MoU/MG **N 912**

MoU/MG "ISO-IEC-ITU-UNECE Memorandum of Understanding on e-Business Management Group"
Secretariat: **ISO**
Secretary: **Euchner Martin Mr**

Report of ITU-T to 44th MoU/MG meeting 17-18 January 2023 - ITU-T report on MoU/MG Resolutions and actions for ITU-T

Document type	Related content	Document date	Expected action
Meeting / Other	Meeting: Geneva (Switzerland) 17 Jan 2023	2023-01-03	**INFO**

Description

Report of ITU-T to 44th MoU/MG meeting 17-18 January 2023 - ITU-T report on MoU/MG Resolutions and actions for ITU-T

MoU/MG/23N912

Status: draft

Date of meeting: 17-18 January 2023, hybrid

Source: ITU-T

Report of ITU-T to 44th MoU/MG meeting 17-18 January 2023

ITU-T report on MoU/MG Resolutions and actions for ITU-T

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Section 5.2 – ITU-T report:

Resolution R09/06

R09/06	Healthcare Informatics	The MoU/MG invites ITU-T SG 16 to coordinate its work on eHealth with ISO/TC 215 and its related groups (in progress).

- New ITU-T Joint Coordination Activity on digital COVID-19 certificate (ITU-T JCA-DCC)
- (ongoing) ITU-T FG4H on AI for Health (FG-AI4H)

Recommendation ITU-T F.760.1 "Requirements and reference framework for emergency rescue systems" describes the application scenarios, functional requirements, and reference architecture of pre-hospital emergency rescue and applies to the planning and designing emergency rescue systems in emergency centres, hospitals and other medical institutions. The appendix to this Recommendation includes some use cases of the proposed reference system.

Recommendation ITU-T F.780.1 (V2) (revised) "Framework for telemedicine systems using ultra-high definition imaging" describes requirements for using ultra-high definition (UHD) imaging, such as 4K and 8K video, for telemedicine. The purpose of these requirements is to use UHD systems for medical practices that use endoscopes and/or microscopes. This Recommendation also describes a list of requirements for using a UHD-based "endoscopic video camera" as a medical device. In addition, Annex A describes the requirements on the use of this technology as a medical device. This revision adds the clause for profiles of UHD imaging for medical services, as well as new definitions and abbreviations.

Recommendation ITU-T F.780.2 "Accessibility of telehealth services" defines accessibility requirements for technical features to be used and implemented by governments, healthcare providers and manufacturers of telehealth platforms to facilitate the access and use of telehealth services by persons with disabilities, older persons with age-related disabilities and persons with specific needs.

With the passage of the United Nations Convention on the Rights of Persons with Disabilities in 2006, and its ratification by numerous countries, persons with disabilities have the right to enjoy the highest attainable standard of health without discrimination on the basis of disability. Countries need to take all appropriate measures to ensure access for persons with disabilities to health services. During the current Covid-19 pandemic, the use of telehealth services has increased substantially in many countries and telehealth has become a basic need for the general population, especially for those in quarantine, enabling patients in real time through contact with health care providers to access advice. However, due to the lack of global and comprehensive standards and guidelines for accessibility of telehealth services, many persons with disabilities experience difficulties accessing and using such services and are often forgotten. This Recommendation

summarizes and defines those requirements and features that industries can implement to ensure accessible provision of telehealth services.

Technical requirements defined in this Recommendation are based on a comprehensive feedback collected from civil society on barriers that persons with disabilities experience when accessing and using telehealth services, as well as on the feedback from the industry. This is a first edition of the document. This Recommendation was developed collaboratively by the World Health Organization (WHO) and ITU.

Recommendation ITU-T F.780.3 "Use cases and requirements for ultra-high-definition teleconsulting system" describes the use cases and technical requirements of ultra-high-definition (UHD) teleconsulting system. UHD teleconsulting system is an important application of UHD display technology and ICT in the medical field, under the background of unbalanced medical resources, especially the COVID-19 pandemic, which can realize the optimal allocation of medical resources and benefit people in areas with less developed medical resources. It recommends the framework, functional requirements, and performance requirements of UHD teleconsulting system which are the necessary hardware and software foundations for teleconsultation. Finally, the Recommendation gives two application cases of UHD teleconsulting system in Appendix I, including the roles of different participants, as well as the teleconsultation process. The Recommendation is suitable for the development, construction and evaluation of UHD teleconsulting system in different countries and regions.

Recommendation ITU-T H.845.10 (revised) "Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 5J: Insulin pump": This edition includes the corrections approved in ITU-T H.845.10 (2017) Corrigendum 1 (11/2017), and the maintenance contents from ISO/IEEE 11073-20601:2022 and ISO/IEEE 11073-10419:2019 (Insulin Pump) versions.

Recommendation ITU-T H.870 (V2) (revised) "Guidelines for safe listening devices/systems" describes the requirements on safe listening devices and systems, called personal/portable audio systems, especially those for playing music, to protect people from hearing loss. It also gives a glossary for common understanding as well as background information on sound, hearing and hearing loss. It recommends the criteria for avoiding unsafe listening: one for adults and the other for children, both based on the equal energy principle, the assumption that equal amounts of sound energy will cause equal amounts of sound induced permanent threshold shift regardless of the distribution of the energy over time. Importantly, this Recommendation provides guidelines on health communication for safe listening so that appropriate warning messages can be delivered effectively when necessary. Examples of such messages can be found in Appendix VII. Finally, this Recommendation also gives information about the implementation of dosimetry and related issues. Communication devices and assistive devices are excluded from the scope of this Recommendation. Gaming devices are also for future study. This standard was developed collaboratively by the World Health Organization (WHO) and ITU under the 'Make Listening Safe' initiative, and it is adopted by both organizations.

ITU-T X.Suppl.38 "Supplement to ITU-T X.1152: Use cases for contact tracing applications to prevent spread of infectious diseases" describes various use cases for contact tracing technologies. It also provides data processing models including their procedures, data processing flow and security considerations. In addition, practical use cases are described in Appendix I.

ITU-T Technical Paper FSTP-CONF-F780.1 "Conformance testing specification for F.780.1 - Framework for telemedicine systems using ultra-high definition imaging" (under publication) defines the testing specification for F.780.1 "Framework for telemedicine systems using ultra-high definition imaging".

Work items under development:

- Draft F.MIBS "Requirements for Medical Image Based Service: Normalization and Human factors" (Q24/16)
- Draft F.780.1 (V3) "Framework for telemedicine systems using ultra-high definition imaging" (Q28/16)
- Draft FSTP.MED-THS "Outline and Elements of Basic Telehealth Services" (Q28/16)
- Draft FSTP-CONF-F780.2 "Conformance testing specification for ITU-T F.780.2" (Q28/16)
- Draft HSTP-CONF-H870 (V2) "Testing of personal audio systems for compliance with ITU-T H.870" (Q28/16)
- Draft Y.FSPH "Framework for smart public health emergency management in smart and sustainable cities" (Q2/20)

Resolution R16/04

R16/04	Healthcare Informatics	The MoU/MG notes the work of ISO/TC 292 Security and resilience, UNECE Working Party on regulatory cooperation and standardization policies (WP.6) and UNISDR on disaster risk reduction, ISO/TC 215 on Patient tracking, ITU-T SG17 on Security and OASIS EDXL Tracking of Emergency Patients, and invites these groups to explore collaboration on patient tracking and other areas of preparedness.

Resolution R16/15

R16/15	Collaboration and coordination	MoU/MG recognizes Recommendations ITU-T A.5 "Generic procedures for including references to documents of other organizations in ITU-T Recommendations", A.25 "Generic procedures for incorporating text between ITU-T and other organizations", and A-series Supplement 5 "Guidelines for collaboration and exchange of information with other organizations", and invites the participating members of the MoU/MG to utilize these documents in developing joint documents, and to provide feedback to ITU-T on their use.

WTSA-20 approved:

- Recommendation ITU-T A.5 (revised) "**Generic procedures for including references to documents of other organizations in ITU-T Recommendations**"
- Recommendation ITU-T A.25 (revised) "**Generic procedures for incorporating text between ITU-T and other organizations**"

TSAG approved:

- new Recommendation ITU-T A.23 Amd.1 "Collaboration with ISO and IEC on information technology – Appendix II: Best practices".

Resolution R19/02

R19/02	Digital Identity	The MoU/MG welcomes the involvement of UN/CEFACT eGovernment Domain in ITU-T on Digital Identity Management in order to consider this work in their Digital Identity project.

Draft Recommendation ITU-T X.1353 "Security methodology for zero-touch deployment in massive IoT based on blockchain" (under approval): Massive Internet of Things (mIoT) is a significant application of future communication networks. With diverse use cases anticipated in mIoT, it is difficult for manufactures to pre-install their manufactured IoT devices with mobile-operator-specific and/or the service-specific information (e.g., identities and keys), since manufactures may not know where their devices will eventually be deployed and activated. The current approach relies on customers' manual configuration. This is acceptable for small-scale IoT applications. However, for mIoT devices, the aforementioned approach is unacceptable due to the fact that manual configuration is time consuming, cost-ineffective and cumbersome. Thus, automatic credential provisioning without user involvement, known as "zero-touch" is needed for mIoT. This Recommendation provides a security methodology on designing such a decentralized identity management system to support the zero-touch deployment of future mIoT. Zero-touch deployment will enable IoT devices to automatically find their mobile network operator and their service provider, automatically obtain credentials from them and automatically connect to the network and the service. This will greatly facilitate the future deployment of mIoT devices for verticals. The content of this Recommendation will cover the security architecture, the security considerations and the related security procedures (such as device attestations, authentication, and credential provisioning) which are needed for building such a zero-touch mIoT deployment platform.

Recommendation ITU-T Y.3081 "Self-Controlled Identity based on Blockchain: Requirements and Framework" presents the motivations and principles for self-controlled identity based on blockchain in future networks including networks beyond IMT-2020. It provides the high-level framework and requirements of self-controlled identity based on blockchain. It specifies the capability requirements of the self-controlled identity based on blockchain accordingly in the context of future networks including networks beyond IMT-2020. Detailed descriptions of the use cases and business models are listed in the appendix.

