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| **Keywords:** | Communiqués, CTO group |
| **Abstract:** | This TD contains the communiqués of the last three CTO group meetings:   * CxO group meeting, 23 October 2016, Hammamet, Tunisia; * 8th CTO meeting, 13 November 2016, Bangkok, Thailand; * First North-American west coast CTO consultation meeting in San José, CA, US, 30 March 2017. |

**Action**: TSAG RG-StdsStrat is invited to consider the communiqués as part of its work and to follow-up on the CTO group agreements on priority topics from the executive-level to the Study Group experts.

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

This TD contains the communiqués of the last three CTO group meetings where Annexes A, B, and C contain the full communiqués as published.

* **CxO group meeting, 23 October 2016, Hammamet, Tunisia**

A CTO group meeting of 24 ICT industry executives and the strategic management of the ITU Telecommunication Standardization Sector (ITU-T) took place in in Hammamet, Tunisia, 23 October, hosted by Tunisie Télécom.

ICT industry executives have highlighted the importance of innovation capitalizing on VoLTE and other unique opportunities presented to network operators by advanced packet-based communications. Leaders agree that Gigabit-speed broadband access and data security will form key priorities to industry in coming years. These executives have also reaffirmed their request for regulation to provide a level playing field for competition between telecoms and OTT players in fields where they provide equivalent services. Participants agreed that hybrid, technology-agnostic networks would constitute a stepping stone towards true fixed-mobile convergence, an important requirement for the development of 5G networks.

The meeting recommended that ITU consider augmented and virtual reality as topics of great strategic importance, creating the necessary synergies between ITU study groups, and between relevant standards bodies in order to lay the foundations for standards and interoperability in this domain.

The meeting’s full set of conclusions were issued as a [communiqué](http://www.itu.int/md/T13-WTSA.16-INF-0009/en). (See Annex A)

* **8th CTO meeting, 13 November 2016, Bangkok, Thailand**

CTOs present in Bangkok also reviewed the results of a pre-WTSA ‘CxO meeting’ of high-level industry executives representing leading ICT companies, with the Arab and African regions especially well-represented. This 8th CTO discussed strategies to accelerate the deployment of gigabit-speed broadband access networks and the new industry dynamics introduced by the rise of over-the-top (OTT) services.

The CTO meeting also encouraged ITU-T to identify strategies, in close coordination with ITU-D, to assist developing countries and emerging markets in the implementation of future 5G systems, identifying relevant cost-effective use cases for 5G systems and related migration scenarios. [Communiqué](https://www.itu.int/en/ITU-T/tsbdir/cto/Documents/161123/Communique%20-%20CTO%20meeting%20Bangkok%20-%20final.pdf). (See Annex B).

* **First North-American west coast CTO consultation meeting in San Jose, CA, US, 30 March 2017**

Eight high-level industry executives and the strategic management of ITU’s standardization arm, ITU-T, met for the first North-American west coast CTO consultation meeting in San Jose, CA, US, 30 March 2017.

The meeting issued a [communiqué](http://www.itu.int/en/ITU-T/tsbdir/cto/Documents/170330/communique-170330.pdf) outlining emerging trends in 5G innovation and associated demands on ITU-T standardization. CTOs of leading ICT companies in west coast of North America have reaffirmed that fixed-mobile convergence will be fundamental to the success of 5G systems. (See Annex C).

**Annex A – Communiqué of the** **CxO group meeting, 23 October 2016, Hammamet, Tunisia**

COMMUNIQUÉ

Strategies to accelerate the deployment of gigabit-speed broadband access networks and the new industry dynamics ushered in by the rise of over-the-top (OTT) services were the key topics discussed at a meeting of 24 high-level industry executives (CxOs), representing leading ICT companies, with the Arab and African regions especially well-represented, and the senior management of the ITU Telecommunication Standardization Sector (ITU-T).

Held at the outset of ITU’s quadrennial World Telecommunication Standardization Assembly (WTSA‑16) in Hammamet, Tunisia, the CxO meeting was opened by H.E. Mr. Habib Dababi, Secretary of State for Digital Economy, Republic of Tunisia, and hosted by Mr. Nizar Bouguila, Chairman and CEO, Tunisie Télécom.

The meeting provided the private sector with an opportunity to brief, advise and exchange views with ITU-T on emerging industry needs and associated standardization priorities.

