

A Year of Impact

Advancing sustainable digital transformation
with ITU standards in 2024



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Introduction

The Year of Impact 2024 report highlights the pivotal milestones, initiatives, and global impact of the ITU Telecommunication Standardization Sector (ITU-T) in advancing digital transformation, smart sustainable cities, virtual worlds, and metaverse, all while aligning with the UN Sustainable Development Goals (SDGs).

The World Telecommunication Standardization Assembly (WTSA-24), held from 15 to 24 October 2024 in New Delhi, India, set strategic priorities for standards and capacity development with new resolutions on topics including metaverse, artificial intelligence (AI), sustainable digital transformation, and digital public infrastructure.

The 5th Global Standards Symposium (GSS-24) also brought together over 2600 international experts to discuss the evolving role of standards in charting the next digital wave and driving innovation in emerging technologies like AI and the metaverse. This event built on the momentum of the UN Virtual Worlds Day, a groundbreaking event that explored the future of immersive technologies and their potential to accelerate progress toward the SDGs. This event, held in collaboration with another 17 UN entities, fostered dialogue among key stakeholders on the responsible development of virtual worlds, with the aim of ensuring that they remain inclusive, accessible, and sustainable.

Additionally, ITU's launch of the Global Initiative on Virtual Worlds – *Discovering the Citiverse* in collaboration with UNICC and Digital Dubai has introduced an innovative UN platform to support cities around the world in seamlessly integrating virtual and real-world urban environments. This initiative aims to foster open, interoperable, and innovative virtual spaces that are safe, reliable, and accessible for individuals, businesses, and public services alike.

Among the significant achievements this year, ITU-T Study Group 20 (SG20) “Internet of Things (IoT), digital twins, and smart sustainable cities & communities” continued its important work in developing international standards to advance IoT frameworks, enhance interoperability, and foster secure, human-centred digital solutions for smart cities and communities.

Further progress came with the conclusion of focus groups on metaverse and AI and IoT for digital agriculture, groups that delivered expert guidance on innovative solutions merging physical and digital worlds to enhance sustainable development. The launch of new thematic groups under the United for Smart Sustainable Cities (U4SSC) initiative and cities' ongoing participation in the U4SSC Key Performance Indicator programme underscore our commitment to supporting smart city transformations worldwide.

Looking ahead, ITU remains committed to driving collaboration with international organizations, governments, and industry leaders to ensure that technology serves as a powerful tool for achieving sustainability, resilience, and digital inclusion. Explore this report to see how we are shaping people-centred smart cities globally.



Message from the Director

Dear colleagues,

As we reflect on our achievements in 2024, I am proud of the strides we have made in sustainable digital transformation, smart sustainable cities, and virtual worlds. Key milestones reached in 2024 again demonstrate our commitment to advancing sustainable digital development with ITU standards.

WTSA-24 set strategic priorities for our standards work on topics including metaverse, AI, sustainable digital transformation, and digital public infrastructure.

Our new Citiverse initiative will support cities in discovering new dimensions of sustainable development made possible by virtual worlds.

We have delivered key standards and related expert guidance on emerging technologies with the work of ITU-T Study Group 20 and focus groups on metaverse and AI and IoT for digital agriculture.

The U4SSC initiative continues to support cities and communities worldwide in taking advantage of digital technology for sustainable development.

Our expanding Digital Transformation Dialogues continue to provide an open platform to engage with thought leaders on topics such as quantum computing, digital twins, and AI.

Finally, hosting the first-ever UN Virtual Worlds Day showcased our role in fostering collaboration to ensure that immersive technologies help address global challenges.

I thank everyone involved for your dedication to this important work and I look forward to our continued work together to shape sustainable digital transformation.



