IoT Conference 2023

The SAREF EN
Ontologies to Support Digital and Green Transformation

Presented by: Joachim Koss
JK Consulting & Projects

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Agenda

- **Introduction**

- **What is SAREF?**

- **The SAREF EN (European Norm)**

Introduction – Setting the Scene

- Facts:
  - Fragmentation of the IoT ecosystem in terms of standardization, architectures and available technologies and IoT service platforms.

  - Increasing number of IoT devices located in different IoT networks generate greater quantities of data to be shared across the IoT

  - Existing solutions target specific applications or application domains and there is no easy way of sharing information between the resulting silos

- Challenge:
  - A solution to enable interoperability across information silos

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Introduction – Setting the Scene

- Keys:
  - Several levels of interoperability identified by the existing literature
    - Technical Interoperability (connectivity, network)
      Usually associated with hardware/software components that enable communication. It is about how the information is transported across multiple communication networks and the protocols needed.
    - Syntactic Interoperability
      Usually associated with data formats. Messages transferred by communication protocols and their payload need to have a well-defined, agreed syntax and encoding
    - Semantic Interoperability
      Associated with the meaning of the content that is exchanged. This requires agreement on common concepts and their relationships
    - Organizational Interoperability
      Ability of organizations to effectively communicate and transfer meaningful information among a variety of different information systems and infrastructures. Organizational interoperability depends on successful technical, syntactic and semantic interoperability
  - **Semantic interoperability** is a key element of the digital transformation
  - **Cross-sector semantic interoperability** is a key to assure the evolution of the IoT and the related services to human markets

Source: Semantic IoT Solutions - A Developer Perspective, Semantic Interoperability White Paper by Martin Bauer
https://www.researchgate.net/publication/336679022

Introduction – Setting the Scene

- Goals:

  - Foster cross-domain exchange of measurements and data

  - Open and standardised interfaces among networked devices of different brands to interoperate to avoid vendor-lock in

  - Abstract from specific details of individual standards and create an abstraction layer based on a commonly agreed semantics with a high level model - a reference ontology

> SAREF standardisation is crucial to provide a common methodology for the ontologies integration, that are a key part of Artificial Intelligence and Digital Twin technologies applications

What is SAREF?

What is SAREF? (1)

- In year 2013 European Commission launched the first initiative to build a common ontology in close collaboration with the Smart Appliances industry, which resulted into the creation of the **S**mart **A**ppliances **REF**erence ontology (SAREF).

- During the next 10 years a SAREF main core and 11 extensions have been developed under stimulus and continuous support of the EU Commission in collaboration with ETSI, which address the following domains:
  - Energy, Environment, Building, Smart Cities, Industry and Manufacturing, Smart Agriculture and Food Chain, Automotive, eHealth/Ageing-well, Wearables, Water and Lift ➤ name change: Smart Applications REFerence

- In order facilitate the SAREF suite of ontologies and to enable the SAREF community and industry stakeholders to contribute directly to the SAREF evolution facilitate and support further accompanying tools have been developed in ETSI:
  - SAREF community portal (https://saref.etsi.org/)
  - SAREF development framework and workflow including the SAREF source repository (https://labs.etsi.org/rep/saref/) and pipeline (https://labs.etsi.org/rep/saref/saref-pipeline/)

What is SAREF? (2)

ETSI

The Smart Applications REFerence ontology (SAREF) developed and maintained by ETSI since 2015 provides a mature, sustainable and standardised framework of ontologies for IoT that enables different parties to interoperate with each other at the semantic level.
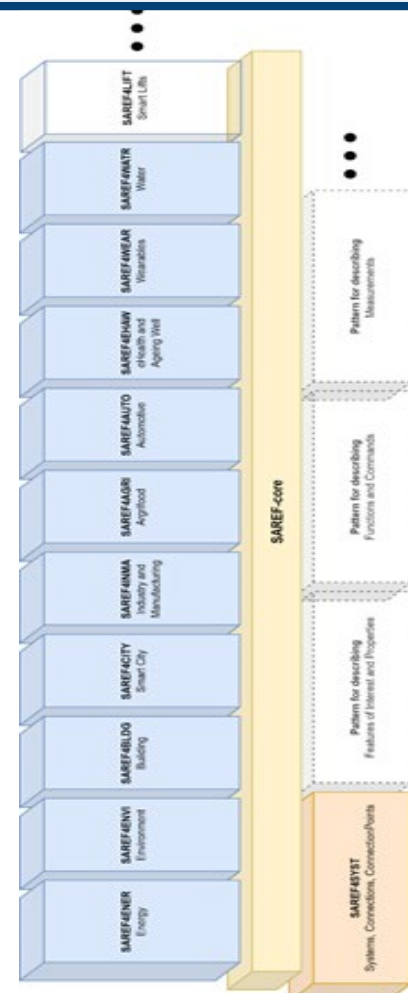
- SAREF is a commonly agreed and standardized ontology with currently 11 extension in different domains, a shared model of consensus that facilitates the matching of existing assets in the smart applications
- SAREF is built of a series of Technical Specifications specifying the SAREF suite of ontologies
- SAREF is designed to evolve and expand in future
- SAREF provides an online portal with user friendly documentation of the SAREF suite of ontologies
- SAREF provides development framework and workflow:
  - a repository for developers
  - with a pipeline (SW) and automated workflow for checking consistency & correctness and creating updated SAREF TSes to become formally standards
- SAREF online portal allows interested stakeholders to contribute to the SAREF suite to expand SAREF (existing and new extensions)

