

**CPI382**

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# *Hotel Booking System*

Presented by

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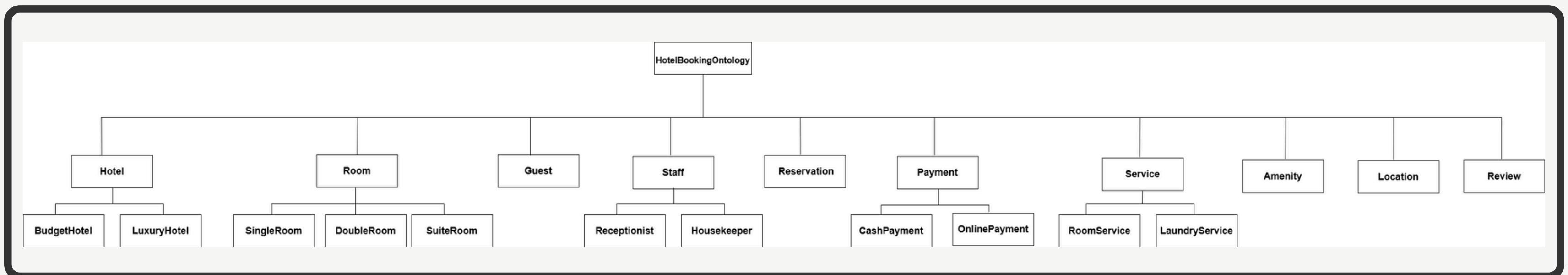
**Maria Alghamdi 2210867**

# *Introduction* →

This project develops a semantic ontology for a hotel reservation and management system using RDF and OWL. Traditional hotel systems store data in simple structures that cannot support intelligent reasoning or advanced queries. Our ontology organizes key hotel information such as rooms, guests, reservations, payments, services, and locations in a clear and machine-understandable format. With SPARQL, the system can answer smarter questions and provide a stronger foundation for future hotel management applications.

