

# F20BD Report

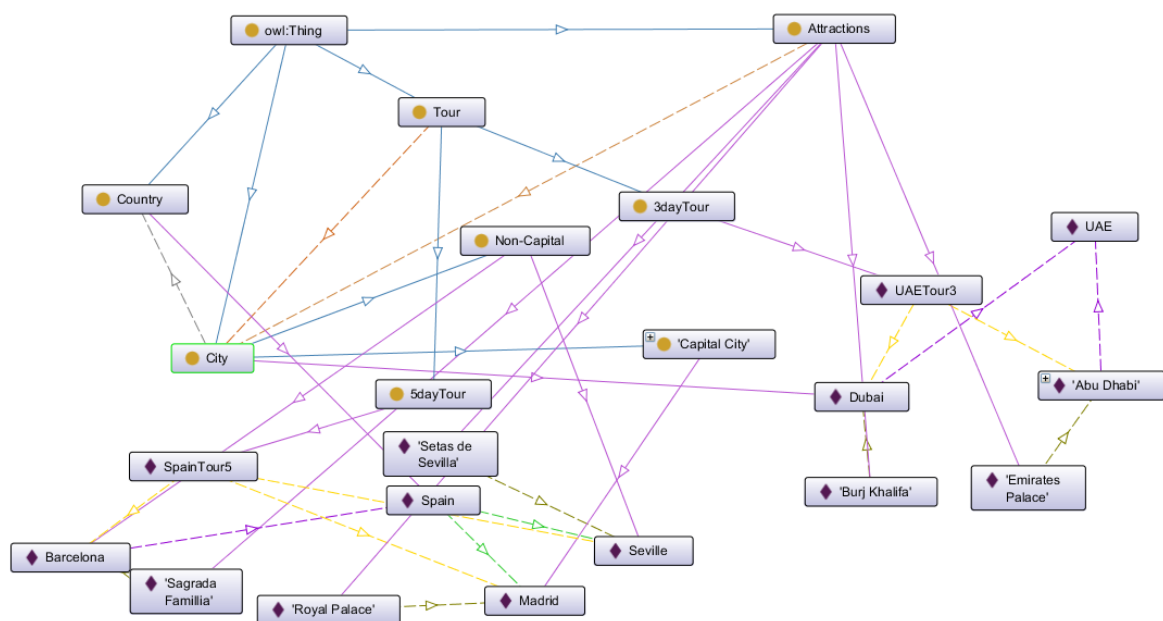
## Group 12: Anas Patel, Zaid Parkar, Harshal Thachhapully, Hitesh Manani

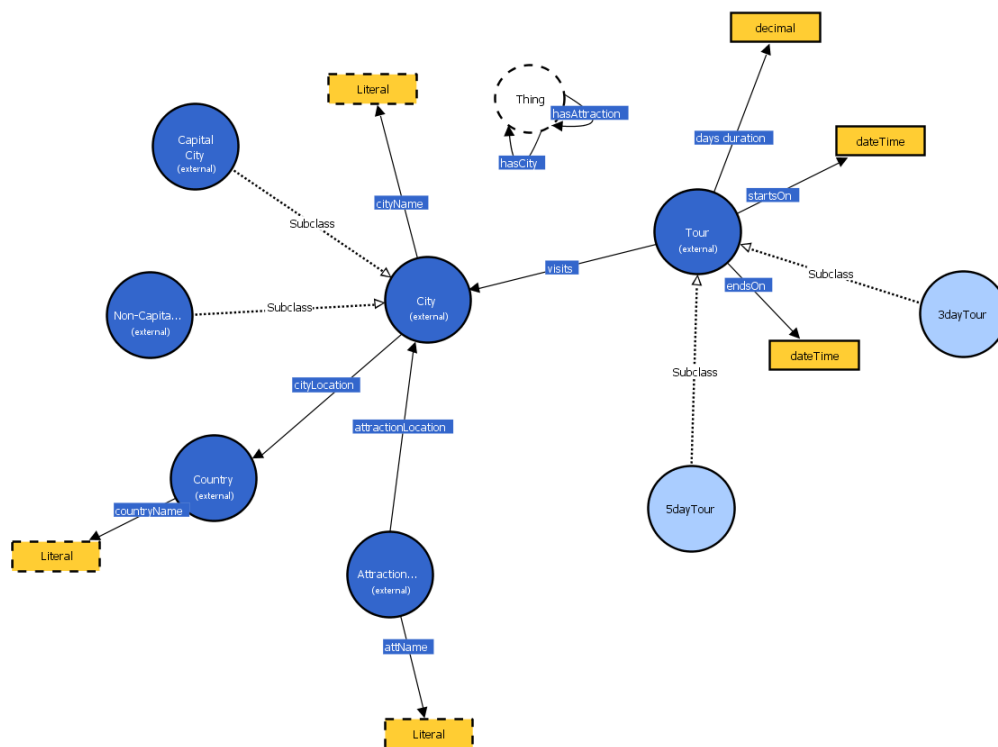
### For Task 1:

Contributions:

