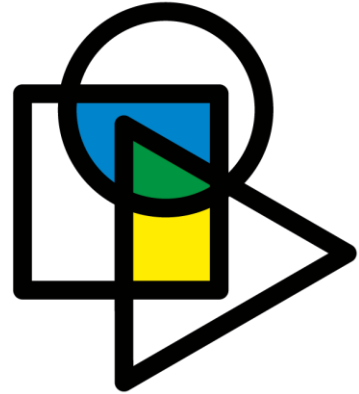


WORLD TELECOMMUNICATION
STANDARDIZATION ASSEMBLY



ITU WTSA-20

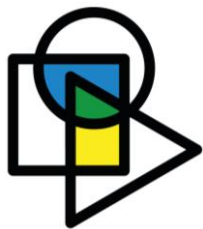
GENEVA2022

1- 9 March 2022
Geneva, Switzerland

Internet of Things (IoT) and Smart Cities and Communities (SC&C)

Highlights of ITU-T Study Group 20





ITU-T Study Group 20 (SG20) Main Achievements

Internet of Things
and its Applications



IoT Identification



Smart Cities and
Communities

Main Statistics and Outcomes:

More than 150 experts participate actively in the work and attend each meeting. (including the active participation of Academia members and SMEs)

From 2017-2022:

- 99 Recommendations Decided/Determined/Approved
- 15 Supplements agreed
- 6 other informative texts agreed
- Over 70 events organized related to IoT and Smart Cities and Communities



KEY TOPICS & ITU-T Recommendations

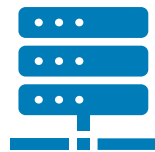


Requirements and use cases

Recommendation ITU-T Y.4208: “IoT requirements for support of edge computing”

Recommendation ITU-T Y.4211: “Accessibility requirements for smart public transportation services”

Recommendation ITU-T Y.4214: “Requirements of IoT-based civil engineering infrastructure health monitoring system”



Infrastructure and architecture

Recommendation ITU-T Y.4470: “Reference architecture of artificial intelligence service exposure for smart sustainable cities”

Recommendation ITU-T Y.4480: “Low power protocol for wide area wireless networks”

Recommendation ITU-T Y.4500.1: “oneM2M-Functional Architecture” (Y.4500 series)



Interoperability

Recommendation ITU-T Y.4200: “Requirements for interoperability of smart city platforms”

Recommendation ITU-T Y.4201: “High-level requirements and reference framework of smart city platform”

Recommendation ITU-T Y.4805: “Identifier service requirements for the interoperability of smart city applications”



Data management and Processing

Recommendation ITU-T Y.4461: “Framework of open data in smart cities”

Recommendation ITU-T Y.4464: “Framework of blockchain of things as decentralized service platform”

Recommendation ITU-T Y.4472: “Open data application programming interface (APIs) for IoT data in smart cities and communities”



Evaluation and Assessment

Recommendation ITU-T Y.4904: “Smart sustainable cities maturity model”

Recommendation ITU-T Y.4905: “Smart sustainable city impact assessment”

Recommendation ITU-T Y.4906: “Assessment framework for digital transformation of sectors in smart cities”

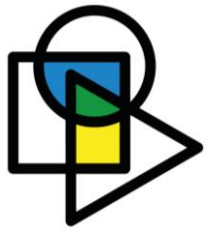


Identification and security

Recommendation ITU-T Y.4807: “Agility by design for ICT Systems security used in the Internet of Things”

Recommendation ITU-T Y.4808: “Digital entity architecture framework to combat counterfeiting in IoT”

Recommendation ITU-T Y.4809: “Unified IoT Identifiers for intelligent transport systems”



ITU-T STUDY GROUP 20 (SG20)

Regional Groups



Africa Region



Americas Region



Arab Region



EECAT Region

Joint Coordination Activity



Joint Coordination Activity on Internet of Things and Smart Cities and Communities (JCA-IoT and SC&C)

