IoT Week 2022

High Priority Edge Computing Standardisation Gaps and Relevant SDOs

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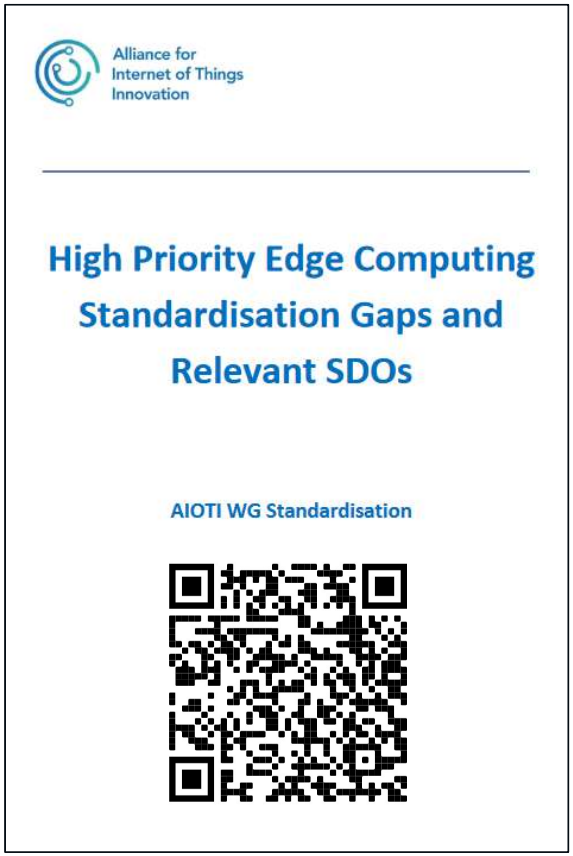
A Standardisation Landscape Report

- An **AIOTI** initiative
- Published on April 2022*
  *https://aioti.eu/wp-content/uploads/2022/04/AIOTI-High-Priority-Edge-Computing-Gaps-Final.pdf
- Goal: To introduce an approach for the definition and identification of key **edge** computing and/or combination of **IoT/IIoT**, edge computing and **cloud** computing **standardisation gaps** in several initiatives



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Contents of the Report

1. Extensive description of key research and standardisation edge computing challenges

2. High-level description and categorisation of these standards challenges

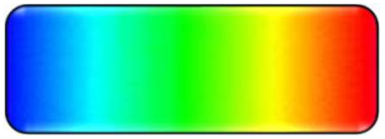
3. Related work from Standards Developing Organizations (SDOs)

4. Identification, classification, and prioritization of Edge Computing Standardisation Gaps

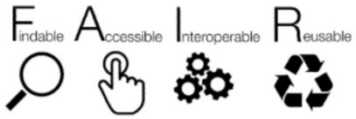
1. Research & Standardisation Challenges Description

