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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATION STANDARDIZATION SECTOR**STUDY PERIOD 2017-2020 | TSAG-TD948 |
| **TSAG** |
| **Original: English** |
| **Question(s):** | N/A | E-Meeting, 11-18 January 2021 |
| **TD(Ref.:** [SG20-LS193](http://handle.itu.int/11.1002/ls/sp16-sg20-oLS-00193.docx)) |
| **Source:** | ITU-T Study Group 20 |
| **Title:** | LS on ITU-T SG20 Lead Study Group Report [from ITU-T SG20] |
| **Purpose:** | Information |
| **LIAISON STATEMENT** |
| **For action to:** | - |
| **For comment to:** | - |
| **For information to:** | TSAG |
| **Approval:** | ITU-T Study Group 20 management team (14 December 2020 by correspondence) |
| **Deadline:** | N/A |
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| **Contact:** | Harinderpal Singh GrewalWP2/20 Co-chairman | Tel: +65 9795 0698 Fax: +65 6211 2116 E-mail: harin@yahoo.com  |

A new liaison statement has been received from SG20.

This liaison statement follows and the original file can be downloaded from the ITU ftp server at <http://handle.itu.int/11.1002/ls/sp16-sg20-oLS-00193.docx>.

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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATIONSTANDARDIZATION SECTOR**STUDY PERIOD 2017-2020 | SG20-LS193 |
| **STUDY GROUP 20** |
| **Original: English** |
| **Question(s):** | All/20 |  |
| **LIAISON STATEMENT** |
| **Source:** | ITU-T Study Group 20 |
| **Title:** | LS on ITU-T SG20 Lead Study Group Report  |
| **LIAISON STATEMENT** |
| **For action to:** | - |
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| **Keywords:** | Internet of Things (IoT); Smart Cities and Communities; |
| **Abstract:** | This report contains the report of the ITU-T SG20 on lead study group activities (August 2020 – December 2020). |

ITU-T Study Group 20 is actively fulfilling its mandate as the lead study group on Internet of Things (IoT) and its applications; smart cities and communities, including its e-services and smart services; and for Internet of Things identification.

For additional information on ITU-T SG20, please see <https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/Pages/mandate.aspx>

# 1 ITU-T SG20 as:Lead Study Group on Internet of Things (IoT) and its applications

# Lead Study Group on Smart Cities and Communities, including its e-services and smart services

# Lead Study Group for Internet of Things identification.

# Achievements

The list of results pertaining to the ITU-T SGs Recommendations on Internet of Things (IoT), and its applications since August 2020, are provided in Annex 1 (status: 14 December 2020).

# Plan of work for this study period

Draft Recommendations and other texts on Internet of Things (IoT) and Smart Cities and Communities (SC&C) currently under development in ITU-T SG20 are listed in Annex 2.

# Working Party 1/20

# Main achievements

Since the last TSAG meeting, WP1/20 approved 11 New Work Items and 9 outgoing Liaison Statements were prepared within WP1/20.

# Ongoing work in Working Party 1/20

# Question 1/20 – End-to-end connectivity, networks, interoperability, infrastructures and Big Data aspects related to IoT and SC&C

Q1/20 studies the use of ICT infrastructure and relevant models such as implementation and deployment models, to ensure end-to-end connectivity and service management. These studies include, but are not limited to: access and core telecom networks and platforms, pipelines, intelligent building systems, information and traffic systems, as well as Big Data systems and facilities. This Question includes interoperability studies of IoT devices, networks and verticals for reliable IoT communications and services, which operate through horizontal platforms, regardless of manufacturer or industry.

Q1/20 considers developing measures to effectively tackle Big Data challenges in IoT and smart cities and communities. This also includes developing standardized efficient systems for data analytics, data dimensionality reduction, pattern reduction, features selection, distributed data computation, real time Big Data encryption, and more.

Q1/20 is currently working on 8 work items as detailed in Annex 2.

# Question 2/20 - Requirements, capabilities, and use cases across verticals

Question 2/20 is responsible for developing Recommendations for the support of emerging services and applications for IoT, covering: use cases; ecosystem aspects, taking into account business models and use cases; requirements for IoT services and applications (including for the different service interfaces that will be required). One essential objective is the maximization of common requirements, in order to provide support to a broad range of IoT services and applications in different vertical markets, in cost-efficient, multivendor and easily deployable ways over converged infrastructures. Consideration is also given to applications and services based on the integration of the IoT services and applications with advanced information and communication technologies (ICTs).

