ISO/IEC JTC 1 **N 14916**

ISO/IEC JTC 1 "Information technology"
Secretariat: **ANSI**
Committee Manager: **Rajchel Lisa Mrs.**

SC 41 Business Plan 2020

Document type	Related content	Document date	Expected action
General document / Other		2020-09-11	**COMMENT/REPLY** by 2020-11-02

Description

This document is circulated for review and consideration at the November 2020 virtual JTC 1 Plenary

0BUSINESS PLAN FOR JTC 1/SC 41
Internet of Things and related technologies

September 2020

1 Executive Summary

The Internet of things (IoT) is a system concept that uses many technologies that are standardized by other JTC 1 entities and SDOs. These technologies include sensors, actuators, networking and communications, database and big data, distributed and cloud computing, analytics, digital twins and AI technologies.

IoT systems and systems of systems are software and data intensive and can be quite complex, ranging from simple architecture to multi-tier distributed computing cyberphysical systems.

IoT systems are key enablers of 'Smart Everything' such as Smart Agriculture, Smart Health, Smart Manufacturing, Smart Energy, the Smart Grid, Smart Transportation and Smart Cities.

JTC 1 created SC41 with a systems committee mandate at its November 2016 plenary. SC41 inherited standards and projects from JTC 1 WG7 (Sensors networks) and JTC1/WG10 (IoT). The Work Program of JTC 1/WG7 and WG10 was transferred to SC41 at the beginning of its May 2017 Plenary. SC41 has had six successful plenaries since then.

SC41 has to deal with a complex and evolving ecosystem of technologies and markets, and SDOs. A system approach is thus used for standard development, with a strategic focus. Capitalizing on the excellent work done by its predecessors, SC41 has already a substantial portfolio of standards and projects, with 27 published standards as of 2020-08-27 and 19 projects.

Fourteen Exploratory Ad Hocs and Advisory groups (formerly known as 'Study Groups') have concluded since the creation of SC41 (See 2.2), many proposing New Work. Three of them are currently active to explore possible New Work or progress existing standards, as well as one trend report's projects.

For SC41 current performance and highlight please refer to the dashboard in annex.

2 Chairman's Remarks

In its fourth year of existence, SC41 is continuing to develop its program of work through the work of three Exploratory Ad Hocs and contributions from its P Members.

From a governance perspective, SC41 has put in place an infrastructure that is becoming operational. It has two plenary per years to ensure proper agility in its decision-making. Its governance AG, which meets for at all its plenary, is fully functional. Rapporteurs position have been created and staffed for respectively vocabulary and use-cases. Two Ad Hoc groups have been created for Communications and Outreach and Business Planning.

The industrial IoT (IIoT), which is riven by the convergence between operating technology (OT) and information technology (IT), is a key area for the subcommittee. SC41 has a successful joint working group with IEC TC 65, which prepares standards for industrial-process measurement, control and automation. SC41 has published a TR on this topic (ISO/IEC TR 30166:2020) and has currently three active projects

Another priority is smart energy. SC41 has formed a joint working group with the IEC Systems Committee for Smart Energy and is the process to create one with IEC TC 57, which standardizes power system management systems.

2.1 Market Requirements, Innovation

The Internet of Things (IoT) is defined in ISO/IEC 20924 as:

> *an infrastructure of interconnected entities, people systems and information resources together with services which processes and reacts to information from the physical and virtual world.*

The IoT brings value as part of a system or a system of systems. IoT systems have the following main characteristics:

- Network centric
- Distributed, and Machine to Machine (M2) driven, with various distributed computing architectures using two or more tiers (e.g. 'mist', 'swarm', 'fog', edge and cloud computing)
- Data intensive

The IoT 'objects', which range from sensors and actuators to integrated systems such as a connected vehicle or an industrial robot, can also be 'Smart'.

Some of these systems, or more precisely systems of systems, are also socio-technical. An example of this is a smart city. Others, such as smart factories or autonomous vehicles, are cyber-physical in nature.

As we can see in Figure 1, the IoT is a horizontal technology that is impacting, and disrupting, many application domains in our global society. This also means that there is a wide range of requirements, both functional and non-functional (i.e. availability, resiliency...) for IoT systems. A wide range of IoT architectural patterns are thus needed to meet these diverse requirements.

