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| ITU‑T Study Group 16 |
| Multimedia coding, systems and applications |
| Report of ITU-T SG16 to the World Telecommunication Standardization Assembly (WTSA-16), Part II: Questions proposed for study during the next study period (2017-2020) |

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| **Abstract:** | This contribution contains the text of the Study Group 16 Questions proposed for approval by the Assembly for the next study period. |

Note by the TSB:

The report of Study Group 16 to the WTSA-16 is presented in the following documents:

Part I: **Document 17** – General

Part II: **Document 18** – Questions proposed for study during the study period 2017-2020

# 1 List of Questions proposed by Study Group 16

| Question number | Question title | Status |
| --- | --- | --- |
| QA/16 | Multimedia coordination | Continuation of Question 20/16 |
| QB/16 | Immersive live experience systems and services | New Question |
| QC/16 | Multimedia systems, terminals, gateways and data conferencing | Continuation of Questions 1/16, 2/16, 3/16 and 5/16 |
| QD/16 | Multimedia framework, applications and services | Continuation of Question 21/16 |
| QE/16 | Multimedia application platforms and end systems for IPTV | Continuation of Question 13/16 |
| QF/16 | Digital signage systems and services | Continuation of Question 14/16 |
| QG/16 | Accessibility to multimedia systems and services | Continuation of Question 26/16 |
| QH/16 | Vehicle gateway platform for telecommunication/ITS services and applications | Continuation of Question 27/16 |
| QI/16 | Multimedia framework for e-health applications | Continuation of Question 28/16 |
| QJ/16 | Visual coding | Continuation of Question 6/16 and part of Question 7/16 |
| QK/16 | Speech/audio coding, voiceband modems, facsimile terminals and network-based signal processing | Continuation of Questions 10/16, 15/16 and 18/16 and of part of Question Q7/16 |

# 2 Wording of Questions

The proposed text of the Questions is provided in the remaining part of this document.

DRAFT Question A/16

Multimedia coordination

(Continuation of Question 20/16 - Multimedia coordination)

### A.1 Motivation

ITU‑T Study Group 16 has been assigned lead study group roles, and coordination is a major responsibility within the lead study group roles.

The objective of this Question is to manage the development and progress of multimedia standardization. The technical studies will be addressed in the relevant Questions of Study Group 16 as well as by other groups.

### A.2 Study items

Study items to be considered include, but are not limited to:

– coordination with other key players on multimedia communication standardization, there included network signal processing, media coding, emergency communications, conferencing, telepresence and virtual reality;

– development and updating of the Mediacom Project documentation, their included roadmaps and action plans for Study Group 16-wide topics.

### A.3 Tasks

Tasks include, but are not limited to:

– develop and update a multimedia services and applications standardization roadmap through an appropriate communication process amongst all interested parties, including the organization of workshops on dedicated standardization issues;

– define and implement a management structure including a multimedia standards steering committee involving all interested organizations;

– document and agree the processes for coordination;

– using appropriate coordination mechanisms, negotiate with the relevant bodies to ensure that overlapping efforts are avoided, all required standards are being addressed, and the need for devices (e.g. gateways) to ensure end-to-end interoperability is minimized;

– cooperate with the Telecommunication Development Sector of ITU for activities aiming at bridging the standardization gap.

NOTE – This Question performs as a coordination focal point in the study groups and as such it is not expected to produce any Recommendations.

### A.4 Relationships

Recommendations

– F, G, H, I, Q, T, V, X, Y-series Recommendations under the responsibility of SG16

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 2, 3, 5, 9, 11, 12, 13, 15, 17 and 20

– ITU‑R SGs 5 and 6

– ITU‑D SGs 1 and 2

Other bodies

– IEC TC 100, ISO/IEC JTC1 (SC 29, SC 31 and others), ETSI, IETF

– Relevant forums and consortia

DRAFT Question B/16

Immersive live experience systems and services

(New Question)

### B.1 Motivation

Recently, some of huge sport events and music concerts are not only broadcasted, but also delivered to remote sites for public viewing or live viewing in order to share emotion by audiences in remote sites as if they were in main event venues. In order to provide high-realistic sensations to audiences at remote sites, immersive live experience (ILE) needs to be implemented to reconstruct event sites virtually with presentation of real-sized objects and sound direction by transmitting environmental information together with audio and video streams.

Implementing ILE needs several technologies such as real-time objects extraction technologies at event sites, spatial location sensing technologies for objects, sound direction identify technologies, media transport technologies for extracted objects including spatial location information, presentation technologies including 3D projection at remote sites, synchronous technologies with video, sound and lighting, and so on. Although some of them are already established, there are some conditions and/or limitations such as specific content and pre-arrangement of remote sites. Pre-arrangement of remote sites includes 3D projection mapping, and takes much time for adjustment terminal devices. In addition, these technologies have not systemized, and most of them are not standardized yet.

In order to share enthusiasm at event venues with large audiences even if they are in remote sites far from event venue, implementing immersive live experience services based on standardized designs is desired. By standardizing ILE in ITU‑T, it is expected that audiences anywhere in the world can cheer their favourite sport teams or artists at remote sites even if they are not in the event venue, and they can feel a sense of togetherness and get passionate as if they were in the event venue. Most of these technologies are related to the multimedia studies in Study Group 16, thus this Question will progress standardization activities of ILE.

Globally interoperable standards will activate a market for the ILE systems and services. This Question will cover all relevant work items on multimedia aspects of immersive live experience systems and services.

### B.2 Study items

Study items to be considered include, but are not limited to:

– definition and scope of immersive live experience systems and services;

– domain of immersive live experience services;

– use cases and requirements for immersive live experience systems and services;

– architectural aspects of immersive live experience systems to support requirements and various use cases;

– presentation equipment profiles for supporting various kinds of immersive live experience applications;

– provision of content including spatial information from content source to presentation equipment for immersive live experience;

– multimedia application frameworks for immersive live experience;

NOTE – MPEG media transport (MMT) and relevant standards need to be considered for the multimedia application frameworks for immersive live experience.

