



# ASSESSMENT SUMMARY v1.0.0

Smart Applications Reference Ontology (SAREF)<sup>1</sup>

European Telecommunications Standards Institute (ETSI)<sup>2</sup>

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<sup>1</sup> Smart Applications Reference Ontology (SAREF): <https://saref.etsi.org/core/v3.1.1/>

<sup>2</sup> ETSI: <https://www.etsi.org/>

# Change Control

Modification		Details
Version 1.0.0		
Initial version		

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## 1. INTRODUCTION

The present document is a summary of the assessment of **SAREF** carried out by CAMSS using the CAMSS EIF assessment scenario. The purpose of this scenario is assessing the compliance of a standard or specification with the European Interoperability Framework (EIF)<sup>3</sup>.

## 2. ASSESSMENT SUMMARY

The Smart Applications Reference Ontology (SAREF) is a standard intended to enable interoperability between solutions from different providers and among various activity sectors on the Internet of Things (IoT), thus contributing to the development of the global digital market. As an ontology, its purpose is inherently related to semantic interoperability. Ontologies play a crucial role in achieving semantic interoperability.

ETSI is a European Standards Organization (ESO). They are the recognized regional standards body dealing with telecommunications, broadcasting and other electronic communications networks and services. They have a special role in Europe. This includes supporting European regulations and legislation through the creation of Harmonised European Standards. Only standards developed by the three ESOs (CEN, CENELEC and ETSI) are recognized as European Standards (ENs).

### 2.1 Interoperability Principles

Interoperability principles are fundamental behavioural aspects that drive interoperability actions. They are relevant to the process of establishing interoperable European public services. They describe the context in which European public services are designed and implemented. The specification specifically addresses interoperability in cloud computing, which can be extremely useful in eGovernment by enhancing data portability, increased efficiency and integrity.

***The specification does not support the principles setting context for EU actions on interoperability:***

- **Subsidiarity and proportionality**

SAREF is not included in any national catalogue of recommended specifications whose Member State NIF has a high performance on interoperability according to NIFO factsheets.

***The specification partially supports the principles setting context for EU actions on interoperability:***

- **Openness**

SAREF is designed to facilitate the publication of data on the web, particularly in the context of the Internet of Things (IoT). This standardisation promotes interoperability and facilitates the sharing and publication of data on the web in a consistent and understandable manner.

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<sup>3</sup> European Interoperability Framework (EIF): [https://ec.europa.eu/isa2/eif\\_en](https://ec.europa.eu/isa2/eif_en)

This Technical Specification (TS) has been produced by ETSI Technical Committee Smart Machine-to-Machine communications (SmartM2M)<sup>4</sup>. The participation in the technical group is reserved to ETSI members, who require registration, fees, and membership approval. ETSI (European Telecommunications Standards Institute) typically follows a policy of providing fair, reasonable, and non-discriminatory (FRAND) licensing for its standards. SAREF is currently in its 3.1.1 version thus, major releases have been published. In addition, public documentation has been published about its supporting process, specifically related to change history<sup>5</sup> and issues regarding every version. This specification is being directly used to create innovative solutions. For instance, it is included in AgroPortal<sup>6</sup>, the homepage of ontologies and semantic artefacts in agri-food and related domains.

- **Transparency**

While SAREF's scope is not explicitly directed towards administrative procedures, rules data, and services, the use of ontologies in general, including SAREF, can contribute to certain aspects of visibility in administrative procedures and related domains if they happen to describe smart appliances. The exposure of interfaces to access public administration's services typically falls within the domain of service-oriented architectures, web services, and related standards. While SAREF itself does not explicitly address the exposure of interfaces, it provides the semantic foundations for better communication between interfaces, although these later depend on other technologies.

- **Reusability**

SAREF is primarily designed for representing the semantics of smart appliances in the context of the Internet of Things (IoT). While its initial focus is on the domain of smart appliances, the ontological principles it employs, combined with its extensibility features, allow for potential usage beyond the business-specific domain of smart appliances.

