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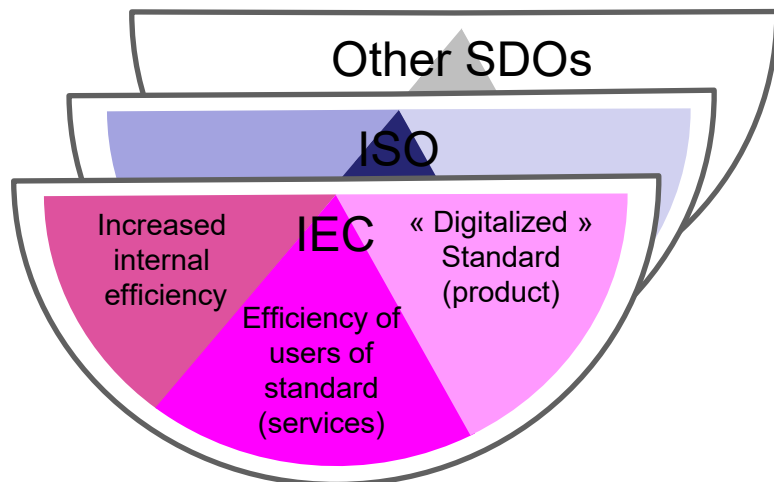
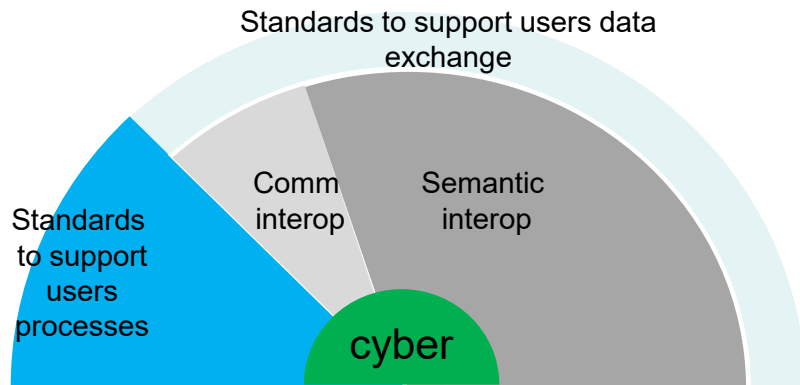
Semantic interoperability Work engaged at IEC SG12



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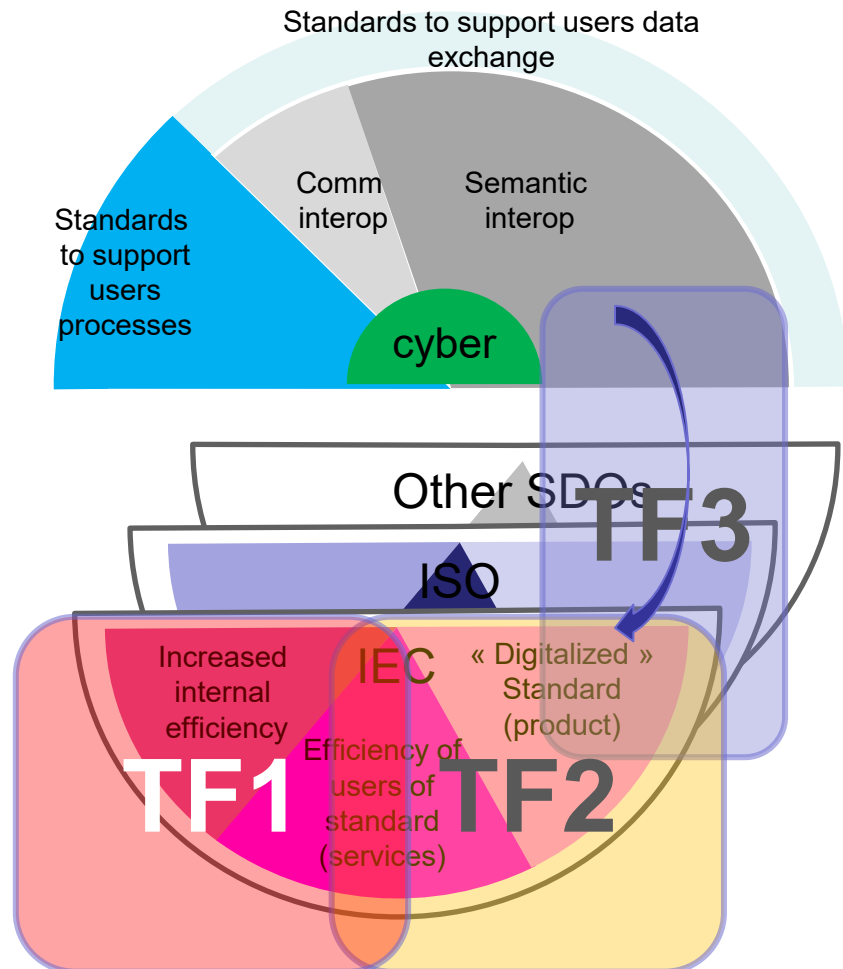
2023-06-27

