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# Executive Summary

*Achievements in ITU standardization*

In the timespan from October 2016 until mid-March 2017, **87 new and 49 revised ITU-T Recommendations** were approved, see Appendix I for the list and summary of approved Recommendations and other approved texts.

ITU-T continues to provide leadership in the standardization of **broadband access and home networks** andinfrastructures for **ultra-high-speed transport**; as well as **future networks including 5G** andnetworking innovations in fields suchas **network slicing, fixed mobile convergence, information centric networking, software-defined networking** and **cloud computing.** See sections 1, 2 and 3.

The third amendment of Rec. ITU-T G.9701 doubles the aggregate net data rate achievable with **G.fast**, increasing its capacity to 2 Gbit/s using spectrum up to 212 MHz over traditional telephone lines, providing operators with a valuable complement to fibre to the home (FTTH) technologies in scenarios where G.fast proves the more cost-efficient strategy.

Enhancements to optical fibre standards allow to extend and optimize the use of these optical fibres beyond their current capabilities.

A new standard aims to bring **affordable implementation of broadband to rural communities** by identifying low-cost, sustainable broadband backhaul infrastructures, with a special focus on rural communications in developing countries.

Broadband cable networks have seen a new standard for **4K Ultra High Definition Television set-top boxes** with a functional specification of such cable set top boxes.

Synchronized mobile backhaul is essential to the success of wireless systems through 4G, 5G and beyond. A new industry standard enables highly accurate time synchronization and levels of reliability translating into holdover capabilities up to several days, with technology typically based on a combination of GNSS (Global Navigation Satellite Systems, such as GPS) and atomic clocks (e.g. cesium clocks).

Expanding and accelerating standardization work on **software-defined networking (SDN)** yielded two new standards which lay down the foundational requirements for and architecture of SDN. A new standarddefines the integration of a Green Abstraction Layer into the ITU-T Software-Defined Networking architecture while another standard defines the security requirements and security reference architecture for SDN. A new standard describes the commonalities in SDN and ASON network management-control, covering common SDN and ASON control approaches.

Coordination work of the ITU-T Joint Coordination Activity on SDN (**JCA-SDN)** continues.

A new standard for a **soft network architecture** **for mobile** **packet core network** which bridges current legacy mobile networks toward future networks is considered to form the basis of 5G work in SG13. This new standard defines the design principles and requirements of soft network architecture for mobile (SAME), i.e., flexible traffic steering, virtualization of SAME network functions, SAME network slice, and separation of control function and forwarding function, and thereby enables operators to improve the flexibility of their networks, such as using network resources more efficiently and enhancing their network capabilities more quickly.

The concluded ITU-T **Focus Group on network aspects of IMT-2020** (‘5G’) bought **five draft ITU international standards** and **four draft ITU technical reports** to drive related work in ITU-T Study Groups. About **13 new work items**, largely based on the outcomes of the Focus Group, were initiated in February 2017 covering requirements for IMT-2020 networks and fixed-mobile convergence, IMT-2020 architecture framework, IMT-2020 network management framework, network slicing, and information centric networking. First standards on 5G out of these deliverables are expected in summer 2017. A **new ITU-T Joint Coordination Activity on IMT2020 (ITU-T JCA-IMT2020)** will be coordinating the ITU-T IMT2020 standardization work with the focus on the non-radio aspects within ITU-T, and will be maintaining the roadmap of mobile communication studies and activities across three ITU Sectors.

A new standard puts forth the requirements for s**ervice management in cloud-aware Telecommunication Management System**. Standardization **roadmaps** for cloud computing and for big data were developed and will be maintained.

ITU **multimedia** standards offer a common platform for innovation and are essential in easing the burden on global networks increasingly geared towards the massive exchange of video traffic. See section 4. The fourth edition of the **H.265 High Efficiency Video Coding** was standardized which adds extensions profiles for screen content coding, scalable range extensions profiles, and additional high throughput profiles. A joint experts groups is seeking evidence towards the case for a **future video coding** standard beyond today’s ‘High Efficiency Video Coding’ (HEVC, published as ITU-T H.265 | ISO/IEC 23008-2, with the purpose to doubling the video compression capability of HEVC.

A new standard specifies a system for **augmented reality smart television service** allowing TV viewers to choose whether a user turns on the augmented content or watches the original TV content only (without the augmented content).

A family of **video quality monitoring** standards were developedto monitor the quality of video streaming over mobile devices as well as large screens with fixed-network connections. The standards are applicable to both progressive-download and adaptive-bitrate video streaming.

Experts have launched new standardization work on systems for **Immersive Live Experience (ILE)**, which will bring the sensation of live events to remote audiences, replicating the experience of being present at the event venue.

A new suite of ITU standards provides model algorithms to monitor the **quality of video streaming** over mobile devices as well as large screens with fixed-network connections.

ITU standards supporting the wide range of technologies under the banner of the **Internet of Things** 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. See section 5. The **IoT and Smart Cities and Communities Standards Roadmap** is being maintained by JCA-IoT and SC&C. A case study was published on “Implementing ITU-T International Standards to Shape Smart Sustainable Cities: The Case of Dubai”. 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. A new standard gives general guidance to cities and provides **key performance indicators (KPIs) for Smart Sustainable Cities (SSCs)** to help cities achieve Sustainable Development Goals (SDGs).

New and revised ITU standards specify the electrical-accoustical characteristic, performance requirements, and test signals for **hands-free communication in motor vehicles,** and speech quality requirements for **emergency calls originating** from vehicles. A new ITU standard describes the service requirements and functional requirements for the **vehicle gateway platform in the intelligent transport system**.

ITU work to build **confidence and security in the use of ICTs** continues to intensify in a bid to facilitate more secure network infrastructure, services and applications, and ITU members are engaged in a new standardization effort to describe the fundamentals of a trusted ICT environment. See section 6. The 8th edition of the ITU-T X.500-series was completed; among is ITU-T X.509 on public-key certificates and privilege management infrastructure. Two new security standards define the telebiometric authentication framework using a biometric hardware security module, and technical and operational countermeasures for telebiometric applications using mobile devices.

ITU's **'green ICT'** standards are contributing to the reduction of the ICT sector's environmental footprint as well as those of other industry sectors. A number of new green ICT standards in the ITU-T L.1300 series of Recommendations enable energy efficient ICT/telecommunication solutions. See section 7. For example, a new environmentally friendly standard for **external universal power adapter solutions** for laptops and other portable devices provides for improved energy efficiency and reduced greenhouse gas emissions and is expected to lead to significant reductions in e-waste, and thereby will contribute to the achievement of the targets set out by Goal 12 of the UN Sustainable Development Goals to ensure sustainable production and consumption patterns; and will assist in meeting the e-waste target of the Connect 2020 Agenda to reduce the volume of redundant e-waste by 50 per cent by 2020.

A new standard specifies **Green ICT solutions for telecom network facilities** allowing to introduce highly-efficient infrastructure solutions, including highly-efficient power solutions, renewable energy solutions, air-conditioning energy saving solutions and free and economized cooling solutions.

A new standard allowsto evaluate the **energy efficiency** of a base station site including the energy consumption for all the telecom equipment inside the base station site, the entire infrastructure, and energy losses due to AC/DC rectifiers, generator and cable losses.

ITU standards to assist in the responsible **management of electromagnetic fields** include measuring techniques, procedures and numerical models for evaluating the electromagnetic fields stemming from telecommunication systems and radio terminals. Several new and revised standards in the ITU-T K-series of Recommendations provide EMC resistability and safety limits of ICT equipment and infrastructure, and thereby contribute to the SDG goal 9.

Three new standards define requirements for **lightning protection** of fibre to the distribution point equipment, and of earthing for radio base stations and of miniature base stations. A new standard defines the **EMC requirements** for electrical equipment in telecommunication facilities and describes the requirements for radiated and conducted emissions from electrical systems installed in telecommunication facilities.

The **ITU/WMO/UNESCO-IOC Joint Task Force on SMART Cable Systems** is leading an ambitious new project to equip submarine communications cables with climate and hazard-monitoring sensors. ITU standardization continues to tackle **disaster relief, network resilience and recovery**, recognizing that the 21st century is playing host to an increasing prevalence of extreme weather events.

A new standard on **ICT and adaptation of agriculture to the effects of climate change** provides a description of how the use of ICT can help sustain the agricultural sector in the event of poor yields or disasters triggered by climate change.

Several revised standards cater for **resistibility** of telecommunication equipment against overvoltages and overcurrents, and provide **safety limits** for electromagnetic radiation for devices and to protect human beings.

The international community is looking to ITU's unique, globally representative public-private for a neutral platform to **strengthen the ties between technical innovation, business needs and economic and policy requirements**. ITU members at WTSA-16 approved new standards addressing Universal Service, charging and accounting principles for NGNs, developed an approach to reducing international roaming rates, and put forward principles and guidelines to assist countries in defining and identifying of operators with significant market power. See Section 8.

ITU standardization work on **performance, quality of service (QoS) and quality of experience (QoE)** spans the full spectrum of terminals, networks and services, ranging from speech over fixed circuit-switched networks to multimedia applications over mobile and packet-based networks. See section 9.

The **ITU conformity and interoperability (C&I) programme** is of particular value to developing countries in their efforts to increase conformance with ITU standards and benefit from the improved interoperability that results from this conformance. See section 10. A new guideline defines the **ITU-T CASC procedure** to appoint ITU-T technical experts. For example, a new ITU standards provides guidance to assist regulators to **monitor the QoS of Internet** when provided by service providers.

ITU technical work to **combat ICT counterfeiting** continues to gain momentum with new standards under development, supported by ongoing studies into the scale and dynamics of the counterfeiting challenge. See section 13. SG11 developed plans for implementation of WTSA-16 Resolution 96 “ITU Telecommunication Standardization Sector studies for combating counterfeit telecommunication/information and communication technology devices” and Resolution 97 “Combating mobile telecommunication device theft” where new work was started to develop a framework for combating the use of stolen mobile ICT devices, and supporting information on a framework for solution to combat counterfeit ICT devices; along with guidelines on best practice and solutions.

**ITU-T Focus Groups** have proven effective in responding to immediate ICT standardization demands, establishing the basis for subsequent standardization work in ITU-T Study Groups. Focus Groups are open to ITU members as well as organizations outside ITU's membership, and these groups are afforded great flexibility in their chosen deliverables and working methods. See section 14. Concerning the two Focus Groups (DFS and IMT-2020) that concluded end of 2016, positive experiences were made in the implementation of Rec. ITU-T A.7, in particular with the streamlined transfer of deliverables from the Focus Groups to the parent study groups as per Rec. ITU-T A.7 Appendix I, which was found very useful.

The concluded ITU Focus Group Digital Financial Services (**FG DFS)** has delivered **28 thematic reports** in the areas of DFS ecosystem, interoperability, consumer protection and technology, innovation and competition. The reports support some **85 policy recommendations** establishing guiding principles to assist the pursuit of digital financial inclusion at the national and global level.

Study Group 20 in March 2017 created a **new Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities** which will research data processing and management in the context of smart cities. 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.

ITU-T is leading efforts to improve the capacity of developing countries to participate in the development and implementation of ICT standards, using the vehicle provided by **ITU's Bridging the Standardization Gap (BSG) programme**. See section 17. TSB continues its successful practice to give **hands-on training sessions** to newcomers from developing countries. Since January 2016, 12 hands-on training sessions were held for delegates of ITU-T SG2, SG9, SG11, SG12, SG13, SG16 and SG17. In total, 191 participants from 35 countries and 64 different organizations have benefited from these sessions. **73 fellowships** were awarded during the period from October 2016 until February 2017; of which 8 fellowship were cancelled.

The Ministry of Science, ICT and Future Planning (MSIP) of Korea has kindly made a contribution to the **BSG Fund**. TSB is encouraging other voluntary contributions to the BSG Fund.

With the recent creation of five new regional groups by SG17 and SG20, ITU-T now has **23 regional groups**. This significant enhancement gives ITU-T Study Groups a good footprint in the various regions to conduct its business towards bridging the standardization gap between developing and developed countries and to increase the efficiency and effectiveness of international standardization work, see section 17.2.

A new TSB project, the “European operator target list”, has been launched to increase the **participation of European operators** (both Members and non-Members) in ITU-T SGs, FGs, JCAs and Workshops. This project targets increased participation in ITU-T by specific EU operators, engaging decision-makers such as CIOs, CTOs and CISOs, linked to identified subject-matter interest and upcoming meetings. A database of close to 1000 European operator contacts has been mapped to relevant ITU-T study groups and activities. This project has resulted in an increase in the participation of EU operators in ITU’s open events as speakers and participants.

The first **Women In Standardization Expert (WISE) event** was held on 30 October 2016 at the WTSA-16. The event consisted of a workshop on practical skills for successful negotiations, as part of ITU-T's commitment to promoting equality for men and women delegates attending its meetings and conferences, followed by a panel discussion highlighting the experiences of leading women from the ICT and standardization fields. Currently, 56 per cent of all TSB staff are women. The number of women in the professional category has more than quadrupled over the last 10 years, taking the proportion of women in the professional category to 39 per cent. **Diversity of staff, gender equality and the empowerment of women** continue to be among TSB's priorities.

Several **Chief Technology Officer (CTO) group** meetings at international and regional level brought together industry executives to highlight their business priorities and supporting standardization strategies.

The third **Global Standards Symposium (GSS)** brought together thought leaders to discuss how standards efforts could best integrate the consideration of security, privacy and trust. The discussions of the symposium will assist ITU in fulfilling its mandate to 'build confidence and security in the use of ICTs', particularly in supporting the development of the trusted ICT environment necessary to fulfil the enormous potential of IMT-2020 (5G) systems, the Internet of Things and Smart Sustainable Cities.

**ITU and the NGMN Alliance** have signed a cooperation agreement formalizing their mutual commitment to the development of next-generation mobile broadband technologies and affirms NGMN’s support for ITU’s international standardization of 5G systems.

**ETSI and ITU** continue to enjoy successful and strong collaboration involving SGs 5, 11, and 17.

ITU has partnered with the World Bank and the Bill & Melinda Gates Foundation in establishing a new multi-partisan **Financial Inclusion Global Initiative (FIGI 3x3x3)** aimed at accelerating progress towards universal access to financial services with the purpose to implement the recommendations of the Focus Group Digital Financial Services, the Payment Aspects of Financial Inclusion report of the World Bank and CPMI and the Level One Project of the Gates Foundation.

ITU has signed a cooperation agreement with the **European Committee for Electrotechnical Standardization (CENELEC)** and with the **European Committee for Standardization (CEN)**, wherein the three signatories express their intent to cooperate within a high-level, non-exclusive framework in areas of mutual interest such as in standardization activities on IoT and smart sustainable cities, on trust, on privacy-by-design in technical standards, on cybersecurity, and on mobility and Intelligent Transportation System (ITS) communication standards; and allowing to exchange relevant information among the three organizations.

***The ITU standardization platform***

**ITU-T membership growth** remains positive with a total of 536 members on 28 February 2017 which is an increase from 531 recorded on 31 October 2016. Overall, ITU-T has a**dded 22 new members** since 31 October last year. Among these new additions were 4 Sector Members and 4 Associates. The number of new Associates were shared equally across Study Group 2: Operational aspects, Study Group 5: Environment and climate change, Study Group 15: Transport, access and home, and Study Group 17: Security. **Academia** accounted for the majority of new additions with 14 in total. Overall there have been 17 denunciations since 31 October 2016. TSB continues its efforts to include a **gender perspective** in all of its activities and programmes under the umbrella of the ITU Gender Task Force. See section 18.

**Over 7500 pages** of ITU-T Recommendations and Supplements were published between October 2016 and February 2017. See section 19. The ITU product "ITU-T Recommendations and selected Handbooks" continues to be distributed on a quarterly basis. Because of space limitations of the double-layer DVD format, the product will be distributed on a **USB key** starting with the March 2017 edition.

The consistent output of **ITU-T news content**, coupled with a coordinated social media strategy led by the ITU General Secretariat, continues to see news of ITU-T's work feature in a variety of mainstream publications. ITU-T celebrated the **60th Anniversary of CCITT/ITU-T**, under the leadership of TSB Director Chaesub Lee, with a series of talks were held during the WTSA-16 Plenary sessions on 26 October 2016. See section 20.

**Electronic working methods** offer crucial support to members engaged in ITU standardization work. The ITU secretariat continues to develop new applications and services to maintain and expand ITU's advanced electronic working environment; such as the **new ITU-T Rapporteur Group Meeting (RGM) system** with **ITU-T SharePoint collaboration sites** for any Rapporteur Group wishing to utilise and take advantage of its improved capabilities. See section 21.

TSB continues to translate all Recommendations approved under the traditional approval process (TAP), as well as all TSAG reports in all the languages of the Union. **TSB translated two AAP Recommendations** (128 English pages) in the reporting period, in accordance with requests previously received from the ITU-T Study Groups and linguistic groups, and within the allocated translation budget.

ITU-T's work contributes to the implementation of ITU mandates of the **World Summit on the Information Society (WSIS)**. In line with the WSIS process' efforts to promote the pursuit of the UN **Sustainable Development Goals (SDGs)**, ITU-T has undertaken a mapping of its activities to the SDGs to highlight the ITU-T activities most relevant to the SDGs and propose actions for ITU-T to expand its contribution to the achievement of these goals. See section 22.

As part of TSB’s **implementation of ITU-T A-series Recommendations**, TSB noticed that the "For Comment" field in liaison statement templates should be discontinued in Rec. ITU-T A.1 as was agreed by TSAG 2016; however, those changes were missed to be brought to WTSA-16. Hence, there is a need to correct A.1 accordingly.

# Annex – Full Report of activities in ITU-T (from mid-October 2016 to end of March 2017)

# 1 Broadband access and transport technologies

## 1.1 G.fast: Breathing new life into existing copper infrastructure

*Within 400 metres of a distribution point,* ***G.fast******provides fibre-like speeds*** *matched with the customer self-installation of DSL, resulting in cost-savings for service providers and an improved customer experience.*

ITU standards experts have doubled the access speeds achievable with the ITU G.fast broadband standard. G.fast is now capable of enabling data rates up to 2 Gbit/s over traditional telephone lines, providing operators with a valuable complement to fibre to the home (FTTH) technologies in scenarios where G.fast proves the more cost-efficient strategy. G.fast provides fibre-like speeds matched with the customer self-installation of DSL, resulting in cost-savings for service providers and improved customer experience.

**The third amendment of Rec. ITU-T G.9701** (under approval) doubles the aggregate net data rate achievable with G.fast, increasing its capacity to 2 Gbit/s using spectrum up to 212 MHz over traditional telephone lines, providing operators with a valuable complement to fibre to the home (FTTH) technologies in scenarios where G.fast proves the more cost-efficient strategy. The update to the standard maintains spectral compatibility with VDSL2. The coexistence of G.fast and VDSL2 offers service providers the agility required to switch customers between G.fast and VDSL2 as business operations demand. The amendment extends G.fast’s application to coaxial cable, enabling the coexistence of G.fast and satellite signals in coaxial cable infrastructure. The amendment also specifies a mechanism for dynamic time assignment (DTA) functionality that enables upstream or downstream transmission to exploit G.fast’s full aggregate net data rate. This functionality will improve users’ broadband experience by increasing upload or download speeds in line with the demands of the applications in use. [Full text of press release](http://newslog.itu.int/archives/1400).

## 1.2 Optical fibres

Revisions to **Recs. ITU-T G.652 “Characteristics of a single-mode optical fibre cable”** and **G.657 “Characteristics of a bending-loss insensitive single-mode optical fibre and cable”** extend and optimize the use of these optical fibres beyond their current capabilities. Rec. ITU-T G.652 was released in 1984 as the first standard for single-mode fibres, leading to these fibres becoming known as “standard single-mode fibres”. ITU-T G.652 fibres were the first to be deployed in public networks and still account for the vast majority of the fibres installed worldwide. Rec. ITU-T G.657 is a standard for single-mode fibres created in 2006 specifically for optical access networks, networks which are more demanding of fibre and fibre-optic cabling with respect to macrobending sensitivity and connectivity.

**Rec. ITU-T G.654 (revised) “Characteristics of a cut-off shifted single-mode optical fibre and cable”**, which traditionally dealt with the characteristics of fibres for submarine cables, includes a new subcategory of fibre (G.654.E fibre) to support coherent digital transmission systems in terrestrial optical networks at rates beyond 100 Gbit/s.

The new **G-series Supplement 59** provides guidance relevant to the long-term reliability of cabled optical fibres. The supplement describes the factors that impact the performance of an optical fibre over time, looking at fibres’ optical and mechanical reliability and how this can be impacted by the cabling process.

Demand for optical fibre continues to display steady growth. In 2014, the volume of fibre produced worldwide exceeded 300 million kilometres, and estimates suggest that 2016 will yield over 400 million kilometres. Built in conformance with ITU standards, these fibres are at the core of the ultra-high-speed optical networks that form the backbone of the Information Society. [Full text of press release](http://newslog.itu.int/archives/1400).

**Approved Recommendations: see Appendix I.1.2.**

## 1.3 Optical transmission systems

**Approved Recommendations: see Appendix I.1.3.**

## 1.4 Optical fibre submarine cables

**Approved Recommendations: see Appendix I.1.4.**

## 1.5 Transport network control aspects

**Approved Recommendations: see Appendix I.1.5.**

**1.6 Ethernet over transport networks**

**Approved Recommendations: see Appendix I.1.6.**

**1.7 MPLS over transport networks**

**Approved Recommendations: see Appendix I.1.7**

**1.8 Synchronization and timing**

**Approved Recommendations: see Appendix I.1.8.**

## 1.9 Broadband to rural communities

**Recommendation** [**ITU-T L.1700**](http://www.itu.int/itu-t/recommendations/rec.aspx?rec=12885) **“Requirements and framework for low-cost sustainable telecommunications infrastructure for rural communications in developing countries”** aims to bring broadband to rural communities. The standard builds on established technologies to identify the founding principles for low-cost, sustainable broadband backhaul infrastructure, with a special focus on rural communications in developing countries. As a framework standard, L.1700 is largely technology-neutral. The unique feature of L.1700 and its corresponding supplements is the focus on ease of deployment. Cost-effective, practical implementation is the standard’s top priority. Reliability is the second most important attribute. This reverses the common approach to fibre-optic cable design – reliability is usually the first prize, but with L.1700, affordable implementation comes first. Local communities will have the ability to secure these on-surface lines, using everyday tools to partially bury the lines, settle them on ground underwater, suspend them aerially, or relocate the lines as necessary. [Full text of press release](https://itu4u.wordpress.com/2016/11/21/new-itu-standard-can-help-bring-broadband-to-rural-communities/).

## 1.10 Cable

**Approved Recommendations: see Appendix I.1.10.**

# 2 Ultra-high-speed networks

***The standards developed by ITU-T Study Groups 9 and 15 detail technical specifications giving shape to global high-speed communication infrastructure****.*

*The group's standards define technologies and architectures of high-speed transport networks enabling long-haul global information exchange.*

ITU members continue to make considerable progress on a number of high-speed transport network technology fronts, including Optical Transport Network (OTN) and coaxial cable, providing the backbone networks crucial to the successful operation of mobile-wireless networks.

## 2.1 Ultra-high-speed optical core network: OTN beyond 100G

**Approved Recommendations: see Appendix I.2.1.**

## 2.2 Ultra-high-speed access NG-PON2

ITU standards for **"40-Gigabit-capable passive optical networks" (NG-PON2)** provide for passive optical network systems with a nominal aggregate capacity of 40 Gbit/s in the downstream direction and 10 Gbit/s in the upstream direction.

***NG-PON2*** *is a major milestone in the field of access networking as the first series of standards to provide ultra-high-speed access beyond 10 Gbit/s.*

The new series of standards addresses operators' need for common technologies to support the optical-access demands of homes and businesses, mobile backhaul and fronthaul and other applications. Major operators are testing NG-PON2 systems with the intention of deploying these systems in the near future.

NG-PON2 is a flexible optical fibre access network capable of supporting the bandwidth requirements of mobile backhaul, business and residential services. Furthermore, ITU-T G.989.2 describes optional configurations to extend beyond this nominal capacity as the G.989 series of standards allows for multiple upstream and downstream line rates.