– usage of cloud computing technologies for efficient deployment and operation, and for effective service offering;

– presentation aspects of immersive live experience services such as combination of multiple displays, multiple speakers and lighting equipment;

– specifications on metadata and media format for immersive live experience content for fitting with the use cases;

– management and operational aspects of immersive live experience systems;

– consideration on providing emergency information including warning messages in the disaster environment;

– consideration on providing accessibility for disabled people, elder people, and foreign visitors;

– review and analysis of existing Recommendations and relevant specifications to find any reusable materials for immersive live experience systems and services;

– considerations on how to help measure and mitigate climate change.

### B.3 Tasks

Tasks include, but are not limited to:

– identification of the use cases and requirements;

– definition of functional architectures and its components to support use cases and requirements for immersive live experience systems and services;

– definition of immersive live experience presentation equipment profiles based on capabilities;

– definition of a mechanisms and protocols to provide content delivery function;

– definition of interface specifications amongst functional components of immersive live experience systems;

– definition of procedures and methods to interact between immersive live experience systems and audiences' devices such as smart phone and tablet PC;

– definition of multimedia application frameworks, metadata and media formats for providing immersive live experience services;

– definition of control functions for synchronous/asynchronous presentation of multiple displays and other presentation equipment;

– modification and/or extension of existing Recommendations under the ITU‑T Study Group 16 responsibility to provide immersive live experience services;

– collaboration and harmonization with other standardization bodies, forums and consortia to develop Recommendations to support immersive live experience service.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=xx/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=27/16)).

### B.4 Relationships

Recommendations

– ITU‑T Study Group 16 Recommendations, in particular telepresence system Recommendations ITU‑T F.734, ITU‑T H.420 and emerging ITU‑T H.TPS-AV and H.TPS-SIG

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 11, 12, 13 and 17

– ITU‑R SG6

Other bodies

– ISO, IEC, ISO/IEC JTC1

– ETSI SIG MEC (Mobile Edge Computing)

– W3C, IETF (e.g. CLUE), IEEE

DRAFT Question C/16

Multimedia systems, terminals, gateways and data conferencing

(Continuation of Questions 1/16, 2/16, 3/16 and 5/16)

### C.1 Motivation

As the lead study group on multimedia coding, systems and applications, Study Group 16 strives to make advances in multimedia communication systems that take advantage of emerging technologies, as well as advances in and deeper understanding of existing technologies, in an effort to enable new and better forms of communication capabilities.

To that end, Study Group 16 developed several sets of videoconferencing Recommendations: ITU‑T H.320 for audiovisual communication systems for N-ISDN environments; ITU‑T H.323, one of the most widely used packet-switched communication systems supporting audio, video, and data collaboration; ITU‑T H.324 for audiovisual communications over fixed and mobile (wireless) telephone networks; and ITU‑T H.310-series for point-to-point and multipoint communications on B-ISDN networks. For data conferencing in point-to-point and multipoint environments, the T.120-series of ITU‑T Recommendations was developed, enabling capabilities like file transfer, electronic whiteboarding, and screen sharing. To enable an H.323 gateway to be realized as two components from different vendors distributed across different physical platforms, the ITU‑T H.248-series, which decomposes the H.323 gateway function defined in ITU‑T H.246 into functional subcomponents called media gateway controllers and media gateways, was developed to specify the protocols these components use to communicate. While originally addressing H.323 gateways, the H.248 protocol is applicable to many different types of gateways.

Several enhancements, with particular attention to the support of advanced coding technologies, security features, interworking with other terminals accommodated in different networks and enhancements to cover other services, may need to be developed in the form of new Recommendations or revision to existing ones to assure existing systems remain competitive in the marketplace. In line with its objective to improve the lives of users through improved multimedia communications capabilities, Study Group 16 continues its study of newer multimedia communications systems and functions that include applications like telepresence, which offers a user-rich immersive experience.

In addition to the core multimedia system specifications, various supporting protocols and functions are essential to successful deployment of terminals, gateways, gatekeepers, multipoint control units, and other elements that comprise a system. This Question explores advanced multimedia functions that will enable videoconferencing, data conferencing, telepresence, distance learning, e-health, interactive multimedia information distribution, real-time multimedia collaboration in future networks environment and existing packet-based networks. Aspects include multimedia directory services, quality of service (QoS), quality of experience (QoE), multimedia security, and multimedia mobility.

This Question considers multimedia gateway architecture and the development of multimedia gateway control protocols for gateways interworking existing networks and new networks.

This Question also deals with extension and maintenance of this large body of multimedia conferencing standards.

### C.2 Study items

Study items to be considered include, but are not limited to:

– enhancements to existing Recommendations by the addition of advanced audio and visual coding (e.g. ITU‑T H.265 extensions and beyond);

– enhancements to interoperability of H.300-series terminals by using new and emerging protocols and architectures, such as WebRTC, private media, etc., through additions to ITU‑T H.246 and other Recommendations as necessary;

– continued enhancements relating to error resilience in error-prone environments, such as mobile networks;

– specifications of multimedia system characteristics to support non-conversational services, such as retrieval, messaging, or distribution services;

– enhancements to existing H-series Recommendations with respect to accessibility;

– next generation multimedia system and its related functions and capabilities, including system architecture, signalling protocols, downloadable codecs, service discovery, transcoding functions, distributed applications, integrated QoS, gateways, security, mobility, and accessibility;

– architecture and protocols to integrate and enhance advanced service features, such as directory services, QoS/QoE, security, and mobility, with the Study Group 16 defined multimedia system platforms;

