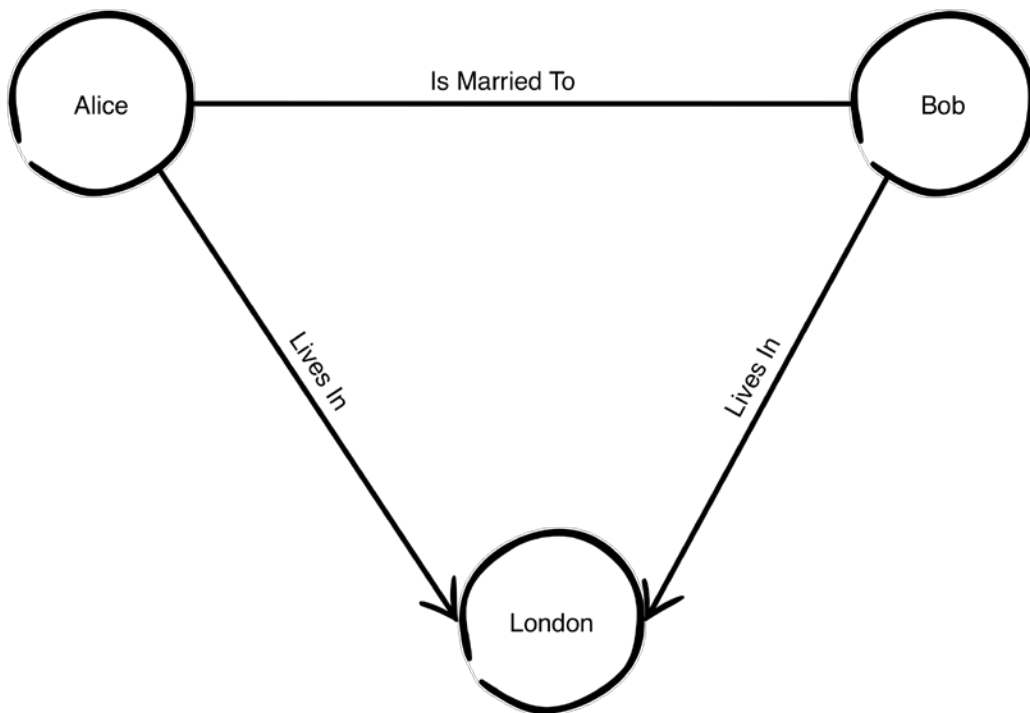
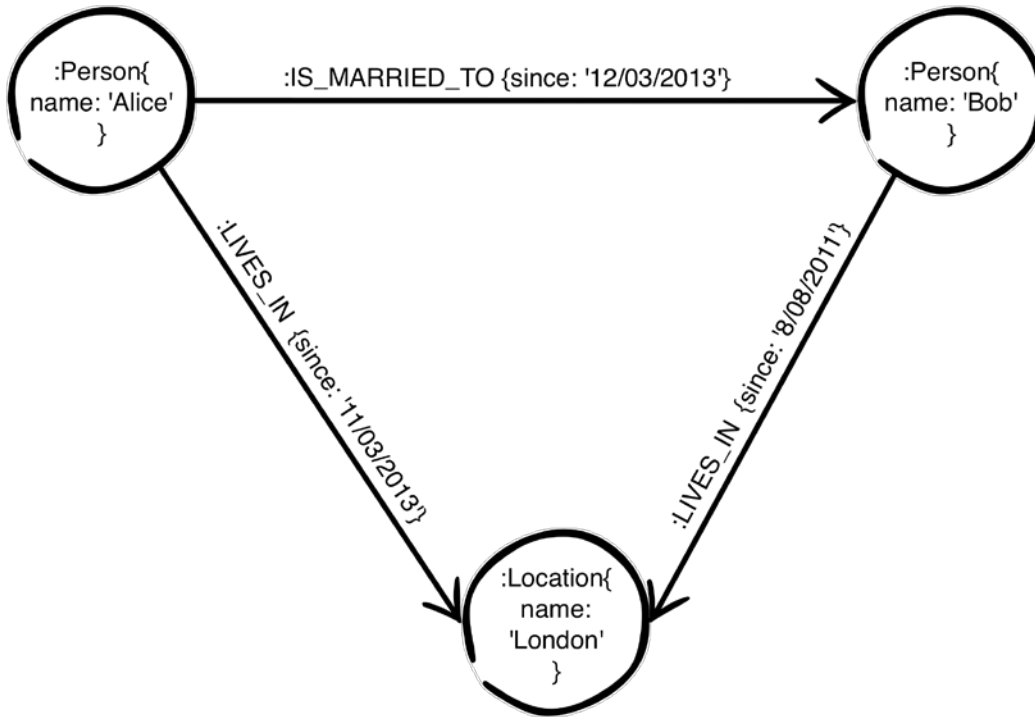
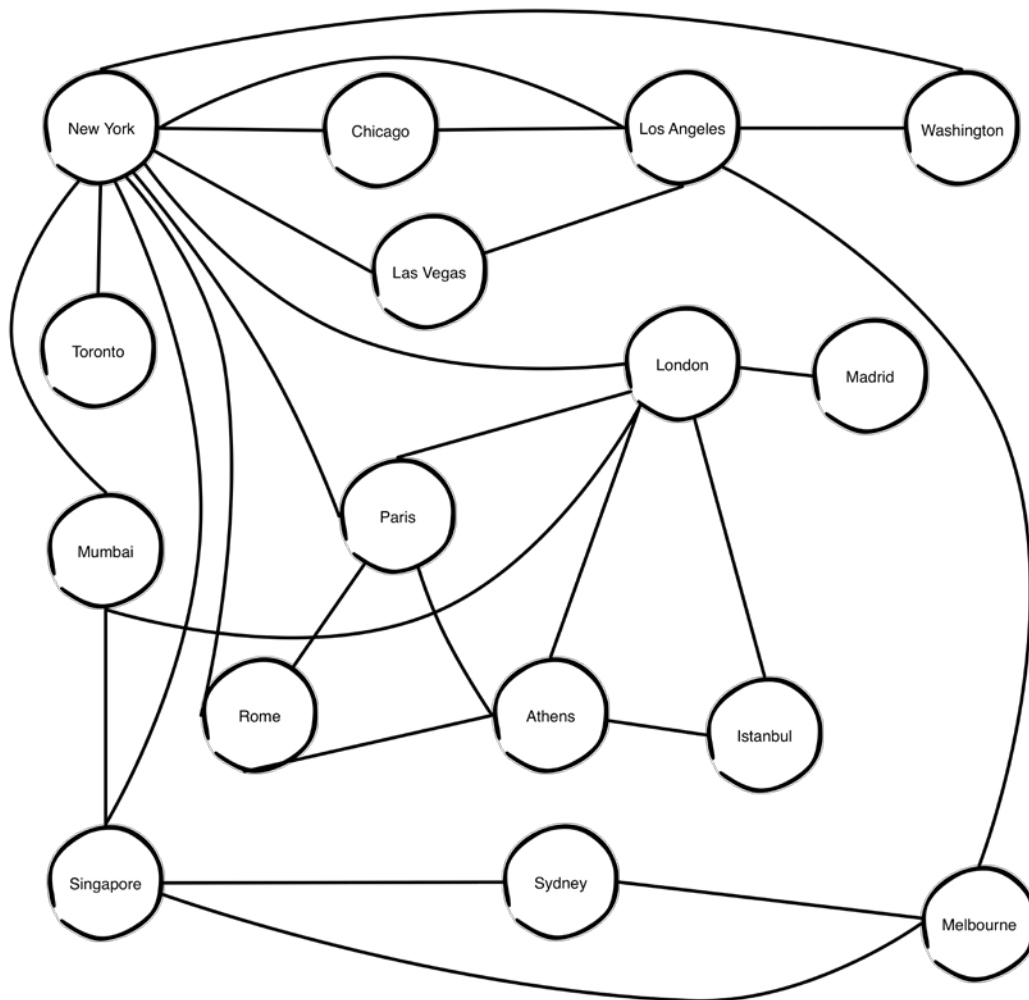