#### **Anas Patel:**

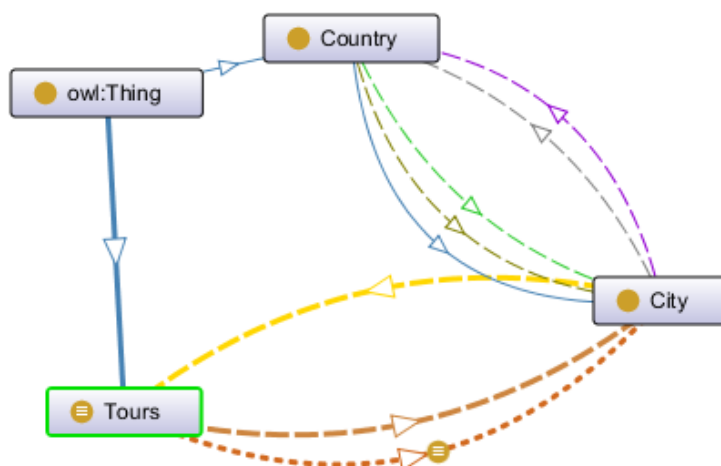
- Individual Ontology
  - o Created 4 main classes for the attraction, city, country, and tour. Created subclasses city, capital city and a normal city and made two different subclasses representing different types of tours under the tour class.
  - o Created several individuals which represented the tour for each country, the attractions as well as the cities
  - o Created object properties to delineate the connections between the several individuals created
  - o Created several data properties to specify the type of data being used and to give values to the data

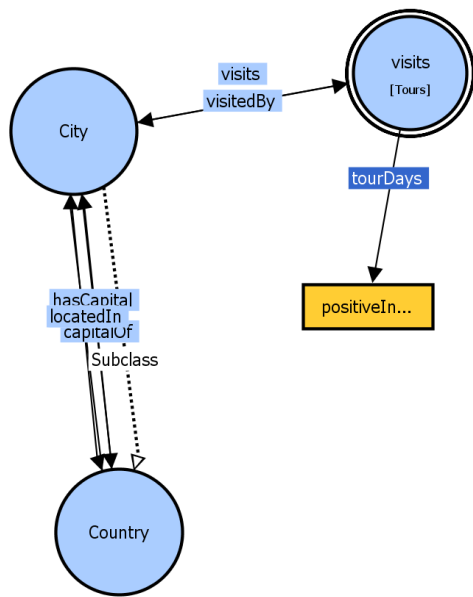




**Zaid Parkar:**

- Individual Ontology
  - o Created two principal classes, country, and tours, and created a subclass within country for the class called city
  - o Had several object properties which define the relationships between each individual
  - o Added a data property to signify the amount of the days that the tour occurs for