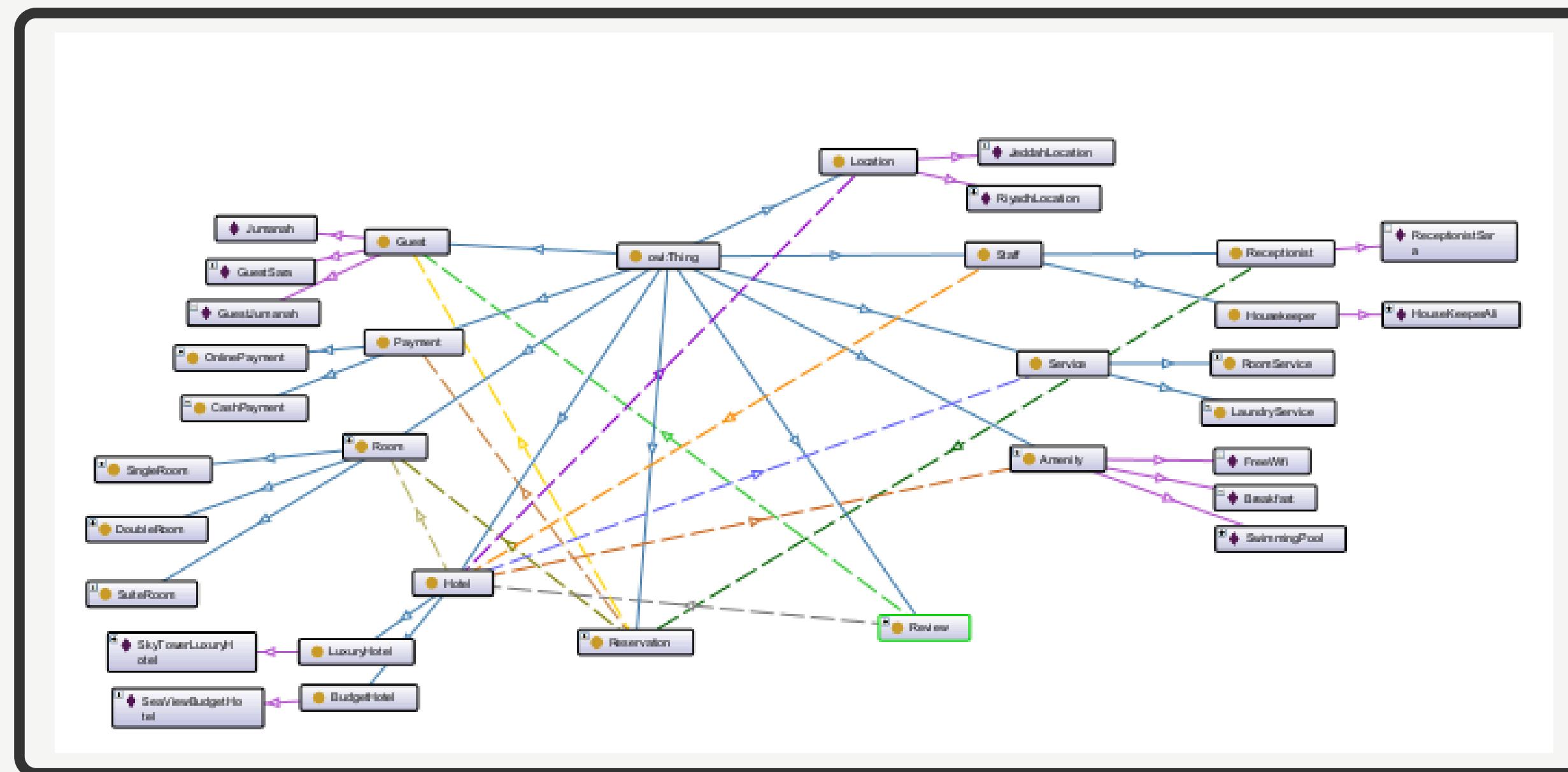
# Application Design

## Tree Diagram



# *Application Design*

## *Tree Diagram*



# *Description of classes and subclasses*

	Description	Hierarchy Position
<b>Hotel</b>	Represents hotels in general	Class
<b>LuxuryHotel</b>	Represents high-end or luxury hotels.	Subclass of Hotel
<b>BudgetHotel</b>	Represents economical hotels	Subclass of Hotel
<b>Room</b>	Represents the types of rooms available in a hotel	Class