Chapter 1-Graphs are Everywhere



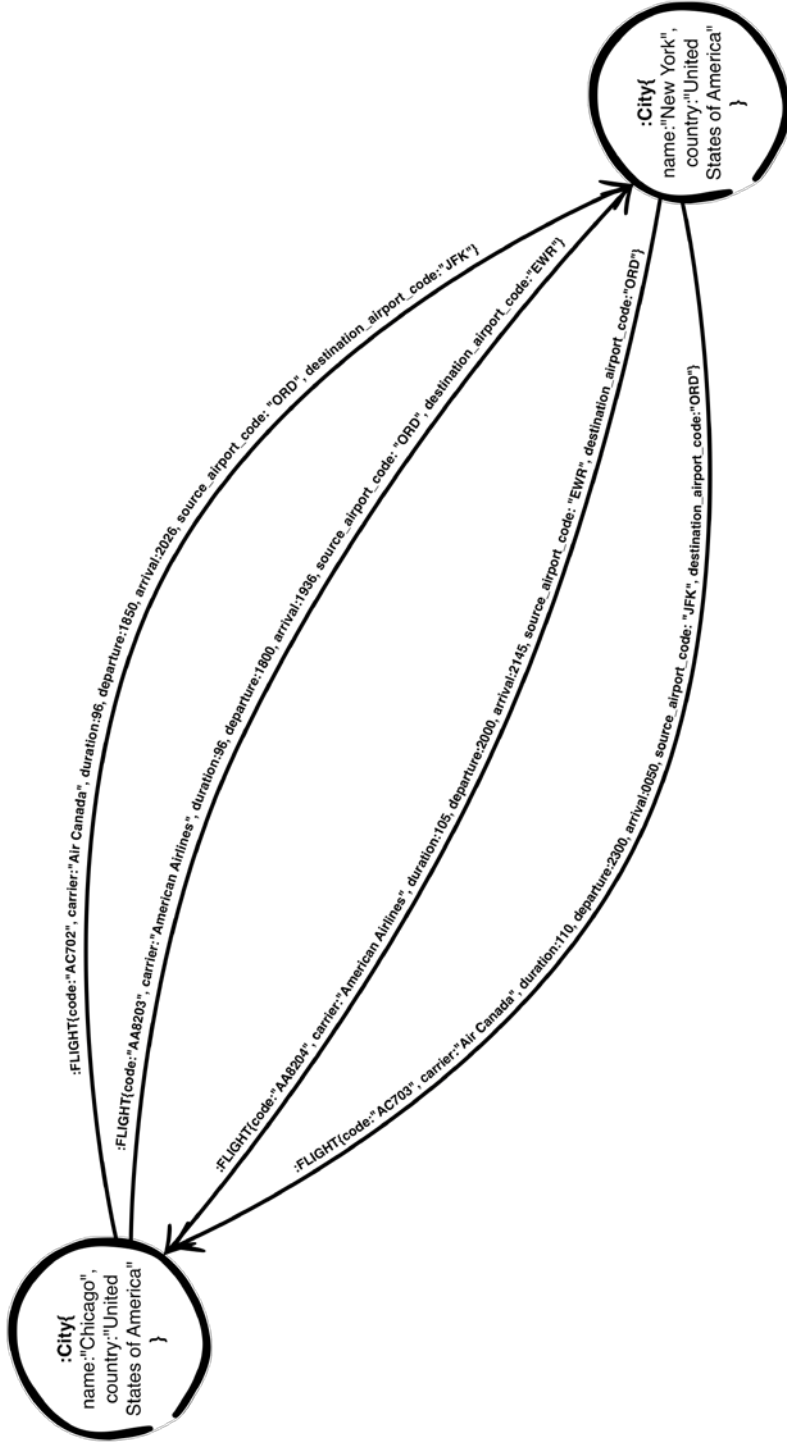


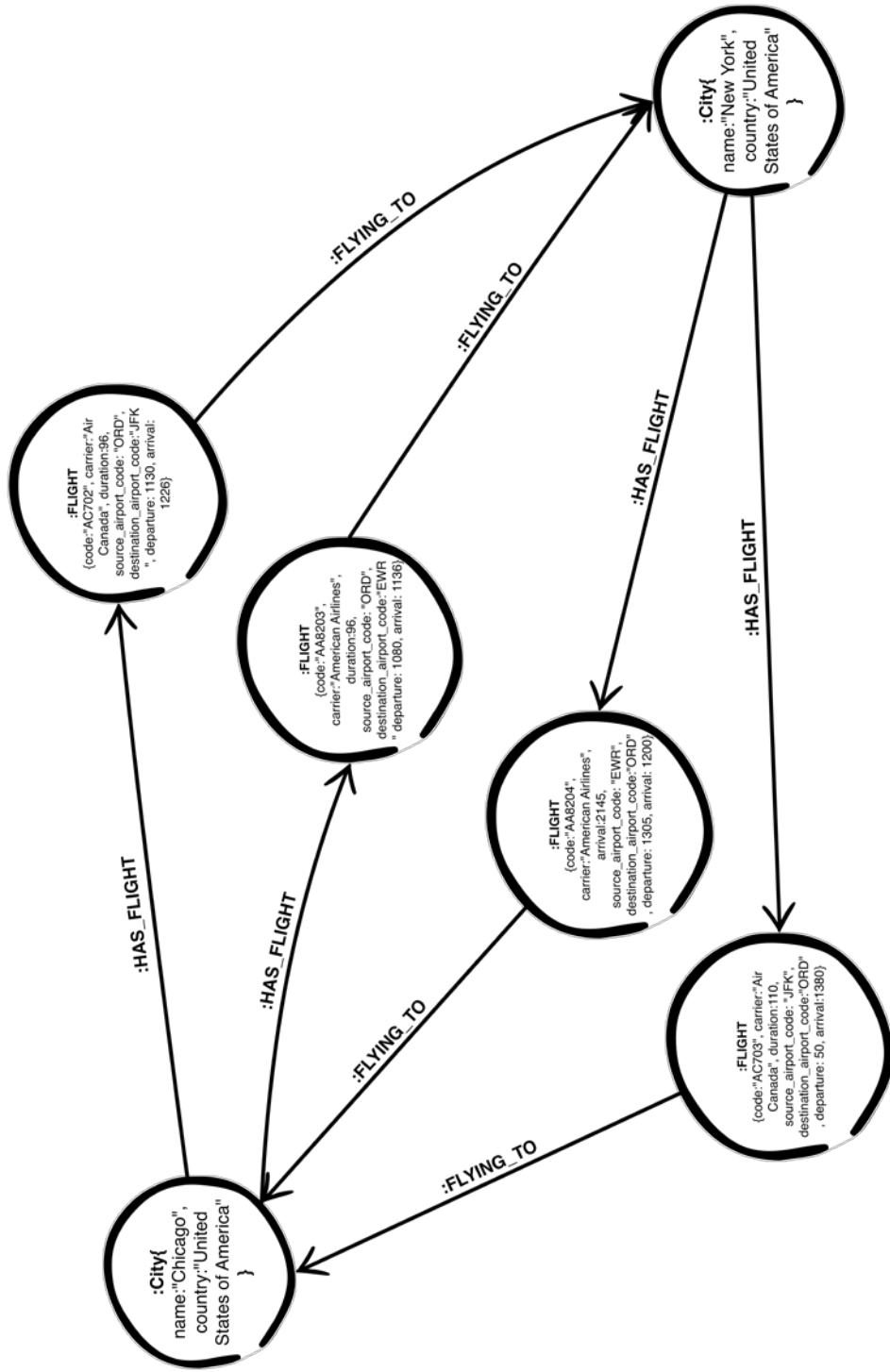
Chapter 2-Modeling Flights and Cities



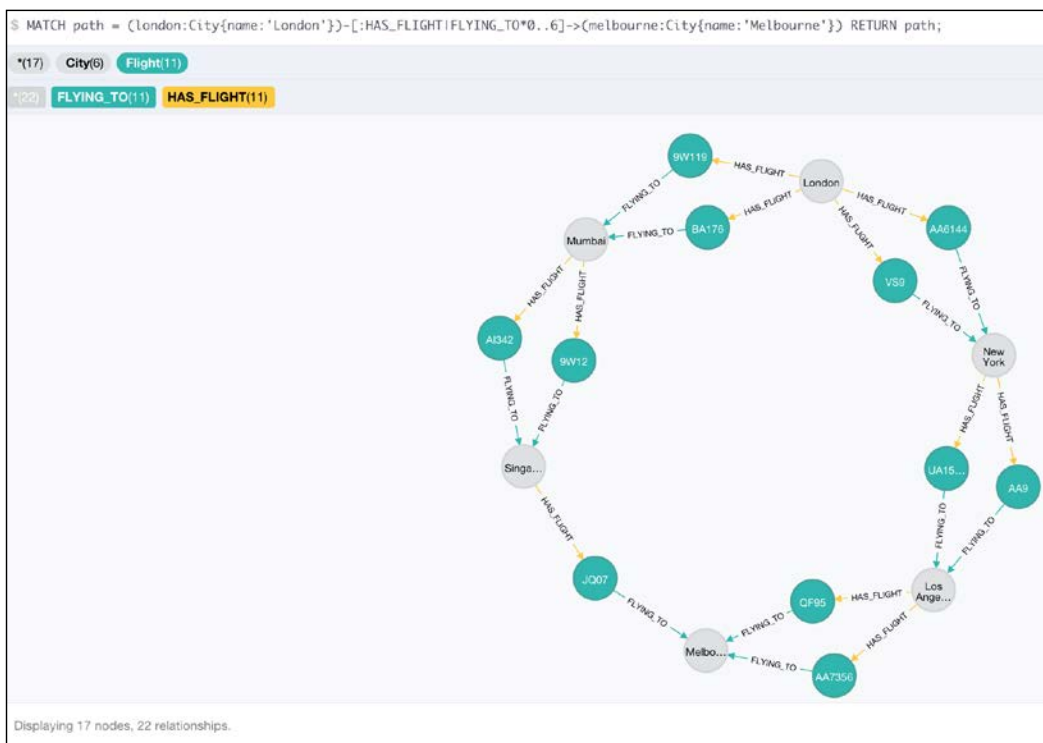
:City
{name: "New York",
country: "United States of
America"}

:Flight
{code: "AA1234",
carrier: "American Airlines",
duration: 360,
source_airport_code: "JFK",
destination_airport_code: "CDG"
departure: 720,
arrival: 945 }





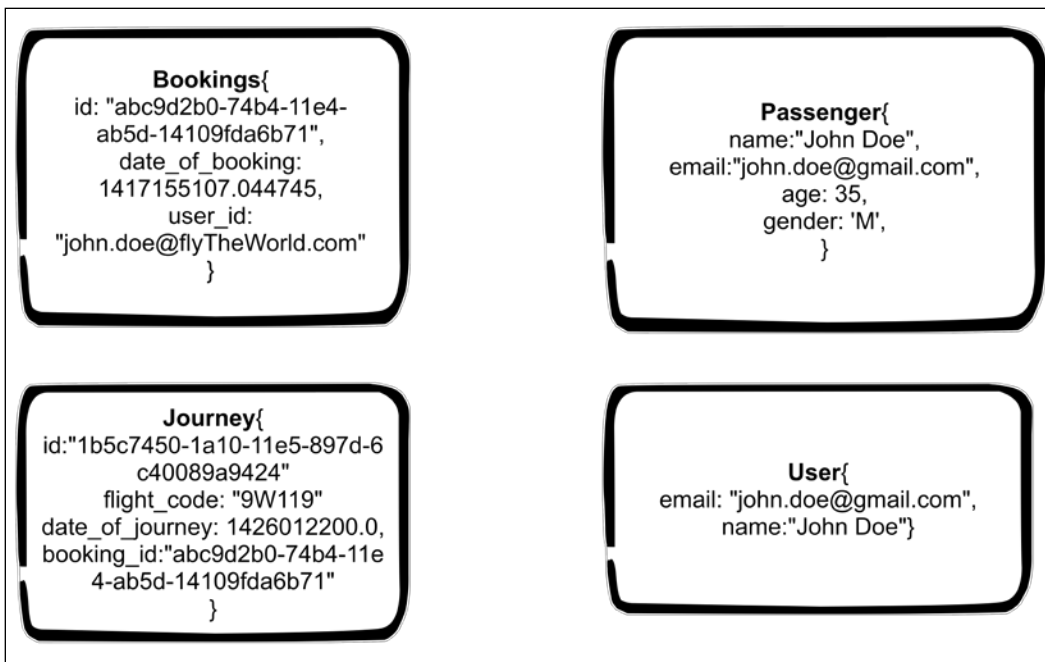
Chapter 3 - Formulating an Itinerary

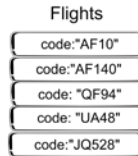
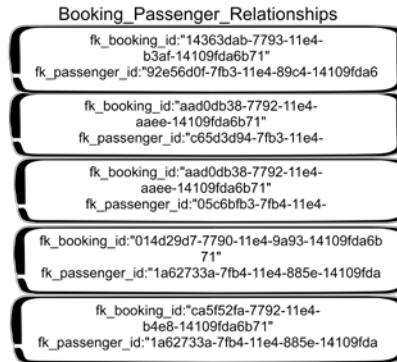
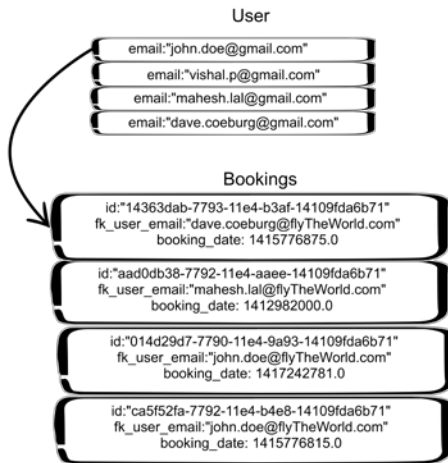


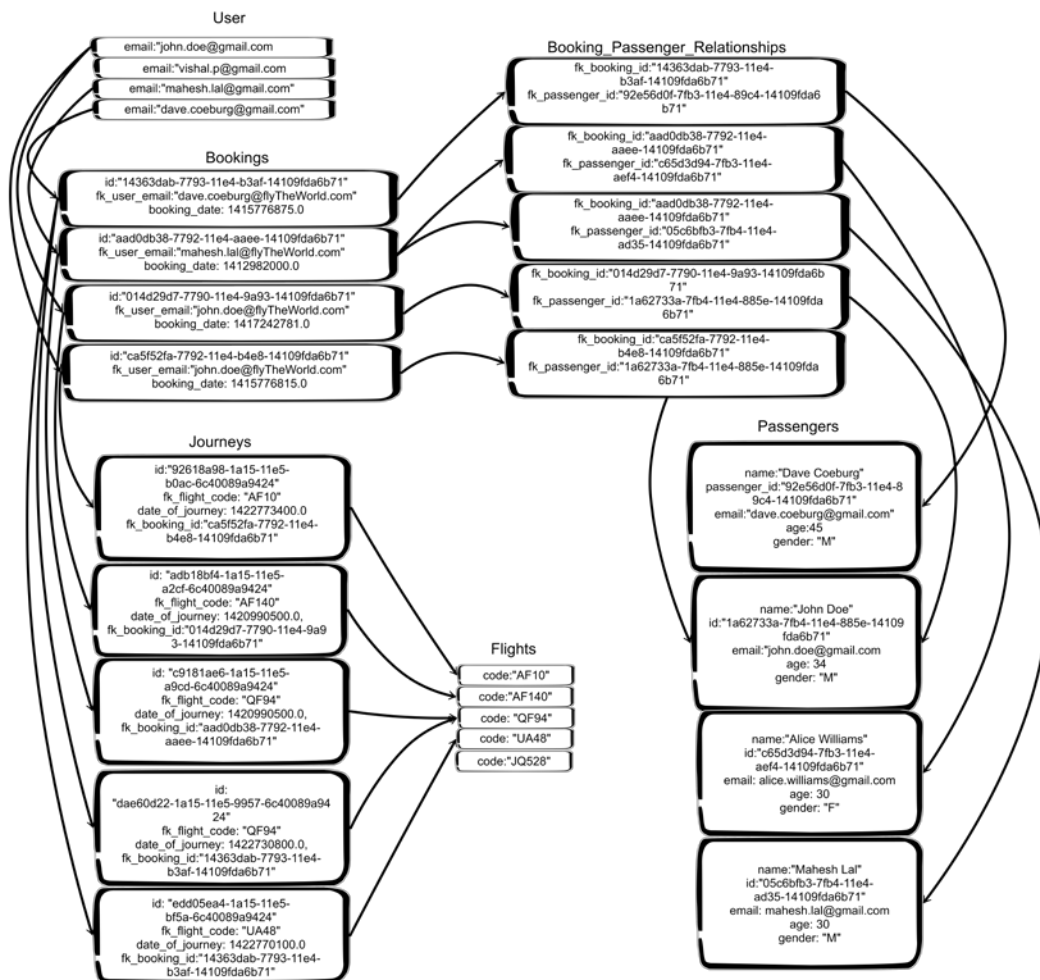
| city | code | carrier | departure | arrival | duration | from_airport | to_airport |
|--------------------------------------------|--------------------------|-----------------------------------------------------------|--------------------|-------------------|-----------------|-----------------|-----------------|
| [London, New York, Los Angeles, Melbourne] | [AA6144, AA9, AA7356] | [American Airlines, American Airlines, American Airlines] | [1085, 1300, 1370] | [1255, 1114, 515] | [535, 314, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [V99, AA9, AA7356] | [Virgin Atlantic, American Airlines, American Airlines] | [965, 1300, 1370] | [1130, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [AA6144, UA1507, AA7356] | [American Airlines, United, American Airlines] | [1085, 720, 1370] | [1255, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [V99, UA1507, AA7356] | [Virgin Atlantic, United, American Airlines] | [965, 720, 1370] | [1130, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [AA6144, AA9, QF95] | [American Airlines, American Airlines, Qantas] | [1085, 1300, 1370] | [1255, 1114, 515] | [535, 314, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [V99, AA9, QF95] | [Virgin Atlantic, American Airlines, Qantas] | [965, 1300, 1370] | [1130, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [AA6144, UA1507, QF95] | [American Airlines, United, Qantas] | [1085, 720, 1370] | [1255, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, New York, Los Angeles, Melbourne] | [V99, UA1507, QF95] | [Virgin Atlantic, United, Qantas] | [965, 720, 1370] | [1130, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX] | [JFK, LAX, MEL] |
| [London, Mumbai, Singapore, Melbourne] | [9W119, AI342, JQ07] | [Jet, Air India, Jetstar] | [1280, 1, 1260] | [660, 465, 405] | [550, 315, 405] | [LHR, BOM, SIN] | [BOM, SIN, MEL] |
| [London, Mumbai, Singapore, Melbourne] | [BA176, AI342, JQ07] | [British Airways, Air India, Jetstar] | [625, 1, 1260] | [1430, 465, 405] | [535, 315, 405] | [LHR, BOM, SIN] | [BOM, SIN, MEL] |
| [London, Mumbai, Singapore, Melbourne] | [9W119, 9W12, JQ07] | [Jet, Jet, Jetstar] | [1280, 80, 1260] | [660, 570, 405] | [550, 340, 405] | [LHR, BOM, SIN] | [BOM, SIN, MEL] |
| [London, Mumbai, Singapore, Melbourne] | [BA176, 9W12, JQ07] | [British Airways, Jet, Jetstar] | [625, 80, 1260] | [1430, 570, 405] | [535, 340, 405] | [LHR, BOM, SIN] | [BOM, SIN, MEL] |