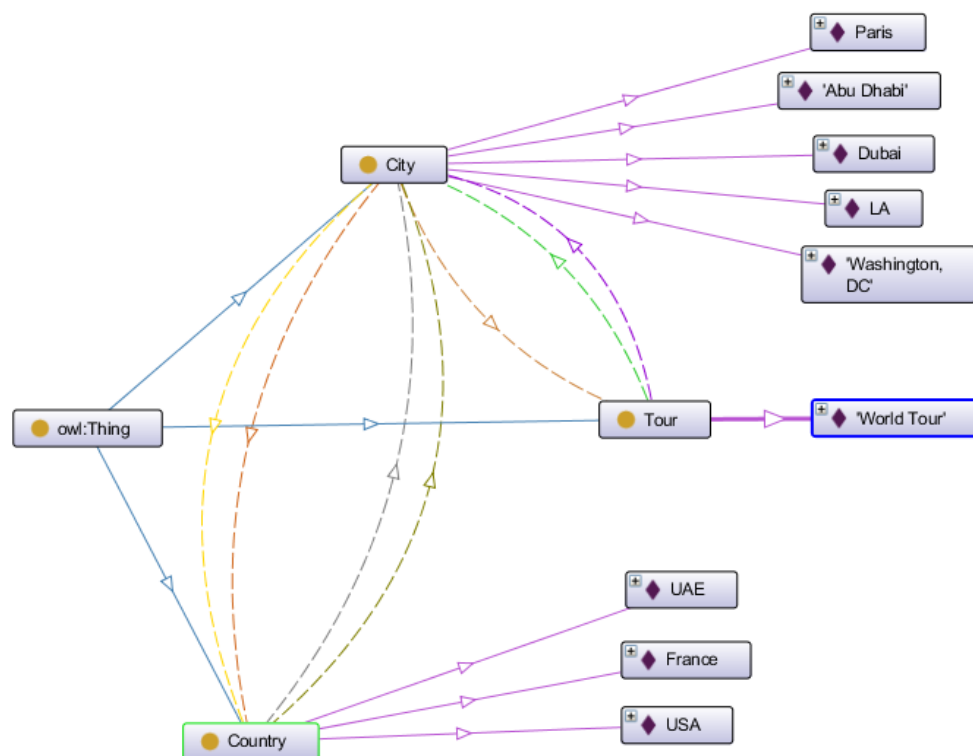


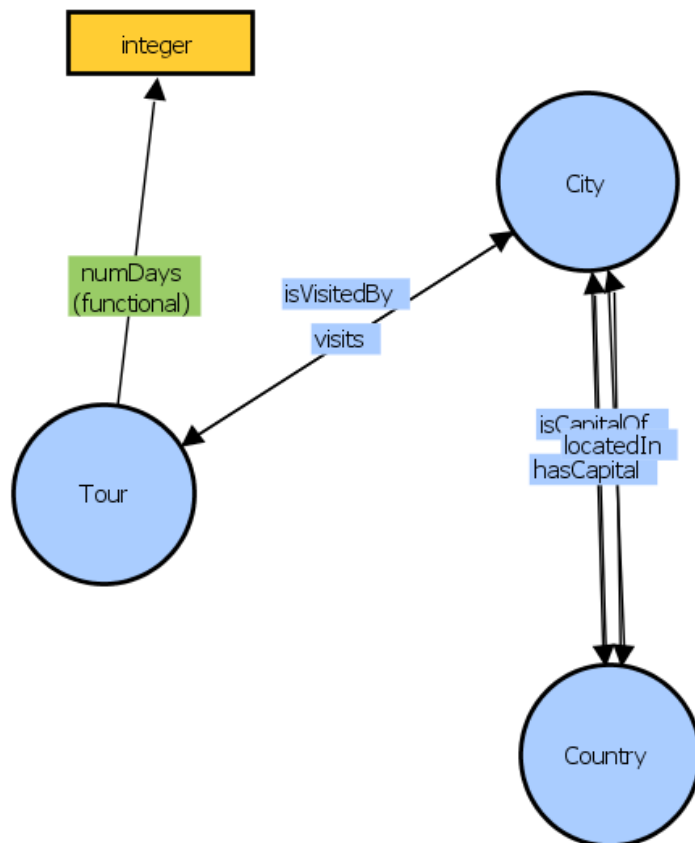


**Hitesh Manani:**

- Individual Ontology
  - o Created three separate equivalent classes called city, country, and tour
  - o Defined 6 different object properties to link each of the individuals in respect to the class they fall in and the relationship between the individuals
  - o Created 15 different individuals representing the cities, the countries, and tours

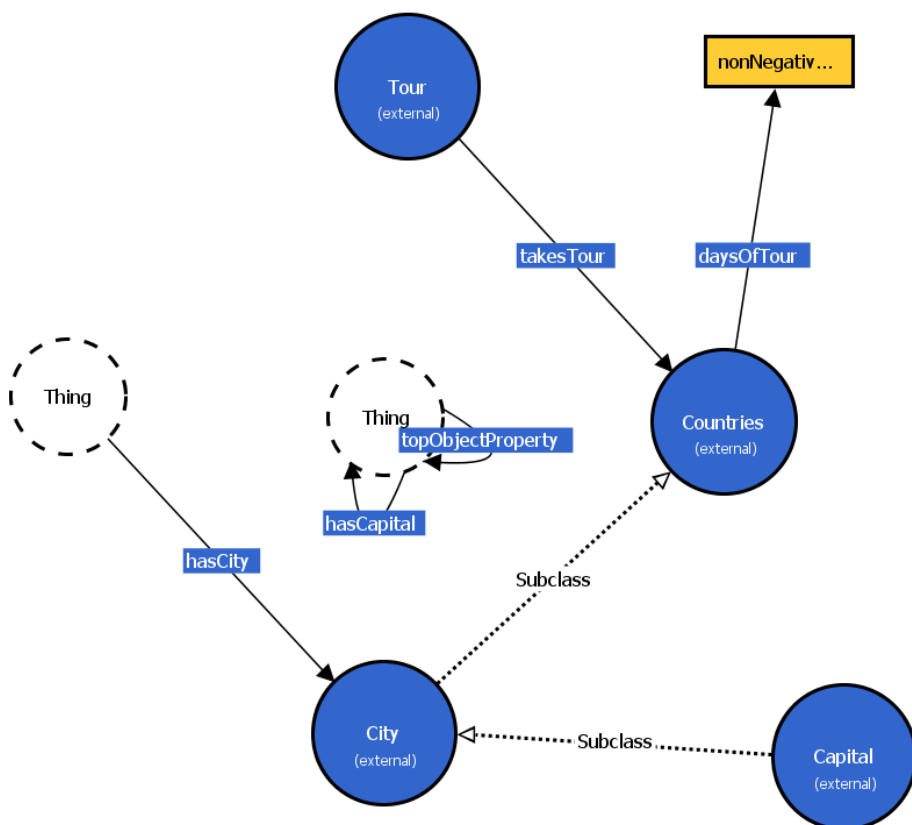
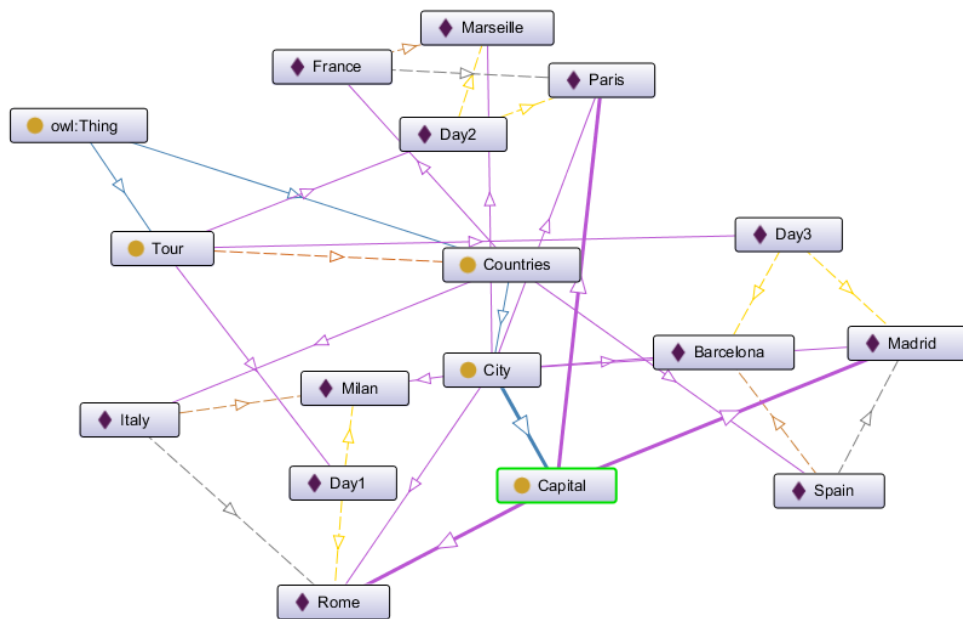
o





