

# ISO/IEC JTC 1/SC41

# Internet of Things and Digital Twin

v 1.0

**Workshop on IoT and Edge  
Computing Research and  
Standardisation Convergence  
Virtual  
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# Introduction

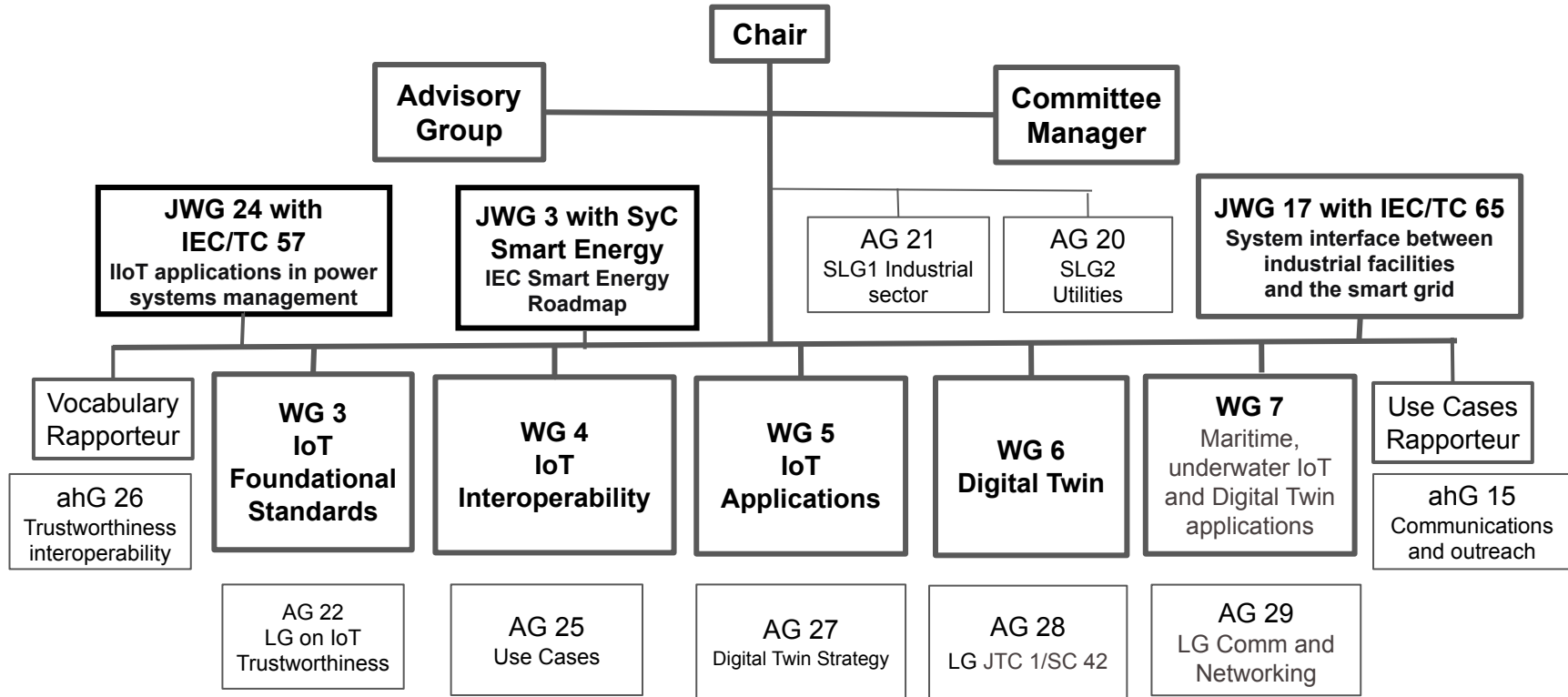
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- Part of the Joint Committee (JTC 1) of ISO and the IEC for the standardization of IT
- Mandate:
  - Standardization in the area of Internet of Things and Digital Twin including their related technologies.
- Approach:
  - Created as a 'system committee'
  - Emphasis on cooperative work with internal (ISO and IEC) and external SDO's
  - Externally (and compatible) developed documents can be adopted and/or fast-tracked (PAS Submissions)

