UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Foundations of Databases A.Y. 2021-2022

Homework 3 – Physical Design

Master Degree in Computer Engineering
Master Degree in Cybersecurity
Master Degree in ICT for Internet and Multimedia

Deadline: December 17, 2021

Team acronym	TAGMS	
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Variations to the Relational Schema

From the previous homework we have found some typos within the Data Dictionary section. The respective corrections are shown below: - In Employee the "Registration_date_ID" attribute has been renamed to "Registration_date". - In Draws_from, the description of the "Lot_ID" attribute is changed from "Foreign Key to Lot, Primary key to Lot" to "Foreign Key to Lot, Primary key" - In Ship, the "Employee_ID" attribute is not a serial but a text type. In particular, a new domain called "taxnumber" has been defined, to which the Employee entity ID is associated.

Physical Schema

[Report SQL statements for the database creation]

– Database Creation

```
-- Database Creation
CREATE DATABASE tagmsdb OWNER admin ENCODING = 'UTF8';

-- Create new Schema (you can use the public schema without creating a new one, if you want)
DROP SCHEMA IF EXISTS Tagms CASCADE;
CREATE SCHEMA Tagms;

-- Create new domains
CREATE DOMAIN Tagms.emailaddress AS VARCHAR(255)
CONSTRAINT properemail CHECK (((VALUE)::text ~* '^[A-Za-z0-9._%]+@[A-Za-z0-9.]+[.][A-Za-z]+$'::text));

-- checks for the italian number structure w/ or w/o prefix
CREATE DOMAIN Tagms.phonenumber AS VARCHAR(17)
CONSTRAINT properphonenumber CHECK (VALUE ~ '^(\((00|\+)39\)|(00|\+)39)?3\d{9}$');

CREATE DOMAIN Tagms.vatnumber AS CHAR(12)
CONSTRAINT properVAT CHECK (((VALUE)::text ~* ^[0-9]*$::text));

s

CREATE DOMAIN Tagms.price AS MONEY
CONSTRAINT price CHECK (VALUE > 0);

CREATE DOMAIN Tagms.quantity AS INTEGER
CONSTRAINT quantity CHECK (VALUE >= 1);

CREATE DOMAIN Tagms.dimension AS INTEGER
CONSTRAINT dimension CHECK (VALUE > 0);

CREATE DOMAIN Tagms.percentage AS DECIMAL(4,1)
CONSTRAINT percentage CHECK (VALUE >= 0 and VALUE =< 100);

CREATE DOMAIN Tagms.tracknum AS VARCHAR(30)
CONSTRAINT propertracknum CHECK(VALUE ~ '[A-Za-z0-9]');



-- Table Creation (create tables in the correct order, i.e. use FKeys only referring to
already created tables)
```

```
CREATE TABLE Tagms.product (
product_id SERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500),
production_cost Tagms.price NOT NULL,
price_increase Tagms.price NOT NULL,    %TODO: price_increase Numeric(5,2) or Double precision or Range or T
volume Tagms.dimension NOT NULL,
net_weight Tagms.dimension NOT NULL,
package_weight Tagms.dimension NOT NULL,
nutritional_facts VARCHAR(500) NOT NULL,
product_category_id SMALLINT NOT NULL,
FOREIGN KEY (product_category_id) REFERENCES Tagms.product_category(product_category_id)
);

CREATE TABLE Tagms.product_category (
product_category_id SMALLSERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500)
);

CREATE TABLE Tagms.item (
item_id SERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500),
quantity Tagms.quantity NOT NULL,
minimum_quantity Tagms.quantity NOT NULL,
item_category_id SMALLINT NOT NULL,
FOREIGN KEY (item_category_id) REFERENCES Tagms.item_category(item_category_id)
);

CREATE TABLE Tagms.item_category (
item_category_id SMALLSERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500)
);

CREATE TABLE Tagms.specify (
item_id INTEGER,
contract_id INTEGER,
price Tagms.price NOT NULL,
purchased_quantity Tagms.quantity NOT NULL,
FOREIGN KEY (item_id) REFERENCES Tagms.item(item_id),
FOREIGN KEY (contract_id) REFERENCES Tagms.contract(contract_id),
PRIMARY KEY (item_id, contract_id)
);

CREATE TABLE Tagms.contract (
contract_id SERIAL PRIMARY KEY,
description VARCHAR(500),
contract_date TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP,
delivery_date TIMESTAMP WITH TIME ZONE NOT NULL,
expiration_date TIMESTAMP WITH TIME ZONE NOT NULL,
supplier_id Tagms.vatnumber NOT NULL,
```

```
employee_id Tagms.taxnumber NOT NULL,
