

ABSTRACTING AND INTERACTING WITH VEHICLES IN THE WEB OF THINGS

SECOND W3C WORKSHOP ON THE WEB OF THINGS

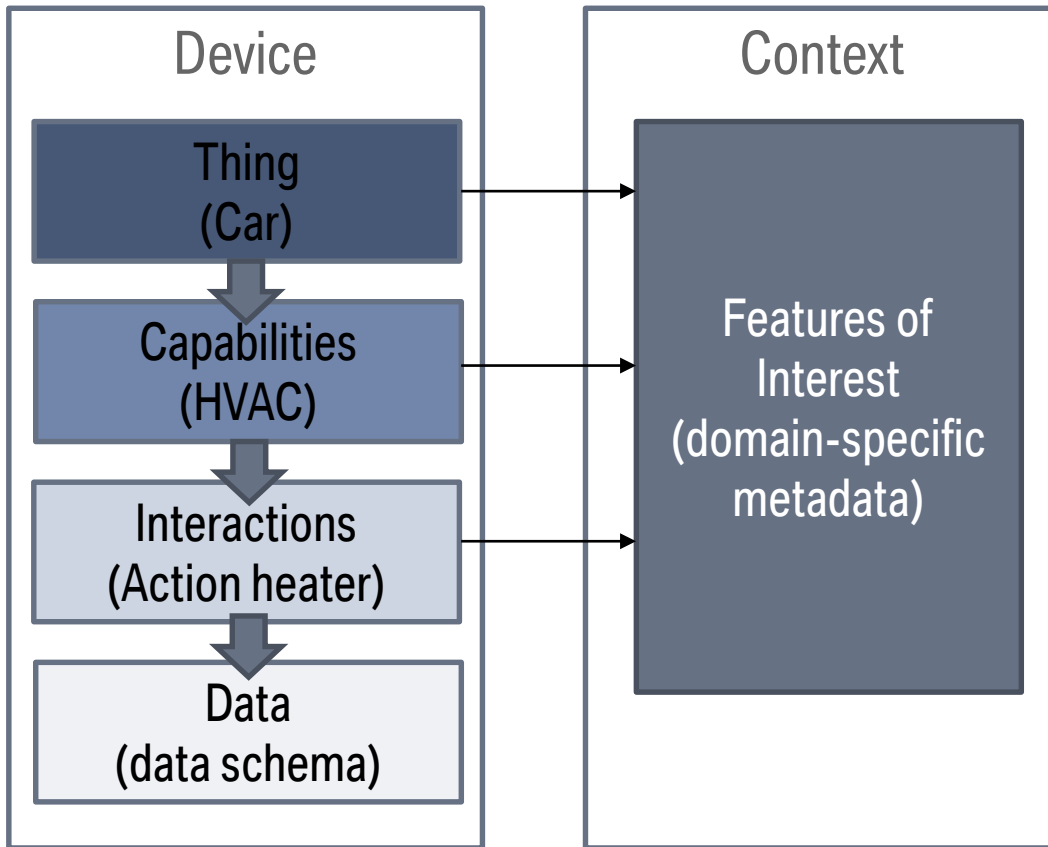
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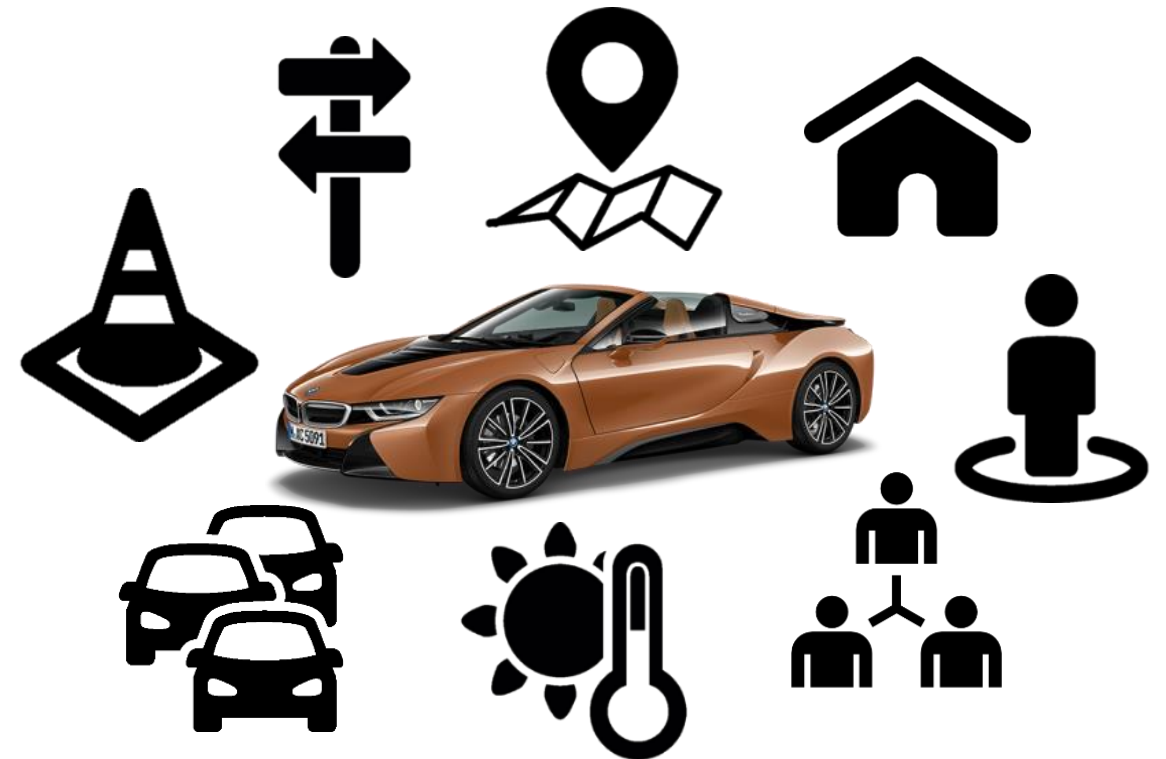
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GOALS