<b>SingleRoom</b>	Represents hotels in general	Subclass of Room

# Description of classes and subclasses

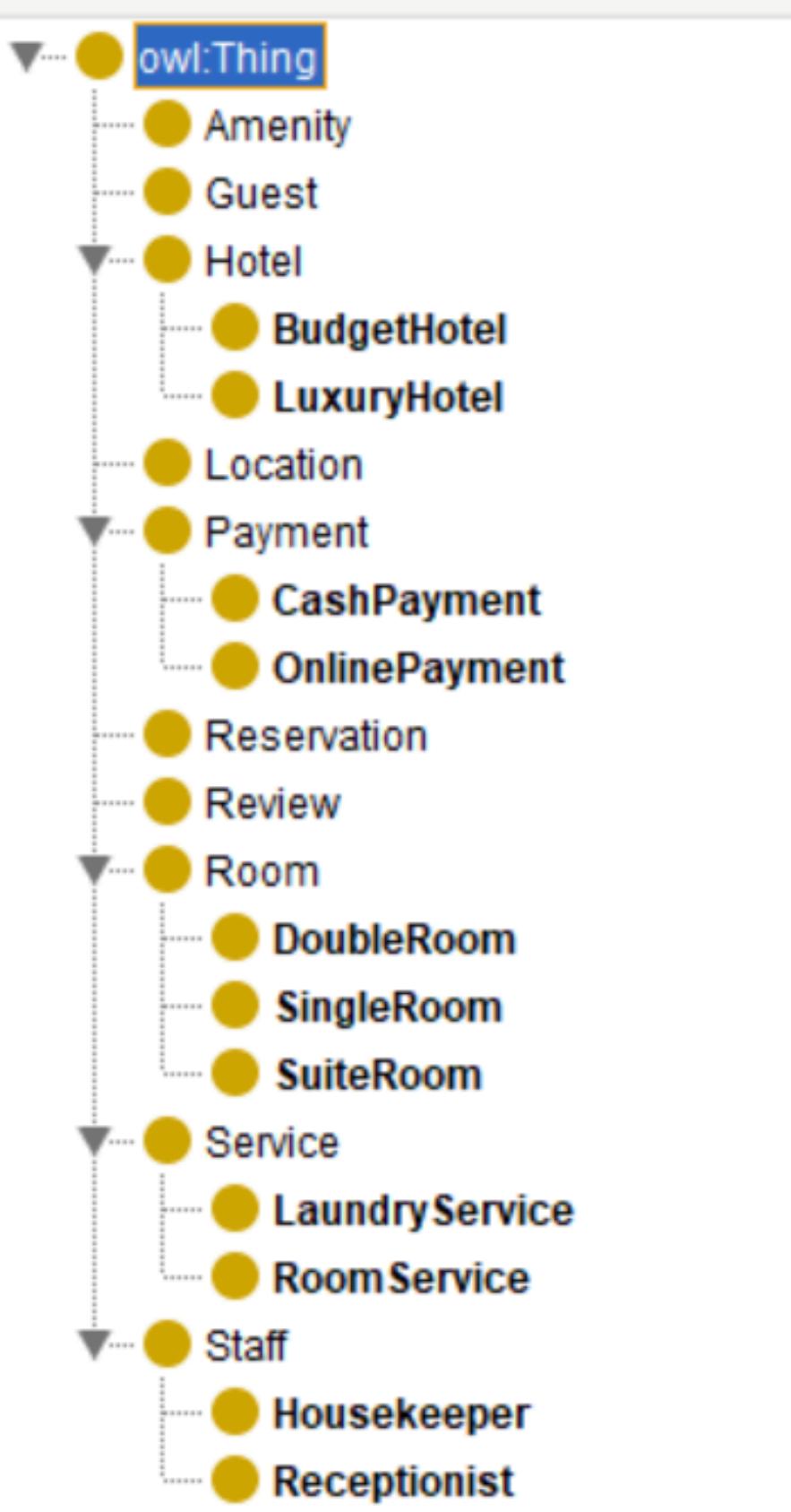
	Description	Hierarchy Position
DoubleRoom	Represents double occupancy rooms	Subclass of Room
SuiteRoom	Represents hotel suites	Subclass of Room
Payment	Represents methods of payment for services	Class
CashPayment	Represents payments made in cash	Subclass of Payment
OnlinePayment	Represents payments made online	Subclass of Payment