Question 2/20 is also responsible for providing the necessary collaboration for joint activities in this field within ITU and between ITU-T and other relevant SDOs, consortia and fora.

Question 2/20 is currently working on 22 work items, as detailed in Annex 2.

# Question 3/20 - Architectures, management, protocols and Quality of Service

Question 3/20 is responsible for developing Recommendations on IoT functional architecture, protocols, management mechanisms, and QoS (including performance) of IoT and Smart Sustainable Cities and Communities (SC&C). One essential objective is to address the requirements of IoT devices, networks, and applications, analyse related architectures and frameworks, in order to provide a common IoT functional architecture, which could be widely applied for different IoT applications, platforms, and systems. Question 3/20 is also responsible for developing Recommendations on other aspects based on this architecture, including, but not limited to, protocols, APIs, identification and management mechanism.

Question 3/20 is also responsible for providing the necessary collaboration for joint activities in this field within ITU and between ITU-T and other relevant SDOs, consortia and fora.

Question 3/20 is currently working on 15 work items as detailed in Annex 2.

# Question 4/20 - e/Smart services, applications and supporting platforms

Question 4/20 is responsible for developing Recommendations on e-Smart services and applications platforms for IoT and SC&C, taking into consideration the whole process of communications and middleware and application interfaces for service supporting such as configuration of resources, provision of capabilities and management with application profiles, whilst maintaining the required privacy and security.

Question 4/20 is also responsible for developing Recommendations on context/event management and reasoning standard, autonomic service management with machine learning mechanisms for intelligent aspects, as well as service management standards and business support capabilities.

Question 4/20 is currently working on 20 work items as detailed in Annex 2.

# Working Party 2/20

# Main achievements

Since the last TSAG meeting, WP2/20 has agreed five Supplements. WP2/20 has also agreed 5 New Work Items and 9 outgoing Liaison Statements were prepared.

# 3.2 Ongoing work in Working Party 2/20

# Question 5/20 - Research and emerging technologies, terminology and definitions

Question 5/20 is tasked to capture and develop definitions, to contribute to a common terminology for IoT and SC&C. This Question is also contributing to the research on solutions for interoperability across different technologies (including identification) and takes into account end-user and market needs. Considering the rapid evolution of the IoT domain, Q5/20 is also contributing to the identification and discussion of relevant research and technological developments in this area, to bring the most relevant topics to the attention of the ITU-T Study Group 20 (SG20) and/or to the corresponding Questions.

Question 5/20 is currently working on 2 work items as detailed in Annex 2.

# Question 6/20 - Security, privacy, trust and identification for IoT and SC&C

Question 6/20 is developing Recommendations, Supplements, Guidelines and Technical Reports on topics such as: authenticity, confidentiality, integrity, non‑repudiation and availability of IoT devices, systems, applications, protocols, platforms, and services; security and trust provisioning in IoT at the ICT infrastructure and future heterogeneous converged-service environments; security and trust provisioning in IoT services and applications for converged environments among stakeholders of different industries; requirements to mitigate the risks and threats identified in IoT and SC&C systems and services; utilizing security constructs in IoT systems to protect identity, privacy, and security of the system; technical measures to prevent compromise, and protect the integrity and privacy of IoT systems, applications, platforms, and services; technical measures needed to support the protection of privacy in SC&C applications, services, and platforms; identifying the potential risks associated with the different management, administration, maintenance, and service provisioning in SC&C; how to mitigate risks associated with the different management, administration, maintenance, and service provisioning in SC&C; supporting availability and portability of the data in IoT and SC&C platforms, systems, and services; the use of naming, addressing, and identification in IoT and SC&C deployments; and identity discovery and identity management in IoT and SC&C.

Question 6/20 is currently working on 11 work items as detailed in Annex 2.

1. **Question 7/20 - Evaluation and assessment of Smart Sustainable Cities and Communities**

Question 7/20 is developing Recommendations, Supplements and Reports on topics such as: methodologies for assessment of city SDGs, considering general principles, criteria for evaluating ICT impact; collecting and calculating reliable data to feed into the assessment model; developing methodologies for measuring and evaluating a city's specific performance and e/smart services with respect to defined sector indicators; reporting on the Global Smart Sustainable Cities Index and reporting a city's performance to help cities to reach SDGs.

