

2nd W3C Workshop on the Web of Things

Position Statement from ETSI ISG CIM

Contributors (and agreed by ETSI ISG CIM):

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Introduction

This position statement outlines the consensus view of the **ETSI ISG CIM** Group on future work on the *Web of Things* W3C standards. The goal of ISG CIM is to develop technical specifications and reports to enable multiple organisations to develop interoperable software implementations of a cross-cutting Context Information Management (CIM) Layer.

With the rapid development of technologies such as IoT, Big Data, AI, Semantic Web, complex workflow, autonomous decision making, etc., the need for interoperable sharing of information has increased massively in the past few years. A Context Information Management system offers a clearing-house for publishing, discovering, monitoring and manipulating data (and related metadata) which is evolving in time and space.

NGSI-LD Overview

NGSI-LD is a Group Specification developed by ISG CIM, intended to define a *core information model and accompanying REST API* to provide, consume and subscribe to context information in multiple scenarios (including federation) and involving multiple stakeholders. It enables close to real-time access to information coming from many different sources (not only IoT).

Figure 1 shows an RDF/RDFS based definition diagram of the NGSI-LD *core information model*. In the NGSI-LD information model, there are Entities, Properties and Relationships. Entities (instances) can be the subject of other Properties or Relationships. Properties can be seen as the combination of an attribute (property) and its value. Relationships allow establishing "links" between instances using JSON-LD conventions. Properties and Relationships can be the subject of other Properties or Relationships, which is made feasible by the definition of the NGSI-LD meta-model described in following diagram.

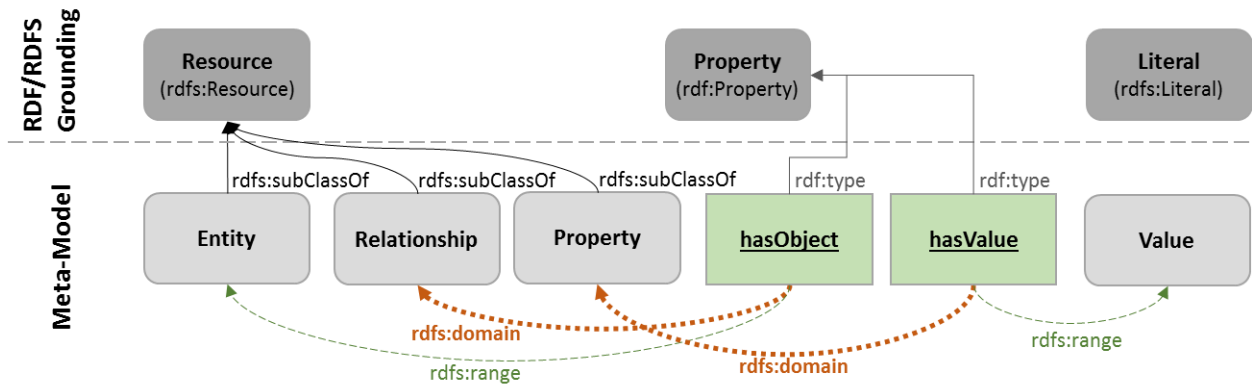


Figure 1 - The NGSi-LD Information Model

Figure 2 shows an instantiation example of the NGSi-LD information model. It conveys that there is an instance of an entity of type *Vehicle* which is parked at a certain parking garage (entity of type *OffStreetParking*). Different properties of these entities are provided and additional properties of properties or properties of relationships are described.

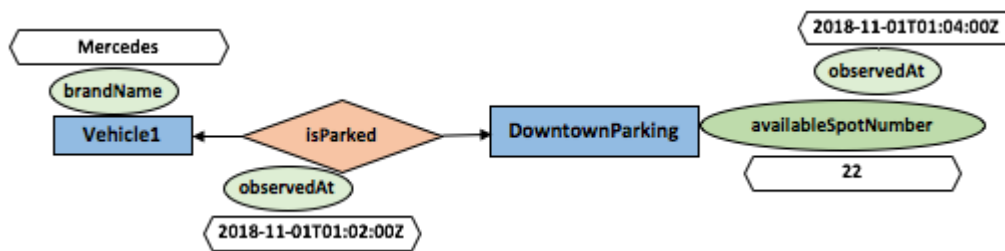


Figure 2 - NGSi-LD Instantiation example

Figure 3 shows the JSON-LD representation of one of the Entities conveyed in Figure 2.

```

{
  "id": "urn:ngsi-ld:OffStreetParking:DowntownParking",
  "type": "OffStreetParking",
  "availableSpotNumber": {
    "type": "Property",
    "value": 22,
    "observedAt": "2018-11-01T01:02:00Z"
  },
  "@context": [
    "http://uri.etsi.org/ngsi-ld/v1/ngsi-ld-core-context.jsonld",
    "http://example.org/ngsi-ld/parking.jsonld"
  ]
}

```

Figure 3 – JSON-LD representation of an Entity

Our Position – NGSI-LD interworking with Web of Things

First of all, ISG CIM welcomes the progress made and W3C's commitment in producing Web standards to challenge the IoT fragmentation, paving the way to semantic interoperability. Particularly, the *WoT Thing Description* Specification is definitely a right step towards semantic descriptions of IoT devices and services. In fact, we believe that those semantic descriptions, based on well-established W3C standards, can be a key pillar for interworking with NGSI-LD and Linked Open Data Platforms.