**Approved Recommendation: see Appendix I.2.2.**

# 3 Smart 5G networks and networking solutions

## 3.1 Synchronized mobile backhaul networks

Timing and synchronization is crucial to the efficient operation of advanced mobile-wireless technologies. Industry looks to ITU-T for standards to support the synchronized mobile backhaul essential to the success of wireless systems through 4G, 5G and beyond. The new **Rec. ITU-T G.8272.1/Y.1367.1 “Timing characteristics of enhanced primary reference time clocks”** specifies the requirements of enhanced primary reference time clocks (ePRTCs) suitable for time and phase synchronization in packet networks. The new standard will enable highly accurate time synchronization and levels of reliability translating into holdover capabilities up to several days, with technology typically based on a combination of GNSS (Global Navigation Satellite Systems, such as GPS) and atomic clocks (e.g. cesium clocks). The ePTRCs provided for by Rec. ITU-T G.8272.1/Y.1367.1 will make it possible to design synchronization networks where the prolonged loss of GNSS would not impact the performance of the network, an important consideration amid increasing concerns around GNSS vulnerability. A planned future edition of Rec. ITU-T G.8272.1/Y.1367.1, based on the further development of atomic clock technology, will include an option for holdover periods potentially as long as 80 days. [Full text of press release](http://newslog.itu.int/archives/1400).

## 3.2 Smart ubiquitous networks, next-generation networks evolution, and future networks

An ITU workshop is planned on ["ITU-T Standardization Work on Future Networks: Towards a Better Future for Africa"](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/standardization/20170402/Pages/default.aspx), during 2 – 3 April 2017 in Cairo, Egypt, back to back with the fifth meeting of the African regional group of ITU-T SG13.

The new Recommendations ITU-T Y.3301 and Y.3302 on functional requirements and functional architecture of SDN were approved in September 2016 and January 2017 respectively. A new Recommendation ITU-T Y.3323 on soft network architecture for mobile packet core network, also approved in September 2016, complement these studies that form the basis of 5G work in SG13. ITU-T Y.3323 bridges current legacy mobile networks toward future networks and is considered to form the basis of 5G work in SG13. This new standard defines the design principles and requirements of soft network architecture for mobile (SAME), i.e., flexible traffic steering, virtualization of SAME network functions, SAME network slice, and separation of control function and forwarding function, and thereby enables operators to improve the flexibility of their networks, such as using network resources more efficiently and enhancing their network capabilities more quickly.

New Recommendation ITU-T Y.3071 “Data Aware Networking (Information Centric Networking) - Requirements and Capabilities” was approved.

**Approved Recommendations: see Appendix I.3.2.**

## 3.3 IMT-2020/5G networks

The [ITU-T Focus Group on network aspects of IMT-2020 (‘5G’)](http://www.itu.int/en/ITU-T/focusgroups/imt-2020/Pages/default.aspx) was established in May 2015 to analyze how emerging 5G technologies will interact in future networks. The group has undertaken in-depth studies into network softwarization and slicing, 5G architecture and fixed-mobile convergence, end-to-end network management, information-centric networking, and related open-source innovation. The Focus Group’s vision of the 5G era is of a highly dynamic ICT industry characterized by the entrance of new players to the networking business and new opportunities for telecoms companies. The approach to year 2020 will play host to the emergence of new business models capitalizing on the transformative effects of softwarization and the associated convergence of open-source and telecoms communities.

The group held its final meeting in Geneva, 5-9 December, hosting a [workshop and demo day](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/201612/Pages/Programme.aspx) on 7 December 2016 to showcase networking innovations to support the diverse range of envisioned 5G use cases, use cases which span from automated driving to industrial robotics and tele-surgery. The FG IMT2020 has concluded its preliminary study into the networking innovations required to achieve the ambitious performance targets of smart 5G systems. The group’s output takes the form of five draft ITU international standards and four draft ITU technical reports to drive related work in ITU-T Study Groups.

Draft ITU international standards:

* Requirements of IMT-2020 from network perspective
* Framework for IMT-2020 network architecture
* Requirements of IMT-2020 fixed mobile convergence
* IMT-2020 network management requirements
* Network management framework for IMT-2020

Draft ITU technical reports:

* Application of network softwarization to IMT-2020
* Unified network integrated cloud for fixed mobile convergence
* Application of information centric networking to IMT-2020
* Terms and definitions for IMT-2020 in ITU-T

The draft ITU standards and technical reports are undergoing final editing before being transferred ITU-T Study Group 13. [Full text of press release](http://newslog.itu.int/archives/1457).

About 13 new work items, largely based on the outcomes of the Focus Group, were initiated in February 2017 covering requirements for IMT-2020 networks and fixed-mobile convergence, IMT-2020 architecture framework, IMT-2020 network management framework, network slicing, and information centric networking. First standards on 5G out of these deliverables are expected in summer 2017.

ITU-T SG13, in response to the WTSA-16 Resolution 92 (IMT-2020), created **new ITU-T Joint Coordination Activity on IMT2020 (ITU-T JCA-IMT2020)** which is to coordinate the ITU-T IMT2020 standardization work with the focus on the non-radio aspects within ITU-T and coordination of the communication with standards development organizations, consortia and forums also working on IMT2020 related standards. One of the tasks of JCA-IMT2020 is to maintain the roadmap of mobile communication studies and activities across three ITU sectors. Pending endorsement of TSAG, the first meeting is scheduled for July 2017.

A one day ITU workshop on 5G roadshow is planned on 11 July 2017 in Geneva, Switzerland.

## 3.4 Home network

## 3.5 Software-defined networking

***SDN is a promising route towards more dynamic network management-control****, enabling operators to establish and manage-control virtual network resources without introducing new specialized hardware. SDN answers industry's need for a flexible, cost-efficient means of accommodating large fluctuations in bandwidth use by offering an alternative to overprovisioning of dedicated transport resources.*

Expanding and accelerating standardization work on software-defined networking (SDN) was one of the key directives issued by ITU's membership at WTSA-12 in Resolution 77 ("Standardization work in ITU-T for software-defined networking"). Revised WTSA-16 Resolution 77 strengthened the mandate on SDN for SG13 and other study groups to develop Recommendations on SDN.

The new **Rec. ITU-T G.7701 “Common Control Aspects”** describes commonalities in SDN and ASON network management-control, covering common SDN and ASON control approaches as they relate to transport resources and their representation, control components, control communications, and naming and addressing. The new Rec. ITU-T G.7701 follows the 2015 approval of ITU-T G.7711/Y.1702 “Generic protocol-neutral information model for transport resources”, which provides a core information model for transport resources to enable smooth transitions to SDN architectures from traditional management using OSS. Rec. ITU-T G.7711/Y.1702 gives operators the ability to deploy SDN selectively, migrating parts of the infrastructure to SDN without nullifying the value of investments in legacy OSS infrastructure. [Full text of press release](http://newslog.itu.int/archives/1400).

The [Joint Coordination Activity on SDN (JCA-SDN)](http://www.itu.int/en/ITU-T/jca/sdn/Pages/default.aspx) maintains a global SDN standardization roadmap, available for download on the homepage of JCA-SDN.

**Approved Recommendations: see Appendix I.3.5.**

## 3.6 Cloud computing

*Cloud computing is a model offering users ubiquitous, convenient, on-demand network access to a shared pool of configurable cloud resources: networks, servers, storage, applications, and services provided rapidly and released with minimal management effort or service provider interaction.*

**Approved Recommendations: see Appendix I.3.6.**

The **Cloud Computing Roadmap** is a collection of information from ITU-T and other standards bodies documenting their work to develop technical standards for cloud computing. It is a live document with global scope that captures both published and ongoing work on cloud computing.

## 3.7 Big Data

Further to the first Recommendation ITU-T Y.3600 on Big Data approved in 2015, SG13 published a Big Data standardization roadmap in December 2016, known as Supplement 40 to Y.3600-series.

# 4 Media networking/broadcasting solutions

## 4.1 Video and image coding

*Estimates suggest that video already accounts for more than 50 per cent of bandwidth use, a figure expected to rise to over 80 per cent by 2018.*

### 4.1.1 ITU-T H.265 High Efficiency Video Coding

**Approved Recommendations: see Appendix I.4.1.1.**

### 4.1.2 Studies on future video coding

The Joint Video Exploration Team (JVET) was established in October 2015 with MPEG to consider the large volume of contributions addressing the next generation of video coding. This informal joint activity will be succeeded by a formal collaboration when sufficient evidence supports the development of a new generation of video compression standard. These discussions on the future of video are also ongoing within the formal Joint Collaborative Team (JCT) on Video Compression, which has to date focused on HEVC. The group held several meetings until the end of the study period and achieved significant progress that is expected to become a formal collaboration in the beginning of the new study period.

### Beyond HEVC: ‘Call for Evidence’ supporting the case for next-generation video codec

[ITU-T Study Group 16 (SG16)](http://www.itu.int/en/ITU-T/about/groups/Pages/sg16.aspx) and the [ISO/IEC Moving Pictures Expert Group (MPEG)](http://mpeg.chiariglione.org/) are inviting experts to submit evidence supporting the case for a future video coding standard beyond today’s ‘High Efficiency Video Coding’ (HEVC, published as ITU-T H.265 | ISO/IEC 23008-2).

The [‘Preliminary Joint Call for Evidence on Video Compression with Capability beyond HEVC’](https://itu.int/en/ITU-T/studygroups/2017-2020/16/Documents/201701/Video-CfE-SG16R1-AnnexH.pdf) is in search of advances in video coding with potential to drive the development of a standard with double the video compression capability of HEVC. Should the ‘Call for Evidence’ support a strong case for the development of a future video coding standard, SG16 and MPEG will issue a ‘Call for Proposals’ to fuel the new standardization project, targeting the completion of this project by late 2020.

The SG16-MPEG Joint Video Exploration Team (JVET) is studying the feasibility of the project and evaluating candidate technology designs. JVET is reporting roughly 30 per cent improvement in compression capability relative to HEVC with its preliminary ‘Joint Exploration Model’, with the qualification that this improvement comes with high computational complexity. This work is considering a wide variety of video source content, including new types of content such as high dynamic range video and virtual-reality/360° omnidirectional video.

The preliminary ‘Call for Evidence’ will be followed by a final ‘Call for Evidence’ on 7 April 2017. Responses to these calls will be evaluated by a meeting of JVET in Turin, Italy, 14-21 July 2017; [full text of press release](http://newslog.itu.int/archives/1487).

## 4.2 Intelligent, interoperable visual surveillance systems

**Approved Recommendation: see Appendix I.4.2.**

## 4.3 Smart television systems

*ITU continues to develop standards enabling IPTV services and terminals, detailed by the ITU-T H.700-series. Some of them – ITU-T H.721, H.761 and H.762 – are already employed by millions of users in Asia.*

**Approved Recommendation: see Appendix I.4.3.**

## 4.4 IPTV and digital signage

*A large push for standardized digital signage solutions came after the Great East Japan Earthquake and Tsunami in 2011, as standards-based digital signage systems can be a powerful vehicle for public announcements in the event of public emergencies.*

ITU-T's suite of IPTV standards includes standards such as ITU-T H.721 for IPTV set-top boxes, [ITU-T H.761](http://itu.int/ITU-T/H.761) for Ginga/NCL, and ITU-T H.762 for Lightweight Interactive Multimedia Environment (LIME) for IPTV services.

SG16 approved new Recommendation ITU-T H.763.2 "*Scalable vector graphics for IPTV services*"; in March 2017. A new Technical Paper HSTP.CONF-H702 was approved, which contains the conformance testing specification for ITU-T H.702. This document was refined at the **conformance testing** of a related product that took place during the SG16 meeting. In order to facilitate such future activities, SG16 agreed to establish an **IPTV Testing Team** composed of interested SG16 experts.

Proprietary digital-signage solutions are available, but there is agreement that globally defined solutions have the potential to lower the cost entry point through, for example, the federation of content and reaching wide audiences.

**Approved Recommendation: see Appendix I.4.4.**

## 4.5 ITU IPTV IPv6 global testbed

The ITU IPTV IPv6 global testbed ([I3GT](http://www.itu.int/en/ITU-T/C-I/interop/I3GT/Pages/default.aspx)), a project supported by the ITU secretariat, encourages the establishment of IPTV testbed sites implementing ITU-T’s IPTV Recommendations. These testbed sites are connected over IPv6 research networks and test various aspects of IPTV solutions built in conformance with ITU standards, including their interoperability, in different environments, countries or regions. The project is also aimed at training academia on the latest IPTV technologies, showcasing standardized IPTV to stakeholders, and promoting IPTV capability enhancement especially in developing countries. A number of testbeds have been established since 2012 at sites in countries including Japan, Switzerland, Singapore, Thailand, Philippines, Malaysia, South Africa and Rwanda. A project is ongoing with academia in Brazil, as well as accessibility contents are planned to be tested/showcased through I3GT.

## 4.6 New work on immersive live experience

ITU members have launched new standardization work on systems for Immersive Live Experience (ILE), which will bring the sensation of live events to remote audiences, replicating the experience of being present at the event venue. Work progressed for immersive live environments, in addition to a [mini-workshop](https://www.itu.int/en/ITU-T/studygroups/2017-2020/16/Pages/ws/201701_ILE.aspx) and three new work items were started within SG16 (planned completion in 2018) on H.ILE-SS "*ILE service scenarios*", H.ILE-Reqs "*ILE requirements*", and H.ILE-FW "*ILE architectural framework*".

## 4.7 New standards to assess quality of adaptive-bitrate video streaming

ITU members have completed a family of **video quality monitoring standards in the ITU-T P.1200 series** of Recommendations. Developed by Study Group 12 the ITU-T P.1203 series standards provide model algorithms to monitor the quality of video streaming over mobile devices as well as large screens with fixed-network connections. The standards are applicable to both progressive-download and adaptive-bitrate video streaming. **The ITU-T P.1203 suite for “Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport”** describes a set of objective parametric quality-assessment modules, which together form a complete model to predict the impacts on end-user experience resulting from audio and video encodings and observed IP network impairments. The standards provide models for short-term estimations of video and audio quality, as well as a final integration model to incorporate these short-term estimations into a long-term estimation of audiovisual quality. The standards describe different model realizations for different levels of content encryption and computational complexity. ITU-T P.1203 currently supports quality estimations for HD video encoded using ITU-T H.264. ITU-T Study Group 12 is extending the standards to provide support for ‘4K’ UHD video encoded using ITU-T H.264, ITU-T H.265 and VP9. [Full text of press release](http://newslog.itu.int/archives/1477).

Study Group 12 is now extending the standards to provide support for ‘4K’ UHD video encoded using ITU-T H.264, ITU-T H.265 and VP9.

**Approved Recommendations: see Appendix I.4.7.**

## 4.8 New services and applications

SG16 approved two new standards on virtual content delivery networks and on information centric networks.

**Approved Recommendations: see Appendix I.4.8.**

# 5 Hyperconnected smart world

## 5.1 Internet of Things and Smart City

*IoT technologies offer both developed and developing countries an opportunity to spur smart transformations of city infrastructure, benefiting from the efficiencies of intelligent buildings and transportation systems, and smart energy and water networks. ITU is well-positioned to assist government and industry in capitalizing on this opportunity.*

ITU put forward a vision of IoT in the landmark ["Internet of Things" report](http://www.itu.int/pub/S-POL-IR.IT-2005/e) published in 2005 as part of a series of ITU reports on the Internet, and has since built-up over ten years of experience in international standardization for IoT. This experience includes the activities undertaken by the [Internet of Things Global Standards Initiative (IoT-GSI)](http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx) as well as the Joint Coordination Activity on Internet of Things (JCA-IoT; renamed JCA-IoT and SC&C), which assisted in initiating active collaboration with relevant SDOs.

ITU-T continues to advance IoT standardization work in the fields of definition, overview, requirements, functional frameworks, architectures, identification, applications and services.

The **IoT and Smart Cities and Communities Standards Roadmap** documents complete as well as ongoing work on IoT and Smart Cities and Communities by ITU-T as well as a range of standards other standards bodies.This roadmap is maintained by 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).

The International Telecommunication Union (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. It will be a major conference on the Internet of Things (IoT) and will gather top experts, innovators and stakeholders in the Internet of Things. It is the place where emerging IoT technologies, strategies, and policies will be discussed and partnerships developed. The 2017 edition of IoT Week is growing in scope and will encompass IoT Emerging Technologies and Research; IoT and Sustainable Development, with the adoption of the “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).

[*ITU-T Study Group 20*](http://www.itu.int/en/ITU-T/about/groups/Pages/sg20.aspx) *develops 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.*

An [ITU Forum on Data Management: Transforming Data Into Value - Expanding the IoT Potential with a special focus on smart cities](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/iot/201703/Pages/default.aspx) took place on 12 March 2017 in Dubai, United Arab Emirates.

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. 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. [See full press release](http://www.itu.int/en/mediacentre/Pages/2017-PR13.aspx).

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: Mr Heung Youl Youm and Mr Nasser Al Marzouqi. A special session on collaboration between SG17 and SG20 on IoT security took place on 28 March 2017.

## Approved Recommendation: see Appendix I.5.1

## 5.2 Smart sustainable cities global initiative

*U4SSC is assisting the response to Goal 11 of the United Nations Sustainable Development Goals (SDGs): to “Make cities and human settlements inclusive, safe, resilient and sustainable”.*

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 (KPIs).

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 (see section 5.3).

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 Ms Gloria Placer Maruri, Chief of Cabinet, ‎Secretary of State for Information Society and Digital Agenda, Ministry for the Digital Agenda, Spain, and Mr 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). Mr Paolo Gemma, Senior Specialist at Huawei, and Ms Victoria Sukenik, Chairman of ITU-T Study Group 5 (Environment, Climate Change and Circular Economy) have taken up the role of U4SSC Vice-Chairman. [Full text of 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.

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.

ITU is organizing jointly with IEC and ISO the World Smart City Forum in Barcelona, November 2017.

## 5.3 Cities trialling ITU key performance indicators for smart sustainable cities

Dubai and Singapore were the world's first cities to join a two-year pilot project to implement ITU-standardized KPIs for smart sustainable cities. This pilot project is assisting ITU in ensuring that any future refinement of these indicators is undertaken on the basis of cities' experiences with their implementation.

In December 2016, ITU published the case study [“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.

**Approved Recommendation: see Appendix I.5.3.**

## 5.4 Methodologies to assess the environmental impact of ICTs

***ITU-T has developed standardized methodologies to assess the environmental impacts of ICTs****, both in terms of ICT greenhouse gas (GHG) emissions and the emissions savings created through green ICT applications in other industry sectors.*

*These methodologies were developed in cooperation with over 60 organizations including major ICT private sector organizations, the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environmental Programme (UNEP) and the European Telecommunications Standards Institute (ETSI).*

## 5.5 Connected vehicles, automated driving and intelligent transport systems

A [workshop](http://www.tiaonline.org/events/tia-vehicle-connectivity-workshop) organized by TIA in partnership with ITU in Detroit, USA, 29 November 2016, brought together key players in vehicle connectivity to discuss their plans to improve road safety, decrease emissions and exploit new data-driven revenue opportunities. Thought leaders of the ICT and automotive sectors shared insight into the transformation of the transport ecosystem and its contribution to the development of smart sustainable cities. The workshop focused on advances in vehicle connectivity, impending regulatory decisions, emerging technologies, consumer trends and standardization strategies. The workshop showcased new facilities providing testbeds for innovations in the field of connected, automated driving. The workshop was be followed by a meeting of the [Collaboration on ITS Communication Standards](http://www.itu.int/en/ITU-T/extcoop/cits/Pages/default.aspx), the body responsible for the coordination technical standardization work to encourage the offer of interoperable ITS products. [Full text of press release](http://newslog.itu.int/archives/1429).

The [Symposium on the Future Networked Car](http://www.itu.int/en/fnc/2017/Pages/default.aspx) within the [87th Geneva International Motor Show](http://www.salon-auto.ch/en/), 9 March 2017, brought together the automotive and ICT industries to explore advances in the field of connected, automated vehicles and the associated implications for business, technology and regulation. The Symposium was convened by ITU and UNECE.

Technical sessions highlighted the crucial roles of connectivity, information security and privacy, artificial intelligence and machine learning in transforming vehicles transportation. The symposium also discussed how standards bodies can best meet industry needs.

[*The Collaboration on ITS Communication Standards (CITS)*](http://www.itu.int/en/ITU-T/extcoop/cits/Pages/default.aspx) *provides a globally recognized forum for the creation of an internationally accepted, globally harmonized set of ITS communication standards of the highest quality in the most expeditious manner possible to enable the rapid deployment of fully interoperable ITS communication-related products and services in the global marketplace.*

The Symposium was followed by a meeting of the [Collaboration on ITS Communication Standards](http://www.itu.int/en/ITU-T/extcoop/cits/Pages/default.aspx) at ITU Headquarters, 10 March 2017, an open international platform to advance the development of a globally harmonized set of ITS communication standards. From 13-14 March 2017, ITU hosted a meeting of the **UNECE Task Force on cybersecurity and over-the-air issues** (CS/OTA). This is a subgroup of the Informal Working Group on Intelligent Transport Systems / Automated Driving of UNECE WP.29. The draft ToR of this group is available [here](https://www2.unece.org/wiki/download/attachments/42041360/TFCS-02-02e-Rev1e%20ToR%20updated%20clean.pdf?api=v2).

Much of the ITS work is coordinated and channeled through CITS, which also serves as ITU's interface to the UNECE World Forum for Harmonization of Vehicle Regulations (WP.29) and its informal working groups (e.g., ITS/Automated Driving; Accident Emergency Call System). The role played by CITS is to bring activities to ITU and support ITU initiatives. CITS is not a standardization working group, but rather a mechanism to coordinate the work of standardization working groups.

**Cooperation with the UNECE Transport Division** has made good progress. WP.29 now looks to ITU to provide communications standards in support of vehicle regulations. The standards will be performance standards. For example, new global regulation on vehicle emergency calls (Automatic Emergency Call Systems (AECS)) is nearing approval and is expected to reference an ITU-T voice-quality performance standard (ITU-T P.1140).

An ITU workshop on ITS security is planned on Monday 28 August 2017, Geneva, Switzerland.

**Approved Recommendations: see Appendix I.5.5.**

**Related new / revised ITU-T standards:**

In its meeting in January 2017, Study Group 12 updated its standards on hands-free communication in motor vehicles (P.1100, P.1110) and emergency calls originating from vehicles (P.1140), and consented a new Recommendation Super-wideband (SWB) and fullband (FB) hands-free communication in motor vehicles (P.1120).

Also in January 2017, Study Group 16 consented a new Recommendation on Service requirements for vehicle gateway platforms (F.749.2). This Recommendation specifies functional requirements for vehicle gateway platform, including description, communication requirements and service requirements. A Vehicle Gateway Platform (VGP) is the collection of ICT hardware and software in a vehicle operating as an open platform to provide an integrated runtime environment for delivering the communications services of a Vehicle Gateway (VG). Some use cases are included in the Appendix I to ITU-T F.749.2.

**Related ongoing ITU-T work:**

**ITS security:** ITU members are making progress in their development of new ITU standards for the security of remote software updates for connected vehicles (approved Rec. ITU-T X.1373) and security guidelines for V2X communication systems (X.itssec-2).

**Taxonomy for ICT-enabled motor vehicle automated driving systems:** An overview/review of documents that describe levels of automation with respect to motor vehicles and driving (see work item [F.AUTO-TAX](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=10436) in Q27/16).

The next CITS activities are planned for July 2017 (Asia) and fall 2017 (North America).

## 5.6 Connected health: e-Health

SG16 developed updates to the personal connected health specifications in the ITU-T H.810-H.850 series of Recommendations, where two new and 39 revised conformance testing specifications were consented (expected approval in June 2017) for the third edition of the Continua Design Guidelines (CGD) in the ITU-T H.810 series. With this updates, developers will be able to check compliance of their implementations of H.810 devices and systems to the latest version of the CDG.

A revision was completed of the Technical Paper HSTP.H810-XCHF that explains fundamentals of data exchange within ITU-T H.810 Continua Design Guideline architecture. The revised paper is now aligned with the 3rd edition of ITU-T H.810.

SG16 experts agreed to start two new work items for developing a framework for telemedicine systems using ultra-high definition imaging, and for developing an issues list for enhancing availability of e-health services and applications in developing countries.

In cooperation with the Personal Connected Health Alliance (formerly Continua Health Alliance), a list of devices previously tested according to these new Recommendations were included in ITU's ["ICT product conformity database"](http://www.itu.int/net/itu-t/cdb/ConformityDB.aspx) at its launch. See section 10.2.1.