### Harshal Thachapully:

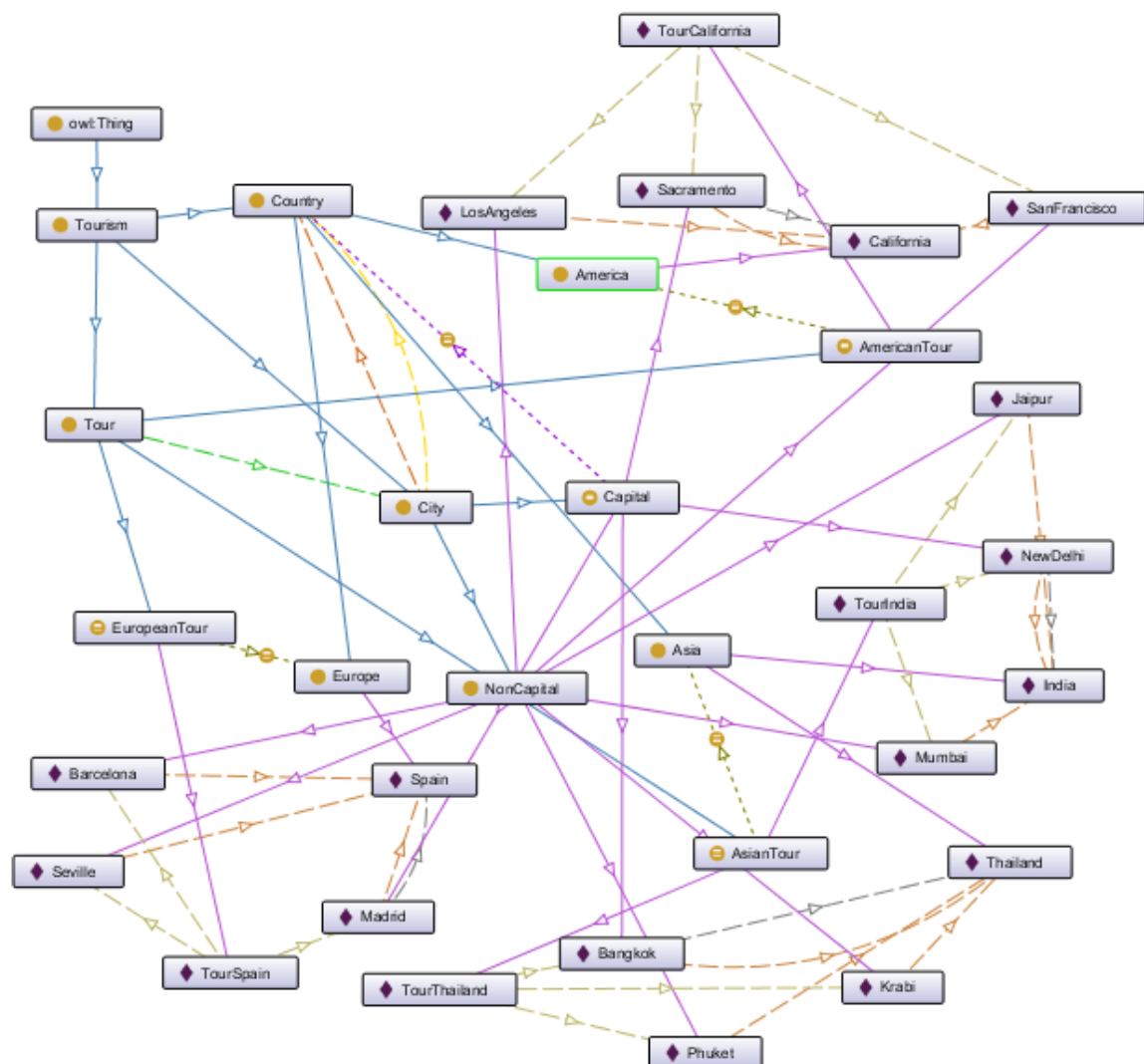
- Individual Ontology
  - Created a country which had a subclass of city, and city had a subclass of capital
  - Created another class for tours
  - Created several individuals including the cities (included the wiki data link in the IRI), countries (included the wiki data link as well) as well as each of the days of the tour
  - Several object properties that outline the relationship between the individuals in accordance with their classes
  - One data property that delineates the number of days the trip last