– performance monitoring and measurement functions for multimedia applications;

– requirements for metadata in descriptions of user profile, terminal capability, access network characteristics and service profile that relate to service mobility;

– standardizing the means for full interworking between telepresence systems, including means facilitating the coherent presentation of multiple audio and video streams, allowing remote participants to be rendered at their true size for their apparent distance, maintaining correct eye contact, gesticular cues, and simultaneously providing spatial audio that is consistent with the video presentation, as well as taking into account the meeting environment to provide a more immersive experience;

– new functionality to the H.248.x sub-series to enable existing and new network nodes to work as a split media gateway controller and media gateway. Items of study may also include further work on IP-IP connection models such as QoS control, network address translation (NAT) and firewalling, enhanced conferencing, media streaming control, network access control, secure media transport, privacy enhanced transport and new real time communication architectures;

– consideration will also be given to the evolution of media gateways and media gateway controllers with respect to architectures based on cloud, software defined networks (SDN) and network function virtualisation (NFV);

– considerations on how to help measure and mitigate climate change.

### C.3 Tasks

Tasks include, but are not limited to:

– development of new Recommendations pertaining to the study items above as needed, including new H.TPS-AV and H.TPS-SIG;

– produce enhanced QoS/QoE, gateway, security, and mobility mechanisms for multimedia systems;

– enhancement and maintenance of ITU‑T F.734, H.100, H.110, H.130, H.140, H.221, H.222.0, H.222.1, H.223, H.224, H.225.0, H.226, H.230, H.231, H.233, H.234, H.235-series, H.239, H.241, H.242, H.243, H.244, H.245, H.246, H.247, H.248-series, H.249, H.281, H.310, H.320, H.321, H.322, H.323, H.324, H.331, H.332, H.341, H.350 series, H.360, H.361, H.362, H.420, H.450-series, H.460-series, H.501, H.510, H.530, T.120-series, T.134, T.135, T.137, T.140 and H-series Supplements 1, 2, 4 to 9, 11 to 14.

An up-to-date status of work under this Question is found in the Study Group 16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=1/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=1/16)).

### C.4 Relationships

Recommendations

– ITU‑T F.700-series, G.700-series audio codecs, G.1000, G.1010, G.1080, H.260-series video codecs, Q.115.0, Q.931, Q.1707, Q.1950, T.38, V.151, V.152, V.153, X.509, X.680, X.690, X.800-series, X.1303, Y.1540, Y.1541, Y.2111

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SG2 for service aspects and human factors

– ITU‑T SG5 for ICT environmental aspects

– ITU‑T SG9 on security for IPCablecom, CableHome systems and home networking

– ITU‑T SG11 for signalling

– ITU‑T SG12 for quality aspects and performance

– ITU‑T SG13 for future networks aspects

– ITU‑T SG15 for transport aspects

– ITU‑T SG17 for security, web services, languages, directories and ASN.1

– ITU‑T SG20 for IoT and smart cities

– ITU‑R SG5 for IMT

– ITU‑R SG6 on broadcasting

– ITU‑D SG2 on information and communication infrastructure and technology development, emergency telecommunications and climate change adaptation

Other bodies

– 3GPP for IMS multimedia security, mobility and gateways incorporating a H.248-based interface

– ETSI NFV on virtualization

– ECMA on QSIG interworking and tunnelling

– IEEE for 802.x WLAN and Link Layer security

– ISO/IEC JTC1/SC27 for digital signature, key management, non-repudiation, etc.

– ISO/IEC JTC1/SC29/WG11 for MPEG aspects, content and copy protection, watermarking, IPMP, secure JPEG 2000, etc.

– IMTC for interoperability aspects and enhancements to existing Recommendations

– IETF for HTTP, TLS, media transmission, media packetization, Internet supported services, QoS, security, IP mobility, WebRTC extensions

– IETF AVTCORE, AVTEXT, CLUE, MMUSIC, RTCWEB, XRBLOCK for media gateways and controllers matters

– IANA for package registration matters

– NIST for AES and other cryptographic algorithms, FIPS security documents, security guidelines, etc.

– W3C for HTML, XML, WebRTC

DRAFT Question D/16

Multimedia framework, applications and services

(Continuation of Question 21/16)

### D.1 Motivation

The standardization work in Study Group 16 has resulted in the definition of a number of multimedia systems. ITU‑T H.610 defines a multiservice system architecture and customer premises equipment architecture for the delivery of video, data and voice services across a VDSL access network to an in-home environment, and the H.700-series defines a family of IPTV protocols. As broadband services over various access technologies have evolved and given that the desire for the delivery of multimedia services to the home has gained attention from service providers, home networking architectural issues and their impact on broader communications must also be considered.

With the fast development of smart buildings, smart communities and smart cities, requirements for visual surveillance and related applications and services are fast growing. Definition of requirements, architectures and protocols in support of massive successful commercial deployment of visual surveillance is crucial for this Question. To echo the growth trend in intelligent multimedia services and applications, this Question will focus on architectural and protocol issues for typical intelligent multimedia services and applications such as video contents search, multimedia services and applications for intelligent transportation systems, etc.

Furthermore, there is a wide range of fast emerging multimedia services other than traditional multimedia conferencing, which are to be dealt with inside and outside ITU. For example, cloud computing will give rise to new forms of multimedia services and applications since the large computing power embodied in clouds will enable support of rich-media functionalities on thin client devices and attract a large number of users and revolutionize the way people use multimedia services and applications. To cope with these new multimedia services, requirement analysis and definition are important and should be a key area for this Question. There is a need for globally standardized multimedia applications and services, which will fully meet evolving user needs and guarantee the compatibility of multimedia systems and terminals on a worldwide basis.