## 5.7 Artificial Intelligence

ITU and XPIZE Foundation are hosting an event on “[AI for Good Global Summit](http://www.itu.int/en/ITU-T/AI/Pages/201706-default.aspx)” is planned 7-9 June 2017, Geneva, Switzerland. The Summit aims to accelerate and advance the development and democratization of AI solutions that can address specific global challenges related to poverty, hunger, health, education, the environment, and others. The Summit provides a neutral platform for government officials, UN agencies, NGO's, industry leaders, and AI experts to discuss the ethical implications of AI systems and ultimately publish the first UN-backed "AI Guiding Principles" to provide guidelines on ethical, technical, standardization, societal and policy issues related to AI and promote international dialogue and cooperation in support of AI innovation.

# 6 Security and trust

*ITU work to build confidence and security in the use of information and communication technologies (ICTs) continues to intensify in a bid to facilitate more secure network infrastructure, services and applications.*

ITU security standardization work focuses on topics including:

* Cybersecurity
* Security management
* Security architectures and frameworks
* Countering spam
* Identity Management
* Protection of Personally Identifiable Information

This work also includes the development of standards for the security of applications and services for IoT, smart grid, smartphones, web services, social networks, cloud computing, mobile financial systems, IPTV, telebiometrics and more.

An [ITU Workshop on Security Aspects of Blockchain](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/201703/Pages/default.aspx) in Geneva, 21 March 2017, examined blockchain’s potential to build trust into a wider variety of our interactions online. Technical sessions assessed the status of blockchain technology and its application, focusing on blockchain use-cases supporting security, privacy and trust. The workshop explored the surrounding policy and regulatory environment.

An expert roundtable brought together representatives of industry associations and standards bodies to identify where ITU-T SG17 could contribute to further standards collaboration in support of blockchain. (see [Full text of press release](http://newslog.itu.int/archives/1489))

## 6.2 New security standards

**Approved Recommendations: see Appendix I.6.2.**

## 6.3 Trust

The first two ITU-T Recommendations on trust were approved in March 2017. Those are Recommendations ITU-T Y.3051 and Y.3052 dealing respectively with the basic principles of what trusted environment in ICT infrastructure is and overview of trust provisioning in ICT.

# 7 Environment and emergency communications

## 7.1 Green ICT standards

ITU has approved a new environmentally friendly standard officially known as Recommendation **ITU-T L.1002 "External universal power adapter solutions for portable ICT devices"** for a universal charger for laptops and other portable devices. The new standard provides for improved energy efficiency and reduced greenhouse gas emissions and is expected to lead to significant reductions in e-waste.

One million tons of external power supplies are manufactured each year. ITU-T L.1002 specifies principles for the eco-design of laptop chargers to reduce no-load power consumption five times lower than the norm. When multiplied by the millions of such chargers in use this will greatly reduce the greenhouse gas emissions produced by these devices; usage of the ITU-T L.1000 series of standards will contribute to the achievement of the targets set out by [Goal 12 of the UN Sustainable Development Goals](http://www.itu.int/en/sustainable-world/Pages/goal12.aspx) to ensure sustainable production and consumption patterns; and will assist in meeting the e-waste target of the [Connect 2020 Agenda](http://www.itu.int/en/connect2020/Pages/default.aspx) to reduce the volume of redundant e-waste by 50 per cent by 2020. The applicability of the charger to multiple devices, as well as design principles for the efficient use of raw materials, will greatly increase their lifetime and reduce the e-waste resulting from their disposal. Study Group5 developed Rec. ITU-T L.1002 in the context of WTSA Resolution 79 to pursue international standards, methodologies and other publications relevant to the reduction and responsible management of e-waste. [Full text of press release](http://newslog.itu.int/archives/1418).

**Approved Recommendations: see Appendix I.7.1.**

## 7.2 Electromagnetic fields

***ITU standards to assist in the responsible management of electromagnetic fields (EMF)*** *include measuring techniques, procedures and numerical models for evaluating the electromagnetic fields stemming from telecommunication systems and radio terminals.*

**Approved Recommendations: see Appendix I.7.2.**

## 7.3 SMART\* submarine cables systems

*Continents are connected by information superhighways of fibre-optic submarine cables that span our oceans to provide the backbone of the global telecommunications system. The first submarine communication cable was deployed across the English Channel in 1850, and since, more than a million kilometres of cable have been laid on the ocean floor, covering a significant portion of the globe.*

The [ITU/WMO/UNESCO-IOC Joint Task Force on SMART[[1]](#footnote-1) Cable Systems](http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx) is leading an ambitious new project to equip submarine communications cables with climate and hazard-monitoring sensors to create a global observation network capable of providing earthquake and tsunami warnings as well as data on ocean climate change and circulation. These new ''SMART (green) cables' would collect data of great value to the scientific community, as well industries such as fisheries and energy.

The JTF is developing a pilot project (a so-called 'wet demonstrator') with the active participation of cable suppliers, owners and researchers from existing ocean observatories. Experts have deemed the project to be technically feasible with the JTF members now working to solve business, legal and economic challenges. In order to identify qualified candidates to provide materials and services needed to realize the Wet Demonstrator project, an RFI (request for information) was sent to various organizations at the end of 2016. Several positive responses were received and they are now under study. Information on this Task Force including publications and workshop information is available at its web page at <http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx> .

Find the JTF's annual reports and other studies on the group's homepage.

## 7.4 Emergency communications & disaster relief

**Approved Recommendation: see Appendix I.7.4.**

## 7.5 Symposia on ICT, Environment and Climate Change

ITU Symposia on ICT, Environment and Climate Change raise awareness of the potential of ICTs to address environmental challenges, encouraging decision-makers to integrate ICTs into their efforts to create smart, sustainable economies and societies.

## 7.6 Green Standards Week

[ITU Green Standards Week](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/Pages/default.aspx) is a global platform for discussion and knowledge-sharing on means of capitalizing on ICTs and supporting technical standards in building smart sustainable cities and ensure a sustainable future. The [Seventh Green Standards Week](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201704/Pages/default.aspx) (GSW-17) will be held from 3 to 5 April 2017 in Manizales, Colombia, and will be kindly hosted by the Ministry of Information Technologies and Communications and the Municipality of Manizales, Colombia; organized by 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). This year, the Green Standards Week is dedicated to the theme of “Circular Economy and Smart Sustainable Cities” and will explore the policies, standards and best practices required to transition to resource-efficient Circular Economy and Smart Sustainable Cities. The event will also the launch of the first series of case studies and research papers developed under the auspices of the United for Smart Sustainable Cities (U4SSC) initiative.

***The 21st century is playing host to an increasing prevalence of extreme weather events.*** *ITU standards include technical mechanisms to ensure the prioritization of emergency calls, and ITU members continue to develop new standards to improve the resilience of ICT networks to natural disasters and to assist the recovery of communications capabilities when disaster strikes.*

Accompanying sessions will explore contemporary challenges to city governance and the wellbeing of city inhabitants, examining the role to be played by Smart Sustainable Cities in the pursuit of the United Nations’ [New Urban Agenda](http://www.un.org/sustainabledevelopment/blog/2016/10/newurbanagenda/) and [Sustainable Development Goals](http://www.itu.int/en/sustainable-world/Pages/default.aspx).

Latin-American cities will share insight into their smart-city projects, identifying successes able to be replicated across the region. Emphasis will be afforded to the importance of standardized metrics in gauging the success of smart-city projects.

Discussions focused on the Internet of Things (IoT), machine-to-machine (M2M) communications and artificial intelligence will look at the technical foundations of Smart Sustainable Cities, highlighting the value of standards in supporting the interoperability of city systems. Data management will form a key part of the discussions, particularly as it relates to security, privacy and trust. ([Full text of press release](http://newslog.itu.int/archives/1493http:/newslog.itu.int/archives/1402)).

# 8 Tariff and accounting principles and international telecommunication/ICT economic and policy issues

## 8.1 IXP, Universal service, NGN, Mobile Roaming and SMP

Study Group 3 determined, at its 2016 meeting, the four new Recommendations and revised an existing Recommendation, those Recommendations were approved by WTSA-16:

**Approved Recommendations: see Appendix I.8.1.**

*ITU’s technical standardization work is predominantly industry-driven, with business requirements forming the main fuel to standardization. ITU-T Study Group 3 is taking action in response to the perception among ITU members that* **the *alignment of technology, business and policy*** *will see* ***significant improvement*** *if technical standardization grants* ***equal weight*** *to* ***technical innovation, business needs and policy requirements.***

## 8.2 Strengthening the ties between the progress of technology and policy

The international community is looking to ITU’s unique public-private partnership of members for a neutral platform to strengthen the ties between technical innovation, business needs and economic and policy requirements.

ITU has intensified its efforts to ensure congruent technical innovation and policy development, addressing concerns that technology too often races ahead of policy, with the result that governance frameworks fall out of step with market realities. Challenges to fair market competition may arise as a result, and legislation may no longer afford adequate protection to consumers.

Growing interest among ITU members in building greater cohesion in the progression of technology and policy is very evident in the work of ITU-T Study Group 3. [Full text of press release](http://www.itu.int/net/pressoffice/press_releases/2016/09.aspx#.WKr4edIrL0M).

# 9 Quality of service and experience

**Approved Recommendations: see Appendix I.9.**

# 10 Conformity, interoperability and testing

***The ITU conformity and interoperability (C&I) programme is of particular value to developing countries*** *in their efforts to increase conformance with ITU standards and benefit from the improved interoperability that results from this conformance.*

The [ITU Conformity and Interoperability (C&I) programme](http://www.itu.int/en/ITU-T/C-I/Pages/default.aspx) entered the 2013-2016 study period with a strengthened mandate resulting from WTSA-16's revision of [Resolution 76](http://www.itu.int/en/ITU-T/wtsa12/Documents/resolutions/Resolution%2076.pdf) ("Studies related to conformance and interoperability testing, assistance to developing countries, and a possible future ITU Mark programme").

ITU-T Study Group 11 (SG11) supports the coordination of ITU's C&I activities while also acting as the first point of contact for organizations interested in contributing to this work.

ITU-T SG11 maintains a list of key technologies within its mandate which the ITU-T Study Groups consider suitable for C&I testing. This remains a living list and forms input to the first pillar of the four-pillar C&I programme which delineates C&I work into four separate but interdependent categories:

1. Conformity assessment
2. Interoperability events
3. Human resource capacity building
4. Assistance in the establishment of test centres and C&I programmes in developing countries

Actions 1 and 2 are led by the Telecommunication Standardization Bureau (TSB), actions 3 and 4 by the Telecommunication Development Bureau (BDT).

The SG11 regional workshop for Africa on “[Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/20170405/Pages/default.aspx)” in planned for 5 April 2017 in Cairo, Egypt.

**Approved Recommendations: see Appendix I.10.**

## 10.1 Conformance Assessment Steering Committee (CASC)

The main objective of ITU-T CASC is to set up criteria, rules and procedures to recognize Test Laboratories (TL) with competence in ITU-T Recommendation(s) and register these TLs in the ITU recognized TL list. This effort is supported by a guideline "Testing laboratories recognition procedure" agreed by ITU-T SG11 in 2015. According to requests received from ITU members and ITU-T Study Groups, ITU-T CASC established a list of ITU-T Recommendations (e.g., ITU-T P.1140, ITU-T P.1100 and P.1110, and ITU-T K.116) which may become subjects of the future joint certification schemes.

In February 2017, ITU-T SG11 approved a new guideline *“ITU-T CASC procedure to appoint ITU-T technical experts”*.

ITU-T CASC continues to collaborate with existing Conformity Assessment Systems and Schemes such as IEC and ILAC. In 2016, the Certification Management Committee (CMC) of IEC set up a [Task Force “ITU requirements”](http://www.iecee.org/dyn/www/f?p=106:46:11161765169405::::FSP_ORG_ID:19407).

In addition, IECEE informed the ITU-T CASC about the received responses on IECEE inquiry on ITU Recommendations to be used for certification. Among IECEE members which provided feedback are: Italy, Slovenia, Switzerland and Viet Nam. ITU-T CASC noted that there is market need for conformance testing against ITU-T Recommendations.

ITU-T CASC is currently developing guidelines to detail collaboration mechanisms with accreditation bodies such as IECEE and ILAC. More details are available on the ITU-T CASC [web page](https://www.itu.int/en/ITU-T/studygroups/2013-2016/11/Pages/CASC.aspx).

## 10.2 ICT Product Conformity Database

In December 2014, ITU launched the ["ICT product conformity database"](http://www.itu.int/net/itu-t/cdb/ConformityDB.aspx) to provide industry with a means to publicize the conformance of ICT products and services with ITU-T Recommendations. The database assists users in their efforts to select standards-compliant products.

Currently, the C&I database contains more than 500 entries which include E-health devices, mobile phones and Ethernet services.

### 10.2.1 e-Health solutions

Information was provided on 95 e-health products for inclusion in the database at its launch. The e-health devices populating the database were tested for compliance with the specifications of the [ITU-T H.810 "Interoperability design guidelines for personal health systems"](http://eu.vocuspr.com/Tracking.aspx?Data=HHL%3d%3d%2f41A%26JDG%3c%3d2%3f27%2f.LP%3f%40185%3e&RE=IN&RI=740110&Preview=False&DistributionActionID=26956&Action=Follow+Link) sub-series, which are a transposition of the Continua Design Guidelines as international standards. The testing procedures are specified in the ITU-T H.820-H.850 sub-series of Recommendations.

### 10.2.2 Mobile phones compatible with Bluetooth-enabled vehicle hands-free terminals

The database includes mobile phones found to be compatible with Bluetooth-enabled vehicle hands-free terminals, compatibility determined in accordance with the 'Chapter 12 tests' ("Verification of the transmission performance of short-range wireless (SRW) transmission enabled phones") of ITU‑T P.1100 and ITU-T P.1110. The best hands-free performers are also highlighted in the “[whitelist](https://www.itu.int/en/ITU-T/C-I/Pages/HFT-mobile-tests/HFT_testing.aspx)”.

Feedback on this topic from a company participating in the [third test event](http://www.itu.int/go/hft-test-event-3) can be found in [SG12-C.54](https://www.itu.int/md/T17-SG12-C-0054/en). This input led to discussions at the SG12 meeting about the usage of the words “shall” and “should” in requirements of Recommendations, and actions required to overcome the problem of interpreting, which tests are mandatory and which tests are optional. Please see the corresponding liaison statement from SG12 in [TSAG TD 109](https://www.itu.int/md/T17-TSAG-170501-TD-GEN-0019/en) for more information.

In addition, following the results of three test events, ITU-TSB is organizing a roundtable on 10 March 2017 ([web page](https://www.itu.int/en/ITU-T/C-I/Pages/HFT-mobile-tests/roundtable_march17.aspx)) which aim is to discuss possible approaches to address such issues, including the feasibility of establishing a special logo which may appear on the display of a hands-free terminal in a car when a ‘whitelisted’ phone connects to it.

### 10.2.3 Ethernet services

Products found to comply with ITU-T G.8011/Y.1307 "Ethernet Services Characteristics" have also been added to the database. This standard as well as the corresponding tests are based on the work of MEF (formerly called Metro Ethernet Forum).

## 10.3 SIP-IMS conformity assessment

ITU-T SG11 finalized the first set of Recommendations (58) which specify requirements and relevant test specifications for basic call and some supplementary services for SIP-IMS. More details are available on [SIP-IMS web page](https://www.itu.int/en/ITU-T/C-I/Pages/SIP/IMS.aspx).

ITU-T is inviting fixed network operators to establish an alliance to promote these basic requirements for IMS-based equipment. A plan to develop a list of terminal equipment compliant with the ITU-T Recommendations is also under discussion.

## 10.4 Internet-related performance measurements

In 2016, ITU-T SG11 approved a new Recommendation ITU-T Q.3960 *“Framework of Internet related performance measurements”* which is the first of a series of ITU-T Recommendations on Internet measurements. This Recommendation describes the framework for Internet related performance measurements which can be established at the national or international level, providing customers of the existing public telecommunication operator's networks the possibility to measure the customer's connection to the Internet.

ITU-T SG11 jointly with ETSI TC INT is developing draft Recommendation ITU-T Q.3961 *“Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operator's networks”* and encourages all interested parties and SDOs to join this activity.

**Approved Recommendation: see Appendix I.10.4.**

## 10.5 IPTV testing events

A series of ITU test events on IPTV has been organized to offer a continuous platform to test products based on both existing and developing ITU-T IPTV standards, to meet rapidly growing market needs and to improve the ITU-T standards and test specifications on IPTV. Based on these testing experiences, IPTV manufacturers showed interest in conducting conformance testing of their products to submit entries to populate the ITU Product Conformity Database, after successfully passing the relevant tests. To meet this market demands, ITU-T SG16 started a new pilot project of conformity assessment against Recommendation ITU-T H.700 series, as listed on the relevant [webpage](http://www.itu.int/go/pilot-projects) on the C&I portal and established an ITU IPTV testing team. The team and Keio University conducted conformance testing on ITU-T H.721 using [HSTP-CONF H721 – Conformance testing specification for ITU-T H.721](http://www.itu.int/pub/T-TUT-IPTV-2015-H721) (2015) on 17 January 2017, Geneva during the ITU-T SG16 meeting, and the required tests were successfully conducted. The next IPTV test event is planned to be held during next Q13/16 Rapporteur meeting in Geneva.

## 10.6 ITU-T studies on interconnection/interoperability of VoLTE/ViLTE services

*The span of ITU-T work on VoLTE/ViLTE includes the deployment of signalling protocols for VoLTE interconnection, relevant numbering issues, quality of service (QoS) considerations, and emergency calls on VoLTE-based networks.*

2016 kicked-off with a new, high-priority ITU-T standards initiative to broker the international agreement of a framework for the interconnection of Voice and Video over LTE (VoLTE/ViLTE)-based networks. ITU-T SG11 achieved a progress on a work item Q.30xx\_VoLTE\_Interconnection "Framework of interconnection of VoLTE/ViLTE-based networks" which started following the discussion at the [ITU Workshop](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/conformity-interoperability/20150112/Pages/default.aspx) on "Voice and Video Services Interoperability Over Fixed-Mobile Hybrid Environments, Including IMT-Advanced (LTE)" on 1 December 2015. The framework will assist in expanding industry's offer of VoLTE/ViLTE 'roaming', where interactions between subscribers of different networks will be supported by seamless packet-based, high-quality voice and video communications.

In February 2017, ITU-T SG11 started two new work items on VoLTE, as follows:

* Q.suppl.VoLTE\_ETS\_Interconnection *“Signalling requirements for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS)”*;
* Q.VoLTE\_INT\_TEST *“VoLTE/ViLTE interconnection testing for interworking and roaming scenarios including relevant QoS/QoE testing”*.

The initiative is being undertaken in close cooperation with other standards bodies, building on existing standards and answering to industry's need for a unified international reference for VoLTE/ViLTE interconnection.

ITU-T G.1028, a new ITU standard approved in 2016, highlights the key factors influencing end-to-end QoS for voice communications over 4G mobile networks. The standard will form the basis of future ITU standards on specific aspects of QoS for VoLTE and ViLTE. More information can be found [here](http://newslog.itu.int/archives/1475).

# 11 Mainstreaming accessibility in ICTs

***ITU-T is a strong advocate of “Universal Design”*** *and has developed standardization guidelines to produce solutions that are inherently accessible to persons with and without disabilities.*

SG16 approved new Recommendation ITU-T F.921 “Audio-based network navigation system for persons with vision impairment” that specifies key elements of audio-based network navigation systems for persons with vision impairments. Work started to revise ITU-T F.791 with accessibility terms and definitions.

**Approved Recommendation: see Appendix I.11.**

## 11.1 Accessible ITU-T meetings

ITU-T provides services such as sign-language interpretation and captioning, and financial support in some cases, to engage persons with disabilities in the ITU-T standardization process.

## 11.2 Work on Accessibility and Human Factors

Work on human factors is now reinforced within SG16 after its move from SG2. [ITU-T Q24/16](http://www.itu.int/en/ITU-T/studygroups/2017-2020/16/Pages/q24.aspx) (Human factors related issues for improvement of the quality of life through international telecommunications) (Continuation of ITU-T Q4/2) and [ITU-T Q26/16](http://www.itu.int/en/ITU-T/studygroups/2017-2020/16/Pages/q26.aspx) (Accessibility to multimedia systems and services) progressed their work on Accessibility and Human factors related issues for improvement of the quality of life through international telecommunications.

## 11.3 Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)

The [Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)](http://www.itu.int/en/ITU-T/jca/ahf/Pages/default.aspx) is mandated to reinforce cooperation within ITU, other UN agencies and activities, ISO, IEC, regional and national SDOs, industry groups, academia, disability organizations and telecommunication user groups for persons with disabilities, with the aim of increasing standardization experts' awareness of the importance of accessibility to ICTs and the need to mainstream the consideration of accessibility in international standardization efforts.

JCA-AHF meetings take place at least twice a year with accessibility experts including persons with disabilities, each with TSB-provided teleconference facilities, a tool for remote sharing of documents (Adobe Connect), sign-language interpretation and real-time captioning on request.

# 12 Intellectual property rights

## 12.1 TSB Director's Ad Hoc Group on Intellectual Property Rights

The [TSB Director’s Ad Hoc Group on Intellectual Property Rights (IPR AHG)](http://www.itu.int/en/ITU-T/ipr/Pages/adhoc.aspx) continues its work to protect the integrity of the standards-development process by clarifying aspects of the [ITU-R/ITU-T/ISO/IEC Patent Policy and related Guidelines](http://www.itu.int/en/ITU-T/ipr/Pages/revpatent.aspx) – the Union's main tool to manage the challenges associated with the incorporation of patents in [ITU-T and ITU-R Recommendations](http://www.itu.int/en/ITU-T/publications/Pages/recs.aspx).

# 13 Combating counterfeit ICT devices

TSB in collaboration with BDT conducted a study in Africa in accordance with the outcome of the results of the ITU-T SG11 meeting (22-29 April 2015) where it was recognized that counterfeit and substandard ICT devices pose a lot of challenges in developing countries, particularly the Africa region. The Survey report on counterfeit ICT devices in Africa region was approved by ITU-T SG11 in February 2017.

In addition, ITU-T SG11 started a new work item ITU-T Q.FW\_CSM *"Framework for combating the use of Stolen Mobile ICT Devices"* and achieved a progress on two technical reports:

* Q.FW\_CCF “Framework for solution to combat counterfeit ICT Devices”;
* TR-CF\_BP *“Technical Report - Guidelines on Best Practice and Solutions for Combating Counterfeit ICT”.*

In February 2017, ITU-T SG11 decided to create the plans for implementation of Resolution 96 *“ITU Telecommunication Standardization Sector studies for combating counterfeit telecommunication/information and communication technology devices”* and Resolution 97 *“Combating mobile telecommunication device theft”* of WTSA-16.

# 14 ITU-T Focus Groups: Exploring new directions in ITU standardization

Focus Groups are formed in response to immediate ICT standardization demands, tasked with establishing the basis for subsequent standardization work in ITU-T Study Groups. These groups are the place to explore new directions in ITU standardization.

Focus Groups are open to ITU members as well as organizations outside ITU's membership, and these groups are afforded great flexibility in their chosen deliverables and working methods.

## 14.1 Network aspects of IMT-2020

See section 3.2.

## 14.2 Digital Financial Services

After two years of extensive consultation, the [ITU Focus Group Digital Financial Services](http://www.itu.int/en/ITU-T/focusgroups/dfs/Pages/default.aspx) (FG DFS) has concluded its work with the publication of 85 policy recommendations and 28 supporting thematic reports. The Focus Group brought together more than 60 organizations from over 30 countries to drive greater financial inclusion for the estimated 2 billion people around the world who remain unbanked.

FG DFS has delivered 28 [thematic reports](http://www.itu.int/en/ITU-T/focusgroups/dfs/Pages/deliverables.aspx) in the areas of DFS Ecosystem, Interoperability, Consumer Protection and Technology, Innovation and Competition. The 85 policy recommendations offer guidance in areas such as digital liquidity, consumer protection to enhance DFS usage, data privacy, digital identity and e-KYC (Know Your Customer), as well as interoperability and fair access to the communication channel. Full details on the recommendations can be found [here.](http://www.itu.int/en/ITU-T/focusgroups/dfs/Documents/201703/ITU_FGDFS_Main-Recommendations.pdf)

On 13 December 2016 ITU hosted a seminar in London where the overall findings and key next steps were discussed towards implementation. [Full text of press release](http://newslog.itu.int/archives/1498).