# Description of classes and subclasses

	Description	Hierarchy Position
Staff	Represents employees who work at the hotel	Class
Receptionist	Represents front desk staff	Subclass of Staff
Housekeeper	Represents housekeeping staff	Subclass of Staff
Service	Represents the services offered by the hotel	Class
LaundryService	Represents laundry services	Subclass of Service

# Description of classes and subclasses

	Description	Hierarchy Position
<b>RoomService</b>	Represents in-room dining or service	Subclass of Service
<b>Guest</b>	Represents the hotel guests or customers	Class
<b>Amenity</b>	Represents facilities extra features	Class
<b>Reservation</b>	Represents a booking transaction for a room	Class
<b>Review</b>	Represents ratings and reviews of the hotel or service.	Class
<b>Location</b>	Represents the geographical location of the hotel	Class

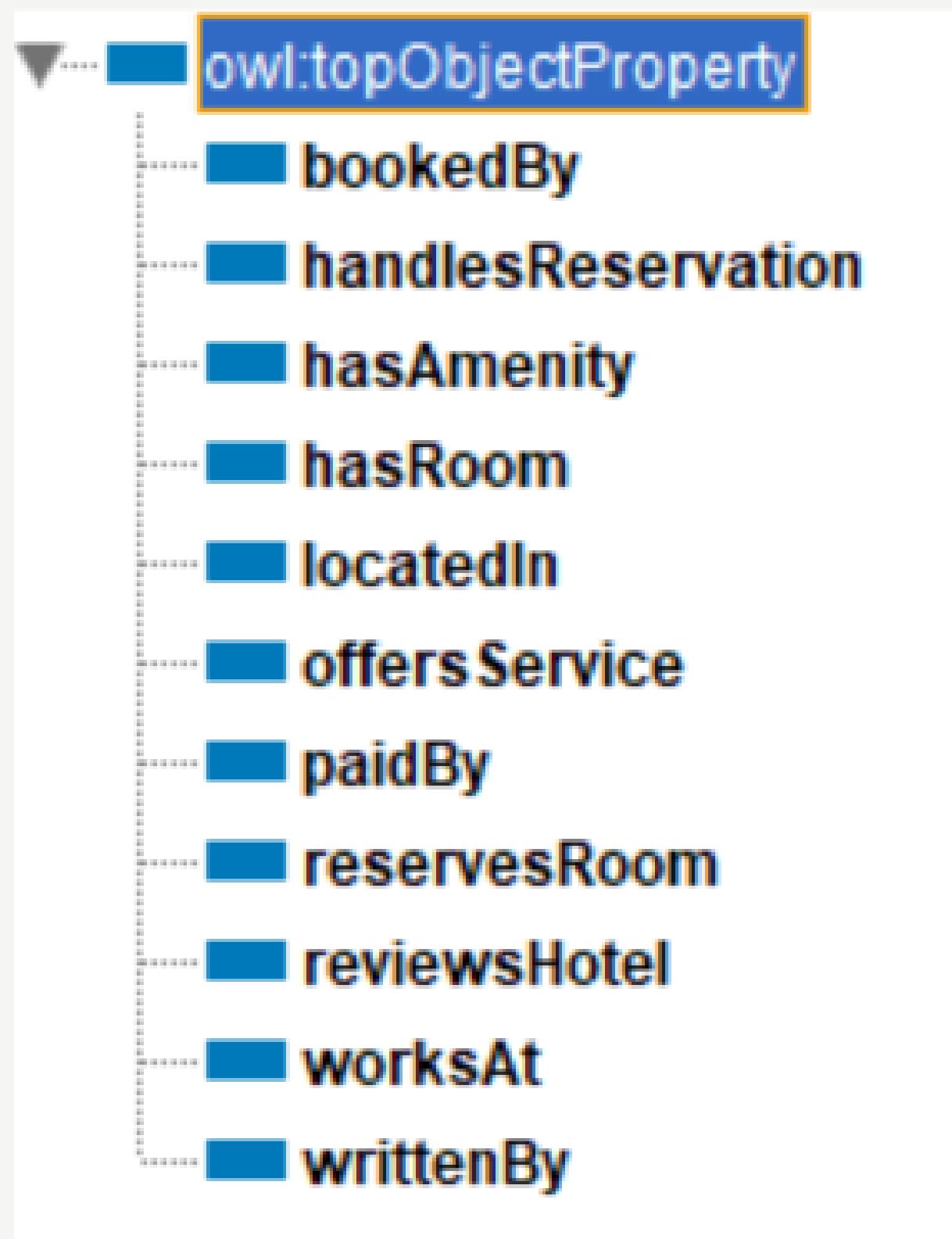


# object properties

	Domain	Range	Description
<b>bookedBy</b>	Reservation	Guest	Links a reservation to the guest who made the booking
<b>handlesReservation</b>	Receptionist	Reservation	Associates a receptionist with the reservations they process.
<b>hasAmenity</b>	Hotel	Amenity	Connects a hotel to the amenities it offers like WiFi and breakfast
<b>hasRoom</b>	Hotel	Room	Links a hotel to the rooms it contains
<b>locatedIn</b>	Hotel	Location	Specifies the geographical location (city/region) where a hotel is situated
<b>offersService</b>	Hotel	Service	Associates a hotel with the services it provides such as room service and laundry

# *object properties*

	Domain	Range	Description
paidBy	Reservation	Payment	Links a reservation to the payment transaction used
reservesRoom	Reservation	Room	Connects a reservation to the specific room that was booked
reviewsHotel	Review	Hotel	Links a review to the hotel being reviewed
worksAt	Staff	Hotel	Links a staff member to the hotel where they are employed
writtenBy	Review	Guest	Connects a review to the guest who wrote it



# Data Properties

	Domain	Range	Description
checkInDate	Reservation	xsd:dateTime	Links a reservation to the guest who made the booking
checkOutDate	Receptionist	xsd:dateTime	Associates a receptionist with the reservations they process.
guestEmail	Guest	xsd:string	Connects a hotel to the amenities it offers like WiFi and breakfast
guestName	Guest	xsd:string	Links a hotel to the rooms it contains
hotelName	Hotel	xsd:string	Specifies the geographical location (city/region) where a hotel is situated
hotelRating	Hotel	xsd:decimal	Associates a hotel with the services it provides such as room service and laundry

# *Data Properties*

Domain	Range	Description
reviewText	Review	xsd:string Links a reservation to the guest who made the booking
roomNumber	Room	xsd:string Associates a receptionist with the reservations they process.
totalPrice	Reservation	xsd:decimal Connects a hotel to the amenities it offers like WiFi and breakfast

- ▼ **owl:topDataProperty**
  - checkInDate**
  - checkOutDate**
  - guestEmail**
  - guestName**
  - hotelName**
  - hotelRating**
  - paymentAmount**
  - reviewRating**
  - reviewText**
  - roomNumber**
  - totalPrice**