Seizo Onoe

Director, Telecommunication Standardization Bureau,
ITU

Uniting the world through standards

Global Standards Symposium

The Fifth Global Standards Symposium (GSS-24) took place on 14 October 2024 in New Delhi, India, bringing together over 2600 participants including thought leaders, policymakers, and innovators from around the globe. This global event, chaired by Rajkumar Upadhyay, CEO of the Centre for Development of Telematics, focused on the theme:

"Charting the Next Digital Wave: Emerging Technologies, Innovation, and International Standards."

Communications ministers, industry leaders, and tech experts at the High-Level Segment of GSS-24 showcased their latest innovations, exchanged insights, and shared aspirations for international standards development.

The symposium reaffirmed the importance of investing in technical standards development to propel innovations in key areas like AI, smart cities, and virtual worlds to accelerate sustainable development.

The symposium's outcomes were submitted for the consideration of ITU's membership at WTSA-24 and are [freely available online](#).

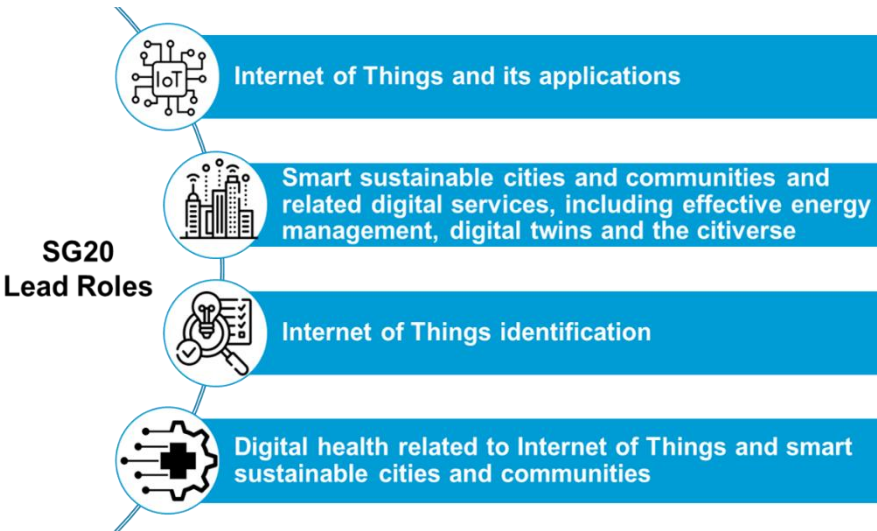


ITU-T Study Group 20: Internet of Things, digital twins, and smart sustainable cities and communities

2024 has been an impactful year for ITU-T Study Group 20 (SG20), with the group spearheading initiatives addressing the ever-growing demands of IoT, digital twins, and smart sustainable cities and communities. From developing new standards to promoting digital transformation across regions, SG20’s work is instrumental in building future-ready cities.

In the 2022-2024 study period, SG20 deliver over 50 international standards (ITU-T Recommendations) as well as six supplements to standards and six technical papers. These outputs provide essential guidance for global digital transformation in areas from urban planning to digital twins and AI applications.

Regional groups within SG20 continue to play a key role in ensuring that the unique needs of regions worldwide are reflected in the development and implementation of standards. This collaborative approach ensures that SG20's work considers a broad range of geographical and cultural contexts, making standards adaptable and impactful across different regions.



Highlights from SG20:

	4	Physical Meetings		6	Supplements
	50+	Recommendations		6	Technical Papers

Global Initiative on Virtual Worlds

Discovering the Citiverse

The Global Initiative on Virtual Worlds – *Discovering the Citiverse* launched at the first-ever UN Virtual Worlds Day on 14 June 2024 marks the start of a new chapter in the evolution of cities. Spearheaded by ITU in collaboration with the UN International Computing Centre and Digital Dubai, this initiative aims to help cities bridge the gap between virtual and real-world urban environments.