- **Technological neutrality and data portability**

SAREF itself is designed to be technology and platform agnostic in the sense that it focuses on providing a standardised and semantically rich representation for smart appliances in the context of the Internet of Things (IoT), without being tied to specific implementation technologies or platforms. The specification is designed to be modular and extensible, allowing for partial implementations based on specific use cases and requirements. While SAREF itself is not explicitly designed for data portability, it contributes to broader interoperability goals within the IoT domain as it provides a common formal language for smart appliances. Standardising and structuring IoT data enables an easier and more efficient data portability across different systems and domains in the IoT ecosystem.

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<sup>4</sup> ETSI Technical Committee SmartM2M: <https://www.etsi.org/committee/smartm2m>

<sup>5</sup> SAREF Change Management: <https://labs.etsi.org/rep/saref/saref4auto/-/commits/prerelease-v1.1.1/>

<sup>6</sup> AgroPortal SAREF: <https://agroportal.lirmm.fr/ontologies/SAREF>

***The specification partially supports the principles related to generic user needs and expectations:***

- **User-centricity**  
SAREF is designed to support the reuse of relevant information when needed. The principle of reuse and alignment of concepts and relationships are embedded in SAREF, contributing to the ability to reuse information effectively across different contexts and applications within the domain of smart appliances and the Internet of Things (IoT).
- **Inclusion and accessibility**  
The purpose of SAREF is not related to e-accessibility. Therefore, this criterion is considered not applicable to this specification.
- **Privacy**  
SAREF, which is an ontology related to IoT appliances, is not related to privacy matters in any way. Therefore, this criterion is considered not applicable to this specification.
- **Security**  
The standardised terms and concepts within SAREF can facilitate clearer communication and understanding between systems, which is beneficial for secure data exchange protocols. Nevertheless, SAREF is not related to enabling the secure processing of data nor the authentication of roles agents involved in the data transactions. Also, the responsibility for ensuring data processing accuracy lies with the implementers and the systems that use SAREF, which is not related to providing an access control mechanism either.
- **Multilingualism**  
SAREF is designed to be compatible with a multilingual context to some extent. This specification allows the use of labels and annotations for concepts, properties, and individuals. These labels can be provided in multiple languages to support a multilingual environment. Implementers can use language tags or annotations to indicate the language of the labels.

***The specification fully supports the foundation principles for cooperation among public administrations:***

- **Administrative Simplification**  
While SAREF can simplify the delivery of European public services regarding the IoT sector, it may not directly simplify it across all sectors. The delivery of European public services typically involves a broader range of domains and sectors, including governance, healthcare, education, transportation, and more. In summary, by providing a standardised framework for IoT devices and applications, it can provide an efficient way of exchanging and communicating data on different platforms, improving processes related to the delivery of public services.

- **Preservation of information**

SAREF indirectly aids in long-term preservation by providing a standardised way to describe the functionalities and interactions of smart appliances in the context of the IoT, facilitating its accessibility and understanding over time.

- **Assessment of effectiveness and efficiency**

The effectiveness and efficiency of SAREF is often evaluated through various means, including practical implementation and scalability. For instance, a 2018-paper<sup>7</sup> by the Ontology Engineering Group from Universidad Politécnica de Madrid asserts that the SAREF ontology represents a reference model for smart appliances. Another 2020-paper<sup>8</sup> for the Applied Ontology Journal explains the need for interoperability of IoT healthcare applications and the role of standardised ontologies to achieve semantic interoperability. Furthermore, there is a first attempt to extend SAREF for specific e-Health use cases related to ECG data.

## 2.2 Interoperability Layers

The interoperability model which is applicable to all digital public services includes:

- Four layers of interoperability: legal, organisational, semantic, and technical.
- A cross-cutting component of the four layers “integrated public service governance”.
- A background layer, “interoperability governance”.