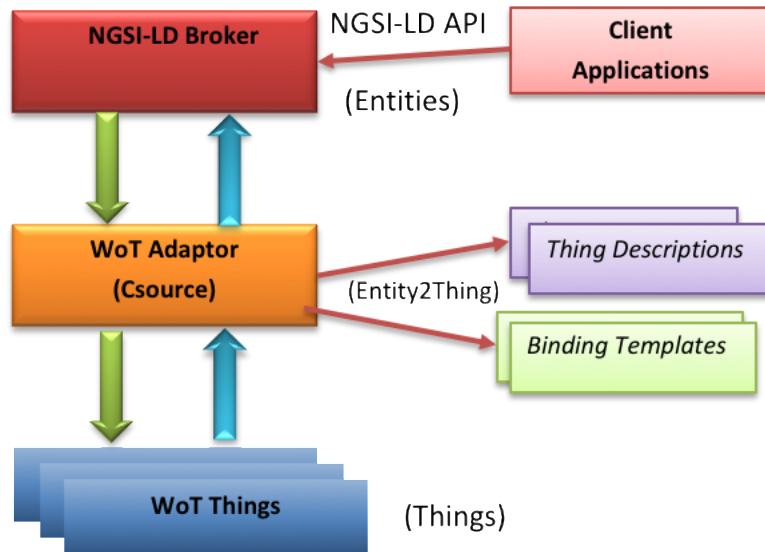


Figure 4 Interworking between NGSI-LD and WoT

The figure above shows a possible approach of an envisaged architecture intended to bridge NGSI-LD (at the context/information management layer of applications) and the Web of Things (at the IoT device and service layer). We propose, as a potentially feasible interworking mechanism, an “NGSI-LD-WoT Adaptor” element that can play a dual role:

- *NGSI-LD Context Source*, offering applications an NGSI-LD interface to publish, consume and subscribe to information (for instance, Properties or Events), offered by Things or “Thing aggregations”, abstracted as NGSI-LD Entities. Such Context Source could be federated (through NGSI-LD or other standard mechanisms) with other Linked (Open) Data sources.
- *WoT Servient*, playing both the role of a client and a server in the WoT domain, i.e. allowing applications to interact with Things or “Thing aggregations” (executing Actions) associated to NGSI-LD Entities, and to consume functionalities provided by Things, exposing them as/to NGSI-LD Entities. For instance, a WoT Property/Event can be exposed/propagated very easily as an Attribute of an NGSI-LD Entity.

The proposed interworking architecture could benefit from semantic annotations added to Thing Descriptions, for instance, conveying the feature of interest (NGSI-LD Entity) or other metadata

associated to a Thing. For that purpose, different ontologies such as iotschema.org and the W3C Semantic Sensor Network (SSN), can be helpful. Ultimately, our NGS-LD-based proposed bridge will enable to combine the best of breed of the Web of Things and the Linked Open Data domain, raising the level of awareness within both communities, opening a new world of possibilities in a promising, standards-based, ecosystem.

Conclusions and next standardization steps

We made a contribution that outlines how NGS-LD can interwork with the Web of Things. During the coming months, ISG CIM, in collaboration with open source communities, W3C and other stakeholders is planning to contribute to its further development.

Concerning next standardisation steps, ISG CIM is welcoming a renewed WoT Working Group focused on progressing towards Recommendation, additional specifications such as the Binding Templates, the Scripting API and/or an extended Thing Description.

About ETSI ISG CIM

ETSI ISG CIM is an Industry Specification Group on Context Information Management. The goal of ETSI ISG CIM is to develop technical specifications and reports to enable multiple organisations to develop interoperable software implementations of a cross-cutting Context Information Management (CIM) Layer. The current number of participants is around 25 with a wide diversity of organizations (Telecom operators, Cloud Service Providers, Research groups, etc.). The ETSI ISG CIM is expected to continue this work until at least 2021.

References

NGS-LD Specification

https://www.etsi.org/deliver/etsi_gs/CIM/001_099/009/01.01.01_60/gs_CIM009v010101p.pdf

iotschema.org

<https://iotschema.org>

W3C Semantic Sensor Networks

<https://www.w3.org/TR/vocab-ssn/>

Acknowledgements

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