

# Report on the SAREF4CITY Validation Workshop at the IoT Week 2018

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SAREF is a reference ontology for the Internet of Things that has been published as an ETSI Technical Specification and includes dedicated extensions to specific domains (currently energy, buildings and environment). In 2017, a Specialist Task Force (STF) was requested by ETSI and the European Commission to further extend SAREF to new domains, including smart cities (<https://portal.etsi.org/STF/stfs/STFHomePages/STF534>). The STF will result, among others, in an ETSI Technical Report that describes the requirements for the extension of SAREF for smart cities (final draft planned for June 2018) and an ETSI Technical Specification that specifies the extension itself, from here on SAREF4CITY, (final draft planned for February 2019).

To that end, the STF team initiated a number of interactions with relevant stakeholders in the smart city domain with the goals of 1) creating awareness about the STF and 2) collecting background information and requirements to be used to develop the SAREF extension.

In the smart city domain, the team has elaborated a considerable number of requirements by performing a reverse engineering process on existing standards, data models, ontologies, and data sets.

Before the publication of the Technical Report with the requirements, the STF team carried out different initiatives to validate such requirements with different stakeholders, such as the SAREF4CITY Validation workshop that took place on June 4<sup>th</sup>, from 11:15 to 18:00 during the IoT Week 2018 at Bilbao.

The attendants (from 15 to 21, depending on the session) included a mix of stakeholder representatives ranging from public administrations to industry passing by academy.

The workshop was organized into three sessions of 105 minutes each, in which a balance of presentations about SAREF and SAREF4CITY and practical activities involving all participants were planned. More precisely, the sessions were organized as follows:

- Preparation
  - Introduction
  - Overview of SAREF (presentation)
  - **Use cases presentation by participants (all participants)**
  - Overview of SAREF4CITY (presentation)

- **Working groups creation (all participants)**
- Working session 1
  - Introduction to working session 1 (presentation)
  - **Identification of main entities in use cases (all participants)**
  - **Outcomes of working session 1 (all participants)**
- Working session 2
  - Introduction to working session 2 (presentation)
  - Presentation of SAREF4CITY requirements (presentation)
  - **Requirements validation (all participants)**
  - **Outcomes of working session 2 (all participants)**
  - Conclusions and future steps (presentation)

## Preparation

During the first session, the SAREF ontology, the existing SAREF extensions and the ongoing efforts for the development of the new extensions as well as the planned timeline were presented.

Participants were asked to bring to the workshop their use cases for SAREF4CITY and in a dedicated slot two participants presented the use cases to the audience:

- Joao García (Ubiwhere) presented different types of smart city use cases and provided details on a use case from the H2020 Symbiote project on smart mobility and ecological urban routing.
- Keith Dickerson (Climate Associates) presented the use cases identified in the AIOTI WG8 and provided details on a couple of them on air quality monitoring, traffic routing and road pricing and on smart parking and assisted living, coming from the H2020 VICINITY project.

The workshop organizers presented the three use cases to be used during the workshop, based on the ones provided by the participants (Use case 1 - e-Health and Smart parking; Use case 2 - Air quality monitoring and mobility; Use case 3 - Street Lighting, Air Quality Monitoring and Mobility) and the session ended with the assignment of participants into three groups to work together for the rest of the workshop.

Some of the discussions during this session dealt with the SAREF ontology itself: how can people know about the current status of the ontology and its extensions, how can these ontologies be integrated with other ontologies or with existing systems, how can SAREF support the interchange of security and privacy data, etc. This highlighted the need for increasing the awareness of SAREF, for coordinating with stakeholders, and for providing guidelines for its usage.

Regarding the use cases, it was highlighted the lack of expertise in the industry with ontologies and the need to identify clear interoperability points and to show by example the benefits of aiming for semantic interoperability. This is something that AIOTI WP3 is trying to address in a white paper under development.

During the discussions it was clear that the concept of smart city is a fuzzy one, but the idea is to aim for cross-domain use cases that involve IoT (i.e., those ones where smart city and IoT use cases overlap). In any case, it is expected that different use cases will require different levels of abstraction and different granularity. Therefore, any solution should cover these needs and reuse existing work.