A Workshop on [Digital Financial Services and Financial Inclusion](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/ifds/Pages/201704.aspx) is planned to be held on 19 April 2017 to disseminate the main findings of the focus group to DFS stakeholders and to provide more information on the work to be undertaken as a follow up to the Focus Group activities.

## 14.3 New Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities

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. 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. [See full press release](http://www.itu.int/en/mediacentre/Pages/2017-PR13.aspx).

# 15 ITU-T Technology Watch reports

[Technology Watch](http://www.itu.int/en/ITU-T/techwatch/Pages/default.aspx) explores emerging ICT trends and associated demands on international standardization, determining how these trends can be supported by the ITU-T work programme. These reports are intended to provide an up-to-date assessment of new technologies in language that is accessible to non-specialists. Technology Watch has been successful in assessing the impact of new technologies both on developed and developing countries, as well in analyzing related implications for international standardization activities.

2015 hosted a change to the target audience, content and format of Technology Watch reports. Whereas in previous years the target audience was the ICT-savvy but non-expert reader and reports were written or co-written in part by TSB staff, reports issued since 2015 have been written by experts in specific fields in a format more relevant to the work of experts participating in ITU-T Study Groups or Focus Groups.

WTSA-16 reaffirmed Resolution 66 for the TSB Director to continue the Technology Watch Function in TSB.

# 16 Collaboration in standardization

## 16.1 Coordination and cooperation among ITU Sectors

Collaboration with ITU-R and with ITU-D is a standing agenda point of TSAG, where TSAG examines existing methods and approaches to collaboration and/or cooperation with other sectors, with the view to encouraging ITU-T to work more collaboratively and/or cooperatively in a reciprocal manner, and review is performed on a regular basis based on information received. TSAG, established and maintains a close relationship with the RAG and TDAG in order to develop synergies with the objective of strengthening coordination and cooperation among the three ITU Sectors on matters of mutual interest. Three intersector rapporteur groups (IRGs) were created to work on items of interests to various ITU-T and ITU-R study groups.

* IRG-AVA: Intersector Rapporteur Group Audiovisual Media Accessibility, amongst ITU-T SG9, ITU-T SG16 and ITU-R SG6
* IRG-AVQA: Intersector Rapporteur Group Audiovisual Quality Assessment, amongst ITU-T SG9, ITU-T SG12 and ITU-R SG6
* IRG-IBB: Intersector Rapporteur Group Integrated Broadcast-Broadband, between ITU-T SG9, ITU-T SG16 and ITU-R WP 6B.

The inter-Sector coordination team (ISCT) on issues of mutual interest is composed by representatives of all three advisory groups, and works to identify subjects common to the tree Sector. It also seeks to identify the necessary mechanisms to strengthen the cooperation and joint activity among the three Sectors, with particular emphasis on the interests of developing countries. In addition, the ITU Inter-Sectoral Coordination Task Force (ISC-TF) is coordinating activities among the tree Bureaux.

## 16.2 Chief Technology Officer group meeting

[Chief Technology Officer (CTO) group meetings](http://www.itu.int/en/ITU-T/tsbdir/cto/Pages/default.aspx) bring together industry executives to highlight their business priorities and supporting standardization strategies.

A CTO group meeting of 24 ICT industry executives and the strategic management of the ITU Telecommunication Standardization Sector (ITU-T) took place in in Hammamet, Tunisia, 23 October, hosted by Tunisie Télécom. ICT industry executives have highlighted the importance of innovation capitalizing on VoLTE and other unique opportunities presented to network operators by advanced packet-based communications. Leaders agree that Gigabit-speed broadband access and data security will form key priorities to industry in coming years. These executives have also reaffirmed their request for regulation to provide a level playing field for competition between telecoms and OTT players in fields where they provide equivalent services. The meeting’s full set of conclusions were issued as a [communiqué](http://www.itu.int/md/T13-WTSA.16-INF-0009/en). [Full text of press release](http://newslog.itu.int/archives/1402).

Another CTO group meeting was held 13 November 2016 at the outset of ITU Telecom World 2016 in Bangkok, Thailand. The results of the ITU World Telecommunication Standardization Assembly 2016 (WTSA-16) and standards for future smart 5G systems were the key topics discussed at a meeting of 14 high-level ICT industry executives (CTOs) with the senior management of the ITU Telecommunication Standardization Sector (ITU-T) and the ITU Radiocommunication Sector (ITU-R). The meeting gave CTOs the opportunity to learn more about the key outcomes of WTSA-16, among which revised Resolution 68 calls on the ITU secretariat to continue organizing CTO meetings to assist in identifying and coordinating standardization priorities and subjects.

CTOs present in Bangkok also reviewed the results of a pre-WTSA ‘CxO meeting’ of high-level industry executives representing leading ICT companies, with the Arab and African regions especially well-represented. This meeting discussed strategies to accelerate the deployment of gigabit-speed broadband access networks and the new industry dynamics introduced by the rise of over-the-top (OTT) services. [Full text of press release](https://www.itu.int/en/ITU-T/tsbdir/cto/Documents/161123/Communique%20-%20CTO%20meeting%20Bangkok%20-%20final.pdf).

Eight high-level industry executives and the strategic management of ITU’s standardization arm, ITU-T, met for the first North-American CTO consultation meeting in San Jose, CA, US, 30 March 2017. The meeting issued a [communiqué](http://www.itu.int/en/ITU-T/tsbdir/cto/Documents/170330/communique-170330.pdf) outlining emerging trends in 5G innovation and associated demands on ITU-T standardization. Chief Technology Officers (CTOs) of leading ICT companies in North America have reaffirmed that fixed-mobile convergence will be fundamental to the success of 5G systems.

CTOs have also highlighted the great promise of information-centric networking to assist dynamic, performance-oriented management of ICT service quality, in addition acknowledging that high-performance 5G signal processing will demand significant innovation in chip architectures. CTOs also agree that identification, and associated protections of security and privacy, will be essential to the success of 5G use cases of the Internet of Things.

Achieving the full potential of 5G systems will demand true fixed-mobile convergence, ensuring that the wired and wireless elements of 5G networks operate in unison. CTOs emphasized that seamless 5G service operation will call for ITU-T standardization to support the emergence of a unified, access-independent framework for network management.

CTOs encouraged ITU to accelerate its standardization work on information-centric networking (ICN), acknowledging the great potential of ICN to assist in optimizing content distribution. ITU-T was urged to address the scalability, mobility and security of ICN solutions as well as to monitor related open-source projects.

5G will have significant impacts on the semiconductor industry, pushing digital signal-processing platforms to their limits. CTOs highlighted that ITU-T standardization should provide for novel chip architectures able to meet the high-performance signal processing demands of the 5G era, while concurrently achieving greater flexibility, security and lower power consumption.

Identity Management (IdM), and associated protections of security and privacy, will be essential to the success of 5G use cases under the banner of the Internet of Things. CTOs underlined the importance of the efficient, sustainable use of ITU’s [international numbering resources](file:///C:\Users\scholl.ITU_USERS\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\PVIIWK6V\v) allocated in support of the Internet of Things, as well as the value of related ITU standardization work on security and IdM.

CTOs were briefed on the results of the [ITU World Telecommunication Standardization Assembly 2016](http://www.itu.int/en/ITU-T/wtsa16/Pages/default.aspx), in particular the agreement of the new [WTSA Resolution 92](http://www.itu.int/pub/T-RES-T.92-2016) calling for ITU-T standardization to expand its study of the wireline networking innovations required to achieve the ambitious performance targets of 5G systems. See [full text of press release](http://newslog.itu.int/archives/1520).

A future CTO group meeting was tentatively scheduled for 24 September 2017 in Busan, Republic of Korea, the venue of ITU Telecom World 2017. A future regional CTO group meeting for the Arab region is scheduled in December 2017 in Dubai, United Arab Emirates.

## 16.3 World Standards Cooperation: IEC, ISO and ITU

The World Standards Cooperation (WSC) is a partnership of ITU, ISO and IEC to promote international standards.

The 16th meeting of the IEC/ISO/ITU World Standards Cooperation took place on 16 February 2017 and was hosted by ITU.

The WSC Academic Day promotes dialogue between universities and the international standards community, raising awareness and fostering cooperation and joint initiatives. See section 18.3.3.

World Standards Day is a UN-recognized international day of observance held each year on 14 October. The celebration of World Standards Day is led by IEC, ISO and ITU, paying tribute to the collaborative efforts of the thousands of experts worldwide who develop the voluntary technical agreements that are published as international standards. The theme of World Standards Day 2017 (14 October) will be “Standards make cities smarter”.

## 16.4 Global Standards Collaboration

ITU-T continues to engage in many collaborative standardization efforts with other SDOs such as the [Global Standards Collaboration (GSC)](http://www.itu.int/en/ITU-T/gsc/Pages/default.aspx). GSC-21 to be hosted by IEEE is planned for 26 – 27 September 2017 in Vienna, Austria. Some of the forthcoming tentative GSC-21 strategic topics are: Technical and non-technical aspects of Artificial Intelligence used in telecommunication and network systems; mixed reality considerations for a trusted experience; communication technologies for robotics & smart manufacturing; strengthening cooperation on information security field for future IT-converged technologies; collaboration and excavation of new work items for autonomous vehicle standardization; and promotion of IoT through propagation of oneM2M.

ITU hosts the [repository](http://www.itu.int/en/ITU-T/gsc/Pages/meetings.aspx) of GSC-documents from past meetings.

## 16.5 Global Standards Symposium (GSS)

The third Global Standards Symposium (GSS) took place on 24 October 2016, in Hammamet, Tunisia, at the kind invitation of the Government of Tunisia. The GSS brought together thought leaders to discuss how standards efforts could best integrate the consideration of security, privacy and trust. The GSS discussed regulatory principles for security, privacy and trust; how industry meets end-users’ expectations of security, privacy and trust; and standards bodies’ approach to security, privacy and trust.

Recalling thatprivacy and data protection constitute core values of individuals and societies, and that the Universal Declaration of Human Rights enshrine privacy as a fundamental right,GSS-16 encouraged policymakers and regulators to promote adherence to privacy-by-design principles, privacy impact assessment and the development of privacy-enhancing technologies. The sharing of cyber threat intelligence among government agencies and private-sector players was highlighted as especially valuable in increasing cybersecurity capabilities, a view expressed in volumes by private-sector security professionals throughout the discussions of GSS-16.

GSS-16 stressed that transparency and technological integrity are essential to industry players' efforts to protect and gain the trust of consumers. Quantum computing is a potential threat on the horizon that security professionals generally agree will render conventional encryption methods inadequate, and several speakers at the symposium urged participants to prioritize the development of quantum-safe technologies.

The standardization community was encouraged to adopt a privacy-by-design mind-set, paying due regard to privacy considerations throughout the standardization process. The symposium highlighted the value of open-source software in addressing challenges to security, privacy and trust, and encouraged sustained effort to enable the exchange of work between open-source and standardization communities to ensure high-quality, high-security software implementations.

The discussions of the symposium will assist ITU in fulfilling its mandate to 'build confidence and security in the use of ICTs', particularly in supporting the development of the trusted ICT environment necessary to fulfil the enormous potential of IMT-2020 (5G) systems, the Internet of Things and Smart Sustainable Cities.

## 16.6 ETSI & ITU

The ITU-ETSI MoU was reaffirmed in 2016. ETSI and ITU continue to enjoy successful and strong collaboration in particular in the fields of TTCN-3 (SG17 with ETSI TC MTS), standardization for C&I testing including SIP-IMS conformity testing, test specifications on VoLTE/ViLTE interconnection and Internet-related performance measurements (SG11 with ETSI TC INT; see sections 10.3, 10.4 and 10.7), and on green ICT standards (SG5 with ETSI TC EE). Topics of shared interest in this arena include, for example, ICT energy efficiency and methodologies to assess the environmental impacts. See section 7.1.

## 16.7 ITU and NGMN Alliance underline commitment to enabling the 5G era

ITU and the [NGMN Alliance](http://www.ngmn.org/home.html) have signed a cooperation agreement formalizing their mutual commitment to the development of next-generation mobile broadband technologies. The agreement highlights the mutual intent of ITU and NGMN to coordinate their contributions to the development of 5G technology and architecture. This cooperation will also extend to the management of the interplay of intellectual property rights and standardization in the 5G era, and the creation of an enabling environment for open-source software to assist in shaping the future of broadband.

The agreement affirms NGMN’s support for ITU’s international standardization of 5G systems. ITU is proactive in building cooperation with bodies such as NGMN, recognizing that the efficient collaboration of technical bodies active in the 5G arena will be crucial to ensuring that 5G fulfils its potential to assist social and economic development.

In 2012, ITU established a programme on “International Mobile Telecommunications for 2020 and beyond (IMT-2020)”, providing the framework for 5G research and development worldwide. ITU members have defined the framework and overall objectives of this standardization process, as well as the roadmap to guide this process to its conclusion by 2020.

ITU’s Radiocommunication Sector (ITU-R) is coordinating the international standardization and identification of spectrum for 5G mobile development. ITU’s Standardization Sector (ITU-T) will play a similar convening role for the technologies and architectures of the wireline elements of 5G networks. [Full text of press release](http://newslog.itu.int/archives/1396).

## 16.8 ITU joins Financial Inclusion Global Initiative (FIGI 3x3x3)

The study of the drivers of digital financial inclusion initiated by the ITU Focus Group on Digital Financial Services (FG DFS) has led ITU to partner with the World Bank and the Bill & Melinda Gates Foundation in establishing a new multi-partisan Financial Inclusion Global Initiative aimed at accelerating progress towards universal access to financial services. The new initiative will be a three-year programme in collaboration with the Gates Foundation, World Bank Group and the Committee on Payments and Market Infrastructure (CPMI). The FIGI 3x3x3 was launched on 20 April 2017 in Washington D.C and was held back to back with the ITU Workshop on Digital Financial Services and Financial Inclusion. The main objective of the FIGI 3x3x3 programme will be to implement the recommendations of the Focus Group Digital Financial Services, the Payment Aspects of Financial Inclusion report of the World Bank and CPMI and the Level One Project of the Gates Foundation. One main activity which is being proposed will be to provide targeted assistance to selected countries in their pursuit of financial-inclusion targets. Other activities in the FIGI 3x3x3 programme include the organization of annual symposia and three thematic working groups to develop technical standards and guidelines focusing on: Digital ID and its relationship with financial inclusion; Electronic payments and merchants’ acceptance of these payments; and Security, Infrastructure and Trust , particularly in relation to security, consumer protection and quality of service. TSB and BDT are leading ITU’s contribution to the FIGI 3x3x3 programme. The priority will be to assist selected countries in their pursuit of financial-inclusion targets. The main focus will be on implementation in order to achieve concrete results in terms of new accounts open by low-income individuals. [Full text of press release](https://itu4u.wordpress.com/2016/12/16/itu-to-join-new-global-initiative-to-expand-financial-inclusion/).

## 16.9 ITU signs cooperation agreement with CENELEC and CEN

On 21 March 2017, ITU signed a cooperation agreement with the European Committee for Electrotechnical Standardization (CENELEC) and with the European Committee for Standardization (CEN), wherein the three signatories express their intent to cooperate within a high-level, non-exclusive framework in areas of mutual interest such as in standardization activities on IoT and smart sustainable cities, on trust, on privacy-by-design in technical standards, on cybersecurity, and on mobility and Intelligent Transportation System (ITS) communication standards; and allowing to exchange relevant information among the three organizations.

# 17 Bridging the standardization gap

ITU-T is leading efforts to improve the capacity of developing countries to participate in the development and implementation of ICT standards. The disparity between developing and developed countries in their standards capability continues to be a factor in the persistence of the digital divide. This disparity diminishes opportunities for economic development and technological innovation.

The goal of bridging the standardization gap has been moving up the ITU agenda since the 2002 Plenipotentiary Conference in Marrakesh (Morocco) which adopted Resolution 123 calling for initiatives to assist in closing this gap. Later, the 2004 World Telecommunication Standardization Assembly (WTSA) held in Florianopolis (Brazil) adopted Resolution 44 ("Bridging the standardization gap between developing and developed countries"). Resolution 44 was updated by WTSA in 2008, held in Johannesburg (South Africa) giving further impetus to the work of ITU-T in this area. In October 2010, the Plenipotentiary Conference held in Guadalajara (Mexico) established bridging the standardization gap (BSG) as one of the three strategic objectives of ITU-T. ITU's Plenipotentiary Conference in 2014 held in Busan (Korea) then confirmed BSG as one of the 5 strategic objectives of ITU's standardization sector (ITU-T).

WTSA-16 agreed on an Action Plan to address further the disparity in standardization between developed and developing countries, including least-developed countries, Small Island Developing States (SIDS) and countries with economies in transition. The plan outlines four major programmes, as follows:

1. Strengthening standards-making capabilities
2. Assisting developing countries with respect to the application of standards
3. Human resources capacity building
4. Fundraising for bridging the standardization gap

This section provides a brief report on the implementation of the Action Plan during the last Study Period, as well as the main resolutions and instructions of Resolution 44, through the efforts of the implementation group established within TSB.

For the purpose of reporting, the classification of countries as developing and developed follows the UN M.49 classification used by the United Nations for statistical purposes. Country classifications by region and development status can be found at: [http://www.itu.int/ITU-D/ict/definitions/regions/](http://www.itu.int/ITU-D/ict/definitions/regions//).

## 17.1 BSG hands-on training sessions

The successful hands-on training sessions conducted by ITU-T SG3 since early 2014 have been extended to cover the activities of other study groups and their regional groups. BSG hands-on training sessions assist developing countries in developing their skills and capabilities for international standards-making. The sessions focus on the development of practical skills to maximize the effectiveness of developing countries' participation in the ITU-T standardization process, covering topics including strategies for participation in study groups, drafting contributions to meetings, presenting proposals, collaborative working methods and building consensus.

Since January 2016, 12 hands-on training sessions were held for delegates of ITU-T SG2, SG9, SG11, SG12, SG13, SG16 and SG17. . These sessions focused on five key aspects set out in the Figure 1 below.



**Figure 1 – Focus areas of BSG hands-on sessions**

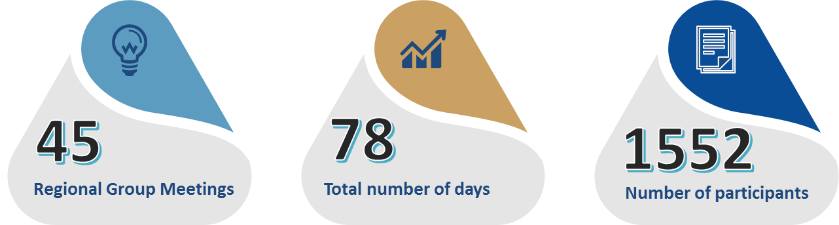
There have also been tailored on-site sessions organized in Tunisia and India. In total, 191 participants from 35 countries and 64 different organizations have benefited from these sessions.

## 17.2 Regional Groups

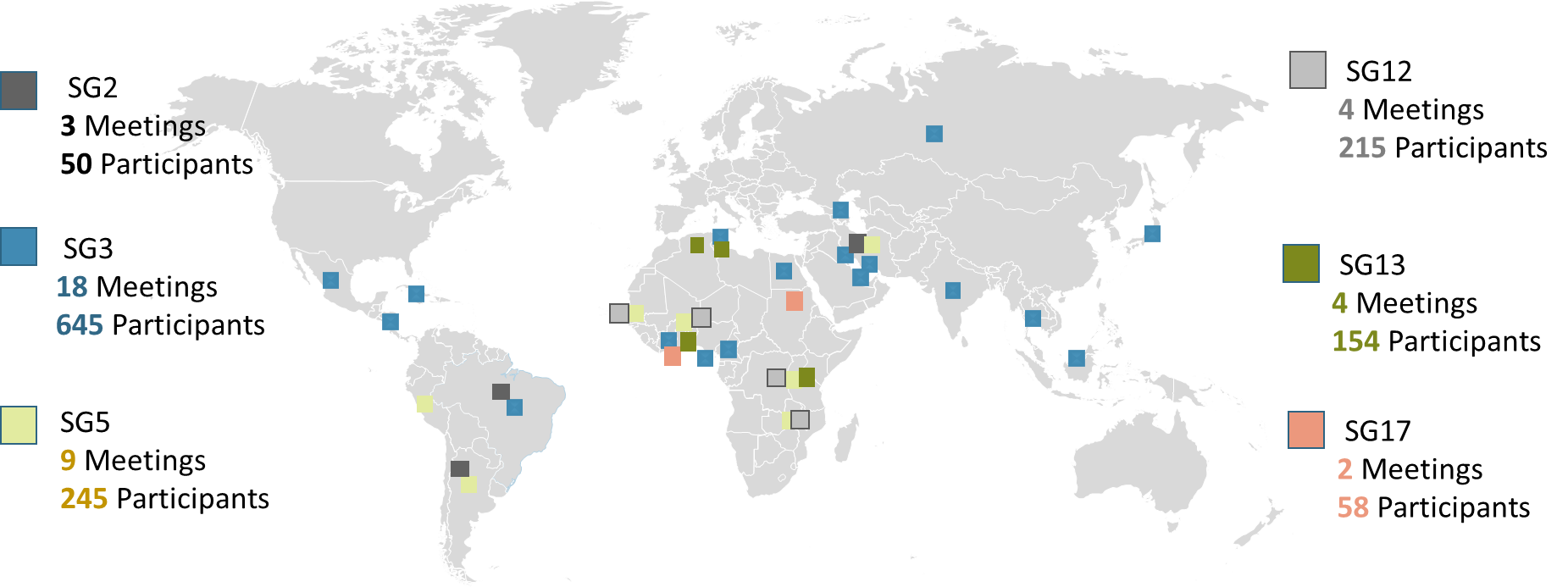
Regional Groups within ITU-T Study Groups have proven effective mechanisms to assist in bridging the standardization gap by stimulating effective participation in ITU-T Study Groups and increasing the number and quality of contributions from developing countries that could eventually lead to standards. ITU-T now has 23 regional groups:

* Eight for Africa (Study Groups 2, 3, 5, 12, 11[[2]](#footnote-2), 13, 17, and 20[[3]](#footnote-3))
* Four for the Americas (Study Groups 2, 3, 5, and 203)
* Five for the Arab States (Study Groups 2, 3, 5, 17[[4]](#footnote-4), and 203)
* Two for Asia and the Pacific (Study Groups 3 and 5)
* One for Europe and the Mediterranean Basin (Study Group 3, not active)
* One for Eastern Europe, Central Asia and Transcaucasia (Study Group 203).
* One for the Regional Commonwealth in the field of Communications / CIS region (RCC/CIS) (Study Group 3), one for RCC (Study Group 11[[5]](#footnote-5)).

Statistics on Regional Groups and meetings for 2013 to 2016 are set out in the Figures 2 and 3 below. From 2009 to 2012 there were 15 Regional Group meetings.



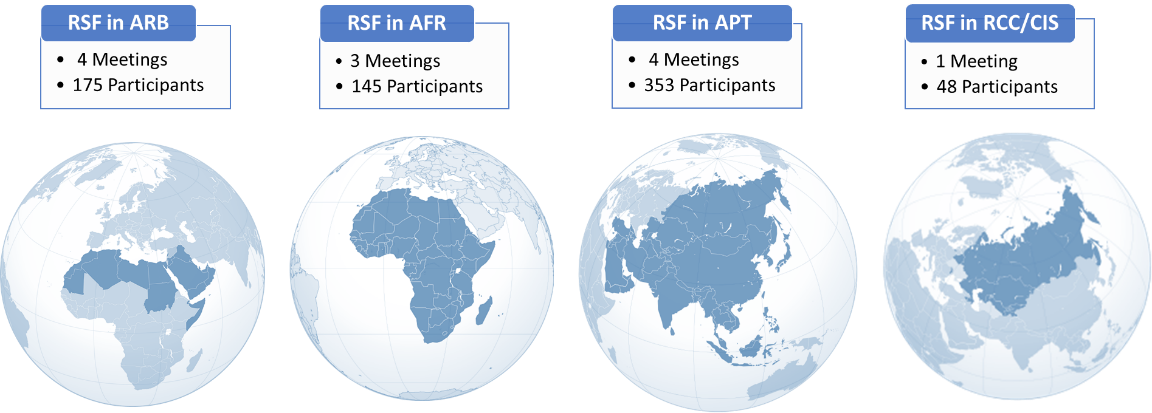
**Figure 2 – Study Group Regional Group meetings  
Total number, duration and participation, 2013-2016**



**Figure 3 – Study Group Regional Group Meetings  
Location, number and participation, 2013-2016**

## 17.3 Regional Standardization Forums

Overall, there were three Regional Standardization Forums (RSFs) held for developing countries or in developing countries during the September 2016- April 2017 period (see also Figure 4). These forums included tutorials on ITU-T working methods as well as more technically-oriented events covering themes including ICTs Digital trends, the impact of the OTTs digital services on the economy, collaborative regulation in the Apps economy, and the economic and financial issuesin a converged broadband environment.