Focus Groups



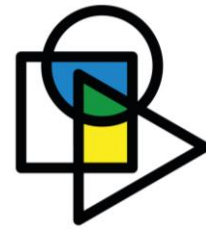
NEW Focus group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A)



Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities (FG-DPM)

JOINT COLLABORATION IS KEY



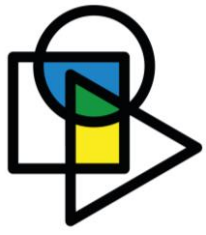


UNITED 4 SMART SUSTAINABLE CITIES

U4SSC Key Performance Indicators U4SSC Thematic Groups

ITU's implementation
of the U4SSC KPIs
over 150 cities
worldwide





UNITED 4 SMART SUSTAINABLE CITIES

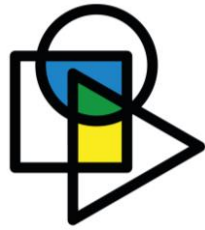
U4SSC Deliverables



U4SSC Country hub

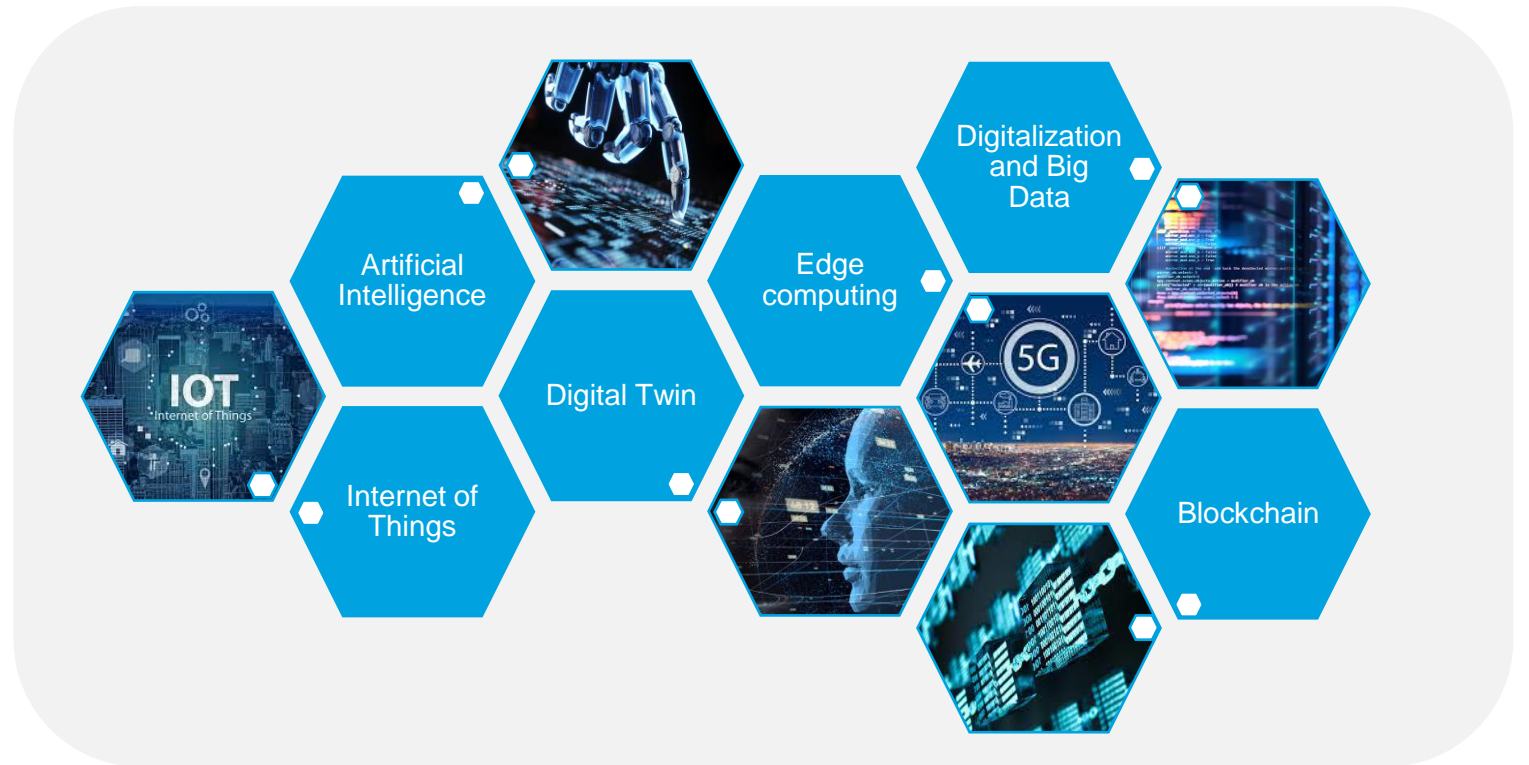
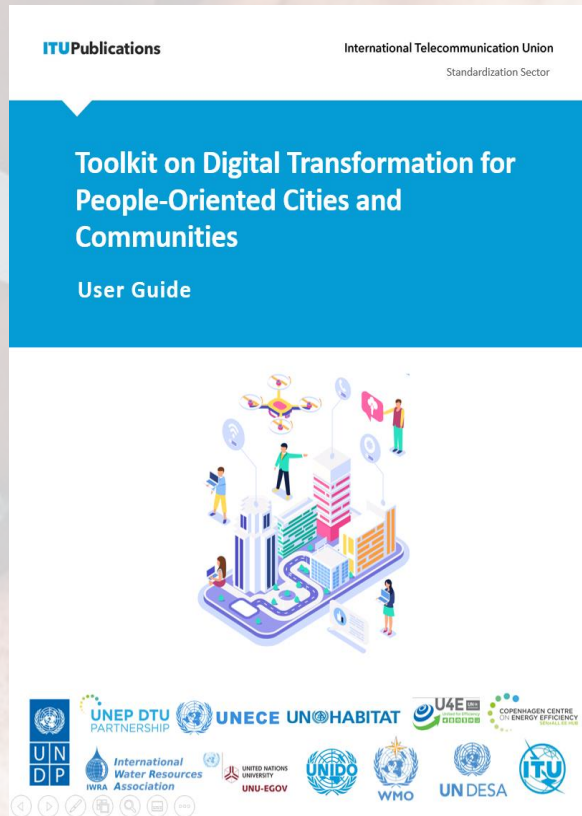