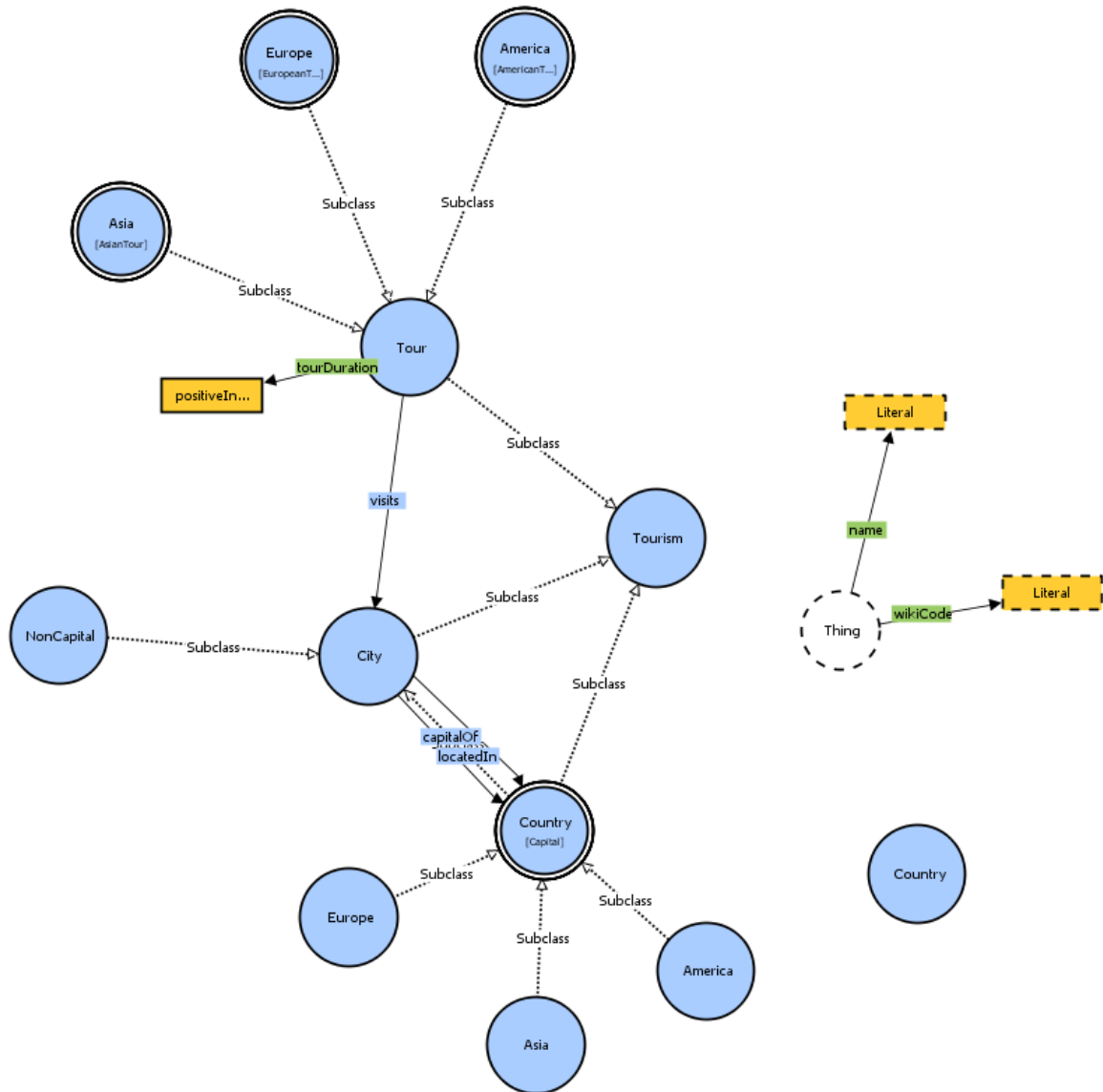


All group members:

### Discussion to reach final ontology design

After reviewing every individual ontology, we concluded that we all had certain features that we liked and could implement within the final ontology as well as certain ideas and features that we collectively thought upon adding or improving upon. The class layout from the ontology provided by Anas was optimal in our case, thus we decided separating the country, city and tour would be beneficial in querying and creating a sense of separation even though later along with object properties we can create a relationship between them. A lot of group members made object properties where they would say isCapitalOf and hasCapital, which in one sense meant the same thing, thus, to make it more efficient we decided to make the 3 main object properties pertaining to the capital, location, and visits (for the tours). We decided to add 3 data properties as well which identified the duration of the tour, the name, and the wiki code as well, so it is easily identifiable. We also decided to add in three cities for each country, and thus consequently have a more coherent system where there is a tour which was represented by each group member. Each tour, being the European, American or the Asian tour had different touring options for WattTours.





## Requirements being made

The above made ontology meets the requirements of the WattTours as it covers 2 to 3 cities per tour for a set number of days which also includes information about it as well from wikidata. The name of the city is present along with the country in which the city in question can be found, moreover an external knowledge graph is included as a link which can be accessed through the wikidata links which are associated with each city and country.