Another characteristic of many IoT systems is heterogeneity. This is because of the large number of technologies that are in use and also because of the large number of suppliers of IoT products and services. This characteristic is there to stay not only because of the large scope of requirements for IoT systems but also because of the continuous evolution of these technologies.

Finally, IoT systems incorporate other "smart ICT" such as Big Data and Analytics including learning systems and other artificial intelligence (AI) technologies.

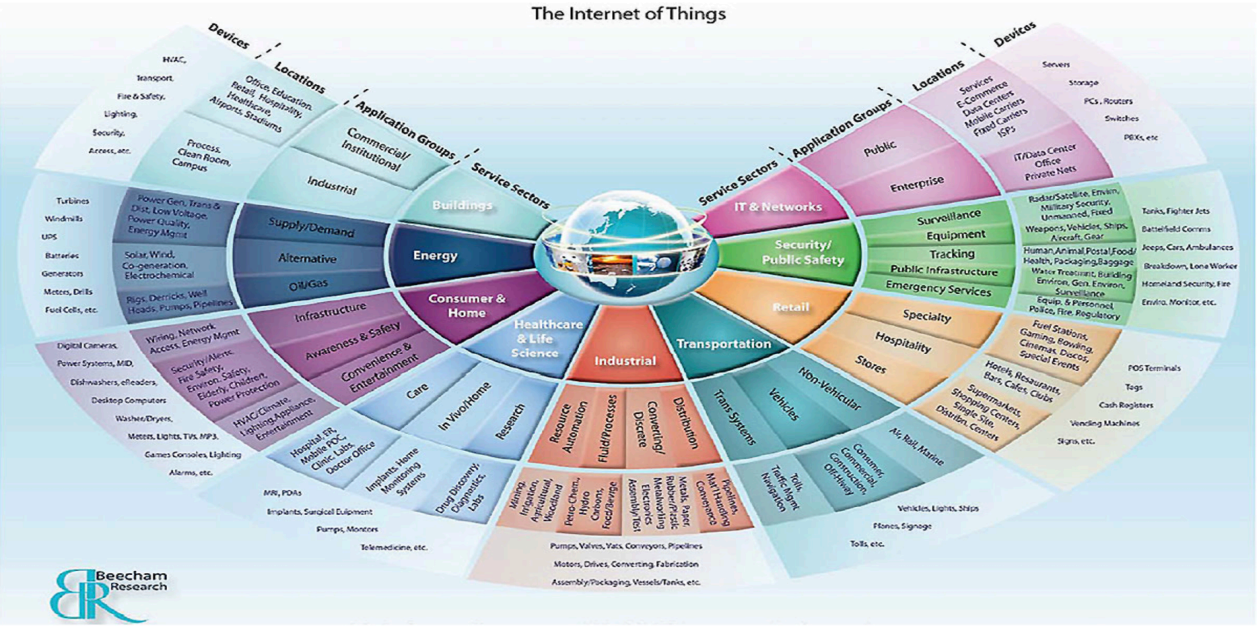


Figure 1 The horizontality of IoT

This implies, for SC41:

- A strong need for horizontal and flexible foundational standards (Reference Architecture, Vocabulary)
- Challenges to get a consensus on some technical topics given the continuing evolution of the technology and the market.
- Horizontality challenged from both a technical (overlap with topics like cloud computing, security...) and application domain standpoint.
- An emphasis of 'not reinventing the wheel' given the high level of activity in SDOs and consortia.

The following principal strategic approaches are thus followed:

- Use a system approach
    - Practice strategic planning
    - Embrace an agile approach
    - Work cooperatively with SDO's and leverage their work
    - Work cooperatively with other JTC 1, ISO and IEC entities, considering joint work

- Actively explore new areas and options with exploratory Ad Hocs and Advisory Groups.

This is why SC41 was created as a systems committee: to fulfill its mandate, it will have to work cooperatively with other JTC 1, ISO and IEC entities as well as with many SDO's.

Given the IoT characteristics that have been listed previously, SC41 needs to concentrate on technology agnostic frameworks and standards, and also to publish standards that would help bridge IoT technology with its wide range of application domain.