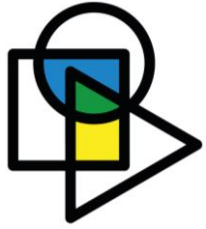
The first country hub has been set up in Vienna, Austria.



Standardizing digital transformation for people-oriented cities

Cross-Sector Partnership





THANK YOU

Questions? Interested in learning more?
Let us know!



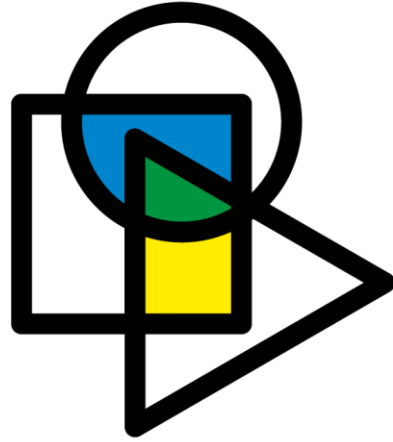
Email

tsbsg20@itu.int



Website

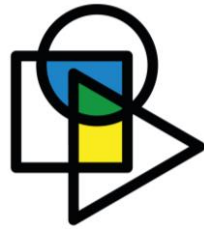
[ITU-T Study Group 20](#)



ITU WTSA-20
GENEVA2022

Setting the standard

1- 9 March 2022
Geneva, Switzerland



ITU SUPPORTS DIGITAL TRANSFORMATION



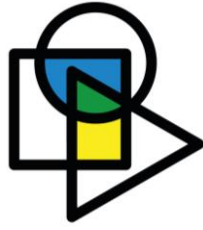
U4SSC:
United for Smart Sustainable Cities initiative

