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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2020 | | | | TSAG-TD1200 |
| **TSAG** |
| **Original: English** |
| **Question(s):** | | N/A | | | E-Meeting, 10-17 January 2022 |
| **TD (Ref.:** [SG20-LS252](http://handle.itu.int/11.1002/ls/sp16-sg20-oLS-00252.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 (15 December 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-00252.docx>.

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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2020 | | | **SG20-LS252** | |
| **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:** | | | | - | | |
| **For comment to:** | | | | - | | |
| **For information to:** | | | | TSAG | | |
| **Approval:** | | | | ITU-T Study Group 20 management team (15 December 2021 by correspondence) | | |
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| **Contact:** | | | | Harinderpal Singh Grewal WP2/20 Co-chairman | | Tel: +65 9795 0698  Fax: +65 6211 2116  E-mail: [harin@yahoo.com](mailto:harin@yahoo.com) |

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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 (September – December 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 September 2021, are provided in Annex 1 (status: 15 December 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 7 New Work Items and 9 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 27 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 23 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 5 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 4 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 7 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 11 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. ​

ITU-T SG20 received a liaison statement as contained in [TD2382](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2382) from oneM2M, which was presented during the SG20 Opening Plenary.

Following discussions, it was agreed to hold an ad hoc session on 15 October 2021. As a result of this ad hoc session, it was agreed to send a liaison statement to TSAG and oneM2M ([TD2446-R3](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2446)). This TD presents three possible options identified by SG20 to transpose oneM2M technical specifications into ITU-T Recommendations.

SG20 was not able to reach consensus and requested TSAG's advice on best way forward.

TSB was requested to present an A.5 qualification analysis of TSDSI and oneM2M at the next SG20 meeting.

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

[**Webinar: Digital Twins in Cities**](https://www.itu.int/en/ITU-T/webinars/202109/Pages/default.aspx)

On 8 September 2021, ITU together with ISO and IEC organized a webinar to discuss “Digital Twins in cities”. This was the first episode of a series of webinars on "Digital transformation for cities and communities" that ITU is running from September through to December 2021. The webinar looked at the impacts of digital twin in cities and examined the enabling role that standards play in accelerating the deployment of digital twin. The webinar brought together panellists who shared their experience in using digital twin in cities and the latest standards in this emerging field.

**The fourth J-SCTF meeting (virtual, 27 & 29 September 2021)**

The fourth J-SCTF meeting which was chaired by ISO co-lead Mr Bernard Gindroz (Chair, ISO/TC 268) took place for two days.

During the discussion on the draft J-SCTF working methods, it was clarified that J-SCTF will formally report to only three governing bodies of three SDOs (IEC SMB, ISO TMB, and ITU TSAG) and will informally exchange with SPCG, as appropriate, to share knowledge, ideas, and experiences. The related informal exchange may take the form of participating in SPCG meetings, or raising questions, or updating on activities, as appropriate, to get useful feedback from SPCG.

It was proposed to set up new Task and Finish (T&F) group(s) with wider members’ participation. Below is candidate topic for T&F Task 1:

**Mapping exercise on the existing SDOs work in smart and sustainable cities**

Three SDOs are seeking possibilities for organizing a side event (back-to-back event to a global event as to attract relevant stakeholders), within the context of an existing organized event and involve IEC, ISO and ITU CEOs and Offices to present accomplishments of the J-SCTF. Each SDO is working on identifying major smart city related events in Q3 and Q4 in 2022 and will report back to the Joint Secretariat.

J-SCTF will coordinate to align on timeframe and content of reporting to the Boards (the same report to be provided to IEC SMB, ISO TMB, and ITU TSAG)

**Next J-SCTF meeting**

The fifth J-SCTF meeting will be chaired by the ITU co-lead Mr Nasser Saleh Al Marzouqi (Chair, ITU-T SG20) and is planned to take place on 18 and 20 January 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. The meetings identified important work items for GOUI such as interoperability aspects as well as related ontology and its use.

## 4.5 Collaboration with LoRa Alliance

During the ITU-T SG20 meeting, LoRa Alliance has been successfully qualified in accordance with Recommendation ITU-T A.5 ([TD2394](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2394)).