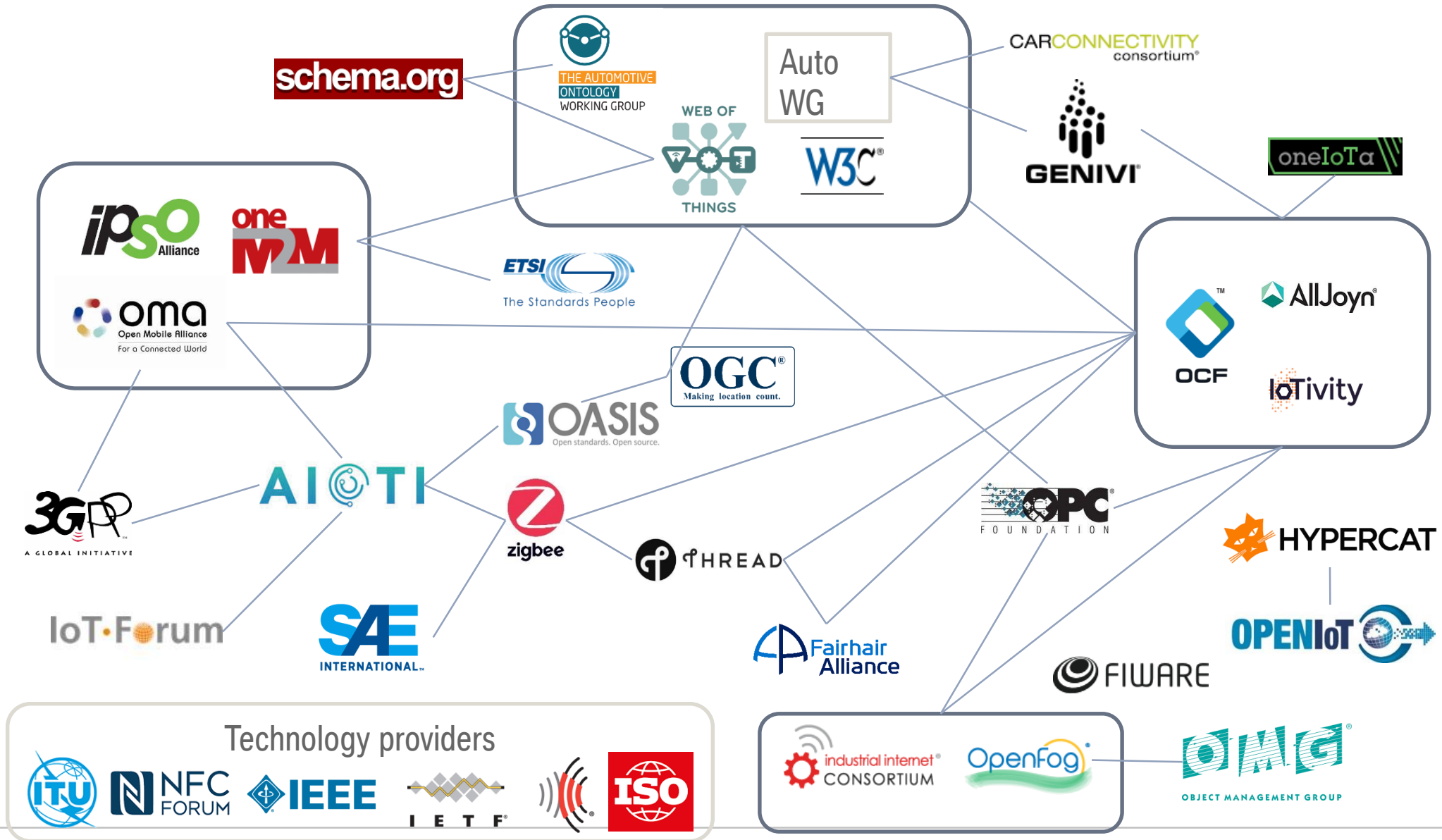
Annotate Vehicle interactions and data



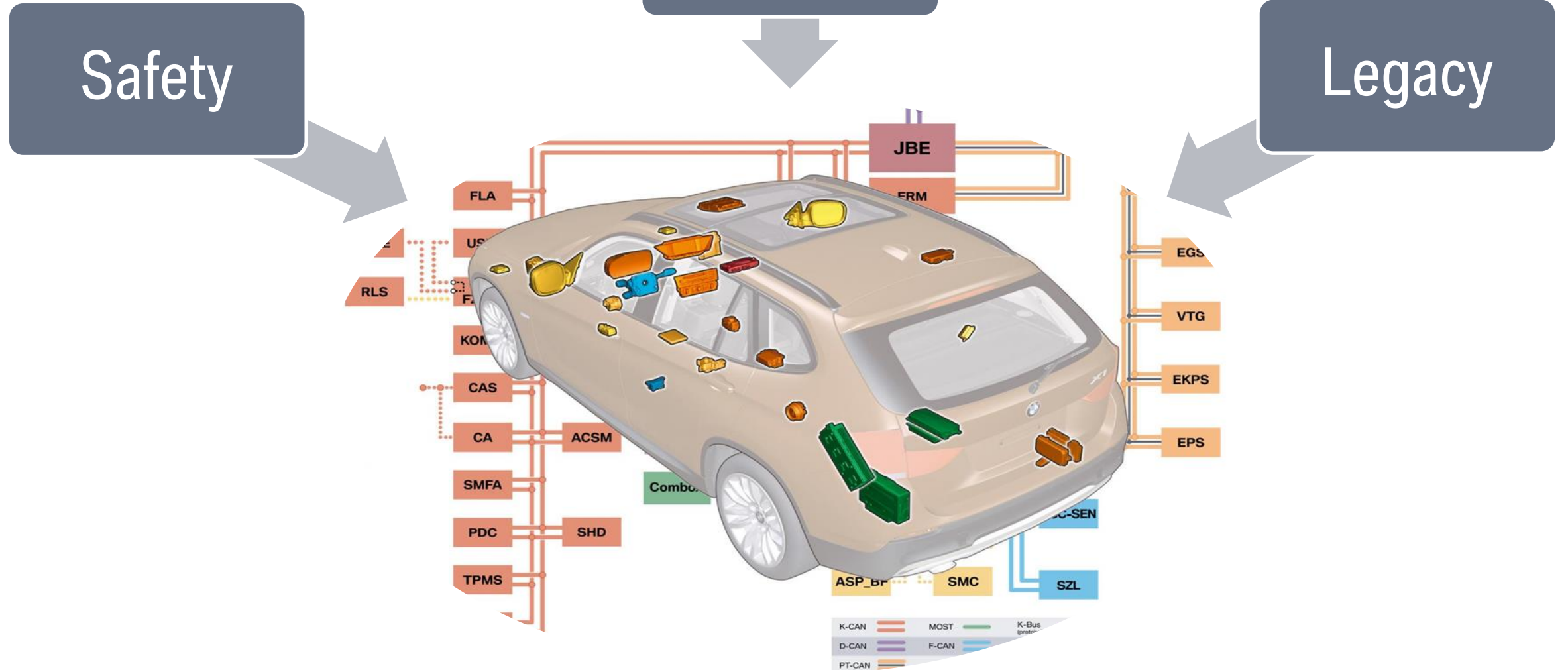
Interact with the many automotive domains