## Task 2

**Note:** The below queries are pasted as text with a black background and not as an image.

#Query1 : Provide the name for the cities in your ontology in two non-English languages. We are using Arabic and Russian.

```
PREFIX cw1: <http://www.semanticweb.org/wattTours/>
```

```
PREFIX wdt: <http://www.wikidata.org/prop/direct/>
```

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
```

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

```
SELECT DISTINCT ?name ?Arabic ?Russian WHERE {  
    ?c rdf:type/rdfs:subClassOf* cw1:City.  
    ?c cw1:name ?name.  
    ?c cw1:wikiCode ?code.  
    ?c cw1:locatedIn ?country.  
    ?cou cw1:wikiCode ?countryCode.  
    ?cou rdf:type/rdfs:subClassOf* cw1:Country.  
    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?code)) as  
?cityIRI).  
    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?countryCode)) as  
?countryIRI).  
    SERVICE <http://query.wikidata.org/sparql>  
    {  
        ?cityIRI wdt:P17 ?countryIRI.  
        ?cityIRI rdfs:label ?Arabic FILTER (lang(?Arabic) = "ar") .  
        ?cityIRI rdfs:label ?Russian FILTER (lang(?Russian) = "ru")  
    }  
}
```



#Query 2 : Populate an information box for your cities containing the data asked in the description.

PREFIX **cw1**: <http://www.semanticweb.org/wattTours/>

PREFIX **wdt**: <http://www.wikidata.org/prop/direct/>

PREFIX **rdf**: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX **rdfs**: <http://www.w3.org/2000/01/rdf-schema#>

```
SELECT DISTINCT ?name ?area ?pop ?timeZone ?website (COUNT(DISTINCT
?twinLabel) as ?twinCities) WHERE {

    ?c rdf:type/rdfs:subClassOf* cw1:City.

    ?c cw1:name ?name.

    ?c cw1:wikiCode ?code.

    ?c cw1:locatedIn ?country.

    ?cou cw1:wikiCode ?countryCode.

    ?cou rdf:type/rdfs:subClassOf* cw1:Country.

    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?code)) as
?cityIRI).

    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?countryCode)) as
?countryIRI).

    SERVICE <http://query.wikidata.org/sparql>

    {

        ?cityIRI wdt:P2046 ?area;

            wdt:P1082 ?pop;

            wdt:P421 ?time;

            wdt:P856 ?website;

            wdt:P190 ?twin.

        ?time rdfs:label ?timeZone FILTER (lang(?timeZone) = "en").
```

```
    ?twin rdfs:label ?twinLabel FILTER (lang(?twinLabel) ="en").  
  }  
}
```

```
GROUP BY ?name ?area ?pop ?timeZone ?website
```

```
ORDER BY ?name
```

#Query 3 : Provide the number of art galleries, museums, and botanical gardens in the city

```
PREFIX cw1: <http://www.semanticweb.org/wattTours/>
```

```
PREFIX wd: <http://www.wikidata.org/entity/>
```

```
PREFIX wdt: <http://www.wikidata.org/prop/direct/>
```

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
```

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
```

```
SELECT ?name (COUNT(DISTINCT ?museum) as ?numberOfMuseums)  
(COUNT(DISTINCT ?art) as ?numberOfArtGallery) (COUNT(DISTINCT  
?botanical) as ?numberOfBotanicalGarden) WHERE {
```

```
    ?c rdf:type/rdfs:subClassOf* cw1:City.
```

```
    ?c cw1:name ?name.
```

```
    ?c cw1:wikiCode ?code.
```

```
    ?c cw1:locatedIn ?country.
```

```
    ?cou cw1:wikiCode ?countryCode.
```

```
    ?cou rdf:type/rdfs:subClassOf* cw1:Country.
```

```
    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?code)) as  
?cityIRI).
```

```
    BIND(IRI(CONCAT("http://www.wikidata.org/entity/",?countryCode)) as  
?countryIRI).
```

```
    OPTIONAL {
```

```
SERVICE <http://query.wikidata.org/sparql>

{
  ?museum wdt:P31/(wdt:P279)* wd:Q33506;
    wdt:P131 ?cityIRI.
  ?art wdt:P31 wd:Q1007870;
    wdt:P131 ?cityIRI.
  ?botanical wdt:P31 wd:Q167346;
    wdt:P131 ?cityIRI
}}
}