Work item under development:

- Draft YSTR.IoT-IMS "Requirements and capability framework for identification management service of IoT device" (Q6/20)

Resolution R19/03

R19/03	Artificial Intelligence	The MoU/MG welcomes the involvement of the ITU-T Study Group 16 in the work of the UNECE Transportation Division and the work of ISO-IEC JTC1 SC42 and the work of ISO TC204 on the topic of autonomous / assisted driving.

- (ongoing) Collaboration on ITS Communication Standards (CITS)

Recommendation ITU-T H.551 "Architecture of vehicular multimedia systems" defines the configuration for vehicle multimedia systems (VMSs), the reference model of VMS architecture, and the reference solution for VMS multimedia applications. VMS security issues and personally identifiable information protection and privacy issues are also described.

ITU-T Supplement H.Sup20 "Practice for intelligent traffic sensing device deployment in the roadside": The detection and analysis of traffic elements based on roadside sensing devices is an

important foundation for intelligent transportation. Sensing devices used in roadside to build an intelligent transport system generally include cameras, lidars, millimetre wave radars, etc. The requirements for sensing devices, such as the deployment and the function characteristics will affect the quality of data for intelligent transportation system. In order to support ITS to obtain comprehensive and effective perception data, this supplement gives the practice references for roadside sensing devices' deployment in ITS. This Supplement applies to ITU-T H.550-H.599 series: Vehicular gateways and intelligent transportation systems (ITS).

Recommendation ITU-T X.1377 "Guidelines for an intrusion prevention system for connected vehicles" establishes guidelines for an intrusion prevention system (IPS) for connected vehicles. This Recommendation mainly focuses on aspects of active response capability for intrusion and includes the implementation guidance and use cases of IPS for connected vehicles. Prior in-vehicle intrusion detection systems (IDSs) have limitations, e.g., requiring too many computing resources that a vehicle cannot provide and being unable to mitigate intrusions due to characteristics of protocol and bus topology. To address these limitations of conventional in-vehicle IDSs, this Recommendation provides methodologies for intrusion detection and intrusion prevention. The proposed IPS consists of the intrusion detection plane – an external component that calculates intrusion detection algorithms – and the data plane – in-vehicle networks (IVNs) where traffic monitoring and active response happen. This Recommendation aims to protect (automotive) Ethernet-based IVNs.

Recommendation ITU-T X.1379 "Security requirements for roadside unit in intelligent transportation system" specifies security requirements for roadside unit (RSU) in intelligent transportation system (ITS) based on security threat analysis. This Recommendation will help to guide vendors and operators of RSUs to adopt appropriate security schemes to fulfil security requirements specified to protect RSUs from security risks and attacks from cyberspace thus to ensure the security of ITS.

Recommendation ITU-T X.1381 "Security guidelines for Ethernet-based In-Vehicle networks" (under approval) provides security guidelines for Ethernet-based in-vehicle networks (IVNs). The current trend in electrical and electronic (E/E) architecture is to integrate the Ethernet with legacy IVNs such as the controller area network (CAN), local interconnect network (LIN), media-oriented systems transport (MOST) and FlexRay. In the past, the Ethernet was considered only as a connection between vehicles with external environments. Standard protocols that enable Internet protocol-based connections over the Ethernet (e.g., diagnostic communication over Internet protocol or universal measurement and calibration protocol) have been used to enable communications between the external environment and vehicles. These use cases generally do not need to meet stringent real-time constraints. However, in-vehicle applications using Ethernet communication require characteristics that include high time sensitivity and reliability. Current developments in in-vehicle communication technologies require increased bandwidth in the network. Compared to the Ethernet, legacy IVNs are insufficient to meet the bandwidth requirements of current in-vehicle applications. Therefore, now and in the future, Ethernet-based IVNs are a major part of E/E architecture. However, countermeasures known from common computer networks cannot be suitable for an automotive application because they were not designed with regard to automotive requirements and capabilities. To address this demand, this Recommendation provides security guidelines for automotive Ethernet technology. This Recommendation includes a reference model of automotive Ethernet and analysis of threat and vulnerability for Ethernet-based IVNs. In addition, this Recommendation provides security requirements and use cases of Ethernet-based IVNs.

Recommendation ITU-T X.1382 "Guidelines for sharing security threat information on connected vehicles" (under approval): Connected vehicles are facing increasingly prominent network security issues along with their rapid development. Security threat information of connected vehicles means any information that can help an organization identify, assess, monitor, and respond to the connected vehicle, which plays an integral role in securing connected vehicles. Organizations that

share threat information for connected vehicles can improve their own security postures and those of other organizations. This Recommendation is a guide on the principles, rules, methodology and procedures of sharing security information for connected vehicles. This Recommendation also provides a brief description of the different scopes, roles and effectiveness of the various organizations while they engage in the life cycle of security threat information sharing. This Recommendation is intended to help organizations stay in touch with the existing shared community. Furthermore, this Recommendation helps organizations contribute to the threat information of a connected vehicles sharing community, which would support the practices of connected vehicles safety protection. Overall, this Recommendation aims to enhance security threat information sharing; and mitigate the potential impact of cyber security attacks on connected vehicles.

Recommendation ITU-T X.1383 "Security requirements for categorized data in vehicle-to-everything (V2X) communication" (under approval): Data security is one of the most important works for vehicle-to-everything (V2X) communication. However, in a resource constrained environment such as in-vehicle communication, a lot of resources are consumed protecting data as cryptographic functions are required. This Recommendation categorizes the data used in V2X communication into several types such as object attribute data, vehicle status data, environmental perception data, vehicle control data, application service data and user personal data, and assigns three security levels for categorized data types. Based on these categorized data types and assigned data security levels, this Recommendation provides security requirements for categorized data in V2X communication.

Work items under development:

- Draft H.ADSDP-spec "Automated driving safety data protocol: Specification" (Q27/16)
- Draft H.VM-VMIA "Vehicular Multimedia Implementation Aspects" (Q27/16)
- Draft X.evpnc-sec "Security guidelines for electric vehicle plug and charge (PnC) services using vehicle identity (VID)" (Q13/17)
- Draft X.sup-cv2x-sec "Supplement to X.1813 - Security deployment scenarios for cellular vehicle -to-everything (C-V2X) services supporting ultra-reliable and low latency communication (URLLC)" (Q13/17)

Section 6 New coordination items with respect to e business:

A21/01	Internet of Things	Noting the limited understanding of how IoT relates to e-business, the MoU/MG invites groups that are working with IoT to report on this topic, with a view to considering a future webinar on IoT and e-business.

Recommendation ITU-T Q.4069 "Testing requirements and procedures for Internet of Things based green data centres" specifies testing requirements and procedures for Internet of Things based green data centres. This Recommendation introduces testing requirements including interoperability testing requirements between platform, systems and IoT devices, functional testing requirements(e.g. testing requirement of analysis of IoT devices status) and self-optimization testing requirements (e.g. testing requirement of data quality audit), and testing procedures including interoperability testing procedure, functional testing procedure, and self-optimization testing procedure for IoT based green data centres.

Recommendation ITU-T X.1352 "Security Requirements for Internet of things (IoT) device and gateway" establishes detailed requirements for five security dimensions applicable to Internet of things (IoT) device and gateway: authentication, cryptography, data security, device platform

security, and physical security, based on the IoT reference model specified in [ITU-T Y.4100] and the IoT security framework in [ITU-T X.1361]. The authentication dimension includes user authentication, secure use of authentication credentials and device authentication. The cryptography dimension includes the use of secure cryptography, secure key management and secure random number generation. The data security dimension includes secure transmission and storage, information flow control, secure session management and personally identifiable information (PII) management. The device platform security dimension includes five elements: software security; secure update; security management; logging; and timestamp. Likewise, the physical security dimension includes a secure physical interface and tamper-proofing.

Recommendation ITU-T X.1353 "Security methodology for zero-touch deployment in massive IoT based on blockchain" (under approval): Massive Internet of Things (mIoT) is a significant application of future communication networks. With diverse use cases anticipated in mIoT, it is difficult for manufactures to pre-install their manufactured IoT devices with mobile-operator-specific and/or the service-specific information (e.g., identities and keys), since manufactures may not know where their devices will eventually be deployed and activated. The current approach relies on customers' manual configuration. This is acceptable for small-scale IoT applications. However, for mIoT devices, the aforementioned approach is unacceptable due to the fact that manual configuration is time consuming, cost-ineffective and cumbersome. Thus, automatic credential provisioning without user involvement, known as "zero-touch" is needed for mIoT. This Recommendation provides a security methodology on designing such a decentralized identity management system to support the zero-touch deployment of future mIoT. Zero-touch deployment will enable IoT devices to automatically find their mobile network operator and their service provider, automatically obtain credentials from them and automatically connect to the network and the service. This will greatly facilitate the future deployment of mIoT devices for verticals. The content of this Recommendation will cover the security architecture, the security considerations and the related security procedures (such as device attestations, authentication, and credential provisioning) which are needed for building such a zero-touch mIoT deployment platform.

Recommendation ITU-T X.1369 "Security requirements for IoT service platform" specifies security requirements for IoT service platform. It assesses security threats and challenges to IoT business service platform and describes security measures that could mitigate security threats and challenges.

Recommendation ITU-T Y.4052 "Vocabulary for blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects" contains blockchain-related vocabulary to be used for Internet of things (IoT) and smart cities and communities (SC&C) in aspects of data processing and management (DPM). The vocabulary in this Recommendation is collected from the Recommendations, Supplements and standards published by ITU and ISO. In addition, this Recommendation includes and defines new terms to meet the needs of SC&C work within ITU.

Recommendation ITU-T Y.4123 "Requirements and capability framework of smart shopping mall system": By deploying IoT devices, smart shopping malls make use of IoT technologies to collect data, control device remotely, monitor the environment, etc. These IoT technologies can enable intelligent services such as intelligent device collaboration, indoor navigation, asset tracking etc., which can help to improve management efficiency, resulting in enhanced consumer experience and more businesses opportunities. This Recommendation specifies requirements and capability framework of smart shopping mall system.

Recommendation ITU-T Y.4214 "Requirements of IoT-based civil engineering infrastructure health monitoring system": Monitoring the safety and integrity of civil engineering infrastructures using objective data collected from the infrastructures themselves with Internet of things (IoT) capabilities is an effective means to supplement inspection and diagnosis for advanced and efficient maintenance work on civil engineering infrastructures. In this Recommendation, an IoT-based

system for this purpose is called a civil engineering infrastructure health monitoring system. This Recommendation describes the requirements specific to the IoT-based civil engineering infrastructure health monitoring system for the purpose of maintaining civil engineering infrastructures.