Joint IEC-ISO-ITU Smart Cities Task Force

JCA-IoT and SC&C:
Joint Coordination Activity on IoT and Smart Cities and Communities

ITU-T Study Group 20:
ITU Study Group on IoT and Smart Cities and Communities

ITU:
International Telecommunication Union – the UN specialized agency for ICTs



ITU-T STUDY GROUP 20 (SG20) Structure

Q1/20 Interoperability and interworking of IoT and SC&C applications and services

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

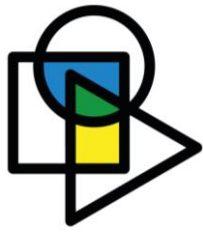
Q3/20 IoT and SC&C architectures, protocols and QoS/QoE

Q4/20 Data analytics, sharing, processing and management, including big data aspects, of IoT and SC&C

Q5/20 Study of emerging digital technologies, terminology and definitions

Q6/20 Security, privacy, trust and identification for IoT and SC&C

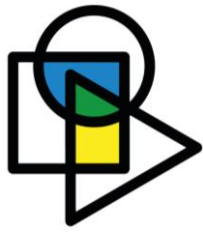
Q7/20 Evaluation and assessment of SC&C



ADDITIONAL INFORMATION

ITU-T SG20 Standards

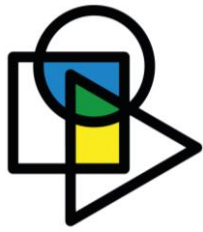
Work item	Subject / Title
Y.4200 (ex Y.SSCP, Y.SCP)	Requirements for interoperability of smart city platforms
Y.4201 (ex Y.frame-scc)	High-level requirements and reference framework of smart city platform
Y.4461 (ex Y.SC-OpenData)	Framework of open data in smart cities
Y.4477 (ex Y.IoT-sd-arch)	Framework of service interworking with device discovery and management in heterogeneous Internet of things environments
Y.Suppl.45 to ITU-T Y.4000 series (ex Y.SC-Overview)	An overview of smart cities and communities and the role of information and communication technologies
Y.Suppl.58 (ex Y.Sup.issr)	Internet of Things and smart cities and communities standards roadmap
Y.Suppl.58	Internet of things and smart cities and communities standards roadmap
Y.4003 (ex Y.SmartMan-IIoT-overview)	Overview of smart manufacturing in the context of the industrial Internet of things
Y.4101/Y.2067	Common requirements and capabilities of a gateway for Internet of Things applications
Y.4114 (ex Y.IoT-BigData-reqts)	Specific requirements and capabilities of the IoT for Big Data
Y.4116 (ex Y.TPS-req)	Requirements of transportation safety service including use cases and service scenarios
Y.4117 (ex Y.IoT-WDS-Reqts)	Requirements and capabilities of Internet of Things for support of wearable devices and related services
Y.4118 (ex Y.IoT-AC-reqts)	Internet of Things requirements and technical capabilities for support of accounting and charging
Y.4119 (ex Y.AERS-reqts)	Requirements and capability framework for IoT-based automotive emergency response system
Y.4120 (ex Y.IoT-Retail-Reqts)	Requirements of Internet of things applications for smart retail stores
Y.4121 (ex Y.IoT-GP-Reqts)	Requirements of an Internet of Things enabled network for support of applications for global processes of the Earth
Y.4122 (ex Y.IoT-EC-GW)	Requirements and capability framework of edge computing-enabled gateway in the IoT