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- For more than 5 years, IEC has considered the digital transformation as a strategic standardization stake, and has formed the IEC Strategic Group 12
- This approach de facto addresses two main folders below
- Supporting the digital transformation of the society. This concerns :
 - Standards enabling digitalization of :
 - Data exchange between third parties and seamless interoperability (communication, semantic)
 - Processes, methods, .. (y.c conformance testing)
 - Possibly both (such as cybersecurity)
- Supporting the digital transformation of standardization bodies themselves
 - The full transposition of « products » (standards) into digital format - Virtualization (product and tools impact). **This will consume outcome from the above.**
 - Increased efficiency thanks to digital technologies (processes and tools impact)
 - An increased efficiency of standard users thanks to services

IEC SG12 is the IEC strategic group in charge of supporting the digital transformation, reporting to the IEC Standardization Management Board (SMB):



- **TF3 is focusing on semantic interoperability and "digitalized" standard model (standard information model – SIM – feeding the "smart standard" initiative)**
- **Note :**
 - Semantic interoperability feeds de facto the standard information model
 - It is not the goal of this group to produce standards, but just to favor the building-up and the spreading of semantic interoperability – related standards.
- **TF2 is looking at producing more digital (products and services)**
- **TF1 is focusing in working more digital**



IEC SG12 - TF3 today's roadmap related to semantic interoperability

3 reports are currently in the work program of IEC SG12 TF3, related to semantic interoperability :

- **Report 1: Introduction of Semantic domains and associated interoperability**
- **Report 2: Analysis of today's practices and ways for improvements**
 - Identification of the high-level requirements of a standardized semantic domain
 - and a gap analysis of what is currently being done in the IEC

With the goal to adapt the IEC standardization ecosystem to better support the building-up of standardized semantic domains

- **Report 3 : Practical guidance (to standardization technical entities) for working in and managing standardized semantic domains for improved interoperability**

Note : ultimately all technical entities will face the digitalization of their domains (products, systems, services, processes), and this includes associated conformity assessment



5 Semantic Domain and Semantic Interoperability

- 5.1 IEC White paper “Semantic interoperability: Challenges in the digital transformation age”
- 5.2 Semantic Domains
- 5.3 Intermediate conclusions

6 Semantic Interoperability approaches

- 6.1 General approaches
- 6.2 Semantic profiles

7 SIM (Standard Information Model) – An information model for any standards

- 7.2 Main principles of semantic interoperability and the digitalization of standards
- 7.3 Semantics attached to the digital structure of an IEC publication
- 7.4 Semantics attached to the content of the IEC publication

8 Identification of main challenges and proposed next steps

Annex A Considerations of semantic interoperability in IT and OT domains

Annex B What is the meaning of semantic interoperability for Humans and machines

- B.3 Semantic Interoperability approaches
 - B.3.1 Information modelling
 - B.3.2 Semantic domains and interoperability
 - B.3.3 Considerations for Interoperability by design (Model 1 from Figure 5)
 - B.3.4 Interoperability by translation (Model 2 from Figure 5)
 - B.3.5 Semantic domain convergence
 - B.3.6 Relationship of information model and semantic interoperability

90% drafted



5% done

Objectives :

Identification of the high-level requirements of a semantic domain and a gap analysis of what is currently being done in the IEC, with the goal to adapt the IEC standardization ecosystem to better support the building-up of standardized semantic domains.