# The SAREF EN (A European Norm)

The SAREF EN

The EC has commissioned ETSI to draft an European Norm on SAREF. This technical work has been assigned to an ETSI Specialist Task Force (STF641), founded in November 2022.

High Level Objective: Giving provisions, how to prove and show SAREF compliance

- Bring together widely considered good practice in semantic interoperability for IoT smart applications in a set of high-level outcome-focused provisions
- Provide guidance on making IoT smart applications and products interoperable in compliance to the SAREF framework
- Give organizations the flexibility to innovate and implement SAREF-compliant semantic interoperability solutions appropriate for their products and applications
- Provide a basis to support normative and regulation recommendations

SAREF EN – ETSI Technical Specifications
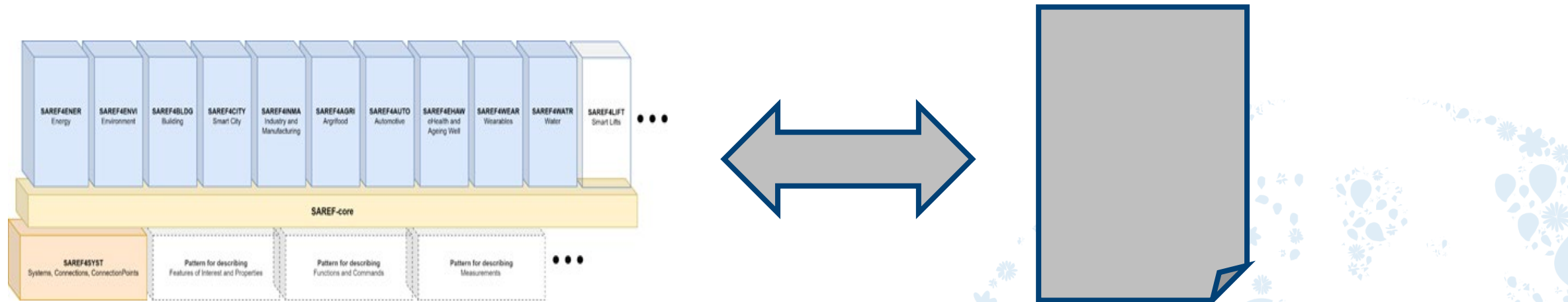
## SAREF Technical Specifications (TSes)

- Heart of SAREF ontology suite:
  Core Specification and currently 11
  Extension Specifications

- TSes allow to maintain the SAREF
  evolution flexible and dynamically

SAREF EN

- Guidelines/provisions to prove and
  show compliance to the SAREF
  process and SAREF TSes

- Static basis to support normative
  and regulation recommendations
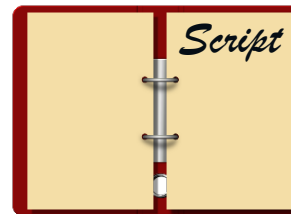
The SAREF EN – Screenplay (1)

The EN is being drafted currently following a screenplay
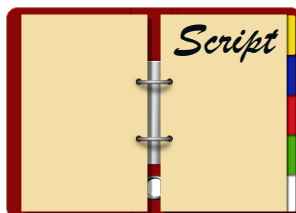
Starting point:

- A company wants to apply SAREF in their products/solutions and

- show SAREF compliance according to the SAREF EN and

- optionally contribute to a new SAREF extension
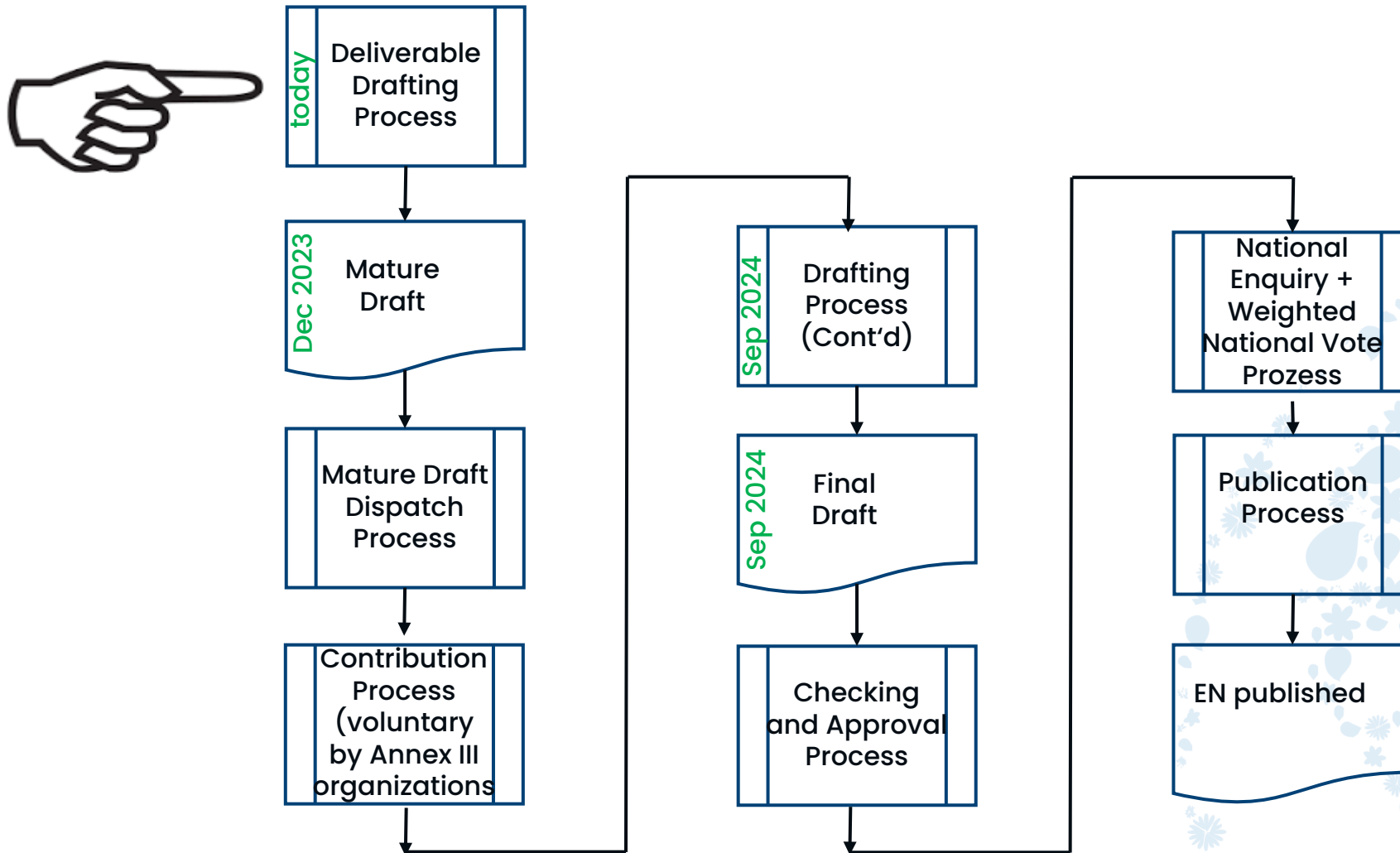 (if what they need is not yet in the SAREF framework)

The SAREF EN – Screenplay (2)

- **Step 1:**
  Motivation, principles for reading the EN and reading guidance considering different roles of reader (decision maker, traditional developer not experienced in semantic technology, ontology expert, etc.

- **Step 2:**
  Description of best practice to define use cases as a way to clarify requirements and identifying core elements from them

- **Step 3:**
  Guidance and provisions to identify which SAREF modules/extensions can be relevant, so that stakeholders can keep focus on getting acquainted with these parts of the SAREF framework

- **Step 4:**
  Guidance / provisions to use SAREF in practice by the translation of data into semantically enriched SAREF data, optionally test them according to interoperability

- **Step 5:**
  Guidance / provisions about showing that the semantically enriched SAREF-data have been created by following the guidance / provisions of this EN and is SAREF compliant

- **Step 6:**
  Guidance / provisions about extending the existing SAREF ontology in case that concepts needed by some interested stakeholders are currently missing

- **Step 7:**
  Guidance / provisions how to contribute and incorporate new SAREF extensions or pattern (ontology schema) in the official standardisation process in ETSI

SAREF EN – Simplified Approval Process

today

Deliverable Drafting Process

Dec 2023

Mature Draft

Mature Draft Dispatch Process

Contribution Process (voluntary by Annex III organizations

Sep 2024

Drafting Process (Cont'd)

Sep 2024

Final Draft

Checking and Approval Process

National Enquiry + Weighted National Vote Prozess

Publication Process

EN published

Thank you for your attention

Joachim Koss

JK Consulting & Projects
Email: joachim.koss@jk-conpro.de
Phone: +49 3379 379092
Mobile: +49 1573 2100402