A high-level view of SC41 'space' is illustrated in Figure 2. Noteworthy is the importance of Trustworthiness, a system engineering attribute that include reliability, availability, resilience, security, privacy, safety, accountability, transparency, integrity, authenticity, quality, usability and accuracy, to IoT systems. After the successful completion of an Exploratory AHG, SC41 has initiated two projects in this area (30147 & 30149).

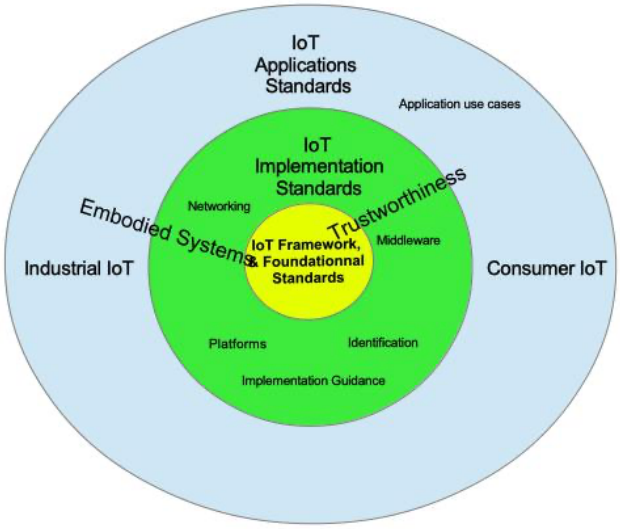


Figure 2 SC41 'Space'

2.2 Accomplishments

SC41 has held two plenaries (and WGs meetings) in this period respectively in: Saint Petersburg, Russia, in November 11-26, 2019 and a virtual one, May 24-29, 2020. Attendance to these meetings was respectively 85 and 116 participants. Some key highlights are:

Saint Petersburg:

Work Program

- 9 projects (Work Item) have progressed
- New Work Items have been tabled
- 2 Technical Reports has been initiated
- 1 Preliminary Work Item (PWI) has been registered

- standards have been re-confirmed
- 1 standards revision has been approved

Strategic

- Approval Joint work (JWG) with the IEC SyC Smart Energy
- Initiation of negotiations of Joint Work with IEC/TC 57 on Industrial IoT for Power Systems.
- Invitation to ISO/TC307 (Blockchains) for Joint Work

May 2020 virtual:

Work Program

- 6 projects (Work Item) have progressed
- 1 project rescope has been proposed
- New Work Items have been tabled
- 1 Technical Reports has been initiated
- 1 Preliminary Work Item (PWI) has been rescoped

Strategic

- Creation of an AHG on trustworthiness interoperability
- Support of initiation of OCF PAS submission

Exploratory Ad Hocs and Advisory groups (formerly known as 'Study Groups') are used in SC41 to explore new areas and contribute to its strategic planning. Since the Seoul Plenary, 13 SGs have been created. These are:

1. **Edge Computing**
   a. Work completed 2017-11. TR published.
2. **IoT Trustworthiness**
   a. Work completed 2018-05. 2 ongoing projects.
3. **Industrial IoT (IIoT)**
   a. Work completed 2018-05. TR published. 2 ongoing projects,
4. **Real-Time IoT**
   a. Work completed 2018-05. 1 ongoing project.
5. **IoT Use Cases**
   a. Work completed 2018-05. Recommendations accepted. 1 NWIP
6. **Reference Architecture and Vocabulary**
   a. Work completed 2018-05. Recommendations accepted and implemented.
7. **Wearables**
   a. Initial work completed 2018-05. Work completed 2018-11. A PWI has been initiated on 2019-05-31. Ongoing project.
8. **Reference Architecture and Vocabulary Harmonization**
   a. Created 2018-11. Implementation strategy for the recommendation of previous SG. Work completed 2019-05.

9. **Societal and Human Factors in IoT Based Services**
    a. Created 2018-07-06. Disbanded 2019-06.

10. **Integration of IoT and Blockchains**
    a. Created 2018-07-06. Disbanded 2020-05. A TR project has been initiated on 2019-11.
11. **Swarm Intelligence for IoT**
    a. Created 2018-07-06. Work completed 2019-05.
12. **IoT Personnel positioning management system (PPMS)**
    a. Created 2019-05-31.
13. **Trustworthiness interoperability**
    a. Created 2020-05-29

SC41 has, as of 2020-05, 26 participating members and 13 observing members as well as 8 A liaison. 300 experts are registered at the IEC.