Question 7/20 is currently working on 8 work items as detailed in Annex 2.

# Collaboration with other SGs and external organizations

ITU-T SG20 received and responded to many liaison statements including those from: TSAG, ITU-T SG2, ITU-T SG3, ITU-T SG5, ITU-T SG9, ITU-T SG11, ITU-T SG12, ITU-T SG13, ITU-T SG15, ITU-T SG16, ITU-T SG17, ITU-D, FG-DPM, FG-DLT, FG-VM, Standardization Committee for Vocabulary (SCV), JCA-IMT2020, JCA-AHF, CITS, ITU-R, ITU-D, IEC SyC Smart Cities, ISO/IEC JTC1, ISO TC 204, ISO TC 184, IEC TC 65, Internet Engineering Task Force (IETF), OMA, ETSI ISG CDP, ISCG, ICAO, TM Forum, W3C and oneM2M, among others.

In addition, JCA-IoT/SC&C seeks coordination with other SDOs and other forums.

## 4.1 Collaboration with TM Forum

According to [TD1755](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-200706-TD-GEN-1755) - LS/i on Technical specifications on TMF 908 IoT agent and device management API specification and IoT service management API specification from TM Forum, TM Forum invited ITU-T SG20 to consider transposing the following Technical Specifications on TMF 908 IoT Agent and Device Management API Specification and IoT Service Management API Specification into ITU-T Recommendations using Recommendation ITU-T A.25.

During the ITU-T SG20 closing plenary (July 2020), the two new work items were approved which were contained respectively in [TD1783-R3](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-200706-TD-GEN-1783) and [TD1782-R3](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-200706-TD-GEN-1782) .

* ITU-T Y.TM.DM-API "IoT Device Management API REST Specification".
* ITU-T Y.TM.SM-API "IoT Service Management API REST Specification".

​Working Party 1 of ITU-T SG20 reviewed the two Technical Specifications during the Q3/20 Rapporteur Group Meeting held virtually on 2-5 November 2020 and during the Working Party 1/20 meeting that took place on 6 November 2020. The meeting received a list of comments and questions. Accordingly, Working Party 1 of ITU-T SG20 send out a LS to TMForum, including the comments and questions received from the meeting, as contained [TD1961](https://www.itu.int/md/T17-SG20-201106-TD-GEN-1961/en).

## 4.2 Collaboration with oneM2M

ITU has excellent cooperation with oneM2M and is exploring the possibility to further its synergies with oneM2M. ​

ITU-T Study Group 20 thanked Mr Enrico Scarrone, Chairman of the oneM2M Steering Committee for providing information on oneM2M during the SG20 opening plenary on 6 July 2020 and during an ad-hoc session that took place on 13 July 2020.

The main aim of the ad-hoc session was to provide ITU-T SG20 members the opportunity to ask questions or present comments concerning the possibility for ITU to sign a Partnership Agreement and join officially oneM2M. See [TD1776-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-200706-TD-GEN-1776).

ITU-T SG20 has sought the advice of TSAG which is currently discussing this matter. ITU-T SG20 will keep oneM2M posted on future developments. See [TD1876-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-200706-TD-GEN-1876).

## 4.3 Joint ITU/ISO/IEC Task Force on Smart Cities

The following are the background and updates on the IEC-ISO-ITU Joint Smart Cities Task Force (J-SCTF) activities:

* The World Smart City Forum was initiated by ITU, ISO, and IEC in 2016 to understand and meet the identified needs of our stakeholders and to discuss good practices that address urban challenges;
* Annual World Smart City Forum was organized by each SDOs and after the third edition in 2018, an effective collaboration channel between ITU, ISO and IEC to share information in the form of a “Joint Task Force for Smart Cities” was envisioned;
* Three SDOs eventually agreed on the ToR for the IEC-ISO-ITU Joint Smart Cities Task Force (J-SCTF) and designated 3 leads and 26 experts for the task force;
* The kick-off meeting was planned on 3 April 2020 but was moved to 7 October 2020 and took place virtually due to the pandemic;
* The main goal of the kick-off was to inform J-SCTF experts about the scope and objectives of the Task Force (ToR) and talk about potential activities to be launched within this framework;
* It was also themed ‘capturing global learnings from the management of the Covid-19 Pandemic’ highlighting the scale and urgency of the challenge; and
* Second meeting is planned to take place virtually on 24 February 2021 to discuss further topics and working methods.