**Figure 4 – ITU-T Regional Standardization Forums for BSG  
Meetings and Participants by Region (2013- 2016)**

## 17.4 National Standardization Secretariats

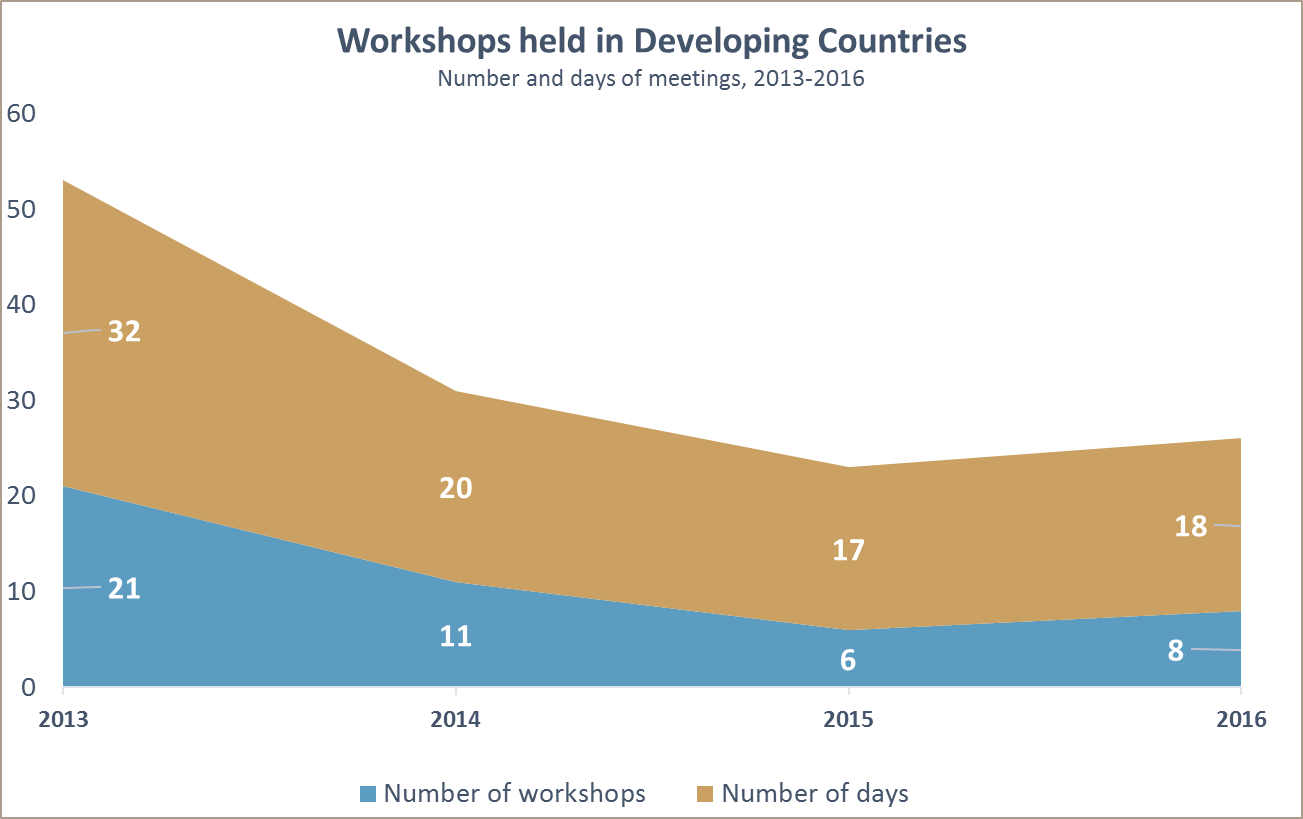
One of the findings of the ITU-T study on the "ICT Standardization Capabilities of Developing Countries" carried out in 2011 was the lack of proper coordination of standardization activities at the national level. In 2013, TSB developed ["Guidelines on the establishment of a National Standardization Secretariat (NSS) for ITU-T"](https://www.itu.int/dms_pub/itu-t/oth/0b/1f/T0B1F0000023301PDFE.pdf). Published in 2014, these guidelines consider the different capability levels for standardization across developing countries, showing how it is possible to establish an NSS at a basic level with very little new cost or resource requirements.

The guidelines are intended for countries that do not have a national standardization secretariat or are in the process of establishing an organization structure at the national level to coordinate standardization activities. The Annex to the Guidelines contains further practical information and examples of NSS implementation. ITU Member States wishing to establish an NSS that require additional assistance may contact the BSG Secretariat at [bridging@itu.int](mailto:bridging@itu.int) for more information.

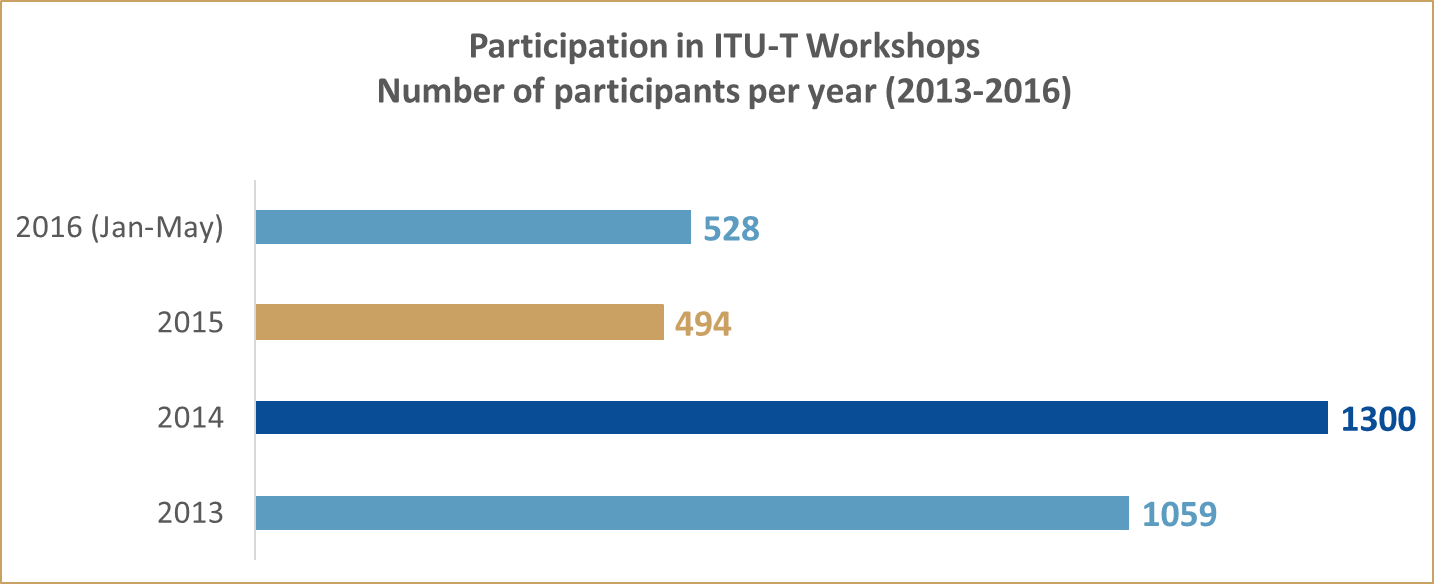
In 2015, for instance, TSB provided technical assistance to the Zambia ICT Authority (ZICTA) in the assessment of the country's NSS. The NSS in Zambia has established technical committees mirroring Questions in ITU-T Study Groups 2, 5, 12, 13, 15 and 16. Training on how to establish an NSS was also given at the ITU Regional Standardization Forum for the Asia-Pacific Region from 27 to 28 October 2016 in Jakarta, Indonesia, attended by some 30 participants from 11 countries.

## 17.5 Workshops and Tutorials

In the study period 2013-2016, ITU-T organized 46 workshops and seminars (see Figure 5) in developing countries for a duration of 87 days covering a wide array of topics in the field of ICT and attracting high-ranking experts as speakers, and more than 3000 attendees (see Figure 6) from engineers to managers from all industry sectors.



**Figure 5 – Workshops held in developing countries**



**Figure 6 – Participation in ITU-T Workshops**

Targeted invitations to ITU-T workshops, forums and symposia are now sent to the standardization organizations of all the ITU Regions, to keep them informed about ITU-T activities of common interest, as well as to enhance the participation of national standards bodies in the work of ITU-T, in accordance with the implementation of the strategic goals of the Union for 2016-2019, namely objective T.5 “Extend and facilitate cooperation with international, regional and national standardization bodies”. In this regard, increased cooperation between TSB and the ITU Regional and Area Offices has proven valuable, particularly in facilitating cooperation with relevant standards bodies.

## 17.6 e-Learning courses

In 2014, TSB developed an e-learning course on the ITU-T Recommendation A.1 "Working methods of ITU-T Study Groups". This course is hosted on the [ITU Academy](https://academy.itu.int/index.php?lang=en) platform. The main objectives of the e-learning course are to introduce the structures, management, coordination mechanisms and operating procedures of ITU-T study groups as defined in Recommendation ITU-T A.1. It provides guidelines related to working methods, such as the conduct of meetings, preparation of studies, management of study groups, the role of Rapporteurs and the processing of ITU-T contributions and temporary documents. The course takes some two hours to complete and comprises six modules:

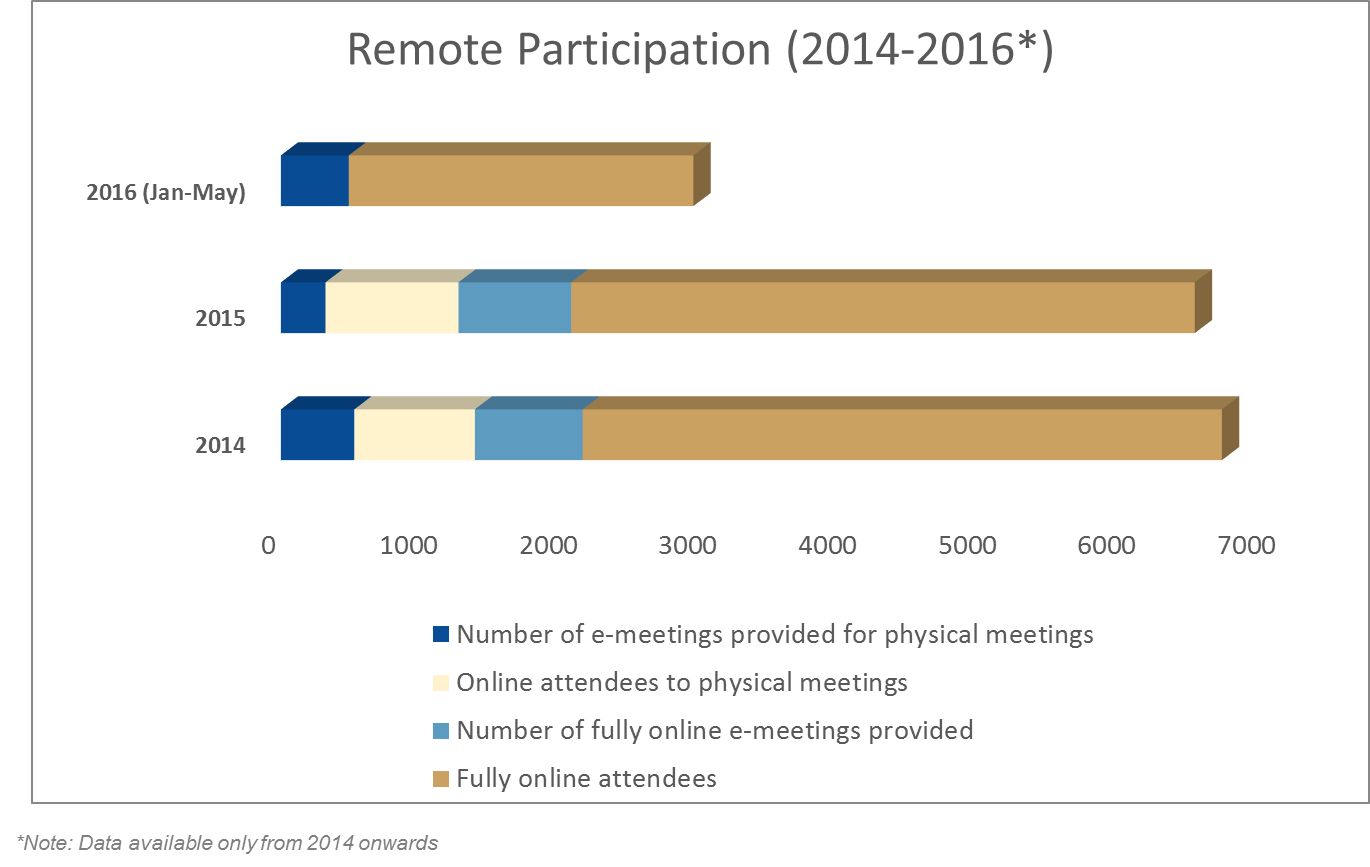
* Standardization in ITU-T
* Managing the study groups
* Coordination
* Inputs to the study groups
* Outputs of the study groups
* Further infrastructure supporting the study group process.

Each module is a self-contained unit, including course content and quizzes. The course is followed by a final assessment exam online. Certificates of achievement are awarded for scores over 80 per cent.

## 17.7 Study Group Mentoring Programme

In 2011, a mentoring programme for ITU-T Study Groups was introduced. The objective of the mentoring programme is to provide a contact point to assist new delegates with the working methods of ITU-T and to facilitate participation and contributions from developing countries. It has since featured as an important part of the work of ITU-T Study Groups and TSAG. In the 2013-2016 study period, 56 per cent of the mentors were representative of industry (ITU-T Sector Members) and 44 per cent were representative of governments (ITU Member States).

## 17.8 Remote participation and e-Meetings



**Figure 7 – Remote participation and e-Meetings**

TSB continues to improve electronic meeting facilities for the members. TSB now provides GoToMeeting and Adobe Connect as remote participation tools for e-Meetings. TSB uses Adobe Connect as the official remote participation tool to complement physical meetings that are held in ITU HQ in Geneva. GoToMeeting is still used for physical, fully online (virtual) and any on-demand ad-hoc meetings. Statistics on e-Meetings have been compiled as from 2014 and are indicated below.

## 17.9 Technical Papers

A series of technical reports and papers produced provide additional information for developing countries on the best practices in implementing ITU-T Recommendations. See technical reports and papers [web page](http://www.itu.int/pub/T-TUT).

## 17.10 Fellowships

The table below shows the fellowships awarded during the period from October 2016 until February 2017 with a breakdown by region and gender. 73 fellowships were awarded; of which 8 fellowship were cancelled.

| **Meeting** | **Fellows** | | **Total** |
| --- | --- | --- | --- |
| **Female** | **Male** |
| ITU-T Study Group 5 Meeting  *Geneva 10-14 October 2016* | 2  + 2 cancelled | 2 | 6 fellowships awarded  4 participants |
| WTSA-16  *Tunisia 25 October – 03 November 2016* | 25  + 3 cancelled | 7 | 35 fellowships awarded  32 participants |
| ITU-T Study Group 12 Meeting  *Geneva 10 – 19 January 2017* | 5 | 0 | 5 fellowships awarded  5 participants |
| ITU-T Study Group 16 Meeting  *Geneva 16 - 27 January 2017* | 2  + 1 cancelled | 0 | 3 fellowships awarded  2 participants |
| ITU-T Study Group 3 RG-AFR meeting and Associated BDT Forum  *Victoria Falls, Zimbabwe 30 Jan – 3 Feb 2017* | 9  + 1 cancelled | 4  + 1 cancelled | 15 fellowships awarded  13 participants |
| ITU-T Study Group 11 Meeting  *Geneva 06 – 15 February 2017* | 2 | 2 | 4 fellowships awarded  4 participants |
| ITU-T Study Group 13 Meeting  *Geneva 06 – 17 February 2017* | 1 | 3  + 1 cancelled | 5 fellowships awarded  4 participants |

## 17.11 BSG Programme 4: Fundraising for Bridging the Standardization Gap

Over the period mid October 2016 to February 2017, the Ministry of Science, ICT and Future Planning (MSIP) of Korea has made a contribution to the BSG Fund. TSB is encouraging other voluntary contributions to the BSG Fund.

# 18 Membership

## 18.1 Evolution of ITU-T membership

ITU-T membership growth remains positive with a total of 536 members on 28 February 2017 which is an increase from 531 recorded on 31 October 2016. Overall, ITU-T has added 22 new members since 31 October last year. Among these new additions were 4 Sector Members and 4 Associates. The number of new Associates were shared equally across Study Group 2: Operational aspects, Study Group 5: Environment and climate change, Study Group 15: Transport, access and home, and Study Group 17: Security. Academia accounted for the majority of new additions with 14 in total. Overall there have been 17 denunciations since 31 October 2016.

Table 1: Evolution of ITU-T membership from 31 December 2006 to 28 February 2017

|  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sector Members | 344 | 314 | 309 | 294 | 273 | 271 | 278 | 284 | 275 | 270 | 258 | 260 |
| Associates | 112 | 116 | 134 | 128 | 125 | 136 | 144 | 139 | 138 | 137 | 137 | 136 |
| Academia | ‑ | ‑ | ‑ | ‑ | ‑ | 25 | 36 | 45 | 67 | 109 | 132 | 140 |
| TOTAL | 456 | 430 | 443 | 422 | 398 | 432 | 458 | 468 | 480 | 516 | 527 | 536 |

NOTE – The Academia category was created in 2011.

**Figure 8 – Evolution of ITU-T membership from 31 December 2006 to 28 February 2017**

## 18.2 European operator target list

A new TSB project, the “European operator target list”, has been launched to increase the **participation of European operators** (both Members and non-Members) in ITU-T SGs, FGs, JCAs and Workshops. This project targets increased participation in ITU-T by specific EU operators, engaging decision-makers such as CIOs, CTOs and CISOs, linked to identified subject-matter interest and upcoming meetings. A database of close to 1000 European operator contacts has been mapped to relevant ITU-T study groups and activities. This project has resulted in an increase in the participation of EU operators in ITU’s open events as speakers and participants. These contacts will be systematically approached by membership each time a new workshop approaches. Work is also being done to include them in the new CRM system and invite them to the new ITU newsletter.

To date this project has resulted in an increase in participation of EU operators in ITU open events in the form of speakers and participants. Over 20 participants from the following companies Deutsche Telekom, Swisscom, Proximus, Vodafone, Sunrise, KPN, TNO, Volvo and Ericsson have participated in the SS7 Workshop, Global Standards Symposium, DFS Workshop, Blockchain Workshop and Future Networked Car Symposium. This effort also attracted participation from companies like Symantec, Oracle, Google and Return Path.

Participation in ITU workshops is a good first introduction and the challenge remains to convert them into regular study group contributors.

## 18.3 Academia

ITU-T is carrying out various activities to encourage and facilitate the participation of academia in the work of the Sector, as well as to benefit from their technical and intellectual expertise.

### 18.3.1 Kaleidoscope academic conferences

Held since 2008, [Kaleidoscope events](http://www.itu.int/en/ITU-T/academia/kaleidoscope/Pages/default.aspx) are peer-reviewed academic conferences to bring together a wide range of views from universities, research institutions and industry that increase dialogue between academics and ICT standardization experts. The aim of the conference is to identify emerging trends in ICT research and their associated implications for international standardization. Kaleidoscope is organized by ITU-T with the technical co-sponsorship of IEEE Communications Society.

[Kaleidoscope 2016: *ICTs for a Sustainable World*](http://www.itu.int/en/ITU-T/academia/kaleidoscope/2016/Pages/default.aspx) was held 14-16 November 2016 co-located with ITU Telecom World in Bangkok, Thailand. Kaleidoscope 2016 called for research relevant to the pursuit of the United Nations’ Sustainable Development Goals (SDGs). The SDGs call for every industry sector to innovate in the interests of sustainable development. Innovations will be plentiful, multifaceted and tailored to context, but all innovators are looking to ICTs to form part of their portfolio of sustainability measures. Participants in Kaleidoscope 2016 highlighted research into ICT developments capable of supporting the broad spectrum of innovation required to achieve the SDGs. They emphasized the role of international ICT standards in providing the platform for this innovation to achieve its goals on a global scale. The presented papers shared a close connection with on-going ITU work, and some of them might bring about new work for the Union. For a detailed overview of Kaleidoscope 2016, please see the event [Final Report](http://www.itu.int/en/ITU-T/academia/kaleidoscope/2016/Documents/K-2016_final_report.pdf).

The 9th Kaleidoscope edition will be kindly hosted by the Nanjing University of Posts and Telecommunications (NUPT), Nanjing, China, on 27 – 29 November 2017. Kaleidoscope 2017 “Challenges for a data-driven society” calls for original academic papers that offer innovative and bold approaches relevant to technology, business and policy aspects of data management and analysis, and encourage the development of applications and services building on data technologies to improve society.

### 18.3.2 ITU-Academia consultation meetings

Following the first [Academia Consultation meeting](http://www.itu.int/ITU-T/uni/meetings.html) coordinated by TSB in 2007 (which led to the creation of the Kaleidoscope series of academic conferences), a second consultation meeting, organized by the ITU General Secretariat in collaboration with TSB, took place in conjunction with Kaleidoscope 2015 and highlighted the importance of strengthening the collaboration of ITU's three sectors in their engagement with academia. A third event, the [ITU Secretary-General's Academia Consultation](http://www.itu.int/en/join/academia/Pages/consultation2016.aspx), took place on 13 November 2016, preceding Kaleidoscope 2016. This event, in particular, yieled feedback on the planned establishment of an ITU scholarly, professional, peer-reviewed and freely available online Journal. TSB is the lead for this Journal, supported by collaboration with ITU's Radiocommunication Bureau and Development Bureau and the ITU General Secretariat.

This consultation meeting was followed by an Academic Roundtable on 17 November 2016 organized by ITU under the umbrella of the World Standards Cooperation (WSC) and discussed the role of Academia in the standards-development process (see more on academia and WSC in section 17.3.3).

### 18.3.3 World Standards Cooperation and Academia

IEC, ISO and IEC organize World Standards Cooperation (WSC) Academic events, which aim at discussing the role of academia in the standards-development process.

WSC Academic Days took place in France (2013), Canada (2014), Korea (2015), and Germany (2016), in conjunction with the annual International Cooperation for Education about Standardization (ICES) conferences. The next event will be held in Chicago, USA, in 11 August 2017; the focus will on the benefits of standards and on how education about standardization can benefit from methods and case studies highlighting the use of standards and their contribution to public welfare and organizations’ performances.

The first [WSC Academic Roundtable](http://www.iso.org/sites/WSCRoundtable2013/), organized by ISO, took place in Washington DC, USA, 26-27 June 2013, while the second edition was organized by IEC and took place in Seattle, USA, in January 2015.

The third edition, [*Engaging academia in standardization for a sustainable future*](http://www.itu.int/en/ITU-T/extcoop/Pages/wsc-academia-16.aspx), organized by ITU-T in Bangkok on 17 November 2016, brought together university professors, students, standards leaders and representatives of industry and government, to debate the following topics:

* Collaboration among academia, industry, and global standards organizations to develop international standards for a sustainable future
* Gender dimension in international standardization
* Internet of Things (IoT) to accelerate sustainable development.

## 18.4 Gender

TSB continues its efforts to include a gender perspective in all of its activities and programmes under the umbrella of the ITU Gender Task Force. ITU Member States and Sector Members are encouraged to support the active involvement of women experts in standardization groups and activities.

In this regard, TSB launched the Women in Standardization Expert Group (WISE) at TSAG in February 2016. WISE is dedicated to promoting women in standardization, telecommunication/ ICTs and related fields and to recognizing men and women who have made and continue to make remarkable contribution in promoting women and the work of women in these fields.

The first WISE event was held on 30 October 2016 at WTSA-16. The event consisted of a workshop on practical skills for successful negotiations, as part of ITU-T's commitment to promoting equality for men and women delegates attending its meetings and conferences, followed by a panel discussion highlighting the experiences of leading women from the ICT and standardization fields. [Full text of press release](http://newslog.itu.int/archives/1420).