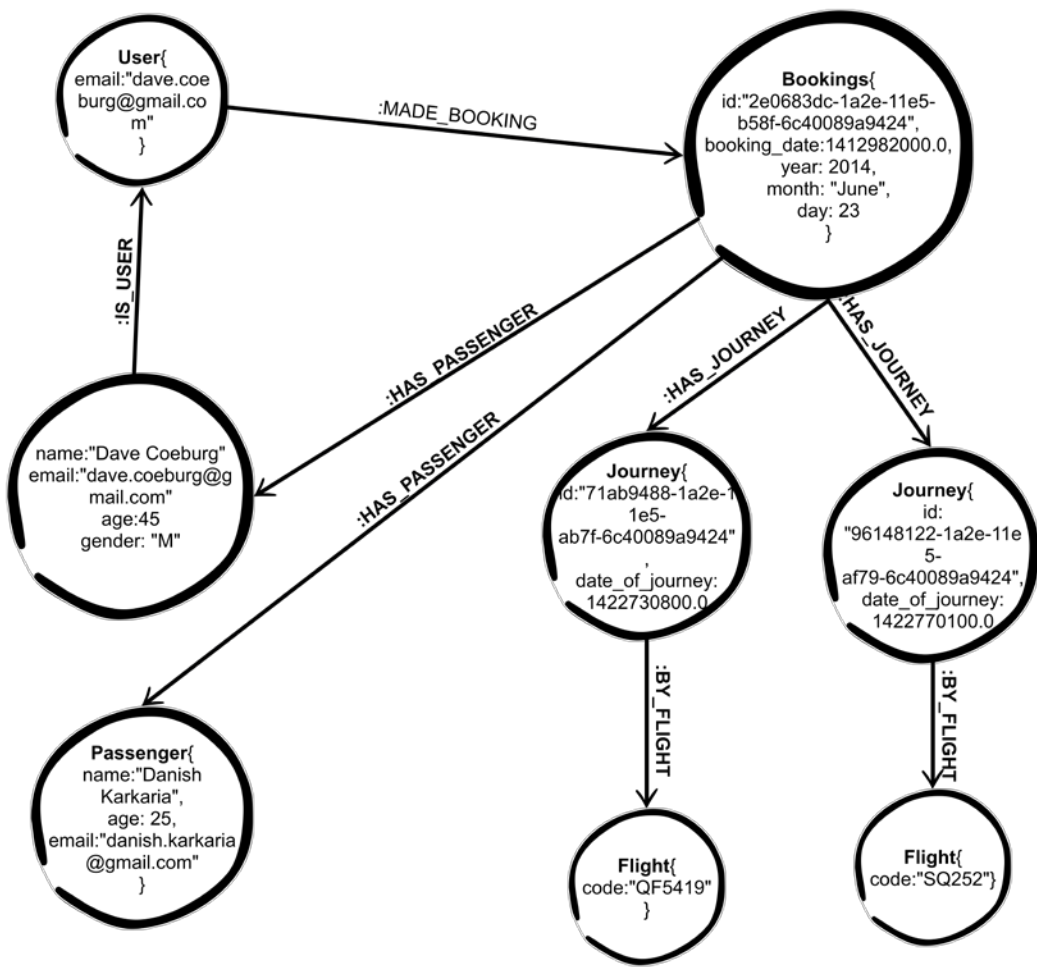
Returned 12 rows in 126 ms.

Chapter 4 - Modeling Bookings and Users



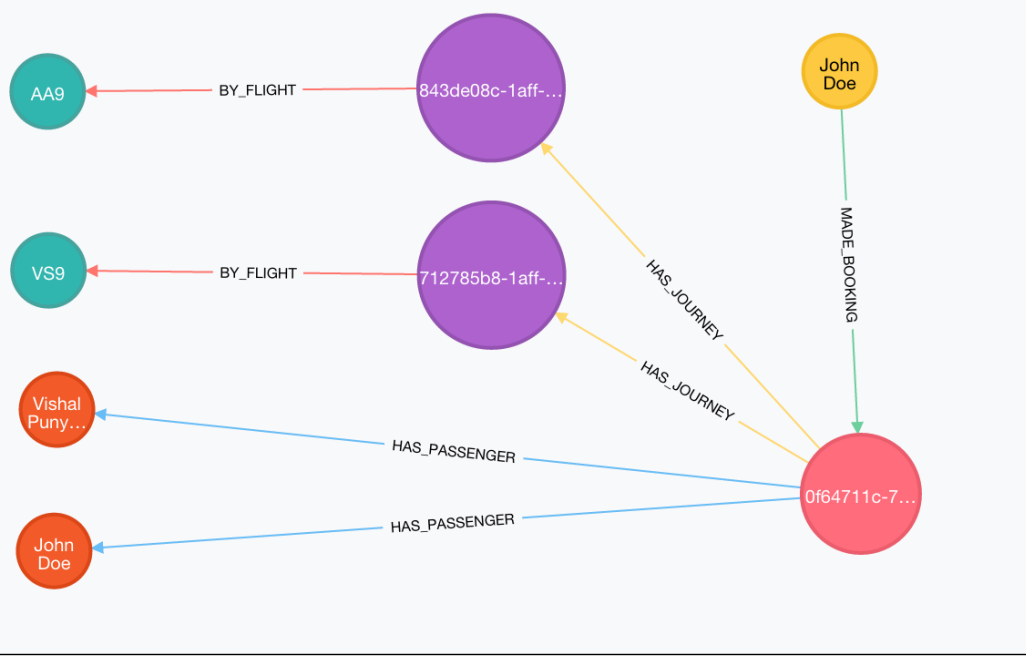






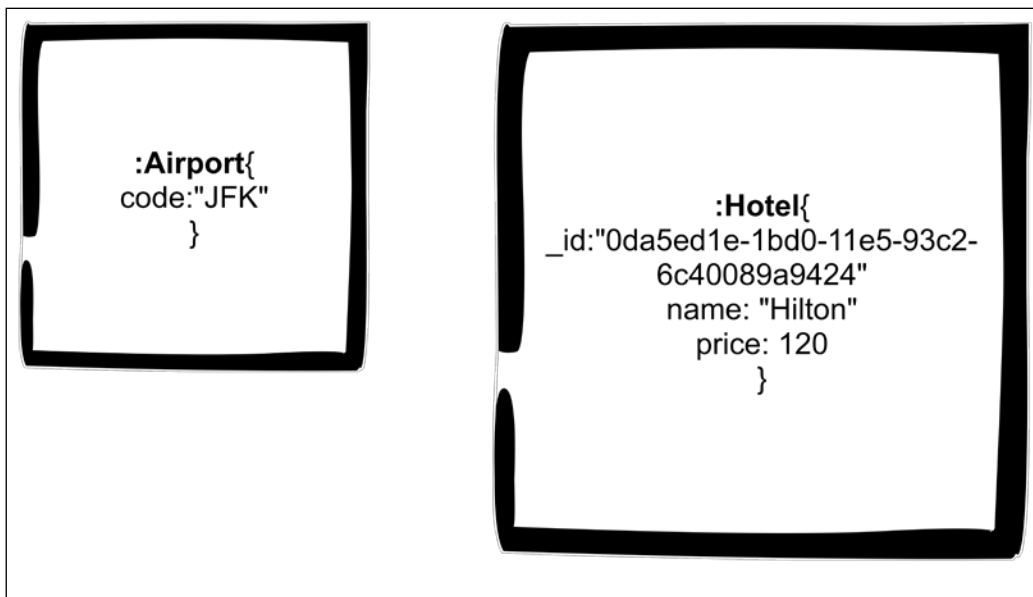
```
$ MATCH (user:User{email:"john.doe@gmail.com"}) MATCH (f1:Flight{code:"VS9"}),
```

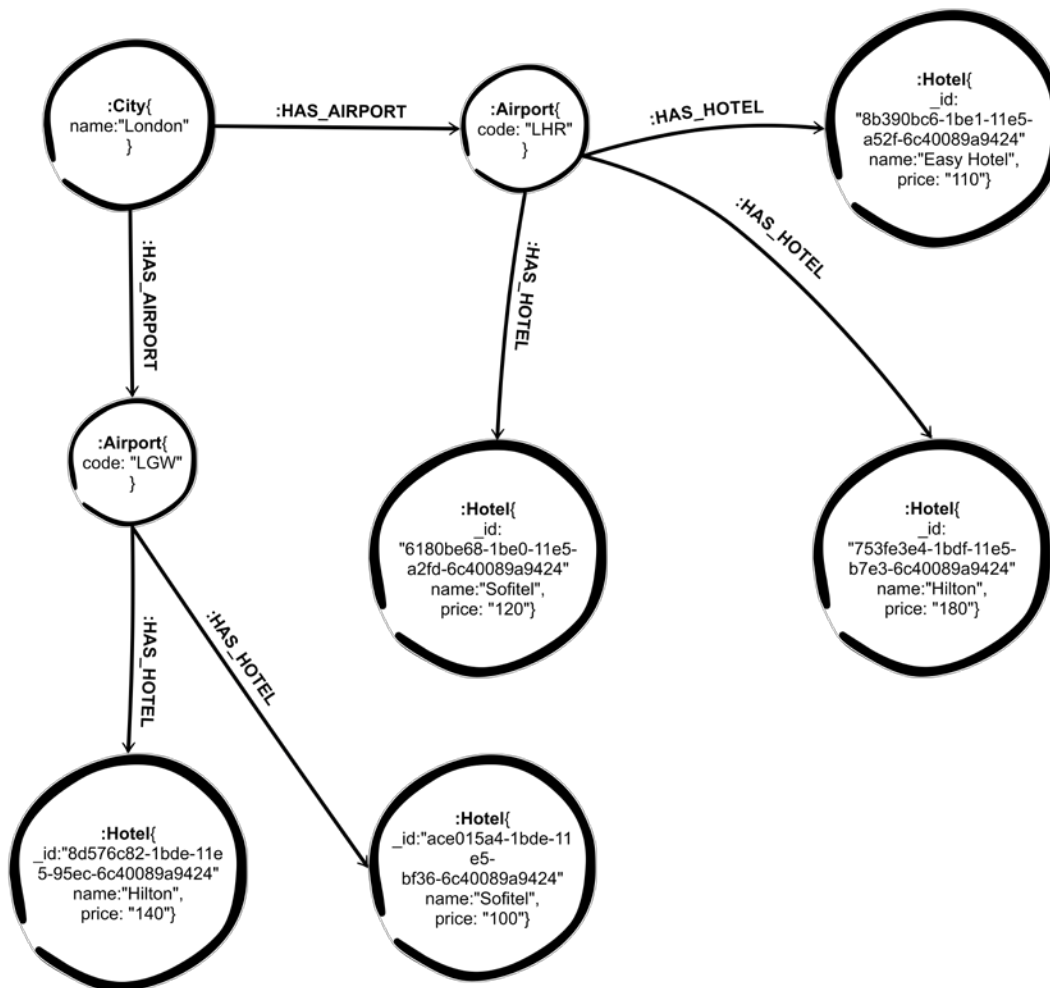
```
* (8) Booking(1) Flight(2) Journey(2) Passenger(2) User(1)
*(7) BY_FLIGHT(2) HAS_JOURNEY(2) HAS_PASSENGER(2) MADE_BOOKING(1)
```