FOREIGN KEY (supplier_id) REFERENCES Tagms.supplier(vat_number),
FOREIGN KEY (employee_id) REFERENCES Tagms.employee(tax_number)
);

CREATE TABLE Tagms.package (
package_id SMALLSERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500),
weight Tagms.dimension NOT NULL,
height Tagms.dimension NOT NULL,
width Tagms.dimension NOT NULL,
depth Tagms.dimension NOT NULL,
package_category_id SMALLINT NOT NULL,
FOREIGN KEY (package_category_id) REFERENCES Tagms.package_category(package_category_id)
);

CREATE TABLE Tagms.package_category (
package_category_id SMALLSERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500)
);


CREATE TABLE Tagms.lot (
lot_id SERIAL PRIMARY KEY,
expiration_date TIMESTAMP WITH TIME ZONE NOT NULL,
product_id INTEGER NOT NULL,
product_quantity Tagms.quantity NOT NULL,
package_id INTEGER NOT NULL,
package_quantity Tagms.quantity NOT NULL,
lot_discount Tagms.percentage  NOT NULL,
vat Tagms.percentage NOT NULL,
lot_price Tagms.price NOT NULL,
FOREIGN KEY (package_id) REFERENCES Tagms.package(package_id),
FOREIGN KEY (product_id) REFERENCES Tagms.product(product_id)
);


CREATE TABLE Tagms.order (
order_id SERIAL PRIMARY KEY,
net_price Tagms.price NOT NULL,
taxes Tagms.price NOT NULL,
order_date TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP,
employee_id Tagms.taxnumber NOT NULL,
customer_id Tagms.vatnumber NOT NULL,
FOREIGN KEY (employee_id) REFERENCES Tagms.employee(employee_id),
FOREIGN KEY (customer_id) REFERENCES Tagms.customer(customer_id)
);

CREATE TABLE Tagms.customer (
vat_number Tagms.vatnumber PRIMARY KEY,
customer_name VARCHAR(50) NOT NULL,
phone_number Tagms.phonenumber NOT NULL,
```

```
address VARCHAR(100) NOT NULL,
email_address Tagms.emailaddress NOT NULL,
registration_date TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP
);

CREATE TABLE Tagms.draws_from (
lot_id INTEGER PRIMARY KEY,
order_id INTEGER NOT NULL,
FOREIGN KEY (lot_id) REFERENCES Tagms.lot(lot_id),
FOREIGN KEY (order_id) REFERENCES Tagms.lot(order_id),
);

CREATE TABLE Tagms.made_up_of_1 (
product_id INTEGER,
item_id INTEGER,
quantity Tagms.quantity NOT NULL,
FOREIGN KEY (product_id) REFERENCES Tagms.product(product_id),
FOREIGN KEY (item_id) REFERENCES Tagms.item(item_id),
PRIMARY KEY (product_id, item_id)
);

CREATE TABLE Tagms.made_up_of_2 (
package_id INTEGER,
item_id INTEGER,
quantity Tagms.quantity NOT NULL,
FOREIGN KEY (package_id) REFERENCES Tagms.package(package_id),
FOREIGN KEY (item_id) REFERENCES Tagms.item(item_id),
PRIMARY KEY (package_id, item_id)
);

CREATE TABLE Tagms.ship (
order_id INTEGER PRIMARY KEY,
employee_id Tagms.taxnumber NOT NULL,
shipping_date TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP,
track_num NUMERIC(10),
FOREIGN KEY (order_id) REFERENCES Tagms.order(order_id),
FOREIGN KEY (employee_id) REFERENCES Tagms.employee(employee_id),
);

CREATE TABLE Tagms.employee (
tax_number Tagms.taxnumber PRIMARY KEY,
first_name VARCHAR(30) NOT NULL,
last_name VARCHAR(30) NOT NULL,
phone_number Tagms.phonenumber NOT NULL,
email_address Tagms.emailaddress NOT NULL,
birth_date DATE,
hiring_date DATE NOT NULL,
still_working BOOLEAN NOT NULL,
role_id SMALLINT NOT NULL,
FOREIGN KEY (role_id) REFERENCES Tagms.role(role_id)
);

CREATE TABLE Tagms.role (
role_id SMALLSERIAL PRIMARY KEY,
```

```
name VARCHAR(30) NOT NULL,
description VARCHAR(500)
);

CREATE TABLE Tagms.work (
department_id SMALLINT,
employee_id Tagms.taxnumber,
FOREIGN KEY (department_id) REFERENCES Tagms.department(department_id)
FOREIGN KEY (employee_id) REFERENCES Tagms.employee(employee_id)
PRIMARY KEY (department_id, employee_id)
);

CREATE TABLE Tagms.department (
department_id SMALLSERIAL PRIMARY KEY,
name VARCHAR(30) NOT NULL,
description VARCHAR(500)
);

CREATE TABLE Tagms.supplier (
vat_number Tagms.vatnumber PRIMARY KEY
supplier_name VARCHAR(50) NOT NULL,
phone_number Tagms.phonenumber NOT NULL,
email_address Tagms.emailaddress NOT NULL,
address VARCHAR(100) NOT NULL,
registration_date DATE NOT NULL
);
```