# SPARQL Queries

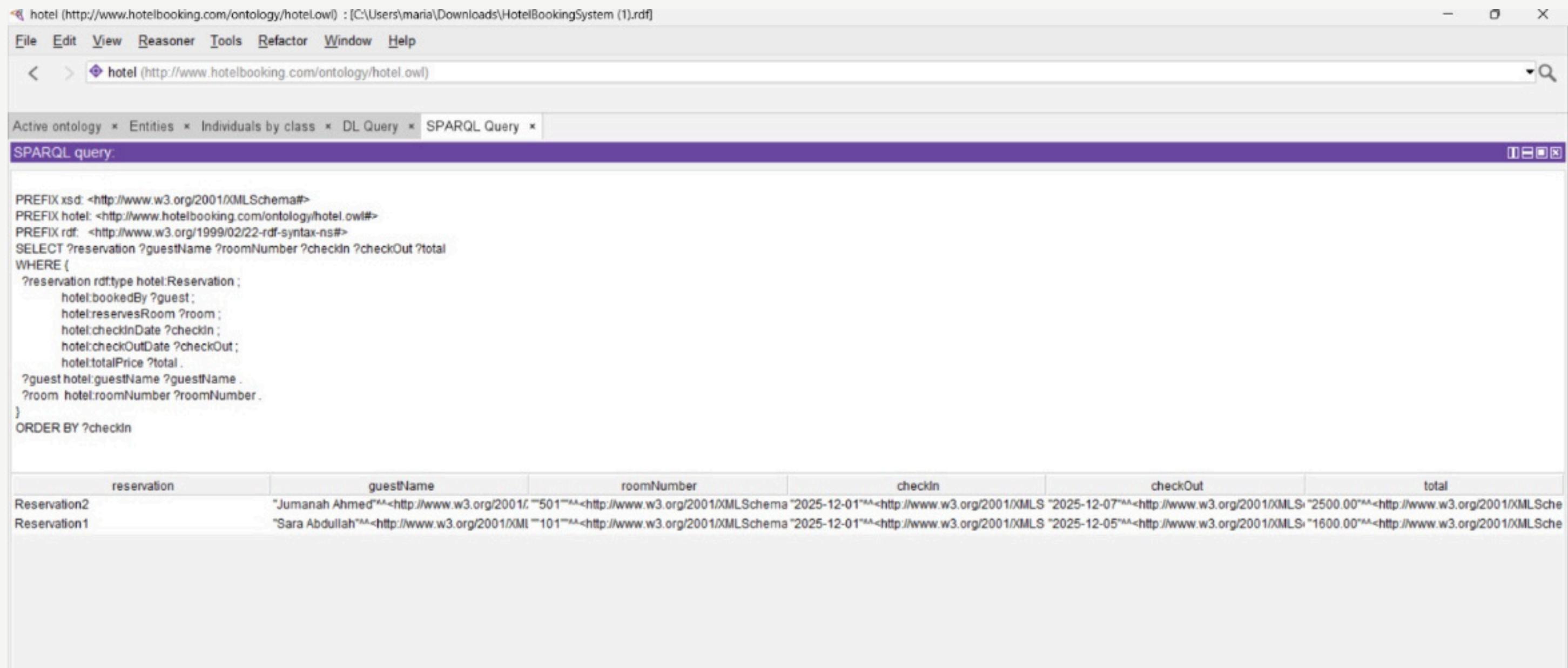
The screenshot shows the Protege 4.3.0 interface with the following details:

- Toolbar:** File, Edit, View, Reasoner, Tools, Refactor, Window, Help.
- Title Bar:** hotel (<http://www.hotelbooking.com/ontology/hotel.owl>)
- Breadcrumbs:** Active ontology > Entities > Individuals by class > DL Query > SPARQL Query
- SPARQL query editor:**