Recommendation ITU-T Y.4215 "Use cases, requirements and capabilities of unmanned aircraft systems for the Internet of Things" describes the use cases, requirements and capabilities of unmanned aircraft systems (UASs) for the Internet of things (IoT). According to different wireless communication scenarios, the use cases are classified in four categories: UAS-aided offloading, UAS-aided emergency response, UAS-aided relaying and UAS-aided information dissemination and data collection. Common and specific requirements and capabilities of UASs for IoT support of the different use cases are described in this Recommendation.

Recommendation ITU-T Y.4217 "Service requirements and capability framework for IoT-related crowdsourced systems": Service requirements and capability framework for IoT-related crowdsourced systems can help the implementation of IoT-related crowdsourced systems. This Recommendation specifies service requirements of IoT-related crowdsourced systems, in addition to the requirements of IoT-related crowdsourced system [ITU-T Y.4205] and the common requirements of IoT [ITU-T Y.4100]. Based on these requirements, a capability framework of IoT-related crowdsourced systems is developed.

Recommendation ITU-T Y.4481 "Framework for data middle-platform in IoT and smart sustainable cities": A data middle-platform (DM) is expected to provide innovative digital data services to deliver data value. It allows separation of the fundamental technical supporting capabilities from the business-related services. The main purpose of a DM is to aggregate and manage cross-domain data into services. For Internet of things (IoT) and smart sustainable cities (SSC), a DM aims at providing common data services that can be reused in diverse application domains by governments, enterprises, organizations and individuals.

Recommendation ITU-T Y.4482 "Requirements and framework for smart livestock farming based on the Internet of things": Smart livestock farming (SLF) is a convergence service where Information and Communication Technologies (ICT) are applied into the livestock value chains. It has the potential to deliver a more productive and sustainable production by integrating processes of the smart farming, Management Information Systems (MIS), stockbreeding automation and robotics to provide a better decision making or more effective exploitation operations and management of livestock value chains. The use of Internet of Things (IoT) technologies in the SLF aims at providing a full coverage of the processes by collecting and transmitting data from the entire agroecosystem. That means SLF can establish contact with each participant of a livestock chain, bringing and collecting information about their processes, increasing the possibilities for control and improvement on the efficiency of their tasks. This Recommendation provides an overview of SLF based on IoT, high-level requirements for SLF, as well as a reference model which represents a generic sequence for the livestock value chains and is applicable to these chains as a whole, regardless of species or rearing techniques.

Recommendation ITU-T Y.4483 "Reference architecture of service exposure for decentralized services for Internet of things applications" introduces a service exposure for decentralized services (DSE) for Internet of things (IoT) applications and specifies its common characteristics, general requirements, reference architecture and common capabilities. A DSE is a functional entity for IoT applications in an IoT device, which integrates multiple decentralized services (such as services based on distributed ledger technologies) and exposes uniform interfaces to IoT applications. Those integrated decentralized services may support the same or different types of decentralization solutions. IoT applications can use uniform interfaces to integrate and access multiple decentralized services at the same time, regardless of their decentralization solutions. A DSE can bring efficiencies and benefits to application providers and users.

Recommendation ITU-T Y.4484 "Framework to support Web of Objects ontology based semantic data interoperability of eHealth services" specifies the framework to support Web of Objects (WoO) ontology based semantic data interoperability of eHealth services in accordance with [ITU-T Y.4452] and [ITU-T Y.4563]. A semantic data interoperability enables the various eHealth systems to combine received information with other information resources and to process it in a manner that preserves meaning. In order to support the semantic data interoperability functions among eHealth systems, this draft Recommendation applies the WoO framework in [ITU-T Y.4452] and the semantic data interoperability function in [ITU-T Y.4563].

Draft Recommendation ITU-T Y.4500.3 "oneM2M - Security solutions" (under approval) provides specifications for machine to machine (M2M) security and privacy protection.

Work items under development:

- Draft Y.IoT-RTPS "Use cases, requirements and capabilities of Internet of Things infrastructures in roadside traffic perception system" (Q2/20)
- Draft Y.IoT-NCM-arch "Functional architecture of network connectivity management in the Internet of things" (Q3/20)
- Draft Y.DPM-alm-fra "Functional requirements and architecture of blockchain-based activity logs management for IoT data processing and management" (Q4/20)
- Draft Y.IoT-CRE-fr "Framework of Common rule enablement for intelligent IoT services in heterogeneous IoT platform environments" (Q4/20)
- Draft Y.SF-prediction "Service framework of prediction for intelligent IoT" (Q4/20)
- Draft YSTP.AIoT "Challenges of and Guidelines to Standardization on Artificial Intelligence of Things" (Q4/20)

R21/01	API	The MoU/MG recognizes the importance of the ongoing work on API and invites member organizations to report on their ongoing work in future MoU/MG meetings and encourages groups to create liaisons to maximize their efforts.

Recommendation ITU-T J.1201 (revised) "Functional requirements of a smart TV operating system" specifies the functional requirements of a smart TV operating system over integrated broadcast and broadband cable networks. A smart TV operating system is intended to be installed in an integrated broadcast and broadband (IBB) capable cable set-top box (STB) and TV and to enable broadcasting and IP-based interactive services provided by cable television operators and third party providers. By running a smart TV operating system, the IBB-capable cable STB and TV will be able to intelligently provide subscribers with advanced and personalized services by downloading and installing advanced and personalized apps from cable operators' platforms and third party platforms, which are interconnected with the related cable operators' platforms. This Recommendation is the first of a series of smart TV operating system Recommendations. The Recommendations for this smart TV operating system will cover functional requirements, architecture, security and application programming interfaces (APIs).

Recommendation ITU-T J.1205 "The HAL API of a smart TV operating system" defines the hardware abstract layer API of a smart TV operating system (TVOS) to enable integrated broadcast and broadband (IBB)-capable cable set-top box (STB) and TV to apply to broadcasting services and IP-based interactive services provided by cable television operators and third-party providers. The TVOS hardware abstract layer (HAL) consists of multiple hardware abstraction functional interface modules. These modules implement abstraction and encapsulation of different hardware capabilities

and provide the upper-layer software with interfaces used to invoke the corresponding hardware capabilities.

Recommendation ITU-T Q.819 "REST-based Management Services" defines a set of services required to support REST-based interfaces and along with Recommendation ITU-T X.785 composes a framework for REST-based network management interfaces. It specifies protocol requirements, and defines some network management-specific support services, which are notification service, heartbeat service, and containment service. The JSON/YAML interface definitions for the network management-specific support services are also provided.

Recommendation ITU-T X.786 "Guidelines for implementation conformance statement proformas associated with REST-based management systems" provides guidelines for implementation conformance statement (ICS) proformas for REST-based interface systems. It provides an overview and constructions for the OpenAPI Specification (OAS), and provides several proformas (tables) for each OAS syntax component to be used in REST-based interfaces. Instructions on how to complete the columns in the conformance tables are also provided. Examples of REST-based interface ICSs are provided in appendices.

Draft Recommendation ITU-T Y.3183 "Framework for network slicing management assisted by machine learning leveraging QoE feedback from verticals" (under approval) provides a framework for machine learning assisted network slicing management, leveraging vertical end users' feedback on QoE, which can help achieve run-time optimisation of user perceived performance. The overall architecture, components, workflow and related APIs of this framework are specified with respect to the high-level requirements identified. A use case is provided in appendix to show an application example of this framework. Example implementations of the key APIs are also provided.

Recommendation ITU-T T.808 (V2) "Information technology – JPEG 2000 image coding system: Interactivity tools, APIs and protocols": This second edition cancels and replaces the first edition, which has been technically revised. The main changes compared to the previous edition are as follows:

1. consolidates all outstanding amendments and corrigenda published since the first edition;
2. extends support for the file format specified in Rec. ITU-T T.815 | ISO/IEC 15444-16;
3. clarifies normative server responsibilities in response to certain request fields documented in Annex C;
4. removes the registration authority (Annex L); and
5. adds media type registration information (Annex O).

Work items under development:

- Draft M.tsm-rest "REST-based interface design for on-site generic telecommunication smart maintenance" (Q7/2)
- Draft H.IPTV-TMRAPI "IPTV terminal middleware remote API"(Q13/16)
- Draft Y.TM.DM-API "IoT Device Management API REST Specification" (Q3/20)
- Draft Y.TM.SM-API "IoT Service Management API REST Specification" (Q3/20)

R21/02	Circular economy	The MoU/MG encourages member organizations to look into the potential of circular economy in the area of e-business and report in future MoU/MG meetings on this topic.

Recommendation ITU-T L.1016 "Method for evaluation of the environmental, health and safety performance of true wireless stereo headphones": In recent years, more and more headphones belonging to the group of True Wireless Stereo products are sold. In 2019, sales of TWS earbuds surpassed the sales of (non-TWS) wireless earphones. The advent of True Wireless Stereo headphones raises the question on their performance in terms of health and safety of the user. There is a close link between the health/safety of the user and substances used in True Wireless Stereo headphones. The concept of products with minimal substances of concern and phasing out of harmful substances for non-essential uses is one of the key aspects in the European Sustainable Chemicals Strategy, which is an important building block towards a zero pollution goal, essential for a circular economy. While the idea of non-essential uses is somewhat new in EU legislative initiatives, it originates from the 1978 US Toxic Substances Control Act, and was taken up by other countries like Canada. The concept was finally enshrined in the Montreal Protocol, designed to protect the ozone layer. As more and more countries recognize the importance of a circular economy to combat climate change, the notion of products with minimal substances of concern gains relevance. With increasing relevance, the need for a method to compare the environmental, health and safety performance of TWS products is rising. This Recommendation aims to establish a methodology to evaluate a score of aforementioned aspects.

Recommendation ITU-T L.1035 "Sustainable management of batteries": Batteries are crucial for the functioning of information and communication technologies (ICTs). Improving their design, prolonging their lifespan, improving their recyclability and preventing the dumping of waste batteries can lower their overall energy consumption, reduce exposure of humans and the environment to hazardous substances and reduce global greenhouse gas emissions. This Recommendation provides guidance on the sustainable management of used batteries in ICT equipment and the environmentally responsible management of waste batteries from ICT products, including waste prevention, minimization, recycling, recovery and final disposal. It also provides information on best practices in recycling batteries for dissemination.