Typical content would be :

- **Identification of the requirements (via use cases) to support semantic interoperability in standardization, e.g. How to:**
 - Create a standardised semantic domain
 - Manage the standardised semantic domain content
 - Manage the standardised semantic domain cross semantic domain interaction
 - Use a standardised semantic domain
 - Maintain a standardised semantic domain
 - Summary of main requirements identified
- **Analysis on how these aspects are currently covered within IEC (and ISO)**
- **Assess the approaches and identify steps for improved harmonisations / management**
- **Identify the need of guidance and governance for semantic domains and any changes required in IEC reference material (directives etc)**
- **Recommendations**



IEC SG12 - TF3

Report 3: Guidelines in managing standardized semantic domains

Targeted content structure (extract)

Objectives :

- Provide guidance to standardization technical entities on how to create, build, maintain/extend a standardized semantic domain
- Provide guidance on how to create, build and maintain standard semantic namespaces (constituting the semantic domain).

4 Standardized Semantic Domain

4.1 General

4.2 Set of common properties and rules of semantic domains

- 4.2,x Name , Description, Domain map structure, Effective domain map, Common technical rules, Licensing rules, Spreading Policy, Tooling policy, Copyright, Recommendation associated to semantic domains and associated semantic namespaces, Common conformity assessment evaluation, Common process related rules among different technical entities (different TCs, WGs) contributing to the same semantic domains

4.3 Define, publish "standard" profile(s) with conformity assessment

4.4 Semantic Domain related processes (Typical activities applying to all types of extension of semantic domain)

- 4.4.3 Ensure knowledge of the semantic domain existing content
- 4.4.4 Identify possible semantic domain gaps
- 4.4.5 Build-up namespace as semantic domain extension
- 4.4.6 Maintain the namespace
- 4.4.7 Define & publish a standard namespace – if needed

5 Standardized Semantic Namespaces

5.1 What is a Semantic Namespace

5.2 Semantic Namespace model

5.3 Set of common properties and rules of Semantic Namespaces

5.3.x Name, Description, Versioning, Spreading Policy, Licensing rules, tooling, copyright

5.4 Namespace multiple rendering

5.5 Translation of the semantic namespaces

5.6 Identification of a semantic namespace

5.7 Dependencies between semantic namespaces

5.8 Life cycle of semantic namespaces

5.9 Versioning of semantic namespaces

5.10 End of "active" life management of semantic namespaces

Annex A (normative) Semantic domain parameters template

Annex B (informative) IEC 61850 Semantic domain

Annex C (informative) IEC 61360 Semantic domain (IEC CDD)

70% drafted



Some "early" challenges for the standardization ecosystem for supporting standardized semantic domains

- **Speed (time to market)**
 - Market demand for standardized semantic domains is already at high level,
 - But standardization resources (and skills) may be really challenged for producing the expected outcomes
 - And standardization processes may not be fully adequate (see agility below ...)
 - And adequate tools are missing (see Tooling)
- **Favoring the re-use**
 - The siloed organization of the standardization ecosystem is a real obstacle to favor the re-use of existing semantics, or semantic structures (through "specialization" of "abstract" concepts/structures for example)
- **Agility in building up and maintaining these semantic domains**
 - The development of a semantic domain is mostly incremental by nature, and may need quick but frequent updates.
 - Agile standardization processes may need to be defined.
- **Tooling**
 - Producing standardized semantic domains for machine needs IT tool for building –up, specifying, checking, producing, rendering, maintaining, versioning and publishing -> a quite important and long lasting investment
- **Distribution**
 - As for IEV (Electropedia) for "conventional" semantics, the publication of standardized semantic domains has some specificities to facilitate its spreading (accessibility, ability to redistribute, to modify etc), challenging today's licensing conditions of standards.

- **Semantic interoperability is at the heart of IEC SG12**
- **Main objectives are to :**
 - "Educate" standardization stakeholders about the importance of considering these stakes
 - Adapt the standardization ecosystem to better support the building-up, the maintenance and the spreading of a limited set of standardized semantic domains
 - Provide guidance to all technical entities on how to best address such area for their own technical domain
 - Attract new experts being "digitally" minded
- **This will have ultimately a huge impact on experts creating standards, and on smart standards themselves, which will consume such standardized semantic domains.**
 - Such link needs to be anticipated right now
 - Initiatives around the standard digitalization approaches (e.g IEC SIM) and possible pilots should help better framing the requirements and solutions.