Following a liaison statement received from LoRA Alliance ([TD2390-R1](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2390)), it was agreed to: approve A.5 ([TD2457-R4](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2457)) and A.25 ([TD2457-R4​](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2457))

* Create a new work item ([TD2457-R4](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2457))
* Consent Draft Recommendation ITU-T Y.4480 (Y.lorawan): *Low power protocol for wide area wireless networks* and
* Send a liaison statement contained in [TD2529](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2529) to LoRa Alliance.

Recommendation ITU-T Y.4480 “Low power protocol for wide area wireless networks” has been approved on 29 November 2021.

# ITU-T Study Group 20 Meetings

ITU-T SG20 held a meeting virtually, from 11-21 October 2021. See [Report 19](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-R-0019) for additional details on the last SG20 meeting.

The next ITU-T SG20 meeting will be held virtually on 3 February 2022 and a physical meeting is planned to be held from 18-28 July 2022.

# 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 September 2021, the JCA IoT and SC&C has held the following meeting:

* Twenty-fifth meeting, Virtual, 07 October 2021.

The next JCA IoT SC&C meeting is planned to take place in conjunction with the next SG20 meeting.

# Correspondence Group on Artificial intelligence of Things (CG-AIoT)

During the SG20 meeting, Q4/20 discussed two proposals contained in [C978](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-C-0978) and [C979](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-C-0979) requesting to conduct a series of activities aimed at carrying out preliminary efforts and aimed at developing a Technical Paper to provide guidelines for future Artificial Intelligence of Things (AIoT) standardization in SG20.

Based on the discussion, Q4/20 proposed to create a new Correspondence Group (CG) which will start a series of activities for preliminary efforts on AIoT standardization in SG20. The Terms of Reference of the proposed Correspondence Group for AIoT Activities (CG-AIoT) is contained in [TD2458](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2458).

The meeting appointed Mr Gyu Myoung Lee as convenor for AIoT activities.

The lifetime of AIoT activities will be from January 2022 to December 2022 (one year), but extensible, if necessary, by decision of the SG20. The first meeting is planned to take place on 19 January 2022.

The AIoT activities will use the email list cg-[aiot@lists.itu.int](mailto:aiot@lists.itu.int).

# Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A)

During the ITU-T SG20 meeting, it was agreed to hold Ad-hoc sessions to discuss the proposed new ITU-T Focus Group related to Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture. These sessions were dedicated to advance discussion on the Terms of Reference (ToR) of the proposed new Focus Group related to Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture. Following the series of Ad-hoc sessions, it was agreed to establish a new Focus Group on Artificial Intelligence and Internet of Things for Digital Agriculture (FG-AI4A).

The Ad-hoc meeting report is contained in [TD2514](https://www.itu.int/md/T17-SG20-211011-TD-GEN-2514/en).

The final Terms of Reference of the FG-AI4A can be found in [TD2532](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG20-211011-TD-GEN-2532) and in the FG-AI4A webpage available [here](https://itu.int/go/fgai4a).

# 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) – none.
* [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

* The [ITU Digital transformation for cities and communities Webinar Series](https://www.itu.int/en/ITU-T/webinars/Pages/dt4cc.aspx) will continue to run until 2022;
* [DTC4CC Episode #13: Architecting the Web of Things](https://www.itu.int/en/ITU-T/webinars/20220203/Pages/default.aspx)  
  Virtual, 3 February 2022​
* A series of e-meetings will take place in 2021 and 2022; and
* The next meeting of ITU-T SG20 will take place on 3 February 2022 and a physical meeting in Geneva, Switzerland is planned to be held from 18-28 July 2022.