**Over-the-top (OTT) services – opportunities and challenges for telecommunications operators**

In recent years, telecommunications operators have witnessed exponential growth in data traffic, and declining revenues for their voice and messaging services. This trend has impacted the financial stability of certain operators, sometimes with significant implications for the GDP of national economies. Participants in the CxO meeting noted that operators have seen the emergence of new opportunities and challenges as a result of the proliferation of services delivered over communications networks by third party providers, so-called OTT services. Participants recognized that to date – despite frequent discussion, in many venues – no adequate, sustainable approach has been found to address the interplay of OTT service providers and operators. They requested a fair level playing field and that OTT players need to be subject to the same regulations as those of the telecoms sector, when providing an equivalent service.

The CxO meeting called on ITU-T to study the economic impact of OTT services on operators, and to develop international standards and a holistic approach to address the OTT market environment. CxOs suggested that ITU study groups should act as international platforms to the issues at play, study viable business models and develop best practices, and build partnerships between operators and OTT service providers. Collaboration with other standards bodies and industry organizations was encouraged.

Participants in the meeting highlighted that users, operators and service providers – particularly in developing countries – would benefit from international standards, frameworks, best practices and guidelines addressing OTT services in the telecom environment. The view of the CxOs is that this guidance would help to place industry players in developing countries in a stronger position to compete internationally, as well as provide a wider choice of ICT products and services at a lower cost, with greater quality and ease of access.

Concerning information security and privacy in today’s data-driven society, and in OTT services in particular, CxOs noted that conflicts can sometimes arise in the interests of users, network operators, service providers and governments. The meeting was of the view that all stakeholders would need to increase their collaboration to address security and privacy, sharing information on threats and data usage and establish appropriate risk-detection mechanisms and procedures to respond to data breaches. It was also pointed out that a shift from system-centric to data-centric security will be necessary to account for the new security challenges associated with new data-driven applications and services. Participants in the meeting encouraged ITU to play a more active role in this regard, highlighting that international standards and frameworks for security, privacy and trust in ICT infrastructure and services are key ingredients to achieving the desired outcomes.

**G.fast and other broadband access technologies based on ITU standards**

Ambitious broadband targets set by governments worldwide, highly competitive ICT markets and the massive growth in data traffic, largely driven by video, are among the key factors motivating operators to provide Gigabit-capable broad access services.

The CxO meeting reviewed recent developments and deployments of broadband access networks, including those championed and standardized by ITU-T, such as G.fast, G.hn, VDSL2 and passive optical networks (e.g., NG-PON2).

The meeting also discussed fixed wireless access and solutions combining two or more heterogeneous networks (e.g., LTE and Wi‑Fi) to achieve increases in bandwidth and reductions in network cost, especially to support the delivery of high-definition video services. The meeting invited ITU-T to consider the inclusion of such hybrid approaches in its portfolio of access network standards.

Participants noted that while there is no broadband access solution suitable for all deployment scenarios, a wide range of viable standardized options are available to address different market needs, whether defined in terms of bandwidth offered, the level of investment required, the geographical area to be covered, or time to market. The meeting’s participants highlighted that cost efficiency remained a decisive factor in the choice of broadband access solutions, making it important to leverage existing infrastructure or use integrated, unified platforms where feasible.

Participants agreed that hybrid, technology-agnostic networks would constitute a stepping stone towards true fixed-mobile convergence, an important requirement for the development of 5G networks.

**Augmented reality & virtual reality**

Augmented reality and online virtual reality form prime use cases for gigabit-speed connections and 5G networks. These applications offer an enhanced user experience, but these applications are very demanding of the network with respect to throughput and latency. A range of innovative technologies in transport, IP and access networking, media coding and cloud and edge computing are under development to fulfil these stringent requirements. The meeting recommended that ITU consider augmented and virtual reality as topics of great strategic importance, creating the necessary synergies between ITU study groups, and between relevant standards bodies in order to lay the foundations for standards and interoperability in this domain.

**Moving forward**

Participants expressed their appreciation to ITU for providing this forum to exchange views on emerging ICT trends and the associated standardization priorities of the Arab and African Region and beyond. The ITU management agreed to bring this communiqué to the attention of the ITU membership, and to the newly formed rapporteur group on standardization strategy, operating under the Telecommunication Standardization Advisory Group (TSAG). The CxOs agreed to hold regular meetings in this format to review the progress, adjust and refine the recommendations for action.

Trace Media Telecom Review kindly offered to host the next meeting in Dubai, December, 2017.

The meeting acknowledged and thanked Tunisie Télécom for the hospitality and generosity extended in hosting this CxO meeting.