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX hotel: <http://www.hotelbooking.com/ontology/hotel.owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?hotel ?name ?rating
WHERE {
{
?hotel rdf:type hotel:BudgetHotel .
}
UNION
{
?hotel rdf:type hotel:LuxuryHotel .
}
?hotel hotel:hotelName ?name .
?hotel hotel:hotelRating ?rating .
}
ORDER BY DESC(?rating)
```
- Results table:**

hotel	name	rating
SkyTowerLuxuryHotel	"Sky Tower Luxury Hotel"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"4.8"^^< <a href="http://www.w3.org/2001/XMLSchema#decimal">http://www.w3.org/2001/XMLSchema#decimal</a> >
SeaViewBudgetHotel	"Sea View Budget Hotel"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"3.5"^^< <a href="http://www.w3.org/2001/XMLSchema#decimal">http://www.w3.org/2001/XMLSchema#decimal</a> >
- Buttons:** Execute, Show Inferences (with a warning icon).
- Status bar:** No Reasoner set. Select a reasoner from the Reasoner menu.

# SPARQL Queries

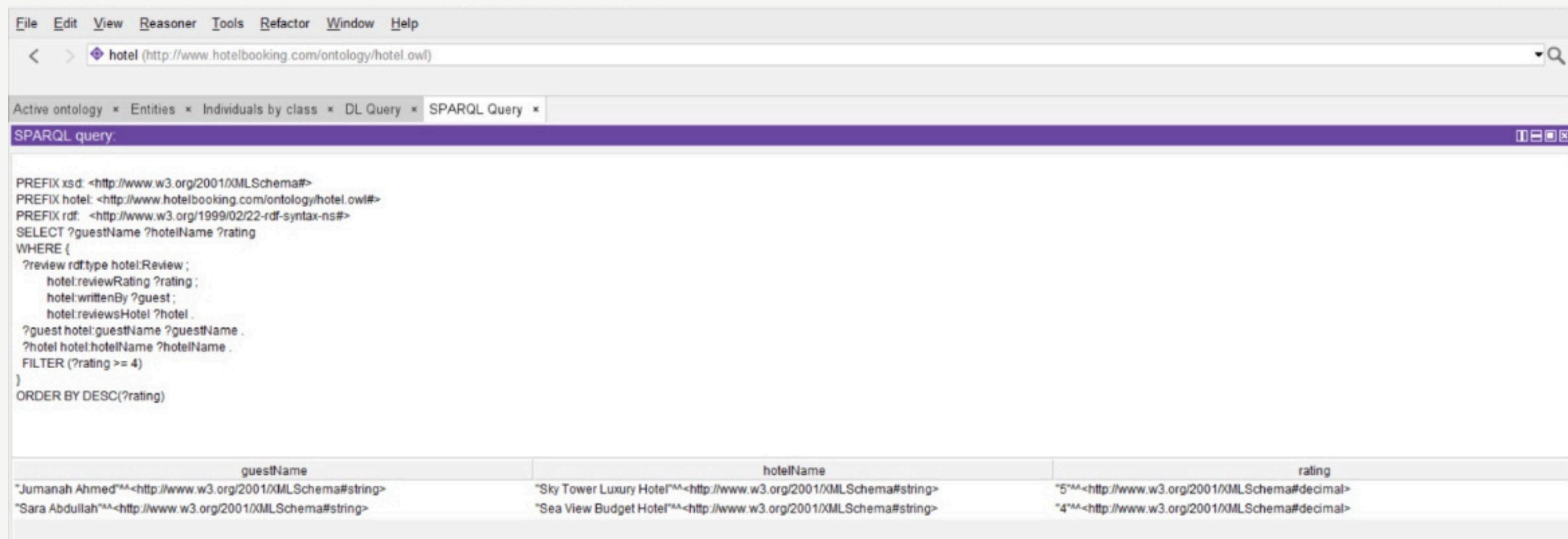


The screenshot shows the Protege 4.3.0 interface with the following details:

- Title Bar:** hotel (<http://www.hotelbooking.com/ontology/hotel.owl>) : [C:\Users\maria\Downloads\HotelBookingSystem (1).rdf]
- Menu Bar:** File Edit View Reasoner Tools Refactor Window Help
- Breadcrumbs:** < > hotel (<http://www.hotelbooking.com/ontology/hotel.owl>)
- Tab Bar:** Active ontology × Entities × Individuals by class × DL Query × SPARQL Query ×
- SPARQL Query Editor:** SPARQL query:  
PREFIX xsd: <<http://www.w3.org/2001/XMLSchema#>>  
PREFIX hotel: <<http://www.hotelbooking.com/ontology/hotel.owl#>>  
PREFIX rdf: <<http://www.w3.org/1999/02/22-rdf-syntax-ns#>>  
SELECT ?reservation ?guestName ?roomNumber ?checkIn ?checkOut ?total  
WHERE {  
?reservation rdf:type hotel:Reservation ;  
 hotel:bookedBy ?guest ;  
 hotel:reservesRoom ?room ;  
 hotel:checkInDate ?checkIn ;  
 hotel:checkOutDate ?checkOut ;  
 hotel:totalPrice ?total .  
?guest hotel:guestName ?guestName .  
?room hotel:roomNumber ?roomNumber .  
}  
ORDER BY ?checkIn
