Purpose:

The purpose of building the Reference Ontology is to provide a consensual knowledge model of the vehicle domain to be used by public for transportation.

Scope:

The ontology has to focus just on the parts + fuel types of vehicles (bus, car, motorbike) domain. The level of granularity is directly related to the competency questions and terms identified.

Implementation language:

The ontology has to be implemented in java language in Protégé software which is based on Java, is extensible, and provides a plug-and-play environment that makes it a flexible base for rapid prototyping and application.

Intended End-Users:

User 1: A vehicle owner

User 2: An authorized representative/employee of a fleet manager

User 3: Employee of the vehicles manufacturer

User 4: Authorized technician

Intended Uses:

Use 1: Commuting from one point to another

Use 2: Good transport tool

Use 3: To race

Use 4: For Independence and freedom

Use 5: For safety and saving time

Use 6: for flexibility

Ontology Requirements

1. Non-Functional Requirements

NFR1. The ontology must support a multiple types of vehicles in the following: Buses, Cars and motorbikes

NFR2. The ontology must be based on the international, European or de-facto standards in existence or under development

1. How many attributes does a car have?
2. What are the model of car?
3. What is the brand of this car?
4. When was produced this car?
5. What type of fuel does this car need?
6. What are the characteristics of engine?
7. How many doors does this car have?
8. How many seats does this car have?
9. On which side is located the steering wheel in this car?
10. Which signals are controllable?
11. Which signals are both observable and actuable?
12. How many sensors does this car contain?
13. What are the maximum values allowed for all signals from a Vehicle?

1:What is the entity part of?

2:What things are contained in this ontology ?

3: what are the parts of (subclasses)of entities?

4: Which retrievable Web Resources describe an ontology?

5: Which types of customers are eligible? Rich , Poor , Middle class

6: Which types of customers are not eligible? Rich , Poor , Middle class

7: Which commuting methods are available?

8:What are the Specifications of the Vehicle? Speed ,Fuel ,Engine ,Color,Brand

9:Which Qualities will attract the Customers more? Speed ,Fuel ,Engine ,Color

10:Which type of fuel ,Engine used in which type of Vehicle? Fuel , Engine

11: what sequence of activities must be completed to achieve some goal?

12:What vehicle customers want ? Car, Bike, Truck, Bus

**Competency Questions for Assessing VSSo**

**Car Attributes**

**What are the attributes of this car and what do they express?**

SELECT ?attribute ?branch ?value

WHERE { ?attribute rdfs:subPropertyOf vsso:attribute.

?branch ?attribute ?value.}

**How many attributes does this car have?**

SELECT (count(distinct ?attribute) as ?nbAttribute)

WHERE{?attribute rdfs:subPropertyOf vsso:attribute.}

GROUP BY ?x

**What is the model of this car?**

SELECT ?model

WHERE { ?branch vsso:model ?model.}

**What is the brand of this car?**

SELECT ?brand

WHERE { ?branch vsso:brand ?brand.}

**What is the VIN of this car?**

SELECT ?vin

WHERE { ?branch vsso:vin ?vin.}

**How old is this car?**

SELECT ?age

WHERE { ?branch vsso:year ?year.

BIND((2018-?year) AS ?age)}

**What are the dimensions of this car?**

SELECT ?length ?width ?height

WHERE { ?branch vsso:length ?length;

vsso:width ?width;

vsso:height ?height.}

**What are the characteristics of this car's chassis?**

SELECT ?attribute ?value

WHERE { ?attribute rdfs:subPropertyOf vsso:attribute.

?chassis a vsso:Chassis;

?attribute ?value.}

**What type of fuel does this car need?**

SELECT ?fueltype

WHERE {?branch vsso:fuelType ?fuelType.}

**What type of transmission does this car have?**

SELECT ?type

WHERE { ?branch vsso:transmissionType ?type.}

**What are the characteristics of this engine?**

SELECT ?engine ?attribute ?value

WHERE { ?attribute rdfs:subPropertyOf vsso:attribute.

