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| Report by the Secretary-General |
| FACILITATING THE INTERNET OF THINGS TO PREPARE FOR A GLOBALLY CONNECTED WORLD (PP RESOLUTION 197) |

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| SummaryThis report describes ITU’s activities related to Resolution 197 (Busan, 2014): Facilitating the Internet of Things to prepare for a globally connected world.Action requiredThe Council is invited to **note** the report.\_\_\_\_\_\_\_\_\_\_\_\_References[*Resolution 197 (Busan, 2014)*](http://www.itu.int/dms_pub/itu-s/opb/conf/S-CONF-ACTF-2014-PDF-E.pdf) |

# 1. ITU-T Activities on IoT and Smart Sustainable Cities

1.1 The World Telecommunication Standardization Assembly in 2016 adopted new WTSA-16 Resolution 98 “Enhancing the standardization of Internet of things and smart cities and communities for global development”.

1.2 ITU standards supporting the wide range of technologies under the banner of the Internet of Things (IoT) will assist both developed and developing countries in transforming city infrastructure, benefiting from the efficiencies of intelligent buildings and transportation systems, smart energy and water networks, and innovation in the field of e-health. ITU-T continues to advance IoT standardization work in the fields of definition, overview, requirements, functional frameworks, architectures, identification, applications, and services.

1.3 [ITU-T Study Group 20](http://www.itu.int/en/ITU-T/about/groups/Pages/sg20.aspx) continues to develop standards that leverage IoT technologies to address urban development challenges. A key part of this study is the standardization of end-to-end architectures for IoT and mechanisms for the interoperability of IoT applications and datasets employed by various vertically oriented industry sectors.

ITU-T SG20 has approved six Recommendations on IoT: ITU-T Y.4113 “Requirements of the network for the Internet of Things”; ITU-T Y.4451 “Framework of constrained device networking in the IoT environments”; ITU-T Y.4452 “Functional framework of Web of Objects”; ITU-T Y.4453 “Adaptive software framework for IoT devices”; ITU-T Y.4553 “Requirements of smartphone as sink node for IoT applications and services”; ITU-T Y.4702 “Common requirements and capabilities”. ITU-T SG 20 has determined ITU-T Y.4454 “Platform Interoperability for Smart Cities”, it has agreed nine Supplements: ITU-T Y.Supp.42 to ITU-T Y.4100 series “Use cases of User-Centric work Space (UCS) Service; ITU-T Y.Supp.34 to ITU-T Y.4000 series “Smart Sustainable Cities - Setting the stage for stakeholders’ engagement”; ITU-T Y.Supp.33 to ITU-T Y.4000 series “Smart Sustainable Cities - Master plan”; ITU-T Y.Supp.32 to ITU-T Y.4000 series “Smart sustainable cities - a guide for city leaders”; ITU-T Y.Supp.31 to ITU-T Y.4550 series “Smart Sustainable Cities - Intelligent sustainable buildings”; ITU-T Y.Supp.28 to ITU-T Y.4550 series “Integrated management for smart sustainable cities”; ITU-T Y.Supp.29 to ITU-T Y.4250 series “Multi-service infrastructure for smart sustainable cities in new-development areas”; ITU-T Y.Supp.30 to ITU-T Y.4250 series “Overview of smart sustainable cities infrastructure”; ITU-T Y.Supp.27 to ITU-T Y.4400 series “Setting the framework for an ICT architecture of a smart sustainable city”.

At its March 2017 meeting, ITU-T SG20 consented the following Draft Recommendations: ITU-T Y.4114 “Specific requirements and capabilities of the IoT for Big Data”; ITU-T Y.4115 “Reference architecture for IoT device capabilities exposure” and ITU-T 4805 “Identifier service requirements for the interoperability of Smart City applications”.

A new standard (ITU-T L.1603/Y.4903) gives general guidance to cities and provides key performance indicators for smart sustainable cities to help cities achieve the Sustainable Development Goals (SDGs).

