05/2016 11:13 AM', 'dd/mm/yyyy hh:mi AM'),
    to_date('04/05/2016 11:18 AM', 'dd/mm/yyyy hh:mi AM'),
    to_date('04/05/2016 11:20 AM', 'dd/mm/yyyy hh:mi AM'),
    (select ref(o) from Orders o where number_ = 2)
  );

insert into Tickets (number_ , init, orderStart, orderEnd, order_)
  values(
    3,
    to_date('04/05/2016 11:13 AM', 'dd/mm/yyyy hh:mi AM'),
    to_date('04/05/2016 11:16 AM', 'dd/mm/yyyy hh:mi AM'),
    to_date('04/05/2016 11:20 AM', 'dd/mm/yyyy hh:mi AM'),
    (select ref(o) from Orders o where number_ = 3)
  );

insert into Tickets (number_ , init, orderStart, orderEnd, order_)
  values(
    4,
    to_date('05/05/2016 01:11 PM', 'dd/mm/yyyy hh:mi AM'),
    to_date('05/05/2016 01:19 PM', 'dd/mm/yyyy hh:mi AM'),
    to_date('05/05/2016 01:22 PM', 'dd/mm/yyyy hh:mi AM'),
    (select ref(o) from Orders o where number_ = 4)
  );

insert into Tickets (number_ , init, orderStart, orderEnd, order_)
  values(
    5,
    to_date('05/05/2016 04:03 PM', 'dd/mm/yyyy hh:mi AM'),
    to_date('05/05/2016 04:06 PM', 'dd/mm/yyyy hh:mi AM'),
    to_date('05/05/2016 04:11 PM', 'dd/mm/yyyy hh:mi AM'),
    (select ref(o) from Orders o where number_ = 5)
  );
```