?engine a vsso:InternalCombustionEngine;

?attribute ?value.}

**How many doors does this car contain?**

SELECT ?nbDoor

WHERE { ?branch vsso:doorCount ?nbDoor.}

**How many seats do I have this my car?**

SELECT ?nbSeats ?nbRows

WHERE { ?seats a vsso:Seat;

vsso:rowCount ?nbRows;

vsso:row1PosCount ?row1Count;

vsso:row2PosCount ?row2Count;

vsso:row3PosCount ?row3Count;

vsso:row4PosCount ?row4Count;

vsso:row5PosCount ?row5Count.

BIND((?row1Count + ?row2Count + ?row3Count + ?row4Count + ?row5Count) AS ?nbSeats)}

**On which side is located the steering wheel?**

SELECT ?steeringWheelSide

WHERE { ?wheel a vsso:SteeringWheel;

vsso:steeringWheelSide ?steeringWheelSide.}

**Static Signals**

**Is there a signal measuring the steering wheel angle?**

SELECT ?signal

WHERE { ?signal a vsso:SteeringWheelAngle.}

**Which signals are controllable?**

SELECT ?signal ?actuator

WHERE { ?actuator vsso:consumes ?signal.

?signal a vsso:ActuatableSignal.}

**Which signals are both observable and actuatable?**

SELECT ?signal ?sensor ?actuator

WHERE { ?actuator vsso:consumes ?signal.

?sensor sosa:observes ?signal.

?signal a vsso:ActuatableSignal, vsso:ObservableSignal.}

**How many sensors does this car contain?**

SELECT (count(distinct ?sensor) as ?nbSensor)

WHERE { ?sensor sosa:observes ?signal.

?signal a vsso:ObservableSignal.}

**How many different speedometers does this car contain?**

SELECT (count(distinct ?sensor) as ?nbSpeedSensors)

WHERE { ?sensor a vsso:Speedometer.}

**In which part of this car is produced the signal vsso:LongitudinalAcceleration?**

SELECT ?branch ?branchType

WHERE { ?branch a ?branchType;

vsso:hasSignal ?signal.

?signal a vsso:LongitudinalAcceleration.

}

**Which signals measure a temperature, and in which part of this car?**

SELECT ?signal ?branch

WHERE { ?branch vsso:hasSignal ?signal.

?signal a vsso:AmbientAirTemperature.

}

**What unit type does the signals of type vsso:VehicleYaw use?**

SELECT ?signal ?unitsystem

WHERE { ?signal a vsso:VehicleYaw;

qudt:unit ?unitsystem.}

**What are the characteristics of the sensor producing the signal “TravelledDistance” in the OBD branch?**

SELECT ?sensor ?p ?o

WHERE { ?sensor a ?sensor;

vsso:observes ?signal;

?p ?o.

?signal a vsso:TravelledDistance.}

**What are the maximum values allowed for all signals from car part “Vehicle”?**

**Dynamic signals**

**What is the current gear?**

SELECT ?signal ?result ?time

WHERE {?signal a vsso:CurrentGear.

?obs a sosa:Observation;

sosa:observedProperty ?signal;

sosa:hasSimpleResult ?result;

sosa:phenomenonTime ?time.

}

ORDER BY DESC(?time)

LIMIT 1

**What are the values of all signals representing the speed of this car now?**

SELECT ?signal ?result ?time

WHERE {?signal a vsso:VehicleSpeed.

?obs a sosa:Observation;

sosa:observedProperty ?signal;

sosa:hasSimpleResult ?result;

sosa:phenomenonTime ?time.

}

ORDER BY DESC(?time)

**Which windows are currently open?**

SELECT ?position ?value ?time

WHERE {?signal a vsso:WindowPosition.

?window vsso:hasSignal ?signal.

?obs a sosa:Observation;

sosa:observedProperty ?signal;

sosa:hasSimpleResult ?value;

sosa:phenomenonTime ?time.

?window vsso:position ?position.

}

ORDER BY DESC(?time)

**What is the local current temperature on the driver side?**