WORLD TELECOMMUNICATION STANDARDIZATION ASSEMBLY
New Delhi, 15-24 October 2024

# Resolution 98 – Enhancing standardization of Internet of Things, digital twins and smart sustainable cities and communities for global development

## FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, and information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

# RESOLUTION 98 (Rev. New Delhi, 2024)

## Enhancing standardization of Internet of Things, digital twins and smart sustainable cities and communities for global development

*(Hammamet, 2016; Geneva, 2022; New Delhi, 2024)*

The World Telecommunication Standardization Assembly (New Delhi, 2024),

*recalling*

*a)* Resolution 197 (Rev. Bucharest, 2022) of the Plenipotentiary Conference, on facilitating the Internet of things (IoT) and smart sustainable cities and communities (SSC&C);

*b)* Resolution ITU-R 66-2 (Rev. Dubai, 2023) of the Radiocommunication Assembly, on studies related to wireless systems and applications for the development of IoT;

*c)* Resolution 85 (Rev. Kigali, 2022) of the World Telecommunication Development Conference, on facilitating IoT and SSC&C for global development;

*d)* the Global Pulse initiative launched by the United Nations Secretary-General to promote opportunities to use big data for sustainable development and humanitarian action;

*e)* the objectives relating to the activities of the ITU Telecommunication Standardization Sector (ITU-T) in Resolution 71 (Rev. Bucharest, 2022) of the Plenipotentiary Conference, which emphasizes collaboration and international cooperation in the fulfilment of ITU-T's mission;

*f)* Resolution 123 (Rev. Bucharest, 2022) of the Plenipotentiary Conference, on bridging the standardization gap between developing[1] and developed countries, which in particular highlights the need to extend and facilitate cooperation with international, regional and national standardization bodies;

*g)* the relevant ITU-T Y.4000 series Recommendations that address IoT, digital twins and SSC&C;

*h)* Recommendation ITU-T Y.4000, on the overview of IoT, which defines IoT as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies";

*i)* Recommendation ITU-T Y.4600, on the requirements and capabilities of a digital twin system for smart cities, emphasizing digital twin technology as a foundational enabler for SSC&C;

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[1] These include the least developed countries, small island developing states, landlocked developing countries and countries with economies in transition.

*j)*        Recommendation ITU-T Y.4900, on overview of key performance indicators (KPIs) in smart sustainable cities, which defines smart sustainable cities[2];

*k)*        Recommendation ITU-T Y.4903, on KPIs for smart sustainable cities to assess the achievement of the Sustainable Development Goals (SDGs),

*considering*

*a)*        that it is expected that the development of IoT technologies will make it possible to connect billions of devices to the network, impacting almost all aspects of daily life;

*b)*        that IoT devices connected to these networks collect and transmit vast amounts of data, which might include personal data that can present security challenges and vulnerabilities;

*c)*        the importance of IoT and digital twins in contributing to the achievement of the relevant SDGs;

*d)*        that digital twins can be used to achieve specific goals of SSC&C by conducting simulations;

*e)*        that various sectors, such as energy, transportation, health, agriculture, education, environmental protection and electronic public services, are collaborating for the development of IoT, digital twins and SSC&C applications and services across verticals;

*f)*        that IoT, digital twins and SSC&C can be key enablers for the information society and offer the opportunity to transform the urban and rural infrastructure, taking advantage of, among other things, the efficiencies of smart buildings, smart hospitals, intelligent transport systems, smart energy management, smart water management, smart education, smart agriculture and aquaculture, smart manufacturing, electric vehicles and smart energy storage, working together with services for the benefit of users;

*g)*        that a multistakeholder approach (which includes government, academia, industry and civil society) is crucial to planning for and building truly people-centred smart cities;

*h)*        that citizen engagement is crucial for smart cities, fostering participation, empowering citizens, stimulating innovation and resolving issues through public initiatives;

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[2]   A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental, as well as cultural aspects." (Note: City competitiveness refers to policies, institutions, strategies and processes that determine the city's sustainable productivity)

*i)* that SSC&C can use IoT and digital twins to discover and respond to regional and/or global crises, such as natural disasters and epidemics/pandemics;

*j)* that research and development of new and emerging telecommunication/information and communication technology (ICT) aspects of IoT, artificial intelligence (AI), digital twins, metaverse and citiverse can help to improve global development, delivery of basic services and monitoring and evaluation programmes in different sectors;

*k)* that IoT has evolved into a wide variety of applications with different aims and requirements, as a result of which it is necessary to work in coordination with other international standardization bodies and other related organizations in order to integrate better standardization frameworks;

*l)* that standards as well as public-private partnerships should reduce the time and cost for implementing IoT and digital twins with benefits in terms of economies of scale;

*m)* that interoperability is a necessary enabler for the development of IoT systems and services on a global scale;

*n)* that ITU-T should play a leading role in the development of IoT-, digital twin- and SSC&C-related standards;

*o)* the importance of collaboratively assessing and standardizing IoT, digital twins and SSC&C data interoperability;

*p)* that in IoT, digital twins and SSC&C environments, connected devices and applications represent a diverse range of ecosystems;