Decentralisation

Multi-Access Edge

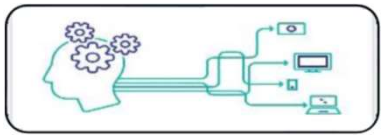


IoT-Edge-Cloud Continuum



Interoperability

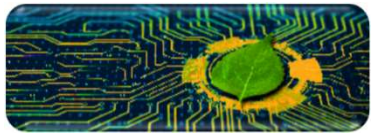
Security & Privacy



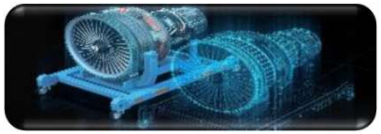
Explainable AI

Quality assurance

ESG monitoring



Digital for Green

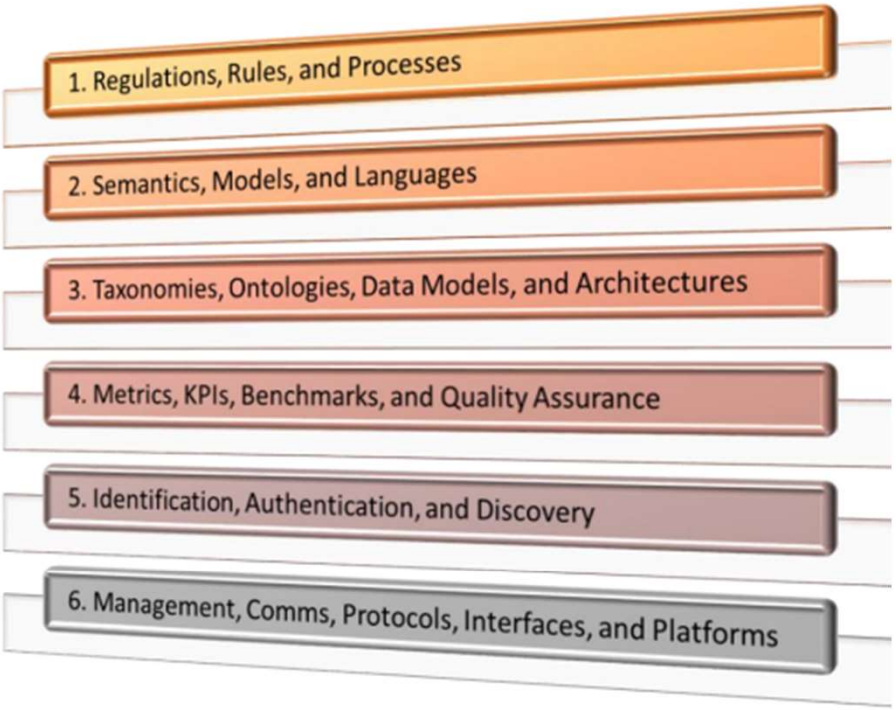


Digital Twins

... +30 more challenges, of various levels

2. Standardisation Challenges Categorisation (#1)

Solutions Types



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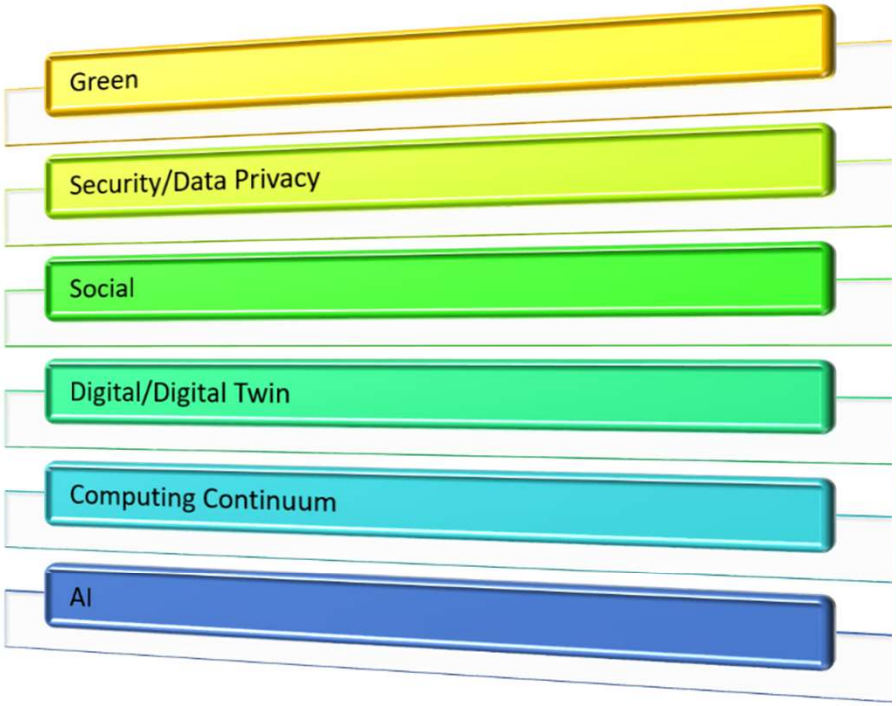
>25 keywords

Challenges presented in detail in	SCC1 – Rules	SCC2 – Semantics	SCC3 – Structure	SCC4 – Measuring	SCC5 – Accessing	SCC6 – Managing
Section 2.1	legal/ethical/ social adoption	semantic interoperability				
Section 2.2		novel model & languages	distributed architectures	edge-specific constraints		device/agents management
Section 2.3					service discovery	infrastructure interoperability
Section 2.4	EU Green Deal			CO_2 footprint measurability		energy-efficient protocols
Section 2.5	EU Green Deal		data-models, ontologies	CO_2 footprint measurability		comms. energy usage control
Section 2.6	ESG regulations (e.g., SFDR)	impact definition	ESG Data Taxonomy	define ESG scoring/ratings		connectivity, interoperability
Section 2.7	ethical principles	meaningful explanations				
Section 2.8	data privacy	semantic annotation				large-scale computation
Section 2.9		models	knowledge graph			
Section 2.10				testing methods/ techniques		
Section 2.11						seamless MEC deployment
Section 2.12						seamless MEC transition
Section 2.13			NGIoT architecture			orchestration, interoperability
Section 2.14		context/models coherency	data meta-models		search, trade, trackability	connect spaces, interoperability
Section 2.15.1	interoperability on policy level	interoperability on meta-data				
Section 2.15.2	regulation framework					coexistence of intelligent IoT
Section 2.15.3				IoT/edge certification		
Section 2.15.4	non-functional properties					
Section 2.15.5			data-models, ontologies			Interfaces & APIs