INTEROPERABILITY IN A FRAGMENTED IOT ECOSYSTEM

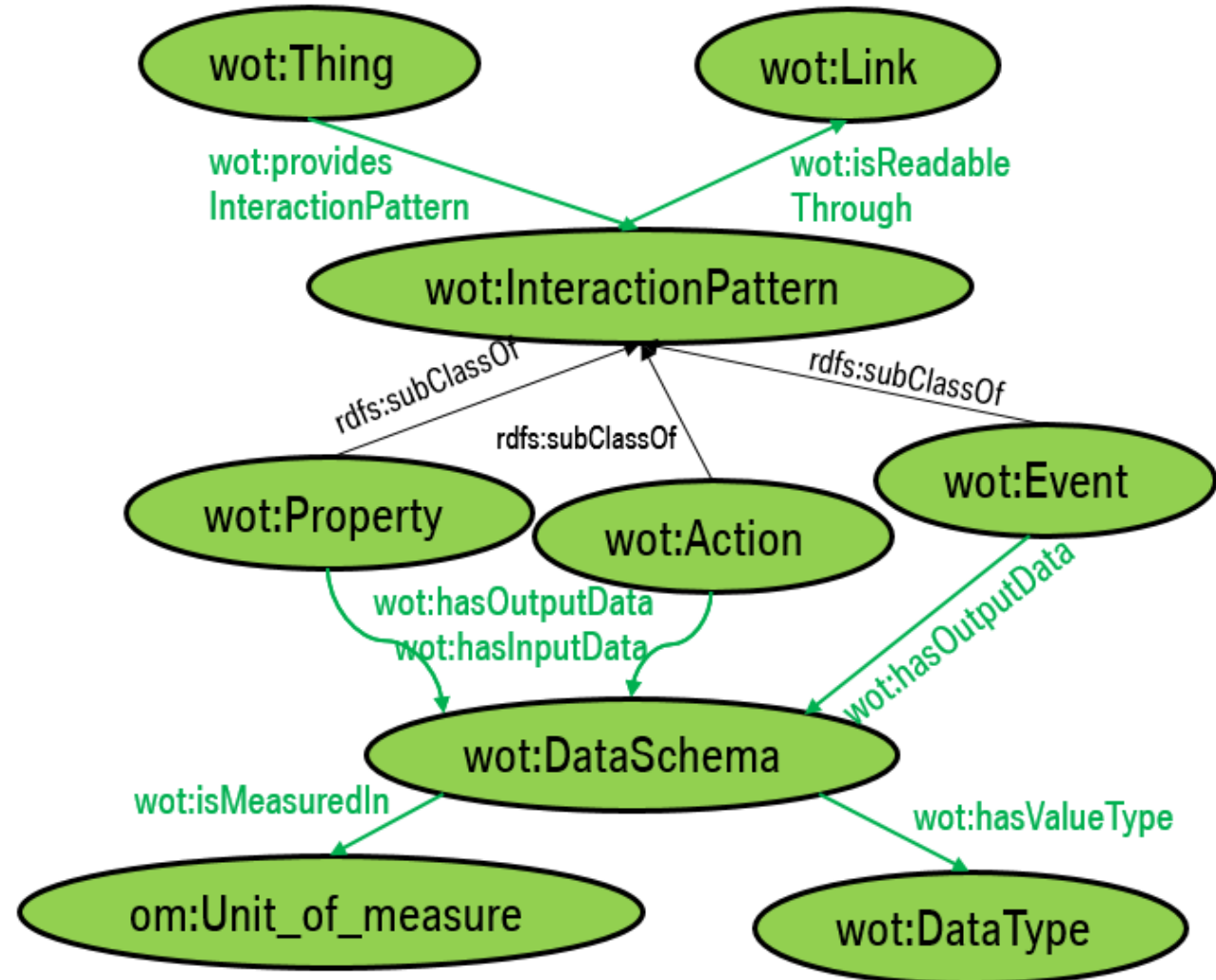


REQUIREMENTS [1]



WOT ONTOLOGY [2]

- Define a wot:Thing
- Centered on wot:interactionPattern
 - Properties
 - Actions
 - Events
- Use dataSchema
 - Literal value
 - wot:DataType
 - om:Unit_of_measure