# ITU-T Study Group 20 Meetings

ITU-T SG20 held a meeting virtually, from 6–16 July 2020. See [Report](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-R-0010) 10 for additional details on the last SG20 meeting.

Working party 1/20 held a meeting virtually on 6 November 2020 and was prece​ded by Rapporteur meetings of Q1/20, Q2/20, Q3/20 and Q4/20 from 2 to 5 November 2020. See [Report 14](https://www.itu.int/md/T17-SG20-R-0014/en) for additional information.

An ITU-T SG20 plenary will take place virtually on 16 December 2020 and the only matter for discussion will be the consideration for Decision on TAP Recommendations that were Determined.

The next ITU-T SG20 meeting will be held in May 2021.

# JCA IoT and Smart Cities & Communities

The scope of the [JCA-IoT and SC&C](https://www.itu.int/en/ITU-T/jca/iot/Pages/default.aspx) is to coordinate the ITU-T work on the “Internet of Things and Smart Cities and Communities” and provide a visible contact point for IoT and its applications including smart cities and communities (SC&C) activities within ITU-T. This would also help to coordinate with external bodies working in the field of IoT and SC&C and enable effective two‑way communication with these bodies. External bodies include representatives from relevant SDOs such as IEC, ISO or relevant academia, consortia or fora.

The JCA-IoT and SC&C maintains an IoT and SC&C standards roadmap which documents complete as well as ongoing work on IoT and SC&C carried out by ITU-T, as well as by other SDOs and Forums. The IoT and SC&C standards roadmap is available [online](https://www.itu.int/net4/itu-t/roadmap#?topic=0.78&workgroup=1&searchValue=&page=1&sort=Revelance) and as Supplement ITU-T Y.Suppl.58 “Internet of Things and smart cities and communities standards roadmap”.

Since January 2020, the JCA IoT and SC&C has held the following meeting:

* Twenty-third meeting, Virtual, 26 June 2020.

The twenty-fourth meeting of the JCA IoT and SC&C will be held in conjunction with the meeting of ITU-T SG20 in 2021.

# ITU-T Study Group 20 Regional Groups

The following are the updates from the ITU-T SG20 Regional Groups since the last TSAG meeting:

* [SG20 Regional Group for the Africa Region](https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgafr/Pages/default.aspx) - none.
* [SG20 Regional Group for the Arab Region](https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgarb/Pages/default.aspx) - none.
* [SG20 Regional Group for the Latin America Region](https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rglatam/Pages/default.aspx) held its third meeting virtually from 13-14 October 2020. See [SG20RG-LATAM Report 3](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG020RG.LATAM-R-0003) for additional details.
* [SG20 Regional Group for Eastern Europe, Central Asia and Transcaucasia](https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgeecat/Pages/default.aspx) – none.

# Future events and dates of next ITU-T Study Group 20 meeting and Regional Group meetings

* A series of e-meetings will take place in 2021; and
* The next meeting of ITU-T SG20 is planned to take place virtually in May 2021.

# Other activities

Since August 2020, a series of events on IoT and SSC have been held:

* The [5th meeting of the United for Smart Sustainable Cities Initiative (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/202010/meeting.aspx) took place virtually on 9 October 2020;
* The International Telecommunication Union (ITU) organized, together with UN-Habitat, a [Virtual forum on “Digital Transformation of Cities and Communities"](https://www.itu.int/en/ITU-T/climatechange/Pages/20201207.aspx) that took place virtually ​on 7 December 2020.
	+ The programme and presentations delivered during the Forum can be [here](https://www.itu.int/en/ITU-T/climatechange/Pages/20201207.aspx).
* The International Telecommunication Union (ITU), together with the Regional Center for Studies on the Development of the Information Society (Cetic.br) of the Brazilian Network Information Centre (NIC.br), organized a [webinar on “Smart sustainable cities and frontier technologies in Latin America"](https://www.itu.int/en/ITU-T/climatechange/Pages/202012.aspx) which took place on 8 December 2020.