Technical Areas	ISO/IEC JTC 1 (Information Technology) Subcommittees and Working Groups
Application Technologies	SC 36 - Learning Technology
Cultural and Linguistic Adaptability and User Interfaces	SC 02 - Coded Character Sets SC 22/WG 20 – Internationalization SC 35 - User Interfaces
Data Capture and Identification Systems	SC 17 - Cards and Personal Identification SC 31 - Automatic Identification and Data Capture Techniques
Data Management Services	SC 32 - Data Management and Interchange
Document Description Languages	SC 34 - Document Description and Processing Languages
Information Interchange Media	SC 11 - Flexible Magnetic Media for Digital Data Interchange SC 23 - Optical Disk Cartridges for Information Interchange
Multimedia and Synthesis	SC 24 - Computer Graphics and Image Processing SC 29 - Coding of Audio, Picture, and Multimedia and Hypermedia Information WG12 - 3D Scanning and Printing
Networking and Middleware	SC 06 - Telecommunications and Information Exchange Between Systems SC 25 - Interconnection of Information Technology Equipment <a href="#">SC 38 - Cloud Computing and Distributed Platforms</a>
Office Equipment	SC 28 - Office Equipment
Green IT	SC 39 – Sustainability, IT and data centres
Programming Languages and Software Interfaces	SC 22 - Programming Languages, their Environments and Systems Software Interfaces
Security	SC 27 - Information security, cybersecurity and privacy protection SC 37 - Biometrics
Software, Processes and Systems	SC 07 - Software and System Engineering SC 40 – IT Governance and IT Management WG13 - Trustworthiness
Internet of Things	<a href="#">SC 41 – Internet of Things and Digital Twin</a>
Artificial Intelligence	SC 42 - Artificial Intelligence
Smart Cities	WG 11 - Smart City
Quantum Computing	WG 14 - Quantum Computing

# SC 41 Structure (June 2021)



# A few noteworthy standards

(see annex for a complete list of standards and projects)



- ISO/IEC 30141:2018 Edition 1.0 (2018-08-30)- Internet of Things (IoT) - Reference architecture
- ISO/IEC TR 30164 ED1 - Internet of things (IoT) - Edge Computing
- ISO/IEC TR 23188:2020 Information technology — Cloud computing — Edge computing landscape
- ISO/IEC 21823-x - Internet of Things (IoT) - Interoperability for IoT Systems:
  - Part 1: Framework
  - Part 2: Transport interoperability
  - Part 3: Semantic interoperability
  - Part 4: Syntactic interoperability (under development)
- ISO/IEC 30161 Internet of things (IoT) - Data exchange platform for IoT services
  - Part 1: General requirements and architecture
  - Part 2: Transport interoperability between nodal points (under development)
- ISO/IEC 30178 ED1 Internet of Things (IoT) - Data format, value and coding (under development)
- ISO/IEC 30162 ED1 Internet of Things (IoT) - Compatibility requirements and model for devices within Industrial IoT systems (under development)

Smart society

Smart healthcare



Smart transport

Smart territory improvement

Smart payments

Smart buildings

Smart energy

# Thank You!

<https://www.idc-now.com/2017/09/25/67259-everything-can-smart-key-trail>



# ANNEX:

## ISO/IEC JTC 1/SC 41

### Published standards and work program

# About IOT

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- The IoT is a system concept that use many technologies that are standardized by other JTC 1 entities and SDOs ranging from networking and Digital Twin to cloud computing and AI.
- IoT systems are software and data intensive as well as network-centric. They can be quite complex, ranging from simple architecture to multi-tier distributed computing cyberphysical systems.
- IoT systems are key enablers of ‘Smart Everything’.



# About Digital Twin

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According to Gartner and Deloitte, a digital twin as a digital representation of a real-world entity or system. It is an evolving digital profile of the historical and current behavior of a physical object or process.

The implementation of a digital twin is an encapsulated software object or model that mirrors a unique physical object, process, organization, person or other abstraction. The digital twin is thus based on massive, cumulative, real-time, real-world data measurements across an array of dimensions.