2. Standardisation Challenges Categorisation (#2)

Solutions Domains



Challenges presented in detail in	Green	Security/ Data Privacy	Social	Digital/Digital Twin	Computing Continuum	AI
Section 2.1		intelligent approaches			interoperability, orchestration	
Section 2.2	energy costs balance	distributed security			federation, cross-platform	network optimization
Section 2.3		users trust, fault tolerance	agile pricing		systems' collaboration	
Section 2.4	energy /CO_2 footprint	solutions evaluation		massive IoT applications		green AI
Section 2.5	energy /CO_2 footprint	solutions evaluation				
Section 2.6	environmental impact score	GDPR compliance	ESG monitoring	metrics collection		performance acceleration
Section 2.7						explainable AI, common sense
Section 2.8		confidentiality, non-repudiation		digital twins, physics realism		explainable AI, interpretability
Section 2.9		digital attestations		digital twins, data spaces		federated learning
Section 2.10				new solutions certification		
Section 2.11					MEC, connectivity	
Section 2.12					MEC hosts, interoperability	
Section 2.13		access, share, store, threats	human-centric		microservices, scaling, planes	distributed AI, fed. learning
Section 2.14	environmental meta-model		societal context, buy-sell	model coherency	interoperability, internet space	
Section 2.15.1					interoperability, ecosystems	
Section 2.15.2					coexistence rules	
Section 2.15.3				devices/systems certification		
Section 2.15.4		trustworthiness, dependability		non-functional properties		
Section 2.15.5				digital service		

AIOTI

>25 keywords

3. Related work from SDOs (#1)

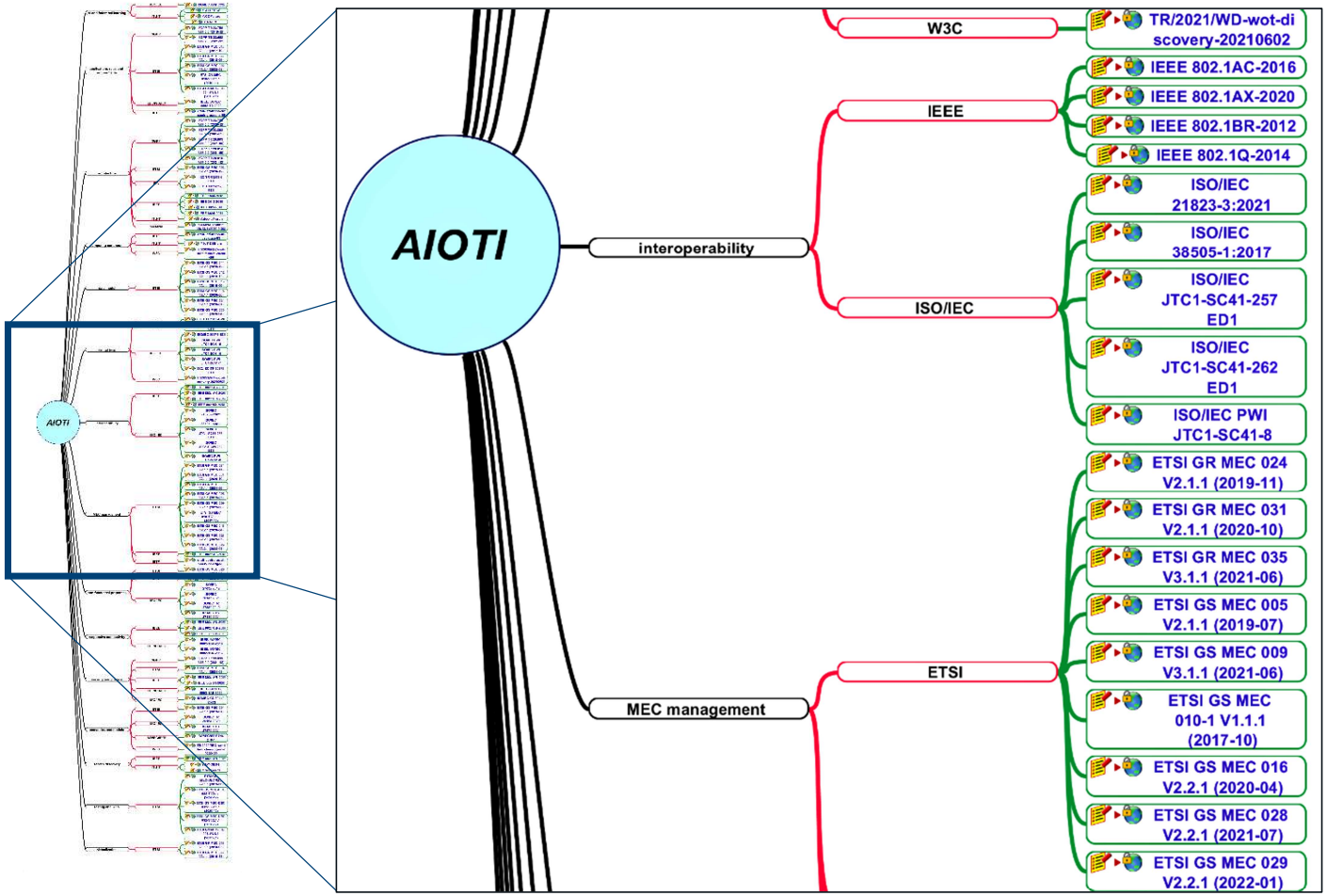
***Mapping** of Challenges to related work*