The objective of this Question is to ensure that the work of multimedia standardization takes place within an architectural framework that promotes integrity of system design, scalability of solutions, reuse of system components, and consistency with the architecture of the broader telecommunication network. Additionally, this Question will study a consistent approach for various generic multimedia applications and services taking into consideration the increasing technical development and convergence of the telecommunication, television and Internet fields and to apply it specifically to the applications and services developed by Study Group 16. The Question can be viewed as addressing multimedia services and applications for "e-everything".

This Question will also address some functions in multimedia service systems that improve service delivery and service implementation are sometimes independent of a particular system and can be provided by common entities or stand-alone systems. One case is of network-based multimedia content delivery functions, which can be used to accelerate media distribution by more efficiently delivering media flows for e.g. IPTV, telepresence and videoconferencing, Internet video, other over-the-top (OTT) video services, visual surveillance, and e-learning.

### D.2 Study items

Study items to be considered include, but are not limited to:

– identify multimedia services and applications that are studied by ITU and other bodies and produce a map of their interrelationship;

– update the service description methodology in the ITU‑T F.700-series to better reflect evolving network services, emerging multimedia services and generic applications;

– coordinate the work on multimedia architecture with related work being performed in other SDOs and industry forums for home networking, visual surveillance, content delivery and other broader telecommunication issues;

– consideration of intelligence in multimedia services and applications, aiming at developing architectures and protocols in support of intelligent multimedia systems;

– identify the services and applications to be explored by Study Group 16 and define their respective scopes, requirements and contribute to the development of technical specifications;

– study of cloud computing-based multimedia services and applications by identifying requirements, defining architectures and developing underlying protocols;

– study of service-agnostic network-based multimedia delivery function deployed in the network (for content distribution, caching, storage and delivery). Define mechanisms for the exchange of media control messages that control media flows;

– study service-agnostic, context awareness adaptation. Multimedia service systems are required to be aware of and adaptive to frequent changes in the environment, such as variable bandwidth, transport delay, device capabilities and instability, etc. when the user accesses the system from different sites/strata of network;

– study transcoding amongst different media formats for audio, video and other data (in coordination with the media coding Questions);

– study file format and transport mechanism for rich media, such as comic, animation, gaming, and interactive advertisement;

– study media streams transport: generic formats and encapsulation methods of various media streams for the purpose of transport over heterogeneous networks (in coordination with relevant IETF WGs such as AVT Core);

– study other service-agnostic multimedia functions over current and future networks.

### D.3 Tasks

Tasks include, but are not limited to:

– documentation of architectural assumptions made by previous work on multimedia standardization (H- and T-series Recommendations) and production of the scope, use cases, and requirements capture for the services and applications under Study Group 16 responsibility, such as speech-to-speech translation;

– study the requirements for and, if needed, create F-series Recommendations to cover new applications and services; e.g.:

• retrieval services, including interactive audiovisual and multimedia services;

• distribution services, including broadcasting services;

• e-commerce services or applications;

• real-time collaboration services;

• visual surveillance services and applications;

• intelligent multimedia services and applications;

• cloud-computing-based multimedia services and applications;

– develop a generic home network architecture, including visual surveillance;

– coordinate with ITU‑T Study Groups 2, 9, 11, 12, 13, 15, 17, 20 and other groups to advance multimedia services and applications related work;

– enhancement and maintenance of Recommendations ITU‑T F.700, F.701, F.702, F.703, F.720, F.721, F.723, F.724, F.731, F.732, 733, F.740, F.741, F.742, F.743, F.743.1, F.745, F.746, F.746.1, F.746.2, F.746.3, F.750, F.761, H.610, H.611, H.622.2, [H.625](http://www.itu.int/rec/T-REC-H/recommendation.asp?lang=en&parent=T-REC-H.625), H.626, [H.626.1](http://www.itu.int/rec/T-REC-H/recommendation.asp?lang=en&parent=T-REC-H.626.1), H.627;

– identification of requirements for service-agnostic multimedia service functions;

– develop service-agnostic architecture specifications, such as the inspection technology, inspection policy, delivery function, network topologies, robustness, etc.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=21/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=21/16)).

### D.4 Relationships

Recommendations

– F, G, H, I, Q, T, V, X, Y-series Recommendations under the responsibility of SG16

– ITU‑T J.160- and J.170-series

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 2, 9, 11, 12, 13, 15, 17 and 20 for multimedia studies related to cloud computing, future networks and IoT

– ITU‑T SG5 for ICT and climate change issues

– ITU‑R SG6 for multimedia-related studies and broadcast services and applications

Other bodies

– 3GPP, 3GPP2 for mobile multimedia services and applications

– Architectural groups within regional telecommunications standardization bodies

– IETF for Internet services (particularly the Applications and Real-Time Area, Transport Area, and Internet Area)

– W3C for Internet multimedia services and applications

– DMTF for cloud computing related multimedia services and applications

– IMTC for interoperability

– Broadband Forum for home network issues and other E2E IP/MPLS network issues

– ISO, IEC, OASIS and UN/ECE for the MoU on electronic business

– ISO/IEC JTC1/SCs 25 (home networking), 29 (JPEG/MPEG), 35 (user interfaces)

– APT ASTAP E.G.-MA for speech-to-speech translation

DRAFT Question E/16

Multimedia application platforms and end systems for IPTV

(Continuation of Question 13/16)

### E.1 Motivation

As the lead study group on multimedia coding, systems and applications, including ubiquitous applications, Study Group 16 meets the demands of a fast-evolving market by producing standards for multimedia communication systems that take advantage of both emerging and existing technologies.

In this regard, Study Group 16 has been successful in producing numerous Recommendations that address topical areas such as multimedia terminal design, home networking, multimedia architecture, audiovisual communications, multimedia conferencing, media coding, multimedia content, multimedia security, metadata, multimedia directories, multimedia service description and multimedia delivery systems.