group by ?name
```

Results:

Query 1:

|    | name              | Arabic             | Russian            |
|----|-------------------|--------------------|--------------------|
| 1  | "NewDelhi"@en     | "نيودلهي"@ar       | "Нью-Дели"@ru      |
| 2  | "Bangkok"@en      | "بانكوك"@ar        | "Бангкок"@ru       |
| 3  | "Madrid"@en       | "مدريد"@ar         | "Мадрид"@ru        |
| 4  | "WashingtonDC"@en | "واشنطن"@ar        | "Вашингтон"@ru     |
| 5  | "Jaipur"@en       | "جاپور"@ar         | "Джайпур"@ru       |
| 6  | "Mumbai"@en       | "مومباي"@ar        | "Мумбаи"@ru        |
| 7  | "Barcelona"@en    | "برشلونة"@ar       | "Барселона"@ru     |
| 8  | "Krabi"@en        | "محافظة كرابي"@ar  | "Краби"@ru         |
| 9  | "LosAngeles"@en   | "لوس أنجلوس"@ar    | "Лос-Анджелес"@ru  |
| 10 | "Phuket"@en       | "محافظة بوكيت"@ar  | "Пхукет"@ru        |
| 11 | "SanFrancisco"@en | "سان فرانسيسكو"@ar | "Сан-Франциско"@ru |
| 12 | "Seville"@en      | "إشبيلية"@ar       | "Севилья"@ru       |

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Query 2:

|    | name              | area  | pop  | timeZone                | website                    | twinCities                                    |
|----|-------------------|---|--|-------------------------|----------------------------|---|
| 1  | "Bangkok"@en      | "1568.737"^^<http://www.w3.org/2001/XMLSchema#d...> | "5696409"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+07:00"@en          | <http://www.bangkok.g...>  | "29"^^<http://www.w3.org/2001/XMLSchema#d...> |
| 2  | "Barcelona"@en    | "101.3"^^<http://www.w3.org/2001/XMLSchema#d...>    | "1636732"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+01:00"@en          | <https://www.barcelona...> | "41"^^<http://www.w3.org/2001/XMLSchema#d...> |
| 3  | "Barcelona"@en    | "101.3"^^<http://www.w3.org/2001/XMLSchema#d...>    | "1636732"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+02:00"@en          | <https://www.barcelona...> | "41"^^<http://www.w3.org/2001/XMLSchema#d...> |
| 4  | "Jaipur"@en       | "2185"^^<http://www.w3.org/2001/XMLSchema#d...>     | "3073350"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+05:30"@en          | <http://jaipurmc.org>      | "5"^^<http://www.w3.org/2001/XMLSchema#d...>  |
| 5  | "Jaipur"@en       | "2205"^^<http://www.w3.org/2001/XMLSchema#d...>     | "3073350"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+05:30"@en          | <http://jaipurmc.org>      | "5"^^<http://www.w3.org/2001/XMLSchema#d...>  |
| 6  | "Jaipur"@en       | "467"^^<http://www.w3.org/2001/XMLSchema#dec...>    | "3073350"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+05:30"@en          | <http://jaipurmc.org>      | "5"^^<http://www.w3.org/2001/XMLSchema#d...>  |
| 7  | "Jaipur"@en       | "710"^^<http://www.w3.org/2001/XMLSchema#dec...>    | "3073350"^^<http://www.w3.org/2001/XMLSchema#d...> | "UTC+05:30"@en          | <http://jaipurmc.org>      | "5"^^<http://www.w3.org/2001/XMLSchema#d...>  |
| 8  | "LosAngeles"...   | "1302.15171"^^<http://www.w3.org/2001/XMLSc...>     | "3976322"^^<http://www.w3.org/2001/XMLSch...>      | "Pacific Time Zone"@en  | <https://www.lacity.org/>  | "36"^^<http://www.w3.org/2001/XMLSche...>     |
| 9  | "LosAngeles"...   | "1302.15171"^^<http://www.w3.org/2001/XMLSc...>     | "3976322"^^<http://www.w3.org/2001/XMLSch...>      | "UTC-07:00"@en          | <https://www.lacity.org/>  | "36"^^<http://www.w3.org/2001/XMLSche...>     |
| 10 | "LosAngeles"...   | "1302.15171"^^<http://www.w3.org/2001/XMLSc...>     | "3976322"^^<http://www.w3.org/2001/XMLSch...>      | "UTC-08:00"@en          | <https://www.lacity.org/>  | "36"^^<http://www.w3.org/2001/XMLSche...>     |
| 11 | "Madrid"@en       | "604.4551"^^<http://www.w3.org/2001/XMLSche...>     | "3305408"^^<http://www.w3.org/2001/XMLSch...>      | "UTC+01:00"@en          | <http://www.madrid.es/>    | "47"^^<http://www.w3.org/2001/XMLSche...>     |
| 12 | "Madrid"@en       | "604.4551"^^<http://www.w3.org/2001/XMLSche...>     | "3305408"^^<http://www.w3.org/2001/XMLSch...>      | "UTC+02:00"@en          | <http://www.madrid.es/>    | "47"^^<http://www.w3.org/2001/XMLSche...>     |
| 13 | "Mumbai"@en       | "603"^^<http://www.w3.org/2001/XMLSchema#dec...>    | "15414288"^^<http://www.w3.org/2001/XMLSc...>      | "Indian Standard Tim... | <https://portal.mcgm.g...> | "13"^^<http://www.w3.org/2001/XMLSche...>     |
| 14 | "NewDelhi"@en     | "42.7"^^<http://www.w3.org/2001/XMLSchema#de...>    | "249998"^^<http://www.w3.org/2001/XMLSche...>      | "UTC+05:30"@en          | <http://www.ndmc.gov....>  | "14"^^<http://www.w3.org/2001/XMLSche...>     |
| 15 | "Phuket"@en       | "543.034"^^<http://www.w3.org/2001/XMLSchem...>     | "378364"^^<http://www.w3.org/2001/XMLSche...>      | "UTC+07:00"@en          | <http://www.phuket.go....> | "4"^^<http://www.w3.org/2001/XMLSche...>      |