WTSA-16 reaffirmed ITU-T [Resolution 55](#Resolution_55) on promoting a gender equality in ITU Telecommunication Standardization Sector activities, committing ITU-T to continue its efforts to ensure that all of the its policies, work programmes, information dissemination activities, publications, study groups, seminars, assemblies and conferences reflect the Union’s commitment to gender equality and the empowerment of women.

Currently, 56 per cent of all TSB staff are women. The number of women in the professional category has more than quadrupled over the last 10 years, taking the proportion of women in the professional category to 39 per cent. Diversity of staff, gender equality and the empowerment of women continue to be among TSB's priorities.

# 19 Publications

Over 7500 pages of ITU-T Recommendations and Supplements were published between October 2016 and February 2017.

Figure 9 illustrates the number of Recommendation pages (including Supplements) published in the January 2007 to February 2017 period.

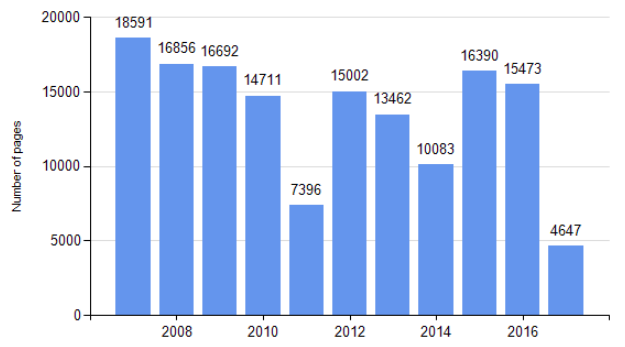


Figure 9 – Number of Recommendation pages published between 1st January 2007  
and 20 February 2017

The ITU product "ITU-T Recommendations and selected Handbooks" continues to be distributed on a quarterly basis. Because of space limitations of the double-layer DVD format, the product will be distributed on a USB key starting with the March 2017 edition. This product represents a tool of great value to standards developers and implementers as a consolidated archive of the over 4000 ITU-T standards in force. The USB key incorporates advanced search tools, including detailed search-by-content capabilities. Search parameters can be defined by keywords, timeframe and Study Group, among others, with searches applicable to the title or the full text of the standard. “Tool-tips” offer real-time guidance to the USB key’s functionality, assisting first-time users and ensuring the accessibility of the product to persons with disabilities.

# 20 Media and promotion

## 20.1 Communications on ITU standardization

[ITU press releases](http://www.itu.int/en/mediacentre/Pages/default.aspx) distribute news on ITU work of particular interest to media. Press releases are distributed with supplemental notes to technical editors in certain cases, a return to past practice valued by media outlets covering standardization.

[ITU-wide newslog](http://newslog.itu.int/) pages are well visited and often spur media attention. TSB/ITU-T continues to produce the majority of the content published on this platform, content which is well appreciated by ITU’s audience (8/10 most popular stories of all time; 9/10 most popular stories of Q1/2017).

[The ITU blog](https://itu4u.wordpress.com/) carries bylined 'opinion' pieces and many of the most successful pieces of content on this platform were developed by TSB/ITU-T (5/10 most popular pieces of all time; 4/10 most popular pieces of Q1/2017).

[SlideShare](https://www.slideshare.net/ITU/presentations) publicizes expert content developed by participants in ITU-T Study Groups or ITU workshops. TSB’s curation of content for this platform is yielding positive results in the form of high levels of engagement with ITU-T content.

The consistent output of ITU-T news content, coupled with a coordinated social media strategy led by the ITU General Secretariat, continues to see news of ITU-T's work feature in a variety of mainstream publications. A [scoop page](http://www.scoop.it/t/itu-t-in-the-news/) highlights a selection of the news coverage of ITU-T.

***Communications on WTSA-16***

[‘WTSA-16 Highlights’ news stories](http://newslog.itu.int/archives/category/standardization/wtsa-16) featured a significant volume of video interviews with experts contributing to WTSA-16 and its side events.

An [infographic and accompanying text](http://newslog.itu.int/archives/1385) were developed to provide a general audience with clear information on the work of ITU-T and the purpose of WTSA-16.

An [abridged ‘TSB Director’s Report’](http://newslog.itu.int/archives/1411) offered an overview of ITU-T’s key achievements over the 2013-2016 study period.

A [‘WTSA-16 Snapshot Report’](http://www.itu.int/en/ITU-T/wtsa16/Documents/WTSASnapshotReport.pdf) of the activities and decisions of WTSA-16 was published the week following the conference.

Visuals supported the TSB Director’s keynote presentation on ITU-T activities ([multimedia-rich slideshow](https://www.slideshare.net/ITU/itu-setting-the-standard-67687434)) and [closing remarks to WTSA-16](https://www.itu.int/md/T13-WTSA.16-C-0129/en) ([photo slideshow](https://www.youtube.com/watch?v=iuqoomXHw7o)).

***ITU-T video content***

The video produced to provide an overview of ITU-T’s work and current priorities, sponsored by NTT and KT – [ITU standardization: The technical foundations of the Information Society](https://www.youtube.com/watch?v=hgP4IyY33iI) – has received over 4,200 views, making this video the most successful piece of ITU-T video content in 2016.

TSB has led ITU’s development of ‘social video’, video content designed specifically for social networking platforms and the user habits commonly observed on these platforms. See, for example, ‘motion slideshow’ videos on [Artificial Intelligence](https://www.facebook.com/ITU/videos/1240008842750586/) and [Intelligent Transport Systems](https://www.facebook.com/ITU/videos/1271884246229712/).

Video interviews with the Chairmen of ITU-T Study Groups are found on ['SG at a Glance' webpages](http://www.itu.int/en/ITU-T/studygroups/2017-2020/Pages/default.aspx), which also host a range of video interviews on specific technical areas.

Communications on ITU workshops feature short interviews with participating experts, interviews which form part of ‘wrap-up videos’ developed to capture the essence of these events and bolster communications on related activities. See, for example, video playlists for workshops on [network aspects of IMT-2020](https://www.youtube.com/watch?v=04W1YI0ZxCs&list=PLpoIPNlF8P2NPFldoAGvSmBijxXSaL5ei); [Digital Financial Services](https://www.youtube.com/watch?v=5_jK8NKQBnU&list=PLpoIPNlF8P2NMDChEpow1n0ks9O63DXkg); [Future Networked Car](https://www.youtube.com/watch?v=zly1rf3cY64&list=PLpoIPNlF8P2MVL0biDS1wPgDEFxJ0Hq93).

## 20.2 CCITT/ITU-T 60th anniversary

### 20.2.1 History background

The work of international standards started in the second decades of the 20th century, as the complexity of international telephone service and long-distance telegraphy.

In order to develop international standards that would have been relevant for the international community, it was necessary to carry out international studies, in a continuous way, also in the intervals between Union conferences in order to develop.

By 1925, two consultative committees were therefore created during the International Telegraph Conference in Paris: the CCIF and the CCIT.

The former ITU-T (known then as CCITT – International Telegraph and Telephone Consultative Committee) was created in 1956, from a merger of two consultative committees, the CCIF (International Telephone Consultative Committee) and the CCIT (International Telegraph Consultative Committee):

* the CCIF with the mandate of studying and developing standards for terminal equipment, transmission quality and tariffs for long-distance telephony;
* the CCIT with the mandate of dealing with the technical and operational aspects of telegraphy, in charge of the standardization of the phototelegraphy and to establish tariffs and international terminology.

In 1992, the ITU the Plenipotentiary Conference decided to rename CCITT to ITU-T, the Telecommunication Standardization Sector of ITU. In 2006, ITU-T celebrated the 50th Anniversary of CCITT/ITU-T, under the leadership of then TSB Director Houlin Zhao. In 2016, the 60th Anniversary of CCITT/ITU-T was celebrated with the leadership of TSB Director Chaesub Lee.

### 20.2.2 The celebrations

The 60th Anniversary was the occasion to strengthen stakeholder dialogue, to take the time to listen and to meet and tailor specific standardization needs by region, by country and by members, and to accommodate ITU-T’s ongoing and emerging work. The 60th Anniversary was a precious opportunity for the Sector and for the Standardization Bureau overall, to enhance and increase:

* coordination and collaboration
* International and regional presence
* Quality and efficiency
* The stakeholder dialogue
* Timely addressing of standardization needs
* Reaching out to markets, industry, governments, communities, users.

### 20.2.3 CCITT/ITU-T 60th Anniversary Celebration at WTSA-16

***2016 marks 60 years since the 1956 establishment of the International Telegraph and Telephone Consultative Committee (CCITT), the precursor to ITU-T, established in 1992****.*

*The* [*60th anniversary of CCITT/ITU-T*](http://www.itu.int/en/ITU-T/60/Pages/default.aspx) *celebrates the many experts that contribute their time and expertise to the development of the ITU standards that bring cohesion to the unceasing innovation of the ICT community.*

In 2016, ITU-T celebrated the 60th Anniversary of CCITT/ITU-T, under the leadership of TSB Director Chaesub Lee. To celebrate the CCITT/ITU-T 60th Anniversary, [a series of talks](http://www.itu.int/en/ITU-T/60/Pages/default.aspx) were held during the WTSA-16 Plenary sessions on 26 October 2016.

In addition, to share the CCITT/ITU-T Anniversary with the members, a gala reception was kindly sponsored jointly by the United Arab Emirates (Gold), South Korea (Silver) and Rohde & Schwarz (Bronze).

#### 20.2.3.1 CCITT/ITU-T 60th Anniversary Talks on Digital Financial Services

Globally, more than 2 billion adults do not have a formal bank account. Low levels of financial inclusion represent a barrier to socio-economic development. Mobile money could be a game-changer for people of limited income and an enabler for financial inclusion in developing countries. The recent growth of Digital Financial Services has allowed millions of people previously excluded from the formal financial system to perform financial transactions relatively cheaply, securely and reliably.

Policy reform and the development of international standards will be important in facilitating the adoption of interoperable Digital Financial Services.

Overall, t**he *Talks on Digital Financial Services* offered** a platform to discuss the opportunities and challenges involved in fast tracking the adoption of digital financial services and scaling up its usage.

#### 20.2.3.2 CCITT/ITU-T 60th Anniversary Talks on Artificial Intelligence

The future will see large parts of our lives influenced by AI technology. Machines can execute repetitive tasks with complete precision, and with recent advances in artificial intelligence (AI), machines are gaining the ability to learn, improve and make calculated decisions in ways that will enable them to perform tasks undertaken by journalists, teachers, doctors and other professions previously thought to rely on human experience and ingenuity. AI will also come to support emerging applications in the IoT space, with billions of devices, things and objects gaining the ability to learn from patterns observed in their environment and communicate these learnings to a larger ecosystem of intelligent devices.

The development and adoption of relevant international standards will help us to realize the benefits of AI advances on a global scale.

Overall the ***Talks on Artificial Intelligence*** offered a platform for discussions on cutting-edge AI technologies, ICT applications and services that could leverage from the capabilities that they offer, as well as the benefits and challenges involved in their standardization.

## 20.3 Outreach work with the Regions

In order to leverage the outreach work and ensure efficient coordination, monthly meetings and conference calls were organized with the ITU regional and Areas offices. Enhanced and continued cooperation between the ITU regional and area offices, as well as with relevant regional and other international organizations dealing with standards will continue to be enhanced.

# 21 Services and tools

Electronic working methods offer crucial support to members engaged in ITU standardization work. The ITU secretariat continues to develop new applications and services to maintain and expand ITU's advanced electronic working environment.

## 21.1 Noteworthy ITU-T Web Areas

**ITU-T Study Groups (Study Period 2017-2020)**

<http://www.itu.int/en/ITU-T/studygroups/2017-2020/Pages/default.aspx>

**AI for Good Global Summit**

<http://www.itu.int/en/ITU-T/AI/Pages/201706-default.aspx>

**ITU workshop on "Security Aspects of Blockchain"**

<http://www.itu.int/en/ITU-T/Workshops-and-Seminars/201703/Pages/default.aspx>

**7th Green Standards Week**

<http://www.itu.int/en/ITU-T/Workshops-and-Seminars/gsw/201704/Pages/default.aspx>

**ITU Women in Standardization Expert Group (WISE)**

<http://www.itu.int/en/ITU-T/wise/Pages/default.aspx>

**Global Standards Symposium**

<http://www.itu.int/en/ITU-T/wtsa16/gss/Pages/default.aspx>

**WTSA-16**

<http://www.itu.int/en/ITU-T/wtsa16/Pages/default.aspx>

## 21.2 ITU-T Databases

Among the numerous databases which are continuously enhanced to serve ITU-T delegates and secretariat staff are:

* [ITU-T Recommendations](http://www.itu.int/itu-t/recommendations)
* [International Numbering Resources](http://www.itu.int/ITU-T/inr/index.html)
* [ITU Product Conformity Database](http://www.itu.int/net/itu-t/cdb/ConformityDB.aspx)
* [ITU-T Patents and Software Copyrights](http://www.itu.int/ipr/)
* [ITU-T Formal descriptions and Object identifiers](http://www.itu.int/ITU-T/formal-language/index.html)
* [ITU-T Test Signals](http://www.itu.int/net/itu-t/sigdb/menu.htm)
* [ITU-T Work Programme](http://www.itu.int/ITU-T/workprog)
* [ITU-T Liaison Statements](http://www.itu.int/net/itu-t/ls/)
* [ITU-T Terms & Definitions](http://www.itu.int/ITU-R/go/terminology-database)

Unique and persistent identifiers based on the DOA are now available for items registered in the following ITU-T databases: ITU-T Recommendations; ITU-T Conformity Statements; ITU-T Patents and Software Copyrights; ITU-T Formal descriptions and Object identifiers; ITU-T Test Signals; and ITU-T Liaison Statements. These persistent identifiers will enable new features such as digital signature-based data integrity checks, role-based information management, data privacy and other advanced information management capabilities.

In order to help the ITU-T community to follow up with the latest services and tool enhancements, a new service announcements platform is now available at <http://tsbtech.itu.int/>

## 21.3 Document Management System for Rapporteur Groups

The ITU IS Department together with TSB have developed a system for managing documents of ITU-T Rapporteur Group Meetings (RGM) in a well-structured and secured environment. This new system, which is based on MS SharePoint, was used extensively at the [SG13 co-located Rapporteur group meetings](https://extranet.itu.int/meetings/ITU-T/T13-SG13RGM/12068-160418/SitePages/Welcome.aspx) in April 2016 and the [Interim Rapporteur group meetings for SG20](https://extranet.itu.int/meetings/ITU-T/T13-SG20RGM/13307-160502/SitePages/Welcome.aspx) in May 2016. With a total of 571 documents submitted (258 documents for SG20, and 313 documents for SG13) over a combined period of 22 meeting days, the system underwent an exhaustive stress test under real-world conditions.

The new ITU-T RGM system is now available for any Rapporteur Group wishing to utilise and take advantage of its improved capabilities. The current and past RGM meetings may be accessed at <http://itu.int/go/itu-t/rgm>. A comprehensive support and FAQs page offering RGM tips and best practices is available to users at <http://itu.int/go/itu-t/rgm-support>. A very detailed online user guide for the RGM System complete with videos is available at: <http://itu.int/go/itu-t/rgm-guide>.

A feedback form for the new RGM system has also been prepared and we invite all users of the system to fill in the form. Your feedback and suggestions will be very helpful for us in assessing and improving the quality of our services. The RGM Feedback Form is available here: <http://itu.int/go/itu-t/rgm-feedback>.

The RGM system is part of several services available in the ITU-T SharePoint collaboration sites. Most of the collaboration sites are restricted to ITU-T Members and can be accessed using a TIES account. Some collaboration sites which are open to non-members can be accessed using ITU Guest accounts. The ITU-T SharePoint collaboration home site can be accessed here:  
<https://extranet.itu.int/sites/ITU-T/>.

## 21.4 New ITU-T Electronic Registration and Subscription Service

Since the launch of the ITU-T Electronic Registration and Subscription Service in 2009, ITU-T participants have provided very important feedbacks on different issues and suggestions for improvements and other enhancements. To address these issues and to further improve the current tools that cover self-registration to mailing lists, access to FTP areas, etc., a new project, Improving Working Method V2 (IWM v2) was launched and successfully implemented in March 2013. The result is the new ITU-T Electronic Registration and Subscription Service web interface which is available at: <http://www.itu.int/en/ITU-T/ewm/Pages/services.aspx>.

## 21.5 International Numbering Resources (INRs)

ITU assigns about two-dozen types of International Numbering Resources (INRs), either directly or indirectly.

Notifications of national numbering/identification plan update and assignment or reclamation of national numbering/identification resources were received and published in the [ITU Operational Bulletin](http://www.itu.int/pub/T-SP-OB). The ITU Operational Bulletin is published in the six official languages twice a month. Some 20 annexes on the lists of codes and the database includes numbers and codes allocated in accordance with the following recommendations are maintained:

* ITU-T E.164 "The international public telecommunication numbering plan"
* ITU-T E.118 "The international telecommunication charge card"
* ITU-T E.212 "The international identification plan for public networks and subscriptions"
* ITU-T E.218 "Management of the allocation of terrestrial trunk radio Mobile Country Codes"
* ITU-T Q.708 "Assignment procedures for international signalling point codes"

[Recommendation ITU-T E.156 “Guidelines for ITU-T action on reported misuse of E.164 number resources”](http://www.itu.int/rec/T-REC-E.156-200605-I) is under revision to include new cases of misuse and to investigate more efficient means of combating misuse.

Council 2016 instructed the Secretariat to submit to Council 2017 a study that identifies all possible sources of revenue, not just on INRs, in ITU, and to submit to Council 2017 the financial implications of the INR proposals discussed in Council 2016 taking into account the different views raised by Councilors.

A new WTSA-16 Resolution 91 on “Enhancing access to an electronic repository of information on numbering plans published by the ITU Telecommunication Standardization Sector” was approved by WTSA-16. It instructs ITU-T SG2 to study this matter on the basis of contributions received and information from TSB and to organize the necessary work in order to determine the requirements for electronic access to a repository of numbering resources reserved, assigned or allocated to each operator/service provider (to the extent available) within every country, including presentation of E.164 national numbering plans on the basis of Recommendation ITU T E.129, and international numbering resources assigned by the Director of TSB. Pursuant to the relevant ITU T Recommendations, Member States are invited to make available information on the presentation of their national numbering plans and amendments thereto in a timely manner, so as to ensure that the electronic repository remains up to date.

## 21.6 ITU-T Study Groups SharePoint collaboration sites

An online collaborative platform has been developed to further improve the electronic working methods of ITU-T Study Groups. Based on SharePoint, the collaboration site allows members to conduct online discussions and work on documents in a secure and shared environment. Several categories for online discussions based on the current structures of the different ITU-T Study Groups have been created and are now available for use. In addition, basic social media functionalities are also available to encourage lively and productive discussions between the members.

The SharePoint collaboration sites are being utilized actively in the work of ITU-T Focus Groups and their documents are now stored exclusively in SharePoint document libraries. The advanced features and tools available in SharePoint make it easier for participants to access and work more efficiently on their documents.

Some notable ITU-T Collaboration sites currently available are:

* Study Group 2 (<https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg2/>)
* Study Group 3 (<https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg3/>)
* Study Group 5 (<https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg5/>)
* Study Group 9 (<https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg9/>)
* Study Group 11 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg11/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg11/SitePages/Home.aspx))
* Study Group 12 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg12/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg12/SitePages/Home.aspx))
* Study Group 13 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg13/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg13/SitePages/Home.aspx))
* Study Group 15 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg15/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg15/SitePages/Home.aspx))
* Study Group 16 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg16/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg16/SitePages/Home.aspx))
* Study Group 17 (<https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg17/>)
* Study Group 20 ([https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg20/](https://extranet.itu.int/sites/itu-t/studygroups/2017-2020/sg20/SitePages/Home.aspx))
* FG DFS - Focus Group Digital Financial Services (<https://extranet.itu.int/ITU-T/focusgroups/fgdfs>)
* FG IMT-2020 - Focus Group on IMT-2020 (<https://extranet.itu.int/ITU-T/focusgroups/imt-2020>)
* United for Smart Sustainable Cities (<https://extranet.itu.int/sites/itu-t/initiatives/U4SSC/>)

## 21.7 TSB SharePoint Services Support site

A site dedicated to providing support to the users of SharePoint collaboration sites is available at: <https://extranet.itu.int/ITU-T/support/>. The support site which is regularly updated contains a knowledge base of FAQs and user guides on the various SharePoint services available to members.

## 21.8 Meeting Documents Sync Application

This application allows meeting participants to synchronize documents of the current meeting of an ITU-T Study Group from the ITU server to their local drive. The application is constantly enhanced and updated following feedback and suggestions from users. A new sync application for Rapporteur Group Meeting documents created in the new RGM system is also now available. 20.9 Electronic meetings

Since January 2014, TSB has been providing Adobe Connect as the remote participation tool for all official ITU-T meetings held at ITU Headquarters in Geneva. Users' TIES accounts grant access to sessions that require login details. Having two possibilities in terms of permissions to access sessions – TIES-secured, or open to guests – adds greater flexibility and security when organizing sessions and simplifies the login procedure for all participants. GoToMeeting is preferred as the tool to facilitate ad-hoc electronic meetings of working groups such as Rapporteur Groups. Statistics on e-Meetings have been compiled as from 2014 and are indicated below.

**Figure 10 – Remote participation and e-Meetings**

## 21.9 Online interim Rapporteur group and electronic meetings

Access to information about interim Rapporteur group meetings and e-Meetings of ITU-T Study Groups and TSAG is available, making it easier for delegates to find and participate in the most relevant ITU-T activities:

* Browse meetings of all groups simultaneously in the [ITU events calendar](http://www.itu.int/events/upcomingevents.asp?lang=en)
* View a specific study group's [Interim Meetings](http://www.itu.int/net/ITU-T/lists/rgmeetings.aspx?Group=15) (by following the link on the SG homepage under Other Meetings)
* Access detailed meeting information for a selected [event](http://www.itu.int/net/ITU-T/lists/rgmdetails.aspx?id=552&Group=15)
* Download a meeting notification letter to support participation
* Full search capacity from the [past events](http://www.itu.int/net/itu-t/lists/rgmeetings-past.aspx?Group=15) search page
* Export the list of meetings into an MS Word file.

## 21.10 Online form for new work item submission

An online version of [ITU-T A.1 (10/2016)](http://www.itu.int/ITU-T/recommendations/rec.aspx?id=13163&lang=en) Annex A justification form for proposal of new work items aiming at becoming Recommendations, is available for ITU-T Study Groups (e.g., <https://www.itu.int/ITU-T/workprog/secured/wp_new_item_in.aspx?sg=15>).

## 21.11 Use in the ITU-T of the languages of the Union on an equal footing

The Standardization Committee for Vocabulary (SCV), comprising of experts in the official languages, serves as focal point to ITU-T Study Groups in terminology-related matters and has provided consultation on terms and definitions to be adopted in ITU-T Recommendations. The Committee has met two times, both virtually, in the new study period in accordance with WTSA-16 Resolution 67. Both meetings were held jointly with the ITU-R Coordination Committee for Vocabulary (CCV).

TSB continues to collect all new terms and definitions proposed by ITU-T Study Groups, and enters them in the online ITU Terms and Definitions database.

As requested by Resolution 67 (Rev. Dubai, 2016) of WTSA, TSB continues to translate all Recommendations approved under the traditional approval process (TAP), as well as all TSAG reports in all the languages of the Union.

TSB translated two AAP Recommendations (128 English pages) in the reporting period, in accordance with requests previously received from the ITU-T Study Groups and linguistic groups, and within the allocated translation budget.

# 22 Implementation of WTSA-16 Resolutions

WTSA-16 Resolution 22 instructs the TSB Director to provide to each TSAG meeting a report on the implementation of WTSA resolutions and actions to be undertaken pursuant to their operative paragraphs. The WTSA-16 Action Plan ([TSAG TD 025](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-TSAG-170501-TD-GEN-0025)) assigns action items to the operational provisions in the Resolutions and also reports information on the progress of the implementation of those action items.

The WTSA-16 Resolutions are freely available at <http://www.itu.int/pub/T-RES>; and the ITU-T Recommendation A-Series are available at <http://www.itu.int/ITU-T/recommendations/index.aspx?ser=A>.