**United for Smart Sustainable Cities (U4SSC) initiative**

The [United for Smart Sustainable Cities (U4SSC) initiative](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) is a United Nations initiative coordinated by the International Telecommunication Union (ITU), the United Nations Economic Commission for Europe (UNECE) and the United Nations Human Settlements Programme (UN-Habitat) and supported by 14 other United Nations Agencies and Programmes (CBD, ECLAC, FAO, UNESCO, UNDP, UNECA, UN-Women, UNEP, UNEP-FI, UNFCCC, UNIDO, UNOP, UNU EGOV and WMO). U4SSC is the global platform to advocate for public policies to encourage the use of ICTs to facilitate and ease the transition to smart sustainable cities.

U4SSC is currently working on the following Thematic Groups:

* City platforms
* Economic recovery in cities and urban resilience building in the time of COVID-19
* Guidelines on tools and mechanisms to finance SSC projects
* Guiding principles for Artificial Intelligence in cities
* Simple ways to be smart
* Procurement guidelines for Smart Cities and Communities
* United for Smart Sustainable Cities Index.

Since August 2020, the following deliverables were published:

* ​[Accelerating city transformation using frontier technologies](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Deliverable-Accelerating-city-transformation/index.html)
* ​[Blockchain for smart sustainable cities](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Blockchain-for-smart-sustainable-cities/index.html)

**Key performance indicators for smart sustainable cities project**

The U4SSC developed a set of international key performance indicators (KPIs) for Smart Sustainable Cities (SSC) to establish the criteria to evaluate ICT´s contributions in making cities smarter and more sustainable, and to provide cities with the means for self-assessments in order to achieve the sustainable development goals (SDGs). This KPIs for SSC are based on an international standard - [Recommendation ITU-T Y.4903/L.1603 on Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals](https://www.itu.int/ITU-T/recommendations/rec.aspx?id=12884&lang=en) and were developed within the framework of the United for Smart Sustainable Cities initiative. Over 100 cities worldwide are already implementing these KPIs.

The list of all the KPIs for SSC along with its collection methodology are contained in the:

* [Flipbook on "Collection Methodology for Key Performance Indicators for Smart Sustainable Cities".](https://www.itu.int/en/publications/Documents/tsb/2017-U4SSC-Collection-Methodology/index.html)

As part of the work on the implementation of the U4SSC KPIs for smart sustainable cities, the following Snapshots and Verification Reports were launched from August – November 2020:

* City snapshot – [Trondheim, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Trondheim-Norway/index.html)
* City snapshot – [Rana, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Rana-Norway/index.html)
* City snapshot – [Molde, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Molde-Norway/index.html)
* City snapshot – [Kristiansund, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Kristiansund-Norway/index.html)
* City snapshot – [Karmoy, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Karmoy-Norway/index.html)
* City snapshot – [Haugesund, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Haugesund-Norway/index.html)
* City snapshot – [Bodo, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Bodo-Norway/index.html)
* City snapshot – [Baerum, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Baerum-Norway/index.html)
* City snapshot – [Asker, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Asker-Norway/index.html)
* City snapshot – [Esperanza, Argentina](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Esperanza-Province-of-Santa-Fe-Argentina/index.html)
* City snapshot – [Santa Fe, Argentina](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Santa-Fe-Argentina/index.html)
* City snapshot – [Wels, Austria](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-City-Snapshot-Wels-Austria/index.html)
* Verification Report – [Trondheim, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Trondheim-Norway/index.html)
* Verification Report –[Rana, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Rana-Norway/index.html)
* Verification Report –[Molde, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Molde-Norway/index.html)
* Verification Report –[Kristiansund, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Kristiansund-Norway/index.html)
* Verification Report –[Karmoy, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Karmoy-Norway/index.html)
* Verification Report –[Haugesund, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Haugesund-Norway/index.html)
* Verification Report –[Bodo, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Bodo-Norway/index.html)
* Verification Report –[Baerum, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Baerum-Norway/index.html)
* Verification Report –[Asker, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Asker-Norway/index.html)
* Verification Report –[Esperanza, Argentina](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Esperanza-Province-of-Santa-Fe-Argentina/index.html)
* Verification Report – [Santa Fe, Argentina](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Santa-Fe-Argentina/index.html)
* Verification Report – [Gjøvik, Norway](https://www.itu.int/en/publications/Documents/tsb/2020-U4SSC-Verification-Report-Gjovik-Norway/index.html)

In addition, U4SSC is also developing several City snapshots and Verification Reports to highlight the performance of cities in the implementation of KPIs.

