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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2021 | | | | TSAG-TD1049 |
| **TSAG** |
| **Original: English** |
| **Question(s):** | | N/A | | | E-Meeting, 25-29 October 2021 |
| **TD (Ref.:** [SG20-LS230](http://handle.itu.int/11.1002/ls/sp16-sg20-oLS-00230.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 (17 September 2021 by correspondence) | | |
| **Deadline:** | | | N/A | | |
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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-00230.docx>.

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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2020 | | | **SG20-LS230** | |
| **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** | | | | | | |
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| **For comment to:** | | | | - | | |
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| **Approval:** | | | | ITU-T Study Group 20 management team (17 September 2021 by correspondence) | | |
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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 (January – August 2021). |

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 January 2021, are provided in Annex 1 (status: 17 September 2021).

# 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 8 New Work Items and 20 outgoing Liaison Statements were prepared within WP1/20.

# Ongoing work in Working Party 1/20

# Question 1/20 – Interoperability and interworking of IoT and SC&C applications and services

Q1/20 addresses use cases, requirements, architectures and data sets and format to support interworking and provide interoperability between IoT and SC&C applications and services not only within but also between cities and communities. ​These studies include, but are not limited to: the use cases for interworking between IoT and SC&C applications and services; requirements and architectures to support interworking and provide interoperability of IoT and SC&C applications and services; and data interoperability and semantic interoperability.

Q1/20 is currently working on 5 work items as detailed in Annex 2.

# Question 2/20 - Requirements, capabilities and architectural frameworks across verticals enhanced by emerging digital technologies

Question 2/20 is responsible for developing Recommendations that addresses the common and specific requirements, capabilities and architectural frameworks enhanced by emerging technologies across verticals. On the basis of use cases and related ecosystem aspects, the requirements, capabilities and architectural frameworks enhanced by emerging technologies for the support of IoT and SC&C services and applications will be specified from both common (not vertical dependent) and vertical specific viewpoints.

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 25 work items, as detailed in Annex 2.

# Question 3/20 - IoT and SC&C architectures, protocols and QoS/QoE

Question 3/20 is responsible for developing Recommendations that addresses architectures, including their functionalities, interfaces, protocols, data models, intelligent management mechanisms, control mechanisms, connectivity technologies, APIs, and Quality of Experience/Service (QoE/QoS) of IoT and Smart Sustainable Cities and Communities (SSC&C), which needed to construct architectural frameworks to interact with services and applications, as well as different networks 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 22 work items as detailed in Annex 2.

# Question 4/20 - Data analytics, sharing, processing and management, including big data aspects, of IoT and SC&C

Question 4/20 is responsible for developing Recommendations on DPM, data analytics and sharing including big data aspects for IoT and SC&C.

Question 4/20 is also responsible for developing Recommendations on trusted data and data quality in DPM frameworks including digital identification and certification; analysis of existing technologies, platforms, guidelines and standards for DPM; architectural frameworks for the future of data driven ecosystems and their applications with DPM and big data.

Question 4/20 is currently working on 10 work items as detailed in Annex 2.

# Working Party 2/20

# Main achievements

Since the last TSAG meeting, WP2/20 has also approved 4 New Work Items and 8 outgoing Liaison Statements were prepared.

# 3.2 Ongoing work in Working Party 2/20

# Question 5/20 - Study of emerging digital 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 can also contribute to research solutions for interoperability across different technologies, taking into account both end-user, regulatory and market needs. Considering the rapid evolution of the IoT domain, this Question can also contribute 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 5 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 10 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 Technical 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; and reporting a city's performance to help cities to reach SDGs.

Question 7/20 is currently working on 9 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, LoRa Alliance, IEEE, 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).

During the Q3/20 Rapporteur Group e-meeting that took place on 1-3 February 2021, an incoming liaison statement from TM Forum, which contains the proposed baseline text for draft new Recommendation ITU-T Y.TM.DM-API *“IoT Device Management API REST Specification”* and draft new Recommendation ITU-T Y.TM.SM-API “*IoT Service Management API REST Specification”*, has been reviewed.

The proposed baseline texts have been reviewed and the meeting participants proposed editorial modifications on the texts.

Please find all documents discussed available [here](https://www.itu.int/ifa/t/2017/sg20/exchange/rapporteurs_1-4february21/q3/).

## 4.2 Collaboration with oneM2M

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

During the ITU-T SG20 opening plenary that took place on 17 May 2021, Mr Bruce Gracie, TSAG Chairman, presented [TD2131](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2131) “LS/i on a draft submission and maintenance process for oneM2M specifications incorporated as ITU-T Recommendations [from TSAG]”. This document contains information from TSAG’s Rapporteur Group on Strengthening collaboration (RG-SC) that it is currently developing a document which will detail the submission and maintenance process for oneM2M specifications that are expected to be transposed into ITU-T Recommendations.

