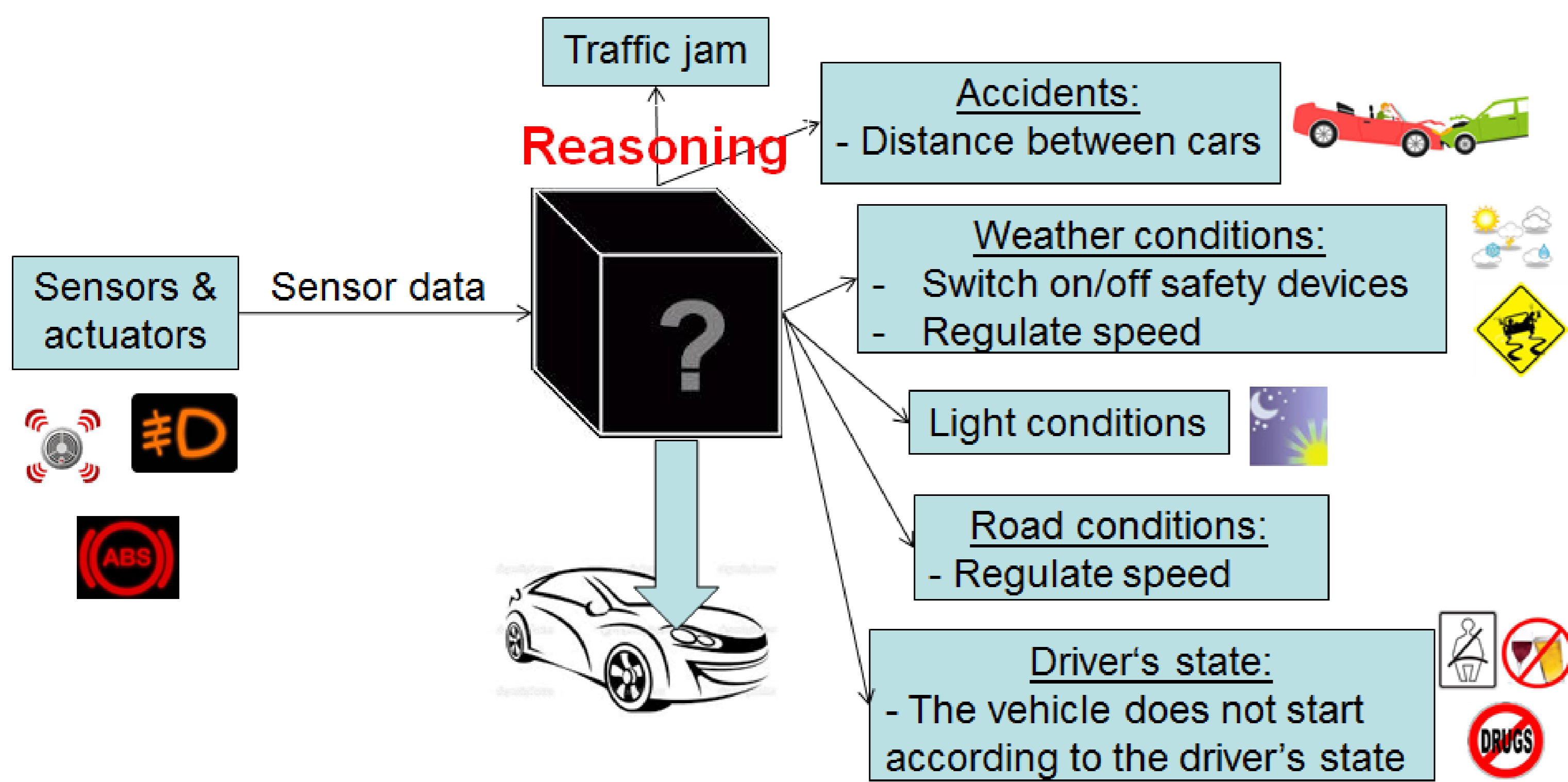


# Ontology-based Intelligent Transportation Systems

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## Motivating scenario



### To help develop generic sensor-based applications:

- Combine cross-domain data
  - E.g., weather & transportation & healthcare
- Reason on sensor data
- Change the actuator's state (on/off)
- Provide recommendations