# 23 ITU-T's activities in the implementation of WSIS and the Sustainable Development Goals

ITU-T has undertaken a mapping of its activities to the UN Sustainable Development Goals (SDGs), an action highlighting the ITU-T activities most relevant to the SDGs and proposing actions for ITU-T to expand its contribution to the pursuit of the SDGs. This mapping of ITU-T work to the SDGs will support the WSIS process in its promotion of efforts to leverage ICTs for sustainable development (see the [WSIS-SDG Matrix](https://www.itu.int/net4/wsis/sdg/) linking WSIS Action Lines with the SDGs), highlighting areas where these efforts will receive support from the international standards developed by ITU-T. This mapping was presented to the February 2016 meeting of TSAG ([TSAG TD419](http://www.itu.int/md/T13-TSAG-160201-TD-GEN-0419/en)) and led to the development of a mapping tool to map all ITU-wide objectives and outputs to SDG goals and targets.

ITU-T's work contributes to the implementation of ITU mandates of the World Summit on the Information Society (WSIS), and in particular to Action Lines C2 (Information and communication infrastructure), C5 (Building confidence and security in the use of ICTs) and C7 (e-Environment).

# 24 Implementation of ITU-T A-series Recommendations

WTSA-16 Resolution 22 instructs the TSB Director to report to TSAG on the experience in the implementation of the A-series Recommendations for consideration by the ITU‑T membership.

Regarding the liaison template in Rec. ITU-T A.1, TSB noticed that the "For Comment" field of liaison statements should be discontinued in Rec. ITU-T A.1 as was agreed by TSAG 2016; however, those changes were missed to be brought to WTSA-16. Hence, there is a need to correct A.1 accordingly.

Concerning the two Focus Groups (DFS and IMT-2020) that concluded end of 2016, positive experiences were made in the implementation of Rec. ITU-T A.7, in particular with the streamlined transfer of deliverables from the Focus Groups to the parent study groups as per Rec. ITU-T A.7 Appendix I, which was found very useful.

## 24.1 Implementation of trail authorized by TSAG (July 2016 meeting)

In implementing the decision of TSAG July 2016 meeting (C.108/TSAG) SG13 set up an ad-hoc group on guidance for drafting technical Recommendations led by Mr Wu Tong (China Telecom) and Mr Marco Carugi (NEC, Japan). This ad-hoc will elaborate some directions how to draft the technical Recommendations in ITU-T. The first meeting of the group gathered the interest in elaboration of the other types of documents, such as “Schema” (e.g. UML, ASN.1 and XML schema for information modelling) and “APIs” related documents. The group is supposed to deliver the results of its findings by the first SG13 meeting in 2018. TSAG members are welcome to join the ad-hoc that will work mainly electronically.

# 25 Stale work items

WTSA-16 Resolution 22 instructs the TSB Director to provide information about any work item that has not given rise to any contribution in the time interval of the previous two study group meetings through his or her report about study group activity.

The following stale work items are identified:

No stale work item in SG13.

Other study group potentially having some stale work item will want to adapt to the new reporting modality first before being able to report on stale items.

# Appendix I – List of approved Recommendations and other approved texts

## I.1.2 Optical fibres

**ITU-T L.155 (revised) “Low-impact trenching technique for FTTx networks”** describes this trenching technique, which allows the easy installation, in narrow trenches, of underground optical cables and mini-cables in ducts or mini-ducts or directly buried. This type of narrow trench allows the use of reduced dimension machinery in small sized roads, typically those in cities, producing a lower quantity of waste material and so should be used in urban areas.

**ITU-T L.162 “Microduct technology and its applications”** describes the solutions for indoor and/or outdoor installation of microducts in different conditions: directly into the trench, existing pipes, aerial applications, access to buildings.

## I.1.3 Optical transmission systems

**ITU-T G.697 (revised) “Optical monitoring for dense wavelength division multiplexing systems”** defines optical monitoring (OM) that can help in dense wavelength division multiplexing (DWDM) systems to perform configuration management for system and channel activation, addition of new channels; fault management to detect and to isolate faults; and degradation management in order to keep the system running and to detect degradations before a fault occurs.

**ITU-T G.808 “Terminology for protection and restoration”** provides terms, definitions and abbreviations used in Recommendations that describe network protection and restoration.

**ITU-T G.870/Y.1352 (revised) “Terms and definitions for optical transport networks”** provides terms, definitions and abbreviations used in optical transport network (OTN) Recommendations.

**ITU-T G.872 (revised) “Architecture of optical transport networks”** describes the functional architecture of optical transport networks (OTN) using the modelling methodology described in Recommendations ITU‑T G.800 and ITU‑T G.805.

**ITU-T G.874.1 (revised) “Optical transport network (OTN): Protocol-neutral management information model for the network element view”** provides a protocol-neutral management information model for managing network elements in the optical transport network (OTN). The 2016 revision of this Recommendation has incorporated Amendment 1 and Amendment 2, and in additional the following updates: change the UML modeling tool from RSA to open source Papyrus tool, update the G.874.1 information model to align with the G.7711 v2.0 Core information model, drop subclassing the TP classes from M.3160, and support the additional management requirements in Recommendation ITU-T G.874.

## I.1.4 Optical fibre submarine cables

**ITU-T G.971 (revised) “General features of optical fibre submarine cable systems”** identifies the main features of optical fibre submarine cable systems, and to provide generic information on relevant Recommendations in the field of optical fibre submarine cable systems.

**ITU-T G.972 (revised) “Definition of terms relevant to optical fibre submarine cable systems”** provide definitions of terms relevant to optical fibre submarine cable systems, including terms relevant to system configuration, system aspects, terminal equipment, optical submarine repeaters and branching units, optical fibre submarine cable, manufacturing and installation, and the maintenance of the submarine portion.

**ITU-T G.973 (revised) “Characteristics of repeaterless optical fibre submarine cable systems”** is concerned primarily with the system performance and interface requirements of repeaterless optical fibre submarine cable systems. It considers both single wavelength systems (SWS), wavelength division multiplexing systems (WDMS), and dense wavelength division multiplexing systems (DWDMS). It also covers the aspects related to the applications of discrete optical fibre amplifiers (OFAs) (power amplifiers, pre-amplifiers, remote optically pumped amplifiers) and/or distributed remotely pumped OFAs using Raman amplification.

**ITU-T G.979 (revised) “Characteristics of monitoring systems for optical submarine cable systems”** is concerned with the characteristics of monitoring systems for optical fibre submarine cable systems. It covers the aspects relating to functional architecture, the characteristics of monitoring equipment and the parameters for monitoring.

## I.1.5 Transport network control aspects

**ITU-T G.7701 “Common Control Aspects”** describes concepts that are common to both SDN controller and ASON control approaches, including common aspects of the interaction between the control functions, management functions and transport resources.

**ITU-T G.7711/Y.1702 (revised) “Generic protocol-neutral information model for transport resources”** specifies a core information model of transport resources. The information model is applicable for the management and control of the transport network regardless of whether the transport networks utilize traditional OSS management, ASON control plane, or SDN controller to configure transport connectivity. The model is also applicable [to the management and control of the transport network] regardless of the technology of the underlying transport network.

**I.1.6 Ethernet over transport networks**

**ITU-T G.8011/Y.1307 (revised) “Ethernet service characteristics”** describes a framework for defining network-oriented characteristics of Ethernet services based on Metro Ethernet Forum (MEF) specifications. The framework is supported by the modelling of Ethernet layer networks described in ITU-T and MEF. The service definition, service attributes and operation, administration and maintenance (OAM) introduced in this framework are used to create numerous specific Ethernet services.

**ITU-T G.8012/Y.1308 (2004) Amd.2 “Ethernet UNI and Ethernet over Transport NNI: Amendment 2”** avoids redefining terms defined in Recommendations ITU-T G.8001/Y.1354 and G.8101/Y.1355 by referencing these Recommendations.

**ITU-T G.8021/Y.1341 (revised) “Characteristics of Ethernet transport network equipment functional blocks”** specifies both the functional components and the methodology that should be used in order to specify the Ethernet transport network functionality of network elements; it does not specify individual Ethernet transport network equipment.

**ITU-T G.8032/Y.1344 (2015) Amd.1 “Ethernet ring protection switching: Amendment 1”** provides support for management information indicating the node state of an Ethernet ring node and the port states of an Ethernet ring node’s ports.

**ITU-T G.8052/Y.1346 (revised) “Protocol-neutral management information model for the Ethernet Transport capable network element”** contains the protocol neutral UML information model for Ethernet Transport NE Management. The 2016 revision of this Recommendation has changed the UML modeling tool from RSA to open source Papyrus tool, update the ITU-T G.8052 information model to align with the ITU-T G.7711 v2.0 Core information model, drop subclassing the TP classes from ITU-T M.3160, and support the additional management requirements in Recommendation ITU-T G.8051.

**I.1.7 MPLS over transport networks**

**ITU-T G.8101/Y.1355 (revised) “Terms and definitions for MPLS transport profile”** is a compilation of terms and abbreviations used in MPLS transport profile Recommendations.

**ITU-T G.8131/Y.1382 (2014) Amd.2 “Linear protection switching for MPLS transport profile (MPLS-TP): Amendment 2”** provides support for pseudowire (PW) protection, and modifications to the references of terms related to new Recommendation G.808.

**ITU-T G.8152/Y.1375 “Protocol-neutral management information model for the MPLS-TP network element”** contains the protocol neutral UML model for MPLS-TP NE Management, and provides a representation of the MPLS-TP technology using the methodologies that have been used for other transport technologies (e.g. SDH, OTN and Ethernet).

**I.1.8 Synchronization and timing**

**ITU-T G.8266/Y.1376 “Timing characteristics of telecom grandmaster clocks for frequency synchronization”** specifies the requirements for packet master clocks suitable for frequency synchronization in packet networks.

**ITU-T G.8272.1/Y.1367.1 “Timing characteristics of enhanced primary reference time clocks”** specifies the requirements for enhanced primary reference time clocks (ePRTCs) suitable for time and phase synchronization in packet networks. It defines the error allowed at the time output of the ePRTC.

**ITU-T G.8273.2/Y.1368.2 (revised) “Timing characteristics of telecom boundary clocks and telecom time slave clocks”** specifies minimum requirements for time and phase for telecom boundary clocks and telecom time slave clocks used in synchronization network equipment that operates in the network architecture as defined in Recommendations ITU-T G.8271, ITU‑T G.8271.1, ITU-T G.8275 and ITU-T G.8275.1. It supports time and/or phase synchronization distribution for packet based networks.

## I.1.10 Cable

**ITU-T J.94 (revised) “Service information for digital broadcasting in cable television systems”** specifies Service Information (SI) describing the services residing within streams constructed in accordance with ITU-T Rec. H.222.0 | ISO/IEC 13818-1 (MPEG-2 Systems), and defines the standard protocol for transmission of the relevant SI data tables carried in the MPEG-2 Transport Stream multiplex.

**ITU-T J.223.2 “Cabinet DOCSIS (C-DOCSIS) System Specification”** defines the system architecture, the functional modules within the C-DOCSIS system, three different C-DOCSIS systems utilizing the functional modules, and the data and control interfaces between these modules for each of those systems. It also defines general device requirements for the different C-DOCSIS systems. With C-DOCSIS system, the modules that perform the physical layer and data link layer function can be deployed in the optical nodes of the HFC cable network.

**ITU-T J.297 “Requirements and functional specification of cable set top box for 4K ultra high definition television”** specifies requirements and functional specification for 4K Cable STB (Set Top Box) that enables 4K UHDTV (Ultra High Definition Television) service reception over cable network considering the compatibility and differences from the existing 2K Cable STB.

**ITU-T J.1104 “Control specification for IP-based switched digital video using Data Over Cable Service Interface Specifications”** describes the operator control specifications of IP-based switched digital video (SDV) using data over cable service interface specifications (DOCSIS) in a digital cable networks.

**ITU-T J.1105 “Requirement of channel switching service over Hybrid Fiber and Coaxial based network”** describes the requirement of channel switching service over Hybrid Fiber and Coaxial based network.

## I.2.1 Ultra-high-speed optical core network: OTN beyond 100G

**ITU-T G.709/Y.1331 Amd.1 “Interfaces for the optical transport network”** contains extensions to the fifth edition (06/2016) of ITU-T Recommendation G.709/Y.1331.

**ITU-T G.709.1/Y.1331.1 “Flexible OTN short-reach interface”** specifies functions associated with the n x 100 Gbit/s FlexO Group interface application.

## I.2.2 Ultra-high-speed access NG-PON2

**ITU-T G.989.3 (2015) Amd.1 “40-Gigabit-capable passive optical networks (NG-PON2): Transmission Convergence Layer Specification – Amendment 1”** contains necessary additional details and clarifications for the Recommendation and provides regular specification maintenance.

## I.3.2 Smart ubiquitous networks, next-generation networks evolution, and future networks

**ITU-T Y.2041 “Policy Control Mechanism in Multi-connection”** describes policy control mechanism in multi-connection. The recommendation also covers scenarios, requirements, solutions, information flows. ITU-T Y.2041 provides a coordination mechanism to ensure that all policies can work together in a coherent manner for multi-connection.

**ITU-T Y.2304 “Network intelligence capability enhancement - Requirements and capabilities to support mobile content delivery optimization”** identifies the technical requirements and the enhanced NICE capabilities to support mobile content delivery optimization. In order to support mobile content delivery optimization, the NICE capabilities need to be specifically enhanced as follows: the access and core transport capabilities are required to be enhanced to support cache in access and core network, the policy control and enforcement capabilities are required to be enhanced to support caching policy and content transcoding, the content and context detection and analysis capabilities are required to be enhanced to support network status collection and mobility information updates, and the open environment capabilities are required to be enhanced to support 3rd party mobile content delivery applications.

**ITU-T Y.2341 “Next Generation Network evolution - Requirements and capabilities for supporting authorized account messaging service”** specifies requirements of profile management, identification, messaging related features, open API, resource allocation and policy control, as well as capabilities support of service stratum, transport stratum and end user in Next Generation Network (NGN) evolution for supporting authorized account messaging service.

**ITU-T Y.2773 “Performance models and metrics for deep packet inspection”** specifies the performance models and metrics for deep packet inspection in evolving networks.

**ITU-T Y.3051 “The basic principles of trusted environment in ICT infrastructure”** is devoted to the issue of creating trusted environment in ICT infrastructure providing information and communication services. The Recommendation provides the definition, common requirements and the basic principles of creating trusted environment.

**ITU-T Y.3052 “Overview of trust provisioning for ICT infrastructures and services”** provides an overview of trust provisioning in ICT infrastructures and services. It introduces necessity of trust to cope with potential risks due to lack of trust. The concept of trust provisioning is explained on the trusted ICT infrastructures and services. From the general concept of trust, the key characteristics of trust are described. In addition, the trust relationship model and trust evaluation based on the conceptual model of trust provisioning are introduced. Finally, it describes trust provisioning processes in ICT infrastructures and services.

**ITU-T Y.3071 “Data Aware Networking (Information Centric Networking) - Requirements and Capabilities”** specifies the requirements and capabilities of data aware networking (DAN) to realize the use cases and scenarios described in ITU-T Supplement 35 to Recommendation Y.3033, Data aware networking – Scenarios and use cases, which are expected to be major applications/services provided on DAN. One of the objectives reflecting emerging requirements for future networks (FNs) is data awareness as specified in ITU-T Recommendation Y.3001 – Future networks: Objectives and design goals. DAN is expected to have capabilities optimized to handle enormous amount of data and to enable users to access desired data safely, easily, quickly, and accurately, regardless of their location by making information the destination of request delivery. DAN can be rephrased as the networking whose central concern is retrieving information, i.e., information centric networking (ICN).

**ITU-T Y.3301 “Functional requirements of software-defined networking”** describes the functional requirements of software-defined networking (SDN) including the general requirements and functional requirements of the SDN application layer, SDN control layer, SDN resource layer and any multilayer management functions.

**ITU-T Y.3302 “Functional architecture of software-defined networking”** defines the functional architecture of SDN with descriptions of functional components and reference points. The described functional architecture can be used as an enabler for further studies on other aspects such as protocols and security as well as being used to customize SDN in support of appropriate use cases (e.g., cloud computing, mobile networks).describes the framework of software-defined networking (SDN) including definitions, objectives, high-level capabilities, requirements and the high-level architecture of SDN.

**ITU-T Y.3323 “Requirements of soft network architecture for mobile”** defines the design principles and requirements of soft network architecture for mobile (SAME), i.e., flexible traffic steering, virtualization of SAME network functions, SAME network slice, and separation of control function and forwarding function.

## I.3.5 Software-defined networking

**ITU-T L.1360 “Energy control of SDN architecture”** defines the integration of Green Abstraction Layer into a Software-Defined Networking architecture ITU-T Y.3302 in which the connections between a set of network resources are on demand and are managed by one or more Software-Defined Networking controllers.

**ITU-T X.1038 “Security requirements and reference architecture for software-defined networking”** supports security protection and provides security requirements and a reference architecture for software-defined networking (SDN). ITU-T X.1038 identifies new security threats as well as traditional network security threats to SDN, defines security requirements, provides possible security countermeasures against new security threats, and designs a security reference architecture for SDN.

**ITU-T Y.3302 “Functional architecture of software-defined networking”** describes the framework of software-defined networking (SDN) including definitions, objectives, high-level capabilities, requirements and the high-level architecture of SDN, whereas Recommendation ITU-T Y.3301 describes more detailed requirements. Y.3302 provides the functional architecture of SDN with descriptions of functional components and reference points. The described functional architecture is intended to be used as an enabler for further studies on other aspects such as protocols and security as well as being used to customize SDN in support of appropriate use cases (e.g., cloud computing, mobile networks).

## I.3.6 Cloud computing

**ITU-T M.3371 “Requirements for Service Management in Cloud-aware Telecommunication Management System”** defines the general and functional management requirements that support the service management in cloud-aware telecommunication management System and provides functional framework for service management in cloud-aware telecommunication management system.

### I.4.1.1 ITU-T H.265 High Efficiency Video Coding

**ITU-T H.265 “High Efficiency Video Coding”** **(revised)** is the successor to the Primetime Emmy award-winning standard ITU-T H.264, which remains the most-deployed video codec worldwide and accounts for some 80 per cent of today's web video. Version 4 adds screen content coding extensions profiles, scalable range extensions profiles, additional high throughput profiles, additional supplement enhancement information, additional colour representation identifiers, and corrections to various minor defects in the prior content of the Specification.

With double the compression power of its predecessor, ITU-T H.265 HEVC will unleash a new phase of innovation in video production spanning the whole ICT spectrum, from mobile devices through to Ultra-High Definition TV. The standard will also assist in easing the burden on global networks increasingly geared towards a massive exchange of video traffic.

Known formally as ITU-T H.265 | ISO/IEC 23008-2, HEVC is the product of collaboration between the ITU Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG).

**ITU-T H.265.1 (V2) (revised) “Conformance specification for ITU-T H.265 high efficiency video coding”** specifies tests for (non-exhaustive) testing to verify whether bitstreams and decoders meet the normative requirements specified in ITU T H.265 | ISO/IEC 23008-2.

**ITU-T H.265.2 (V3) (revised) “Reference software for ITU-T H.265 high efficiency video coding”** provides reference decoder software capable of decoding and producing bitstreams that conform to Rec. ITU-T H.265 | ISO/IEC 23008-2.

**ITU-T H.273 “Coding-independent code points for video signal type identification”** defines various code points and fields that establish properties of a video (or still image) representation and are independent of the compression encoding and bit rate. These properties may describe the appropriate interpretation of decoded data or may, similarly, describe the characteristics of such signal before the signals compressed by an encoder that is suitable for compressing such an input signal.

## I.4.2 Intelligent, interoperable visual surveillance systems

**ITU-T H.627.1 “Protocols for mobile visual surveillance”** describes the detailed specification of reference points, message flows control methods, and overall protocols of a mobile visual surveillance system based on the requirements described in Recommendation ITU-T F.743 and functional architecture described in Recommendation ITU-T H.626.1. This Recommendation focuses on the protocols of a visual surveillance system with mobile units and the services related to mobile units, such as a mobile customer unit accessing real-time video stream from a visual surveillance system. This Recommendation defines reference points, message syntax and semantics, and relevant protocols.

## I.4.3 Smart television systems

**ITU-T J.302 “System Specifications of Augmented Reality Smart Television Service”** specifies the related technologies that should be implemented for augmented reality smart television system; allowing TV viewers to choose whether a user turns on the augmented content or watches the original TV content only (without the augmented content).

## I.4.4 IPTV and digital signage

**ITU-T H.763.2 “Scalable vector graphics for IPTV services”** describes the functionalities of SVG Tiny, which is issued by W3C, as one of multimedia application frameworks for IPTV services. According to different capabilities of terminal devices on supported services and processing performance, SVG Tiny is classified into "Basic Profile" and "Advanced Profile" for different IPTV terminal device models in this Recommendation. SVG basic profile is designed for the IPTV TD basic model [ITU-T H.721] and mobile model [ITU-T H.723], and SVG advanced profile is designed for the IPTV TD full-fledged model [ITU-T H.722]. SVG advanced profile supports more capabilities of two-dimensional graphics’ rendering than SVG basic profile, particularly in styling, animation, multimedia and interactivity. This Recommendation describes the required aspects of SVG modules, elements, attributes and properties to be supported by those two profiles. It also gives some typical example codes or simulation results.

## I.4.7 New standards to assess quality of adaptive-bitrate video streaming

**ITU-T G.1071 (revised) “Opinion model for network planning of video and audio streaming applications”** provides algorithmic models for network planning of IP-based video services. ITU-T G.1071 addresses the higher resolution (HR) application area, including services such as IPTV; and the lower resolution (LR) application area, including services such as mobile TV.

**ITU-T P.1203 “Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport”** provides the introductory document for a set of documents that describe model algorithms for monitoring the integral media session quality for TCP-type video streaming.

**ITU-T P.1203.1 “Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport - video quality estimation module”** specifies the short-term video representation quality estimation modules for ITU-T P.1203 (*Pv* module). The *Pv* module comprises components reflecting the effects due to video compression, up-scaling of content and the effect due to low frame rates.

**ITU-T P.1203.2 “Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport - audio quality estimation module”** specifies the short-term audio quality estimation module for Rec. P.1203. ITU-T P.1203.2provides details for the module for bitstream-based, short-term audio quality estimation.

**ITU-T P.1203.3 “Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport - quality integration module”** specifies the quality integration module for ITU-T P.1203. ITU-T P.1203.3 can be applied to the monitoring of performance and quality of experience (QoE) of video services such as adaptive bitrate video streaming.

## I.4.8 New services and applications

**ITU-T F.743.4 “Functional requirements for virtual content delivery networks”** specifies the requirements for virtual content delivery network (VCDN), including requirements on service provision, physical resource management, virtual resource management, VCDN logically isolated network partition (LINP) management, service management, backbone network, and security consideration.

**ITU-T F.746.4 “Requirements for deployment of information centric networks”** describes the scenarios and requirements for deployment of information centric networks (ICN). The deployment supports flexible methods for deploying various ICN instances on a single network service provider (NSP) network, deploying an ICN instance over multiple NSP networks, and interoperating between different ICN instances. The framework requires decoupling the data plane and the control plane, and it is required to have one or more switches and controllers supporting such deployment. The software and hardware resources in the switches and controllers are required to be virtualized and to be used to create ICN instances. There exist appropriate inter-ICN service providers interfaces to facilitate interoperations between two ICN instances.

**ITU-T H.222.0 (2014) Amd.7 “Information technology - Generic coding of moving pictures and associated audio information: Systems: Virtual segmentation”** enables signaling and notation of a stream with virtual segmentation carried in MPEG-2 transport stream.

**ITU-T H.222.0 (2014) Amd.8 “Information technology - Generic coding of moving pictures and associated audio information: Systems: Signalling HDR and WCG video content in MPEG-2 systems”** specifies MPEG-2 TS ‘signaling’ to indicate presence of WCG and HDR video in the HEVC elementary stream.

**ITU-T H.625 “Architecture for network-based speech-to-speech translation services”** defines the system architecture for network-based speech-to-speech translation (S2ST) on the basis of Recommendation ITU-T F.745 and serves as a technical introduction to the subsequent definitions of detailed system components and protocols. The scope of this Recommendation is to describe the functional architecture and mechanisms of network‑based S2ST, interface protocols between S2ST modules, and a workflow of the network-based S2ST system. This revision includes additional information to clarify that H.625 could be applicable to both face-to-face communication and remote communication. The modality conversion markup language (MCML) is also enhanced for adding more flexibility.