The following outgoing liaison statements were discussed and approved: ​

* [TD2260-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2260) – Draft LS/o/r on a draft submission and maintenance process for oneM2M specifications incorporated as ITU-T Recommendations (TSAG-LS43) [to TSAG] (answers TD2131)
* [TD2290](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2290) – Draft LS/o on information on the draft submission and maintenance process for oneM2M specifications incorporated as ITU-T Recommendations [to oneM2M]

In addition, TSB was requested to provide an A.5 Qualification of oneM2M at the next SG20 meeting to be held in October 2021.

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

The second J-SCTF meeting took place on 24 February 2021 (chaired by Mr Nasser Al Marzouqi, Chairman of ITU-T SG20). A draft working method document for the J-SCTF was presented and discussed. Each organization presented and shared information on updates on activities related to the pandemic. It was decided to hold a workshop to understand the work of each organization better especially regarding the different working methods. Various topics such as city architecture, terminology, city data, mapping standards, smart city framework, J-SCTF purpose and goals, etc. were proposed by the members for future J-SCTF meetings

J-SCTF Forum on “Strengthening IEC, ISO and ITU collaboration for Smart Cities” took place on 21 June 2021. The working methods of IEC, ISO, ITU-T, and ISO/IEC JTC1 were presented including the structure of the organization, creation of new work items, decision making process, process on joint work etc. The Standardization Programme Coordination Group (SPCG) also joined the event and presented the role and functions of the group.

The third J-SCTF meeting took place on 29 June 2021. The J-SCTF has been given a mandate for two years with possibility of extension. During the third J-SCTF meeting, it was decided as action that a short report on J-SCTF activity should follow this meeting and be addressed to the SPCG for further distribution to the respective governing boards (SMB, TMB, TSAG) and will include a clarification on the lifetime extension of two years, i.e. that our understanding is that this is to be taken as up to October 2022 which is two years from the kick-off meeting. A series of output shown below have been decided as objectives of the J-SCTF:

* Produce a common position paper on smart cities to start work on it asap;
* Organise a Joint Workshop on public health emergency;
* Propose the organisation of the 4th World Smart City Forum to the central offices of ISO, IEC and ITU, based on a specific theme.

In the document, a paragraph describing the possibility to have Task & Finish (T&F) groups to develop proposals between meetings has been added and a T&F group was established to work on a proposal on how to develop a holistic view of Smart Cities.

Next meetings are planned to take place in September and December 2021.

## 4.4 Collaboration with IEEE

During the ITU-T SG20 opening plenary that took place on 17 May 2021, Mr Joel Myers presented [TD2135](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2135) – The collaboration between ITU and IEEE. The Collaboration with IEEE was welcomed. Dr Gyu Myoung Lee, Q4/20 Rapporteur, was designated as ITU-T SG20 focal point.

An Ad hoc session took place on 20 May 2021 and was chaired by Dr Gyu Myoung Lee. The following TDs were presented:

* [TD2165-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2165) – Draft agenda of the Ad-hoc session
* [TD2166](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2166) – Concept note on the Global Observatory Urban Intelligence (GOUI)
* [TD2167](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2167) – Draft activities and schedule

The meeting agreed to prepare an outgoing LS to inform TSAG about this activity and encourage contributions from all ITU-T SGs. This outgoing LS can be found in [TD2283-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2283). The report of the ad-hoc session can be found in [TD2294-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2294).

The first e-meeting on the Global observatory for urban intelligence (GOUI) took place on 21 July 2021 and the second e-meeting took place on 8 September 2021.

## 4.5 Collaboration with LoRa Alliance

During the ITU-T SG20 opening plenary that took place on 17 May 2021, Mr Olivier Beaujard from LoRa Alliance presented [TD2146](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2146) “LS/i on Collaboration between ITU-T and LoRa Alliance [from LoRa Alliance]", which was noted during the meeting.

[TD2155](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2155) – a preliminary ITU-T A.5 qualification analysis on LoRa Alliance was presented by TSB. The A.5 qualification analysis is expected to be approved during the next ITU-T SG20 meeting to be held in October 2021.

It was agreed to send a reply liaison statement which invited LoRa Alliance to participate and to provide clarifications on the technical specification in the next Q3/20 Rapporteur group e-meeting, as contained in [TD2288-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-210517-TD-GEN-2288).