ADDITIONAL INFORMATION

ITU-T SG20 Standards

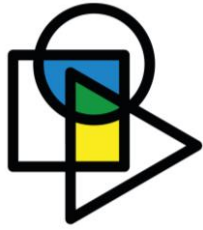
Work item	Subject / Title
Y.4123 (ex Y.SmartShoppingMall)	Requirements and capability framework of smart shopping mall system
Y.4202 (ex Y.WPT-usecase)	Framework of wireless power transmission application service
Y.4203 (ex Y.IoT-things-description-reqts)	Requirements of things description in the Internet of things
Y.4204 (ex Y.Accessibility-IoT)	Accessibility requirements for the Internet of things applications and services
Y.4206 (ex Y.UCS-reqts)	Requirements and capabilities of user-centric work space service
Y.4207 (ex Y.SEM)	Requirements and capability framework of smart environmental monitoring
Y.4208 (ex Y.IoT-EC-reqts)	IoT requirements for support of edge computing
Y.4209 (ex Y.smartport)	Requirements for interoperation of the smart port with the smart city
Y.4210 (ex Y.IoT-UM-reqts)	Requirements and use cases for universal communication module of mobile IoT devices
Y.4211 (ex Y.ACC-PTS)	Accessibility requirements for smart public transportation services
Y.4212 (ex Y.IoT-NCM-reqts)	Requirements and capabilities of network connectivity management in the Internet of things
Y.4213 (ex Y.AM-SC-reqts)	IoT requirements and capability framework for monitoring physical city assets
Y.4214 (ex Y.IoT-CEIHMOn-Reqts)	Requirements of IoT-based civil engineering infrastructure health monitoring system
Y.4215 (ex Y.IoT-UAS-Reqts)	Use cases, requirements and capabilities of unmanned aircraft systems for the Internet of Things
Y.4419 (ex Y.SUM)	Requirements and Capability Framework of Smart Utility Metering (SUM)
Y.Sup.53 to Y.4000 series (ex Y.Sup.IoT-Use-Cases)	IoT use cases
Y.Suppl.56 (ex Y.Sup.SCC-Use-Cases)	Use cases of smart cities and communities
Y.Suppl.68 (ex Y.Sup-IoT-Eco-Plan)	Framework for Internet of Things ecosystem Master Plan
Y.4115 (ex Y.IoT-DE-RA)	Reference architecture for IoT device capabilities exposure



ADDITIONAL INFORMATION

ITU-T SG20 Standards

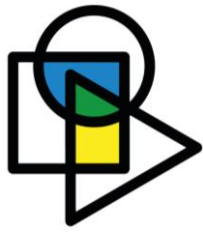
Work item	Subject / Title
Y.4416 (ex Y.NGNe-IoT-arch)	Architecture of the Internet of things based on next generation network evolution
Y.4417 (ex Y.IoT-son)	Framework of self-organization network in the IoT environments
Y.4418 (ex Y.gw-IoT-arch)	Functional architecture of gateway for Internet of things applications
Y.4421 (ex Y.UAV.arch)	Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks
Y.4455 (ex Y.IoT-NCE)	Reference architecture for IoT network service capability exposure
Y.4460 (ex Y.dev-IoT-arch)	Architectural reference models of devices for IoT applications
Y.4462 (ex Y.IoT-ics)	Requirements and functional architecture of open IoT identity correlation service
Y.4467 (ex Y.AERS-msd)	Minimum set of data structure for automotive emergency response system
Y.4468 (ex Y.AERS-mtp)	Minimum set of data transfer protocol for automotive emergency response system
Y.4469 (ex Y.SCCE-arch)	Reference architecture of spare computational capability exposure of IoT devices for smart home
Y.4470 (ex Y.SSC-AISE-arc)	Reference architecture of artificial intelligence service exposure for smart sustainable cities
Y.4471 (ex Y.NDA-arch)	Functional architecture of network-based driving assistance for autonomous vehicles
Y.4476 (ex Y.IoT-rf-dlt)	OID-based resolution framework for transaction of distributed ledger assigned to IoT resources
Y.4478 (ex Y.IoT-SCS)	Requirements and functional architecture for smart construction site services
Y.4480 (ex Y.lorawan)	Low power protocol for wide area wireless networks
Y.4500.1 (ex Y.oneM2M.ARC)	oneM2M- Functional Architecture
Y.4500.2 (ex Y.oneM2M.REQ)	oneM2M- Requirements