Recommendation ITU-T L.1036 "Scheduled waste management for base station (inclusive of e-waste)" was developed pursuant general environment quality act of the members country. At the moment, there is no standard governing the scheduled waste specifically in Base Station (BS). Upon the enrolment of 5G era, it is expected a huge global discharge of telecommunication equipment and upgrading of equipment at each BS, globally. This Recommendation is an extension to any requirement as stipulated in national Environment quality or protection acts, a technical requirement for telecommunication industry to adopt as a practice to reduce scheduled waste including e-waste at the Base Station (BS), as well as it provides guidance on how to dispose e-waste from a base station including the shared responsibility of owners and third parties involved.

Recommendation ITU-T L.1040 "Effects of ICT enabled autonomy on vehicles longevity and waste creation" defines guidelines and requirements on ICT Original Equipment Manufacturer (OEM) vendors providing equipment to autonomous vehicles aiming at reducing the amount of future e-waste. The Recommendation aims to analyse the e-waste risks and other sustainability indicators of autonomous vehicles and propose how these potential challenges can be mitigated. This Recommendation utilises information compiled from stakeholders which can provide good insights into the specified potential challenge.

Recommendation ITU-T L.1050 "Methodology to identify the key equipment in order to assess the environmental impact and e-waste generation of different network architectures": While an assessment framework for environmental impacts of the ICT sector does exist (as developed by ITU

with for example [ITU-T L.1410] on environmental life cycle assessments of information and communication technology goods, networks and services), best practices for equipment identification, developed specifically to assess the environmental impacts of network architecture, remain lacking. In this Recommendation, key equipment in the networks are identified for smoother LCA calculations. Different types of network architecture employ different goods which entail differences in terms of energy usage, e-waste generation as well as environmental footprints. This Recommendation will examine three types of network architectures and will suggest an appropriate set of equipment to be considered for each. This Recommendation will begin to support network designers in determining the environmental and circular performance of different network architectures. This Recommendation utilises information compiled from stakeholders which can provide good insights into the specified potential challenge.

Recommendation ITU-T L.1620 "Guide to Circular Cities": The Guide for Circular Cities contains a circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent method for assessing, prioritising and catalysing different circular actions. This deliverable is developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting. The Guide starts with an assessment of the main developmental and sustainability challenges that cities are facing and the ways in which the concept of circular economy can be extended beyond the economic sphere and be applied to different city assets. It further defines key components of the circular city implementation framework. These components include: city assets and products (i.e. various city infrastructures, city resources, city goods and services available for use in a city); circular city actions (i.e. outcome-orientated actions that can be applied to city assets and products); circular city outputs (i.e. the outputs of circular city actions applied to city assets and products); and circular city enablers (i.e. complementary activities which support or accelerate implementation of circular city actions). Each of these components contains different quality and potential for facilitating circularity in cities. The interactions between these components form the basis of the circular city implementation framework. Finally, the Guide explains the circular city implementation framework. This framework utilizes four different steps to assist city stakeholders in enacting circular actions. The first step is to establish a baseline for circularity. The second step is to determine the potential of circularity in different assets and to prioritize circular actions based on the availability resources. The third step is to apply city enablers to catalyse different circular actions. The last step is to evaluate the impacts of these actions. Cities are invited to use this Guide to identify a course of action for improving circularity. The Guide also includes practical recommendations for preparing circular city actions and their implementation. The Guide is complemented with 17 case studies that illustrate the application of the circularity concept based on experiences from cities around the world.

ITU-T L.Suppl.50 "Case Studies on Implementation of Cities' circular actions" contains circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent method for assessing, prioritising and catalysing different circular actions. The Recommendation is developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting. The Supplement aims to further support the circular city implementation framework by providing 17 case studies on cities implementing circularity in urban operations.

Work items under development:

- Draft revised L.1023 "Revision of Recommendation ITU-T L.1023 - Assessment method for circular scoring" (Q7/5)

- Draft L.D4PI "An information model for digital product information on sustainability and circularity" (Q7/5)
- Draft L.1410rev "Methodology for environmental life cycle assessments of information and communication technology goods, networks and services" (Q9/5)
- Draft L.SimplifiedLCA "Guidance on simplified life cycle assessments of Information and Communication Technologies" (Q9/5)
- Draft L.WHR "Specification for waste heat reuse in telecommunication rooms and data centers" (Q11/5)

Section 7 Coordination of existing actions:

R19/01	Semantic harmonization	The MoU/MG encourages standards organizations to compare their notions of trust and trustworthiness with an aim to providing a consistent use of these terms. Experts are encouraged to work together to understand the specific connotation of trust and trustworthiness in different domains.

Recommendation ITU-T Q.3062 "Signalling procedures and protocols for enabling interconnection between trustable network entities in support of existing and emerging networks": Signaling System No. 7 (SS7) is a stack of signaling protocols, which was initially developed by ITU (CCITT) in the 1980s. Since then, SS7 standards has become a generic stack which are widely applied in public switched telephone network (PSTN) all over the globe. With the growth of mobile telecommunications and appearance of the MAP and CAP protocols, SS7 stack has become suitable for public land mobile network (PLMN), e.g., 2G, 3G networks. Later, SS7 migrated to SIGTRAN stack developed by IETF which allows operators to setup interconnection of SS7-based networks over IP networks. Furthermore, the SS7 logic migrated to DIAMETER which is currently widely used for interconnection of IMS-based networks, including 4G (VoLTE/ViLTE).

At the development stage, SS7 was designed to be managed by operators with the understanding that anyone connected to SS7 network was considered trustworthy. With the current network environment, including interconnection over the Internet, SS7-based networks have become vulnerable and can be easily attacked. Moreover, the latest move to Diameter protocol has not solved any of the basic vulnerabilities found in SS7.

Presently, there have been multiple cases where SS7 vulnerabilities have been used for different hackers' attacks. Amongst well-known attacks on SS7 networks include telephone spam, spoofing numbers, location tracking, subscriber fraud, intercept calls and messages, DoS, infiltration attacks, routing attacks, etc.

The goal of this Recommendation is to define the signalling requirements for authentication of signalling messages, in order for operators to be able to verify the authenticity of signalling exchange based on an accepted trust anchor. This Recommendation includes codes and signalling procedures based on ITU-T Q.3057.

Draft Recommendation ITU-T Y.3140 "Service brokering network framework for Trusted Reality" (under approval) describes service brokering network framework for Trusted Reality featuring application-aware brokering capabilities in terms of context, data and computation. The service brokering network framework for Trusted Reality aims to deliver customized immersive application service experience with real-time communication and recognition of knowledge and information in a safe and convenient way for anyone throughout the automated connection of real and cyber world.

Work items under development:

- Draft Y.atem-tn "Assessing trust evaluation models for telecommunication networks" (Q16/13)
- Draft Y.TiAN-eval "Trustworthiness evaluation for autonomous networks including IMT-2020 and beyond" (Q16/13)
- Draft Y.Trust-Registry "Trust Registry for Devices and Applications: requirements, architectural framework" (Q16/13)
- Draft Y.TRUST-TLA "Framework of Trust-Level Assessment for Trustworthy Networking" (Q16/13)

R09/06	Healthcare Informatics	The MoU/MG invites ITU-T SG 16 to coordinate its work on eHealth with ISO/TC 215 and its related groups (in progress).

➔ see R09/06

R16/04	Healthcare Informatics	The MoU/MG notes the work of ISO/TC 292 Security and resilience, UNECE Working Party on regulatory cooperation and standardization policies (WP.6) and UNISDR on disaster risk reduction, ISO/TC 215 on Patient tracking, ITU-T SG17 on Security and OASIS EDXL Tracking of Emergency Patients, and invites these groups to explore collaboration on patient tracking and other areas of preparedness.

ITU-T X.Suppl.38 "Supplement to ITU-T X.1152: Use cases for contact tracing applications to prevent spread of infectious diseases" describes various use cases for contact tracing technologies. It also provides data processing models including their procedures, data processing flow and security considerations. In addition, practical use cases are described in Appendix I.

A16/05	Big Data for e-business	The MoU/MG invites its member organizations to provide information on their activities in the context of Big Data for e-business.

Recommendation ITU-T X.1752 "Security guidelines for big data infrastructure and platform" analyses security threats and challenges on big data infrastructure and platform and specifies a reference framework to mapping security guidelines against threats for big data infrastructure and platform.

Recommendation ITU-T Y.3602 (revised) "Big data – Functional requirements for data provenance" describes a model and operations for big data provenance. Also, this Recommendation provides the functional requirements for big data service provider (BDSP) to manage big data provenance. The reliability of data is an important factor in determining the reliability of the analysis result. Data provenance aims to ensure the reliability of data by providing transparency of the historical path of the data. In a big data environment, complex data processing and migration due to the big data lifecycle and data distribution cause various difficulties in managing data provenance.

Draft Recommendation ITU-T Y.3607 "Big data – Functional architecture for data provenance" (under approval) describes a functional architecture for big data provenance. To provide the functional architecture for big data provenance, the big data provenance functions are defined based on the functional requirements and logical components identified in [ITU-T Y.3602]. This

Recommendation also provides the relationship between the functional architecture of big data provenance and the big data reference architecture in [ITU-T Y.3605].

Recommendation ITU-T Y.3654 "Big data driven networking - Machine learning mechanism" specifies the mechanisms of machine learning in big data driven networking (bDDN). A set of related aspects of machine learning in bDDN are presented, these aspects include: overview, learning procedure, deployment, interfaces, learning path and control path, security consideration.

Recommendation ITU-T Y.3655 "Big data driven networking - management and control mechanisms" specifies the management and control mechanisms of big data driven networking. The Recommendation studies general mechanisms related to management and control aspects of big data driven networking, and management mechanisms, control mechanisms, orchestration mechanisms of big data driven networking, and other consideration related to management and control mechanisms of big data driven networking.