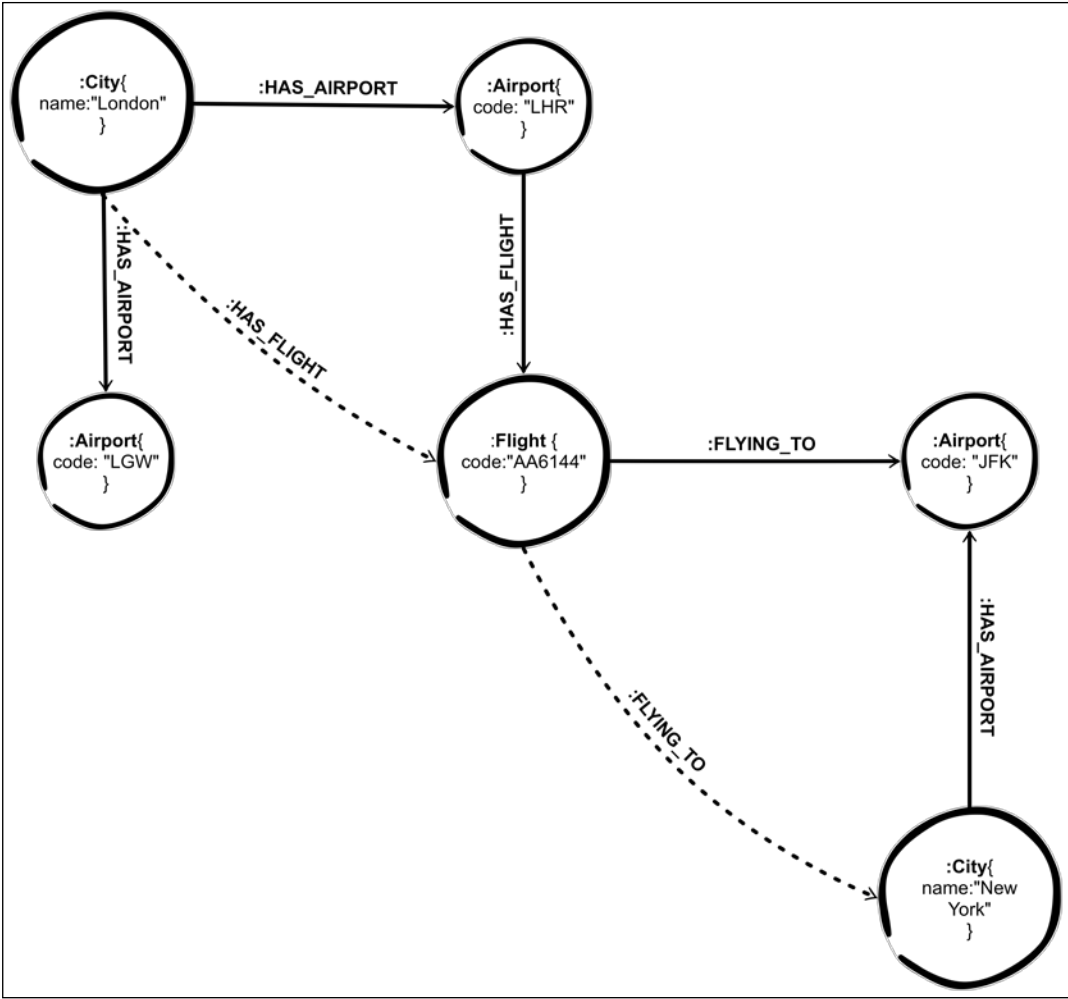


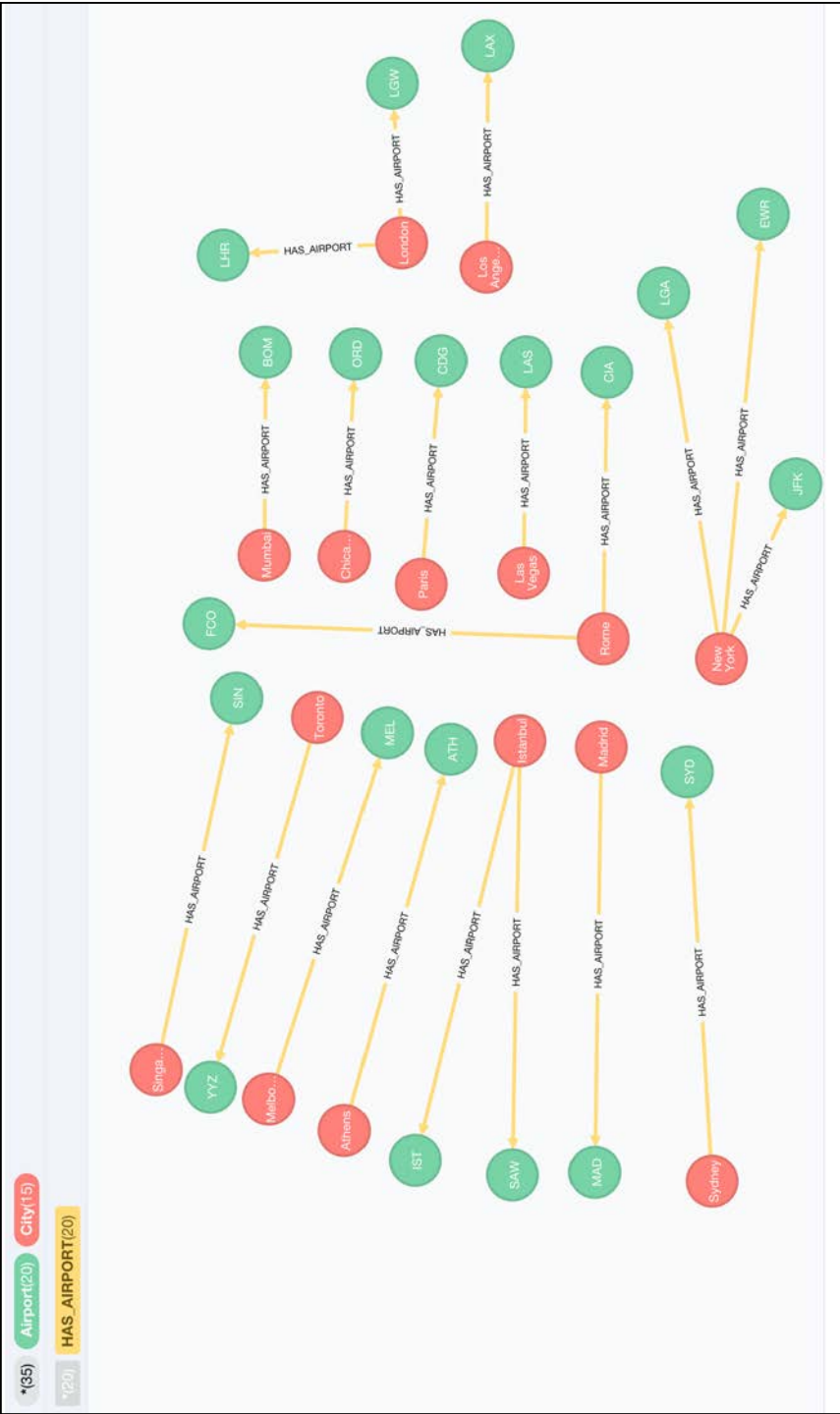
| booking_id | date_of_journey | from | by_flight | to |
|--------------------------------------|-----------------|-------------|-----------|-------------|
| f87a515e-7e2d-11e4-b170-14109fda6b71 | 1431196200 | Los Angeles | AA920 | New York |
| ccc84f47-7e28-11e4-90c4-14109fda6b71 | 1426617000 | New York | UA1507 | Los Angeles |
| b5489547-7e24-11e4-b327-14109fda6b71 | 1426357800 | Mumbai | UA49 | New York |
| fef04c30-7e2d-11e4-8842-14109fda6b71 | 1422642600 | New York | VS8 | London |
| 0f64711c-7e22-11e4-a1af-14109fda6b71 | 1422210600 | London | VS9 | New York |
| 0f64711c-7e22-11e4-a1af-14109fda6b71 | 1422210600 | New York | AA9 | Los Angeles |