As broadband services over various access technologies have evolved and with the advent of the new network technologies (including new generations of mobile networks), the desire and need for enhanced multimedia services have gained momentum and, as is typical when there is rapid evolution in a new technology area, proprietary multimedia service solutions precede standard interoperable solutions. Specifically, with the surge of multimedia services such as video streaming and the desire to offer IPTV services, the market is in serious need of standardized interoperable solutions, especially at the multimedia applications layer. Interoperability will provide benefit for all the players in the value-chain, especially at the multimedia applications layer, and encourage growth of this market.

IPTV is a multimedia service encompassing television, video, audio, text, graphics and data delivered over IP based networks which are managed to provide the required level of QoS and QoE, security, interactivity and reliability. Standards for IPTV, especially those for application and terminal aspects, are of immediate relevance to ITU‑T in general and to Study Group 16 in particular. Study Group 16 is interested, amongst other things, in the associated multimedia (including IPTV) application and terminal aspects.

This Question is intended to produce deliverables related to study IPTV platforms, including *inter alia* middleware, applications, metadata, content formats and their uses, which will facilitate effective and interoperable use of the IPTV systems.

### E.2 Study items

Study items to be considered include, but are not limited to:

– identify the use cases and requirements of IPTV application platforms and end system aspects;

– review and analyse existing standards and Recommendations to find any gaps seen against the requirements of IPTV application platforms and end systems, and to identify those requirements where new standards or changes to existing standards are recommended;

– help coordinate, harmonize and encourage interoperability amongst existing systems and standards for IPTV application platforms and end systems;

– investigate functional architectures of the IPTV terminal;

– identify services and applications relevant to IPTV application platforms and end systems;

– based on the analysis of requirements and existing standards, investigate the relevant areas, including but not limited to:

• metadata, i.e. the descriptive data about content and environment;

• service navigation, channel and menu processing;

• service discovery;

• content presentation and rich media;

• multimedia content delivery services such as VoD, linear TV and interactive services;

• enhanced user interaction in content delivery services and interactive services;

• multimedia content for IPTV from multiple sources and their integration;

• terminal devices for IPTV that support multiple sources of content and delivery, such as hybrid terminals;

• applications using IPTV, such as e-services (e.g. e-health and e-learning);

• audience measurement;

• IPTV middleware and application frameworks;

• required aspects of security on IPTV applications;

• IPTV end system and devices, and interworking between them (such as companion screen or multi-screen);

• conformance and interoperability of IPTV systems and services;

– considerations on how media accessibility may be enhanced, together with Questions focused on accessibility and human factor aspects;

– consideration on how digital divide may be mitigated by applying already existing mature and stable technologies rather than only on future advanced technologies;

– identify the use cases, requirements, services and applications of IP-based TV-related multimedia services, such as Connected TV and Smart TV;

– consider how non-IPTV content delivery services (e.g. over-the-top services) would integrate with and/or take advantage of IPTV services;

– how to enrich user experience and engagement (e.g. social IPTV, recommendation systems, enhancing audience measurement, use of big data and of video sensors);

– impact of UHDTV (4K/8K) in IPTV services. How to provide cinema applications over IPTV platforms;

– considerations on how to help measure power consumption and mitigate climate change;

– facilitate IPTV services and applications converging with cross-industry new technologies, help the coordination of standards and evolution of IPTV specifications;

– considerations on how the evolution of cloud computing, big data, network functions virtualization (NFV), software defined networks (SDN), and other trending ICTs may help deploying IPTV services as well as enhance them;

– considerations on how the evolution of mobile networks (5G) and the mobility capability may impact IPTV services;

– how to support immersive, multi-viewing and 3D IPTV services including video and interactivity.

### E.3 Tasks

Tasks include, but are not limited to, the development of deliverables on the following areas:

– required aspects of IPTV end systems and devices;

– required aspects of platform and end system of IP-based TV-related multimedia services, such as Connected TV and Smart TV;

– required aspects of IPTV middleware, application and content platforms;

– required aspects of IPTV delivery;

– configuration of IPTV services;

– content adaptation for IPTV;

– IPTV service deployment scenarios;

– interface between content providers and service providers;

– IPTV audience measurement, including the use of video sensors;

– IPTV widgets and widget service;

– multiple IPTV terminal devices, their interworking and multi-device services;

– IPTV Terminal device models, including mobile model and virtualized model;

– multimedia application frameworks for IPTV;

– enhanced user interface for IPTV;

– 3D-IPTV services;

– IPTV metadata, including scene-based metadata;

– conformance and interoperability testing on IPTV;

– enhancement and maintenance of ITU‑T H.700-series, T.170-series, T.180 and H-series Supplement 3.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=13/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=13/16)).

### E.4 Relationships

Recommendations

– F, G, H, I, Q, T, V, X, Y-series Recommendations under the responsibility of SG16

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 2, 5, 9, 11, 12, 13, 15, 17 and 20

– ITU‑R SG5 and SG6

Other bodies

– ATIS, CTA (ex CEA), DLNA, Broadband Forum, DVB, ARIB, ABNT, ATSC, APT, HGI, OASIS, WHO, Personal Connected Health Alliance (Continua), DTG

– ISO, IEC, ISO/IEC, ETSI, IETF, W3C

DRAFT Question F/16

Digital signage systems and services

(Continuation of Question 14/16)

### F.1 Motivation

Digital signage (DS) systems and services have aroused public interest due to various kinds of effective presentation and the feature of the user interaction in advertisement, which is different from the traditional unidirectional advertisement.

It is possible to provide optimal contents containing personalized advertisements which target individual audiences through interactions between the audiences' terminal devices (embedded with wireless communication interface including short range communications such as WiFi, Bluetooth, and NFC) and a digital signage system. Digital signage terminal devices may possess sensing devices such as camera, thermometer, touch panel, and microphone for providing intuitive user experiences. Due to their point-to-multipoint architecture and their potential for contextual adaptation, DS systems are also ideally suited to provide information to the public in the event of emergencies.