## Working session 1

The main goal of the first working session was to validate the use cases selected for the development of the SAREF4CITY extension as well as the domains extracted from such use cases and the analysed existing models. Furthermore, another aim was to make participants knowledgeable about the use cases before being confronted with the requirements for SAREF4CITY.

For doing so, participants were provided with a use case description per group and the list of domains identified by the STF team. During the working session, participants were asked to identify entities and domains in the use cases, to propose those entities or agents missing in the use case definition, and to provide general feedback about the use case.

The main observations noted by participants during working session 1 can be summarized as follows:

- Additional 2nd-level stakeholders could be taken into account, such as: different types of regulators (e.g., traffic, air quality), emergency services, public/private transport, citizens, big service providers (e.g., Google), ESCOS and other energy-related stakeholders, media, people making forecasts, autonomous driving, etc.
- Emergency events are important entities to be considered in smart city use cases.
- Include those infrastructures (devices + cyber physical systems) that are relevant in the use cases.
- Take into account user categories and user profiling, especially important for the eHealth use cases in which habits and daily life activities should be considered.
- The information about a person is constantly changing, so historical information should be taken into account, e.g., evolution of patient characteristics over time.

## Working session 2

During the second working session the goal was, once the participants had their own view on the use cases and on potential requirements, to validate the ontology requirements previously extracted by the STF team for the following domains in the context of smart cities: administrative area, topology, city object, events, public service and Key Performance Indicator (KPI).

For doing so, the participants were provided with a set of tables (one per domain) in which each row corresponded to one of the requirements identified for each domain. Participants were asked to rank the relevance of each requirement (from “1 - not relevant” to “5 - highly relevant”) taking into account the use case assigned to their group.

The main observations noted by participants during working session 2 can be summarized as follows:

- From all the domains presented, topology, city services, and events are usually the most relevant ones independently of the use case.
- There should be information about KPIs ownership and maintenance. Also, it has to be taken into account that KPIs of cities and of citizens are different; KPIs related to citizens could be level of autonomy or happiness.
- Temporal information is relevant, and there will be different types of events for different stakeholders. The situation in a city will change over time, so information should be timestamped. Besides, events that repeat over time should be taken into account.
- Device deployment information is important (i.e., to define the connection between devices and city objects. Furthermore, the location of objects is often not fixed.
- The meaning of a specific region/area/etc. can be open to different interpretations.
- A public service does not need to be provided by the government (e.g., it can be provided by some company); it is better to talk about services in general.
- Social concepts such as ethics, dignity, or privacy are missing.
- Some cases were identified about requirements that are not relevant for every use case or about requirements that may be misunderstood and should be reviewed so they are unambiguous.

## After the workshop

Thanks to the invaluable support of the workshop participants, the use cases and requirements for SAREF4CITY were refined and validated. According to the feedback obtained during the workshop, the ontology requirements were updated through the following actions:

- Some requirements that were scored as “no relevant” by participants were discarded.
- Some requirements were identified as duplicated and only one requirement was kept.
- Requirements referring to regional particularities were discarded, for example the modelling of “province” information.
- The description of some requirements was simplified or clarified.
- New requirements were identified.

## Attendants

<b>Name</b>	<b>Surname</b>	<b>Organization</b>
Miguel Angel	Anton	Tecnalia
Martin	Bauer	NEC
Laura	Daniele	TNO
Keith	Dickerson	Climate Associates
Francisco Javier	Diez	IK4-Tekniker
Iker	Esnaola	IK4-Tekniker

Lindsay	Frost	NEC
João	Garcia	Ubiwhere
Raúl	García-Castro	UPM
Mike	Gligoor	P@ssport Holland
Patrick	Guillemin	ETSI
Antonio	Kung	Trialog
Felix	Larrinaga	Mondragon University
Wenbin	Li	Easy global Market
Svetoslav	Mihaylov	European Commision
Vinicius	Oliveira	CPqD
María	Poveda-Villalón	UPM
Juan	Rico	ATOS
Natalie	Samovich	Enercoutim
Ricardo	Vitorino	Ubiwhere
Katarzyna	Wasielewska	Systems Research institute PAS

## Pictures











