

LOWERING KNOWLEDGE: MAKING CONSTRAINED DEVICES SEMANTICALLY INTEROPERABLE

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CONTEXT: INTEROPERABILITY, A CHALLENGE FOR THE IOT

Interoperability stakeholders:
SDOs, consortiums, industrials, initiatives

Interoperability issues causes:
Number of devices, Silo-oriented approach

USE CASE: IOT DATA MANAGEMENT IN HOME AUTOMATION

WHY LOWERING IS NECESSARY
IoT devices are **constrained**, and richer knowledge necessary for interoperability is **heavy to process**

RELATED WORKS: DATA ENRICHMENT AND KNOWLEDGE LOWERING APPROACHES

Approach	Pros	Cons
Enriched data	- Interoperable - Alignable - Enable reasoning	- Costly processing - Consume bandwidth
Structured raw data	- Lightweight - Structured - Easy to parse	- Ad-hoc - not flexible

References: Sheth et al., 2008; Ferdinand et al., 2004; Bischof et al., 2012; Kopecký et al., 2007; Köpke et al., 2010; Seydoux et al., 2016

CORE CONTRIBUTION: REVERSING ENRICHMENT MAPPINGS VIA A PIVOT TREE

HYPOTHESES AND CONSTRAINTS ON THE TARGET FORMAT

Illustration with a fan command:

```

{
  "value": "on",
  "originator": {
    "acp": "internal",
    "poa": "http://..."
  }
}
    
```

- I The schema defines a tree-like structure
- II The root is mapped to a RDF class
- III Leaf relations are mapped to data properties
- IV Element inclusions are mapped to object properties

PRELIMINARY RESULTS

	Supported scenario	Code base	Execution time	Enables reasoning	Flexibility	Supported schema types	Mapping required
Direct schema transformation	Transformation only	Small	Fast	No	Low	Any	None
Schema transformation generation	Transformation only	Large	Fast	No	Medium	Annotated	Two-way
Two-way mapping	Transformation and lowering	Large	Slow	Yes	Important	Annotated	Two-way
Mapping reversal	Transformation and lowering	Large	Slow	Yes	Important	Annotated	One-way

VALIDATION OF THE REQUIREMENTS

- Context of the IoT
 - Tree-like data (XML, JSON) with explicit schemas
 - Existing applicable ontologies
- Validation on different data sources
 - Standards
 - Online API repository

WHAT IS THE BENEFIT OF OUR APPROACH?
Mapping work is cut in half for the developer, and constrained devices can be integrated in semantically enabled systems

FUTURE WORKS

- Integration of RAML-described REST interfaces
- Deployment with smart agents at a larger scale
- Scalability issues with distributed approaches