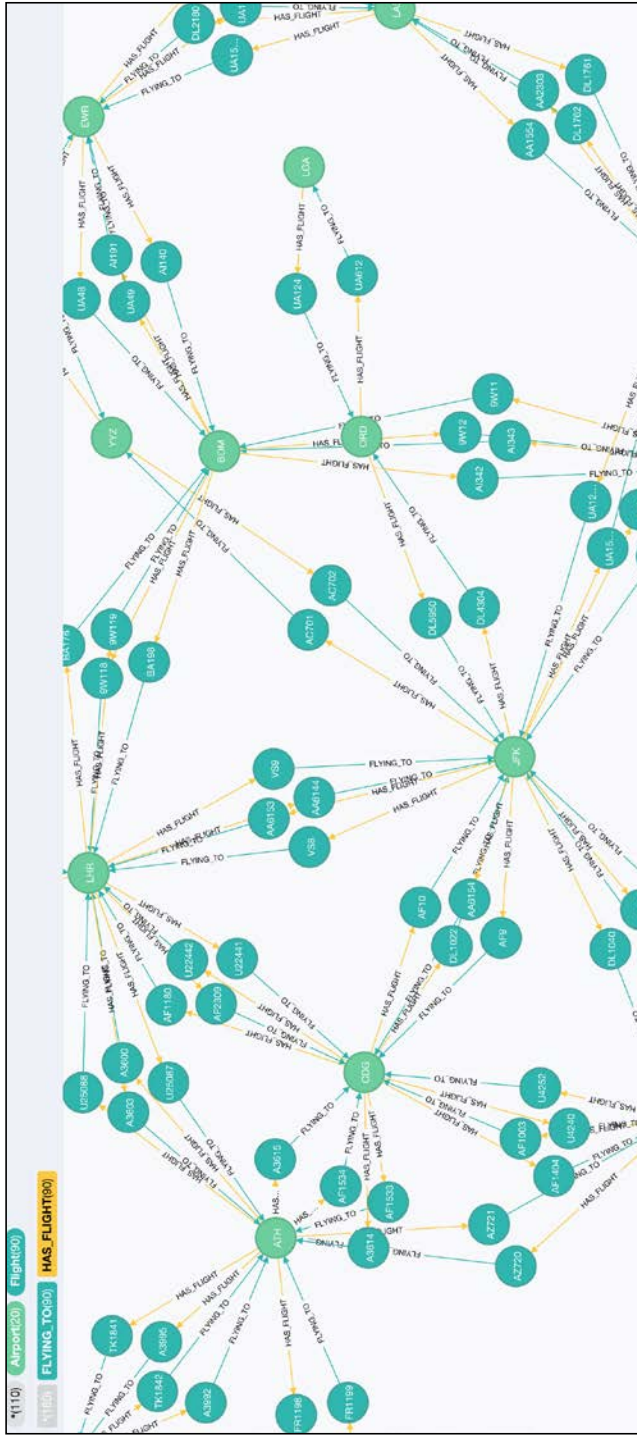
Chapter 5 - Refactoring the Data Model

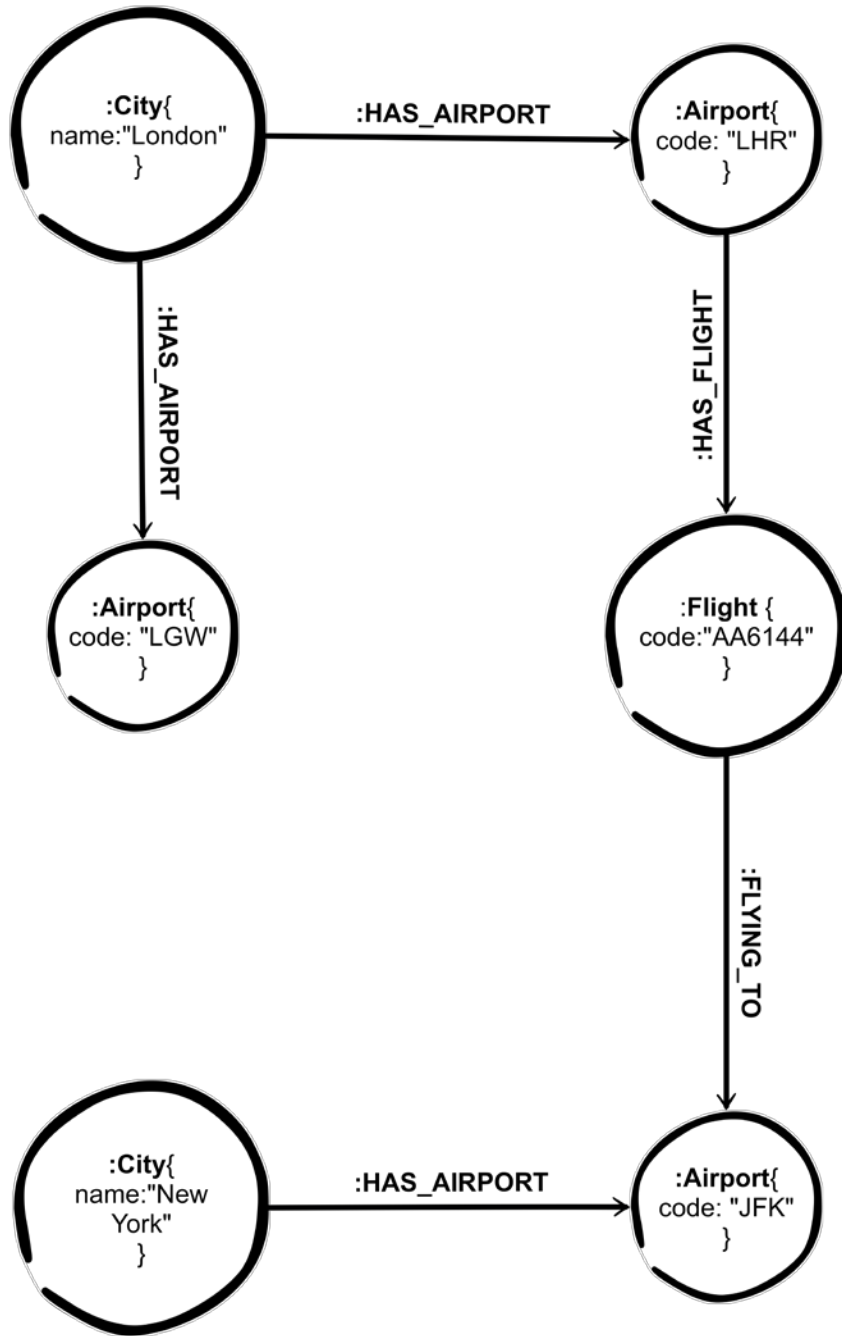




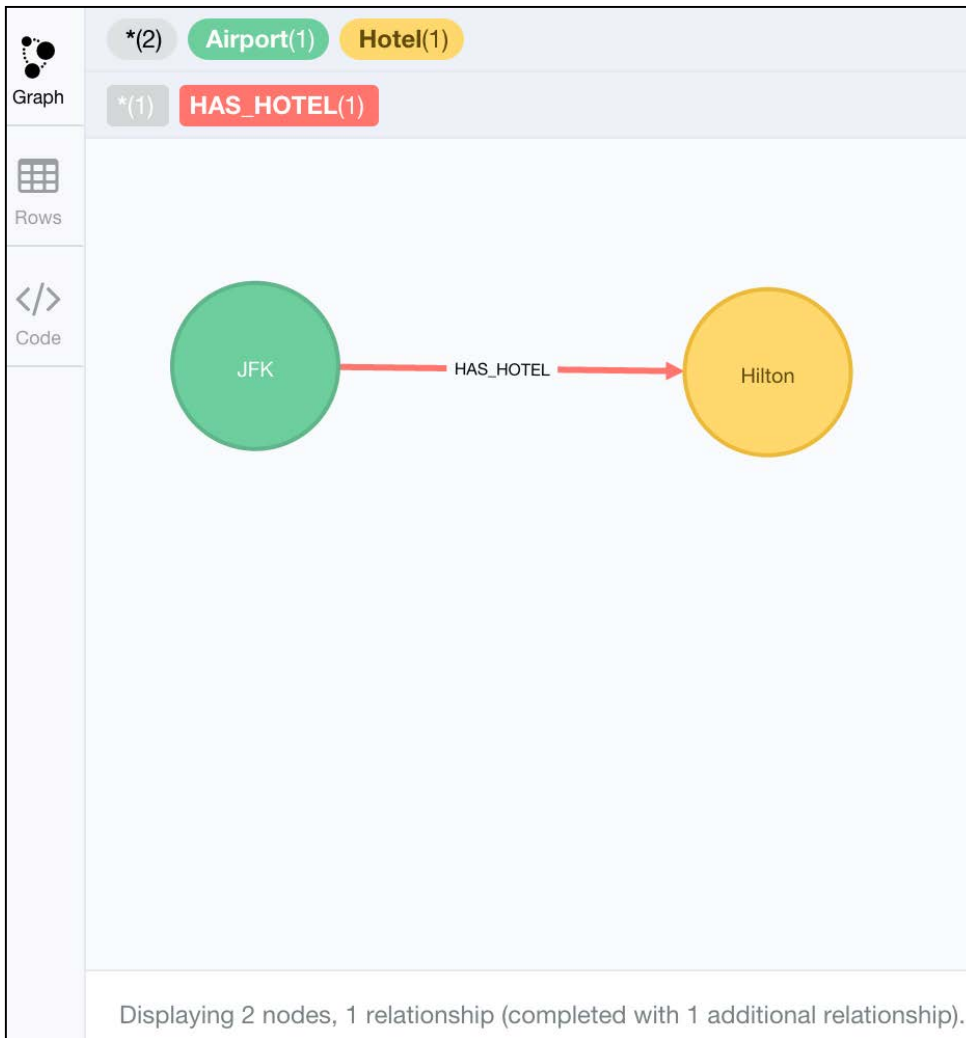








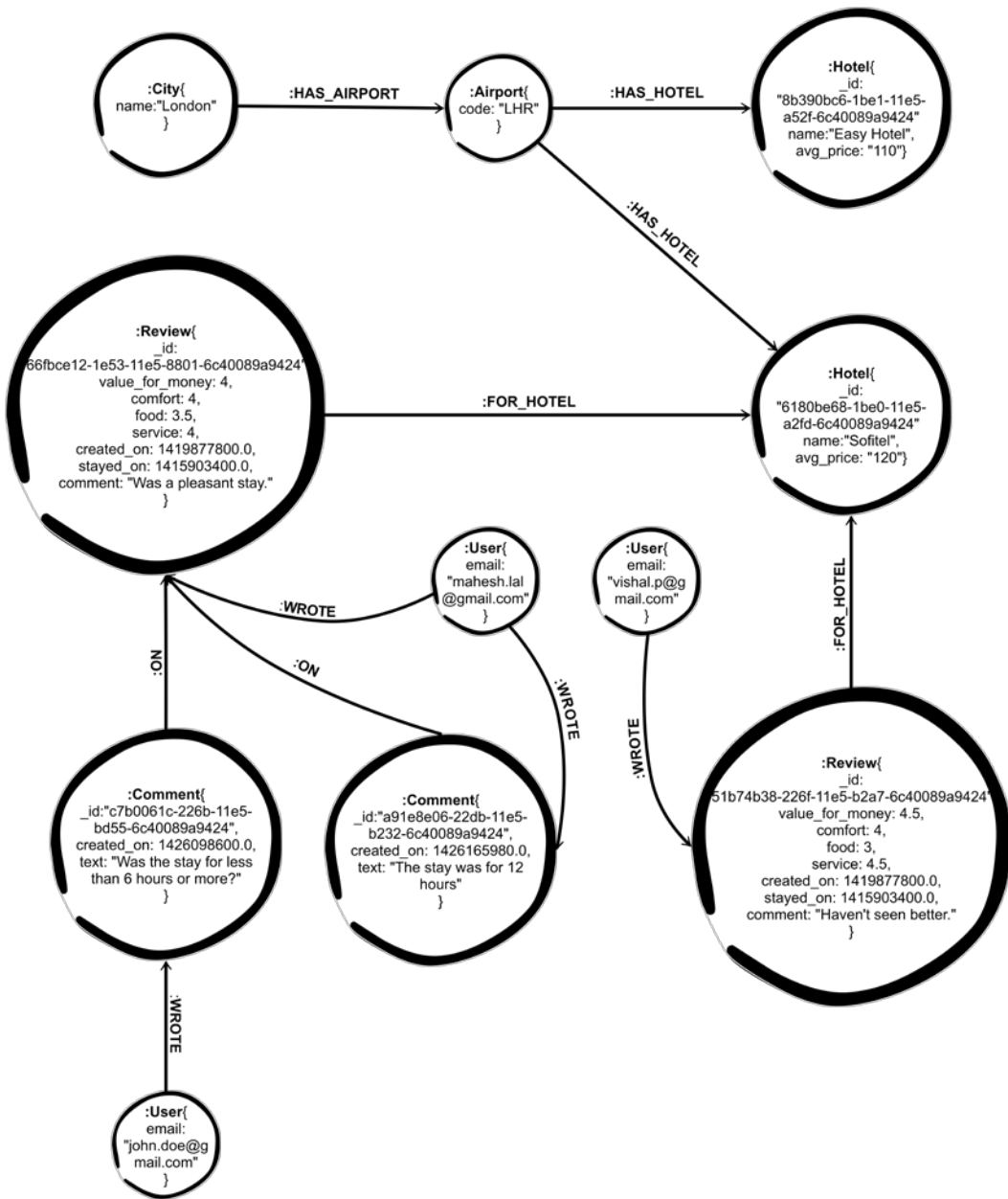
| city | code | carrier | departure | arrival | duration | airport |
|---------------------|--------------------------|-----------------------------------------------------------|--------------------|------------------|-----------------|----------------------|
| [London, Melbourne] | [AA6144, AA9, AA7356] | [American Airlines, American Airlines, American Airlines] | [1085, 1300, 1370] | [1255, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [VS9, AA9, AA7356] | [Virgin Atlantic, American Airlines, American Airlines] | [965, 1300, 1370] | [1130, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [AA6144, UA1507, AA7356] | [American Airlines, United, American Airlines] | [1085, 720, 1370] | [1255, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [VS9, UA1507, AA7356] | [Virgin Atlantic, United, American Airlines] | [965, 720, 1370] | [1130, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [AA6144, AA9, OF95] | [American Airlines, American Airlines, Quantas] | [1085, 1300, 1370] | [1255, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [VS9, AA9, OF95] | [Virgin Atlantic, American Airlines, Quantas] | [965, 1300, 1370] | [1130, 114, 515] | [535, 314, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [AA6144, UA1507, OF95] | [American Airlines, United, Quantas] | [1085, 720, 1370] | [1255, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [VS9, UA1507, OF95] | [Virgin Atlantic, United, Quantas] | [965, 720, 1370] | [1130, 900, 515] | [535, 300, 945] | [LHR, JFK, LAX, MEL] |
| [London, Melbourne] | [BA176, 9W12, JQ07] | [British Airways, Jet, Jetstar] | [625, 80, 1260] | [1430, 570, 405] | [535, 340, 405] | [LHR, BOM, SIN, MEL] |
| [London, Melbourne] | [9W119, 9W12, JQ07] | [Jet, Jet, Jetstar] | [1280, 80, 1260] | [660, 570, 405] | [550, 340, 405] | [LHR, BOM, SIN, MEL] |
| [London, Melbourne] | [BA176, AIS42, JQ07] | [British Airways, Air India, Jetstar] | [625, 1, 1260] | [1430, 465, 405] | [535, 315, 405] | [LHR, BOM, SIN, MEL] |
| [London, Melbourne] | [9W119, AIS42, JQ07] | [Jet, Air India, Jetstar] | [1280, 1, 1260] | [660, 465, 405] | [550, 315, 405] | [LHR, BOM, SIN, MEL] |

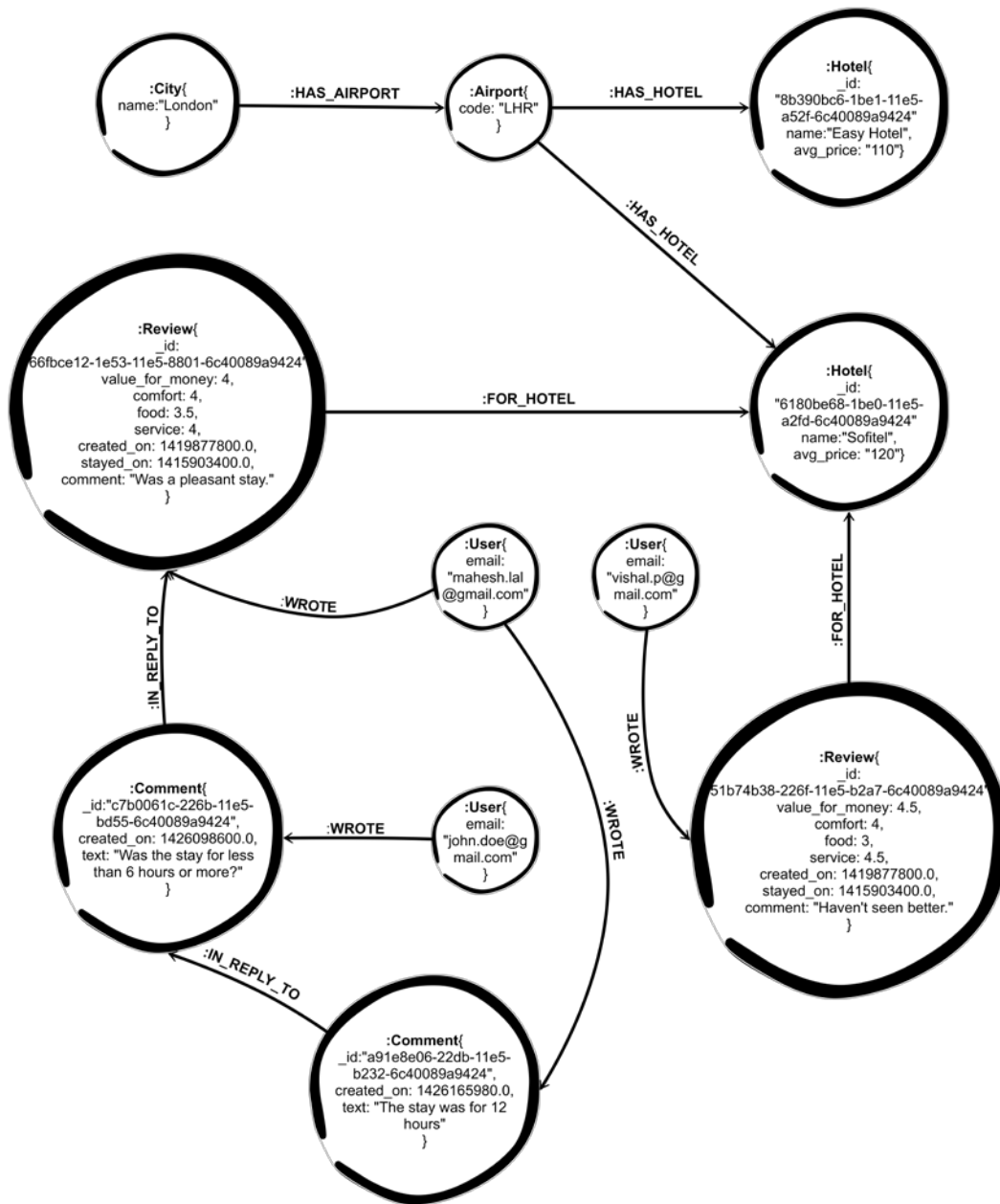


Chapter 6 - Modeling Communication Chains

```
:Review{  
  _id:  
  "66fbce12-1e53-11e5-8801-6c40089a9424",  
  value_for_money: 4,  
  comfort: 4,  
  food: 3.5,  
  service: 4,  
  created_on: 1419877800.0,  
  stayed_on: 1415903400.0  
  description: "Was a pleasant stay. Though  
  the food is average, the staff is courteous  
  and the rooms are comfortable",  
  stay_year: 2014,  
  stay_month: 11,  
  stay_day: 14  
}
```

```
:Comment{  
  _id: "c7b0061c-226b-11e5-  
  bd55-6c40089a9424",  
  created_on: 1426098600.0,  
  text: "Was the stay for less than  
  6 hours or more?"  
}
```





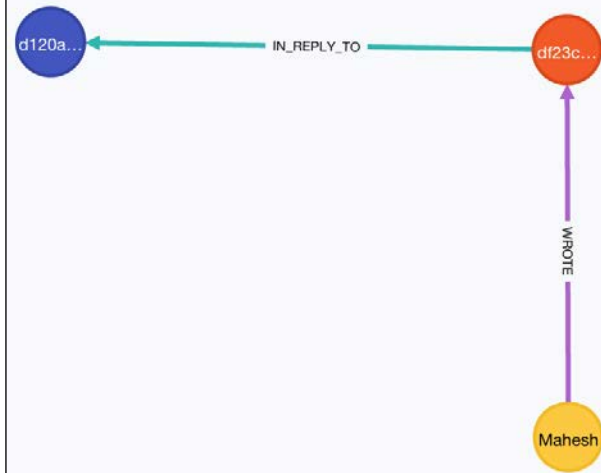
| value_for_money | comfort | food | service | year | month | day | name |
|-----------------|---------|------|---------|------|-------|-----|----------------|
| 1 | 2 | 2 | 2 | 2015 | 6 | 18 | Brian Heritage |
| 4 | 1 | 3 | 1 | 2014 | 12 | 20 | Amit Kumar |
| 3 | 1 | 3 | 3 | 2014 | 9 | 3 | John Doe |
| 3 | 4 | 2 | 4 | 2014 | 1 | 3 | Dave Coeburg |
| 2 | 3 | 4 | 3 | 2014 | 1 | 2 | Mathesh Lal |
| 2 | 4 | 1 | 4 | 2013 | 10 | 12 | Vishal P |