*q)* that security aspects are a key component in the development of a reliable and secure IoT ecosystem;

*r)* that, as citiverse extends beyond the physical boundaries of a city into the digital realm, further analysis and research are required on both the technological standardization and the effective management of citiverse applications;

*s)* that the evaluation and assessment of SSC&C and their digital transformation can help measure the implementation and success of SSC&C goals;

*t)* that open source is important for SSC&C in developing smart sustainable solutions,

*recognizing*

*a)* that industry forums, standards-development organizations (SDOs) and partnership projects are developing technical specifications for IoT;

*b)* the role of the ITU Radiocommunication Sector (ITU-R) in conducting studies on the technical and operational aspects of radio networks and systems for IoT;

*c)*      the role of the ITU Telecommunication Development Sector (ITU-D) in encouraging telecommunication/ICT development at the global level, and in particular the relevant work carried out by ITU-D study groups;

*d)*      that the purpose of the Joint Coordination Activity on IoT and smart cities and communities (JCA-IoT and SC&C), under the leadership of ITU-T Study Group 20, is to coordinate the work on IoT, digital twins and SSC&C within ITU and to seek cooperation from external bodies working in the field of IoT, digital twins and SSC&C;

*e)*      that much progress has been made in efforts to develop collaboration between ITU-T and other organizations, including, but not limited to, active participation in different committees and working groups of Joint Technical Committee 1 of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC 1) and of the European Telecommunications Standards Institute (ETSI), and there has also been collaboration with forums such as oneM2M, the Alliance for Internet of Things Innovation and the LoRa Alliance, and collaboration on intelligent transport system (ITS) communication standards;

*f)*      that ITU-T Study Group 20 is responsible for studies and standardization work relating to IoT, digital twins and SSC&C, including related digital services, such as effective energy management, digital health and citiverse;

*g)*      that ITU-T Study Group 20 is also working on standardization, security, privacy, trust and identification issues related to IoT, digital twins and SSC&C in collaboration with ITU-T Study Groups 17 and 2, in accordance with their mandates as specified in Resolution 2 (Rev. New Delhi, 2024) of this assembly;

*h)*      that ITU-T Study Group 20 is also a platform where the ITU-T membership, including Member States, Sector Members, Associates and Academia, can come together to have an impact on the drafting of international standards for IoT and their implementation;

*i)*      that United for Smart Sustainable Cities (U4SSC) is a United Nations initiative coordinated by ITU, the United Nations Economic Commission for Europe (UNECE), United Nations Environment Programme (UNEP) and the United Nations Human Settlements Programme (UN-Habitat) and is supported by 19 United Nations entities to achieve the SDGs, including SDG 11 (Make cities and human settlements inclusive, safe, resilient and sustainable);

*j)*      that U4SSC is supporting cities and countries in leveraging the full potential of digital transformation and the SDGs;

*k)*      that the ITU Focus Group on metaverse (FG-MV) has explored the role of metaverse in accelerating digital transformation and achieving the SDGs;

*l)*      the significant challenges that developing countries face in implementing and maintaining telecommunications and IoT technologies for SSC&C;

*m)* the Global Initiative on Virtual Worlds – Discovering the CitiVerse[3] was launched by ITU, the United Nations International Computing Centre (UNICC) and Digital Dubai during the first United Nations Virtual Worlds Day to foster open, interoperable and innovative virtual worlds that can be used safely and with confidence in SSC&C;

*n)* the importance of engaging with the work of the Global Initiative on Virtual Worlds – Discovering the CitiVerse;

*o)* that the Digital Transformation Dialogues webinars (DTD)[4] provide an avenue for disseminating knowledge and expanding the understanding of the rapidly evolving landscape of new and emerging telecommunications/ICTs and standardization, including IoT, AI, digital twins and metaverse for SSC&C,

*resolves to instruct Study Group 20 of the ITU Telecommunication Standardization Sector*

1       to develop ITU-T Recommendations focused on IoT, digital twins and SSC&C, addressing a broad range of areas, including, but not limited to, new and emerging telecommunications/ICTs, such as metaverse for SSC&C, and digital services and solutions for vertical industries;

2       to continue, within its mandate, to work with a special focus on the design of a roadmap and harmonized and coordinated international telecommunication standards for the development of IoT, digital twins and SSC&C, taking into account the needs of each region and Member States, as well as the wide variety of use cases and applications, while ensuring that IoT, digital twins and SSC&C are open, adaptable, sustainable and interoperable, thereby fostering a competitive environment and facilitating the seamless integration of devices and platforms;

3       to collaborate with IoT-, digital twin- and SSC&C-related standards organizations and other stakeholders such as industry forums and associations, consortia, SDOs and United Nations entities, as well as other relevant ITU-T study groups, taking into account relevant work;

4       to collate, evaluate, assess and share IoT use cases from the interoperability and standardization standpoints for data and information exchange;

5       to develop ITU-T Recommendations aimed at using IoT for the development of smart communities with a focus on holistic rural development;

6       to develop implementation guidelines aimed at assisting developing countries based on ITU-T Study Group 20 deliverables related to the creation of SSC&C;

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[3]   The Global Initiative on Virtual Worlds – Discovering the CitiVerse aims to explore and harness the potential of virtual worlds and citiverse. This initiative serves as a global platform that aims at fostering open, interoperable and innovative virtual worlds that can be used safely and with confidence by people, businesses and public services.