ADDITIONAL INFORMATION

ITU-T SG20 Standards

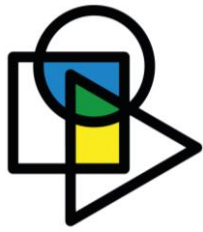
Work item	Subject / Title
Y.4500.4 (ex Y.oneM2M.SLCP)	oneM2M- Service Layer Core Protocol Specification
Y.4500.5 (ex Y.oneM2M.DM.OMA)	oneM2M- Management enablement (OMA)
Y.4500.6 (ex Y.oneM2M.DM.BBF)	oneM2M Management enablement (BBF)
Y.4500.8 (ex Y.oneM2M.PB.CoAP)	oneM2M- CoAP Protocol Binding
Y.4500.9 (ex Y.oneM2M.PB.HTTP)	oneM2M- HTTP Protocol Binding
Y.4500.10 (ex Y.oneM2M.PB.MQTT)	oneM2M- MQTT Protocol Binding
Y.4500.11 (ex Y.oneM2M.CT)	oneM2M- Common Terminology
Y.4500.12 (ex Y.oneM2M.BO)	oneM2M Base Ontology
Y.4500.13 (ex Y.oneM2M.InteropTest)	oneM2M- Interoperability Testing
Y.4500.14 (ex Y.oneM2M.IWK.LwM2M)	oneM2M- LwM2M Interworking
Y.4500.15 (ex Y.oneM2M.TF)	oneM2M- Testing framework
Y.4500.20 (ex Y.oneM2M.PB.WebSocket)	oneM2M- WebSocket Protocol Binding
Y.4500.22 (ex Y.oneM2M.FDC)	oneM2M- Field Device Configuration
Y.4500.23 (ex Y.oneM2M.HAIM)	oneM2M-Home Appliances Information Model and Mapping
Y.4500.32 (ex Y.oneM2M.MAF.MEF)	oneM2M- MAF and MEF Interface Specification
Y.oneM2M.DG.AppDev	oneM2M- Application developer guide: Light control example using HTTP binding



ADDITIONAL INFORMATION

ITU-T SG20 Standards

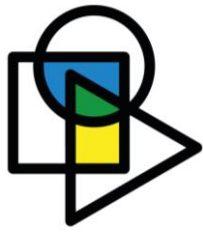
Work item	Subject / Title
Y.oneM2M.DG.CoAP	oneM2M Developer Guide of CoAP binding and long polling for temperature monitoring
Y.oneM2M.DG.DM	oneM2M- Developer guide of device management
Y.oneM2M.Ind.DE	oneM2M Industrial Domain Enablement
Y.oneM2M.UCC	oneM2M Use Case Collection
Y.oneM2M.DG.SEM	oneM2M-Developer Guide of Implementing semantics
Y.4415 (ex Y.WoO-hn)	Architecture of web of objects based virtual home network
Y.4420 (ex Y.IoT-Lift)	Framework of IoT based monitoring and management for Lift
Y.4456 (ex Y.SPL)	Requirements and Functional Architecture for Smart Parking Lot in Smart City
Y.4457 (ex Y.TPS-afw)	Architectural framework for transportation safety services
Y.4458 (ex Y.SSL)	Requirements and functional architecture of smart street light service
Y.4463 (ex Y.del-fw)	Framework of delegation service for IoT devices
Y.4464 (ex Y.IoT-BoT-fw)	Framework of blockchain of things as decentralized service platform
Y.4465 (ex Y.IoT-VLC)	Framework of IoT Services based on Visible Light Communications
Y.4466 (ex Y.ISG-fr)	Framework of smart greenhouse service
Y.4473 (ex Y.DPM-ST-API)	SensorThings API - Sensing
Y.4474 (ex Y.IoT-VLC-Arch)	Functional architecture for IoT services based on Visible Light Communications



