VRIJE
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E-COMMERCE PROJECT

Open Information Systems

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1st master computer science

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1 Introduction

The goal of this project is to design and implement an e-commerce platform. The backbone of this platform is an information system. This system consists out of 5 modules: Products, Warehouses, Costumers, Suppliers and Delivery Services.

Each person was assigned to one module. Firstly we started thinking about the information needs of the database users by creating features and an ER diagram[1] for a module. Once this was achieved, each person created a database with queries, based on the created ER diagram, in standard SQL[2]. We then created one information system by combining the SQL databases. After that, everyone created an ontology, using Protoge, for their module. Then we combined the ontologies to create one information system. Then everyone created a mapping using the R2RML[3] mapping language. Again, we combined our mappings to generate one mapping that represented the whole system. Finally everyone created one SPARQL[4] query, based on one of their features. This SPARQL query was tested using the Ontop system. Ontop translates SPARQL queries into SQL queries, and relies on R2RML mappings [1].

1.1 Modules

As metioned before, this project consists of 5 modules:

1. The module Product is about the physical product itself and the properties it has.
2. The module Warehouses is primarily about the management of an inventory.
3. The module Costumers is concerned with reviews, payments, and other things regarding an online costumer.
4. The module Suppliers is primarily about a supplier that supplies to a warehouse.
5. The module Delivery services is about delivering the product from a warehouse to a costumer.

1.2 Features and data

Product features:

1. All orders: An employee wants to see all the orders placed on the platform and the corresponding customers who place them. Data used: information about the products and orders.
2. Orders for specific product: An employee wants to see the amount of orders placed on each product so far. Data used: information about the products and orders.
3. Customer filters through Mobiles category according to ratings in descending order and location: A customer in brussels searches for the higest rated mobile phones in brussels in descending order. Data used: information about the products and orders.

[1] Entity-Relation diagram
[2] Structured Query Language
[3] RDB to RDF Mapping Language
[4] SPARQL Protocol and RDF Query Language

4. Low rated products: An admin filters through all products to find those with lower ratings. Data used: product ratings and list of products.

5. Profitable locations: A company wants to know the locations with most orders. Data used: information about companies and orders.

Warehouses features:

1. Product quantity: An employee of the inventory management wants to find out how much of a certain product there is left in stock. An online costumer wants to know if the product is available for purchase. Data used: amount of stock of a certain product.

2. Warehouse incomming and outgoing products: An employee wants to know how many products will arrive/departure on a certain day. An accountant wants to keep track of all the arriving and departing products.Data used: all the incomming products from the supplier and all the outgoing products of the delivery service.

3. Delivery service delivery time: An employee from costumer service is asked if the product has already left the warehouse. A costumer wants to know how long it will take for his package to arrive. Data used: details about the delivery service.

4. Supplier product delivery time: An employee of a warehouse wants to know when a product from the supplier arrives. A costumer wants to know how long it will take for his package to arrive. Data used: details about the supplier.

5. Company information: An employee of a warehouse wants to contact a delivery service or supplier. A delivery service or supplier needs to deliver/pick up a package from the warehouse. Data used: information about a warehouse, delivery service and supplier.

Costumers features:

1.

Suppliers features:

1. Response time per supplier: An employee of the logistics area needs the average response time of an order to know when he needs to fill his stock if required. A manager of the logistics area needs it to know the performance of the supplier and to be able to follow up on it. Data used: Expressed in days and hours, it is calculated with the following operation. Date the order was placed - Date the order was delivered.

2. The supplier that gives more facilities: A manager of the logistics area needs it to make the decision to reduce costs if it's possible or choose between suppliers in the future. Data used: For this feature, the count number and the average of the discount for prompt payment per supplier is needed as a field expressed in percentages, the discount is entered when the order is being placed, if the supplier offers it.

3. Maximum payment flexibility: An employee of the logistics area needs it to make budget plans. A manager of the logistics area needs it to make decisions such as changing the payday if necessary or choose between suppliers in the future. Data used: Expressed in days. It is the maximum of the limit days to pay that gives the supplier.

4. Minimum cost of the most product requested: An employee of the logistics area needs it to calculate the necessary budget and predict the days that needs to place orders. A manager of the logistics area needs it to compare with other prices on the market and make decisions between new suppliers. Data used: Expressed in euros, it is minimum cost of the wholesale price of the product that is being ordered the most.

5. Higher and lower delivery costs per supplier: An employee in the logistics area can reduce transportation costs from that value. Analyze whether it is convenient to have a transportation service and present it to the manager as an alternative in the future. It is also an important factor in choosing between providers. Data used: Expressed in euros, it is maximum cost of the delivery cost per supplier.

Delivery services features:

1. Real-time package Tracking: A costumer wants to track their order in real time. Data used: The API key linked to the transport company handling the package the user wants to track.

2. Delivery Time Estimation by packet: A delivery service wants to give the costumer an idea when the package will arive. Data used: The address registered in the packet's order, the packet's weight and size, the amount of trucks available in the company able to deliver a packet to the given address with the given weight and size and the location of the warehouse where the packet is gathered.

3. Delivery Price Estimation: Delivery service wants to request an extra fee to the costumer. Data used: The address registered in the packet's order, the packet's weight and size, the price per km of the company able to deliver the package (As explained in the previous feature).

4. Average amount of delivery trip made by each delivery companies in all the warehouses: A delivery service wants to track with which companies it is worth having delivery contracts, based on the amount of delivery trips they make for the company. Data used: he amount of delivery trip that occurred in every warehouse in the last X months sorted by the vehicle's company.

5. Average Packet loss during delivery trips sorted by company: A delivery service wants to increase its trust. Data used: The average status of the packets in the deliveries of company X.

1.3 Work division

Ardavan Khalij: Costumer database and queries, Costumer ontology, Costumer mapping, SPARQL query, ...

Amadou Sarjo Jallow: Product database and queries, Product ontology, Product mapping, SPARQL query, ...

Brenda Ordoñez Lujan: Supplier database and queries, Supplier ontology, Supplier mapping, SPARQL query, ...

Florent Nicolas J Grimau: Delivery service database and queries, Delivery service ontology, Delivery service mapping, SPARQL query, ...

Milan Pavle Ilic: Warehouses database and queries, Warehouse ontology, Warehouse mapping, SPARQL query, Report introduction and template.

2 Ontology

3 Mapping

4 Queries

5 Discussion

References

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[2] Diego Calvanese, Benjamin Cogrel, Sarah Komla-Ebri, Roman Kontchakov, Davide Lanti, Martin Rezk, Mariano Rodriguez-Muro, and Guohui Xiao. (2017) *Ontop: Answering SPARQL Queries over Relational Databases*, Semantic Web Journal 8.3, pp. 471–487.