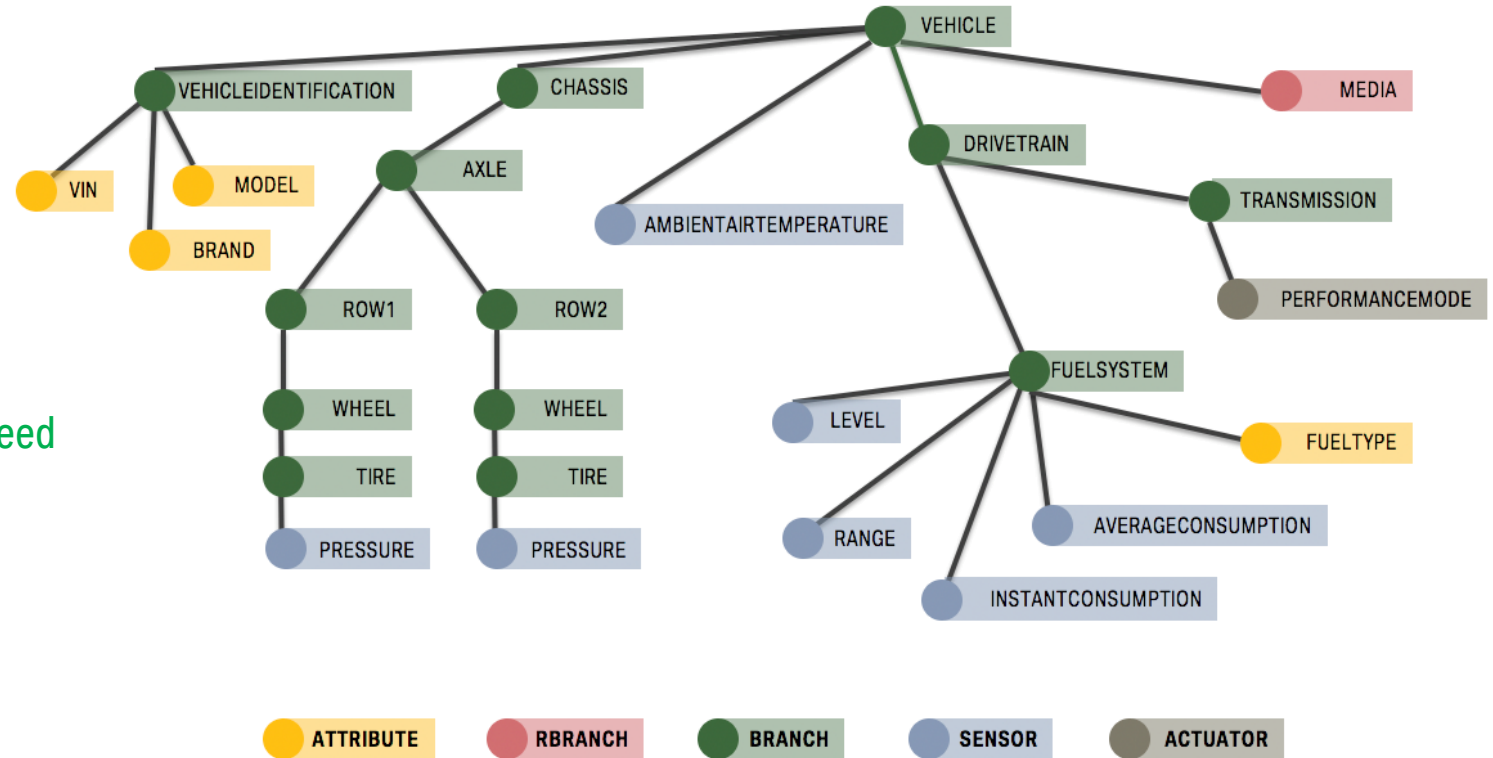


ABSTRACTING VEHICLES IN THE WEB OF THINGS

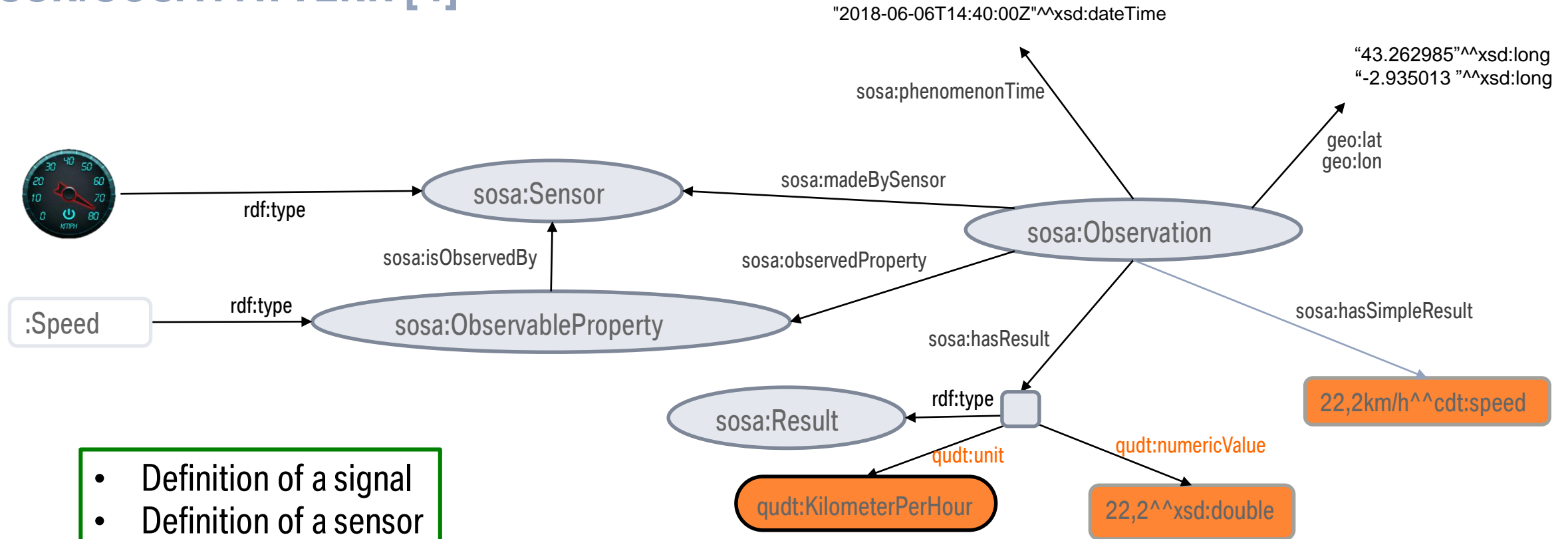
VEHICLE SIGNAL SPECIFICATION (VSS) [3]

Car-related concepts

- 451 branches (“engine”, “mirrors”)
- 1103 leaves:
 - 43 attributes (“weight”, “fuelType”)
 - 1060 signals: (700 seat-related), 268 with unit
- **Examples:**
 - Gearbox-sensed speed: `.Drivetrain.Transmission.Speed`
 - Engine speed: `.Drivetrain.Engine.Speed`
 - GPS-sensed speed: `.Cabin.Infotainment.Speed`
 - Left door lock: `.Body.Row1.Door.Left.IsLocked`
 - Right mirror tilt: `.Cabin.Mirror.Right.Tilt`



SSN/SOSA PATTERN [4]



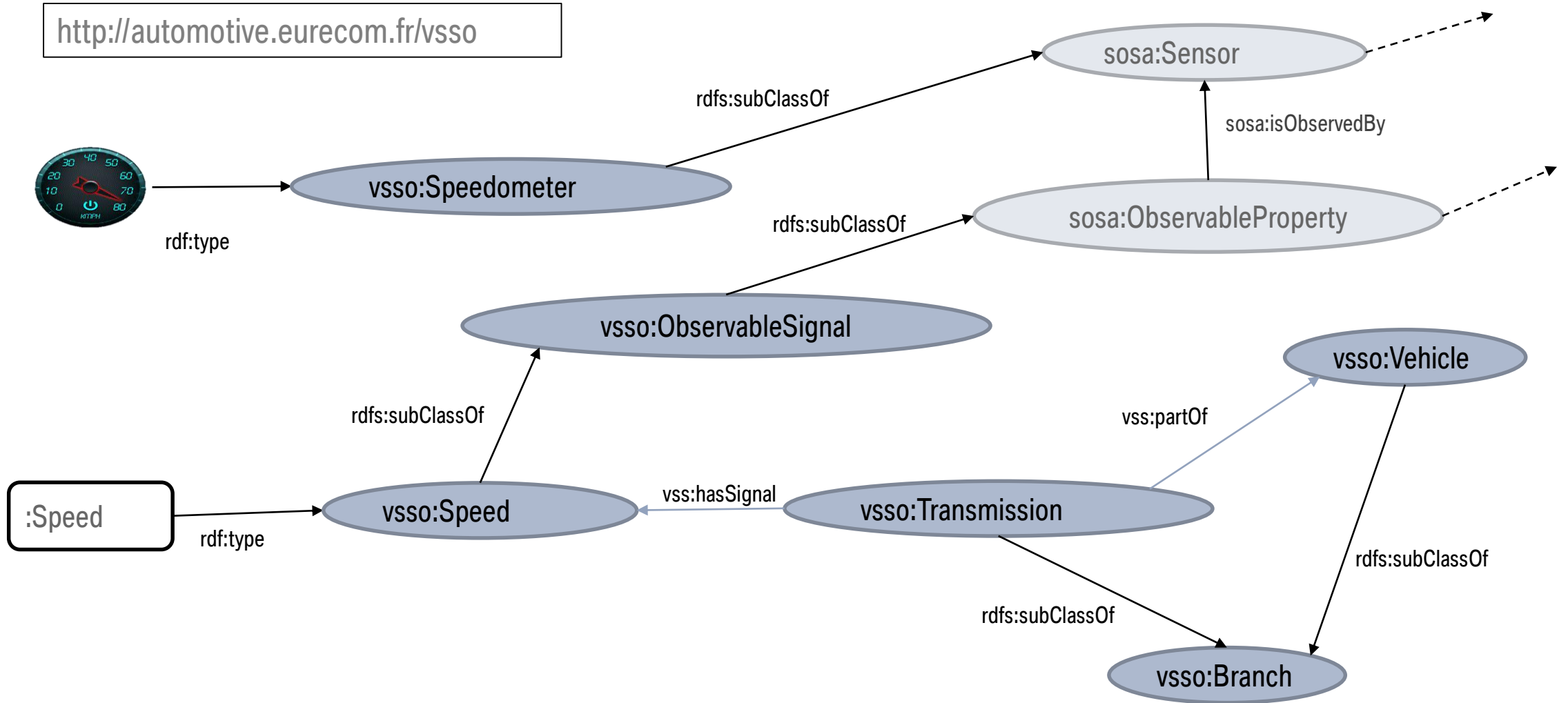
- Definition of a signal
- Definition of a sensor
- Well-defined units
- Geolocation