Work item under development:

- Draft X.gdsml "Guidelines for data security using machine learning in big data infrastructure" (Q8/17)

R17/08	Traceability	The MoU/MG notes a number of initiatives on traceability in various industries such as aerospace, diamonds, agriculture, garments, medical products, and counterfeiting, and invites MoU/MG members to provide more information on this topic of interest.

Recommendation ITU-T L.1034 "Adequate assessment and sensitisation on counterfeit ICT products and their environmental impact" provides awareness and guidance on counterfeit ICT products' health and environmental impacts. The intention is to create awareness and sensitisation on human health and environmental risks and measures implemented in different countries for risk mitigation.

ITU-T X.Suppl.38 "Supplement to ITU-T X.1152: Use cases for contact tracing applications to prevent spread of infectious diseases" describes various use cases for contact tracing technologies. It also provides data processing models including their procedures, data processing flow and security considerations. In addition, practical use cases are described in Appendix I.

Work item under development:

- Draft Q.CCF-CCSD "Consumer centric framework for combating counterfeit and stolen ICT mobile devices" (Q15/11)

R18/01	eAccessibility and eInclusion	The MoU/MG, recognizing the importance of accessibility and inclusion of persons with disabilities resolves to take up eAccessibility and eInclusion for continued coordination and endorses Recommendation 2016 (reference MoU/MG N812) on this topic.

Recommendation ITU-T F.780.2 "Accessibility of telehealth services" defines accessibility requirements for technical features to be used and implemented by governments, healthcare providers and manufacturers of telehealth platforms to facilitate the access and use of telehealth

services by persons with disabilities, older persons with age-related disabilities and persons with specific needs.

With the passage of the United Nations Convention on the Rights of Persons with Disabilities in 2006, and its ratification by numerous countries, persons with disabilities have the right to enjoy the highest attainable standard of health without discrimination on the basis of disability. Countries need to take all appropriate measures to ensure access for persons with disabilities to health services.

During the current Covid-19 pandemic, the use of telehealth services has increased substantially in many countries and telehealth has become a basic need for the general population, especially for those in quarantine, enabling patients in real time through contact with health care providers to access advice. However, due to the lack of global and comprehensive standards and guidelines for accessibility of telehealth services, many persons with disabilities experience difficulties accessing and using such services and are often forgotten. This Recommendation summarizes and defines those requirements and features that industries can implement to ensure accessible provision of telehealth services.

Technical requirements defined in this Recommendation are based on a comprehensive feedback collected from civil society on barriers that persons with disabilities experience when accessing and using telehealth services, as well as on the feedback from the industry. This is a first edition of the document. This Recommendation was developed collaboratively by the World Health Organization (WHO) and ITU.

Also approved in March 2022 were Recommendations ITU-T T.701.21 "Guidance on audio description" and ITU-T T.701.25 "Guidance on the audio presentation of text in videos, including captions, subtitles and other on-screen text". These standards are twins to ISO/IEC TS 20071-21:2015 "Information technology – User interface component accessibility – Part 21: Guidance on audio descriptions" and ISO/IEC TS 20071-25:2017 "Information Technology – User interface component accessibility – Part 25: Guidance on the audio presentation of text in videos, including captions, subtitles and other on-screen text", respectively.

Work items under development:

- Draft JSTR.LCAP "Technical advances, challenges, and best practices in live captioning" (Q11/9)
- Draft FSTP-ACC-Rural "Use cases of accessibility to multimedia systems in rural and out-of-home environments" (Q26/16)

A18/01	Quantum technologies	MoU/MG invites its members to provide inputs to the next MoU/MG meeting on the subject of quantum technologies in the scope of electronic business.

- New ITU-T joint coordination activity (JCA-QKDN) on "Quantum Key Distribution Network" with TSAG as parent
  ➔ MoU/MG participating entities are welcome in this coordination activity.

Recommendation ITU-T X.1715 "Security requirements and measures for integration of quantum key distribution network (QKDN) and secure storage network" specifies security requirements and measures for integrating quantum key distribution network (QKDN) with secure storage network (SSN) in the service layer [ITU-T Y.3800] and public key infrastructure (PKI) [ITU-T X.509].

ITU-T Technical Report TR.hyb-qkd "Overview of hybrid approaches for key exchange with QKD" provides a landscape of the standardization activities on hybrid approaches for migration towards quantum-safe algorithms or protocols within international, regional and national organizations. The hybrid approach that is covered by this technical report is for key exchange. Hybrid approaches are for key exchange consist in generating a key exchange functionality by combining at least two different key exchange methods. This Technical Report studies the possible way forward to accommodate Quantum Key Distribution protocols in the context of the hybrid approaches for key exchange. This compatibility is studied for generic hybrid key exchange and hybrid key exchange specific to certain communication protocols.

Recommendation ITU-T Y.3807 "Quantum Key Distribution networks – QoS parameters" specifies an overview on networks supporting quantum key distribution (QKD). For the purpose of design, deployment, operation and maintenance to support QKD network (QKDN) implementation, the required quality level of quantum key distribution service should be identified and quantified. ITU-T Recommendation Y.3806 describes high-level and functional Quality of Service (QoS) requirements for QKDN. This Recommendation helps to quantify what kind of QoS requirements should be monitored and measured for this purpose; QoS parameters. This Recommendation describes QoS and Network Performance (NP) on QKDN and specifies the associated relative parameters for QoS and their definitions.

Recommendation ITU-T Y.3808 "Framework for integration of quantum key distribution network and secure storage network": For quantum key distribution networks (QKDN), this Recommendation provides an overview of secure storage networks (SSNs). It specifies functional requirements, functional architecture model, reference points and operational procedures for SSNs.

Recommendation ITU-T Y.3809 "Quantum Key Distribution Networks - Business role-based models" provides an overview of secure storage networks (SSNs) for quantum key distribution networks (QKDNs). It specifies the functional requirements, functional architecture model, reference points and operational procedures for SSNs.

Recommendation ITU-T Y.3810 "Quantum key distribution network interworking – framework": For quantum key distribution networks (QKDN), Recommendation ITU-T Y.3810 specifies framework of QKDN interworking (QKDNi). This Recommendation describes the overview of interworking QKDNs, the reference models, and the functional models of gateway functions (GWFs) and interworking functions (IWFs). The configurations for QKDNi are specified. Appendix I includes QKDNi with different key relay schemes.

Recommendation ITU-T Y.3811 "Quantum key distribution networks - Functional architecture for quality of service assurance" specifies a functional architecture of QoS assurance for the quantum key distribution networks (QKDN). This recommendation first provides an overview of the functional architecture of QoS assurance for the QKDN. It then describes the functional architecture of QoS assurance which includes functional entities such as QoS data collection, data processing, data storage, data analytics, QoS anomaly detection and prediction, QoS policy decision making, and enforcement and reporting. Based on the functional entities described in the functional architecture, this Recommendation specifies a basic operational procedure of QoS assurance for the QKDN.

Recommendation ITU-T Y.3812 "Quantum key distribution networks - Requirements for machine learning based quality of service assurance" specifies high-level and functional requirements of machine learning (ML) based QoS assurance for the quantum key distribution networks (QKDN). This recommendation first provides an overview of requirements of ML based QoS assurance for the QKDN. It describes a functional model of ML based QoS assurance and followed by associated high level and functional requirements of ML based QoS assurance. And some use cases are described.

Draft Recommendation ITU-T Y.3813 "Quantum key distribution networks interworking – functional requirements" (under approval): For quantum key distribution networks (QKDN),

Recommendation ITU-T Y.3813 specifies functional requirements for QKDN interworking (QKDNi). This Recommendation describes the functional requirements for key management layer, QKDN control layer, and QKDN management layer, for interworking using gateway nodes (GWNs) and/or interworking nodes (IWNs).

Draft Recommendation ITU-T Y.3814 "Quantum key distribution networks - functional requirements and architecture for machine learning enablement" (under approval): QKDN is expected to maintain stable operations and meet the requirements of various cryptographic applications efficiently. Due to the advantages of machine learning (ML) related to autonomous learning, ML can help to overcome the challenges of QKDN in terms of quantum layer performances, key management layer performances and QKDN control and management efficiency. Based on the functional requirements and architecture of QKDN in [ITU-T Y.3801] and [ITU-T Y.3802], this recommendation is to specify one possible set of functional requirements and a possible architecture for ML-enabled QKDN (QKDNml), including the overview, the functional requirements, architecture and operational procedures of QKDNml.

Work items under development:

- Draft Y.QKDN-qos-ml-fa "Quantum key distribution networks - Functional architecture enhancement for machine-learning based quality of service assurance" (Q6/13)
- Draft Y.QKDN-qos-mmq "Quantum key distribution Networks - Measurement methodology for QoS parameters" (Q6/13)
- Draft TR.QN-UC "Use cases of quantum networks beyond QKDN" (Q16/13)
- Draft Y.QKDN- iwac "Quantum key distribution networks interworking – architecture" (Q16/13)
- Draft Y.QKDN_SSNarch "Functional requirements for integration of quantum key distribution network and secure storage network" (Q16/13)
- Draft Y.QKDN_SSNreq "Functional requirements for integration of quantum key distribution network and secure storage network" (Q16/13)
- Draft Y.QKDN-amc "Quantum key distribution networks - Requirements and architectural model for autonomic management and control" (Q16/13)
- Draft Y.QKDNf-fr "Framework of Quantum Key Distribution Network Federation" (Q16/13)
- Draft Y.QKDNi-SDNC "Quantum Key Distribution Network Interworking – Software Defined Networking Control" (Q16/13)
- Draft Y.Supp.QKDN-UC "Use cases of quantum key distribution networks" (Q16/13)
- Draft TR.smpa "Security middle platform architecture" (Q15/17)
- Draft X.sec_QKDNi "Security requirements for Quantum Key Distribution Network interworking (QKDNi)" (Q15/17)
- Draft X.secadef "Security capabilities definitions" (Q15/17)

A18/02	Smart Manufacturing	MoU/MG invites its members to provide inputs to the next MoU/MG meeting on the subject of smart manufacturing in the scope of electronic business.