***The Specification supports the implementation of digital public services complying with the EIF interoperability model:***

- **Interoperability Governance**

At the time of elaborating this assessment, this specification is included in the Controlled Vocabulary ABB in the current European Library Of Specifications (ELIS). It is also included in the Ontology ABB, specifically the "Semantic View" layer. Most ETSI test specifications are developed according to ISO/IEC 9646. This standard provides an excellent basis to produce high-quality test frameworks and specifications.

Even though SAREF is not included in any Member State’s ICT Catalogues nor in any repository/catalogue of standards at national level, the specification is part of InterConnect<sup>9</sup>, which aims to develop and demonstrate advanced solutions for connecting and converging digital homes and buildings with the electricity sector. Furthermore, SAREF is also included in the European Catalogue of ICT Water Standards and Specifications<sup>10</sup>.

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<sup>7</sup> Extending the SAREF ontology for building devices and topology: <https://ceur-ws.org/Vol-2159/02paper.pdf>

<sup>8</sup> SAREF4health - Towards IoT standard-based ontology-driven cardiac e-health systems:

<https://content.iospress.com/articles/applied-ontology/ao200232>

<sup>9</sup> InterConnect Project: <https://interconnectproject.eu/>

<sup>10</sup> European Catalogue of ICT Water Standards and Specifications:

<https://digital-strategy.ec.europa.eu/es/node/796>

- **Legal interoperability**

ETSI is a European standards development organisation, and as such, all the specifications developed within the organisation are available and can be accessed through its website repository. Therefore, SAREF is a European Standard.

- **Organisational interoperability**

While SAREF itself is not explicitly intended for modeling business processes, it can be part of a broader ecosystem that includes tools and standards for modeling and managing business processes. In contrast, the use of a shared ontology like SAREF can significantly reduce complexities and barriers in establishing interoperable systems across organizational boundaries. SAREF can be used to technologically maintain a single consistent definition of various concepts in the IoT domain, which can facilitate interoperability agreements in that field.

- **Semantic Interoperability**

SAREF is maintained by the European Telecommunications Standards Institute (ETSI), a European Standards Organization (ESO) that is recognised as the regional standards body dealing with telecommunications, broadcasting and other electronic communications networks and services. ETSI has created a specific community for users to discuss about SAREF and report possible bugs<sup>11</sup>.

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<sup>11</sup> SAREF Discussion Forum: <https://labs.etsi.org/rep/saref/>



### 3. ASSESSMENT RESULTS

This section presents an overview of the results of the CAMSS assessments for the **SAREF**. The CAMSS “Strength” indicator measures the reliability of the assessment by calculating the number of answered (applicable) criteria. On the other hand, the number of favourable answers and the number of unfavourable ones is used to calculate the “Automated Score” per category and an “Overall Score”.

Category	Automated Score	Assessment Strength	Compliance Level
Principles setting the context for EU actions on interoperability	20/100 (20%)	100%	Ad-hoc
Core interoperability principles	1420/1700 (83%)	94%	Seamless
Principles related to generic user needs and expectations	1000/1200 (83%)	42%	Seamless
Foundation principles for cooperation among public administrations	460/500 (92%)	100%	Seamless
Interoperability layers*	820/1000 (82%)	100%	Seamless
Overall Score	2920/3700 (79%) <sup>12</sup>	82%	

*\*The technical interoperability layer is covered by the criteria corresponding to the core interoperability principle "Openness".*

With an 82% of assessment strength, this assessment can be considered representative of the specification compliance with the EIF principles and recommendations.

The Overall Automated Score of 79% (2920/3700) demonstrates that the specification supports the European Interoperability Framework in the domains where it applies.

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<sup>12</sup> See the “results interpretation” section of the CAMSS Assessment EIF Scenario Quick User Guide: <https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/camss-assessment-eif-scenario/results-visualisation-and-interpretation>