ADDITIONAL INFORMATION

ITU-T SG20 Standards

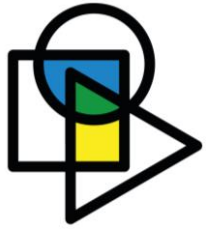
Work item	Subject / Title
Y.4475 (ex Y.IoT-LISF)	Lightweight intelligent software framework for IoT devices
Y.4555 (ex Y.IoT-SQ-fns)	Service functionalities of self-quantification over Internet of things
Y.4556 (ex Y.SC-Residential)	Requirements and functional architecture of smart residential community
Y.4558 (ex Y.smoke-detection)	Requirements and functional architecture of smart fire smoke detection service
Y.4559 (ex Y.UAV-BSI)	Requirements and functional architecture of base station inspection services using unmanned aerial vehicles
Y.4560 (ex Y.DPM-BC-ES)	Blockchain-based data exchange and sharing for supporting Internet of things and smart cities and communities
Y.4561 (ex Y.DPM-BC-DM)	Blockchain-based Data Management for supporting Internet of things and smart cities and communities
Y.4562 (ex Y.STIS-fm)	Functions and metadata of spatiotemporal information service for smart cities
Y.4563 (ex Y.DPM-interop)	Requirements and functional model to support data interoperability in IoT environments
Y.Suppl.57 to ITU-T Y.4409 (ex Y.Sup.4409)	Implementation guidelines to Recommendation ITU-T Y.4409/Y.2070
Y.Suppl.62 to ITU-T Y.4000 series (ex Y.Sup-DPM-OBC)	Overview of blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects
Y.Suppl.69 (ex Y.Sup.Web-DM)	Web based data model for IoT and smart city systems and services
Y.4004 (ex Y.smart-oceans)	Overview of smart oceans and seas, and requirements for their ICT implementations
Y.4051 (ex Y.SCC-Terms)	Vocabulary for smart cities and communities
Y.4205 (ex Y.CrowdSystems)	Requirements and reference model of IoT-related crowdsourced systems
Y.Sup.52 to ITU-T Y.4000-series (ex Y.Sup.MEDT)	Methodology for building digital capabilities during enterprises' digital transformation



ADDITIONAL INFORMATION

ITU-T SG20 Standards

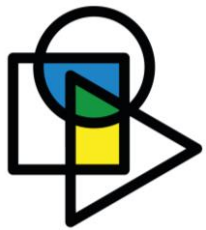
Work item	Subject / Title
Y.Sup.54 to ITU-T Y.4000-series (ex Y.HEP)	Framework for home environment profiles and levels of IoT systems
Y.Suppl.63 to ITU-T Y.4000 series (ex Y.Sup.AI4IoT)	Unlocking Internet of things with artificial intelligence
Y.4459 (ex Y.IoT-Interop)	Digital entity architecture framework for IoT interoperability
Y.4472 (ex Y.API4IOT)	Open data application programming interface (APIs) for IoT data in smart cities and communities
Y.4805 (ex Y.SC-Interop)	Identifier service requirements for the interoperability of Smart City applications
Y.4806 (ex Y.IoT-sec-safety)	Security capabilities supporting safety of the Internet of Things
Y.4807 (ex Y.IoT-Agility)	Agility by design for Telecommunications/ICT Systems Security used in the Internet of Things
Y.4808 (ex Y.IoT-DA-Counterfeit)	Digital entity architecture framework to combat counterfeiting in IoT
Y.4809 (ex Y.IoT-ITS-ID)	Unified IoT Identifiers for intelligent transport systems
Y.4810 (ex Y.Data.Sec.IoT-Dev)	Requirements of data security for the heterogeneous IoT devices
Y.4811 (ex Y.IoT-CSIADE-fw)	Reference framework of converged service for identification and authentication for IoT devices in decentralized environment
Y.Suppl.61 to ITU-T Y.4400 series (ex Y.Sup.Pot API4IOT)	Features of application programming interface (APIs) for IoT data in smart cities and communities
Y.4904 (ex Y.SSC-MM)	Smart sustainable cities maturity model
Y.4905 (ex Y.SSC-IA)	Smart sustainable city impact assessment
Y.4906 (ex Y.AFDTS)	Assessment framework for digital transformation of sectors in smart cities
Y.4907 (ex Y.SSC-BKDMS-arc)	Reference architecture of blockchain-based unified KPI data management for smart sustainable cities