* Kristiansand, Norway
* Vanylven, Norway
* Sande, Norway
* Herøy, Norway
* Ulstein, Norway
* Hareid, Norway
* Ørsta, Norway
* Stranda, Norway
* Sykkylven, Norway
* Vestnes, Norway
* Rauma, Norway
* Aukra, Norway
* Averøy, Norway
* Gjemnes, Norway
* Tingvoll, Norway
* Sunndal, Norway
* Surnadal, Norway
* Smøla, Norway
* Aure, Norway
* Volda, Norway
* Fjord, Norway
* Hustadvika, Norway
* Larvik, Norway
* Tehran, Iran

# Annex 1

**Achievements of ITU-T Study Group 20 on Internet of Things (IoT) and Smart Cities and Communities (SC&C)
(status 14 December 2020)**

1. **Recommendations approved**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | Y.4210 | Requirements and use cases for universal communication module of mobile IoT devices |
| 20 | Y.4211 | Accessibility requirements for smart public transportation services |
| 20 | Y.4469  | Reference architecture of spare computational capability exposure of IoT devices for smart home |
| 20 | Y.4470  | Reference architecture of artificial intelligence service exposure for smart sustainable cities |
| 20 | Y.4473  | SensorThings API - Sensing |
| 20 | Y.4474 | Functional architecture for IoT services based on Visible Light Communications |
| 20 | Y.4475 | Lightweight intelligent software framework for IoT devices |
| 20 | Y.4558 | Requirements and functional architecture of smart fire smoke detection service |
| 20 | Y.4560 | Blockchain-based data exchange and sharing for supporting Internet of things and smart cities and communities |
| 20 | Y.4561 | Blockchain-based Data Management for supporting Internet of things and smart cities and communities |
| 20 | Y.4808 | Digital entity architecture framework to combat counterfeiting in IoT |
| 20 | Y.4907 | Reference architecture of blockchain-based unified KPI data management for smart sustainable cities |

1. **Implementer's guide approved**

**None.**

1. **Deleted Recommendations**

**None.**

1. **Agreed informative texts**

|  |  |  |
| --- | --- | --- |
| **SG** | **No** | **Title** |
| None. |  |  |

# Annex 2

**Current work programme of ITU-T Study Group 20 on Internet of Things (IoT) and Smart Cities and Communities (SC&C)
(status 14 December 2020)**

**Working Party 1/20**

1. **Q1/20 - End to end connectivity, networks, interoperability, infrastructures and Big Data aspects related to IoT and SC&C**

|  |  |  |
| --- | --- | --- |
| **SG** | **No** | **Title** |
| 20 | [Y.cii (ex Y.rrm-data)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15088) | Requirements and reference model of IoT related data from city infrastructure |
| 20 | [Y.DPM-framework](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16391) | Data processing and management framework for IoT and smart cities and communities |
| 20 | [Y.DPM-interop](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16393) | Requirements and functional model to support data interoperability in IoT environments |
| 20 | [Y.DPM-qm](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16394) | Requirements and functional model to support data quality management in IoT |
| 20 | [Y.infra](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13673) | Sensing device management system for city infrastructure |
| 20 | [Y.isms (ex Y.ism-ssc)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13674) | Technical framework for integrated sensing and management system |
| 20 | [Y.nmm-isms (ex Y.isw-ssc)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13675) | The node metadata model for integrated sensing and management system |
| 20 | [Y.Sup.Web-DM](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16392) | Web based data model for IoT and smart city |