An overview of the existing SC41 collection of standards and projects as of September 2020, can be found in figure 3. This figure also includes IoT work from other JTC 1, ISO and IEC entities, as well as a record of areas where there is potential for joint work. Noteworthy in Figure 4 is, under 'IoT identification', the presence of SC31 IoT standards. Many of these stable standards were created by SC31 in cooperation with the IEEE.

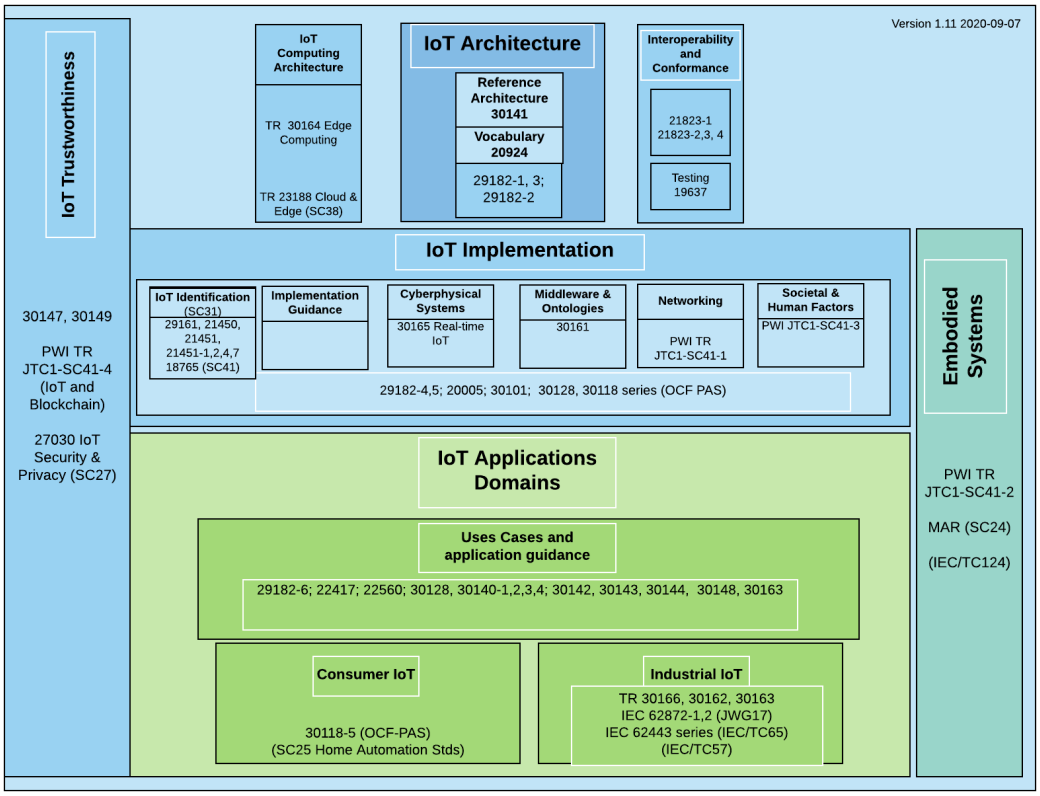


Figure 3 Overview of the SC41 Standards Collection and activities

2.3 Resources

SC41 has sufficient resources for its present program of work, even if this will always remain a continuous challenge. SC41 will try to leverage as much as possible the resource of other JTC 1, ISO and IEC entities as well as SDO's through cooperative work.

2.4 Competition and Cooperation

The full SC41 Membership list, including all external and internal liaisons can be found on the IEC Web site. SC41 is making a conscious effort to increase co-operation with other standards groups by establishing an extensive network of liaisons both internal and external to JTC 1. Noteworthy was the creation of a Joint Working Group (JWG 17) with IEC TC65 to pursue cooperative work in industrial system integration and the JWG 3 with the IEC System Committee on Smart Energy to introduce IoT concepts into the smart energy domain and co-ordinate their integration into Smart Energy standardisation.