However, most of digital signage systems and services are proprietary, and therefore systems, contents and applications across different networks or vendors are not interoperable. Due to this circumstance, it is impossible to realize one-source multiple-use approach for a single content. This also will cause problems in building and expanding large-scale digital signage networks. Thus, it is important to support interoperability amongst different service providers and vendors. Globally interoperable standards will activate a market for the digital signage systems and services.

The current digital signage services treat multimedia contents consisting of text, video, graphics and audio. Emerging technologies may impact on the digital signage services. The digital signage industry needs standards for covering a wide variety of digital signage use cases.

This Question will cover all relevant work items on digital signage systems and services.

### F.2 Study items

Study items to be considered include, but are not limited to:

– definition and scope of digital signage systems and services;

– domain of digital signage services (e.g. location owners);

– use cases and requirements for digital signage systems and services;

– architectural aspects of digital signage systems to support requirements and various use cases;

– digital signage terminal profiles for supporting various kinds of digital signage applications;

– provision of digital signage content from content providers to digital signage service providers;

– multimedia application frameworks for digital signage;

NOTE – HTML5 and relevant standards need to be considered for the multimedia application frameworks for digital signage.

– linkage between digital signage systems and other systems and applications;

– usage of cloud computing technologies for efficient deployment and operation, for effective service offering, and for combining with other services;

– presentation aspects of digital signage services such as combination of multiple displays and/or terminals;

– specifications on metadata and media format of digital signage content for the purpose of one-source, multiple-use approach and for fitting with the use cases;

– sets of interactions and their methods between audience's devices and digital signage systems to accommodate audience participated interactive digital signage services;

– specifications of communications and multimedia technologies supporting promotion/‌advertisement in the digital signage services;

– how to acquire and deliver supplementary data (e.g. audience measurement data) for the purpose of providing context-aware digital signage services (e.g. information is automatically changed along with communications between DS systems and/or audience's devices);

– considerations on providing privacy protection to prevent the side-effects on gathering anonymous information (i.e., personal information, etc.) in public spaces;

– management and operational aspects of digital signage systems;

– consideration on providing emergency information including warning messages in the disaster environment;

– consideration on providing notification in the private/public places;

– consideration on providing accessibility for persons with disabilities and specific needs (including foreign visitors);

– review and analysis of existing Recommendations and relevant specifications to find any reusable materials for digital signage systems and services;

– considerations on how to help measure and mitigate climate change.

### F.3 Tasks

Tasks include, but are not limited to:

– identification of the use cases and requirements;

– definition of functional architectures and its components to support use cases and requirements for digital signage systems and services;

– definition of digital signage terminal profiles based on capabilities;

– definition of mechanisms and protocols to provide content delivery functions;

– definition of a framework and mechanisms for audience measurement in digital signage services;

– definition of interface specifications amongst functional components of digital signage systems;

– definition of requirements and service interfaces of digital signage services using cloud computing technologies;

– definition of procedures and methods to interact between digital signage systems and audience's devices such as smart phones and tablet PCs;

– definition of multimedia application frameworks, metadata and media formats for digital signage services;

– definition of control functions for synchronous/asynchronous presentation of multiple displays and terminals;

– definition of a framework and procedures to provide services having public characteristics, including emergency warning and notification over digital signage systems;

– definition of a security framework for digital signage services to provide service authentication and authorization;

– modification and/or extension of existing Recommendations under ITU‑T Study Group 16 responsibility to enable interoperable digital signage systems;

– collaboration and harmonization with other standardization bodies, forums and consortia to develop Recommendations to support digital signage services.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=14/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=14/16)).

### F.4 Relationships

Recommendations

– F, G, H, I, Q, T, V, X, Y-series Recommendations under the responsibility of SG16

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 2, 9, 11, 13, 15, 17, and 20

– ITU‑R SGs 4, 5 and 6

– ITU-D SG2

Other bodies

– ISO, IEC, ISO/IEC, ETSI

– W3C, IETF, IEEE, OASIS

– Digital Signage Consortium (Japan)

DRAFT Question G/16

Accessibility to multimedia systems and services

(Continuation of Question 26/16)

### G.1 Motivation

The capability to handle different information media and control actions varies within wide boundaries amongst users of telecommunication and multimedia services. The variation may come from age-related functional limitations, disabilities, or other natural causes. With the ageing populations in large parts of the world, many users will have sensory and motor limitations. It is important to meet this wide variety in capabilities in the original design of telecommunication services and systems, so that an increasing number of users can make benefit of the mainstream telecommunication services. Legislation in many countries is also beginning to follow the trend of requiring universal design, as defined by the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), in all forms of communication services and devices.

Multimedia systems and services have great potential to provide valuable and accessible information in a way that the individual user can control, if care is taken from the beginning in universal design of these services and systems, making them accessible to as many users as possible.

The accessibility activities in Study Group 16 and its predecessors have created the following documents:

– ITU‑T V.18 for real time text telephony;

– ITU‑T T.140 as the general presentation protocol for real time text conversation;

– ITU‑T T.134 for real time text conversation in the T.120 data conferencing environment;

– Annex G to ITU‑T H.323 for real time text conversation in H.323 packet multimedia environment;

– Annex L to ITU‑T H.324 for real time text conversation in low bit-rate multimedia applications;

– ITU‑T F.703 – Multimedia conversation service description. Includes definitions of the accessible conversational services, i.e., total conversation;

– H-series Supplement 1 – Application profile – Sign language and lip‑reading real‑time conversation using low bit‑rate video communication;

– ITU‑T F.790 – Telecommunications accessibility guidelines for
older persons and persons with disabilities;

– ITU‑T F.791 – Accessibility Terms and Definitions

– ITU‑T H.702 – Accessibility Profiles for IPTV Systems

– ITU‑T Technical Paper FSTP-AM – Guidelines for Accessible Meetings

– ITU‑T Technical Paper FSTP-ACC-RemPart – Guidelines for supporting remote participation in meetings for all

– ITU‑T Technical Paper FSTP-TACL – Telecommunications Accessibility Checklist.