Data from multiple digital twins can be aggregated for a composite view across a number of real-world entities, such as a ship, a bridge, a building, a factory, a supply-chain or a city.

Mirroring is done through synchronization using data streams. The data streams are generated by sensors, but also transactions and other sources (virtual sensors).

Digital Twin (DT) is an enabler Smart Everything, being based on measurements that creates an evolving profile of the entity or system in the digital world, it provides important insights on system performance, leading to actions in the real world such as a change in system and process design, or optimizing business performance.

# Published Standards - 1



Reference	Title	Year
ISO/IEC 30141	Internet of Things (IoT) - Reference architecture	2018
ISO/IEC 20924 ED2	Internet of Things (IoT) – Vocabulary	2021
ISO/IEC 21823-1	Internet of Things (IoT) - Interoperability for IoT systems - Part 1: Framework	2019
ISO/IEC 21823-2	Internet of Things (IoT) - Interoperability for IoT systems - Part 2: Transport interoperability	2020
ISO/IEC TR 22417	Information technology - Internet of things (IoT) - IoT use cases	2017
ISO/IEC 29182-1	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 1: General overview and requirements	2013
ISO/IEC 29182-2	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 2: Vocabulary and terminology	2013
ISO/IEC 29182-3	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 3: Reference architecture views	2014
ISO/IEC 29182-4	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 4: Entity models	2013
ISO/IEC 29182-5	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 5: Interface definitions	2013
ISO/IEC 29182-6	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 6: Applications	2014
ISO/IEC 29182-7	Information technology - Sensor networks: Sensor Network Reference Architecture (SNRA) - Part 7: Interoperability guidelines	2015
ISO/IEC 19637	Information technology - Sensor network testing framework	2016

# Published Standards - 2



Reference	Title	Year
ISO/IEC 30140-1	Information technology - Underwater acoustic sensor network (UWASN) - Part 1: Overview and requirements	2018
ISO/IEC 30140-2	Information technology - Underwater acoustic sensor network (UWASN) - Part 2: Reference architecture	2017
ISO/IEC 30140-3	Information technology - Underwater Acoustic Sensor Network (UWASN) – Part 3: Entities and interfaces	2018
ISO/IEC 30140-4	Information technology – Underwater Acoustic Sensor Network (UWASN) - Part 4: Interoperability	2018
ISO/IEC 30101	Information technology -- Sensor networks: Sensor network and its interfaces for smart grid system	2014
ISO/IEC 30128	Information technology -- Sensor networks -- Generic Sensor Network Application Interface	2014
ISO/IEC 20005	Information technology - Sensor networks - Services and interfaces supporting collaborative information processing in intelligent sensor networks	2013
ISO/IEC TR 22560	Information technology - Sensor network - Guidelines for design in the aeronautics industry: Active air-flow control	2017
ISO/IEC TR 30148	Internet of things (IoT) - Application of sensor network for wireless gas meters	2019

# Published Standards - 3



Reference	Title	Year
ISO/IEC 30142	Internet of Things (IoT) - Underwater acoustic sensor network (UWASN) - Network management system overview and requirements	2020
ISO/IEC 30143	Internet of Things (IoT) - Underwater acoustic sensor network (UWASN) - Application profiles	2020
ISO/IEC 30144	Internet of Things (IoT) - Wireless sensor network system supporting electrical power substation	2020
ISO/IEC 30147	Internet of Things (IoT) - Integration of IoT trustworthiness activities in ISO/IEC/IEEE 15288 system engineering processes	2021
ISO/IEC 30161-1	Internet of things (IoT) - Data exchange platform for IoT services - Part 1: General requirements and architecture	2020
ISO/IEC 30163	Internet of Things (IoT) - System requirements of IoT and sensor network technology-based integrated platform for chattel asset monitoring	2021
ISO/IEC 30165	Internet of Things (IoT) — Real-time IoT framework	2021
ISO/IEC TR 30164	Internet of Things (IoT) - Edge computing	2020
ISO/IEC TR 30166	Internet of Things (IoT) - Industrial IoT	2020
ISO/IEC TR 30167	Internet of Things (IoT) - Underwater Communication Technologies for IoT	2021