ADDITIONAL INFORMATION

ITU-T SG20 Standards

Work item	Subject / Title
Y.4908 (ex Y.IoT-EH-PFE)	Performance evaluation frameworks of e-health systems in the IoT
Y.Suppl.32 to ITU-T Y.4000 series (ex Y.Sup.32rev)	Smart sustainable cities - A guide for city leaders
Y.Suppl.33 to ITU-T Y.4000 series (ex Y.Sup.33rev)	Smart sustainable cities - Master plan
Y.Suppl.34 to ITU-T Y.4000 series (ex Y.Sup.34)	Smart sustainable cities - Setting the stage for stakeholders' engagement

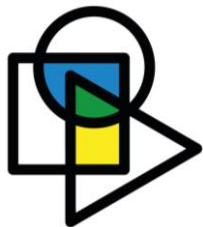


ADDITIONAL INFORMATION

Digital Transformation Webinar and Outcome Document



- **Episode #1:** [Digital twins in cities](#) co-organized with the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO)
- **Episode #2:** [IoT-based automotive emergency response system](#)
- **Episode #3:** [Smart sustainable city architectures: challenges and opportunities](#) co-organized with oneM2M
- **Episode #4:** [Smart Cities: a step towards digital transformation in Latin America](#) co-organized with Regional Telecommunications Technical Commission (COMTELCA)
- **Episode #5:** [Smart sustainable cities maturity model and impact assessment](#) co-organized with Austrian Economics Center
- **Episode #6:** [Smart City Platforms](#) co-organized with China Information Communication Technologies Group (CICT), Electronics and Telecommunications Research Institute (ETRI) and Spanish Association for Standardization (UNE)
- **Episode #7:** [Crowdsourced Systems: A people-led paradigm](#) co-organized with Bournemouth University
- **Episode #8:** [Network capabilities and emerging technologies to support IoT-enabled verticals](#) co-organized with CICT, China Mobile, China Unicom, EADN, Huawei, OKI and Tencent
- **Episode #9:** [Addressing the Security Risks of Digital Transformation on IoT](#) co-organized with ITU-T Study Group 17
- **Episode #10:** [The role of digital technologies on aging and health](#) co-organized with Pan American Health Organization (PAHO)
- **Episode #11:** [Blockchain-based data management for supporting Internet of things and smart cities and communities](#) co-organized with Open & Agile Smart Cities (OASC) and United Nations University (UNU)
- **Episode #12:** [Interoperability of IoT and satellite data for Earth observation supporting sustainable development](#) co-organized with Mandat International and World Meteorological Organization (WMO)
- **Episode #13:** [Architecting the Web of Things](#) coordinated with the Web of Things WG of the World Wide Web Consortium (W3C)



ADDITIONAL INFORMATION

Relevant links

United for Smart Sustainable Cities (U4SSC)	https://www.itu.int/go/u4ssc
ITU-T, Smart Sustainable Cities	https://www.itu.int/en/ITU-T/ssc/Pages/default.aspx
ITU-T Study Group 20: Internet of things (IoT) and smart cities and communities (SC&C)	https://www.itu.int/go/tsg20
Focus group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A)	https://www.itu.int/go/fgai4a
Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities (FG-DPM)	https://www.itu.int/en/ITU-T/focusgroups/dpm/Pages/default.aspx
ITU-T SG20 Regional Group for the Africa Region	https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgafr/Pages/default.aspx
ITU-T SG20 Regional Group for the Arab Region	https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgarb/Pages/default.aspx
ITU-T SG20 Regional Group for the Latin America Region	https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rglatam/Pages/default.aspx
ITU-T 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