



**SmartM2M;
SAREF publication framework reinforcing
the engagement of its community of users**

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Smart Machine-to-Machine communications (SmartM2M).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies the functional requirements for the publication framework of the SAREF ontology and its extensions. The publication framework provides a uniform documentation website for SAREF and its extensions such that (1) the documentation is designed for domain experts and software developers apart from documentation for ontology engineers, (2) industries can interact with the content, provide useful feedback to SAREF developers and suggest additions/modifications. Additionally, SAREF developers would get to know more about the SAREF community of users. Requirements for the publication framework aim at enabling industries to implement solutions with SAREF faster, and to reinforce the engagement of the community of users such that the SAREF developers can plan new evolutions of the current and future extensions.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TS 103 264 (V1.1.1): "SmartM2M; Smart Appliances; Reference Ontology and oneM2M Mapping".
- [i.2] ETSI TS 103 264 (V2.1.1): "SmartM2M; Smart Appliances; Reference Ontology and oneM2M Mapping".
- [i.3] ETSI TS 103 410-1 (V1.1.1): "SmartM2M; Smart Appliances Extension to SAREF; Part 1: Energy Domain".
- [i.4] ETSI TS 103 410-2 (V1.1.1): "SmartM2M; Smart Appliances Extension to SAREF; Part 2: Environment Domain".
- [i.5] ETSI TS 103 410-3 (V1.1.1): "SmartM2M; Smart Appliances Extension to SAREF; Part 3: Building Domain".
- [i.6] ETSI TS 103 410-4 (V1.1.1): "SmartM2M Extension to SAREF Part 4: Smart Cities Domain".
- [i.7] ETSI TS 103 410-5 (V1.1.1): "SmartM2M; Extension to SAREF; Part 5: Industry and Manufacturing Domains".
- [i.8] ETSI TS 103 410-6 (V1.1.1): "SmartM2M; Extension to SAREF; Part 6: Smart Agriculture and Food Chain Domain".
- [i.9] ETSI TR 103 411 (V1.1.1): "SmartM2M; Smart Appliances; SAREF extension investigation".
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- [i.14] Leo Sauermann and Richard Cyganiak: "Cool URIs for the Semantic Web", W3C Note, W3C, December 03 2008.
- [i.15] W3C Design issue: "Linked data", 2005.
- NOTE: Available at <http://www.w3.org/DesignIssues/LinkedData.html>.
- [i.16] W3C OWL Working Group: "OWL 2 Web Ontology Language Structural Specification and Functional-Style Syntax (Second Edition)", W3C Recommendation 11 December 2012. Technical report, W3C, 2012.
- [i.17] Pierre-Yves Vandenbussche and Bernard Vatant: "Metadata recommendations for linked open data vocabularies", Web document, 2012.
- [i.18] W3C OWL Working Group: "OWL 2 Web Ontology Language Document Overview (Second Edition)", W3C Recommendation 11 December 2012. W3C, 2012.
- [i.19] Martin, Philippe. 2000. Propositions of Conventions for RDF. May 28, 2000.
- NOTE: Available at <http://www.sop.inria.fr/acaeria/personnel/phmartin/RDF/conventions.html>.
- [i.20] D. Beckett, T. Berners-Lee, F. Prud'hommeaux, G. Carothers: "RDF 1.1 Turtle, Terse RDF Triple Language", W3C Recommendation 25 February 2014, W3C, 2014.
- [i.21] P. Y. Vandenbussche, G. Atemezing, M. Poveda-Villalón, B. Vatant: "Linked Open Vocabularies (LOV): a gateway to reusable semantic vocabularies on the Web". Semantic Web, 8(3), 437-452. 2017.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following term applies:

ontology: formal specification of a conceptualization, used to explicitly capture the semantics of a certain reality

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

EUREKA	European Research Coordination Agency
HTML	HyperText Markup Language
IoT	Internet of Things
IRI	Internationalized Resource Identifier
ITEA	Information Technology for European Advancement
JSON-LD	Javascript Simple Object Notation for Linked Data