**The participating organizations were:**

**Alibaba Group**, China; **DASAN Network Solutions**, Korea; **Deutsche Telekom**, Germany; **Ericsson**, Region Mediterranean; **Expresso Telecom Group**, United Arab Emirates; **Fujitsu**, Japan; **CSU (Hayo)**, Senegal; **Huawei Technologies**, China; **JPL Informatique**, Switzerland; **KT Corporation**, Korea; **Lycamobile Tunisie**, Tunisia; **Mobilis**, Algeria; **National Institute of Information and Communications Technology**, Japan; **NEC Corporation**, Japan; **Nokia Corporation**, Finland; **Orange**, France; **Prisma**, Tunisia; **Rohde & Schwarz**, Germany; **Sotetel**, Tunisia; **Telkom Group**, South Africa; **Topnet**, Tunisia; **Trace Media Telecom Review**, United Arab Emirates; **Tunisie Télécom**, Tunisia; **ZTE Corporation**, China; **Ministry of Communication Technologies and Digital Economy**, Tunisia; **ITU**.

**Annex B – Communiqué of the TSB DIRECTOR CTO MEETING, 13 November 2016 (pm), Bangkok, Thailand**

COMMUNIQUÉ

The results of the ITU World Telecommunication Standardization Assembly 2016 (WTSA-16) and standards for future smart 5G systems were the key topics discussed at a meeting of 14 high-level ICT industry executives (CTOs) with the senior management of the ITU Telecommunication Standardization Sector (ITU-T) and the ITU Radiocommunication Sector (ITU-R).

The CTO meeting was held at the outset of ITU Telecom World 2016 in Bangkok, Thailand, and provided the private sector an opportunity to brief, advise and exchange views with ITU on industry needs and standardization priorities.

**Review of the outcomes of WTSA-16**

The meeting gave CTOs the opportunity to learn more about the key outcomes of WTSA-16.

These outcomes include the revised Study Group structure, mandates and leadership roles; as well as new and revised WTSA Resolutions, including the revised Resolution 68, which calls on the ITU secretariat to continue organizing CTO meetings to assist in identifying and coordinating standardization priorities and subjects.

The CTO meeting took note of the conclusions of the Global Standards Symposium (GSS-16) held the day prior to WTSA-16, which tackled the theme of ‘Security, Privacy and Trust in Standardization’. The conclusions of GSS-16 underlined the need to support and promote principles of transparency and technological integrity; mitigate the risks posed by IoT botnets using security standards; and assess the impact of quantum computing on security, privacy and trust.

CTOs present in Bangkok also reviewed the results of a pre-WTSA ‘CxO meeting’ of high-level industry executives representing leading ICT companies, with the Arab and African regions especially well-represented. This meeting discussed strategies to accelerate the deployment of gigabit-speed broadband access networks and the new industry dynamics introduced by the rise of over-the-top (OTT) services.

**5G technology and standards landscape**

One of the key results of WTSA-16 was the agreement of a new Resolution on non-radio aspects of international mobile telecommunications (IMT), which calls on ITU-T to strengthen and accelerate its standardization activities in the field of IMT-2020 (5G). The CTOs were briefed on the progress of the ITU-T Focus Group on network aspects of IMT-2020 and its work streams on architecture and fixed-mobile convergence, the evolution of software defined networking, end-to-end network management, and information-centric networking. The Focus Group will conclude its work by the close of 2016, at which point its findings will be submitted to ITU-T Study Groups to inform their development of international standards. The meeting was informed of a recent cooperation agreement [[1]](#footnote-1)between ITU and the NGMN Alliance, highlighting the mutual intent of both organizations to coordinate their contributions to the development of 5G technology and architecture.

The CTO meeting discussed the phased approach employed by 3GPP in developing a new 5G system architecture and core network. Phase 1 will comprise a basic system that meets expectations for initial deployments of 5G systems, including the new 5G core network. Phase 2 will build a complete, feature-rich 5G system using the basic system as a foundation to ensure backward compatibility, and enable convergence with the fixed network. While the work in 3GPP is central to 5G architecture, collaboration with BBF on convergence, and with ETSI on NFV and MEC, amongst others, is ongoing.

CTOs highlighted that a single end-to-end network management standard covering both wireless and wireline networks, and an integrated control, orchestration and management platform, would constitute stepping stones towards convergence, an important goal for future 5G systems. The system architecture should leverage software-based networking functions as well as multi-access edge computing to cater to a large number and variety of use cases, in different industry segments. Participants in the meeting also stressed the need for a review of user and device authentication mechanisms, including harmonized security-by-design frameworks, with a view to reducing fragmentation and discouraging unauthenticated access technologies.