Given the large number of internal entities in liaison (See Figure 4), finding liaison officers from SC41 to these entities is a challenge.

IEC Liaisons

SEG7, TC 1, SC 3D, SC 8B, TC 13, TC 56, TC 57, TC 65, TC 91, TC100, TA 16, TC 124, SyC AAL, SyC COMM, SyC SM, SyC Smart Cities, SyC Smart Energy

ISO Liaisons

TC 10, TC 23, TC34, TC 39, TC 68\SC 2, TC 134, TC 154, TC 184, TC 204, TC 211, TC 215, TC 234, TC 261, TC 268, TC 269, TC 282, TC 282/SC 2, TC 299, TC 307, TC 317

JTC 1 Liaisons

WG 11, SC 6, 7, 17, 22, 24, 25, 27, 28, 29, 31, 32, 35, 36, 37, 38, 39, 40, 42

A Liaisons

AIM, GS1, IIC, OCF, OGC, ITU-T, INCOSE, AIOTI

C Liaisons

IEEE P2413 (WG3), IEEE P2786 (WG4), IEEE P.1931.1 (WG 5), IEEE IMS TC 9 (WG 5), SCOTT (WG5)

Figure 4 SC41 Liaisons

To facilitate these liaisons and foster cooperative work, two Sectorial Liaisons Groups (AGs) were created at the Yokohama plenary in November 2018:

- Sectorial Liaison Group 1 – Industrial IoT
- Sectorial Liaison Group 2 - Utilities IoT

Also, at this same plenary, work on 'white paper' style Trend Report on Agricultural IoT was initiated to ultimately engage the IEC and ISO entities working in the agricultural domain.

Since the IoT covers a technologically wide area that is still evolving, and since it's also enabling the transformation of many application domains, a large number of SDOs and consortia are involved in the development of standards (See Figure 5). This implies that SC41 must either work with many of these entities or ensure that its work is properly communicated.

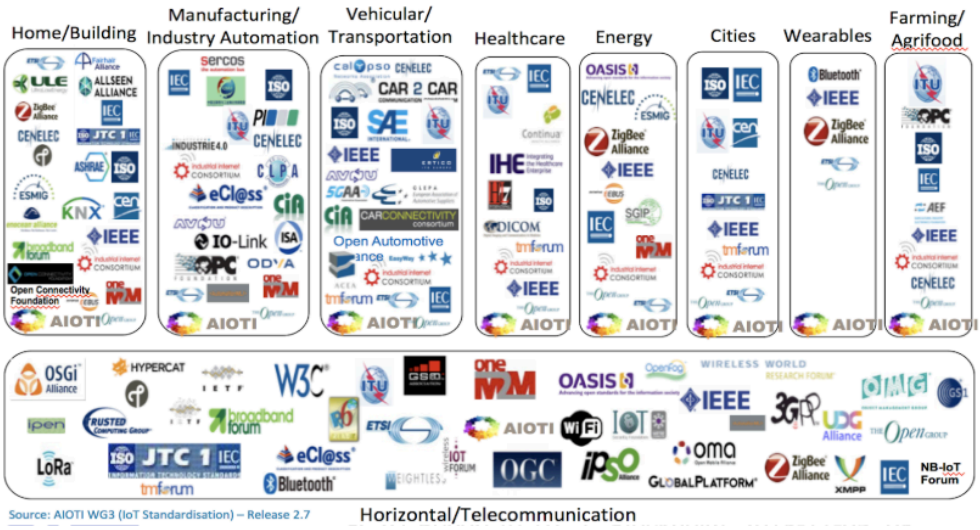


Figure 5 IoT SDOs and Alliance Landscape

3 Work Program

3.1 Structure

SC41 Work Program is done in three working groups and two joint working groups, as illustrated in Figure 5.

These working groups operate under a governance structure that is centred on an Advisory Group (AG) chaired by the SC41 Chair and whose membership include the Committee Manager, the WG Conveners, the P members and the A liaison. As mentioned previously, two plenary and working groups meetings are held each year.