**ITU-T T.621 “File structure for interactive mobile comic and animation content”** defines an interactive mobile comic and animation file structure used for organization and storage of mobile animation contents. This Recommendation can be used as a guideline for creation, processing, transmission and play of mobile animation contents.

**I.5.1 Internet of Things and Smart City**

**ITU-T X.1362 “Simple encryption procedure for Internet of things (IoT) environments”** specifies encryption with associated mask data (EAMD) for the Internet of things (IoT) devices. It describes EAMD and how it provides a set of security services for traffic using it.

## I.5.3 Cities trialling ITU key performance indicators for smart sustainable cities

**ITU-T L.1603/Y.4903 "Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals"** gives general guidance to cities and provides Key Performance Indicators (KPIs) for Smart Sustainable Cities (SSCs) to help cities achieve Sustainable Development Goals (SDGs).

## I.5.5 Connected vehicles, automated driving and intelligent transport systems

**ITU-T F.749.2 “Service requirements for vehicle gateway platforms”** describes the service requirements and functional requirements for the vehicle gateway platform in the intelligent transport system.

**ITU-T P.1100 (revised) “Narrowband hands-free communication in motor vehicles”** describes performance requirements and test methods for narrow-band hands‑free communication in vehicles. This Recommendation addresses the test of complete systems as well as the subsystems of hands‑free microphone and telephone with short-range wireless transmission link used to interconnect the hands-free system to the mobile network.

**ITU-T P.1110 (revised) “Wideband hands-free communication in motor vehicles”** describes performance requirements and test methods for wideband hands‑free communication in motor vehicles. This Recommendation addresses the test of complete systems as well as the subsystems hands-free microphone and the telephone with short-range wireless transmission link used to transmit the speech signals from the hands-free system to the mobile network.

**ITU-T P.1120 “Super-WideBand (SWB) and FullBand (FB) stereo hands-free communication in motor vehicles”** provides guidance to systems architects, developers, and test engineers of integrated automotive speakerphones that operate around Super-WideBand (50-14,000Hz) and/or FullBand (20-20,000Hz) audio bandwidths.

**ITU-T P.1140 (revised) “Speech Quality Requirements for Emergency Calls”** defines use cases, requirements and associated test methods for speech communication for emergency call communications originating from vehicles using a dedicated emergency call system covering built-in emergency call systems (manufacturer installed) as well as after-market emergency call kits.

**ITU-T X.1373 “Secure software update capability for intelligent transportation system communication devices”** provides secure software update procedures between software update server and vehicles with appropriate security controls. This Recommendation can be practically utilized by car manufactures and ITS-related industries as a set of standard capabilities for best practices.

## I.6.2 New security standards

**ITU-T X.500 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Overview of concepts, models and services**” introduces the concepts of the Directory and the DIB (Directory Information Base) and overviews the services and capabilities which they provide.

**ITU-T X.501 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Models”** provides a number of different models for the Directory as a framework for the other Recommendations in the ITU-T X.500-series. The models are the overall (functional) model, the administrative authority model, generic Directory Information models providing Directory User and Administrative User views on Directory information, generic Directory System Agent (DSA) and DSA information models and operational framework, and a security model.

**ITU-T X.509 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks”** defines frameworks for public-key infrastructure (PKI) and privilege management infrastructure (PMI), and specifies the following data types: public-key certificate, attribute certificate, certificate revocation list (CRL) and attribute certificate revocation list (ACRL). It also defines several certificates and CRL extensions, and it defines directory schema information allowing PKI and PMI related data to be stored in a directory.

**ITU-T X.511 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Abstract service definition”** defines in an abstract way the externally visible services provided by the Directory, including bind and unbind operations, read operations, search operations, modify operations, operations to support password policies and operations to support interworking with LDAP.

**ITU-T X.518 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Procedures for distributed operation”** specifies the procedures required for a distributed directory consisting of a mix of Directory System Agents (DSAs) and lightweight directory access protocol (LDAP) servers acting together to provide a consistent service to its users, independent of the point of access. It also describes procedures for protocol conversion between the directory access protocol/directory system protocol (DAP/DSP) protocols and the LDAP protocol.

**ITU-T X.519 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Protocols specifications”** specifies the Directory Access Protocol, the Directory System Protocol, the Directory Information Shadowing Protocol and the Directory Operational Binding Management Protocol which fulfil the abstract services specified in Recommendation ITU-T X.501 | ISO/IEC 9594-2, Recommendation ITU T X.511 | ISO/IEC 9594-3, Recommendation ITU-T X.518 | ISO/IEC 9594-4 and Recommendation ITU-T X.525 | ISO/IEC 9594-9. It includes specifications for supporting underlying protocols to reduce the dependency on external specifications.

**ITU-T X.520 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Selected attribute types”** defines a number of attribute types and matching rules which may be found useful across a range of applications of the Directory. One particular use for many of the attributes defined is in the formation of names, particularly for the classes of objects defined in Rec. ITU-T X.521 | ISO/IEC 9594-7. Other attributes types, called notification attributes, provide diagnostic information. This Recommendation | International Standard defines context types which supply characteristics associated with attribute values. It also includes definitions for LDAP syntaxes relevant for attribute types and matching rules.

**ITU-T X.521 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Selected object classes”** defines a number of selected object classes and name forms which may be found useful across a range of applications of the Directory.

**ITU-T X.525 (revised, 8th edition) “Information technology - Open Systems Interconnection - The Directory: Replication”** specifies a shadow service which Directory system agents (DSAs) may use to replicate Directory information. The service allows Directory information to be replicated among DSAs to improve service to Directory users, and provides for the automatic updating of this information.

**ITU-T X.1058 “Information technology – Security techniques – Code of practice for personally identifiable information protection”**establishes control objectives, controls and guidelines for implementing controls, to meet the requirements identified by a risk and impact assessment related to the protection of Personally Identifiable Information (PII). In particular, this document specifies guidelines based on ISO/IEC 27002, taking into consideration the requirements for processing PII which may be applicable within the context of an organization's information security risk environment(s).

**ITU-T X.1039 “Technical security measures for implementation of ITU-T X.805 security dimensions”** provides a set of security measures to implement the high-level dimensions. It also provides technical implementation guidance for security measures that can be used to improve organizations’ security response capabilities.

**ITU-T X.1085 “Information technology - Security techniques - Telebiometric authentication framework using biometric hardware security module”** describes a telebiometric authentication scheme using biometric hardware security module (BHSM) for the telebiometric authentication of proving owner of X.509 certificate registered individual at RA (Register Authority), and provides the requirements for deploying the BHSM scheme to securely operate the telebiometric authentication under PKI environments.

**ITU-T X.1087 “Technical and operational countermeasures for telebiometric applications using mobile devices”** specifies the implementation model and threats in the operating telebiometric systems in mobile devices and provides a general guideline for security countermeasures from both the technical and operational perspectives in order to establish a safe mobile environment for the use of telebiometric systems.

**ITU-T X.1126 “Guidelines on mitigating the negative effects of infected terminals in mobile networks”** provides guidelines to mobile operators to restrain the infected terminals by utilizing technologies in the mobile network to protect both subscribers and mobile operators. This Recommendation describes the characteristics and effects of malicious software caused by unhealthy ecosystems in the mobile environment. Based on network-side technologies, this Recommendation focuses on mitigating the vicious effects caused by infected terminals. This Recommendation defines and organizes the mitigating measures and corresponding technologies.

**ITU-T X.1212 “Design considerations for improved end-user perception of trustworthiness indicators”** describes design considerations for improved end-user perception of trustworthiness indicators. The appendices describe representative techniques for measuring the end-user perception of such indicators.

**ITU-T X.1362 “Simple encryption procedure for Internet of things (IoT) environments”** specifies encryption with associated mask data (EAMD) for the Internet of things (IoT) devices. It describes EAMD and how it provides a set of security services for traffic using it.

**ITU-T X.1373 “Secure software update capability for intelligent transportation system communication devices”** provides secure software update procedures between software update server and vehicles with appropriate security controls. This Recommendation can be practically utilized by car manufactures and ITS-related industries as a set of standard capabilities for best practices.

**ITU-T X.1550 “Access control models for incidents exchange networks”** introduces existing approaches for implementing access control policies for incident exchange networks. This Recommendation introduces a variety of well-established access control models, sharing models as well as criteria for evaluating incident exchange network performance. Standards-based solutions are considered to facilitate implementation of different access control models within different cybersecurity information sharing models and under diverse trust environments.

**ITU-T Y.3051 “The basic principles of trusted environment in ICT infrastructure”** is devoted to the issue of creating trusted environment in ICT infrastructure providing information and communication services. The Recommendation provides the definition, common requirements and the basic principles of creating trusted environment.

**ITU-T Y.3052 “Overview of trust provisioning for ICT infrastructures and services”** provides an overview of trust provisioning in ICT infrastructures and services. It introduces necessity of trust to cope with potential risks due to lack of trust. The concept of trust provisioning is explained on the trusted ICT infrastructures and services. From the general concept of trust, the key characteristics of trust are described. In addition, the trust relationship model and trust evaluation based on the conceptual model of trust provisioning are introduced. Finally, it describes trust provisioning processes in ICT infrastructures and services.

**ITU-T Z.109 (revised) “Specification and Description Language - Unified modeling language profile for SDL-2010”** defines a unified modeling language (UML) profile that maps to SDL‑2010 semantics so that UML is able to be used in combination with the ITU‑T Specification and Description Language.

**ITU-T Z.161 (revised) “Testing and Test Control Notation version 3: TTCN-3 core language”** defines TTCN-3 (Testing and Test Control Notation 3) intended for specification of test suites that are independent of platforms, test methods, protocol layers and protocols.

**ITU-T Z.164 (revised) “Testing and Test Control Notation version 3: TTCN-3 operational semantics”** defines the operational semantics of TTCN-3 (Testing and Test Control Notation 3).

**ITU-T Z.166 (revised) “Testing and Test Control Notation version 3: TTCN-3 control interface (TCI)”** specifies the control interfaces for TTCN-3 test system implementations, and provides a standardized adaptation for management, test component handling and encoding/decoding of a test system to a particular test platform.

**ITU-T Z.169 (revised) “Testing and Test Control Notation version 3: Using XML schema with TTCN-3”** defines the mapping rules for W3C Schema to TTCN-3 to enable testing of XML-based systems, interfaces and protocols.

**ITU-T Z.100 Annex F1 (revised) “Specification and Description Language - Overview of SDL-2010 - SDL formal definition: General overview”** provides the motivation for and the main objectives of a formal semantics definition for SDL-2010. It gives an overview of the structure of the formal semantics, and it also contains an introduction to the Abstract State Machine (ASM) formalism, which is used to define the SDL‑2010 semantics.

**ITU-T Z.100 Annex F2 (revised) “Specification and Description Language - Overview of SDL-2010 - SDL formal definition: Static semantics”** describes the static semantic constraints of SDL-2010, and it also describes the transformations identified by the 'Model' clauses of Recommendations ITU-T Z.101, Z.102, Z.103, Z.104, Z.105 and Z.107, that are included by reference in Recommendation ITU-T Z.100.

**ITU-T Z.100 Annex F3 (revised) “Specification and Description Language - Overview of SDL-2010 - SDL formal definition: Dynamic semantics”** defines the SDL 2010 dynamic semantics.

## I.7.1 Green ICT standards

**ITU-T F.747.9 “Requirements and architecture for energy management services”** describes requirements, scenarios and functional architecture for user-side energy Management Service (EMS) where energy consumption equipment with heterogeneous metering and control capacities coexist, and helps making energy-saving decisions based on multiple factors, such as the demands and optimization policies from the users, the pricing strategies from the suppliers, government subsidies, device status et al.

**ITU-T L.1006 “Test suites for assessment of the External universal power adapter solutions for stationary information and communication technology devices”** describes the general test suites applicable to the universal power adapter solution (UPA) designed for ICT devices for stationary (non-portable) use defined in ITU-T L.1001.

**ITU-T L.1007 “Test suites for assessment of the External universal power adapter solutions for portable information and communication technology devices”** considers the creation of specific test suites to assess certain functional aspects of the: energy efficiency, interworking, safety and electromagnetic compatibility (EMC) of universal power adapter solution (UPA) designed for ICT devices for portable use.

**ITU-T L.1205 “Interfacing of renewable energy or distributed power sources to up to 400 VDC power feeding systems”** defines the coupling of local or remote renewable energy into an up to 400 VDC power system without reducing DC performances defined in ITU-T L.1202 mainly for efficiency and reliability. The main advantages are saving of fossil fuel (as a source of primary energy consumption), reduction of GHG emission and increase of resilience.

**ITU-T L.1315 “Standardization terms and trends in energy efficiency”** (under approval) contains high level definition of energy efficiency, energy management requirement to increase the energy efficiency of ICT goods/networks/services.

**ITU-T L.1325 “Green ICT solutions for telecom network facilities”** specifies Green ICT solutions for telecom network facilities allowing to introduce highly-efficient infrastructure solutions, including highly-efficient power solutions, renewable energy solutions, air-conditioning energy saving solutions and free and economized cooling solutions.

**ITU-T L.1331 “Assessment of mobile network energy efficiency”** (under approval) provide a better understanding of the energy efficiency of mobile networks. The focus is on the metrics and methods of assessing energy efficiency in operational networks and explains how to extrapolate the measurements made on partial networks to the level of the total network.

**ITU-T L.1350 “Energy efficiency metric of base station site”** contains basic definitions of energy efficiency metrics, to evaluate the energy efficiency of a base station site including the energy consumption for all the telecom equipment inside the base station site, the entire infrastructure, and energy losses due to AC/DC rectifiers, generator and cable losses.

**ITU-T L.1360 “Energy control of SDN architecture”** defines the integration of Green Abstraction Layer into a Software-Defined Networking architecture ITU-T Y.3302 in which the connections between a set of network resources are on demand and are managed by one or more Software-Defined Networking controllers.

**ITU-T L.1504 “ICT and adaptation of agriculture to the effects of climate change”** provides a description of how the use of ICT can help sustain the agricultural sector in the event of poor yields or disasters triggered by climate change.

## I.7.2 Electromagnetic fields

**ITU-T K.20 (revised) “Resistibility of telecommunication equipment installed in a telecommunication centre to overvoltages and overcurrents”** specifies resistibility requirements and test procedures for telecommunication equipment that is attached to or installed within a telecommunication centre.

**ITU-T K.21 (revised) “Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents”** specifies resistibility requirements and test procedures for telecommunication equipment that is attached to or installed within a customer's premises.

**ITU-T K.45 (revised) “Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents”** specifies resistibility requirements and test procedures for telecommunication equipment installed between telecommunication centres and between a telecommunication centre and the customer's premises.

**ITU-T K.50 (revised) “Safe limits for operating voltages and currents in telecommunication systems powered over the network”** provides guidance on voltages and currents that may safely be used to power telecommunication systems that are part of the network of telecommunications service providers.

**ITU-T K.52 (revised) “Guidance on complying with limits for human exposure to electromagnetic fields”** aims to help with compliance of telecommunication installations and mobile handsets or other radiating devices used against the head with safety limits for human exposure to electromagnetic fields (EMFs).

**ITU-T K.93 (revised) “Immunity of home network devices to electromagnetic disturbance”** aims to ensure normal operation of home networking devices and to provide a new additional immunity test method for broadband services, especially for devices that are sensitive to broadband interferences.

**ITU-T K.117 “Primary protector parameters for the surge protection of equipment Ethernet ports”** specifies the common-mode, common mode to differential mode conversion and differential mode surge parameter and test circuit requirements of an Ethernet port primary protector.

**ITU-T K.118 “Requirements for Lightning Protection of Fibre To The distribution point (FTTdp) Equipment”** contains the necessary information to enable the protection of a Distribution Point (DP) node in the access network and the associated equipment in the customers’ premises. It includes information on the resistibility requirements of the equipment, the rating of the lightning protection, when the installation of protection is necessary and on how to install this protection.

**ITU-T K.119 “Conformance Assessment of Radio Base Stations Regarding Lightning Protection and Earthing”** provides the technical requirements and measurement methods to assess the validity and reliability of the lightning protection and earthing system of radio base stations (RBSs). It focuses on the quality control in the process of construction, acceptance, inspection and maintenance.

**ITU-T K.120 “Lightning Protection and Earthing of Miniature Base Station”** provides guidelines for lightning protection and earthing of miniature base station against lightning surge, especially for those of unexposed environments (to lightning) and unconventional telecommunication sites.

**ITU-T K.121 “Guidance on the Environmental Management for Compliance with Radio Frequency EMF Limits for Radiocommunication Base Stations”** gives guidance on how to manage the compliance with RF-EMF limits in areas near to radiocommunication installations and how to establish processes for responding to public concern about exposure to RF-EMF.

**ITU-T K.122 “Exposure levels in the close proximity of the radiocommunication antennas”** gives information concerning the electric field strength levels that can be expected in close proximity to the broadcasting and radiocommunication antennas so that a comparison with the exposure limits is possible.

**ITU-T K.123 “EMC requirements for electrical equipment in telecommunication facilities”** describes the requirements for radiated and conducted emissions from electrical systems installed in telecommunication facilities.

**ITU-T K.124 “Overview of particle radiation effects on telecommunications systems”** provides basic guidance on soft errors that are caused by particle radiation and that affect telecommunication systems, and details the phenomena of soft errors that arise from particle radiation.

## I.7.4 Emergency communication & disaster relief

**ITU-T E.119 “Requirements for safety confirmation and broadcast message service for disaster relief”** describes the requirements for safety confirmation and broadcast messaging for disaster relief, which can realize public organizations’ business continuity plans (BCP) and can, to the best of their ability, help protect lives and property during a disaster.

## I.8.1 IXP, Universal service, NGN, Mobile Roaming and SMP

**ITU-T D.52 "Establishing and connecting regional Internet Exchange Points (IXPs) to reduce costs of international Internet connectivity"** guides regional collaboration to establish central hubs (IXPs) that enable local Internet traffic to be routed locally, saving international bandwidth and reducing the costs of international Internet connectivity.

**ITU-T D.53 "International aspects of Universal Service"** offers guidelines to increase compliance with Universal Service policies as well as the extent to which they achieve their goal of delivering a minimum level of ICT services to every inhabitant of a country.

**The revised ITU-T D.271 "Charging and accounting principles for Next-Generation Network (NGN)"** sets out the general principles and conditions applicable to the use of packet-based networks to transport packets between standards-based interfaces and the services that they support.

**ITU-T D.97 "Methodological principles for determining international mobile roaming rates"** proposes a possible approach to the reduction of excessive roaming rates, highlighting the need to encourage competition in the roaming market, educate consumers and consider appropriate regulatory actions such as the introduction of caps on roaming rates.

**ITU-T D.261 "Principles for market definition and identification of operators with significant market power"** proposes principles and guidelines to assist countries in defining and identifying significant market power and assess whether or not, and the degree to which, this power has been abused by international telecommunications companies.

# I.9 Quality of service and experience, and network performance

**ITU-T Recommendation ITU-T E.802 Amendment 1 “New Annex A on guidelines on selection of representative samples”** incorporates Annex A, which provides guidance on the selection of representative samples in the measurement of QoS parameters, and that takes into account these technical (statistical) and operational (practical QoS data collection) conditions by proposing a simple random sampling methodology.

**ITU-T E.811 “Quality measurement strategy in major events”** addresses the quality assessment of mobile broadband and voice services provided during major events, such as FIFA World Cups and Olympic and Paralympic Games, by creating a useful international reference to be considered by operators and regulators when preparing to host such events.

**ITU-T E.847 “Quality of service norms for time-division multiplexing interconnection between telecom networks”** analyses and identifies QoS parameters for TDM interconnection between telecom networks, which are needed to facilitate effective interconnections with reasonable traffic handling capacities, and provides a guiding framework for TDM interconnection of telecom networks and will facilitate effective monitoring of Performance, QoS (Quality of Service) at POIs (Point of Interconnection); as well as endeavour to ensure end to end customer satisfaction and Quality of Experience (QoE). Regulators may also use this document to envision effective interconnection regulations in respective countries.

**ITU-T P.381 (revised) “Technical requirements and test methods for the universal wired headset or headphone interface of digital mobile terminals”** specifies critical physical and electrical-acoustical characteristics for the universal headset interface and provides corresponding test methods. Both 3.5 mm and 2.5 mm diameter headset/headphone interfaces have been widely used in digital mobile terminals in recent years. Nowadays, the consumer is free to choose either the headset/headphone originally provided by the terminal manufacturer or others that are offered separately. However, the quality of service (QoS)/quality of experience (QoE) perceived by users is influenced by both the electrical performance of the interface and the compatibility between the terminal and the connected headset/headphone.

**ITU-T P.501 (revised) “Test signals for use in telephonometry”** describes test signals which are applicable for several purposes in telephonometry. This Recommendation gives a wide variety of test signals starting with low complexity test signals up to test signals with a high degree of complexity incorporating a lot of typical parameters of speech. Besides technical signals such as sine waves or noise, more speech-like signals are described.

**ITU-T P.1310 “Spatial audio meetings quality evaluation”** concerns the quality assessment of telemeeting systems that apply spatial audio rendering techniques to facilitate communication between parties at remote locations.’

**10 Conformity, interoperability and testing**

**ITU-T Q.3053 “Signalling architecture and requirements for IP based short message service over ITU-T defined NGN”** specifies the signalling architecture for Internet Protocol (IP) based Short Message Service (SMS) over Next Generation Network (NGN), and identifies the signalling requirements for the interworking between NGN and mobile network supporting SMS.

**ITU-T Q.3630 (revised) “Inter-IMS Network to Network Interface (NNI) - Protocol specification”** specifies requirements for the Inter-IMS Network to Network Interface (NNI). The version number, v.1, indicates that this is version one of Recommendation ITU-T Q.3630, and that it relates to Release 10 of the relevant 3GPP/ETSI standard. This Recommendation endorses the ETSI TS 129 165 V10.21.0 (2016-01) Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Inter-IMS Network to Network Interface (NNI) (3GPP TS 29.165 version 10.21.0 Release 10).

**ITU-T Q.3713 “Signalling requirements for Broadband Network Gateway (BNG) pool”** describes the scenarios, architecture and signalling for BNG pool in order to achieve the following outstanding benefits: high reliability for broadband access services, resource sharing and load balancing among multiple BNG devices which composed a pool, simplified OAM and reduction of OPEX&CAPEX.

## I.10.4 Internet-related performance measurements

**ITU-T Y.1545.1 “Framework for monitoring the QoS of IP network services”** is a diagnostic reference for IP network quality of service monitoring, and primarily as a guide to assist regulators monitor the quality of service of Internet that is provided by service providers (although subscribers and network service providers may also derive benefit). It highlights the necessity of monitoring the QoS of network services offered by Internet service providers (ISPs), from the diagnostic and regulatory points of view. The Recommendation also addresses quality of service evaluation scenarios, sampling methodology and testing tools for regulators. Finally, this Recommendation gives a guidance to regulators about minimum QoS parameters for evaluating the quality of Internet services.

# I.11 Mainstreaming accessibility in ICTs

**ITU-T F.921 “Audio-based network navigation system for persons with vision impairment”** explains how audio-based network navigation systems can be designed to ensure that they are inclusive and meet the needs of persons with visual impairments. The Recommendation adopts a technology neutral approach by defining and explaining the functional characteristics of the system. The aim is to give designers of audio-based network navigation systems the information that they need at the initial stages of development to anticipate and overcome any restrictions and barriers that prevent users with visual impairments from making full and independent use of the built environment. This Recommendation explains how to accommodate users’ experience of audio-based network navigation systems and ensure the interoperability of those systems. This Recommendation recognizes that by meeting the user needs of persons with visual impairments, audio-based network navigation systems may also benefit persons with other disabilities, age related disabilities, specific needs and everyone.

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1. Science Monitoring and Reliable Telecommunications [↑](#footnote-ref-1)
2. ITU-T SG11 Regional Group for Africa was established in July 2016 and will initiate activity in 2017. [↑](#footnote-ref-2)
3. ITU-T SG20 Regional Groups for Latin America, Africa, Arab region, and Eastern Europe Central Asia and Transcaucasia were established in March 2017. [↑](#footnote-ref-3)
4. ITU-T SG17 Regional Group for the Arab region was established in March 2017. [↑](#footnote-ref-4)
5. ITU-T SG11 Regional Group for RCC was established in July 2016 and initiated activity in 2017. [↑](#footnote-ref-5)