1.4 The [Joint Coordination Activity on Internet of Things and Smart Cities and Communities (JCA-IoT and SC&C)](http://www.itu.int/en/ITU-T/jca/iot/Pages/default.aspx) is assisting in initiating active collaboration with relevant SDOs and Forums. The JCA is maintaining the IoT and Smart Cities and Communities Standards Roadmap which documents complete as well as ongoing work on IoT and Smart Cities and Communities carried out by ITU-T as well as by other SDOs and Forums.

1.5 A case study was published on [“Implementing ITU-T International Standards to Shape Smart Sustainable Cities: The Case of Dubai](https://www.itu.int/en/publications/Documents/tsb/2016-DubaiCase/index.html#p=1)“. This case study details Dubai’s ambitious and trailblazing journey towards becoming a smart city, a venture worthy of emulation by other aspiring smart cities around the world.

1.6 ITU is co-organizing the [IoT Week 2017](http://iot-week.eu/) event, 6-9 June 2017, Geneva, Switzerland, together with the IoT Forum, the University of Applied Sciences and Arts of Western Switzerland and Mandat International. The 2017 edition of IoT Week will encompass IoT Emerging Technologies and Research; IoT and Sustainable Development, with the adoption of an “International Declaration on IoT for Sustainable Development” to support the 17 SDGs adopted by the UN; IoT Security and Privacy; IoT Business, Finance, and Industry 4.0; and the 1st IEEE endorsed Global IoT Summit (GIoTS).

1.7 ITU at its March 2017 meeting of ITU-T SG20 in Dubai (UAE) established a new Focus Group on “Data Processing and Management to support IoT and Smart Cities & Communities” to research data processing and management in the context of smart cities ([ITU press release](http://www.itu.int/en/mediacentre/Pages/2017-PR13.aspx)). The Focus Group will review existing technical platforms and related guidelines for data processing and management, with a view to identifying standardization demands to be addressed by ITU-T SG20. A key priority of the Focus Group will be to propose mechanisms supporting the interoperability of datasets and data-management systems. The group will investigate established data-management technologies as well as emerging trends such as blockchain, promoting efficient, scalable approaches to the management of systems data. The group will seek out innovations with potential to increase security and trust in data management, including advances in digital identification and certification. This analysis will also review technical challenges to be overcome in relation to data formats, metadata and data protection. The first meeting of this focus group will take place in July 2017 in Geneva. The SG20 meeting was preceded by the first forum on “Data Management: Transforming Data Into Value: Expanding the IoT Potential with a special focus on smart cities”. The Forum concluded with an [Outcome Document](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/iot/201703/Documents/FORUMOUTCOME-Final-12March2017.docx).

1.8 ITU-T SG20 in March 2017 established four regional groups: [Regional Group for Latin America (RG-LATAM)](http://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rglatam/Pages/default.aspx); [Regional Group for the African Region](http://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgafr/Pages/default.aspx) (RG-AFR); [Regional Group for the Arab Region](http://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgarb/Pages/default.aspx) (RG-ARB); and [Regional Group for Eastern Europe, Central Asia and Transcaucasia](http://www.itu.int/en/ITU-T/studygroups/2017-2020/20/sg20rgeecat/Pages/default.aspx) (RG-EECAT).

1.9 ITU-T SG17, at its September 2016 meeting, agreed to continue the Correspondence Group on Security and Privacy for IoT (CG-IoTsec). The Co-Conveners are: Heung Youl Youm and Nasser Al Marzouqi. The report of the special session on collaboration between SG17 and SG20 on IoT security that took place on 28 March 2017 is contained in ([TD27-COM17](https://www.itu.int/md/T17-SG17-170322-TD-PLEN-0027/en)). SG20 members, due to unexpected technical problems were unable to join the session.

