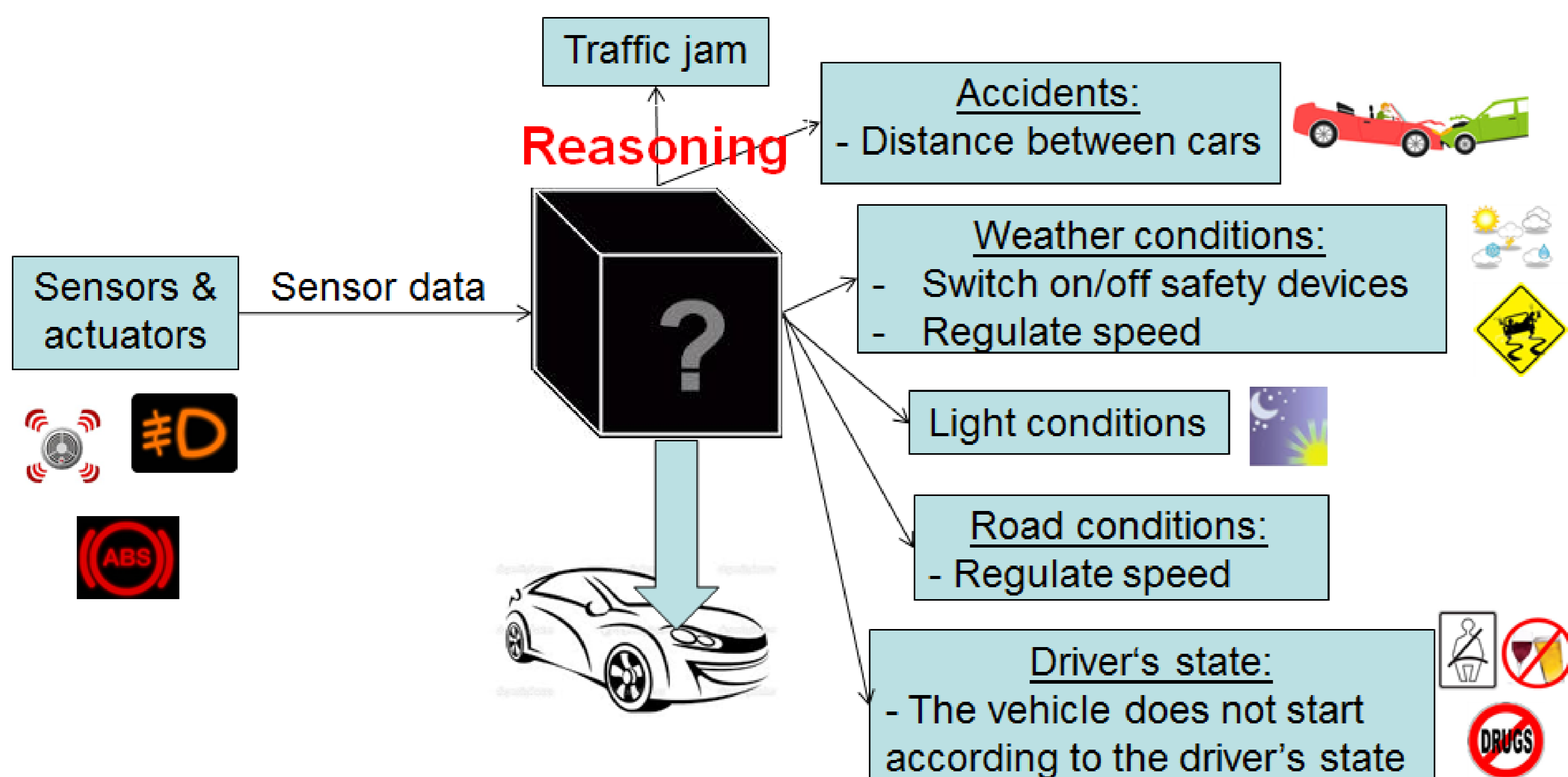


Ontology-based Intelligent Transportation Systems

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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

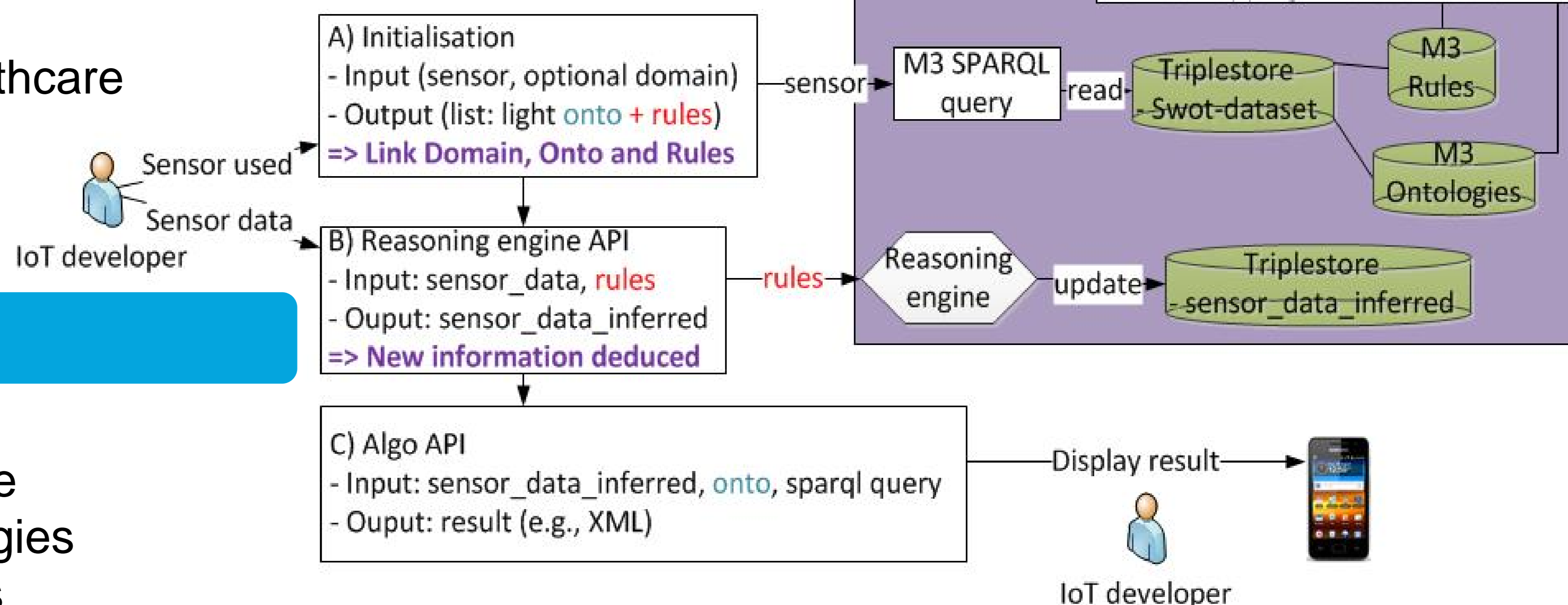
Limitations of existing ontologies:

- 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)

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

- 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