## Related works

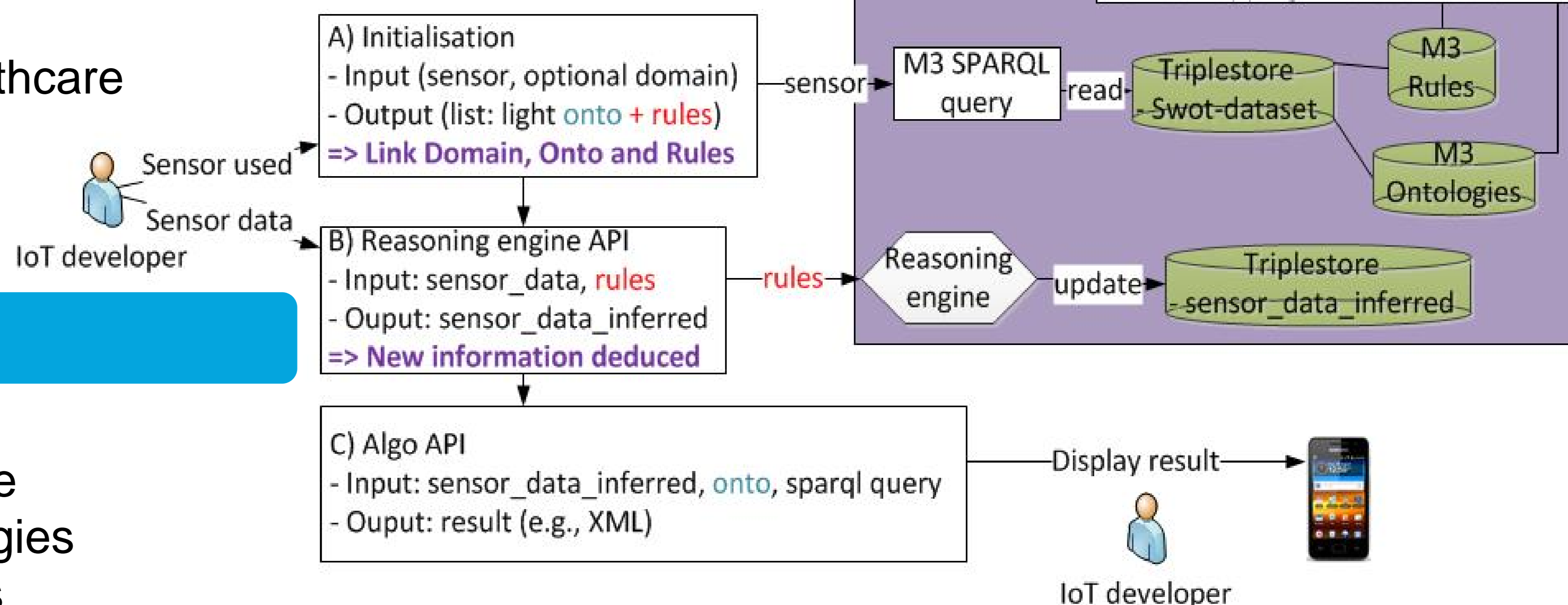
### Limitations of existing ontologies:

- Most of them are not available online
- Do not consider the previous ontologies
- Lack of semantic web best practices
- Lack of unified terms (etymology, synonyms)
  - Technical difficulties for interlinking ontologies

## The SWoT framework



- SWoT: Semantic Web of Things
- Automatically enrich sensor data with semantics
  - Converter SenML to RDF API
- Reuse the domain knowledge already designed
  - Sensor-based Linked Open Rules (LOR)
  - More than 200 sensor-based ontologies are referenced
- Machine-to-Machine (M3) ontology to describe sensor and measurements in a uniform way
  - M3 hub to combine cross-domains
- STAC application (Security) to choose security mechanisms to secure specific technologies



## Implementation

### Sensor-based Linked Open Rules

Sensors used in your application?

Sensors defined in the M3 ontology

Choose a sensor (e.g., accelerometer sensor)

Precipitation Sensor, Pluviom

Rules using this sensor (e.g., choose Wind speed):

Ontology-based reasoning

- Rule: SnowySpeedSafetyDevice, IF Snowy THEN hasSensor\_Speed = Low\_Speed AND hasSafety\_Device = (Snow\_Chains, ABS, ESP)  
Project: Ruta et al. 2010
- Rule: PotentiallyIcy, IF Precipitation GREATER\_THAN 0.1 mm AND temperature LOWER\_THAN 32 degF THEN PotentiallyIcy  
Project: Knoesis, SemSOS, Sheth, Henson et al. 2008-2009
- Rule: RainySpeedSafetyDevice, IF Rainy THEN hasSensor\_Speed = Low\_Speed AND hasSafety\_Device = (ABS, ESP)  
Project: Ruta et al. 2010
- Rule: NoPrecipitation, NoRain, IF Precipitation = 0 mm THEN NoPrecipitation  
Project: Paul Staroch, 2013

### More information about the SWoT framework:

- <http://www.sensormeasurement.appspot.com/>

### Technologies used:

- Semantic Web: OWL, RDF, RDFS, SPARQL, Jena.
- User interface: Java, Google Application Engine (GAE), HTML5, Javascript, AJAX, RESTful (Jersey)

## Conclusion & Future works

- SWoT framework to enrich sensor data with semantics and reason on them:
  - Reuse domain knowledge (ontologies, datasets and rules)
  - Security is also taken into account (STAC application)
- Future works:
  - SWoT integrated in constrained devices (e.g., RaspberryPi, mobile phones)
  - Semantic distributed storage and reasoning