1.10 ITU and UNECE have launched the [United for Smart Sustainable Cities (U4SSC)](http://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx), a global initiative which advocates for public policy to encourage the use of ICTs in enabling the transition to smart sustainable cities. The initiative will assist the response to Goal 11 of the United Nations Sustainable Development Goals (SDGs): to “Make cities and human settlements inclusive, safe, resilient and sustainable”. U4SSC is privileged to have the support of 16 other United Nations Agencies, Programmes, and Regional Commissions, and is open to all United Nations agencies, municipalities, industry, academia, and other relevant stakeholders. It focuses on the integration of ICTs in urban operations, building on existing international standards and key performance indicators. The [Advisory Board for Smart Sustainable Cities](http://www.itu.int/en/ITU-T/ssc/united/Documents/ToR-AdvisoryBoard-and-TechnicalAdvisoryGroup-30may2016.pdf) within the U4SSC initiative consists of members from 16 other UN agencies and representatives of cities involved in a series of pilot projects to implement ITU-standardized KPIs for smart sustainable cities in about fifty cities worldwide.

The first meeting of the [United for Smart Sustainable Cities (U4SSC) global initiative](http://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) held in Geneva, 21-22 July 2016, has appointed the initiative’s leadership team and agreed the Terms of Reference.

The U4SSC initiative is being co-chaired by Nasser Al Marzouqi, Chairman of [ITU-T Study Group 20 (IoT and Smart Cities)](http://www.itu.int/en/ITU-T/about/groups/Pages/sg20.aspx), and Gloria Placer Maruri, Chief of Cabinet, ‎Secretary of State for Information Society and Digital Agenda, Ministry for the Digital Agenda, Spain. Paolo Gemma, Senior Specialist at Huawei and Victoria Sukenik, Chairman of ITU-T Study Group 5 (Environment, Climate Change and Circular Economy), has taken up the role of U4SSC Vice-Chairmen ([press release](http://newslog.itu.int/archives/1336)).

The second meeting of the U4SSC will be held on 5 April 2017 in Manizales, Colombia. During this meeting a Flipbook containing the first 24 deliverables and the U4SSC action plan for 2017 will be presented.

1.11 A [Global Portal on IoT, Smart Cities & Communities](http://www.itu.int/en/ITU-T/ssc/Pages/default.aspx) has been created and provides references to external resources on these issues.

1.12 ITU together with Municipality of Manizales, the University of Manizales, the Economic Commission for Latin American and the Caribbean (ECLAC), the United Nations Industrial Development Organization (UNIDO), the United Nations Environment Programme (UNEP), the Basel Convention, the Basel Convention Regional Centre for the South American Region (CRBAS), the United Nations Economic Commission for Europe (UNECE), the United Nations Human Settlements Programme (UN-Habitat), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Telecommunications Regional Technical Commission (COMTELCA), the Inter-American Telecommunication Commission (CITEL), the Development Bank of Latin America (CAF) and the Inter-American Association of Telecommunication Enterprises (ASIET) is organizing the seventh edition of the [Green Standards Week](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201704/Pages/default.aspx), from 3 to 5 April 2017 in Manizales, Colombia. This year, the Green Standards Week is dedicated to the theme of “Circular Economy and Smart Sustainable Cities”, and will be kindly hosted by the Ministry of Information Technologies and Communications and the Municipality of Manizales, Colombia.

# 2. ITU-R Activities on IoT

2.1 Spectrum management studies within the ITU-R continue to address the harmonization of frequency bands and technical and operational characteristics for the use of short-range radio devices (SRDs) in response to [Resolution ITU-R 54-2](http://www.itu.int/pub/R-RES-R.54), which was updated at the Radiocommunication Assembly 2015 in particular to recognize the role of SRDs in the mobile Internet economy, mobile broadband applications, and the Internet of Things. Of the existing ITU-R publications on SRDs, [Recommendation ITU-R SM.1896](http://www.itu.int/rec/R-REC-SM.1896/en) provides the globally or regionally harmonized frequency ranges identified so far and [Report ITU-R SM.2153](http://www.itu.int/pub/R-REP-SM.2153/en) provides the technical and operating parameters and spectrum requirements for SRDs, as well as the associated national regulations in place in many countries.