- Data Table:** A table showing the results of the query. The columns are: reservation, guestName, roomNumber, checkIn, checkOut, and total.

	reservation	guestName	roomNumber	checkIn	checkOut	total
Reservation2		"Jumanah Ahmed"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"501"^^< <a href="http://www.w3.org/2001/XMLSchema#integer">http://www.w3.org/2001/XMLSchema#integer</a> >	"2025-12-01T00:00:00Z"^^< <a href="http://www.w3.org/2001/XMLSchema#dateTime">http://www.w3.org/2001/XMLSchema#dateTime</a> >	"2025-12-07T00:00:00Z"^^< <a href="http://www.w3.org/2001/XMLSchema#dateTime">http://www.w3.org/2001/XMLSchema#dateTime</a> >	"2500.00"^^< <a href="http://www.w3.org/2001/XMLSchema#float">http://www.w3.org/2001/XMLSchema#float</a> >
Reservation1		"Sara Abdullah"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"101"^^< <a href="http://www.w3.org/2001/XMLSchema#integer">http://www.w3.org/2001/XMLSchema#integer</a> >	"2025-12-01T00:00:00Z"^^< <a href="http://www.w3.org/2001/XMLSchema#dateTime">http://www.w3.org/2001/XMLSchema#dateTime</a> >	"2025-12-05T00:00:00Z"^^< <a href="http://www.w3.org/2001/XMLSchema#dateTime">http://www.w3.org/2001/XMLSchema#dateTime</a> >	"1600.00"^^< <a href="http://www.w3.org/2001/XMLSchema#float">http://www.w3.org/2001/XMLSchema#float</a> >

# SPARQL Queries



The screenshot shows the Protege 4.3 interface with the following details:

- Toolbar:** File, Edit, View, Reasoner, Tools, Refactor, Window, Help.
- Title Bar:** hotel (<http://www.hotelbooking.com/ontology/hotel.owl>)
- Tab Bar:** Active ontology, Entities, Individuals by class, DL Query, SPARQL Query (selected).
- SPARQL query tab content:**

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX hotel: <http://www.hotelbooking.com/ontology/hotel.owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?guestName ?hotelName ?rating
WHERE {
?review rdf:type hotel:Review ;
    hotel:reviewRating ?rating ;
    hotel:writtenBy ?guest ;
    hotel:reviewsHotel ?hotel .
?guest hotel:guestName ?guestName .
?hotel hotel:hotelName ?hotelName .
FILTER (?rating >= 4)
}
ORDER BY DESC(?rating)
```
- Results Table:**

