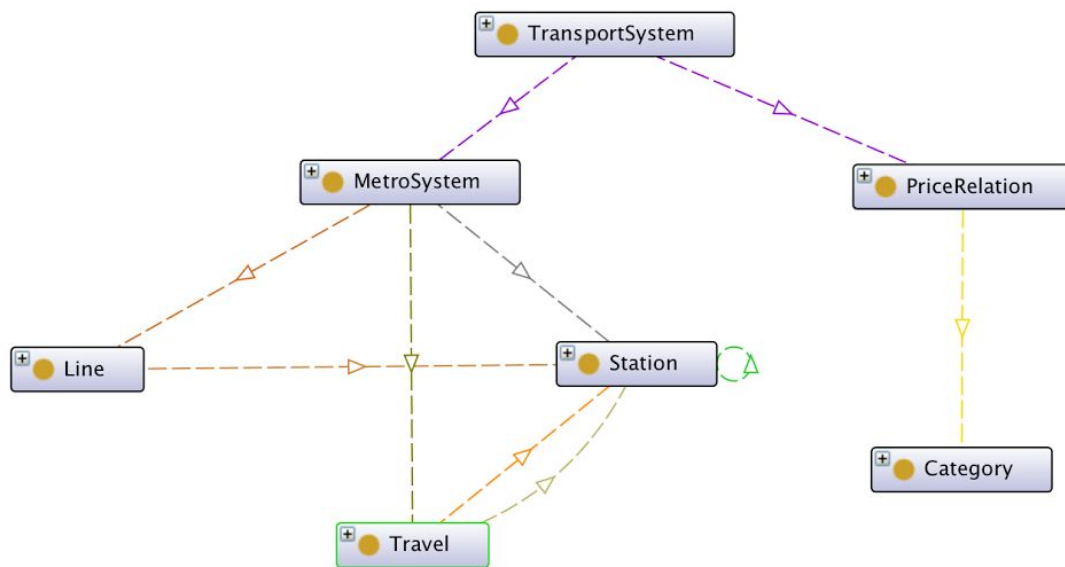


By Hugo Santana.

## Assignment for Unit 4: Developing and Populating Ontologies

On the following report I will explain the ontology I have created and the design decisions. The objectives of the topology is to generalize in a basic way a subway system. After designing the ontology, I have created a knowledge base according to it. For this task, information related to the *Venezuelan Public Transportation System* was used.

The general view of my topology is the following (It is not possible to see the object properties in this view):



### Class creation:

The main class is *Transport System*. Although different types of Transport Systems can exist, in the current ontology we are only dealing with Metro transportation. Regarding of that, the Transport System was included to maintain a notion of possible scalability in the future. Other Transport Systems, such as Bus System, Train System, among others could be added to complete the ontology.

The *Transport System* is related to two classes, *Price Relation* and *Metro System*. Price Relation contains the logic behind the price system. On the current topology it is possible to differentiate between categories of people according to the discount types they could get. For example, in the Caracas Metro System, it is divided into 3 categories - "Student", "Normal" and "Retired". The class *Category* maps these 3 options. The Price Relation entity could be

expanded in the future to include the logic of other Transport Systems, as it is not directly linked to the Metro System.

*Price Relation* was created with 2 Data Objects. Type and Cost. Type refers to the ticket validity length. In the Caracas Metro System, you can purchase a daily ticket or a monthly ticket. Cost corresponds to the price of the selected ticket, according to length and category.

*Metro System*, identifies the Caracas Metro System in this case. It connects with *Travel*, *Station* and *Line* classes. *Station* identifies each station, and it contains the Data Object *foundedYear* (The year when the station was constructed). Line correspond to the Metro Lines and it was created with Data Object *lastTrainTime* and *openingTime*. Those 2 variables define the time the station opens on a daily basis and the time the last train departs.

Finally, the *Travel* class can be classified as the one that specifies a route. It contains two Object Properties, *startsAt* and *endsAt*, specifying the station where the trip starts and where the trip ends.

In order to make “trips” along the Metro Station System, the ontology contains the Object Property *connects*. This property links stations that are connected. The *connect* Object Property is not related to the Lines. In order to handle the Lines to Station relation, the Object Property *passesThrough* was developed. This Object Property uses Line as Domain and Station as Range.

On the following table, each Class is identified with their respective Data Property

Class Name	Data Properties
Transportation System	
Metro System	
Travel	
Line	lastTrainTime::DateTimeStamp openingTime::DateTimeStamp
Station	foundedYear::int
Price Relation	cost::decimal type::String
Category	

It is important to mention that many more Data Objects with interesting information could have been added. For example, station capacity, more detailed scheduling times (Holidays, Repairment dates, difference between week days and weekend opening and closing times, etc.) but it was not the objective of the current activity.

To picture the whole ontology in the right way, we are missing the Object Properties. The following table contains all the object properties with their current Domain and Range (Using WebVOWL tool).