UNICC



The Citiverse initiative serves as the first UN platform focused on the development of open, interoperable, and innovative virtual worlds designed for city leaders, businesses, and public services. It aims to provide the essential tools, frameworks, and training for cities to leverage metaverse technologies for urban development and ensure that virtual city spaces are secure, inclusive, and beneficial for all.

Key Pillars

Pillar 1 - Bringing Virtual Worlds to Life

- Strategic Guidance
- Security and Trust
- Digital Inclusion and Accessibility
- Scaling Framework
- Evaluation and Assessment
- Awareness Building

[Explore more](#)

Pillar 2 - Connecting Cities with the Virtual and Real Worlds

- Emerging Technologies
- Use-case Identification
- Sandbox Experiment Facility
- Virtual Worlds Toolkit
- Annual Training

[Explore more](#)

Pillar 3 - Tunneling the citiverse

- Annual Assembly
- Citiverse Challenge
- Network of Cities and Citiverse for SDGs
- Talent Grants Programme for Developing Countries

[Explore more](#)

The Executive Committee of the initiative brings together a diverse group of thought leaders. The committee is tasked with providing strategic guidance to the initiative, shaping the initiative's vision, and driving collaboration to ensure the initiative's success.

Meet the Executive Committee

Chair



H.E. Mr Hamad Al Mansoori
Director General, Digital
Dubai

Vice-Chairs



H.E. Mr Jerry William Silaa
Minister, Ministry of
Information, Communication
and Information Technology,
Tanzania (United Republic of)



H.E. Ms. Margaret Nyambura Nding'u
Cabinet Secretary, Ministry of
Information, Communications
& The Digital Economy, Kenya



Manuel Barreiro
Founder and Chief Executive
Officer, Aston Group



Karl-Filip Coenegrachts
Chair of the Board of Directors
and Executive Director, Open
& Agile Smart Cities (OASC),
Belgium



Hyoung Jun Kim
Chair, ITU-T Study Group 20
"Internet of Things, digital
twins and smart sustainable
cities and communities"



Jouni Markkanen
City Board, Tampere City
Council, Finland



Paula Llobet Vilarrasa
Councillor for Tourism, Digital
Agenda, Innovation, and
Investment, Valencia, Spain



Sameer Chauhan
Director, United Nations
International Computing
Centre, UNICC



Unlocking the potential of virtual worlds

UN Virtual Worlds Day

The first-ever UN Virtual Worlds Day took place on 14 June 2024 in Geneva, Switzerland, marking a significant milestone in showcasing how virtual worlds, including the metaverse and spatial computing, can accelerate the achievement of the UN Sustainable Development Goals (SDGs). Co-organized by ITU alongside 17 UN entities, including World Bank, UNECE, ITCILO, United Nations Futures Lab Network, WMO, UNICC, WIPO, UNICEF, UN Tourism, UNU, UNDPPA, UNIN, UN Guatemala, FAO, UNESCWA, UNFCCC and its interagency initiative Resilience Frontiers, UNRISD, this pioneering event emphasized the transformative potential of digital spaces to foster collaboration and tackle global challenges.

One of the key features of the event was the UN Metaverse Think-a-Thon 2024, where participants designed innovative virtual simulations aimed at revolutionizing urban planning, education, and disaster preparedness. The Think-a-Thon invited students, academics, and industry leaders to develop cutting-edge solutions for smarter, more sustainable cities.

UN Metaverse Think-a-Thon 2024

UN Metaverse Think-a-Thon 2024

UN metaverse Think-a-thon: Project Showcase & Competition

8 May 2024
11:00 - 15:00 CEST



The first UN Executive briefing on Unlocking the potential of virtual worlds and the metaverse for the SDGs



Delivering impactful results

Groundbreaking achievements as focus groups conclude their work

In 2024, both the Focus Group on metaverse (FG-MV) and the Focus Group on AI and IoT for Digital Agriculture (FG-AI4A) concluded their work, delivering a wealth of knowledge and concrete outcomes that will shape future standards and innovations.