Dr Shane He, Q3/20 Rapporteur, was designated as focal point from ITU-T SG20 to LoRa Alliance.

# ITU-T Study Group 20 Meetings

ITU-T SG20 held a meeting virtually, from 17-27 May 2021. See [Report 16](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-R-0016) for additional details on the last SG20 meeting.

The next ITU-T SG20 meeting will be held virtually from 11-21 October 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/landscape#?topic=0.78&workgroup=1&searchValue=&page=1&sort=Revelance) and as [Supplement ITU-T Y.Suppl.58](https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14176) “Internet of Things and smart cities and communities standards roadmap”.

Since January 2021, the JCA IoT and SC&C has held the following meeting:

* Twenty-fourth meeting, Virtual, 23 April 2021.

The twenty-fifth meeting of the JCA IoT and SC&C will be held virtually on 7 October 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) held its third meeting virtually on 3 June 2021. See [SG20RG-AFR Report 3](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20RG.AFR-COL-0003) for additional details.
* [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) will hold its fourth meeting virtually on 20 September 2021. The meeting will be preceded by a [Webinar on Smart Cities: a step towards digital transformation in Latin America​](https://www.itu.int/en/ITU-T/webinars/20210920/Pages/default.aspx) that will take place on 20 September 2021.
* [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) held its fifth meeting from 16-18 March 2021 in Minsk, Belarus. See [SG20RG-EECAT Report 5](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20RG.EECAT-R-0005) for additional details.

# 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;
* [ITU Digital transformation for cities and communities Webinar Series](https://www.itu.int/en/ITU-T/webinars/Pages/dt4cc.aspx) will start on 8 September 2021 until 14 December 2021;
* The next meeting of the ITU-T SG20 Regional Group for Latin America will take place virtually on 20 September 2021; and
* The next meeting of ITU-T SG20 will take place virtually from 11-21 October 2021.

# Other activities

Since January 2021, a series of events on IoT and SSC have been held:

* The [WSIS Thematic Workshop on "Simple Ways to be Smart"](https://www.itu.int/net4/wsis/forum/2021/Agenda/Session/249) took place virtually on 29 March 2021.
* The [Virtual Forum on "The Role of Standards in Accelerating Digital Transformation for Cities and Communities"](https://www.itu.int/en/ITU-T/climatechange/Pages/20210422.aspx) took place on 23 April 2021.
* The [ITU-T SG20RG-AFR Virtual forum on “Accelerating Digital Transformation in Africa”](https://www.itu.int/en/ITU-T/climatechange/Pages/20210602.aspx) took place on 2 June 2021.

**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
* Innovative Financing Instruments for Smart Sustainable Cities​
* Guiding principles for Artificial Intelligence in cities
* Procurement guidelines for Smart Cities and Communities

Since January 2021, the following deliverable was published:

* ​[Simple ways to be smart](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Simple-ways-to-be-smart/index.html)
* [Guidelines on tools and mechanisms to finance smart sustainable cities projects](https://www.itu.int/en/publications/Documents/tsb/2021-A-U4SSC-deliverable-Guidelines-on-tools-and-mechanisms-to-finance-SSC-projects/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 January – August 2021:

City Snapshots:

* [Kristiansand, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Kristiansand-Norway/index.html)
* [Stavanger, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Stavanger-Norway/index.html)
* [Aukra, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Aukra-Norway/index.html)
* [Aure, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Aure-Norway/index.html)
* [Averøy, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Averoy-Norway/index.html)
* [Fjord, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Fjord-Norway/index.html)
* [Gjemnes, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Gjemnes-Norway/index.html)
* [Hareid, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Hareid-Norway/index.html)
* [Herøy, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Heroy-Norway/index.html)
* [Hustadvika, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Hustadvika-Norway/index.html)
* [Ørsta, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Orsta-Norway/index.html)
* [Rauma, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Rauma-Norway/index.html)
* [Sande, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Sande-Norway/index.html)
* [Smøla, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Smola-Norway/index.html)
* [Stranda, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Stranda-Norway/index.html)
* [Sunndal, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Sunndal-Norway/index.html)
* [Surnadal, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Surnadal-Norway/index.html)
* [Sykkylven, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Sykkylven-Norway/index.html)
* [Tingvoll, Norway](file:///C:\Users\co\Downloads\Tingvoll,%20Norway)
* [Ulstein, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Ulstein-Norway/index.html)
* [Vanylven, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Vanylven-Norway/index.html)
* [Vestnes, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Vestnes-Norway/index.html)
* [Volda, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Volda-Norway/index.html)
* [Mashhad, Iran](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Mashhad-Iran/index.html)

Verification Reports:

* [Kristiansand, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Verification-Report-Kristiansand-Norway/index.html)
* [Stavanger, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Verification-Report-Stavanger-Norway/index.html)
* [Mashhad, Iran](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Verification-Report-Mashhad-Iran/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.