guestName	hotelName	rating
"Jumanah Ahmed" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a>	"Sky Tower Luxury Hotel" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a>	"5" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#decimal">http://www.w3.org/2001/XMLSchema#decimal</a>
"Sara Abdullah" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a>	"Sea View Budget Hotel" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a>	"4" <sup>^^</sup> <a href="http://www.w3.org/2001/XMLSchema#decimal">http://www.w3.org/2001/XMLSchema#decimal</a>

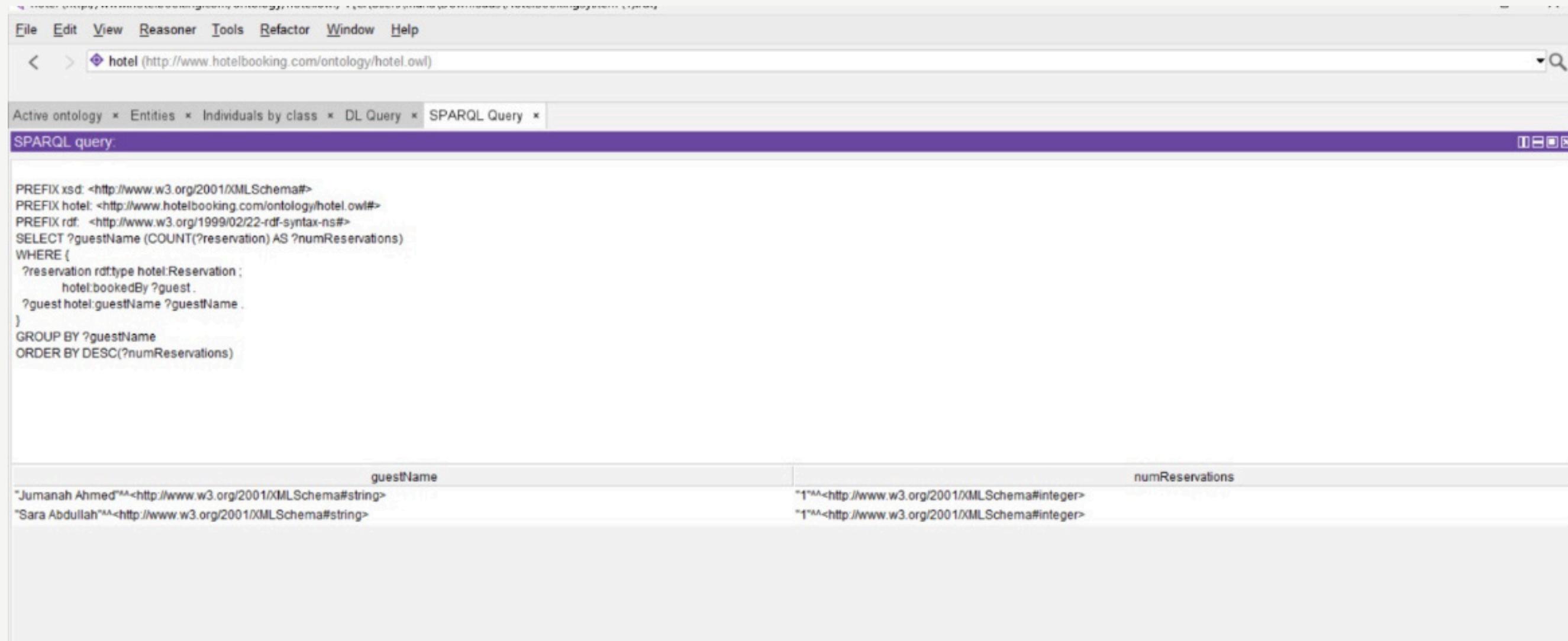
# SPARQL Queries

The screenshot shows the Protege 4.3 interface with the following details:

- File Edit View Reasoner Tools Refactor Window Help**: The top menu bar.
- hotel (http://www.hotelbooking.com/ontology/hotel.owl)**: The active ontology in the title bar.
- Active ontology Entities Individuals by class DL Query SPARQL Query**: The tabs at the top of the main window.
- SPARQL query:** The active tab, indicated by a purple background.
- PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>**  
**PREFIX hotel: <http://www.hotelbooking.com/ontology/hotel.owl#>**  
**PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>**
- SELECT ?staff ?role ?hotelName**
- WHERE {**
  - ?staff hotel:worksAt ?hotel .
  - ?hotel hotel:hotelName ?hotelName .
  - ?staff rdf:type ?role .
- FILTER (?role = hotel:Receptionist || ?role = hotel:Housekeeper)**
- }**
- ORDER BY ?hotelName ?role**
- Results Table:** A table showing the query results with columns: staff, role, and hotelName.
- Data:**

staff	role	hotelName
HouseKeeperAli	Housekeeper	"Sea View Budget Hotel"^^<http://www.w3.org/2001/XMLSchema#string>
ReceptionistSara	Receptionist	"Sea View Budget Hotel"^^<http://www.w3.org/2001/XMLSchema#string>

# SPARQL Queries



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- Title Bar:** hotel (<http://www.hotelbooking.com/ontology/hotel.owl#>)
- Breadcrumbs:** Active ontology < Entities < Individuals by class < DL Query < SPARQL Query
- Tab:** SPARQL query
- Query Editor:** Displays the following SPARQL query:

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX hotel: <http://www.hotelbooking.com/ontology/hotel.owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?guestName (COUNT(?reservation) AS ?numReservations)
WHERE {
  ?reservation rdf:type hotel:Reservation ;
    hotel:bookedBy ?guest .
  ?guest hotel:guestName ?guestName .
}
GROUP BY ?guestName
ORDER BY DESC(?numReservations)
```
- Results Table:** A table showing the results of the query. It has two columns: "guestName" and "numReservations".

guestName	numReservations
"Jumanah Ahmed"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"1"^^< <a href="http://www.w3.org/2001/XMLSchema#integer">http://www.w3.org/2001/XMLSchema#integer</a> >
"Sara Abdullah"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"1"^^< <a href="http://www.w3.org/2001/XMLSchema#integer">http://www.w3.org/2001/XMLSchema#integer</a> >

# SPARQL Queries

The screenshot shows the Protege 4.3.0 interface with the following details:

- Menu Bar:** File, Edit, View, Reasoner, Tools, Refactor, Window, Help.
- Title Bar:** hotel (<http://www.hotelbooking.com/ontology/hotel.owl>)
- Breadcrumbs:** Active ontology > Entities > Individuals by class > DL Query > SPARQL Query
- Toolbar:** SPARQL query (selected), and other icons for reasoner, tools, etc.
- SPARQL Query Editor:**

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX hotel: <http://www.hotelbooking.com/ontology/hotel.owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?hotelName ?roomNumber
WHERE {
  {
    ?hotel rdf:type hotel:BudgetHotel .
  }
  UNION
  {
    ?hotel rdf:type hotel:LuxuryHotel .
  }
  ?hotel hotel:hotelName ?hotelName .
  ?hotel hotel:hasRoom ?room .
  ?room hotel:roomNumber ?roomNumber .
}
ORDER BY ?hotelName ?roomNumber
```
- Results Table:** A table showing the results of the query. It has two columns: "hotelName" and "roomNumber".

hotelName	roomNumber
"Sea View Budget Hotel"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"101"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >
"Sea View Budget Hotel"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"201"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >
"Sky Tower Luxury Hotel"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >	"501"^^< <a href="http://www.w3.org/2001/XMLSchema#string">http://www.w3.org/2001/XMLSchema#string</a> >

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*Thank you*

**For your attention**

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