BUT

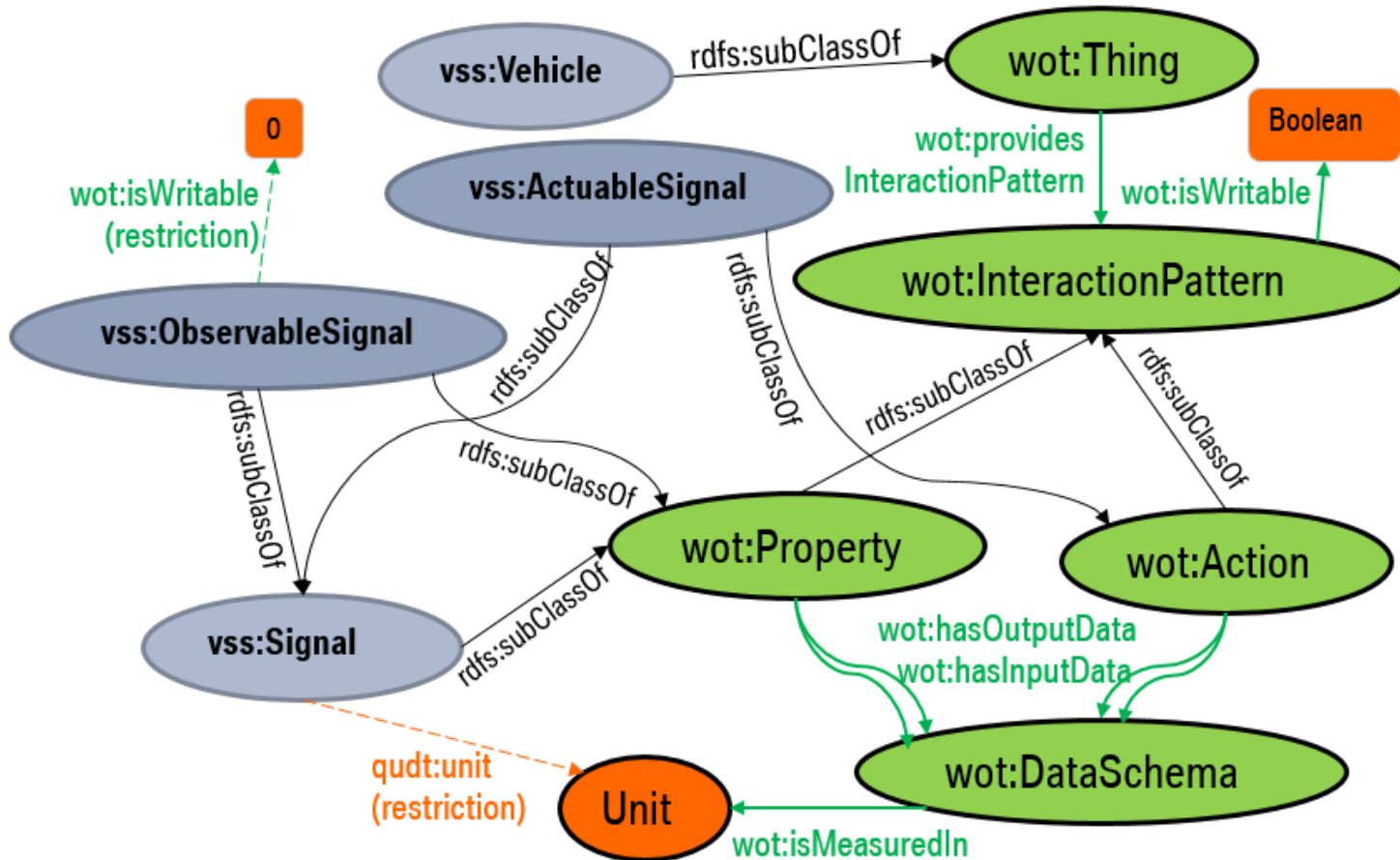
No formal definition of:

- “speed” or other observable properties
- “speedometer” or other car sensors/actuators
- “Car” or vehicle parts

DOMAIN ONTOLOGY (VSSO)