Recommendation ITU-T F.747.11 "Requirements for intelligent surface-defect detection service in industrial production line": Intelligent surface-defect detection service in industrial production line refers to accurate positioning of products defects, high-speed classification of defects types, real-time output and transmission of visual and auditory information to ensure the quality of industrial products. Compared with the inspection carried out manually by workers, the ISD service can improve the efficiency and consistency and reduce manual operations in dangerous areas. This work item specifies requirements for intelligent surface-defect detection service in industrial production line, including performance requirements, application requirements and functional requirements. To provide effective surface-defect detection service, it is required to fulfil three important parts. Firstly, it is important to ensure the accuracy of positioning and classification. Secondly, the inference efficiency of the service is also required to satisfy the real-time settings. Last but not the least, the service is required to adapt to the typical application scenarios in industrial production line inspection task. This Recommendation provides related requirements for intelligent surface-defect detection service in industrial production line.

Recommendation ITU-T F.748.16 "Requirements for machine vision-based applications and services in smart manufacturing" presents the overview and requirements for machine vision-based applications and services in smart manufacturing. It describes basic concept, scenario and ecosystem of machine vision, and identifies several typical requirements which are data acquisition, data pre-processing, data processing and etc. This Recommendation also gives reference model for machine vision-based applications and services in smart manufacturing. The general goals of standardization for machine vision service are:

– Define the requirements of machine vision-based services and applications

– Help ender users and providers to specify the machine vision tasks and the solutions.

– Enhance confidence in machine vision ecosystem and open new applications for machine vision system.

Work items under development:

- Draft L.SE_MI "Smart Energy Solutions for Manufacturing Industry" (Q11/5)
- Draft Y.KPEM-SM "Key performance evaluation models of smart manufacturing" (Q7/20)

R19/04	Artificial Intelligence	The MoU/MG encourages the member organizations to look into the potential of artificial intelligence and machine learning in the area of e-business and report in future MoU/MG meetings on this topic.

- New **ITU-T Joint coordination Activity on Machine-Learning (ITU-T JCA-ML)** with SG13 as parent
  ➔ MoU/MG participating entities are welcome in this coordination activity.
- (ongoing) ITU-T FG-AI4A on AI and IoT for Digital Agriculture (FG-AI4A)
- (ongoing) ITU-T FG-4NDM on AI for Natural Disaster Management (FG-AI4NDM)

Recommendation ITU-T F.742.1 "Requirements for smart class based on artificial intelligence" describes application scenarios and requirements for smart class system based on artificial intelligence, including application scenarios, service requirements, management requirements, and security considerations.

Recommendation ITU-T F.746.16 "Technical requirements and evaluation methods of intelligent levels of intelligent customer service systems": The intelligent customer service system can provide

more convenient, efficient, and stable services for users through the application of AI technologies such as speech recognition, text to speech and natural language processing. Improving and evaluating the intelligence levels of the intelligent customer service system are valuable. This Recommendation specifies the requirements and evaluation methods for system intelligence of intelligence customer service system in four aspects, including the basic functions, the core technologies of AI, the maturation of system and the service experience.

Recommendation ITU-T F.747.12 "Requirements for artificial intelligence based machine vision system in smart logistics warehouse": With the rapid development of industrial automation and logistics technology in accordance with the market demand for high-tech, machine vision technology has begun to enable the automation transformation of logistics warehouse systems. The application of machine vision technology in the field of logistics warehouse has enabled the rapid evolution of goods sorting, goods palletizing and de-palletizing, goods handling, and shelf inventory from intensive manual work to intelligence and automation, improving the operational efficiency and management capabilities of logistics warehouse. This Recommendation specifies the requirements and framework for artificial intelligence based machine vision system in smart logistics warehouse, and provides use cases. This Recommendation is intended to guide the design and development of machine vision systems in smart logistics warehouse.

Recommendation ITU-T F.748.17 "Technical specification for artificial intelligence cloud platform: AI model development" provides a framework for the cloud-based development of AI models. It covers the terminology, features, and reference design of an AI cloud platform to enable the development of AI models. It establishes the technical specifications of the platform's supporting functional modules, core functional modules, and auxiliary functional modules.

Recommendation ITU-T F.748.18 "Metric and evaluation methods for AI-enabled multimedia application computing power benchmark": Facing more and more diverse AI computing systems, users hope to have a unified evaluation metric for the system that provides AI computing power. The establishment of relevant real application performance evaluation benchmarks can objectively reflect the current state of the AI computing ability by providing objective metrics and comparison dimensions. This Recommendation provides an AI computing power benchmark framework, evaluation metrics and methods, and a guideline for technical testing for AI clusters.

Recommendation ITU-T F.748.19 "Framework for audio structuralizing based on deep neural network" presents an overview of the framework for audio structuralizing based on deep neural network. It provides a high-level description of architecture, processing flows, data categories, audio processing tasks and requirements for data management.

Recommendation ITU-T F.748.20 "Technical framework for deep neural network model partition and collaborative execution": Deep neural network (DNN) model inference process usually requires a large amount of computing resources and memory. Therefore, it is difficult for end devices to perform DNN models independently. It is an effective way to implement end-edge collaborative DNN execution through DNN model partition, which can reduce latency and improve resource utilization at the same time. This recommendation aims to specify the technical framework of DNN model partition and collaborative execution. First, it is necessary to predict the overall inference latency under the current system state according to different DNN partition strategies in advance. Then, choose the appropriate partition locations and collaborative execution strategy based on the equipment computation capabilities, network status and DNN model properties. Finally, implement the model collaborative execution and optimize the resource allocation in the meanwhile.

Recommendation ITU-T F.748.21 "Requirements and framework for feature-based distributed intelligent systems" introduces the use cases, classification of features and framework for feature-based distributed intelligent systems relevant to intelligent scenarios, specifying the service requirement, functional requirements, and security requirements for feature-based distributed intelligent systems.

ITU-T L.Suppl.48 "Data center energy saving: Application of artificial intelligence technology in improving energy efficiency of telecommunication room and data center infrastructure": Telecommunication Room and Data Center (DC) Infrastructure is containing a huge number of Information and Communication equipment. In order to keep the equipment running continuously and reliably, the room is necessarily equipped with air-conditioners to create a suitable environment for equipment operation. Nevertheless, it will cause a large amount of energy consumption and carbon emissions. This Supplement focuses on the application of AI technology and other emerging technologies such as digital twin, to improve the energy efficiency and reduce the carbon emissions of telecommunication room and DC infrastructures.

Most of the existing telecommunication room and DC infrastructures do not have the full ability to identify the distribution of indoor temperatures. Therefore, it is difficult to analyse the heat flow and the related power consumption in real-time and make appropriate adjustments timely. Consequently, it leads to unnecessary consumption of energy. This Supplement will address how AI-based power management can achieve the following capabilities:

- Data collections in telecommunication room and DC infrastructure;
- Real-time analysis of the historical power consumption and parameters of the target equipment room;
- The ability of training an intelligent model;
- Making reasonable adjustments dynamically to the air-conditioning and temperature, so as to achieve energy saving in the telecommunication room and DC infrastructure.

Recommendation ITU-T M.3381 "Requirements for energy saving management of 5G RAN system with AI" provides requirements for energy saving management of 5G RAN system with artificial intelligence (AI). The goal of the Recommendation is to explain the requirements of using AI technology to achieve energy saving management for communication units and virtualized hardware resources of 5G RAN system, via EMS and open interfaces provided by vendors, from the OSS level. In addition, this Recommendation includes process recommendations for sending intelligent energy saving strategies from OSS to EMS and then to wireless equipment. This Recommendation describes functional requirements for energy saving management of 5G RAN system with AI, and it also describes use cases of energy saving management of 5G RAN system with AI.

Draft Recommendation ITU-T M.3382 "Requirements for work order processing in telecom management with AI" (under approval) provides requirements for work order processing in telecom management with AI. Based on AI models and features extraction, work orders will be collected, analyzed, forwarded and archived. This Recommendation describes the framework and functional requirements for work order processing in telecom management with AI, and requirements of work orders. It also describes the process of text and image feature extraction.

Draft Recommendation ITU-T P.1402 "Guidance for the development of machine learning based solutions for QoS/QoE prediction and network performances management in telecommunication scenarios" (under approval) introduces Machine Learning techniques and their application for QoS/QoE prediction and network performance management in telecommunication scenarios. Especially, the design of training and evaluation data is described and means to avoid overtraining for Machine Learning models. It is also discussed the relation to classical model or algorithm development and differences are described. This recommendation gives best practice guidance for the successful development and evaluation of models based on Machine Learning but does not describe concrete models or algorithms for a dedicated purpose.

Draft Recommendation ITU-T Q.3646 "Framework and protocols for signalling network analyses and optimization in VoLTE" (under approval): Signalling network includes the network entities and the signalling exchange which are related to telecommunications services. Analyses and optimization

on signalling network are important methods for network and service-related management and operation. This Recommendation specifies the framework, interfaces, protocols, service procedures, AI/ML-assisted functions, and security considerations of signalling network analyses and optimization in the context of VoLTE network.

ITU-T X.Suppl.37 "Supplement to ITU-T X.1231: Countering spam based on machine learning" defines a technical framework for countering spam based on machine learning. It may help some relevant persons and companies in spam management, reduce the benefit loss of users and providers, improve user experience and promote the healthy development of telecommunication business. This Supplement to Recommendation ITU-T X.1231 provides some general scenarios, characteristics of spam, and define general technical framework, work flows about countering spam based on ML.

ITU-T Technical Report TR.sec-ai "Guidelines for security management of using artificial intelligence technology": As a new generation of information and communication technology (ICT) infrastructure, Artificial Intelligence (AI) has been widely used in various fields of social economy. In the development and application of AI technology, AI may also bring some security threats, which may run through the whole process of AI products, applications and services from design and development to retirement. Organizations need to identify the source of security threats according to the using process of AI technology, so as to deploy targeted security defense strategies. This Technical Report focuses on the security threats faced by the current use of AI technology, puts forward AI security management suggestions, and provides a useful reference for organizations to improve the security protection ability in the use of AI technology.

Recommendation ITU-T Y.3180 "Mechanism of traffic awareness for application-descriptor-agnostic traffic based on machine learning" specifies the mechanism of traffic awareness for application-descriptor-agnostic traffic based on machine learning. This Recommendation specifies the following aspects related to traffic awareness for application-descriptor-agnostic traffic: overview, general mechanism, used machine learning methods, implementation consideration based on machine learning, report and auxiliary control mechanism for the malicious application-descriptor-agnostic traffic and security consideration.