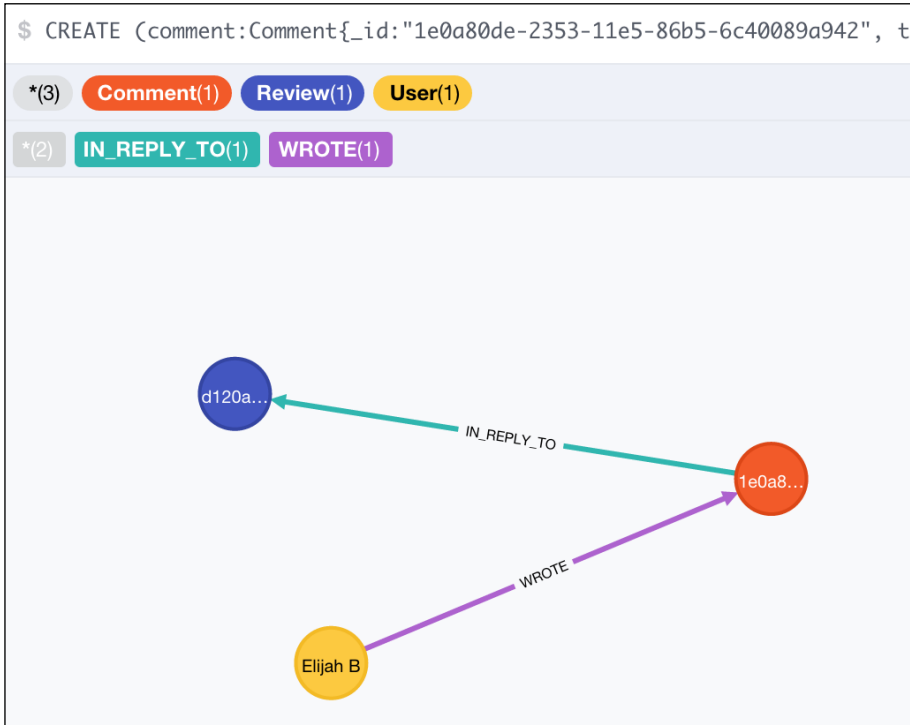
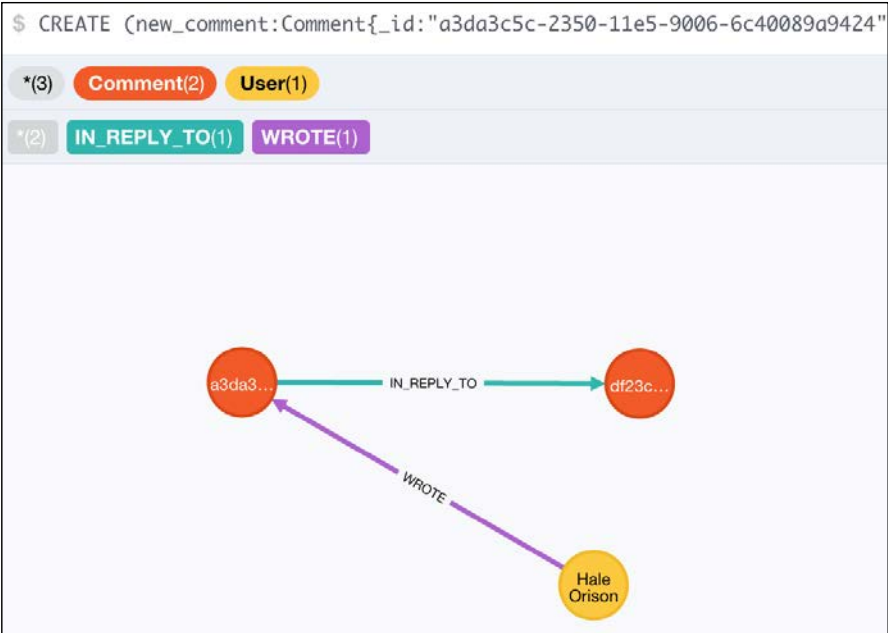
| airport | hotel_name | comfort_rating | service_rating | food_rating | vfm_rating | overall_rating |
|---------|-----------------|--------------------|----------------|--------------------|--------------------|--------------------|
| LGA | LaGuardia Plaza | 3 | 2.5 | 3.25 | 2.25 | 2.75 |
| JFK | Fairfield Inn | 2.6 | 2.8 | 2 | 3.4 | 2.7 |
| JFK | Hampton Inn | 2.3333333333333335 | 2 | 2.5555555555555554 | 2.5555555555555554 | 2.3611111111111111 |
| EWR | Wyndham | 2.25 | 2.75 | 2 | 1.75 | 2.1875 |

```
$ CREATE (comment:Comment[_id:"df23c188-2349-11e5-8966-6c40089a9424", text:"What
```

***(3)** **Comment(1)** **Review(1)** **User(1)**

***(2)** **IN_REPLY_TO(1)** **WROTE(1)**

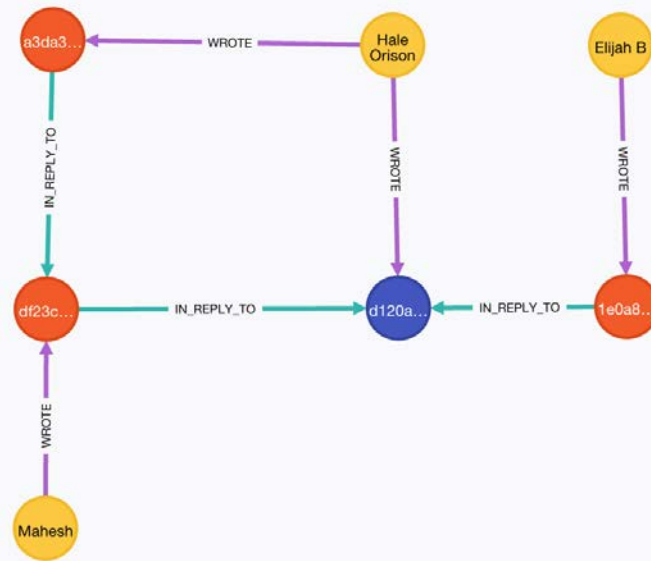




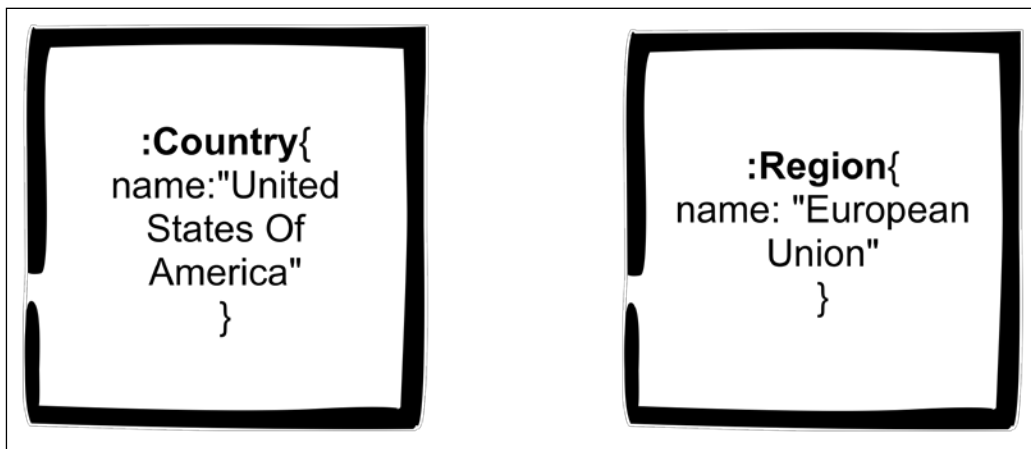
```
5 MATCH p = (review:Review{id:"d120a06e-2331-11e5-bf11-6c40089a9424"})<-[:IN_REPLY_TO]
```

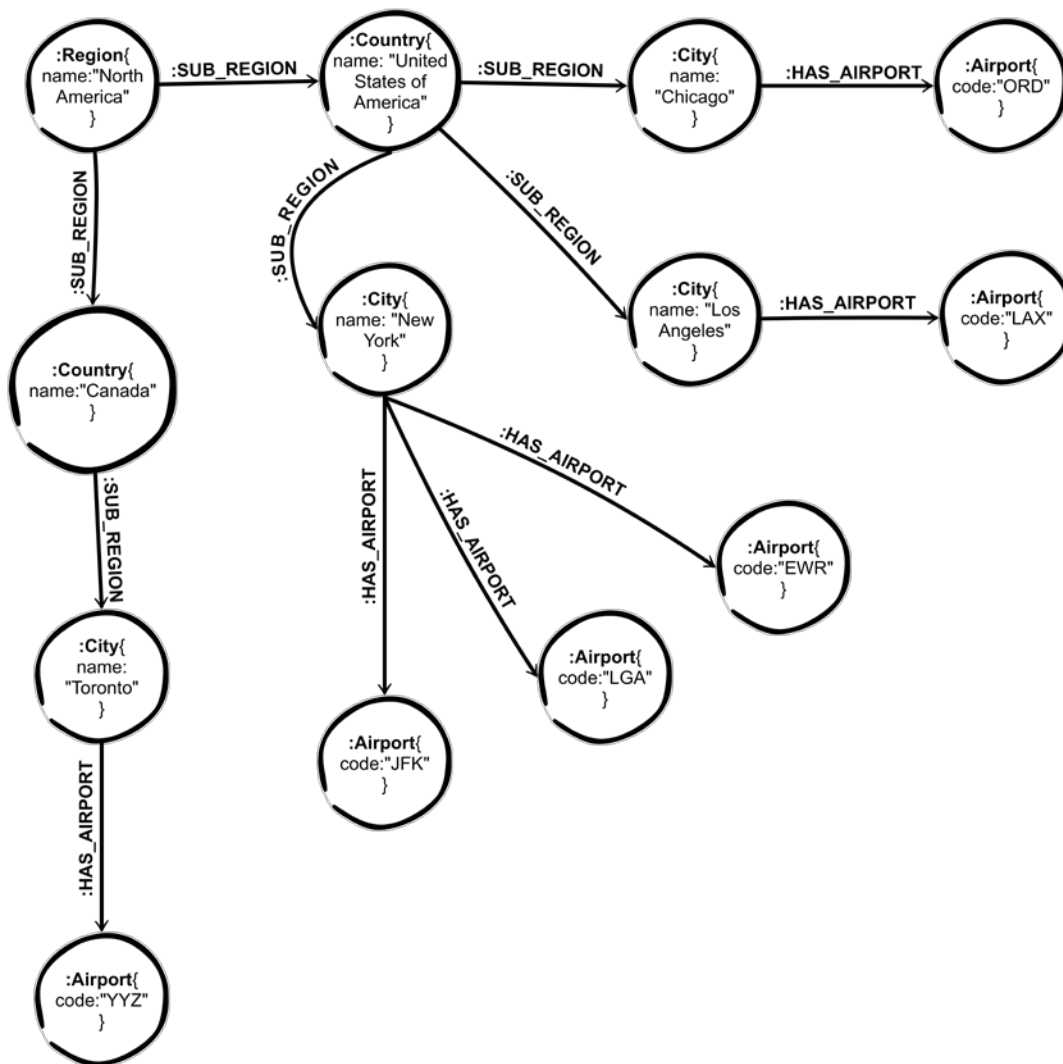
(7) **Comment(3)** **Review(1)** **User(3)**

(7) **IN_REPLY_TO(3)** **WROTE(4)**



Chapter 7 - Modeling Access Control

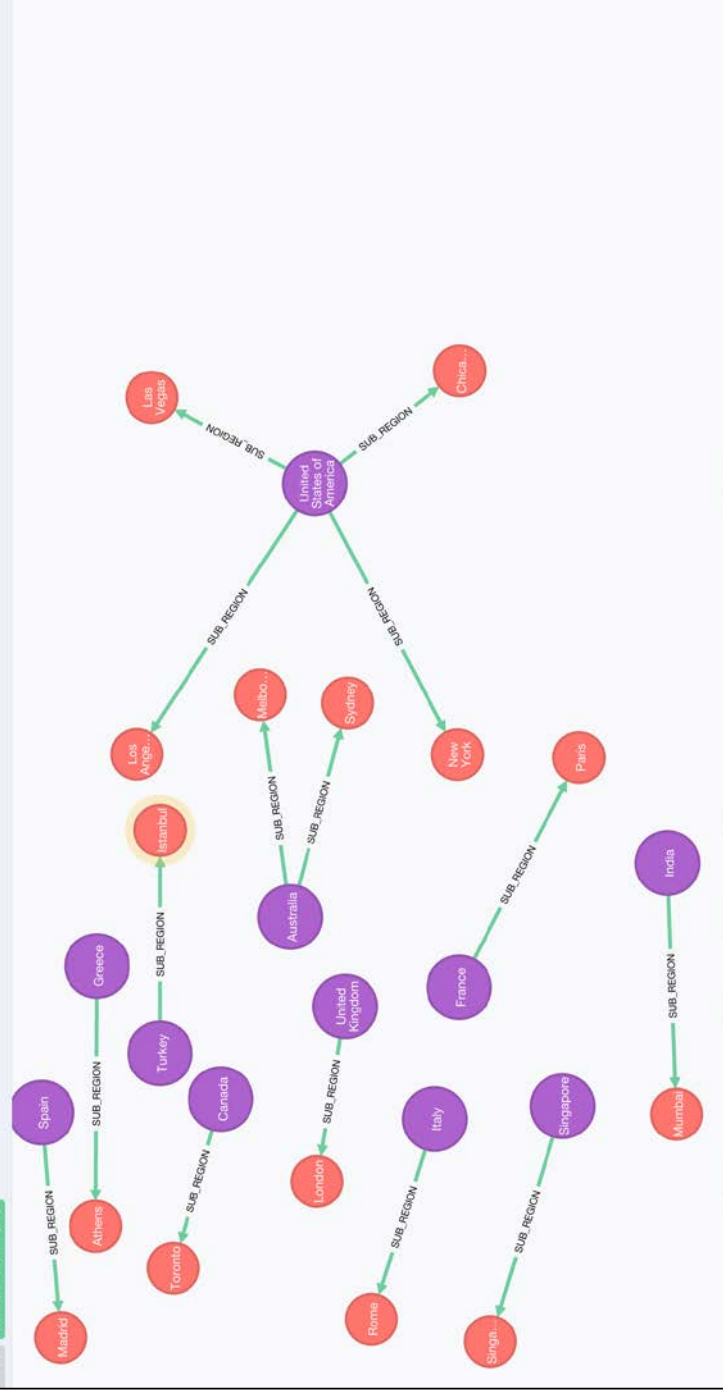




\$ MATCH (City:City) WITH city MERGE (Country:Country{name: city.country}) WITH country, city MERGE (Country)-[:SUB_REGION]->(City) RETURN city, country

*(26) City(15) Country(11)

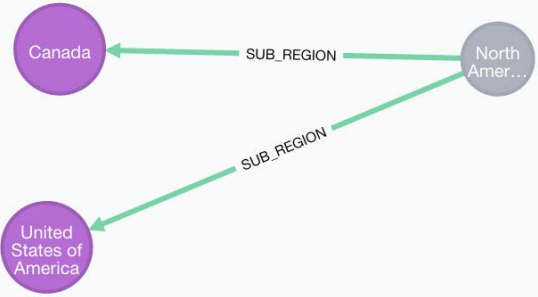
015 SUB_REGION(15)




```
$ CREATE (region:Region{name:"North America"}) WITH region
```