* Møre og Romsdal
* Larvik, Norway
* Daegu, Korea
* Burgenland, Austria

# Annex 1

**Achievements of ITU-T Study Group 20 on Internet of Things (IoT) and Smart Cities and Communities (SC&C)  
(status 14 September 2021)**

1. **Recommendations approved**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | Y.4122 | Requirements and capability framework of edge computing-enabled gateway in the IoT |
| 20 | Y.4419 | Requirements and Capability Framework of Smart Utility Metering (SUM) |
| 20 | Y.4471 | Functional architecture of network-based driving assistance for autonomous vehicles |
| 20 | Y.4476 | OID-based resolution framework for transaction of distributed ledger assigned to IoT resources |
| 20 | Y.4420 | Framework of IoT based monitoring and management for Lift |
| 20 | Y.4559 | Requirements and functional architecture of base station inspection services using unmanned aerial vehicles |
| 20 | Y.4908 | Performance evaluation frameworks of e-health systems in the IoT |

1. **Implementer's guide approved**

**None.**

1. **Deleted Recommendations**

**None.**

1. **Agreed informative texts**

|  |  |  |
| --- | --- | --- |
| **SG** | **No** | **Title** |
| 20 | Y.Suppl.58 | Internet of things and smart cities and communities standards roadmap |
| 20 | Y.Suppl.68 | Framework for Internet of Things ecosystem Master Plan |
| 20 | Y.Suppl.69 | Web based data model for IoT and smart city systems and services |

# 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 September 2021)**

**Working Party 1/20**

1. **Q1/20 - Interoperability and interworking of IoT and SC&C applications and services**

|  |  |  |
| --- | --- | --- |
| **SG** | **No** | **Title** |
| 20 | [Y.DT-interop](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17112) | Interoperability framework of digital twin systems in smart cities and communities |
| 20 | [Y.infra](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13673) | Requirements of sensing and data collection system for city infrastructure |
| 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.isms (ex Y.ism-ssc)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13674) | Technical framework for disaster monitoring 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 |

**b) Q2/20 - Requirements, capabilities and architectural frameworks across verticals enhanced by emerging digital technologies**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.ACC-UI-req](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17117) | Accessibility requirements for user interface of smart applications supporting IoT |
| 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.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.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.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.dt-ITS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17116) | Requirements and capability framework of digital twin for intelligent transport system |
| 20 | [Y.dt-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.IIoT-infra-SM-fr](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17118) | Requirements and framework of Industrial IoT (IIoT) infrastructure for smart manufacturing |
| 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-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-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.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.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.Sup.SmartAgri-usecases](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16660) | Use cases of IoT based smart agriculture |
| 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 |

**c) Q3/20 - IoT and SC&C architectures, protocols and QoS/QoE**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4421 (Determined)](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 |
| 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.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.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.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-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-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-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.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.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.RMDFS-arch](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17119) | Functional architecture of roadside multi-sensor data fusion systems for autonomous vehicles |
| 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-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.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 |

**d) Q4/20 - Data analytics, sharing, processing and management, including big data aspects, of 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.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.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.eHealth-Semantic](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16400) | Framework to support semantic mediation of eHealth services |
| 20 | [Y.energy-data](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17115) | Framework of city-level energy data sharing and analytics among buildings |
| 20 | [Y.IoT-SPWE](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17114) | Framework of IoT services for safety protection of working environment |
| 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.UIM-cs-framework](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17113) | Framework of urban infrastructure monitoring based on crowdsourcing |

**Working Party 2/20**

**a) Q5/20 - Study of emerging digital technologies, terminology and definitions**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 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.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.DTransf](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17108) | Digital transformation in the context of IoT, smart cities and communities |
| 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 |
| 20 | [YSTR.P2P-CC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17109) | Current state of P2P crowd charging platforms and corresponding market needs |

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

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4809](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14947) (Determined) | Unified IoT Identifiers for intelligent transport systems |
| 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-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) (Consented) | Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals |
| 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.MM-DSC-SSC](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17110) | Maturity model of digital supply chain for smart sustainable cities |
| 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.DTw-concept-usecase](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17111) | Concept and use cases of a digital twin in smart sustainable 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 | Use Cases on implemented or evaluated SSC solutions based on ITU-T Y.4900 Recommendation Series |

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