Recommendation ITU-T Y.3181 "Architectural framework for Machine Learning Sandbox in future networks including IMT-2020" provides an architectural framework for machine learning (ML) sandbox in future networks including IMT-2020. More precisely, it describes requirements and high-level architecture for ML sandbox in future networks including IMT-2020.

Recommendation ITU-T Y.3182 "Machine learning based end-to-end multi-domain network slice management and orchestration" describes an intelligent cost-effective network management and orchestration framework that can cope with the challenges of multi-domain network slicing, while minimizing human intervention towards full automation of slice lifecycle management and runtime operation. It addresses the following subjects:

- Overview and interoperability requirements of machine learning based multi-domain end-to-end network slice management and orchestration;
- Functional requirements of machine learning based multi-domain end-to-end network slice management and orchestration;
- Framework of machine learning based multi-domain end-to-end network slice management and orchestration;
- Cognitive components for the framework.

Draft Recommendation ITU-T Y.3183 "Framework for network slicing management assisted by machine learning leveraging QoE feedback from verticals" (under approval) provides a framework for machine learning assisted network slicing management, leveraging vertical end users' feedback

on QoE, which can help achieve run-time optimisation of user perceived performance. The overall architecture, components, workflow and related APIs of this framework are specified with respect to the high-level requirements identified. A use case is provided in appendix to show an application example of this framework. Example implementations of the key APIs are also provided.

Draft Recommendation ITU-T Y.3325 "Framework for high-level AI-based management communicating with external management systems" (under approval): After the IMT-2020 technology and network virtualization technology spread, the appearance of emerging services such as multimedia services (high resolution, AR, VR, etc.) and IoT will be expected. Since huge amount of traffic of these new coming services will be incurred to the network, the importance of the network flexibility and stability will increase. Network operators intend to improve network operations such as provisioning, resource control, failure detection and recovery, etc. Automatic network management supported by recent AI technologies, called AI-based network, will play an essential role for such era. On the other hand, service provider needs to manage service dynamically based on service and network status for better quality of service (QoS). In order for service providers to use the information managed by AI-based network effectively, common interface between system of service providers over AI-based network and AI-based network is required. This Recommendation describes requirements for reference model of such interactions including interface and metadata.

Recommendation ITU-T Y.3654 "Big data driven networking - Machine learning mechanism" specifies the mechanisms of machine learning in big data driven networking (bDDN). A set of related aspects of machine learning in bDDN are presented, these aspects include: overview, learning procedure, deployment, interfaces, learning path and control path, security consideration.

Recommendation ITU-T Y.3680 "Framework of human-like networking": Artificial intelligence technologies, network awareness technologies, network self-restructuring technologies and other technologies applied into network area can bring about innovation of network and new network architecture. Introducing human-like features into network can make the network make full use of advantages of human being and bring a new network architecture named human-like networking to birth. This Recommendation specifies framework for human-like networking. This Recommendation specifies following aspects of human-like networking: overview of human-like networking, framework of human-like networking, generic architecture model for human-like networking based on function and capability, relationship between layers, sub-network and networks for human-like networking, interface aspect of human-like networking and security consideration.

Recommendation ITU-T Y.3812 "Quantum key distribution networks - Requirements for machine learning based quality of service assurance" specifies high-level and functional requirements of machine learning (ML) based QoS assurance for the quantum key distribution networks (QKDN). This recommendation first provides an overview of requirements of ML based QoS assurance for the QKDN. It describes a functional model of ML based QoS assurance and followed by associated high level and functional requirements of ML based QoS assurance. And some use cases are described.

Draft Recommendation ITU-T Y.3814 "Quantum key distribution networks - functional requirements and architecture for machine learning enablement" (under approval): QKDN is expected to maintain stable operations and meet the requirements of various cryptographic applications efficiently. Due to the advantages of machine learning (ML) related to autonomous learning, ML can help to overcome the challenges of QKDN in terms of quantum layer performances, key management layer performances and QKDN control and management efficiency. Based on the functional requirements and architecture of QKDN in [ITU-T Y.3801] and [ITU-T Y.3802], this recommendation is to specify one possible set of functional requirements and a possible architecture for ML-enabled QKDN (QKDNml), including the overview, the functional requirements, architecture and operational procedures of QKDNml.

ITU-T Y.Sup.72 to Y.3000-series of Recommendations "Artificial Intelligence Standardization Roadmap" provides the standardization roadmap for artificial intelligence (AI) in the information

and communication technologies area. This AI standardization roadmap has been developed to assist in the development of AI related standards in the ICT fields by providing information about existing and under developing standards in key standards development organizations (SDOs). In addition, it provides the overviews of AI and AI related technical areas from standards perspective, AI related activities in standards development organizations (SDOs), and gap analysis.

Work items under development:

- Draft Y.bDDN-AA-RAM "Big data driven networking- requirements, architecture and mechanism of application awareness" (Q7/13)
- Draft Y.bDDN-AM-COO "Big data driven networking - Architecture and mechanism for customer-oriented intelligent network operation" (Q7/13)
- Draft Y.bDDN-RA-NPN "Big data driven networking-Functional requirements and functional architecture of operation aspect for non-public network" (Q7/13)
- All Q5/16 work items on AI/ML: https://www.itu.int/ITU-T/workprog/wp_search.aspx?isn_sp=8265&isn_sg=8274&isn_qu=8372&isn_status=-1,1,3,7&recent=12&pg_size=100&details=0&field=acdefghijo
- Draft T.JPEG-AI "Information technology – JPEG AI learning-based image coding system" (Q6/16)
- Draft T.Sup.MACVC "Optimization of encoders and receiving systems for machine analysis of coded video content" (Q6/16)
- Draft F.RCRA-VRS-RF "Reference framework of virtual reconstruction system for restoration of cultural relics and artworks based on artificial intelligence" (Q23/16)
- Draft F.CS-AEI "Requirements and functional specifications for counselling services based on artificial emotional intelligence" (Q23/16)

A19/01	Signed digital evidence	The MoU/MG invited organizations to provide inputs to the next MoU/MG meeting on the subject of signed digital evidence.

A20/02	New Coordination / Blockchain and distributed ledger technologies	The MoU/MG found considerable interest in the use of Blockchain and distributed ledger technologies (DLT) with an impact on electronic business, and invites its members to report to the MoU/MG their approaches and requirements on interoperability of DLT.

Recommendation ITU-T F.747.10 "Requirements of distributed ledger systems for secure human factor services" provides general requirements and functional capabilities for distributed ledger systems (DLS) for secure human factor services. This Recommendation describes the requirements for the secure human factor distributed ledger service model, which can solve conflicting goals of privacy protection and big personal human factor data utilization. This Recommendation also includes the functional capabilities for human factor distributed ledger shared nodes to perform machine learning without decryption on encrypted human factor data. However, the computational burden of machine learning for encrypted data may be excessive. To solve this problem, this human

factor distributed ledger service model provides procedures for allowing the use of two or more encryption key pairs and notifying the key type. In addition, this Recommendation involves the integrity maintaining requirements for secure human factor services to maintain a safe distributed ledger and checked from the beginning to distribute personal human factor information. Therefore, the application of distributed ledger system in the distribution of personal secure human factor information can ensure transparent tracking from the distribution process to the final use path.

Recommendation ITU-T F.751.3 "Requirements for change management in DLT-based decentralized applications": The development of applications using distributed ledger technology (DLT) enables the creation of new business models in various sectors of the economy and it has the potential to tackle, on a large scale, important challenges for our society, due to its ability to increase trust in the relationship among stakeholders. Technical immutability is key to build trust among stakeholders. On the other hand, real-life introduces practical needs to update applications with smart contracts. This document defines some recommendations to tackle changes in applications using smart contracts. The discussion of whether DLT networks provide different levels of technical immutability is out of scope of this document.

Recommendation ITU-T F.751.4 "General framework for DLT-based invoices": DLT-based invoice is an invoice that can be issued, transferred and received in a structured electronic format over digital ledgers which allows for its automatic, electronic transactions based on the smart contracts. It presents as a novel invoice service category, emerges as a promising solution to tackle the challenges by leveraging the capability of distributed ledger technology and the trust requirement of the stakeholders in the ecosystem. The usage of DLT-based invoices is driven mainly by seeking to optimize the end-to-end trustworthy business process across the jurisdictions in the major processes, e.g., issuance, routing, processing, re-imbursement, auditing and so on. The document is not proposing a "regulatory" framework. However, tax consideration involved by nature regulatory considerations must be addressed at a national level and are not the subject of this Recommendation. The electronic exchange of the invoice content between trading partners' accounts receivable and accounts payable business processes is to be recorded over the invoice digital ledger in trustworthy way with local tax compliance. From a technology perspective, it needs to determine how the invoice will be transferred in a secure and interoperable way and how policies in different jurisdiction is enforced, and in the meanwhile the data privacy, security, trust and confidentiality have to be guaranteed, which is relevant to the following aspects:

– Secure messaging infrastructure to ensure that senders and receivers can trust the system and confidently exchange invoices.

– Programmable government tax policies that can be securely enforced.

– Invoice data validation schemes to ensure that integrity of the invoice content.

Immutability of the digital distributed ledgers to allow stakeholders to store, validate the invoice based on their corresponding privileges.

Recommendation ITU-T F.751.5 "Requirements for distributed ledger technology-based power grid data management" defines requirements for distributed ledger technology (DLT)-based power grid data management, including framework of DLT-based power grid data management, requirements for infrastructure layer, requirements for service layer, requirements for application layer and requirements for data governance. This Recommendation can be used as a guideline for power grid data management with DLT technologies.

Recommendation ITU-T F.751.6 "Performance assessment methods for distributed ledger technology platforms" is an extension to the ITU-T F.751.1 and focuses on distributed ledger technology (DLT) performance assessment methods. Based on the performance assessment criteria defined in ITU-T F.751.1, this Recommendation defines specific performance metrics and relevant workflow for the quantitative performance assessment for DLT platform. This Recommendation can

be used as a guideline of DLT platform performance assessment for developers, users, third party testers and researchers.

Recommendation ITU-T F.751.7 "Functional assessment methods for distributed ledger technology platforms" defines functional assessment methods for DLT platforms based on the assessment criteria defined in ITU-T Recommendation F.751.1. For each item of the assessment criteria defined in ITU-T F.751.1, one test case is defined in this Recommendation accordingly. The description of each test case is composed of test purpose, test workflows and expected results.