[4]   The Digital Transformation Dialogues webinars (DTD) offer a dynamic platform to facilitate a deeper understanding of new and emerging telecommunications/ICTs to reshape traditional processes, improve operational efficiency and unlock new possibilities for innovation and standardization.

7        to leverage the use of open source in the development and implementation of IoT and digital twins standards in SSC&C;

8        to explore and study the concepts and frameworks of citiverse in order to enhance urban planning, sustainability and citizen engagement,

*resolves to instruct Study Groups 20, 17 and 2 of the ITU Telecommunication Standardization Sector, in accordance with their scope and mandate as specified in Resolution 2 of the World Telecommunication Standardization Assembly*

to develop ITU-T Recommendations on security, privacy, trust and identification standards to address specific requirements for IoT, digital twins and SSC&C, taking into consideration existing Recommendations, increasing emerging security threats and loss of credit or trust,

*instructs the Director of the Telecommunication Standardization Bureau*

1        to provide necessary assistance in order to take advantage of every opportunity, within the assigned budget, to promote quality standardization work in a timely manner, and to communicate with telecommunication and ICT industries in order to promote their participation in ITU-T's standardization activities on IoT, digital twins and SSC&C;

2        to carry out, in collaboration with Member States and cities, pilot projects in cities and communities related to SSC&C KPI assessment activities, aimed at facilitating the deployment and implementation of IoT, digital twin and SSC&C standards worldwide;

3        to continue to support U4SSC, and share its deliverables with ITU-T Study Group 20 and other study groups concerned;

4        to accelerate the implementation of U4SSC KPIs as a standard for smart sustainable cities' self-assessment in collaboration with Member States, Sector Members, Associates and Academia to promote the deployment of the U4SSC KPIs and their implementation worldwide;

5        to continue encouraging cooperation with other international SDOs, industry forums, other related organizations, and global projects and initiatives, in order to increase the development of international telecommunication standards and reports that facilitate the interoperability of IoT, digital twins and SSC&C services;

6        to support the ITU membership in developing strategies and best practices related to strengthening the cybersecurity aspects of IoT, digital twins and SSC&C, in collaboration with other relevant SDOs, industry forums and consortia;

7        to continue organizing DTD webinars with a special focus on IoT, digital twins and SSC&C in order to disseminate knowledge on new and emerging telecommunications/ICTs and related international standards;

8        to encourage the development of eco-friendly and efficient IoT solutions that promote environmental sustainability in urban and rural communities,

*instructs the Director of the Telecommunication Standardization Bureau, in collaboration with the Directors of the Telecommunication Development Bureau and the Radiocommunication Bureau*

1        to prepare reports considering, in particular, the needs of developing countries in terms of the study of IoT and its applications, sensor networks, services and infrastructure, taking into account the results of work being done in ITU-R and ITU-D to ensure coordination of efforts;

2        to provide support to Member States in implementing U4SSC KPIs for smart sustainable cities;

3        to foster joint work among ITU Sectors in order to discuss the various aspects related to the development of the IoT and digital twin ecosystem and solutions for SSC&C, in the context of the achievement of the SDGs and within the framework of the World Summit on the Information Society;

4        to continue disseminating ITU publications on IoT, digital twins and SSC&C;

5        to organize forums, seminars, training programmes and workshops including DTD webinars, and to support Member States, in particular developing countries;

6        to report to the next world telecommunication standardization assembly on progress made in the organization of forums, seminars, training programmes and workshops dedicated to developing the capacity of developing countries;

7        to assist developing countries in the implementation of Recommendations, technical reports and guidelines related to IoT, digital twins and SSC&C,

*invites the ITU Telecommunication Standardization Sector membership*

1        to submit contributions and continue participating actively in the work of Study Group 20 and in the studies on IoT, digital twins and SSC&C being conducted by ITU-T, including new and emerging telecommunications/ICTs related to IoT, digital twins and SSC&C;

2        to consider developing frameworks, guidelines and other mechanisms to enhance the deployment, accessibility and usability of IoT, digital twins and SSC&C, thereby making cities and communities inclusive for persons with disabilities and persons with specific needs;

3        to develop master plans and exchange use cases and best practices in order to promote the IoT and digital twin ecosystem, as well as SSC&Cs, and to promote social development and economic growth in order to achieve the SDGs;

4        to cooperate and exchange experiences and knowledge related to this topic;

5        to support the organization of forums, seminars, workshops and training programmes on IoT, digital twins and SSC&C in order to promote innovation, development and growth in IoT, digital twins and SSC&C;

6        to take necessary measures to facilitate the growth of IoT, digital twins and SSC&C in the implementation of standards;

7        to participate in the U4SSC initiative and Global Initiative on Virtual Worlds – Discovering the CitiVerse,

*invites Member States, Sector Members, Associates and Academia, as appropriate*

to cooperate and participate actively in the implementation of this resolution.