Focus Group on metaverse:

The FG-MV successfully concluded on 13 June 2024 marking a significant milestone.



155 e-Meetings Held

Throughout the initiative, Working Groups (WG) and Task Groups (TG) **convened 155 times** to drive progress. Check out the meeting documents [here](#).



FG-MV Structure

FG-MV formed **9 Working Groups** and **18 Task Groups**. Learn more about the FG-MV workplan [here](#).



Engaging Events

Witness the energy of **5 forums** and **2 special sessions** held with over **17,000 participants**. Explore our meetings and events [here](#).





Defining the metaverse

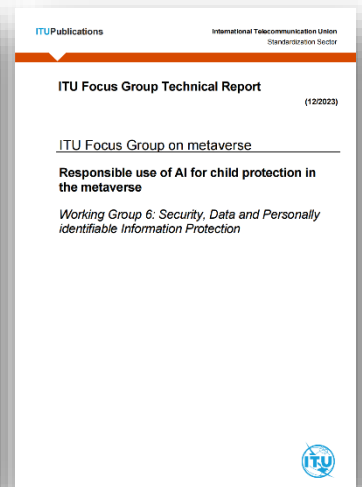
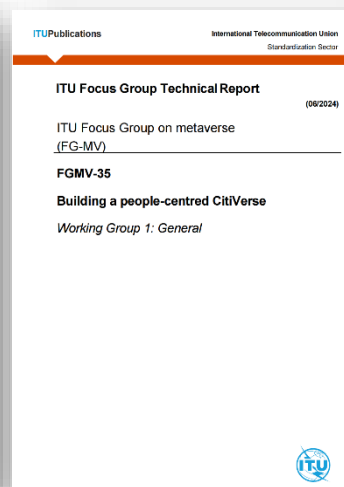
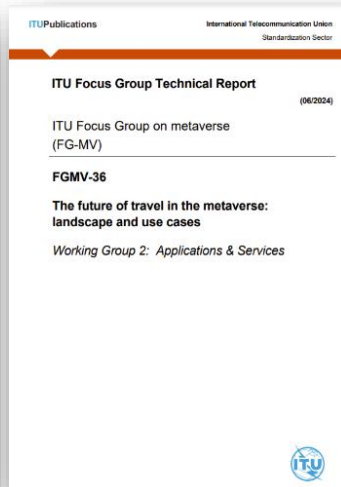
FG-MV approved the definition of the metaverse, shaping its future.

Definition of metaverse: An integrative ecosystem of virtual worlds offering immersive experiences to users, that modify pre-existing and create new value from economic, environmental, social and cultural perspectives.



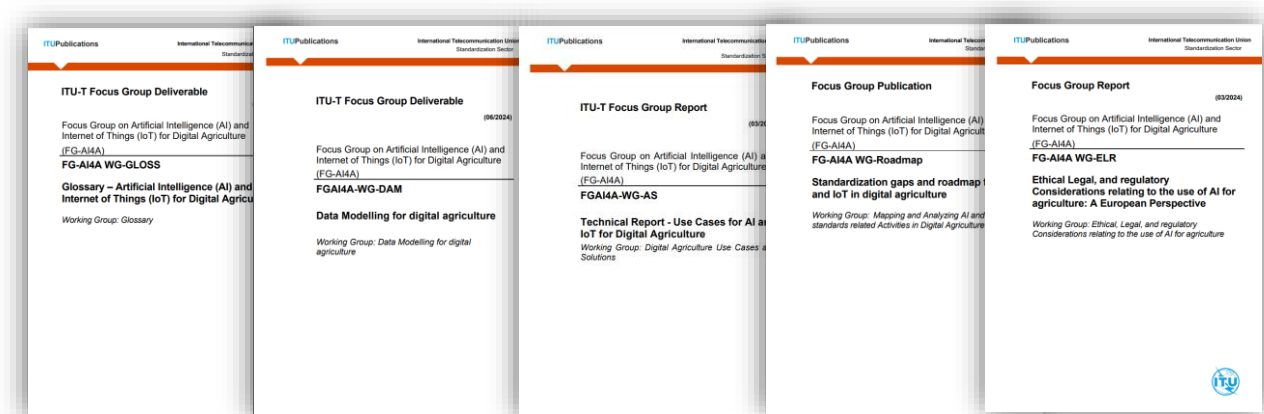
52 Approved Deliverables

Dive deeper into the 52 approved Technical Reports and Specifications [here](#).