*** (3)** Country(2) Region(1)

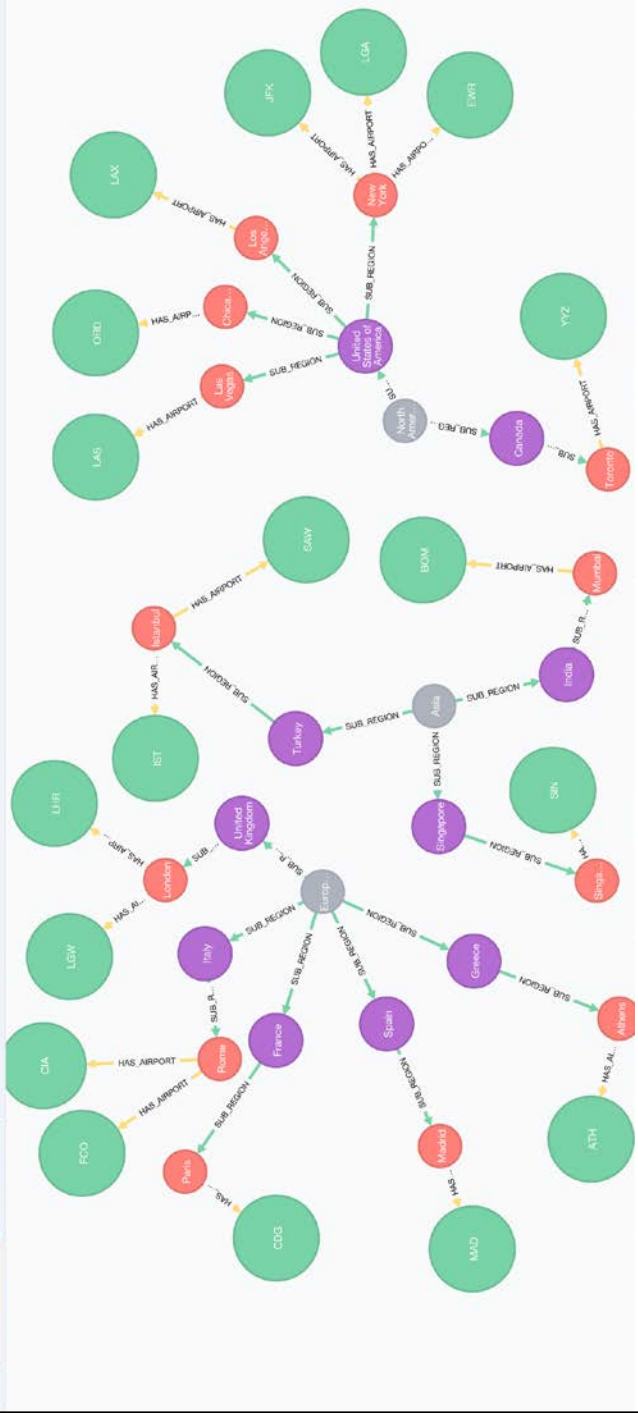
*** (2)** SUB_REGION(2)



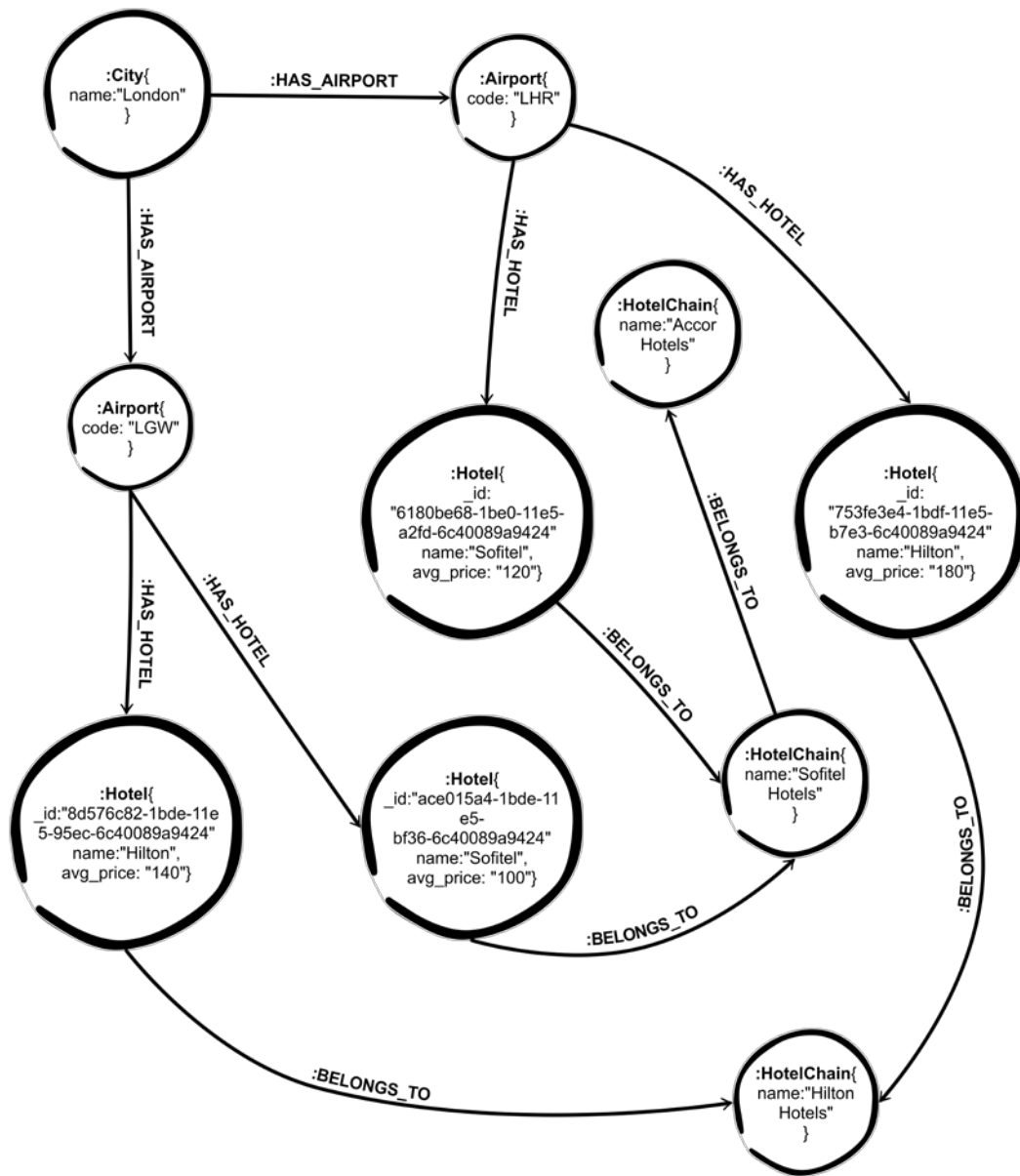
\$ MATCH path = (:region:Region)-[:SUB_REGION*1..*]->(:city:City)-[:HAS_AIRPORT]->(:airport:Airport)-RETURN path

*(60) Airport(20) City(15) Country(11) Region(4)

*(16) HAS_AIRPORT(20) SUB_REGION(20)



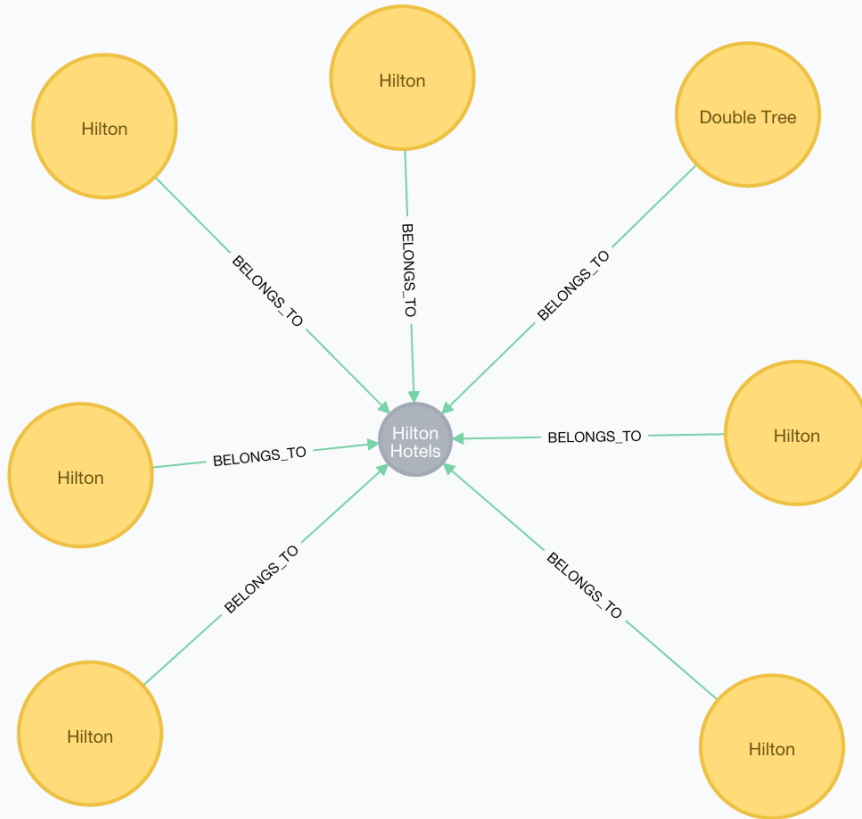
```
:HotelChain{  
name: "Hilton"  
}
```



```
$ CREATE (chain:HotelChain{name:"Hilton Hotels"}) WITH chain MATCH (hotel:Hot
```

*(8) **Hotel(7)** HotelChain(1)

