Ontologies and The Semantic Web

CSE488

Course Project

Pharmacy Management System

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1. Ontology

1) Product Perspective

The product to be developed in our report is a Pharmacy management system, where the customer can order medicine, have alternatives for the medicine if it is not found or our pharmacist can suggest a medicine according to his/her medical case.

According to the users of our system which are the pharmacist, The manager and The cashier. The system supports the ability to track the inventory levels, data of working employees and the salaries of these employees all by the aid of database.

The system can be developed to be used in a hospital management business where medicine management is necessary Or it can developed for a pharmacy business on its own.

2) General Capabilities

The system will provide our users an easy, professional way to track the medicine management, employees' management and the inventory levels with its interactions with the suppliers. It helps the users interact with the customer easier and faster with making the selling process in a more efficient way.

The system makes the pharmacist enters all the medicine data with its expiry dates, its uses, its price and precautions to be saved so it can easily be accessed when needed for either the selling process or checking the inventory levels.

For the cashier using, the system helps when selling process occurs where he takes the customer info to be easily accessed in later selling processes and then confirms the payment method defined by the customer to proceed the selling process successfully.

And finally, for the manager using, the system helps a lot in saving all the employees' working data, calculating their working hours and therefore calculating their salaries.

Our System helps in managing and documenting this amount of data to be easily accessed for further procedures when using it, all these data can be outputted as reports to the users.

3) General Constraints

Our system constraints mainly depend on the current used computer operating capacity so, if running another application with our system could overload it or require additional hardware. This involves financial considerations to accommodate technical improvements.

4) *User Characteristics*

For the pharmacist, he has the access of mainly the medicine management, so he must have the background of dealing with drugs and medicine so that he can add their data to the system in a professional way, but for the cashier, he only deals with the selling process and therefore he must have the background of finance and the ability to deal with the various payment methods that may be chosen by the customer, For the manager of the pharmacy he do the whole management of the employees with their data. The customer has no access on our system as he only does the ordering process via the previously mentioned users of the system. But his information is entered and saved to the system.

5) *Environment Description*

The System should be implemented for the usage of the manager and the employees in the pharmacy including the pharmacist and the cashier.

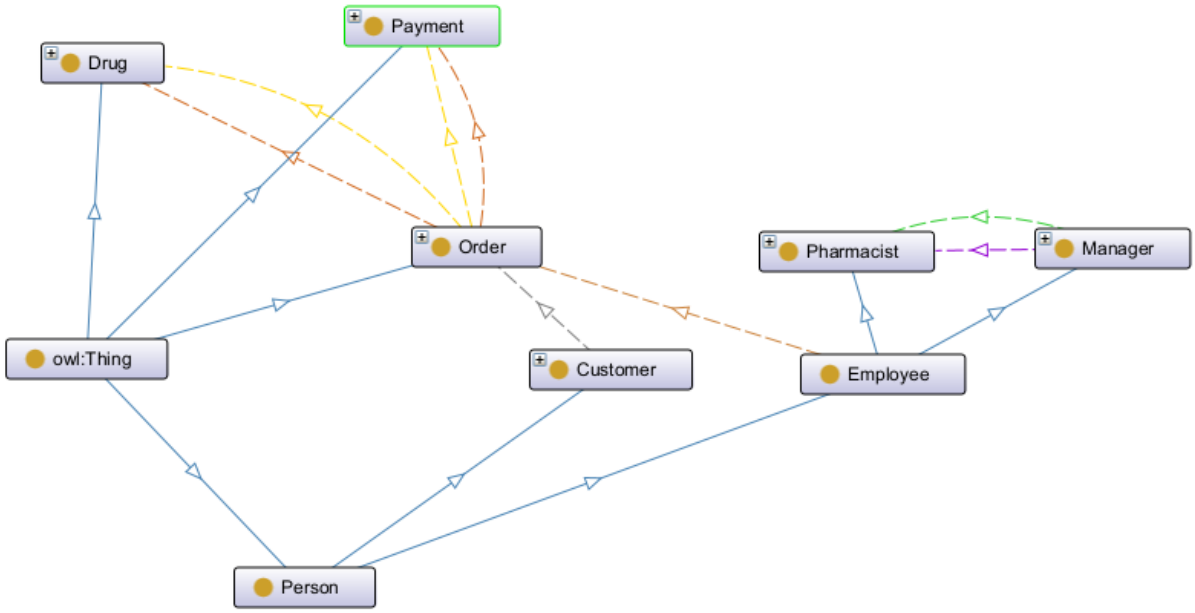
This interface will be set up on a normal computer considering all the functionalities of the system for this computer to be capable of the word load of the various users, and to be able to be connected to the database for storing and getting the various information entered by the users.