# SC 41 Subgroups

Groups	Main Role
WG 3 (IoT Foundational Standards)	IoT foundational standards including IoT and Digital Twin vocabulary
WG 4 (IoT Interoperability)	IoT interoperability, connectivity, IoT platform, middleware, conformance and testing
WG 5 (IoT Applications)	IoT applications, Uses Cases, tools, and implementation guidance
WG 6 (Digital Twin)	Standardization in the area of Digital Twin
WG 7 (Maritime, Underwater IoT and Digital Twin Applications)	Standardization in the applications of Internet of maritime, underwater and inland waterways things, digital twin and related technologies
JWG 17 (Joint WG with IEC TC65)	※ IEC TC65: Industrial-process measurement, control and automation
JWG 3 (Joint WG with IEC SyC Smart Energy)	※ IEC SyC SE: Provide systems level standardization, coordination and guidance in the areas of Smart Grid and Smart Energy.

# SC 41 Subgroups

Groups	Main Role
AG 20 (SLG on Industrial sector)	Coordinate liaisons activities between all SDO's, internal and external, in the Industrial sector and SC41
AG 21 (SLG on Smart Cities and Utilities)	Coordinate liaisons activities between all SDO's, internal and external, for sectors associated with Smart Cities, utilities and other 'smart' infrastructure and SC 41
AG 22 (LCG on IoT Trustworthiness)	Encourage and assist SC27 to maintain compatibility between their standards and JTC 1/SC41 standards
AG 25 (AG on Use cases)	To identify IoT and Digital Twin use cases and populate the use case template (SC41N0962) with specific information on each use case, and explore how they relate to SC 41's current and potential future work.
AHG 14 (Business Plan)	Update and report the SC 41 business plan to the JTC 1 Plenary.
AHG 15 (Communication and Outreach)	Create and maintain the SC 41 Wikipedia pages. Maintain the SC 41 Linked-in site. Create a public repository for outreach materials.
AHG 26 (Trustworthiness Interoperability)	Assess the impact of transversal issues such as trustworthiness on the interoperability of IoT systems.
AG 27 (AG on Digital Twin Strategy)	To further develop the analysis done by JTC 1/AG 11(SC41N1423), and also to identify possible synergies with current SC 41 activities and relationships.
AG 28 (JTC 1/SC 42 Liaison Group)	Advise its liaison officers on approach towards the liaison

# WG 3 Mission

## IoT Foundational Standards

Development of IoT foundational standards, including IoT and Digital Twin vocabulary.

# WG3 Products

Standard	Title	Status	Abstract
ISO/IEC 30141	Internet of Things (IoT) - Reference architecture	Ed. 2 WD	This document specifies a general IoT Reference Architecture in terms of defining system characteristics, a Conceptual Model, a Reference Model and architecture views for IoT.
ISO/IEC 20924	Internet of Things (IoT) and Digital Twin - Vocabulary	Ed. 3 WD	This document provides a definition of Internet of Things and Digital Twin, along with a set of terms and definitions. This document is a terminology foundation for the Internet of Things and Digital Twin.
ISO/IEC 30149	Internet of Things (IoT) — Trustworthiness principles	Ed. 1 WD	This document provides principles for IoT trustworthiness based on ISO/IEC 30141 Internet of Things (IoT) - Reference architecture.



# WG3 Products

Standard	Title	Status	Abstract
ISO/IEC TS 30168	Internet of Things (IoT) - Generic Trust Anchor Application Programming Interface for Industrial IoT Devices	Ed.1 WD	Specification of a generic programming interface for the integration of secure elements within Industrial IoT devices. This includes requirements from industrial usage scenarios and applications. This document also provides guidance for implementation, testing, and conformity validation.

# WG4 Mission

## Interoperability

Standardization in the area of IoT interoperability, connectivity, IoT platform, middleware, conformance and testing.