OEG/UPM	Ontology Engineering Group/Universidad Politécnic de Madrid
OGC	Open Geospatial Consortium
OOPS	OntOlogy Pitfall Scanner
OPT	Option
OWL	Web Ontology Language
RDF	Resource Description Framework
REQ	Requirement
SAREF	Smart Applications REference ontology
SEAS	Smart Energy Aware Systems
SOSA	Sensor, Observation, Sample, and Actuator
SSN	Semantic Sensor Networks
STF	ETSI Specialist Task Force
TB	Technical Body
TR	Technical Report
TS	Technical Specification
URL	Universal Resource Locator
W3C	World Wide Web Consortium
XML	Extensible Markup Language

4 Specification of the SAREF publication framework

SAREF V2.1.1 [i.2] is a reference ontology for the IoT developed by ETSI SmartM2M in close interaction with the industry. SAREF contains core concepts that are common to several IoT domains and, to be able to handle specific data elements for a certain domain, dedicated extensions of SAREF have been created, for example SAREF4ENER [i.3], SAREF4ENVI [i.4], SAREF4BLDG [i.5], SAREF4CITY [i.6], SAREF4INMA [i.7], SAREF4AGRI [i.8]. Each domain can have one or more extensions, depending on the complexity of the domain. As a reference ontology, SAREF serves as the means to connect the extensions in different domains. The earlier document ETSI TR 103 411 [i.9] specifies the rationale and methodology used to create, publish and maintain the SAREF extensions.

The value of SAREF is strongly correlated with the size of its community of users; therefore the SAREF ontologies should be available on the Web. As such, SAREF users and the industry actors need to be attracted to SAREF with clear documentation and a clear indication about how to provide their input and the kind of input that they can provide.

The ETSI members that contribute to SAREF will therefore be able to get benefit from feedback coming from its open community of industrial users, to better plan new evolution of the current and future extensions, and to reduce the costs of developing these extensions. That being said, the development and monitoring of SAREF lies in ETSI's hands to ensure that high quality standards are met, and users that provide feedback have to understand the implication in terms of IPR. The publication and/or use of such feedback has to therefore be controlled by ETSI, but the possibility to provide feedback will be open to the world.

The present document has been developed in the context of the STF 556 (<https://portal.etsi.org/STF/STFs/STFHomePages/STF556.aspx>), which was established with the goal to consolidate SAREF and its community of industrial users based on the experience of the EUREKA ITEA 12004 SEAS (Smart Energy Aware Systems) project. The present document specifies the SAREF publication framework to reinforce the engagement of its community of users and to enable them to implement solutions with SAREF faster.

5 Related initiatives

In this clause, some of the main related initiatives in terms of modelling reference ontology patterns for the IoT, and using these ontology patterns to develop ontologies, are reviewed:

- **EUREKA ITEA 12004 SEAS:** The SEAS ontology is a modular and versioned ontology with all the terms it defines having the same namespace (<https://w3id.org/seas/>). It contains a core of SEAS reference ontology patterns that can be instantiated to create the SEAS ontology itself with a homogeneous and predictable structure for the modelling and the description of any kind of engineering-related data/information/systems. These design patterns and some of their instances fill some of the representational gaps that were identified in SAREF.

- **OnToology:** OnToology [i.10] is an on-line application developed and maintained by OEG/UPM that exploits GitHub capabilities to ease collaborative ontology (or OWL vocabulary [i.18]) development focusing on ontology documentation (HTML, diagrams, or JSON-LD context generation), evaluation and publication (using permanent URLs). OnToology reuses existing software to carry out the above-mentioned activities orchestrating the transition between activities and centralizing the resource exchange in GitHub rather than exporting and importing files in a number of different systems. OnToology integrates existing services such as Widoco for ontology documentation, AR2DTool for diagram generation and OOPS! for ontology evaluation. For ontology publishing, OnToology provides support for publishing ontologies using w3id permanent IRLs and also for generating the content negotiation files needed to deploy an ontology in local servers. It is worth noting that OnToology does not require any installation process to be carried out by users as it is provided as an online application that can be accessed and used with a GitHub account. OnToology is available at <http://ontoology.linkeddata.es/>.
- **Vocol:** The VoCol system [i.11] aims at supporting collaborative vocabulary development, inspired by agile software and content development methodologies, and using Git repositories to maintain the vocabulary-related artefacts. VoCol provides support for project management, quality assurance, documentation and visualization components. It also provides a complete encapsulated framework to publish ontologies and their documentation, relying on the user to deploy them.