**b) Q2/20 - Requirements, capabilities, and use cases across verticals**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.AEDS-smarthome](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16858) | Requirements and capability framework of abnormal event detection system for smart home |
| 20 | [Y.AM-SC-reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14960) | IoT technical requirements and framework for monitoring physical city assets |
| 20 | [Y.CS-framework](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16657) | Service requirements and capability framework for IoT-related crowdsourced systems |
| 20 | [Y.dtf-smartfirefighting](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16857) | Requirements and capability framework of digital twin for smart firefighting |
| 20 | [Y.ElecMon-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16860) | Requirements of IoT-based electric power infrastructure monitoring system |
| 20 | [Y.IoT-AV-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14958) | Requirements and capability framework of IoT infrastructure to support network-assisted autonomous vehicles |
| 20 | [Y.IoT-BC-reqts-cap](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16859) | IoT requirements and capabilities for support of blockchain |
| 20 | [Y.IoT-BPM-reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14497) | Specific requirements of the Internet of things for business process management |
| 20 | [Y.IoT-CEIHMon-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16654) | Requirements of IoT-based civil engineering infrastructure health monitoring system |
| 20 | [Y.IoT-EC-GW](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14644) | Capabilities and framework of edge computing-enabled gateway in the IoT |
| 20 | [Y.IoT-NCM-reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14106) | Requirements and capabilities of network connectivity management in the Internet of things |
| 20 | [Y.IoT-SLF](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14645) | Framework and capabilities for smart livestock farming based on Internet of things |
| 20 | [Y.IoT-SmartBuild](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14959) | Common requirements and capabilities of smart buildings from the IoT perspective |
| 20 | [Y.IoT-UAS-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14303) | Use cases, requirements and capabilities of unmanned aircraft systems for Internet of things |
| 20 | [Y.SCC-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14305) | Common requirements and capabilities of smart cities and communities from IoT and ICT perspectives |
| 20 | [Y.scdt-reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16396) | Requirements and capabilities of a digital twin system for smart cities |
| 20 | [Y.SmartRailwayStation](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14961) | High-level requirements and capabilities of smart railway station platform |
| 20 | [Y.SmartShoppingMall](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16655) | Requirements and capability framework of smart shopping mall |
| 20 | [Y.SRC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13704) | Requirements for deployment of smart services in rural communities |
| 20 | [Y.SUM](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16395) | Requirements and Capability Framework of Smart Utility Metering (SUM) |
| 20 | [Y.Sup.SmartAgri-usecases](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16660) | Use cases of IoT based smart agriculture |
| 20 | [Y.Sup-IoT-Eco-Plan](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14647) | Framework for Internet of things ecosystem master plan |

**c) Q3/20 - Architectures, management, protocols and quality of service**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | Y.4471 (determined) | Functional architecture of network-based driving assistance for autonomous vehicles |
| 20 | Y.4476 (consented) | OID-based resolution framework for transaction of distributed ledger assigned to IoT resources |
| 20 | [Y.AI-DECCS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16856) | Functional architecture of AI enabled device-edge-cloud collaborative services for IoT and smart city |
| 20 | [Y.cnce-IoT-arch](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14651) | Functional architecture of cellular-radio network capability exposure for smart hospital based on Internet of things |
| 20 | [Y.dec-IoT-arch](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14650) | Decentralized IoT communication architecture based on information centric networking and blockchain |
| 20 | [Y.DFR-SM](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16667) | Data format requirements and protocols for remote data collection in smart metering systems |
| 20 | [Y.IoT-AOS-prot](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15089) | Protocols of supporting autonomic operations in the Internet of things |
| 20 | [Y.IoT-DES-fr](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16855) | Framework of decentralized service by using DLT and edge computing technologies for IoT devices |
| 20 | [Y.IoT-DSE-arc](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16862) | Reference architecture of service exposure for decentralized services for IoT applications |
| 20 | [Y.IoT-rmc](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14126) | Reference architecture of accessing IoT resources for management and control |
| 20 | [Y.IoT-sd-arch](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13709) | Framework of service interworking with device discovery and management in heterogeneous IoT environments |
| 20 | [Y.NCE.arch.EIoT](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16861) | Functional architecture enhancement with network capability exposure to support flexible QoS/QoE requirements from enterprise IoT services and applications |
| 20 | [Y.TM.DM-API](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16669) | IoT Device Management API REST Specification |
| 20 | [Y.TM.SM-API](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16668) | IoT Service Management API REST Specification |
| 20 | [Y.UAV.arch](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14653) | Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks |

**d) Q4/20 - e/Smart services, applications and supporting platforms**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4559 (determined)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15092) | Requirements and functional architecture of base station inspection services using unmanned aerial vehicles |
| 20 | [Y.BC-SON](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15093) | Framework of blockchain-based self-organization networking in IoT environments |
| 20 | [Y.blockchain-terms](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16679) | Vocabulary for blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects |
| 20 | [Y.CDML-arc](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16865) | Reference architecture of collaborative decentralized machine learning for intelligent IoT services |
| 20 | [Y.data-MP](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16674) | Framework for data middle-platform in IoT and smart sustainable cities |
| 20 | [Y.eHealth-Semantic](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16400) | Framework to support semantic mediation of eHealth services |
| 20 | [Y.IoT-AR](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14965) | Framework for AR and VR based control in IoT |
| 20 | [Y.IoT-BoT-peer](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16863) | Capability and functional architecture of peer of blockchain of things |
| 20 | [Y.IoT-Lift](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14966) | Framework of IoT based monitoring and management for Lift |
| 20 | [Y.IoT-SCS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15094) | Requirements and functional architecture for smart construction site services |
| 20 | [Y.IoT-SQMS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16864) | Requirements and functional architecture of IoT sensing quality management service |
| 20 | [Y.RA-FML](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16676) | Requirements and reference architecture of IoT and smart city & community service based on federated machine learning |
| 20 | [Y.RA-PHE](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16673) | Requirements and reference architecture of smart service for public health emergency |
| 20 | [Y.RA-SDL](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16678) | Requirements and functional architecture of smart door lock service |
| 20 | [Y.smart-education](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15091) | Requirements and Reference Architecture of Smart Education |
| 20 | [Y.smart-evacuation](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14102) | Framework of Smart Evacuation during emergencies in smart cities and communities |
| 20 | [Y.smart-PBRS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16677) | Requirements and functional architecture of smart power bank rental service |
| 20 | [Y.Smart-SBS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16675) | Requirements and functional architecture of smart sharing bicycle service |
| 20 | [Y.STIS-fm (ex Y.STIS-fdm)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14100) | Function and metadata of Spatiotemporal Information Service for SSC |
| 20 | [Y.water-SFP](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16399) | Framework of monitoring of water system for smart fire protection |

**Working Party 2/20**

**a) Q5/20 - Research and emerging technologies, terminology and definitions**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.smart-oceans](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16409) | Overview of smart oceans and seas, and requirements for their ICT implementations |
| 20 | [Y.Sup.Interact-P-D-cities (ex TR.Interact-P-D-cities)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14658) | Interaction between physical and digital cities for building smart sustainable city |

**b) Q6/20 - Security, privacy, trust and identification for IoT and SC&C**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4472](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14297) ​(consented) | Open data application programming interface (APIs) for IoT data in smart cities and communities |
| 20 | [Y.Data.Sec.IoT-Dev](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16412) | Requirements of data security for the heterogeneous IoT devices |
| 20 | [Y.FW.IC.MDSC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14299) | Framework of identification and connectivity of moving devices in smart city |
| 20 | [Y.IoT-Ath-SC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14657) | Framework of IoT-devices authentication in smart city |
| 20 | [Y.IoT-CSIADE-fw](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16413) | Reference framework of converged service for identification and authentication for IoT devices in decentralized environment |
| 20 | [Y.IoT-IoD-PT](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13690) | Identity of IoT devices based on secure procedures to enhance trust of IoT systems |
| 20 | [Y.IoT-ITS-ID](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14947) | Unified IoT Identifiers for Intelligent Transport Systems |
| 20 | [Y.IoT-Smartcity-Risk](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16665) | Reference framework of cybersecurity risk management of IoT ecosystems on smart cities |
| 20 | [Y.oneM2M.SEC.SOL](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14318) | oneM2M Security Solutions |
| 20 | [YSTR.Feas-DID-IoT](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16411) | Feasibility of Decentralised Identifiers (DIDs) in IoT |
| 20 | [YSTR-IADIoT](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16666) | Intelligent Anomaly Detection System for IoT |

**c) Q7/20 - Evaluation and assessment of Smart Sustainable Cities and Communities**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4903](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14951) | Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals |
| 20 | Y.4908​ [(determined)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13679) | Performance evaluation frameworks of e-health systems in the IoT |
| 20 | [Y.IoT-SQAF](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16662) | Sensing quality assessment framework of IoT systems |
| 20 | [Y.SSC-NGUM](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16663) | A Methodology for Next Generation Urban Measurements |
| 20 | [Y.Stra-SSC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14948) | Standards mapping assessment for smart sustainable city (SSC) strategy |
| 20 | [Y.Sup.digi-inc](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14950) | Guidelines for digital inclusion in the development of digital urban technology and smart cities |
| 20 | [Y.Sup-NGUM](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16664) | Use Cases for Next Generation Urban Measurements |
| 20 | [Y.Sup-SSC-UCE](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16414) | Use Cases on implemented or evaluated SSC solutions based on ITU-T Y.4900 Recommendation Series |

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