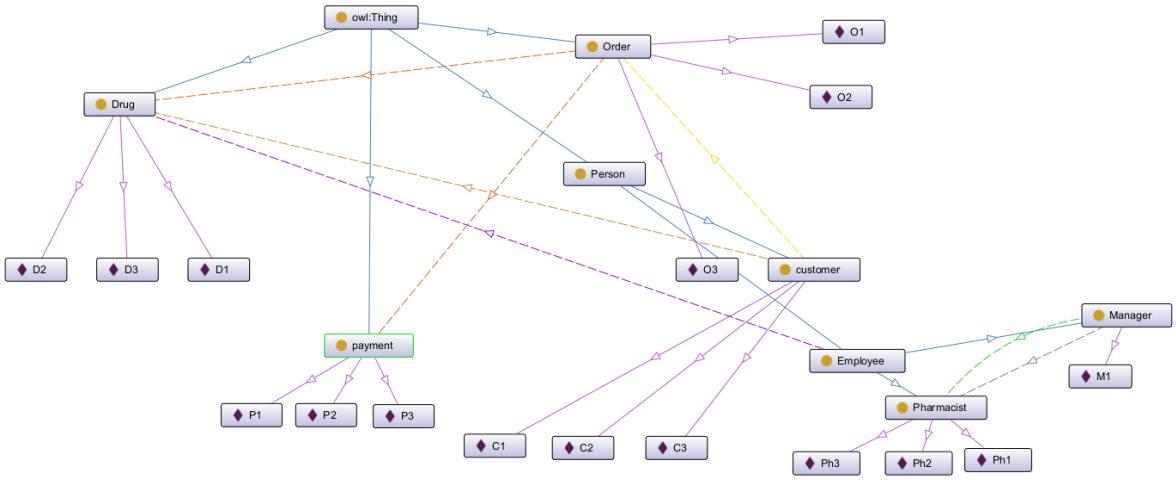
6) *Assumptions and Dependencies*

Our system is managed to sell medicine according to the desire of the customer, therefore, the medicine information entered to the system by the pharmacist should be entered correctly, professionally and with all the details. This to avoid any mistakes in the selling procedure for the customer satisfaction.

Also the data of the employees' working should be entered correctly and continuously be updated by the manager, for the further procedures dealing with these information to be done correctly.

Careful dealing with the data entry to the system should take place, to apply all the functionalities efficiently and to avoid failures, all for the customer satisfaction.

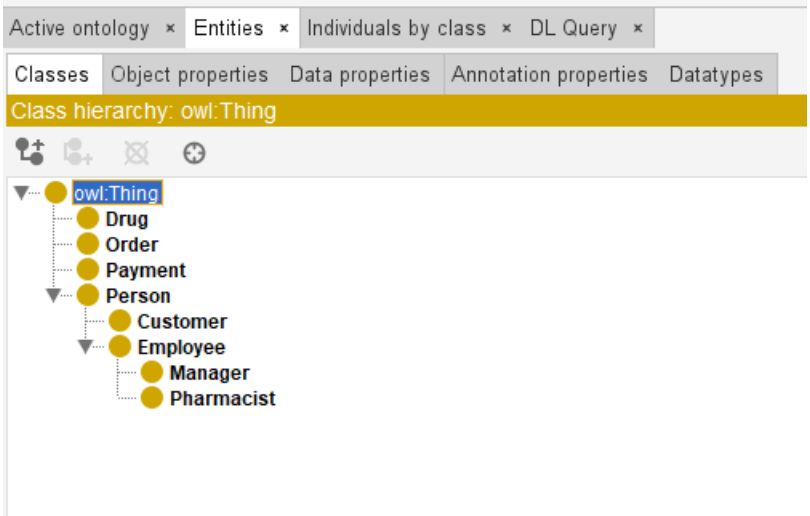

Payment
Drug
Order
Pharmacist
Manager
owl:Thing
Customer
Employee
Person


owl:Thing
Order
O1
O2
Drug
Person
D2
D3
D1
O3
customer
Manager
payment
Employee
M1
Pharmacist
P1
P2
P3
C1
C2
C3
Ph3
Ph2
Ph1