# WG4 Products

Standard	Title	Status	Abstract
ISO/IEC 21823-3	Internet of Things (IoT) - Interoperability for IoT Systems - Part 3: Semantic interoperability	Ed 1 FDIS	This document provides detail on the basic concepts of Semantic Interoperability for IoT systems, as described in the facet model of ISO 21823 Part 1.
ISO/IEC 21823-4	Internet of Things (IoT) - Interoperability for IoT Systems - Part 4: Syntactic interoperability	Ed 1 CDV	This document provides detail on the basic concepts of Semantic Interoperability for IoT systems, as described in the facet model of ISO 21823 Part 1.

# WG4 Products

Standard	Title	Status	Abstract
ISO/IEC 30178	Internet of Things (IoT) - Data format, value and coding	Ed 1 WD	Define a common formats value and coding for Internet of Things (IoT)
ISO/IEC 30161-2	Internet of Things (IoT) – Data exchange platform for IoT services – Part 2: Transport interoperability between nodal points	Ed 1 WD	This document specifies the following items for the transport interoperability among nodal points in the IoT data exchange platform (IoT DEP). <ul style="list-style-type: none"> <li>- Requirements</li> <li>- Functional blocks</li> <li>- Operation mechanism</li> </ul>

# WG5 Mission

## IoT Applications

Standardization in the area of IoT applications, Uses Cases, tools, and implementation guidance

# WG5 Products

Standard	Title	Status	Abstract
ISO/IEC 30162	Compatibility requirements and model for devices within industrial IoT systems	Ed 1 FDIS	This document specifies network models for IIoT connectivity and general compatibility requirements for devices and networks within IIoT systems
ISO/IEC 30169	Internet of things (IoT) - IoT applications for electronic label system (ELS)	Ed 1 CDV	This document specifies the system framework, IoT application model and overall technical requirements for ELS. This document applies to the design and development of the IoT applications for ELS.

# WG5 Products

Standard	Title	Status	Abstract
ISO/IEC TR 30174	Internet of Things (IoT) – Socialized IoT system resembling human social interaction dynamics	Ed 1 DTR	<p>This document describes:</p> <ul style="list-style-type: none"> <li>Key features of the socialized IoT systems, e.g., sensing the external physical world, resolving the uncertainties of targets, satisfying users' demand and providing quality service, etc. ;</li> <li>Socialized attributes, i.e. socialized network, socialized collaboration, and socialized services, which are derived from the key features; and</li> <li>Guidelines in how to use or apply the socialized attributes in the design and development of IoT systems.</li> </ul>

# WG5 Products

Standard	Title	Status	Abstract
ISO/IEC TR 30176	Internet of Things (IoT) - Integration of IoT and DLT/Blockchain: Use Cases	DTR	<p>This document describes use cases on the integration of DLT/Blockchain within IoT, which includes but not limited to the following content:</p> <ul style="list-style-type: none"> <li>To generate the use cases on integration of DLT/blockchain within IoT referring to other template of use case.</li> <li>To collect the use cases of IoT system supported by DLT/blockchain technology with the unified template.</li> </ul>



# WG5 Products

Standard	Title	Status	Abstract
ISO/IEC 30179	Internet of Things (IoT) – Overview and general requirements of IoT system for ecological environment monitoring	Ed 1 WD	<p>This document specifies the Internet of Things system for ecological environment monitoring 201 in the following:</p> <ul style="list-style-type: none"> <li>- System infrastructure and system entities of the IoT system for ecological environment 203 monitoring for natural entities such as air, water, soil, living creatures</li> <li>- The general requirements of the IoT system for ecological environment monitoring.</li> </ul>
PNW JTC1-SC41-245 ED1	Internet of Things (IoT) - Functional requirements to figure out the status of self-quarantine through Internet of Things data interfaces	Ed 1 NP	<p>This document specifies the functional requirements about the following items to figure out the status of self-quarantine through IoT data interfaces working over a set of hand-held devices, wristbands, and a management system:</p> <ul style="list-style-type: none"> <li>- Functional requirements for self-quarantine app and optional wristband at a self-quarantine place;</li> <li>- Functional requirements for self-quarantine management app and system at the management side;</li> <li>- Functional requirements for the protection of the self-quarantine status and the privacy information.</li> </ul>