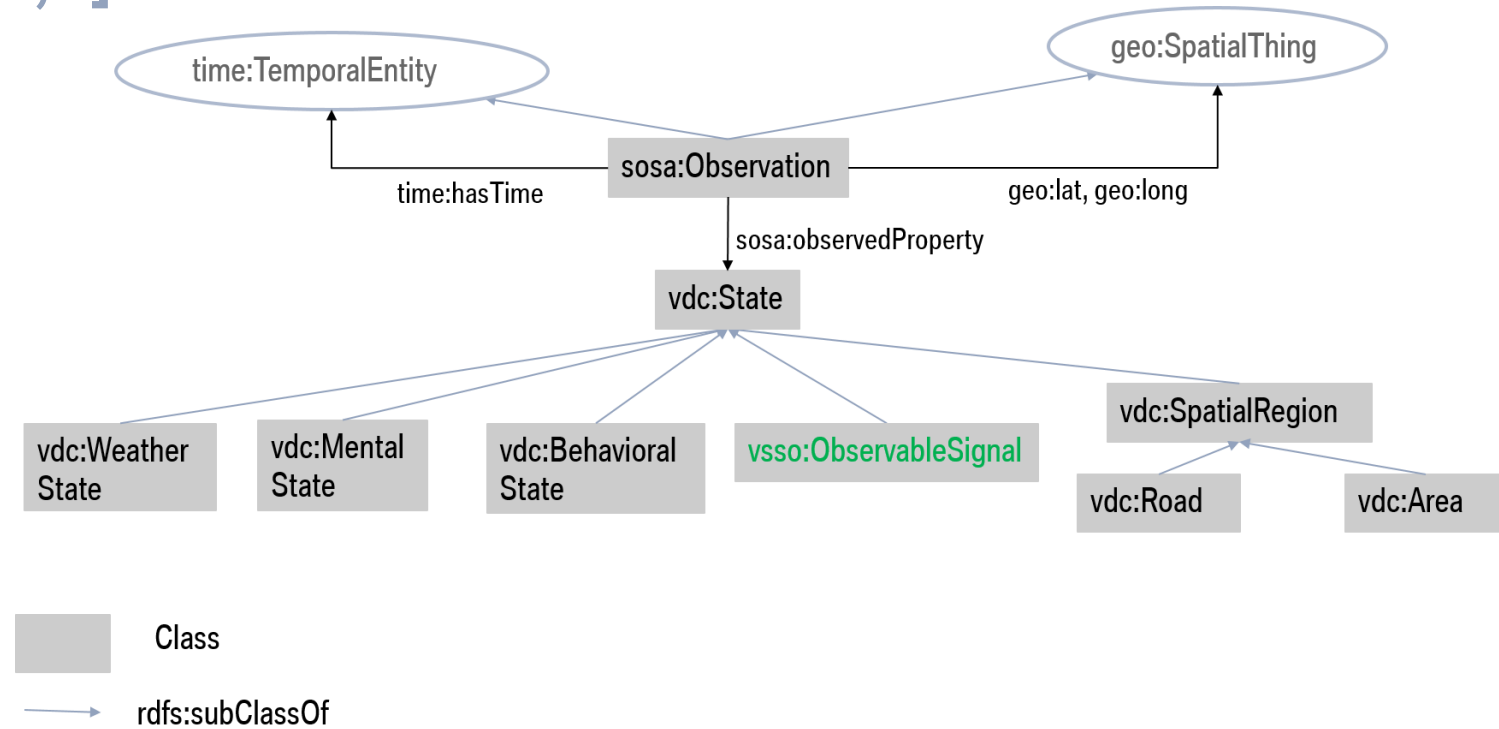
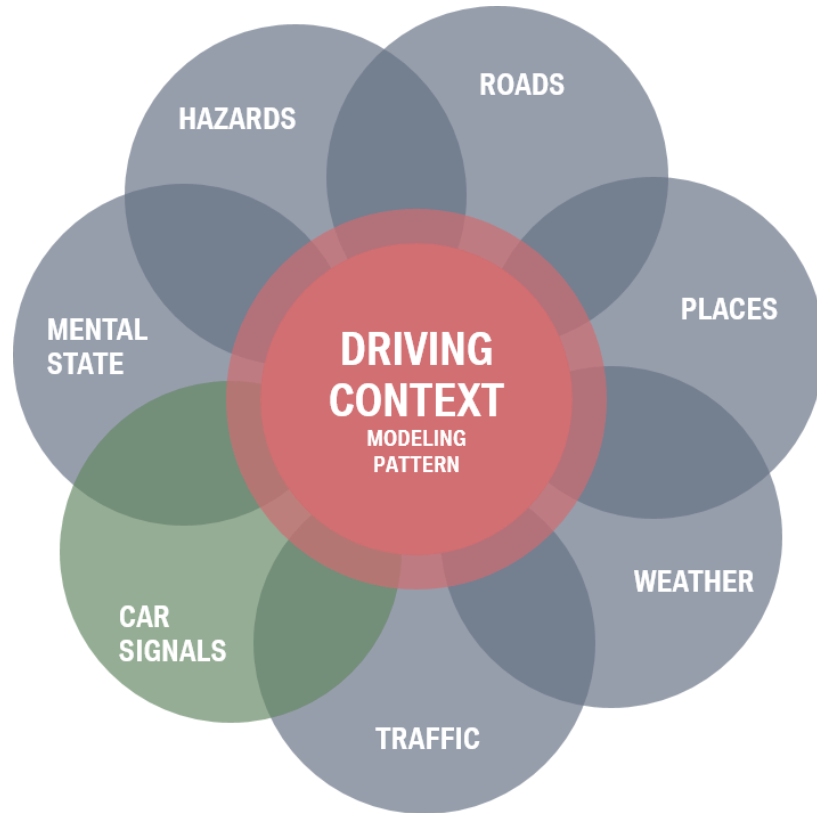
MAIN ALIGNMENT PATTERN (1) [5]



Modeling pattern:

- i. Vehicles are Things
- ii. Signals are properties
Read-write depending on the signal type
- iii. Actuatable signals can be action
- iv. DataSchema use the domain Units

MAIN ALIGNMENT PATTERN (2) [6,7]



Event modeling pattern:

- i. Mapped to the Event Ontology[1]
- ii. $Wot:Event \equiv event:Event$
- iii. The FOI (Vehicle) is an Agent

DEMONSTRATION



VEHICLE THING DESCRIPTION

```
"@context": ["https://www.w3.org/2019/wot/td/v1",
  {"auto": "https://auto.schema.org/" ,
   "iot": "https://iotschema.org/" ,
   "vsso": "https://automotive.eurecom.fr/vsso#" ,
   "qudt": "http://www.qudt.org/1.1/vocab/unit#" }
],
"@type": ["Thing", "auto:Car", "vsso:Vehicle"],
"id": "http://10.159.160.74:5001/WBY8P61020VD33272/",
"base": "http://10.159.160.74:5001/WBY8P61020VD33272/",
"title": "MyCarThing",
"name": "MyCarThing",
"auto:brand": "BMW",
"auto:model": "i3",
"vsso:vin": "WBY8P61020VD33272",
```

Thing

```
"properties": {
  "secured": {
    "@type": ["iot:Property", "vsso:DoorLock"],
    "description": "Shows the current lock status of the car",
    "type": "string",
    "forms": [{
      "href": "property/secured",
      "contentType": "application/json",
      "op": "readproperty"
    }]
  }
}
```