Populate the Database: Example

[Report SQL statements for the database population: one row per table is enough for the HW, but we suggest to insert a sufficient amount of data in your DB to run queries]

```
-- Employee
INSERT INTO Tagms.employee(TAX_numeber, First_name, Last_name, Phone_number, Email_address,
Birth_date, Hiring_date, Still_working, Role_ID) VALUES
('','','','','','','','','');

-- Work
INSERT INTO Tagms.work(Department_ID, Employee_ID) VALUES
('','');

-- Departament
INSERT INTO Tagms.departament(Department_ID, Name,Description) VALUES ('','','');

-- Role
INSERT INTO Tagms.role(Role_ID, Name,Description) VALUES
('','','');

-- Ship
```

```
INSERT INTO Tagms.ship(Order_ID, Employee_ID, Shipping_date,Track_num) VALUES
('','','','');

-- Supplier
INSERT INTO Tagms.supplier(VAT_numeber, Supplier_name, Phone_number, Address, Email_address,
Registration_date) VALUES
('','','','','','');

-- Contract
INSERT INTO Tagms.contract(Contract_ID, Description, Contract_date, Delivery_date,
Expiration_date, Supplier_ID, Employee_ID) VALUES
('','','','','','','');


-- Item
INSERT INTO Tagms.item(Item_ID, Name, Description,
Quantity, Item_Category_ID, Minimum_quantity) VALUES
('','','','','','');

-- Item_Category
INSERT INTO Tagms.item_Category(Item_Category_ID, Name, Description) VALUES
('','','');

-- Specify
INSERT INTO Tagms.specify(Item_ID, Contract_ID, Purchase_Quantity, Price) VALUES
('','','','');


-- Product
INSERT INTO Tagms.product(Product_ID, Name, Description, Product_cost, Price_increase,
Volume, Net_weight, Nutritional_Facts, Product_Category_ID)  VALUES
('', '', '', '', '', '', '', '', '');

-- Product_Category
INSERT INTO Tagms.product_Category(Product_Category_ID, Name, Description) VALUES
('','','');

-- Made_Up_Of_1
INSERT INTO Tagms.Made_Up_Of(Product_ID, Item_ID,Quantity) VALUES
('','','');


-- Package
INSERT INTO Tagms.package(Package_ID, Name, Description, Weight, Height, Width, Depth,
Package_Category_ID)VALUES
('', '', '', '', '', '', '', '');

-- Package_Category
INSERT INTO Tagms.product_Category(Package_Category_ID, Name, Description) VALUES
('','','');

-- Made_Up_Of_2
INSERT INTO Tagms.Made_Up_Of(Package_ID, Item_ID,Quantity) VALUES
('','','');
```

```
-- Order
INSERT INTO Tagms.order(Order_ID,Net_price, Taxes, Order_date, Order_paid, Employee_ID,
Customer_ID) VALUES
('','', '', '', '', '', '')

-- Customer
INSERT INTO Tagms.customer(VAT_numeber, Customer_name, Registration_date, Address,
Email_address, Phone_number) VALUES
('', '', '', '','', '')

-- Lot
INSERT INTO Tagms.lot(Lot_ID, Expiration_date,Lot_discount,VAT, Lot_price, Product_Quantity,
Package_Quantity,Package_ID, Product_ID) VALUES
('', '','','', '', '', '','', '');

-- Draws_from
INSERT INTO Tagms.Made_Up_Of(Lot_ID, Order_ID) VALUES
('','');
```

Principal Queries

[Write some of the queries to be performed to satisfy your functional requirements. 3-4 queries are enough, try to use the techniques seen at lecture (aggregate functions, group by, subqueries,...)]

```
SELECT t1.attr1
FROM table1 as t1
    LEFT JOIN table2 as t2 ON t1.attr2=t2.attr1
WHERE t1.attr3=1
```

JDBC Implementations of the Principal Queries and Visualization

[Report java code to test your DB. Perform 1-2 queries and display the results]

```
/*
 *  Write here your java code
 */

public class HelloWorld {

    public static void main(String[] args) {
        System.out.println("Hello world!");
    }
}
```

Group Members Contribution