# WG6 Mission

Digital Twin

Standardization in the area of Digital Twin

# WG6 Products

Standard	Title	Status	Abstract
ISO/IEC 30173	Digital twin - Concepts and terminology	Ed 1 WD	This document establishes terminology for Digital Twin (DT) and describes concepts in the field of Digital Twin, including the terms and definitions of Digital Twin, concepts of Digital Twin (e.g., Digital Twin ecosystem, lifecycle process for Digital Twin, and classifications of Digital Twin), Functional view of Digital Twin and Digital Twin stakeholders.
ISO/IEC TR 30172	Digital twin - Use cases	Ed 1 WD	This document provides a collection of representative use cases of DT applications in a variety of domains.
PWI JTC1-SC41-6	Guidance for IoT and Digital Twin use cases	Ed 1 PWI	-
PWI JTC1-SC41-5	Digital Twin - Reference Architecture	Ed 1 PWI	-

# WG7 Mission

## Maritime, underwater IoT and Digital Twin Applications

Standardization in the application of Internet of maritime, underwater and inland waterways things, digital twin and related technologies

✳ This group is created in June, 2021. Work programme will be registered soon.

# WG7 Products

Standard	Title	Status	Abstract
ISO/IEC 30171	Internet of Things (IoT) - Base station based underwater acoustic network (B-UWAN) - Overview and requirements	Ed 1 CDV	This document provides the general overview of base-station based underwater wireless acoustic networks (B-UWANs). It gives detailed description for main components of B-UWAN and also provides functions of BUWAN components. It further specifies the requirements of B-UWAN.
ISO/IEC 30175	Internet of Things (IoT) - Underwater Acoustic Sensor Network (UWASN) – Underwater Management Information Base (u-MIB)	Ed 1 CDV	This document provides the underwater management information base (u-MIB) of an underwater network management system (U-NMS). It specifies the following: <ul style="list-style-type: none"> <li>– general requirements for constructing u-MIB in U-NMS;</li> <li>– defining the managed objects of the manager and agent u-MIB;</li> <li>– integrating the managed objects of the manager and agent u-MIB</li> </ul>

# WG7 Products

Standard	Title	Status	Abstract
ISO/IEC 30177	Internet of Things (IoT) - Underwater network management system (U-NMS) interworking	Ed 1 WD	<p>The present document specifies the detail information about interworking components in Underwater Network Management System (U-NMS). It provides the following</p> <ul style="list-style-type: none"> <li>- The intra-working of U-NMS components.</li> <li>- The interworking between terrestrial domain and surface domain</li> <li>- The interworking between surface domain and underwater domain.</li> <li>- The interworking in underwater domain.</li> </ul>

# JWGs

**JWG 17 with IEC TC 65** (Industrial-process measurement, control and automation)

## **System interface between industrial facilities and the smart grid**

This work will identify, profile and extend where needed, the standards needed to allow industrial facilities, and the industrial automation systems within such industrial facilities, to communicate with the smart grid for the purpose of planning, negotiating, and managing the flow of electrical power and related information between them.

**JWG 24 with IEC TC 57** (Power systems management and associated information exchange)

## **IIoT applications in power systems management**

To develop a standard on IIoT applications in power distribution systems management: Architecture and functional requirements

# JWGs

## JWG 3 with IEC SyC Smart Energy

### IEC Smart Energy Roadmap

Map the main Use Cases over the relevant systems architectures within the Smart Energy domain. This includes:

- Provide guidelines in offering standard users ways to select a most appropriate set of standards/specifications (either existing or coming, from IEC but possibly coming from other bodies) fulfilling the set of Use Cases. This includes the breakdown of Smart Energy scope into typical systems and system architectures.
- Work with ISO/IEC JTC1 SC41 to introduce IoT concepts into the smart energy domain and co-ordinate their integration into Smart Energy standardisation
- Identify and rank possible standard gaps/overlaps/recommendations
- Feed the IEC Smart Energy mapping tool with the above findings



# JWG 17 Products

Standard	Title	Status	Abstract
IEC 62872-2 (former ISO/IEC 30160)	Application framework for industrial facility demand response energy management	Ed 1 FDIS	This document presents an IoT application framework for industrial facility demand response energy management (FDREM) in smart grid, to enable efficient information exchange between industrial facilities using IoT related communication technologies.