6 Actors and use cases

6.0 Introduction

The following list shows the different actors and the use cases that each actor could carry out through the ontology development platform. The actors are organized into the following categories: Development actors, Steering actors and Community actors.

6.1 Development actors

Developer: A developer is a member of the ontology development team who has high knowledge about ontology development and rights to modify the ontology and interact in the development cycle.

The use cases of the developer are the following:

- Create ontology
- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Update ontological requirements
- Manage requirements (accept, discard, prioritize, plan, etc.)
- Update ontology (commit)
- Generate ontology documentation: HTML, diagrams, examples, requirements
- Configure ontology publication
- Evaluate ontology (requirement testing and bad practices detection)
- Visualize existing ontologies
- Search ontology terms in existing extensions
- Plan development sprints
- Report change request
- Access ontology development status (through metrics)

Reviewer: A reviewer is a member of the ontology development team who has knowledge about ontology development and the ontology needs for a given project. This role has decision rights about what contributions can be included in the ontology.

The use cases of the reviewer are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Review and discuss contributions (in terms of change requests on the ontology artefacts)
- Approve contributions (and update the corresponding artefacts)

Validator: A validator is a member of the ontology development team who has domain knowledge about the ontology needs for a given project. This role provides new requirements to the ontology and validates whether they are satisfied or not when implemented.

The use cases of the validator are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Insert ontological requirements
- Validate ontological requirements

Domain expert: A domain expert is an expert in the domains covered by the ontology. This role does not need to be knowledgeable about ontology development.

The use cases of the domain expert are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Insert ontological requirements
- Validate ontological requirements
- Review and discuss contributions

Project leader: A project leader is the person in charge of the ontology project who carries out the project management tasks. This actor usually has experience in ontology development projects.

The use cases of the project leader are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Set up project configuration
- Manage (accept, assign, discard, etc.) issues
- Manage requirements (accept, discard, prioritize, plan, etc.)
- Plan development sprints
- Add ontology to the SAREF community portal
- Update the SAREF community portal
- Generate release of the ontology (publish ontology)

6.2 Steering actors

Steering board member: A steering board member belongs to the group of persons in charge of steering the ontology development, the community involvement and the underlying infrastructure.

The use cases of the steering board member are the following:

- Monitor project
- Access ontology development status (metrics)
- Approve project proposal
- Identify ontologies overlap
- Access ontology users list

6.3 Community actors

Ontology user: An ontology user is a potential end user of the ontology. This actor also includes software developers that will make use of the ontology within their applications.

The use cases of the ontology user are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Access user oriented documentation (tutorials, guidelines, etc.)
- Access available conformance results for the standards
- Ontology suggestion based on ontological requirements
- Search ontology terms in the ontology and its existing extensions
- Report change request
- Register as user of the ontology
- Report usage of the ontology

Contributor: A contributor is a person external to the project who is knowledgeable about the ontology domain and proposes contributions.

The use cases of the contributor are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Propose contribution
- Report change request

Interested party: An interested party is an individual related to the domain of the ontology who could be, among others, industry stakeholders, researches, domain experts, etc.

The use cases of an interested party are the following:

- Access ontology development artefacts (ontology code, documentation, tests, etc.)
- Report change request
- Access ontology users list
- Access ontology project metrics (includes contributors, number of sprints, requirements, ontology metrics, users, analytics, etc.)
- Subscription to notifications and news

Project proposer: A person interested in proposing a new ontology project.