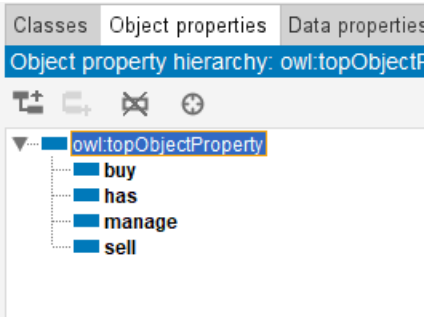
2. RDF

Entities

- Person subclass of thing
- Drug a subclass of thing
- Payment subclass of thing
- Order subclass of thing
- Employee a subclass of person
- Customer a subclass of person
- Pharmacist subclass of person a subclass of employee
- Manager a subclass of employee

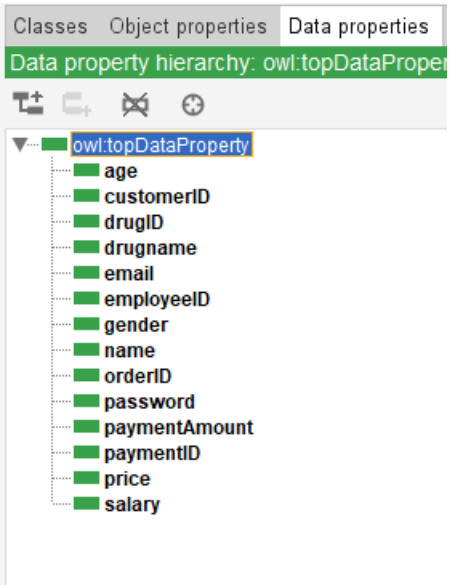


Object Properties



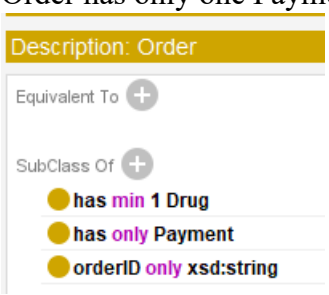
- Buy (Customer buy Order)
- Has (Order has Drug & Order has Payment)
- Manage (Manger manage Pharmacist)
- Sell (Pharmacist sell order)

Data Properties

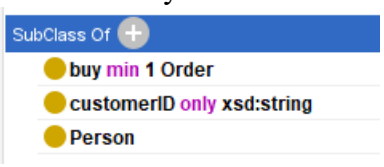


- Age
- customerID
- drugID
- drugname
- email
- employeeID
- gender
- name
- orderID
- password
- paymentAmount
- paymentID
- price
- salary

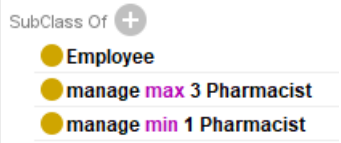
Constraints

- Order has min 1 drug
- Order has only one Payment
- 

- Customer buy min 1 order

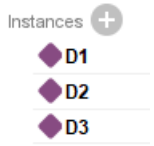


- Manager manage min 1 Pharmacist
- Manager manage max 5 Pharmacist

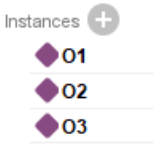


3. Instances

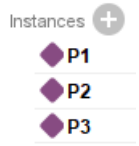
Drug



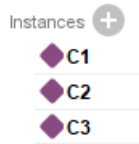
Order



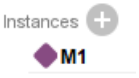
Payment



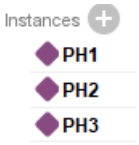
Person:-
Customer



Manager



Pharmacist



4. SparQL Queries

i. List all Pharmacists Listing their name , ID, Salary, and Gender

/pharm/sparql | JSON | Turtle

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
SELECT ?pharmacistname ?pharmacistID ?salary ?gender
WHERE {
  ?pharmacist a ex:Pharmacist.
  ?pharmacist ex:name ?pharmacistname.
  ?pharmacist ex:employeeID ?pharmacistID.
  ?pharmacist ex:salary ?salary.
  ?pharmacist ex:gender ?gender.