>10 SDOs
>100 Documents
>25 keywords

SDO	Specification			Relevant AIOTI identified challenges
	Title	URL	Abstract	Labels & Sections
3GPP	3GPP TR 28.815 V17.0.0 (2021-12): Study on charging aspects of edge computing	https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3758	The present document studies the charging aspects of Edge Computing based on architecture, procedures and information flows for enabling Edge Applications over 3GPP network as well as capabilities for 5GS to support edge computing. The investigation includes different charging scenarios with potential business requirements, alternative solutions with potential impact on charging architecture, charging functions and charging procedures.	scenarios, architectural considerations (Section 2.15.25)
3GPP	3GPP TR 23.803 V7.0.0 (2005-09): Evolution of policy control and charging	https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=883	The document studies: a) the complete harmonization and merger of the policy control and flow based charging architecture and procedures; b) possible architectures and solutions for adding end-user subscription differentiation and general policy control aspects to the policy- and charging control; c) alternative solutions for binding bearers to services (provided today by the authorization token). This includes studying solutions for the network to control bearer usage by service flows.	policy control architecture (Section 2.11, 2.15.25)
3GPP	3GPP TR 23.748 V17.0.0 (2020-12): Study on enhancement of support for Edge Computing in 5G Core network (5GC)	https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3622	The Technical Report studies and performs evaluations of potential architecture enhancements to support Edge Computing (EC) in the 5G Core network (5GC). Specifically, two objectives are included: a) to study the potential system enhancements for enhanced Edge Computing support, and b) to provide deployment guidelines for typical Edge Computing use cases, e.g. URLLC, V2X, AR/VR/XR, UAS, 5GSAT, CDN, etc.	use cases, 5G networks architecture (Section 2.2, 2.3)
3GPP	3GPP TR 26.803 V17.0.0 (2021-06): Study on 5G Media Streaming Extensions for Edge Processing	https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3742	The document is a study of use cases for multimedia processing in the edge and the potential 5G media streaming architecture extensions to enable them.	use cases, architecture (Section 2.2, 2.3)
3GPP	3GPP TS 23.558 V17.2.0 (2021-12): Architecture for	https://portal.3gpp.org/desktopmodules/Specifi	The document specifies the application layer architecture, procedures and information flows necessary for enabling edge applications over 3GPP networks. It includes architectural	requirements, architecture, layer-oriented

3. Related work from SDOs (#2)

Mind map *of SDO specifications and standardisation challenges*



4. Standardisation Gaps Identification (#1)

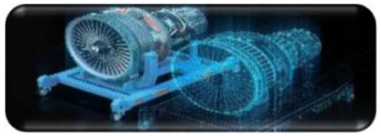
Quantitative approach: *Identification of* ***Standardisation Challenges with no or very little standardisation activities*** *present in their topic.*