CTOs were of the opinion that organizations working on 5G system architecture standards should strengthen collaboration to foster a coherent set of 5G-relevant standards, and encouraged ITU-T to ensure interoperability in a multi-vendor environment, e.g., by defining critical network interfaces. The meeting agreed that standards and open-source software make complementary contributions to the development of 5G systems, and that more effort should be made to facilitate the exchange of work between these communities.

The meeting highlighted the importance for standardization efforts to be aligned with the IMT-2020 deliverables of ITU-R, ensuring that work on the network aspects of 5G is informed by the progression of its radio-transmission systems. CTOs recognized that standards, harmonized at a global level, would facilitate collaboration between the ICT sector and other industry sectors, enabling the development and roll-out of end-to-end solutions for multiple industries on a common network platform. In order to identify detailed requirements of the automotive, healthcare, utilities and other vertical sectors, and to address their needs in the ICT standardization processes, it was suggested to establish and leverage cross-industry partnerships, and to open future CTO meetings to high-level executives representing these markets.

The CTO meeting also encouraged ITU-T to identify strategies, in close coordination with ITU-D, to assist developing countries and emerging markets in the implementation of future 5G systems, identifying relevant cost-effective use cases for 5G systems and related migration scenarios.

**Moving forward**

The CTO meeting’s participants expressed their appreciation to ITU for providing this forum to learn more about WTSA-16 and exchange views on 5G systems and associated standardization needs. The ITU-T management noted that this communiqué will be brought to the attention of the ITU membership, and to the new rapporteur group on standardization strategy operating under the Telecommunication Standardization Advisory Group (TSAG).

The next CTO meeting was tentatively scheduled for 24 September 2017 in Busan, Republic of Korea, the venue of ITU Telecom World 2017.

**The participating organizations were:**

Cisco Systems, United States; Ericsson, Sweden; ETRI, Korea; Fujitsu, Japan; Huawei Technologies, China; KDDI, Japan; KT Corporation, Korea; NEC, Japan; NICT, Japan; Nokia, Finland; NTT DoCoMo, Japan; TraceMedia–Telecom Review, United Arab Emirates; TTC, Japan; ZTE, China; ITU.

**Annex C – Communiqué of the TSB DIRECTOR CTO MEETING, 30 March 2017, San Jose, CA, United States**

COMMUNIQUÉ

Standardization activities towards realizing the 5G Vision were the focus of a consultation meeting of high-level ICT industry executives (CTOs) with the senior management of the ITU Telecommunication Standardization Sector (ITU-T).

The first CTO Consultation Meeting for the North American region was held in San Jose, California, kindly hosted by David Ward, Chief Technology Officer of Engineering and Chief Architect of Cisco Systems. The meeting provided ITU-T Sector Members based in North America with an opportunity to exchange views with the ITU-T secretariat on industry needs and related standardization priorities and coordination efforts.

Discussions on standards for 5G infrastructure and services highlighted the need for seamless connectivity across fixed and wireless networks — fixed-mobile convergence — as well as the need for chip architectures to meet the low-power and flexibility requirements necessary to high-performance signal processing in 5G infrastructure. The meeting recognized the great potential of information-centric networking (ICN) to enable faster and more robust content delivery, supporting strategies to enable dynamic, experience-oriented performance and quality management, including for voice, video and data services.

CTOs were briefed on the outcomes of the ITU World Telecommunication Standardization Assembly 2016 (WTSA-16), including a new Resolution on non-radio aspects of international mobile telecommunications (IMT), which calls on ITU-T to strengthen and accelerate its standardization activities in the field of 5G networks and services.

5G infrastructure ITU-T standardization activities in support of 5G are led by ITU-T Study Group 13, building on preliminary studies undertaken by the ITU-T Focus Group on network aspects of IMT-2020. The Focus Group concluded its study in early 2017 with the delivery of a set of draft ITU standards and technical reports covering aspects of 5G architecture and fixed-mobile convergence, the evolution of software-defined networking, end-to-end network management, and ICN.

CTOs were of the view that a unified, access-independent network management framework would be a key enabler of seamless service operation and provisioning across fixed and mobile networks. They called on ITU-T to contribute to and coordinate the standardization required to enable WiFi-cellular integration (simultaneous radios), anchorless mobility, anchorless content and active endpoints at the service layer to enable the network capability of analyzing and optimizing the quality of user experience. To foster convergence, participants invited ITU-T to collaborate with the various organizations active in this space, making full use of its recently established Joint Coordination Activity on IMT-2020.