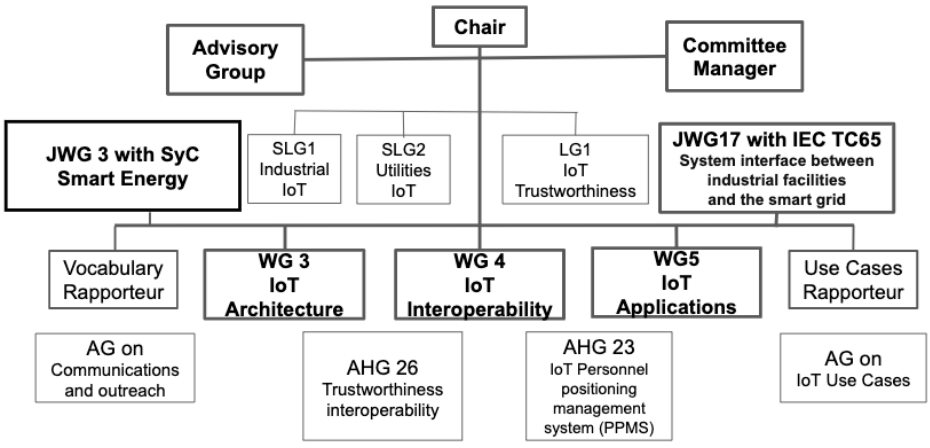


Figure 6 SC41 Structure

3.2 WG3 – IoT Architecture

The terms of reference of WG3 are: *Standardization in the area of IoT vocabulary, architecture, and frameworks*.

From a horizontal point of view, JTC 1/SC 41/WG 3 will undertake standardization activities for reference architecture, frameworks, and vocabulary, in order to establish and maintain a flexible base platform. From a vertical point of view, aspects from the wide range of vertical markets are considered, and cooperation between ICT experts and vertical domain experts is an essential element of the success of this group.

Business Plan: JTC 1/SC41 N0478
Assigned Standards: 29182-1, 2, 3, 4, 5; 30140-1, 2, 3, 4; 3014; 20924
New Publications: 30164
Projects: 30147, 30149, 30165, 30168, Revision of 30141 & 20924
PWIs: JTC1-SC41-172

3.3 WG4 – IoT Interoperability

The terms of reference of WG4 are: *Standardization in the area of IoT interoperability, connectivity, IoT platform, middleware, conformance and testing*.

WG4's focus during next work period is summarized as shown in Figure 6. In addition to the series of ISO/IEC 21823 standards, one objective of WG 4 is to develop interoperability standards for other topics, such as underwater acoustic sensor networks, and web-oriented architecture system model for interoperability. Moreover, WG 4 will also try to develop standards for testing, such as IoT interoperability testing and IoT conformance testing. To explore this further, WG4 has initiated study groups in these areas.

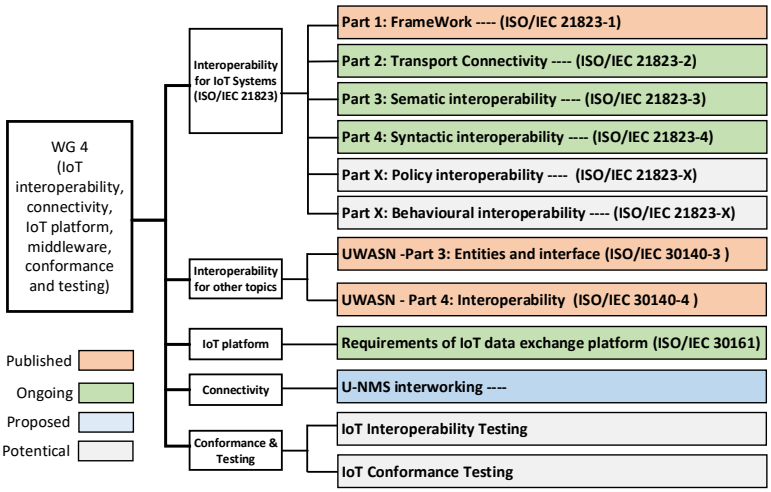


Figure 7 WG4 work program focus

Business Plan: JTC 1/SC41 N0479
Assigned Standards: 19637, 29182-7, 30140-3 & 4. 21823-1
New Publications: 21823-2, 30161
Projects: 21823-3, 4;

3.4 WG5 – IoT Applications

The terms of reference of WG5 are: *Standardization in the area of IoT applications, Uses Cases, , tools and implementation guidance*.