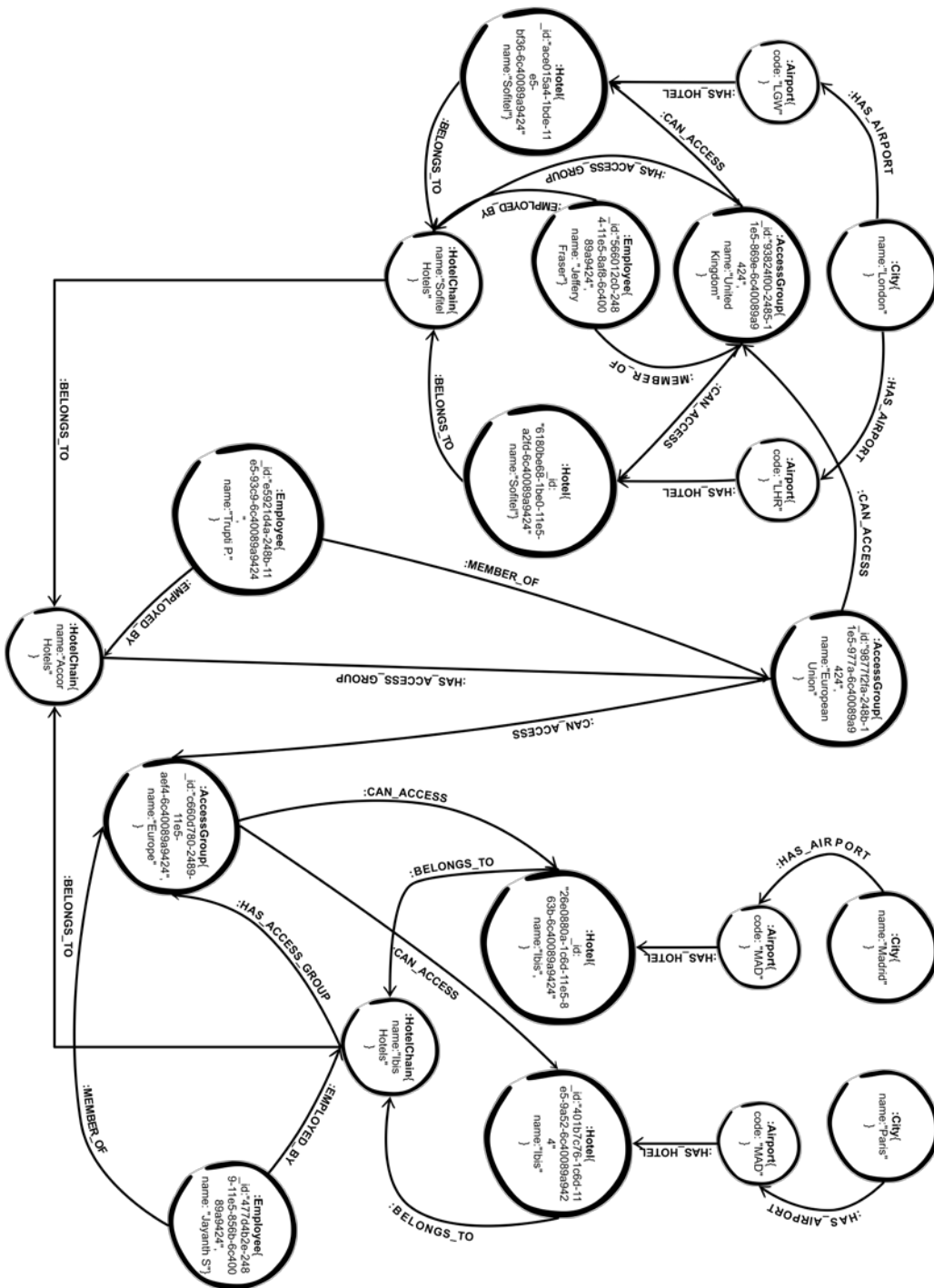
*(7) **BELONGS_TO(7)**

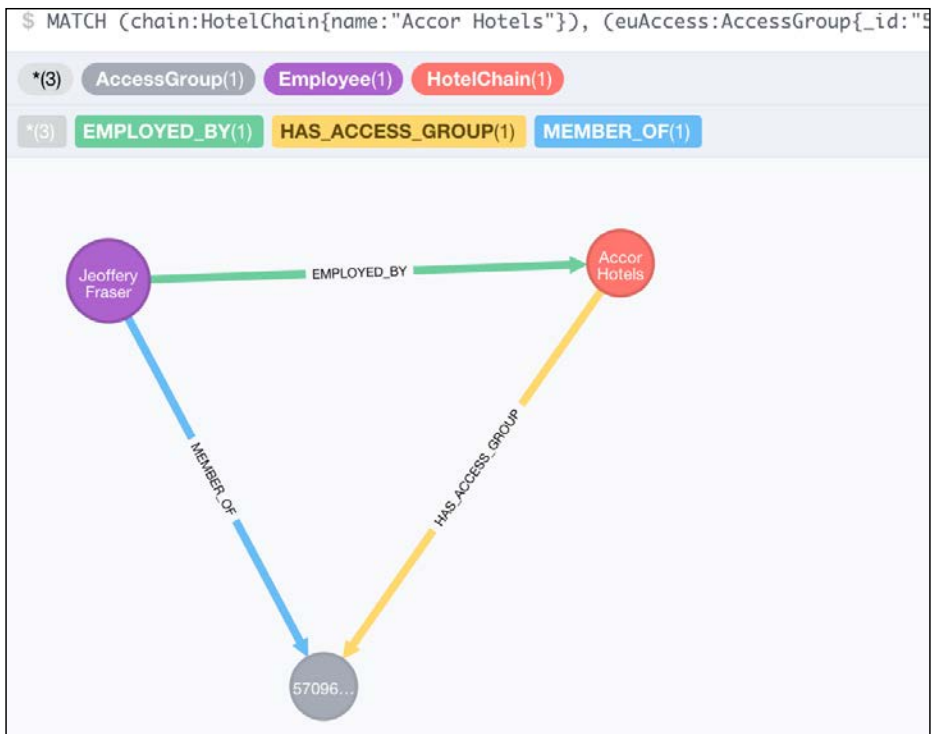


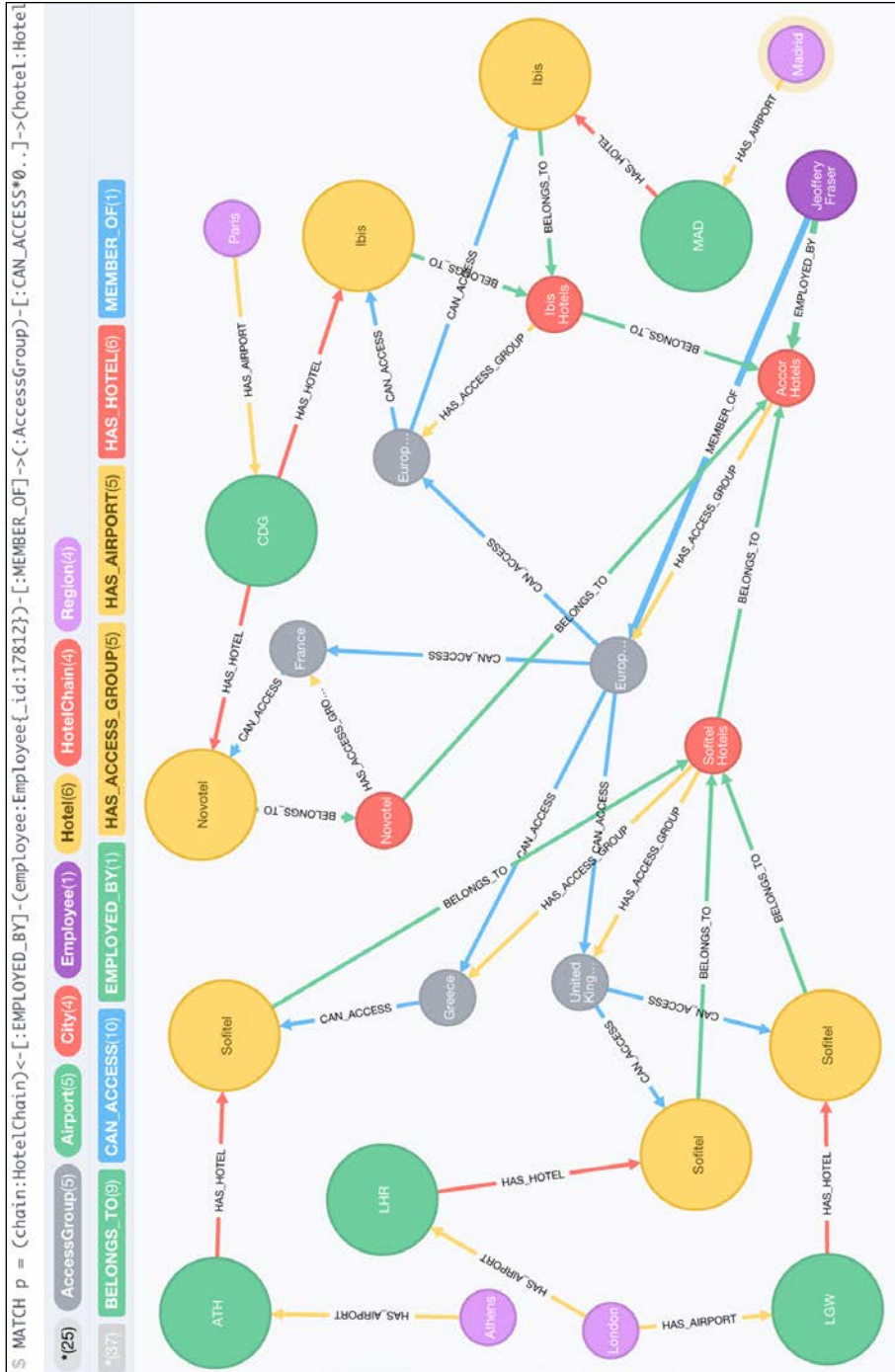
| region | country | city | airport | hotel | chain | parentChain |
|------------------|----------------------------|---------------|---------|------------------------|-------------------------|--------------|
| [North America] | [Canada] | [Toronto] | [YYZ] | [Four Points] | Sheraton Group | null |
| [North America] | [Canada] | [Toronto] | [YYZ] | [ALT Sheraton] | Sheraton Group | null |
| [North America] | [United States of America] | [New York] | [EWR] | [Wyndham] | Wyndham | null |
| [North America] | [United States of America] | [New York] | [LGA] | [LaGuardia Plaza] | Plaza Group | null |
| [North America] | [United States of America] | [New York] | [JFK] | [Hampton Inn] | Airport Inn Hospitality | null |
| [North America] | [United States of America] | [New York] | [JFK] | [Fairfield Inn] | Airport Inn Hospitality | null |
| [North America] | [United States of America] | [Los Angeles] | [LAX] | [LAX South Travelodge] | Travelodges | null |
| [North America] | [United States of America] | [Los Angeles] | [LAX] | [Sheraton] | Sheraton Group | null |
| [North America] | [United States of America] | [Los Angeles] | [LAX] | [Concourse] | Ambassador Suites | null |
| [North America] | [United States of America] | [Chicago] | [ORD] | [Embassy Suites] | Ambassador Suites | null |
| [North America] | [United States of America] | [Chicago] | [ORD] | [Hilton] | Hilton Hotels | null |
| [North America] | [United States of America] | [Chicago] | [ORD] | [Double Tree] | Hilton Hotels | null |
| [North America] | [United States of America] | [Las Vegas] | [LAS] | [Travelodge] | Travelodges | null |
| [North America] | [United States of America] | [Las Vegas] | [LAS] | [Hyatt] | Hyatt Group | null |
| [Asia] | [India] | [Mumbai] | [BOM] | [J W Marriot Sahar] | Marriot Group | null |
| [Asia] | [India] | [Mumbai] | [BOM] | [Hilton] | Hilton Hotels | null |
| [Asia] | [India] | [Mumbai] | [BOM] | [Ibis] | Ibis Hotels | Accor Hotels |
| [Asia] | [Singapore] | [Singapore] | [SIN] | [Ambassador] | Ambassador Suites | null |
| [Asia] | [Turkey] | [Istanbul] | [SAW] | [ISG] | ISG | null |
| [Asia] | [Turkey] | [Istanbul] | [IST] | [Radisson] | Radisson Group | null |
| [Asia] | [Turkey] | [Istanbul] | [IST] | [WOW] | Airavat Group | null |
| [European Union] | [United Kingdom] | [London] | [LHR] | [Yotel] | United Hotels | null |
| [European Union] | [United Kingdom] | [London] | [LHR] | [Sofitel] | Sofitel Hotels | Accor Hotels |

```
:AccessGroup{  
  _id:"20bed0da-2474-11e5-877f-6c  
    40089a9424"  
  name:"Asia"  
}
```

```
:Employee{  
  _id:"7fe66a6e-2474-11e5-9e83-6c  
    40089a9424"  
  name:"Jayanth S"  
}
```

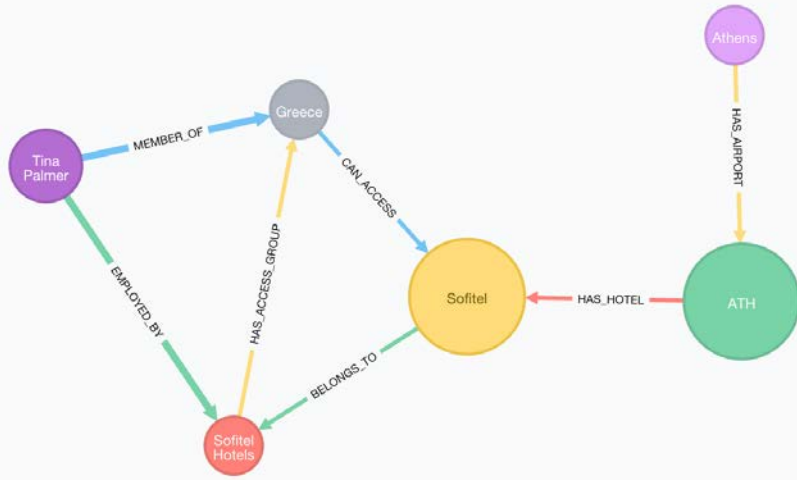






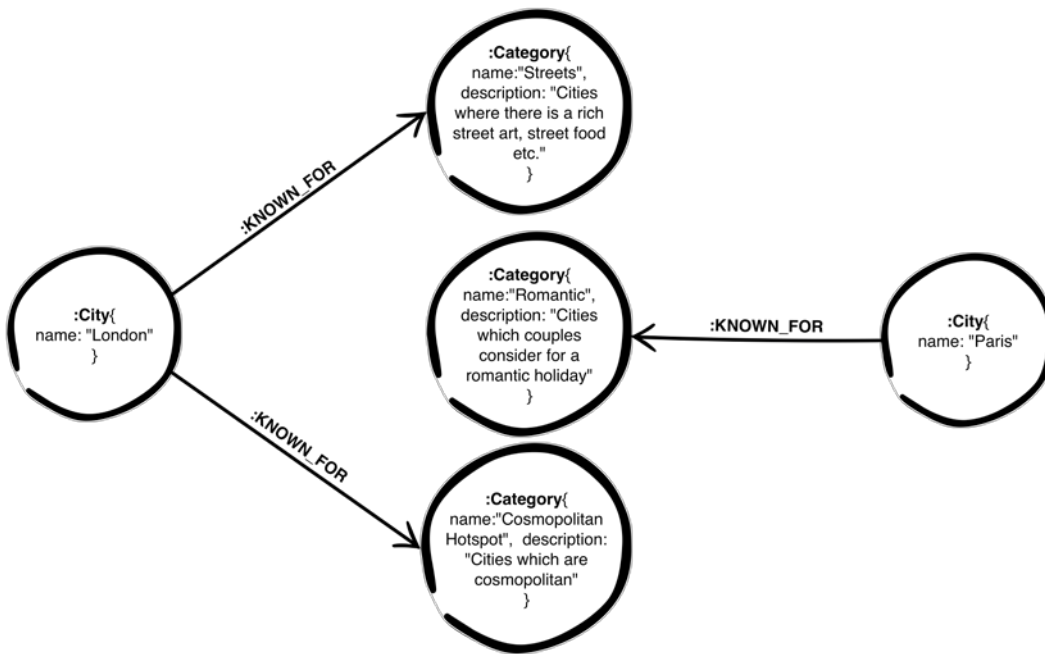
\$ MATCH p = (chain:HotelChain)-[:EMPLOYED_BY]-(employee:Employee{id:78641})-[:MEMBER_OF]->(:Ac

* (6) AccessGroup(1) Airport(1) City(1) Employee(1) Hotel(1) HotelChain(1) Region(1)
*(7) BELONGS_TO(1) CAN_ACCESS(1) EMPLOYED_BY(1) HAS_ACCESS_GROUP(1) HAS_AIRPORT(1) HAS_H



Chapter 8 - Recommendations and Analysis of Historical Data

```
:Category{  
  category_name: "Historical Importance",  
  description: "Cities with historical importance"  
}
```



```
$ CREATE (c:Category{name:"Streets"},
```



Graph

*(1)

Category(1)



Rows



Code

| other_city.name | COLLECT(category.name) | relevance |
|-----------------|--------------------------------------------|-----------|
| Madrid | [Business, Streets, Historical Importance] | 3 |
| Paris | [Business, Historical Importance] | 2 |
| Istanbul | [Streets, Historical Importance] | 2 |
| Melbourne | [Business, Streets] | 2 |
| Sydney | [Business, Streets] | 2 |
| Athens | [Business, Historical Importance] | 2 |
| Singapore | [Business, Cosmopolitan Hotspot] | 2 |
| Toronto | [Business] | 1 |
| Las Vegas | [Streets] | 1 |
| Chicago | [Business] | 1 |
| Rome | [Historical Importance] | 1 |

| Hotel | Similar_travellers | number_of_similar_travellers_who_stayed_here |
|----------|---------------------------------------------------------|----------------------------------------------|
| Radisson | [Abet Ali, Shambhu Dayal, Sadique T, Dominique Shepard] | 4 |
| WOW | [Shambhu Dayal] | 1 |

| Hotel | Similar_travellers | avg_rating_by_similar_travellers |
|----------|---------------------------------------------------------|----------------------------------|
| WOW | [Shambhu Dayal] | 6 |
| Radisson | [Abet Ali, Shambhu Dayal, Sadique T, Dominique Shepard] | 5.875 |

| hotel.name | hotel.price |
|-------------------|--------------------|
| Embassy Suites | 130 |
| Double Tree | 150 |