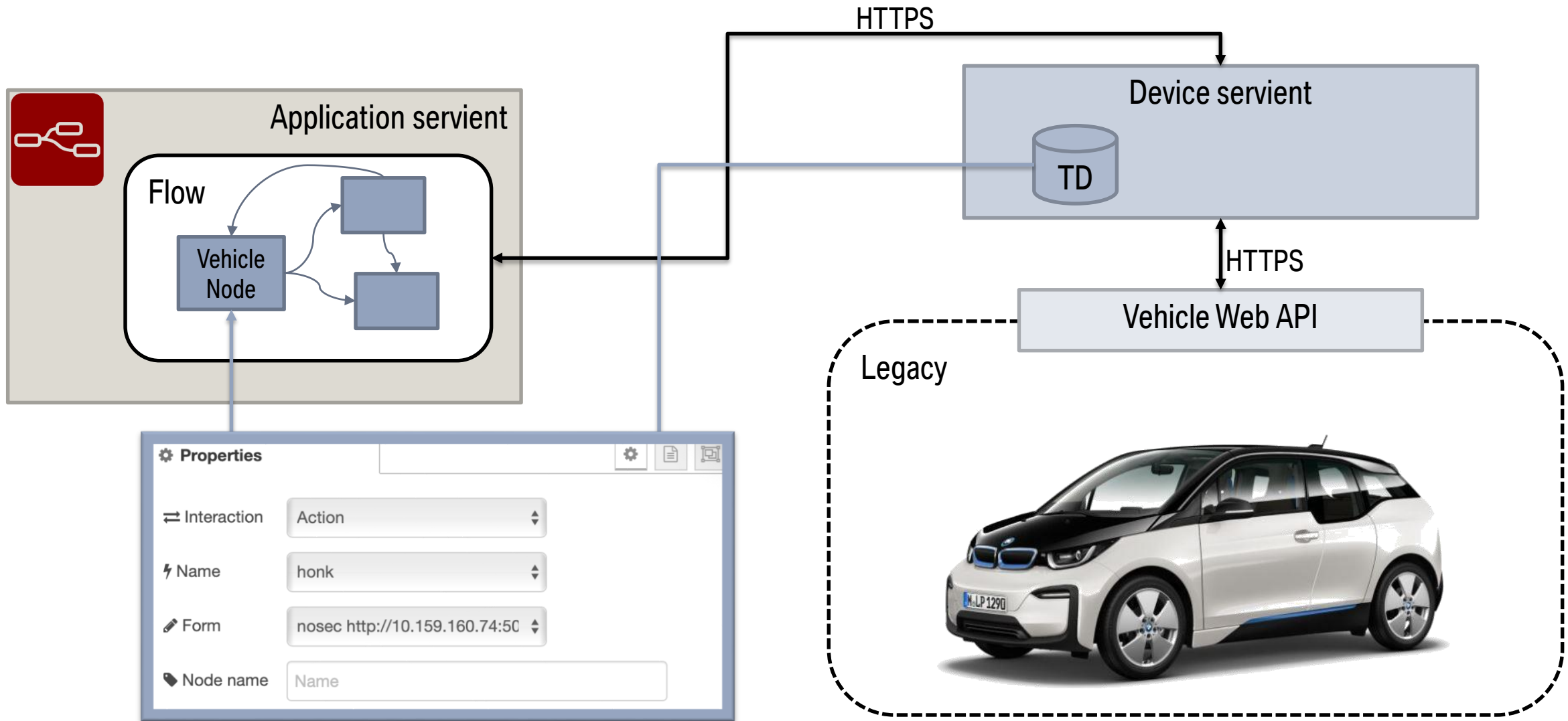
Properties

```
"actions": {
  "write-message": {
    "@type": ["Action", "iot:ChangePropertyAction"],
    "description": "Send message to the vehicle HMI",
    "safe": false,
    "idempotent": false,
    "input": {
      "type": "object",
      "properties": {
        "subject": {
          "type": "string"
        },
        "message": {
          "type": "string"
        }
      },
      "required": ["subject", "message"]
    },
    "forms": [{
      "href": "action/message",
      "contentType": "application/json",
      "op": "invokeaction"
    }]
  },
}
```

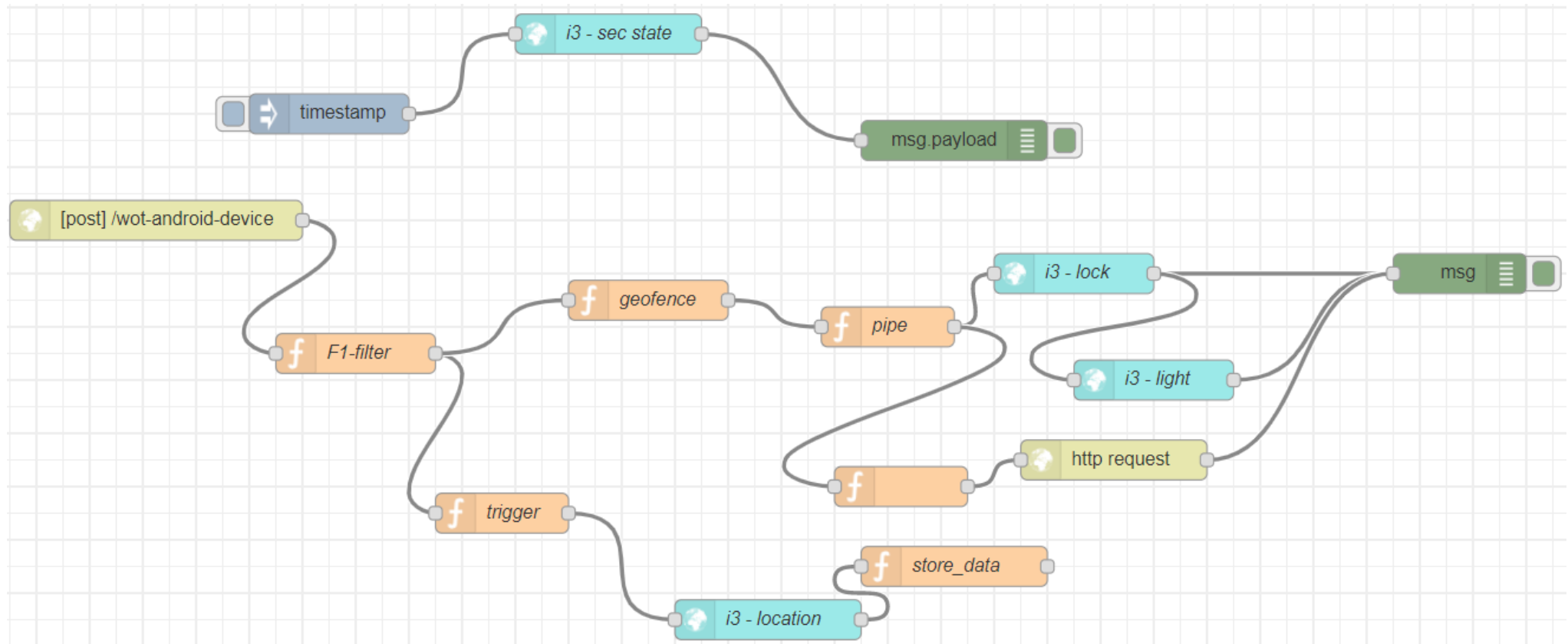
Actions

Semantics | Communication | Access

DEMO ARCHITECTURE



FLOW EXAMPLE (OPEN DAY)