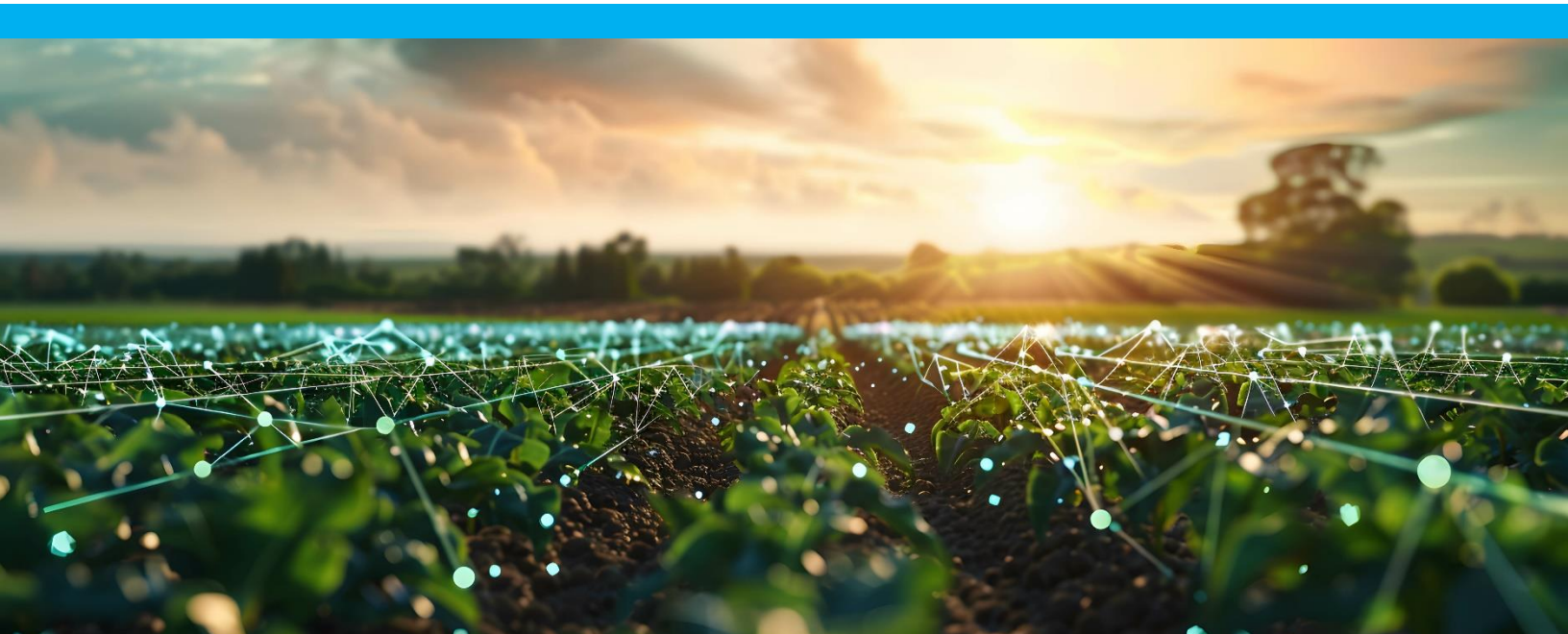
Focus Group on AI and IoT for Digital Agriculture

Similarly, the Focus Group on AI and IoT for Digital Agriculture (FG-AI4A) completed its task, holding 10 meetings and releasing of 5 key deliverables. These deliverables focus on critical areas such as ethical, legal, and regulatory considerations for AI in agriculture, data modeling, use cases for AI and IoT in agriculture, and identifying standardization gaps. The group's efforts have significantly contributed to advancing digital agriculture technologies and laying the groundwork for future AI integration in this sector.