| 16 | "SanFrancisco"... | "600.59028"^^<http://www.w3.org/2001/XMLSch...>     | "881549"^^<http://www.w3.org/2001/XMLSche...>      | "Pacific Time Zone"@en  | <https://sfgov.org/>       | "31"^^<http://www.w3.org/2001/XMLSche...>     |
| 17 | "SanFrancisco"... | "600.59028"^^<http://www.w3.org/2001/XMLSch...>     | "881549"^^<http://www.w3.org/2001/XMLSche...>      | "UTC-07:00"@en          | <https://sfgov.org/>       | "31"^^<http://www.w3.org/2001/XMLSche...>     |

|    |                   |  |  |                        |                          |  |
|----|-------------------|--|--|------------------------|--------------------------|--|
| 18 | "SanFrancisco..." | "600.59028"^^<http://www.w3.org/2001/XMLSchema#float>  | "881549"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC-08:00"@en         | <https://sfgov.org/>     | "31"^^<http://www.w3.org/2001/XMLSchema#float> |
| 19 | "SanFrancisco..." | "600.592202"^^<http://www.w3.org/2001/XMLSchema#float> | "881549"^^<http://www.w3.org/2001/XMLSchema#float> | "Pacific Time Zone"@en | <https://sfgov.org/>     | "31"^^<http://www.w3.org/2001/XMLSchema#float> |
| 20 | "SanFrancisco..." | "600.592202"^^<http://www.w3.org/2001/XMLSchema#float> | "881549"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC-07:00"@en         | <https://sfgov.org/>     | "31"^^<http://www.w3.org/2001/XMLSchema#float> |
| 21 | "SanFrancisco..." | "600.592202"^^<http://www.w3.org/2001/XMLSchema#float> | "881549"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC-08:00"@en         | <https://sfgov.org/>     | "31"^^<http://www.w3.org/2001/XMLSchema#float> |
| 22 | "Seville"@en      | "140.8"^^<http://www.w3.org/2001/XMLSchema#float>      | "684234"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC+01:00"@en         | <http://www.sevilla.org> | "22"^^<http://www.w3.org/2001/XMLSchema#float> |
| 23 | "Seville"@en      | "140.8"^^<http://www.w3.org/2001/XMLSchema#float>      | "684234"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC+02:00"@en         | <http://www.sevilla.org> | "22"^^<http://www.w3.org/2001/XMLSchema#float> |
| 24 | "Washington..."   | "177"^^<http://www.w3.org/2001/XMLSchema#decimal>      | "705749"^^<http://www.w3.org/2001/XMLSchema#float> | "America/New_York"...  | <https://dc.gov/>        | "20"^^<http://www.w3.org/2001/XMLSchema#float> |
| 25 | "Washington..."   | "177"^^<http://www.w3.org/2001/XMLSchema#decimal>      | "705749"^^<http://www.w3.org/2001/XMLSchema#float> | "Eastern Time Zone"... | <https://dc.gov/>        | "20"^^<http://www.w3.org/2001/XMLSchema#float> |
| 26 | "Washington..."   | "177"^^<http://www.w3.org/2001/XMLSchema#decimal>      | "705749"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC-04:00"@en         | <https://dc.gov/>        | "20"^^<http://www.w3.org/2001/XMLSchema#float> |
| 27 | "Washington..."   | "177"^^<http://www.w3.org/2001/XMLSchema#decimal>      | "705749"^^<http://www.w3.org/2001/XMLSchema#float> | "UTC-05:00"@en         | <https://dc.gov/>        | "20"^^<http://www.w3.org/2001/XMLSchema#float> |

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### Query 3:

|    | name              | numberOfMuseums                                  | numberOfArtGallery                               | numberOfBotanicalGarden                         |
|----|-------------------|--|--|---|
| 1  | "WashingtonDC"@en | "80"^^<http://www.w3.org/2001/XMLSchema#integer> | "8"^^<http://www.w3.org/2001/XMLSchema#integer>  | "3"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 2  | "Barcelona"@en    | "75"^^<http://www.w3.org/2001/XMLSchema#integer> | "14"^^<http://www.w3.org/2001/XMLSchema#integer> | "2"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 3  | "Phuket"@en       | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 4  | "Madrid"@en       | "56"^^<http://www.w3.org/2001/XMLSchema#integer> | "2"^^<http://www.w3.org/2001/XMLSchema#integer>  | "4"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 5  | "Mumbai"@en       | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 6  | "Bangkok"@en      | "8"^^<http://www.w3.org/2001/XMLSchema#integer>  | "1"^^<http://www.w3.org/2001/XMLSchema#integer>  | "1"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 7  | "Seville"@en      | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 8  | "Jaipur"@en       | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 9  | "SanFrancisco"@en | "45"^^<http://www.w3.org/2001/XMLSchema#integer> | "13"^^<http://www.w3.org/2001/XMLSchema#integer> | "2"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 10 | "LosAngeles"@en   | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 11 | "NewDelhi"@en     | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |
| 12 | "Krabi"@en        | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer>  | "0"^^<http://www.w3.org/2001/XMLSchema#integer> |

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## Conclusion

In this coursework, we created and succeeded in building an ontology and querying it with an external knowledge graph (wikiData in our case).