Complemented by a number of additions to other Recommendations, the total conversation concept was founded for conversation in video, text and voice as an accessible superset of video telephony, text telephony and voice telephony.

The task of this Question is to engage in standardization activities leading to services and systems that apply the universal design concept.

Consideration should be given to services in new generation networks with fixed as well as mobile features.

The group also has a task to promote and enhance accessibility as a normal part of ITU work.

### G.2 Study items

Study items to be considered include, but are not limited to:

– clauses on accessibility issues in relevant Recommendations, declaring how inclusive design is achieved, as requested by ITU Plenipotentiary Conference Resolution 175 (rev. Busan 2014) and by the UNCRPD;

– support for wide performance limits in production, perception and control of each medium in communication services to allow for maximum usability in accordance with the principles of universal design. Specifically, study profiling of the latest video coding standards to fulfil sign language and lip reading needs at very low bit rates and in error prone environments;

– study potential accessibility benefits offered by emerging technologies, such as independent living, home automation, communication between smart things, cloud-based service and smart homes;

– specification of interfaces on communication equipment to allow various forms of user interface equipment to be attached in order to enable session and device control and media handling by persons with varying capabilities and preferences;
NOTE – Examples of what the interfaces should support include: talking menus, keyboards, pointing devices, listening and viewing devices, Braille and voice call control, text conversation input and output.

– multimedia services including mechanisms for transformation between different media forms of the same content in order to adapt to the capabilities and preferences of end users. Such mechanisms may be automatic, for example text-to-speech, or performed by people, for example sign language interpretation;

– mechanisms for user selectable media, including its production, storage, transport, presentation and logical linking;

– specification of accessible services using wireless telecommunication technologies, and using wireless short range technologies for provision of convenient accessible features on communications equipment;

– mechanisms for interworking with mono-media services in an accessible way (e.g. text telephony and voice telephony);

– maintenance of the total conversation concept, and its inclusion in any new multimedia conversation protocol;

– study the requirements on multimedia metadata from an accessibility point of view to encourage universal design in this field;

– study access to emergency services and early warning services by persons with disabilities and specific needs with a wide range of communication channels, e.g. text, sign language, and lip reading supported speech, audio description, and braille;

– study mechanisms for disability inclusive disaster risk reduction.

### G.3 Tasks

Tasks include, but are not limited to:

– coordination with other ITU‑R, ITU‑T and ITU‑D study groups for fulfilment of accessibility requirements in their Recommendations;

– coordination with other SDOs for fulfilment of accessibility requirements in their specifications;

– promotion of total conversation defined in ITU‑T F.703 as a mainstream service;

– promotion of the concept of universal design, as defined in the UNCRPD;

– develop guidance for implementers of interfaces between communication devices and user interface devices;

– contribute to the continued harmonization and maintenance of the real time text telephone service, for example when new technologies are specified for PSTN or IP transmission;

– create guidelines for the design of IP terminal devices and IP communication systems for the inclusion of accessibility features including text conversation, video and alerting, and maintain interoperability with legacy text telephones;

– develop Recommendations to improve accessibility to audiovisual media, such as IPTV systems;

– assist in the development of guidelines for procurement of accessible systems, services and devices;

– develop specification in support of total conversation for disabilities beyond the needs of the deaf;

– develop guidance for implementers of relay systems for deaf, hard of hearing and speech-impaired users;

– maintain the list of suitable accessibility terms and definitions;

– maintain the documents under the responsibility of the Question (including ITU‑T F.790-series, V.18; FSTP-TACL, FSTP-AM, FSTP-ACC-RemPart);

– modification and/or extension of existing Recommendations under the ITU‑T Study Group 16 responsibility to enable accessible systems (including ITU‑T F.703, H.702).

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=26/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=26/16)).

### G.4 Relationships

Recommendations

– ITU‑T F.700, G.722, G.722.2, G.729, G.769/Y.1242, G.799.1/Y.1451.1, H.300-series, H.248, H.264, H.265, H.17, H.700-series, V.150-series, T.140, Y.1901

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SG2 on human factors

– ITU‑T SG9 on IP Cablecom

– ITU‑T SG12 on media quality

– ITU‑T SG13 on future networks and IPTV

– ITU‑T SG15 on access networks, for inclusive design in communication services

– ITU‑T SG17 on privacy, security and child online protection

– ITU‑T SG20 on IoT and smart cities & communities

– ITU-R WP5A, SG6

– ITU‑D SG1 on access to telecommunication services for people with disabilities

– ITU‑D SG2 on development and management of telecommunication services and networks and ICT applications

Other ITU bodies

– ITU‑T JCA-AHF

– ITU-D Special Initiatives

Other bodies

– IETF in general, and specifically the MMUSIC, WebRTC and AVT groups

– 3GPP and 3GPP2 for mobile accessibility inclusion and co-ordination of text telephony and total conversation related issues

– ETSI, particularly TC HF (Human Factors)

– ISO/IEC JTC1 SC35 on accessibility and user interfaces

– IEC TC100 on assisted living

– W3C on Web accessibility

– Regional organizations such as the Asia Pacific Telecommunity

– G3ict (Global Initiative for Inclusive ICTs)

– Internet Governance Forum

– WHO, WIPO

– Disability organizations including: World Federation of the Deaf (WFD), World Blind Union (WBU), International Federation of Hard of Hearing People (IFHOH) and Disabled People's International (DPI)

DRAFT Question H/16

Vehicle gateway platform for telecommunication/ITS services and applications

(Continuation of Question 27/16)

### H.1 Motivation

Vehicle information obtained from electronic devices as part of an in-vehicle network are critical to telecommunication/intelligent transportation system (ITS) services and applications, and to related industries (insurance, fleet, etc.), including emergency telecommunications. In such vehicle-centric services, a wide range of applications can be proposed, and it is believed that vehicle information has an important role in the value chain of telecommunication/ITS. Currently, the way of extracting vehicle information differs by manufacturer, model type, and data bus type. A few SDOs are developing related specifications that focus on the scope of their interest.