# Other activities

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

* [DT4CC Episode #12: IoT for Earth Observation and Sustainable Development – opportunities and challenges](https://www.itu.int/en/ITU-T/webinars/20211214/Pages/default.aspx)  
  Virtual, 14 December 2021
* [DT4CC Episode #11: Blockchain-based data management for supporting Internet of things and smart cities and communities](https://www.itu.int/en/ITU-T/webinars/20211208/Pages/default.aspx)  
  Virtual, 8 December 2021
* [DT4CC Episode #10: The role of digital technologies on aging and health](https://www.itu.int/en/ITU-T/webinars/20211207/Pages/default.aspx)  
  Virtual, 7 December 2021
* ​The [6th Meeting of the United for Smart Sustainable Cities (U4SSC) Initiative](https://www.itu.int/en/ITU-T/ssc/united/Pages/202112/meeting.aspx)   
  Virtually,7 December 2021
* [DT4CC Episode #9: Addressing the Security Risks of Digital Transformation on IoT](https://www.itu.int/en/ITU-T/webinars/20211206/Pages/default.aspx)  
  Virtual, 6 December 2021​
* [COP26 - Side event: "Unlocking Net Zero in Cities Through Sustainable Digital Transformation and Innovative Solutions"](https://www.itu.int/en/action/environment-and-climate-change/Pages/cop26.aspx)  
  Glasgow, 11 November 2021​​
* [COP26 - UNFCCC Global Innovation Hub - "Accelerating climate innovation for cities and communities"](https://www.itu.int/en/action/environment-and-climate-change/Pages/cop26.aspx)  
  Glasgow, 5 November 2021
* [DT4CC Episode #8: Network capabilities and emerging technologies to support IoT-enabled verticals  
  ​](https://www.itu.int/en/ITU-T/webinars/20211118/Pages/default.aspx)Virtual, 18 November 2021
* [DT4CC Episode #7: Crowdsourced Systems: A people-led paradigm](https://www.itu.int/en/ITU-T/webinars/20211102/Pages/default.aspx)  
  Virtual, 2 November 2021
* [DT4CC Episode #6: Smart City Platforms](https://www.itu.int/en/ITU-T/webinars/20211101/Pages/default.aspx)  
  Virtual, 1 November 2021​
* [Webinar to celebrate World Cities Day on Building climate resilient cities with digital transformation](https://www.itu.int/net4/wsis/forum/2022/Agenda/Session/109)  
  Virtual, 28 October 2021​
* [DT4CC Episode #5: Smart sustainable cities maturity model and impact assessment](https://www.itu.int/en/ITU-T/webinars/20210924/Pages/default.aspx)  
  Virtual, 24 September 2021
* [DT4CC Episode #4: Smart Cities: a step towards digital transformation in Latin America](https://www.itu.int/en/ITU-T/webinars/20210920/Pages/default.aspx) (Spanish only)  
  Virtual, 20 September 2021
* [DT4CC Episode #3: Smart sustainable city architectures: challenges and opportunities](https://www.itu.int/en/ITU-T/webinars/20210916/Pages/default.aspx)  
  Virtual, 16 September 2021
* [DT4CC Episode #2: IoT-based automotive emergency response system](https://www.itu.int/en/ITU-T/webinars/20210914/Pages/default.aspx)  
  Virtual, 14 September 2021​
* [DT4CC Episode #1: Digital twins in cities](https://www.itu.int/en/ITU-T/webinars/202109/Pages/default.aspx)  
  Virtual, 8 September 2021
* [ITU/OiER Webinar on Accelerating the Path to Cities’ Digital Transformation](https://www.itu.int/en/ITU-T/webinars/20210908/Pages/default.aspx)  
  Virtual, 8 September 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.

The [6th meeting of the U4SSC Initiative](https://www.itu.int/en/ITU-T/ssc/united/Pages/202112/meeting.aspx) took place virtually on 07 December 2021.

U4SSC is currently working on the following Thematic Groups:

* City platforms
* Lessons learned from building urban economic resilience at city level during and after COVID-19
* Compendium of Practices on Innovative Financing for Smart Sustainable Cities Projects
* Guiding principles for Artificial Intelligence in cities
* Procurement guidelines for Smart Cities and Communities
* Digital Transformation for People-Oriented Cities

Since September 2021, the following deliverable were published:

* ​[Digital solutions for integrated city management and use cases](https://www.itu.int/en/myitu/Publications/2021/11/26/15/36/U4SSC---Digital-solutions-for-integrated-city-management-and-use-cases)
* [Compendium of survey results on integrated digital solutions for city platforms around the world](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Compendium-of-survey-results/index.html#p=1)
* [Smart public health emergency management and ICT implementations](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Smart-public-health-emergency-management-and-ICT-implementations/index.html#p=1)

**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 150 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 September – November 2021:

City Snapshots:

* [Daegu, Korea](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Daegu-Republic-of-Korea/index.html#p=1)
* [Larvik, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-Larvik-Norway/index.html#p=1)

County Snapshot:

* [Møre og Romsdal](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-City-Snapshot-More-og-Romsdal-Norway/index.html#p=1)