2.2 Work is also being carried out on wide-area sensor and/or actuator network systems. [Recommendation ITU-R M.2002](http://www.itu.int/rec/R-REC-M.2002/en) provides the objectives, system characteristics, functional requirements, service applications, and fundamental network functionalities for mobile wireless access systems providing communications to a large number of ubiquitous sensors and/or actuators scattered over wide areas in the land mobile service. The key objective of wide area sensor and/or actuator network (WASN) systems is to support machine-to-machine service applications irrespective of machine location. [Report ITU-R M.2224](http://www.itu.int/pub/R-REP-M.2224) provides detailed information for system design policy, the wireless applications and examples of wide area sensors and/or actuators network systems for information sharing. Studies are also being carried out on the use of cognitive radio techniques for applications such as smart metering systems.

2.3 Following the successful development of IMT – ITU’s global standard for all of today’s 3G and 4G International Mobile Telecommunication systems – attention is now being focused on enabling a 5G seamlessly connected society in the 2020 time-frame and beyond that brings together people – along with things, data, applications, transport systems, and cities – in a smart, networked communications environment. The detailed specifications for the terrestrial radio interfaces for IMT-2020 are being developed within ITU-R Study Group 5 and the established timeline for having those specifications approved by all stakeholders is 2020, taking into account the holding of the World Radiocommunication Conference in November 2019.

An invitation to propose candidate radio interface technologies for IMT-2020 has been issued, and the proposals submitted will be presented in a specific workshop in October 2017.

2.4 ITU-R studies under [Resolution ITU-R 66](http://www.itu.int/pub/R-RES-R.66) on the Internet of Things are underway on the technical and operational aspects of radio networks and systems for IoT, and the aim is to develop ITU‑R Recommendations, Reports, and/or Handbooks on this topic. An urgent part of this work is in preparation for the World Radiocommunication Conference 2019 in response to item 3 of the Annex to [Resolution 958 (WRC-15)](http://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0024PDFE.pdf) calling for “studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU-R scope of work”.

2.5 To provide an overview of the ongoing ITU-R studies in response to the above-mentioned WRC and ITU-R Resolutions and to discuss the related activities in the different parts of the world on these topics, the Radiocommunication Bureau with the support of the Chairmen of ITU-R Study Groups 1 and 5 and of their relevant Working Parties organized a [Workshop on Spectrum Management issues related to the deployment of Internet of Things (IoT)](http://www.itu.int/en/ITU-R/study-groups/workshops/RSG1SG5-IoT-16/Pages/default.aspx) on 22 November 2016. The information presented during the Workshop addresses potential solutions in terms of spectrum needs and appropriate regulatory regimes for the IoT applications, while taking into account factors such as long or short range communications, signal latency, regulatory flexibility, equipment costs and complexity, QoS, security, and battery lifetime.

2.6 ITU-R studies are also underway on associated topics such as various approaches to licensing the operation of such devices, the use of cognitive radio and software-defined radio techniques and the use of satellites to support IOT applications.

# 3. ITU-D Activities on IoT

3.1 To enhance knowledge-sharing on the regulatory aspects of the IoT and related matters, ITU‑D has prepared discussion papers and addressed the issue of IoT at the Global Symposium for Regulators (GSR) in 2015, 2016, and will be continuing the discussion in 2017 (see [here](http://www.itu.int/en/ITU-D/Conferences/GSR/Pages/GSR.aspx)). The papers focused *inter alia* on [Regulation and the Internet of Things](http://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2015/Discussion_papers_and_Presentations/GSR_DiscussionPaper_IoT.pdf), [Emerging technologies and the global regulatory agenda](http://www.itu.int/en/ITU-D/Conferences/GSR/Documents/ITU_EmergingTech_GSR16.pdf). The theme of GSR-16 was *Be Empowered, Be Included: Building Blocks for Smart Societies in a Connected World,* and addressed technology developments as well as enablers for smart societies, cities, and individuals, including the impact of the Internet of Things. Under the theme *Living in a World of Digital Opportunities*, GSR-17 will address the social and economic impact of digital transformation and smart societies. ITU-D also prepared a series of papers on the app economy that address the contribution of ICT digital services and apps to the economies of developed and developing economies and explore the emerging policy and regulatory measures for the telecommunication/ICT sector.