Additionally, FG-AI4A hosted two major events in 2024:

- DTD Webinar: "Unleashing the Power of Digital Water Solutions," held on 22 March 2024, explored emerging digital technologies for water management.
- ITU/FAO Workshop: "Cultivating Tomorrow: Advancing Digital Agriculture through IoT and AI," held in New Delhi on 18 March 2024, which brought together global experts to discuss the future of digital agriculture



Powering People-Centred Smart Sustainable Cities

United for Smart Sustainable Cities

The eighth U4SSC meeting in Madrid this year solidified the initiative's role as a global platform for driving digital transformation and fostering sustainable, resilient cities.



In 2024, U4SSC expanded its scope with the launch of four new thematic groups.

New Thematic Groups

- Future Foresight for Cities: Helping cities plan for future challenges and emerging trends.
- Sustainable Digital Transformation in Building and Urban Energy: Promoting sustainability through innovative energy solutions and smart building practices.
- Social-Cultural Sustainability in People-Centred City Governance: Focusing on inclusive governance models that emphasize cultural and social sustainability.
- Digital Public Infrastructure for Cities: Enhancing the digital backbone of cities to drive sustainable development and improve urban services




Enabling People-Centred Cities
through Digital Transformation


Artificial Intelligence in Cities


City Platforms


Enhancing Urban Economic
Resilience and Smart
Sustainable Cities


Digital Wellbeing

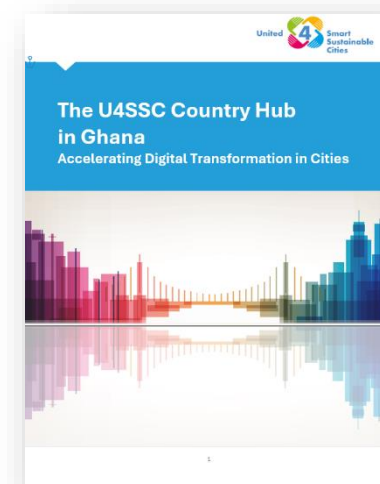
New published deliverables

- Policy Benchmarks for Digital Transformation of People-Centred Cities: A guide for shaping inclusive and people-focused digital transformation strategies.
- Data and API Requirements for Centralized Smart City Platforms: Technical guidelines for integrating centralized platforms to streamline data management.
- Guiding Principles for Artificial Intelligence in Cities: A set of recommendations aimed at ensuring the ethical deployment of AI technologies in urban environments.



U4SSC Country Hubs

Additionally, the U4SSC Country Hubs continue to play a pivotal role in supporting cities and national authorities as they implement smart city initiatives tailored to local needs. These hubs act as centers of expertise, sharing knowledge, resources, and best practices to accelerate the digital transformation of cities globally.



U4SSC Key Performance Indicators

As part of the initiative, the city of Anyang is leveraging data-driven insights to guide its journey toward smart city transformation. Through its participation in the KPI programme, Anyang aims to make informed decisions that will accelerate its sustainability goals and further its digital transformation efforts.



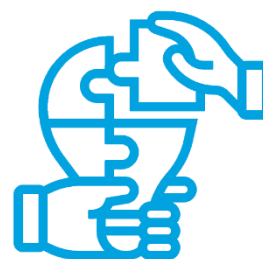
A strong year of collaborations

Collaboration with other SDOs and Forums

Throughout 2024, we continued to build synergies with SDOs and Industry Forums such as Global Cities Hub, OASC, ISO, IEC, TM Forum, LoRa Alliance, and oneM2M.