Verification Reports:

* [Daegu, Korea](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Verification-Report-Daegu-Republic-of-Korea/index.html" \l "p=1)
* [Larvik, Norway](https://www.itu.int/en/publications/Documents/tsb/2021-U4SSC-Verification-Report-Larvik-Norway/index.html" \l "p=1)

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

# Annex 1

**Achievements of ITU-T Study Group 20 on Internet of Things (IoT) and Smart Cities and Communities (SC&C)  
(status 15 December 2021)**

1. **Recommendations approved**

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | Y.4421 | Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks |
| 20 | Y.4477 | ​Framework of service interworking with device discovery and management in heterogeneous Internet of things environments |
| 20 | Y.4212 ​ | ​Requirements and capabilities of network connectivity management in the Internet of things |
| 20 | Y.4213 ​ | ​IoT requirements and capability framework for monitoring physical city assets |
| 20 | ​Y.4478 | ​Requirements and functional architecture for smart construction site services |
| 20 | ​Y.4480 | ​Low power protocol for wide area wireless networks |
| 20 | Y.4562 | Functions and metadata of spatiotemporal information service for smart cities |
| 20 | ​Y.4563 | Requirements and functional model to support data interoperability in IoT environments ​ |
| 20 | Y.4004​ | Overview of smart oceans and seas, and requirements for their ICT implementations​ |
| 20 | Y.4809​ | Unified IoT Identifiers for intelligent transport systems ​ |
| 20 | Y.4810 ​ | Requirements of data security for the heterogeneous IoT devices​ |
| 20 | Y.4811 ​ | ​Reference framework of converged service for identification and authentication for IoT devices in decentralized environment |

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 15 December 2021)**

**Working Party 1/20**

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

|  |  |  |
| --- | --- | --- |
| **SG** | **No** | **Title** |
| 20 | Y.dtf.reqts | Requirements for digital twin federation in smart cities and communities |
| 20 | Y.DT-interop | Interoperability framework of digital twin systems in smart cities and communities |
| 20 | Y.infra | Requirements of sensing and data collection system for city infrastructure |
| 20 | Y.isms | Functional framework and requirements for disaster monitoring system |
| 20 | Y.nmm-isms | Metadata model of sensing capability for disaster monitoring system |

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

| **SG** | **No** | **Title** |
| --- | --- | --- |
| 20 | [Y.4123 (ex Y.SmartShoppingMall)](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16655) | Requirements and capability framework of smart shopping mall |
| 20 | [Y.4214 (ex 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.4215 (ex 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 the Internet of Things |
| 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.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.EMM-Reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17213) | Requirements for Real-Time Event Monitoring and Integrated Management in Smart City Platforms |
| 20 | [Y.EV-charging](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17215) | Requirements of smart charging service for electric vehicles |
| 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-SFFS](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17216) | Requirements and Reference functional model of IoT-based smart forest firefighting system |
| 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-Vreqs](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17214) | Requirements and capability framework of the internet of things for vision |
| 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.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.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 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-CONV-fr](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17219) | Convergence framework for enhancement of service intelligence based on 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-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) | Functional architecture for smart door lock service framework |
| 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) | Functional Architecture of Smart Power Bank Rental Service Framework |
| 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 |
| 20 | [YSTR.IoT-CONV](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17220) | Overview of IoT Convergence |
| 20 | [YSTR.SemComm.IoT](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17221) | Architectural Framework for Semantic Communication Services for IoT and Smart City & Community |

**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-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.DSGS-reqts](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17218) | Requirements and a reference model of data for smart greenhouse service |
| 20 | [Y.eHealth-Semantic](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16400) | Framework to support Web of Objects ontology based 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-MCSI](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17217) | Metadata for camera sensing information of autonomous mobile IoT devices |
| 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.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.Sup.DTAfrica](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17222) | Digital Transformation of Cities and Communities in Africa |
| 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 | [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.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-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) | 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) | Assessment framework of IoT sensing quality |
| 20 | [Y.KPI-Flood](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17224) | Key Performance Indicators of ICT based Urban Flood Disaster Prevention and Mitigation Capability |
| 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.DTKPI](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17223) | Guidance and use case(s) to use digital technologies to visualize the key performance indicators of Recommendation ITU-T Y.4903 "Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals" |
| 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](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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