}
```

Table | Response | 3 results in 0.014 seconds — Simple view ☑ Ellipse ☑ Filter query results — Page size: 1000

pharmacistname	pharmacistID	salary	gender
Ragab	e002	7000	Male
Mona	e003	15000	Female
Michael	e004	9500	Male

Showing 1 to 3 of 3 entries — < 1 >

ii. List all persons listing their name , age and email (Optional)

SPARQL Endpoint: /pharm/sparql | Content Type (SELECT): JSON | Content Type (GRAPH): Turtle

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
SELECT ?name ?age ?email
WHERE {
  ?person ex:name ?name;
          ex:age ?age .
  OPTIONAL { ?person ex:email ?email
  }

}
```

Table | Response | 7 results in 0.02 seconds — Simple view ☑ Ellipse ☑ Filter query results — Page size: 1000

name	age	email
Ahmed	25	ahmed@gmail.com
Manal	45	
Sayed	65	sayed@gmail.com
Mohamed	50	Mohamed@gmail.com
Ragab	28	ragab@gmail.com
Mona	48	Mona@gmail.com
Michael	39	Michael@gmail.com

Showing 1 to 7 of 7 entries — < 1 >

iii. List all customers and arranging them ascendingly by age

/pharm/sparql | JSON | Turtle

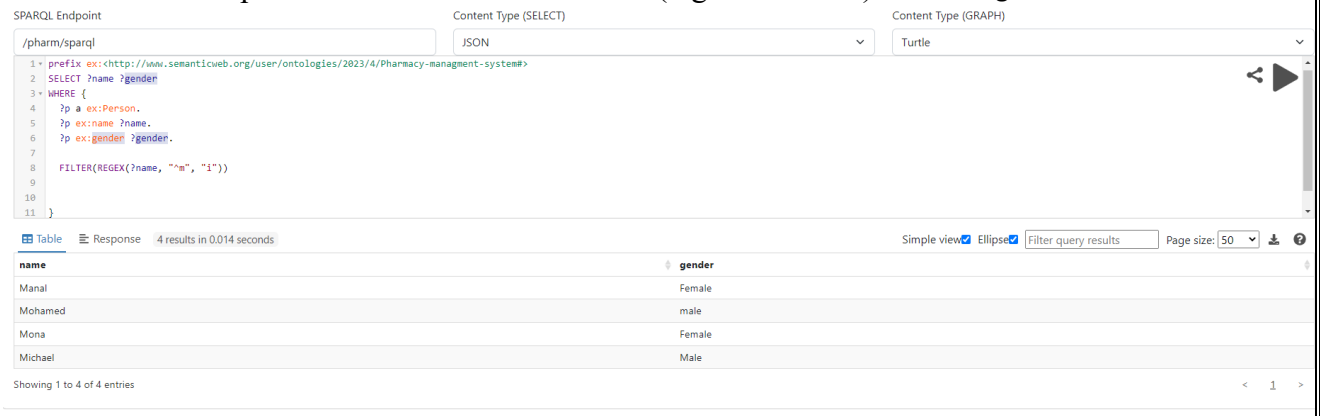
```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
SELECT ?name ?age
WHERE {
  ?emp a ex:Customer.
  ?emp ex:name ?name.
  ?emp ex:age ?age.

}
ORDER BY ASC  (?age)
```

Table | Response | 3 results in 0.015 seconds — Simple view ☑ Ellipse ☑ Filter query results — Page size: 1000