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

The JCA-IoT and SC&C provides a visible contact point for IoT and its applications including smart cities and communities (SC&C) activities. 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. The JCA-IoT and SC&C held its 29th meeting, on 2 July 2024, in Geneva, Switzerland.



IEC-ISO-ITU Joint Smart Cities Task Force (J-SCTF)

In 2024, the Joint IEC-ISO-ITU Smart Cities Task Force (J-SCTF) continued to strengthen collaboration among ITU, ISO, and IEC. The initial tenure, which was extended by two years beyond its original end date of October 2022, remains ongoing, allowing the task force to advance its important work.



Cooperation with Global Cities Hub

In 2024, the ITU formalized a strategic cooperation agreement with the Global Cities Hub to strengthen collaboration on smart cities initiatives. This partnership aims to leverage the collective expertise to advance smart, sustainable city frameworks. By working together, ITU and Global Cities Hub will support city leaders in adopting international standards, promoting knowledge sharing, and driving innovations that enhance urban resilience, sustainability, and digital transformation on a global scale.



Cooperation with OASC

ITU has also embarked on a new collaboration with the Open & Agile Smart Cities (OASC) network, with a specific focus on implementing Recommendations ITU-T Y.4505 on Minimal Interoperability Mechanisms (MIMs) in cities. By aligning efforts, ITU and OASC aim to accelerate the adoption of standardized frameworks for interoperability, ensuring that cities can scale their digital transformation initiatives efficiently while fostering an open ecosystem that benefits inhabitants and urban communities globally.



Collaboration with oneM2M

ITU and oneM2M collaborate on the development and adoption of IoT standards. oneM2M developed a set of technical specifications for a common M2M service layer that can be readily embedded within various hardware and software, and relied upon to connect the myriad of devices in the field with M2M application servers worldwide. These technical specifications have been transposed into ITU-T Recommendations (Y.4500 series) to avoid market fragmentation and duplication of standardization efforts.



Collaboration with LoRa Alliance

ITU and LoRa Alliance have joined forces to develop vital international standards recognized by the low-power wide-area networks (LPWAN) community for IoT. This collaboration grows the agenda forward for the industry and accelerates digital transformation across economies. Buildings these synergies among standardization efforts to better support the Internet of Things and smart cities and communities. The technical specification from LoRa (LoRaWAN® 1.0.4 Specification) has been transposed into Recommendation ITU-T Y.4480 "Low power protocol for wide area wireless networks".



Conversations that matter

DIGITAL TRANSFORMATION DIALOGUES

Webinars

Fireside Chats

Ask the Expert

In 2024, the Digital Transformation Webinars hosted 21 sessions, including a variety of formats such as fireside chats, ask-the-expert sessions, and digital transformation webinars. These events were designed to address the rapidly changing needs of the industry and to explore the future of digital transformation across multiple sectors. The series attracted many expert speakers and engaged more than 2700 virtual attendees globally. This redesigned approach allowed ITU to offer diverse, interactive formats, making it possible to engage with policymakers, industry leaders, and technical experts, while providing critical insights into emerging digital technologies and smart city transformation.

Digital Transformation Webinars

Covering topics ranging from Internet of Things (IoT), digital twins, metaverse, brain-computer interfaces, cloud computing, and artificial intelligence (AI) to data analytics, these webinars delve into how digital technologies can drive positive change and deliver sustainable value. These sessions explore how to harness the power of emerging technologies to support the next digital wave and meet the needs of smart, sustainable cities.



Fireside Chats

Designed as informal, engaging conversations, the Fireside Chats bring together industry experts, thought leaders, and professionals to share their expertise on leveraging digital technologies across diverse verticals such as smart cities, transport, health, cybersecurity, and sustainability. These chats provide an interactive platform to explore the possibilities and challenges of the ever-expanding digital landscape.