The meeting discussed the key 5G capabilities and performance requirements detailed by the draft ITU report providing “Minimum requirements related to technical performance for IMT-2020 radio interface(s)”.

CTOs stated that 5G will have significant impacts on the semiconductor industry and that 5G will push digital signal-processing platforms to their limits.

The discussions emphasized the need for cost-effective novel chip architectures to enable high-performance signal processing, while also meeting the demand for greater flexibility, security, lower power consumption, and limited chip size.

**5G applications and services**

The ITU representatives stated that the proofs-of-concept demonstrated by the Focus Group showed how ICN could constitute a feasible approach to optimizing content distribution, one of the key problems faced by the Internet today. ITU has delivered standards describing ICN’s framework, requirements and capabilities, and the meeting encouraged ITU-T to accelerate its ICN standardization activities, addressing issues such as scalability, mobility and security. CTOs highlighted that ICN software has been open sourced and is currently being validated in research networks around the world. They invited ITU to contribute to the advancement of ICN technology and to contribute to the expansion of the community driving ICT innovation.

CTOs acknowledged that a key benefit of 5G systems and software-based networking functions would be the ability to optimize performance on a per-session basis.

One of the most relevant performance targets would be to enable good end-user experience across a range of services. It was noted that emerging network and computing technologies should ultimately allow multiple media and metadata streams to be managed with a high quality of experience (QoE) for cross-service, user-centric sessions.

CTOs highlighted that fulfilling this potential would require the technology and standards community to determine how the targeted user experience should be defined.

This definition would inform how services are specified, quantifying the targeted experience as part of a service template and enabling metrics to be made available within the service delivery platform to indicate whether or not the targeted experience is being achieved, providing associated feedback to network functions.

Devices would be required to participate actively in the collection and reporting of the metrics. CTOs encouraged ITU’s standardization expert group for ‘performance, QoS and QoE’, ITU-T Study Group 12, to identify candidate elements to populate the templates specifying the targeted user experience; study in-service mechanisms to evaluate whether or not the targeted experience is being achieved; and, in collaboration with other organizations active in this field, explore optimization priorities and strategies as well as define tokens for the allocation of network and computing resources.

Performance-optimization strategies could also have the potential to address concerns around the deteriorations in voice quality perceived by users of mobile communications, deterioration evidenced by steadily decreasing mean opinion scores (MOS, as defined in ITU-T P.800.1).

While CTOs acknowledged that poor voice quality could be attributable to operator policy and resource allocation rather than technical limitations, these CTOs suggested that standards and intelligent tools capable of measuring, logging and reporting end-user experience could make a valuable contribution to improved voice quality.

The meeting underscored the importance of the efficient, sustainable use of the international numbering resources allocated by ITU, for example, in facilitating the identification of Internet of Things devices.

CTOs called for standardized approaches to the mitigation of threats to security and privacy, highlighting the potential to update or extend existing protocols such as SSL/TLS.

Participants welcomed ITU’s initiative to investigate the potential of blockchain and its implications for security, and emphasized the value of distributed ledger technology in the provision of IoT services and digital financial services in a 5G environment.

CTOs were briefed on the establishment of a new ITU-T Focus Group to research data processing and management in the context of smart cities. The priority of this open group will be to propose mechanisms supporting the interoperability of datasets and data-management systems. The group will investigate established data-management technologies as well as emerging trends such as blockchain, promoting efficient, scalable approaches to the management of systems data.

**Next steps**

ITU-T management announced that they would bring this communiqué to the attention of all ITU-T Study Groups as well as the TSAG Rapporteur Group on Standardization Strategy.

The CTO meeting’s participants expressed their appreciation to ITU and Cisco Systems for bringing this forum to North America and for the opportunity it provided to exchange views on 5G standardization priorities.

Chaesub Lee, the Director of the ITU Telecommunication Standardization Bureau, extended an invitation to North American CTOs to participate in the next global CTO meeting, tentatively scheduled for 24 September 2017 in Busan, Republic of Korea, the venue of ITU Telecom World 2017.

**The participating organizations were:**

Cisco Systems, United States; Dolby Laboratories, United States; Ericsson, United States; InterDigital, United States; Juniper Networks, United States; Symantec, United States; TELUS, Canada; Xilinx, United States; ITU.

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1. See <http://newslog.itu.int/archives/1396> [↑](#footnote-ref-1)