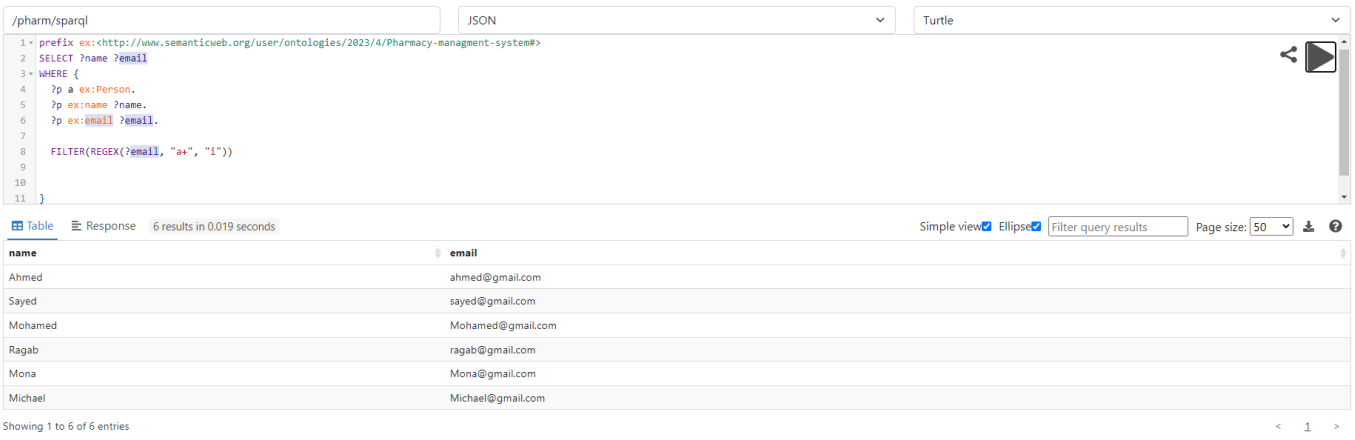
name	age
Ahmed	25
Manal	45
Sayed	65

Showing 1 to 3 of 3 entries — < 1 >

iv. List all persons who starts with letter m (regex and filter) and their gender



v. List all persons who have emails that include letter a (regex and filter) and their names



vi. List all the Payments that have their amounts >450 UNION <300

/pharm/sparql JSON

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
SELECT ?paymentID ?paymentamount
WHERE {
  {
    ?payment a ex:Payment.
    ?payment ex:paymentID ?paymentID.
    ?payment ex:paymentAmount ?paymentamount.
    FILTER( ?paymentamount > 450)
  }
  UNION
  {
    ?payment a ex:Payment.
    ?payment ex:paymentID ?paymentID.
    ?payment ex:paymentAmount ?paymentamount.
    FILTER( ?paymentamount < 300)
```

Table Response 2 results in 0.013 seconds

paymentID	paym
p003	455.0
p002	120.0

Showing 1 to 2 of 2 entries

vii. ASK if there is a manager who manage pharmacist

/pharm/sparql JSON

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
ASK WHERE {
  ?manger a ex:Manager.
  ?pharma a ex:Pharmacist.
  ?manger ex:manage ?pharma
}
```

Table Response Response in 0.018 seconds

✓ True

viii. List all description of all orders that contain customer with customerID “c003”

/pharm/sparql | JSON | Turtle

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
DESCRIBE ?customer WHERE{
  ?customer a ex:Customer ;
            ex:customerID "c003" .
}
```

Table | Response | 8 results in 0.019 seconds | Simple view | Ellipse | Filter query results | Page size: 50

subject	predicate	object
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#name	Sayed
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#gender	Male
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#email	sayed@gmail.com
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#customer...	c003
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#age	65
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#buy	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O2
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#NamedIndividual
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#...	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Custo...

Showing 1 to 8 of 8 entries

ix. Construct a result set containing all orders and the drugs they contain.

/pharm/sparql | JSON | Turtle

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
CONSTRUCT {
  ?order a ex:Order ;
           ex:orderID ?orderID ;
           ex:has ?drug .
  ?drug a ex:Drug ;
          ex:drugID ?drugID .
}
WHERE {
  ?order a ex:Order ;
           ex:has ?drug .
  ?drug a ex:Drug ;
          ex:drugID ?drugID .
}
```

Table | Response | 15 results in 0.013 seconds | Simple view | Ellipse | Filter query results | Page size: 1000

subject	predicate	object
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O1	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D2
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O1	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D1
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O1	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Order
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D2	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d002
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D2	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Drug
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O2	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D1
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O2	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Order
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d003
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D3	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Drug
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D1	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d001
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D1	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Drug
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D3
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D2

x. Obtain a description of all orders that contain a drug with drug ID "d456".

SPARQL Endpoint: /pharm/sparql | Content Type (SELECT): JSON | Content Type (GRAPH): Turtle

```
prefix ex:<http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#>
DESCRIBE ?order WHERE {
  ?order a ex:Order ;
          ex:has ?drug .
  ?drug a ex:Drug ;
         ex:drugID "d003" .
}
```

Table | Response | 12 results in 0.012 seconds | Simple view | Ellipse | Filter query results | Page size: 1000

subject	predicate	object
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d003
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d002
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#P3
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#customerID	c002
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D1
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#paymentID	p003
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#NamedIndividual
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D3
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#drugID	d001
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#Orde
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#has	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#D2
http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#O3	http://www.semanticweb.org/user/ontologies/2023/4/Pharmacy-managment-system#orderID	o003

Showing 1 to 12 of 12 entries < 1 >

5. Front END