Recommendation ITU-T F.751.8 "Technical framework for distributed ledger technology (DLT) to cope with regulation" (under approval) defines the technical framework for distributed ledger technology (DLT) to cope with regulation, including regulatory challenges and technical capacities. The design of the technical framework of DLT in this Recommendation is closely related to DLT properties including decentralization, immutability and openness. This Recommendation can be used as guidance for the DLT system when facing regulation for DLT service providers and DLT system developers.

Recommendation ITU-T X.1407 "Security requirements for digital integrity proofing service based on distributed ledger technology" specifies the security threats and requirements in digital integrity proofing based on distributed ledger technology (DLT). The original proof protected is stored in the off-chain. The hashed data values are stored in the on chain. Recommendation X.1407 analyses the security threats to the digital integrity proofing services based on DLT, namely, proof registration and proof provenance. Recommendation X.1407 describes the security requirements that could address these security threats.

Recommendation ITU-T X.1409 "Security services based on distributed ledger technology": Distributed ledger technology (DLT) has features include immutability, data sharing, decentralization, and tamper-resistance. Certain security services can benefit from the decentralized nodes of DLT to solve problems such as single point of failure, bottleneck performance and tampering. This Recommendation identifies aspects to be evaluated before delivering a security service based on DLT and provides examples to implement four security services which could be delivered based on DLT, namely:

- DLT-based public-key certificate management;
- DLT-based software defined perimeter;
- DLT-based threat intelligence sharing; and
- DLT-based security audit.

Recommendation ITU-T X.1410 "Security architecture for data-sharing management based on the distributed ledger technology" (under approval) specifies a security architecture of data-sharing management based on distributed ledger technologies (DLTs). Based on the architecture, this Recommendation specifies the interfaces between the functional entities and the procedures of data-sharing management based on DLT. Distributed ledger technology is transforming the industries with innovative solutions and changing the way governments, institutions, and businesses operate. It provides a solution for securely replicating, sharing, and synchronizing data across a distributed computer network, considering its decentralization and tamper-proof features. Current approaches for sharing business data and personally identifiable information (PII) data with companies and digital platforms have led to privacy vulnerabilities from hacks or poor data management. Adopting DLT or blockchain in data-sharing management allows individuals or companies to maintain more direct control over their own confidential information. In the DLT-based solution, only non-PII data, e.g., hashed data values, are stored in the on-chain. PII data about a data owner are stored in the off-chain. A DLT-based solution provides a way that improves the traceability, verifiability and changeability of status of data.

Recommendation ITU-T X.1411 "Guidelines on blockchain as a service (BaaS) security" (under approval) provides generic guidelines for blockchain as a service (BaaS). The security threat and vulnerabilities of blockchain as a service (BaaS) are analysed, followed by the security measures of blockchain as a service (BaaS). The Recommendation addresses the security requirements and provides guidelines for all the activities in the construction, operation and use of BaaS. Blockchain as a service has become a mainstream of blockchain development, due to its promising capability and support from giant tech companies, especially top cloud providers. As blockchain as a service (BaaS) provides the fundamental service and resources for blockchain applications and BaaS security also faces challenges arising from both blockchain core technologies and cloud platforms, the guidance on blockchain as a service security is of great importance and a necessity.

Recommendation ITU-T Y.2247 "Framework and requirements of network-oriented data Integrity verification service based on blockchain in future network" (under approval) specifies the network-oriented data integrity verification service based on blockchain in future networks. It provides the service requirements, framework and service scenarios of the network-oriented data integrity verification service based on blockchain and specifies the network capability requirements accordingly in the context of future networks including IMT-2020 network and beyond. Detailed descriptions of the use cases are listed in the appendix.

Recommendation ITU-T Y.3082 "Mobile network sharing based on distributed ledger technology for networks beyond IMT-2020: Requirements and framework" (under approval) specifies the requirements and framework of distributed ledger technology used in mobile network sharing for networks beyond IMT-2020. The detailed requirements of distributed ledger technology based mobile network sharing are put forward. The high-level framework, service procedures and security considerations are presented. The detailed use cases are described in the appendix.

Recommendation ITU-T Y.4052 "Vocabulary for blockchain for supporting Internet of things and smart cities and communities in data processing and management aspects" contains blockchain-related vocabulary to be used for Internet of things (IoT) and smart cities and communities (SC&C) in aspects of data processing and management (DPM). The vocabulary in this Recommendation is collected from the Recommendations, Supplements and standards published by ITU and ISO. In addition, this Recommendation includes and defines new terms to meet the needs of SC&C work within ITU.

Work items under development:

- draft Y.MDRM-DLT-reqts "Requirements and framework of multi-dimensional resource matching of NGNe based on DLT" (Q2/13)
- draft Y.SNICE-DLT-reqts "Requirements and framework of distributed S-NICE based on DLT" (Q2/13)
- Draft F.DLT-TRICI "Technical requirements on inter-chain interoperability for permissioned distributed ledger technologies" (Q22/16)
- Draft H.DLT-AGFAS "Application guideline for authorization services based on distributed ledger technology" (Q22/16)
- Draft H.DLT-AMMSP "Assessment methods for DLT management service platform" (Q22/16)
- Draft H.DLT-DAS "Technical framework for distributed ledger technology based multi-media data asset service" (Q22/16)
- Draft H.DLT-DAS "Technical framework for distributed ledger technology based multi-media data asset service" (Q22/16)
- Draft H.DLT-DCS "Technical framework of DLT-based digital collection services" (Q22/16)

- Draft H.DLT-DST "Technical framework for permissioned distributed ledger technology based on sharding technology" (Q22/16)
- Draft H.DLT-EMDGP "General architecture for DLT-based energy metering data sharing platform" (Q22/16)
- Draft H.DLT-ESSS "Framework of distributed ledger technology-based energy storage sharing systems" (Q22/16)
- Draft H.DLT-ESSS "Framework of distributed ledger technology-based energy storage sharing systems" (Q22/16)
- Draft H.DLT-FMD "Framework for fast message delivery for DLT-based services" (Q22/16)
- Draft H.DLT-MMPA "Maturity model of permissioned distributed ledger technology application" (Q22/16)
- Draft H.DLT-PTS "Performance test suite for distributed ledger technology system" (Q22/16)
- Draft H.DLT-RECT "Reference architecture for information tracing of renewable energy consumption based on distributed ledger technology" (Q22/16)
- Draft H.DLT-RFMSP "Reference framework for DLT management service platform" (Q22/16)
- Draft H.DLT-SCLMR "Smart contract lifecycle management requirements for distributed ledger technology systems" (Q22/16)
- Draft H.DLT-SGDRF "Framework of distributed ledger technology-based smart grid demand response" (Q22/16)
- Draft H.MDDMD-Arch "Reference Architecture for DLT-based Multimedia Data Delivery Management System" (Q22/16)
- Draft Y.4560-rev "Blockchain-based data exchange and sharing for supporting Internet of things and smart cities and communities" (Q4/20)
- Draft Y.DPM-alm-fra "Functional requirements and architecture of blockchain-based activity logs management for IoT data processing and management" (Q4/20)

Miscellaneous:

- New ITU-T Focus Group on metaverse (FG-MV), with TSAG as parent.

Other useful resources

- ITU-T Work Programme
- Forthcoming ITU-T Events and Workshops
- ITU-T Recommendations and Supplements
- ITU-T Technical Papers
- Collaboration on ITS Communication Standards
- Joint Coordination Activities
- AI for Good Global Summit


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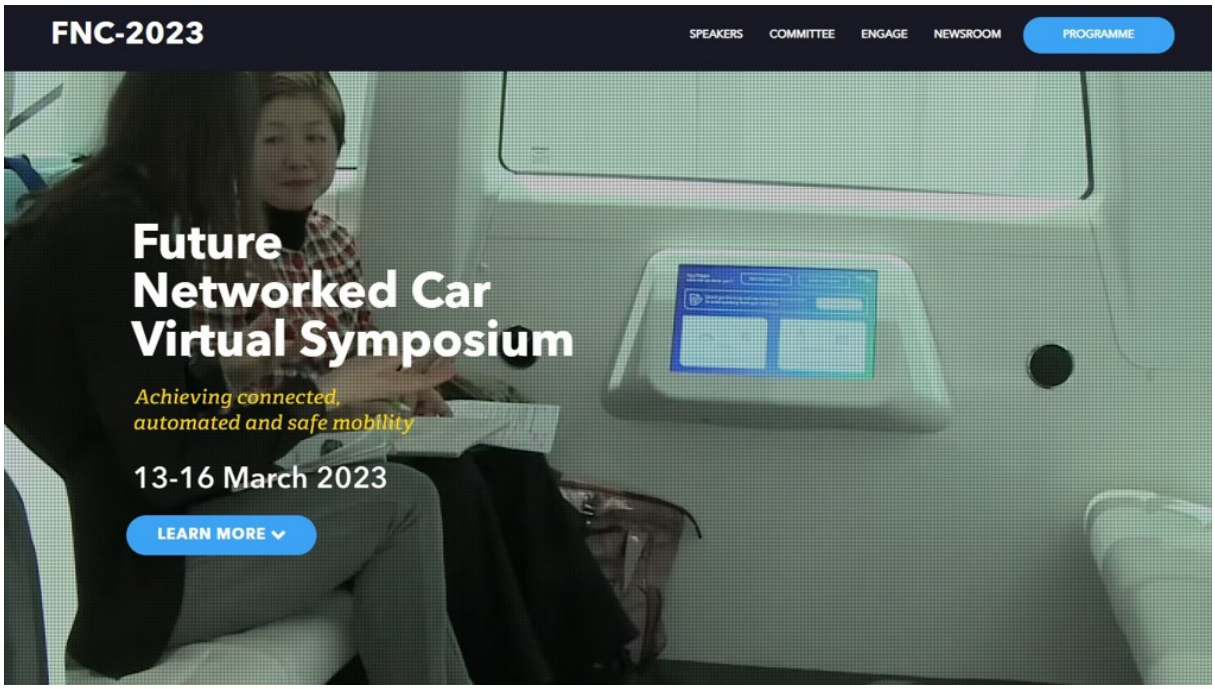
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