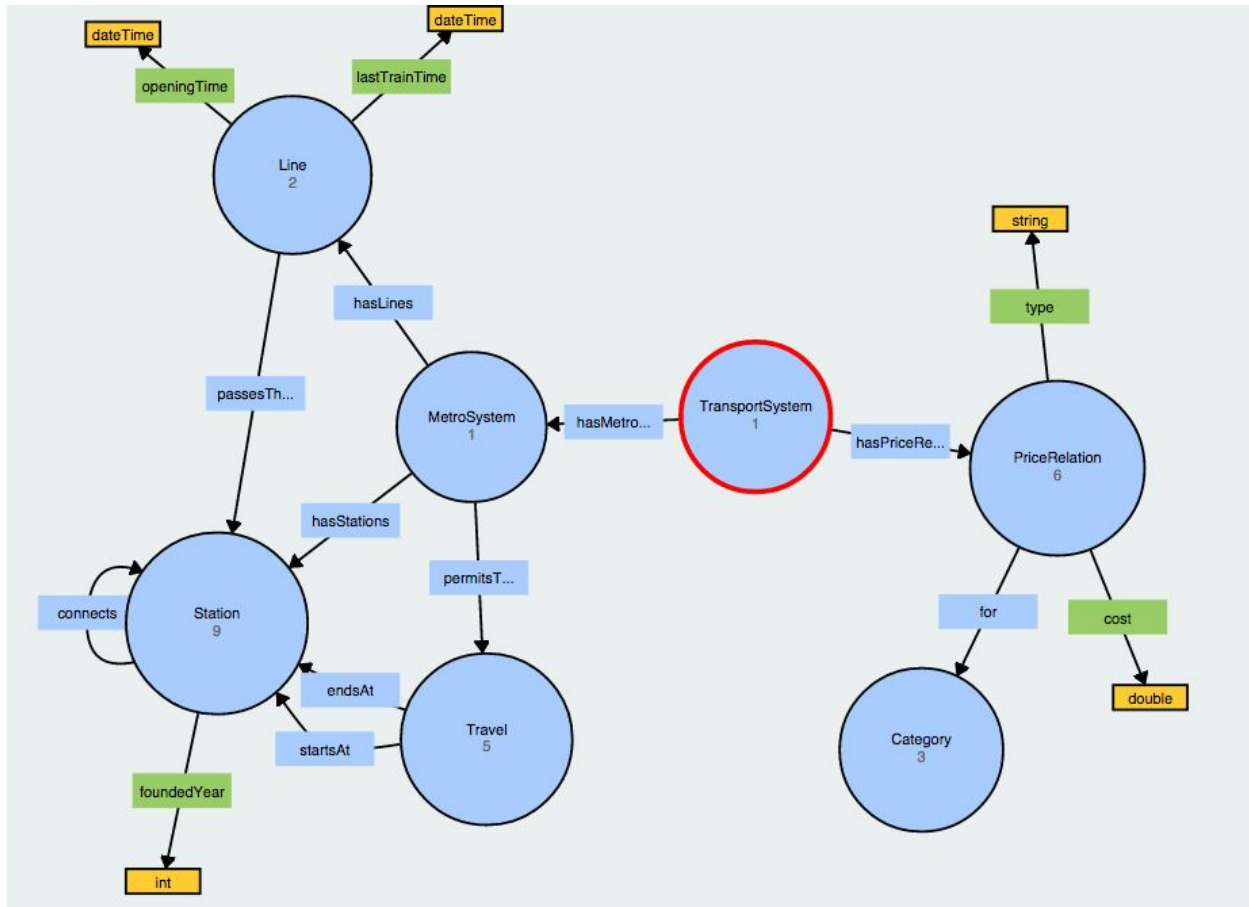
Object Property	Domain	Range
hasMetroSystem	Station	Station
hasPriceRelation	Station	Station
hasLines	MetroSystem	Line
hasStations	MetroSystem	Station
connects	Station	Station
for	PriceRelation	Category
startsAt	Travel	Station
endsAt	Travel	Station
permitsToMake	MetroSystem	Travel
passesThrough	Line	Station

### Knowledge Base:

In order to test and see the ontology in action, Individual Instances were introduced. As it was mentioned earlier, Caracas Metro System was used. Only 2 lines and 9 stations were used for timing purposes. The selected entities consisted on the Blue Line and part of the Red Line (The exact point where both lines combine).

The whole knowledge base can be seen in the Hugo\_On3.owl file, at the github repository:  
<https://github.com/hsantana/onθοTrans>

## Using WebVOWL to visualise the whole Ontology:



Caracas Subway

**In Conclusion:**

After completing this assignment I was able to understand how ontologies work. The difficulty of ontology creation depends on the given scenario. In the Public Transportation System the complexity could be very high if we try to represent a system that covers multiple Transportation options or multiple cities/countries. For that reason, the focus was put on a simple case. There are many powerful tools that help in the development of ontologies, such as Protege. Visual tools such as WebVOWL and also testing platforms such as [oops.linkeddata.es](https://oops.linkeddata.es)