Ask the Expert

These sessions focus on helping participants gain insights into the vast ITU-T standardization landscape. By putting the spotlight on relevant best practices and emerging trends, these sessions facilitate informed decision-making in the quest for digital transformation, with practical guidance on applying ITU-T standards.



Digital Transformation Dialogue Episodes

Fireside Chats:

- Quantum Leaps: Pioneering the Future with Quantum Computing (28 November 2024)
- Less Power, Less Cost, More Impact – Tiny Machine Learning and Edge Artificial Intelligence To The Rescue (17 September 2024)
- Ethical Horizons: Navigating Responsible AI in the Digital Landscape (16 April 2024)
- Beyond Boundaries: Revolutionizing Banking through Digital Transformation (14 March 2024)
- Prospects for Surgical Advances (18 January 2024)

Ask the Expert Sessions

- Smart Submarine Cables: The future of disaster management (05 November 2024)
- Exploring DLT Beyond Cryptocurrency: Applications and Opportunities (23 July 2024)
- Rester connecté: Explorer l'itinérance mobile internationale (27 June 2024)
- Assessing the circularity of ICT goods (22 May 2024)
- Breaking barriers in the metaverse: Improving accessibility (25 April 2024)
- Guardians of Authenticity: Battling Counterfeiting (28 March 2024)
- Urban Intelligence Unveiled: AI Principles for Smart Cities (21 February 2024)
- Digital twin for smart cities (30 January 2024)

Webinars

- City Horizons: Celebrating World Cities Day and Shaping Urban Futures (31 October 2024)
- Greening the Future: Navigating Digital Transformation for Land Restoration (5 June 2024)
- Connected Communities: Harnessing the Power of Digital Public Infrastructure (21 May 2024)
- UN 2.0 Week Side event on Harnessing the metaverse and virtual worlds for global impact (26 April 2024)
- Metaverso 360°: Explorando la Accesibilidad, la Inclusión y los Derechos Humanos en Dominicana Innova (22 April 2024)
- Immersive Inclusivity: Enhancing Virtual Worlds with Accessibility (2 April 2024)
- Unleashing the Power of Digital Water Solutions: Exploring the flow of emerging technologies (22 March 2024)
- Future of real-love in the virtual world: The Perfect Date (14 February 2024)

Knowledge. Innovation. Action.

Digital Transformation Resources Hub

In 2024, the Digital Transformation Resource Hub continued to serve as a vital platform for policy makers. This extensive library of tools, reports, and studies provides crucial guidance for cities on their digital transformation journeys. With resources spanning across smart cities, AI, blockchain, and the metaverse, the hub remains an indispensable source of knowledge for those striving to build a sustainable digital future.



Smart sustainable cities



Digital health & wellbeing



Artificial intelligence



Internet of things



Blockchain



Digital twin



Metaverse



Digital transformation trends



Staying informed on the latest trends

Digital Transformation and Cities Digest

To keep key stakeholders informed, the Digital Transformation and Cities Digest continued throughout 2024. This regular email digest provides up-to-date information on ITU's latest work related to digital transformation, smart sustainable cities, and the metaverse. Each issue offers insights into upcoming events, new publications, and developments in ITU's initiatives, helping stakeholders stay engaged with the latest advancements in the digital landscape.

The digest serves as a valuable resource for city planners, industry leaders, and policymakers, offering a snapshot of the most relevant news and updates from ITU's ongoing projects. Whether it's exploring new standards, highlighting technological innovations, or sharing best practices, the Digital Transformation and Cities Digest ensures that stakeholders are always equipped with the information they need to drive their digital transformation efforts.



ITU Digital Transformation and
Cities Digest - December 2024



ITU Digital Transformation and
Cities Digest - September
2024



ITU Digital Transformation and
Cities Digest - July 2024



ITU Digital Transformation and
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ITU Digital Transformation and
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