Section	Standards	Section	Standards	Section	Standards	Section	Standards
2.1	26	2.11	30	2.15.7	1	2.15.17	0
2.2	41	2.12	15	2.15.8	3	2.15.18	5
2.3	12	2.13	9	2.15.9	2	2.15.19	1
2.4	1	2.14	3	2.15.10	7	2.15.20	3
2.5	1	2.15.1	7	2.15.11	1	2.15.21	2
2.6	2	2.15.2	6	2.15.12	0	2.15.22	4
2.7	1	2.15.3	6	2.15.13	0	2.15.23	4
2.8	7	2.15.4	6	2.15.14	14	2.15.24	6
2.9	1	2.15.5	4	2.15.15	2	2.15.25	2
2.10	6	2.15.6	4	2.15.16	3		

4. Standardisation Gaps Identification (#2)

Section	Standards	Section	Standards	Section	Standards	Section	Standards
2.1	26	2.11	30	2.15.7	1	2.15.17	0
2.2	41	2.12	15	2.15.8	3	2.15.18	5
2.3	12	2.13	9	2.15.9	2	2.15.19	1
2.4	1						
2.5	1						
2.6	2						
2.7	1						
2.8	7						
2.9	1						
2.10	6						

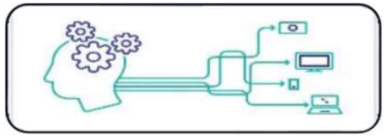
High priority standardisation gaps:



Digital Twins

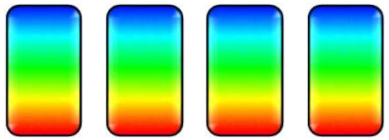
ICT/IoT and policies description and languages for ESG monitoring

Devices & IoT swarm systems management



Federated Learning and AI

Medium priority standardisation gaps:

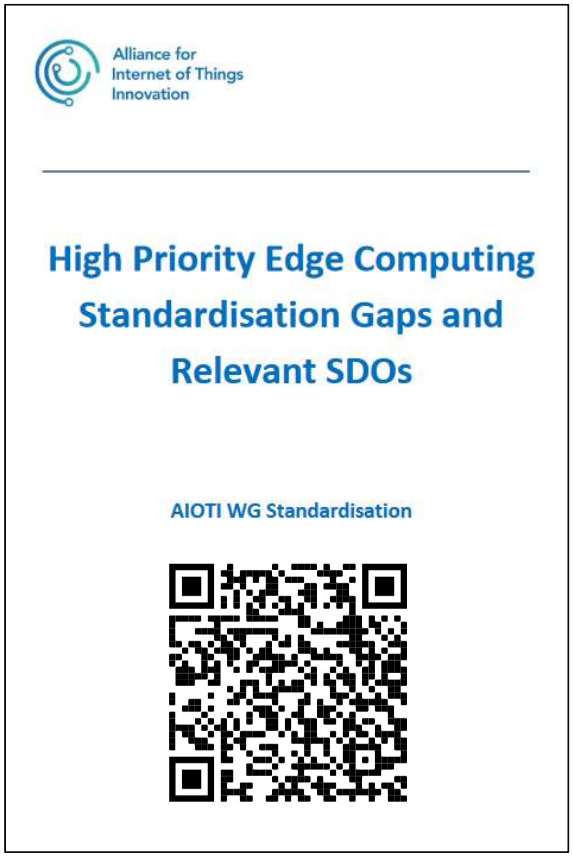


IoT and edge computing coexistence/ integration/ interoperability and continuum across several sectors and platforms

Services discovery and authentication

To sum up…

- Introduction of methodology for standardisation challenges identification and categorisation
- Methodology for challenges mapping to SDOs initiatives
- Analysis and extraction of **Standardisation Gaps**



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The people behind the report

AIOTI

Vision:

"To be recognized as a major contributor to the worldwide interoperability, security, privacy and safety of IoT and Edge Computing systems and applications, and particularly for the development of the market in Europe."

PLEDGER

Vision:

"To deliver a new architectural paradigm and a toolset that will pave the way for next generation edge computing infrastructures."

Thank you for listening

Any questions?

You can find us at @AIOTI_EU or email sg@aioti.eu

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