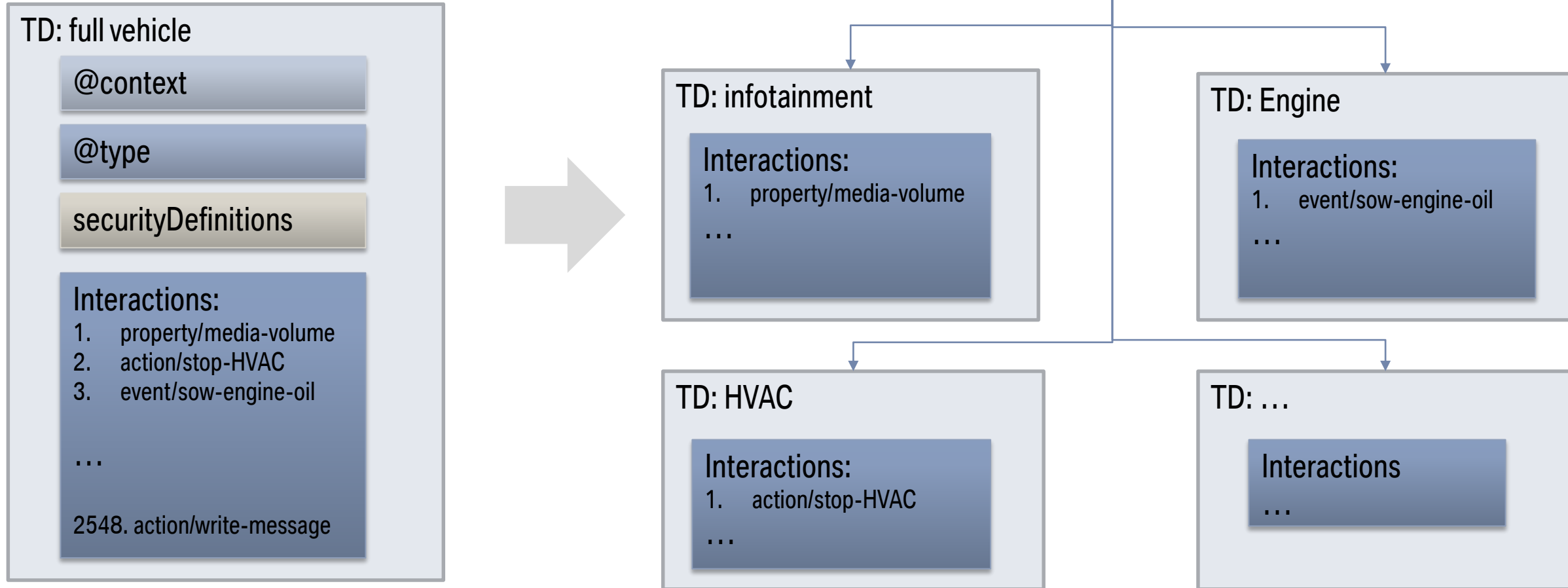
When the user is far from the unlocked vehicle, the vehicle lock is activated

LESSONS LEARNED

1. SAFETY – SECURITY – PRIVACY REQUIREMENTS ADAPTED TO THE (VEHICLE) WOT CAPABILITIES
2. DIVIDING COMPLEX THINGS
3. (INFRASTRUCTURE)

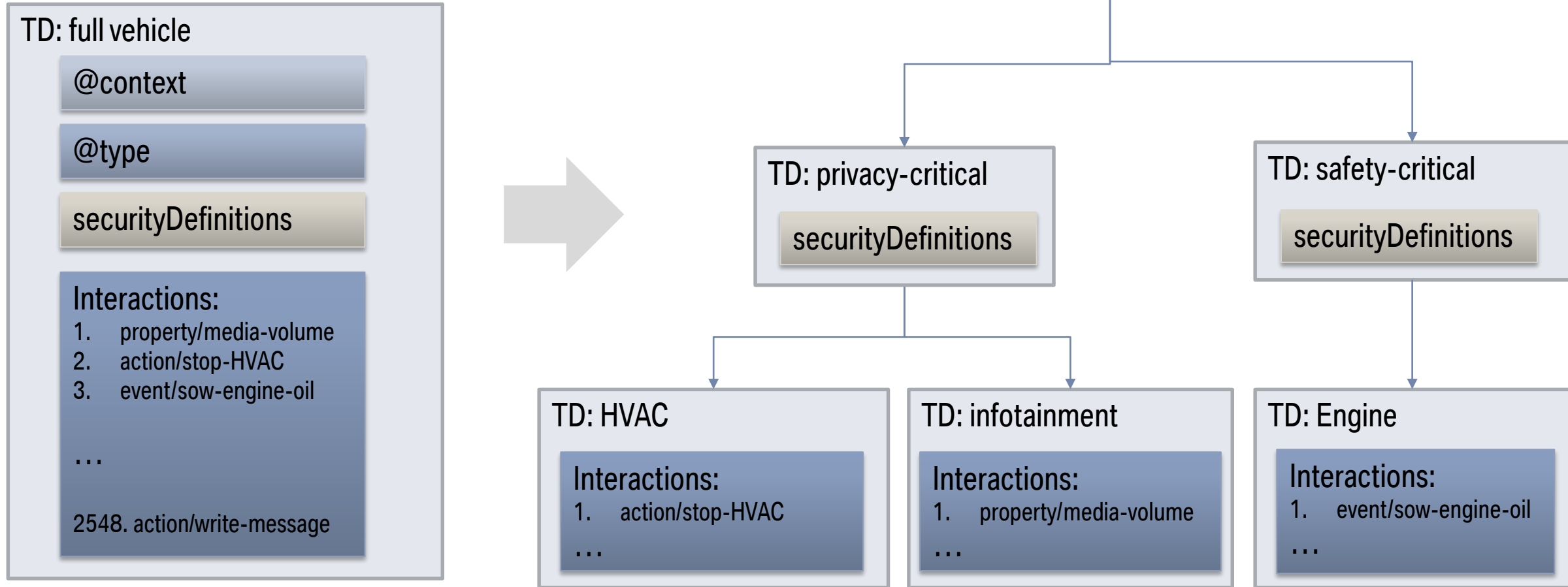
COMPLEX THINGS IN THE WOT (1)

Is a vehicle a Thing ? A network of things?



COMPLEX THINGS IN THE WOT (2)

Differing Safety, Security and Privacy ?



QUESTIONS ?

THANK YOU FOR YOUR ATTENTION

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📄 <https://fr.slideshare.net/BenjaminKlotz2>



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