3.2 WTDC-14 approved a new ITU-D Study Group Question on “Creating the smart society: social and economic development through ICT applications”. Throughout the study period the Question has facilitated the sharing of best practices and case studies on how to enable use of telecommunications and other means of connectivity, including M2M communications, to support sustainable development and to foster smart societies in developing countries. It has analysed factors affecting the efficient roll-out of connectivity to support ICT applications that enable e-government applications in cities and rural areas. The deliverables analyse the foundational principles for ICTs to create the smart society, such as the Internet of Things, ICT resource management, data openness, user-centric strategies, rural-urban digital gaps, and ICT project assessments. Through the many case studies a better understanding is gained of what the smart society can bring to developing countries in the field of health, learning, energy, agriculture, resource management (water and waste), commerce, and smart transport networks and road safety.

3.3 The smart society is also relevant for developing countries, and they should use the smart society as an aspirational model and set the vision for their country based on its specific circumstances, without delay. Regional and sub-regional cooperation and collaboration could further facilitate the setting of the vision and the actual implementation. In order to elaborate possible solutions to address the challenges faced by developing countries, a collaborative innovation challenge was launched in January 2016. Experts gathered within the [cocreate.itu.int](http://cocreate.itu.int/) platform to debate and share their thoughts, with an aim to submit joint inputs to the Rapporteur Group.

3.4 ITU-D supports the implementation of ITU-T and ITU-R Recommendations for developing countries, including building their human and institutional capacities and sharing best practices.

3.5 ITU-D helps countries to build human capacity in dealing with IoT and Big Data. Content development for training is ongoing and a number of training workshops have been organized under the ITU Academy and Centres of Excellence programme. There is related ongoing work on climate change and disaster risk reduction, including support to Member States and exploring effective ways of using IoT and Big Data for data collection. Data collection and analysis for ICT indicators is looking at using big data including IoT to augment current data collection and analysis for the measurement of the Information Society.

3.6 ITU, the National Broadcasting and Telecommunications Commission (NBTC) and the Ministry of Digital Economy and Society (MDES) of Thailand organized, under the ITU Asia-Pacific Centre of Excellence program, a training on “Developing the ICT ecosystem to harness Internet-of-Things (IoTs)”. The training has built capacity of 46 participants from 12 countries in Asia-Pacific.

# 4. IoT and Smart City Forums

* World Smart City Forum, jointly organized with IEC and ISO, Barcelona, November 2017.
* ITU Telecom 25-28 September 2017, Busan, Korea (Republic of), “Smart ABC” (Artificial intelligence, Banking, Cities)
* ITU-D Forum on IoT: Smarter Living in the Caribbean, Port of Spain, Trinidad and Tobago, 24-26 April 2017.
* [7th ITU Green Standards Week](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201704/Pages/default.aspx); 3-5 April 2017, Manizales, Colombia
* [Forum on “Data Management: Transforming Data Into Value”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/iot/201703/Pages/default.aspx); 12 March 2017, Dubai, UAE
* Green Standards Week, Montevideo in September 2016:
* **5-7 September:** [II Meeting of “Smart Cities for inclusion and sustainability”](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201609/Pages/programme-20160905.aspx)
* **8 September**: [XVII Ibero-American Meeting of Digital Cities](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201609/Pages/programme-20160908.aspx)
* **9 September:** [Forum on “Building the Cities we want: Connecting the dots for the New Urban Agenda”](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201609/Pages/programme-20160909.aspx)
* [ITU-UNECE-Habitat III Cross-Cutting Expert Group Meeting on Driving Smart Sustainable Cities Worldwide](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/Pages/20160721/meeting.aspx); 21 July 2016, Geneva, Switzerland
* [World Smart City Forum](http://www.worldsmartcity.org/); 13 July 2016, Singapore, jointly organized with IEC and ISO

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