From the horizontal point of view, SC 41/WG 5 will undertake standardization activities for IoT uses cases, IoT platforms, middleware, tools and implementation guidance promoting interrelationships among various application domains, adapting and expanding the work of WG 3 (Architecture) and WG 4 (Interoperability). From the vertical point of view, SC 41/WG 5 will undertake standardization activities to specify a variety of applications and services per each vertical market.

Business Plan: JTC 1/SC41 N0465
Assigned Standards: 22417; 22560; 29182-6; 20005; 30101; 30128
New Publications: 31042, 31043, 30148, 30166
Projects: 31044, 30162, 30163, 30167, 30169, 30171
PWIs: JTC1-SC41-2; JTC1-SC41-3; JTC1-SC41-4; JTC1-SC41-180

3.5 JWG17 – 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.

Projects: IEC 62872-1,2

3.6 JWG3 – 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 standardization*
- Identify and rank possible standard gaps/overlaps/recommendations
- Feed the IEC Smart Energy mapping tool with the above findings

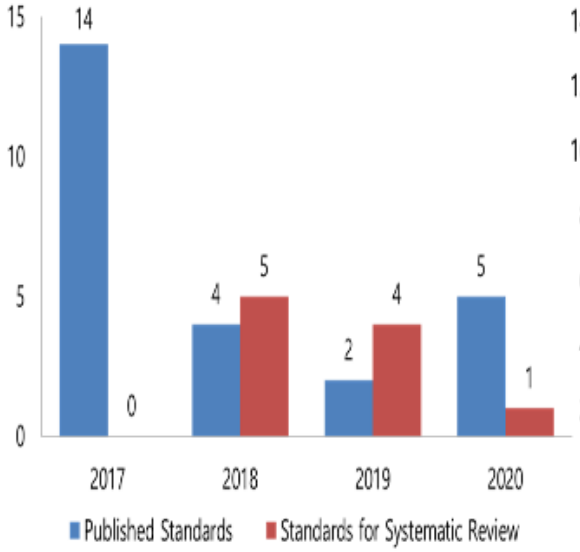
JTC 1/SC41 DASHBOARD 2020-06-01

Systematic Reviews

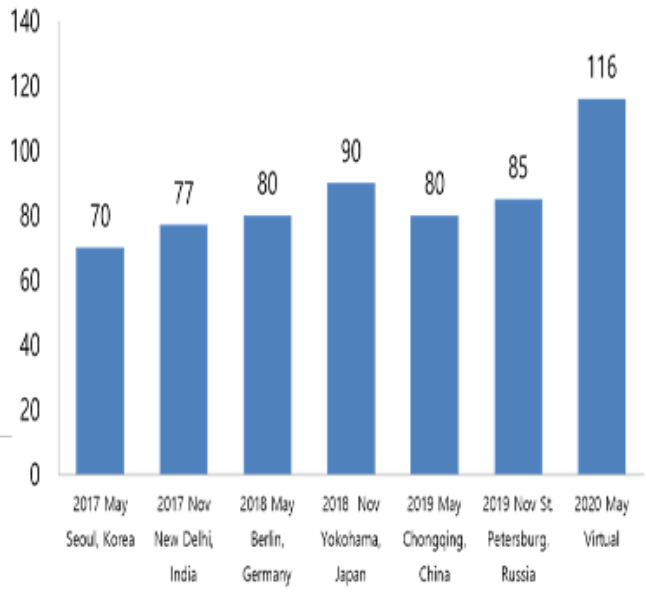
Standards

Year	Total Closed	Closed On time	% on time	Number Published	Avg time to Publish	# within timeframe	% within timeframe
2019	4	4	100%	2	-	-	-
2020	1	1	100%	5	-	-	-

PRODUCTION



MEETING ATTENDANCE



NWIs

- (TS) Generic trust anchor application programming interface for industrial IoT devices
- IoT applications for electronic label system (ELS)
- Base station based underwater acoustic network (B-UWAN) - Overview and requirements
- Underwater Acoustic Sensor Network (UWASN) – Underwater
- Management Information Base (u-MIB)

Ad Hoc GROUPS

- IoT Personnel positioning management system (PPMS)
- IoT Trustworthiness interoperability