In addition, recognizing the importance and urgency of the climate change and road safety issues, ITU should be actively involved in ITS, which can help reduce carbon emissions – for instance by reducing congestion. It is anticipated that vehicle-centric services implemented based on global standards will contribute to mitigating climate change and improve road safety.

Vehicle gateways are intended to provide and support telecommunication using the network environment both within the car and outside it (vehicle to vehicle and vehicle to infrastructure). In this context, vehicle gateways have a significant role to support ubiquitous connectivity in heterogeneous environments. Therefore, global standards for vehicle gateways should be developed to support global seamless ITS services and applications, and to allow plug-and-play operation in any vehicle for any consumer device.

### H.2 Study items

Study items to be considered include, but are not limited to:

– definition and the scope of a vehicle gateway platform;

– functions and service requirements of a vehicle gateway platform to support vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-on-board nomadic devices (V2D), vehicle-to-pedestrians and bicycles (V2P) communications;

– functional architectures and mechanisms of a vehicle gateway;

– use cases and scenarios for vehicle gateways as a bridge between vehicles (V2V) and between vehicles and infrastructure (V2I), between vehicles and on-board nomadic devices (V2D), and between vehicles and pedestrians and bicycles (V2P);

– study enhancements required to provide energy savings and reduction of gas emissions;

– study enhancements to support, directly or indirectly, emergency and early warning services (e.g. for traffic accidents);

– study enhancements required to support security and privacy;

– considerations on road safety issues;

– considerations on the integration of ubiquitous devices;

– considerations on how to help measure and mitigate climate change.

### H.3 Tasks

Tasks include but are not limited to:

– studies on the use cases and requirements in terms of services/applications and functions to support V2V, V2I, V2D, and V2P;

– studies on the use cases, requirements and functions of vehicle gateway and its reference model(s);

– studies on the open interface between VGP and in-vehicle network;

– studies on the open interface between VGP and ICT devices;

– studies on the relevant necessary protocols to support vehicle-oriented services and applications;

– studies on road safety and automated driving;

– maintain deliverables under the responsibility of the Question: ITU-T F.749.1; HSTP-CITS-Reqs.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=27/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=27/16)).

### H.4 Relationships

Recommendations

– F, G, H, I, Q, T, V, X, Y-series Recommendations under the responsibility of SG16

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 2, 9, 11, 12, 13, 17, 20

– ITU‑R SGs 1, 4, 5, 6

– ITU‑D SG2

Other bodies

– Collaboration on ITS communications (CITS)

– AUTOSAR WPII-1.1 Software Architecture

– IEEE 802, 802.11 (Wi-Fi), 802.15.1 (Bluetooth)

– IrDA (Infrared Data Association)

– ISO TC 22 SC 3 WG 1 (Data Communication)

– ISO TC 204 (Intelligent transport systems) WG16 (Wide area communications/protocols and interfaces) and WG17 (Nomadic Devices in ITS systems)

– IEC TC 100

– JSR298 Telematics API

– OSGi Alliance Vehicle Expert Group (VEG)

– SAE International

DRAFT Question I/16

Multimedia framework for e-health applications

(Continuation of Question 28/16)

### I.1 Motivation

The evolution of advanced digital telecommunication techniques has enabled the development of multimedia systems to support e-health applications, including telemedicine.

E-health uses information and communication technology (ICT) to support health needs, while telemedicine is considered as that part of e-health where telecommunication systems which allow interconnecting remote locations and to access distant resources. Examples of telemedicine applications are teleconsulting, teleradiology, telesurgery, etc.

NOTE – According to the World Health Organization (WHO), telemedicine is "the use of information and communication technology to deliver medical services and information from one location to another", while e-health is "a new term used to describe the combined use of electronic information and communication technology in the health sector".

This Question focuses on standardization of multimedia systems and services to support e-health applications.

In order to allow a wide deployment of e-health applications, in particular in developing countries, it is important to achieve interoperability amongst systems and to reduce the cost of devices through economies of scale. Consequently, the development of global international standards with the involvement of the major players (governments, inter-governmental organizations, non-governmental organizations, medical institutions, doctors, manufacturers, etc.) is a key factor to achieve these objectives.

Considering the fact that many organizations are already active in this field (with which ITU has existing cooperation agreements) and that, in addition to technical issues, there are a number of other aspects to be considered (e.g. legal, ethical, cultural, economic, regional), it is considered that ITU‑T can provide the right environment to harmonize and coordinate the development of a set of open global standards for e-health applications.

In the framework of this Question, Study Group 16, as lead study group for [e-health and for] multimedia coding, systems and applications, will coordinate the technical standardization of multimedia systems and capabilities for e-health applications in ITU‑T, and will develop corresponding Recommendations and other deliverables.

NOTE – Improvements and additions to the specific characteristics of multimedia systems and terminals under the responsibility of other Study Group 16 Questions will be addressed within those Questions.

### I.2 Study items

Study items to be considered include, but are not limited to:

– identification of user requirements;

– multimedia framework (including overall concept) for e-health applications (e.g., personal connected health, diagnostics, telemonitoring for communicable disease control, telehealth, mobile health and telemedicine) that leverage various information (e.g., brain information, physiological information and ambient information);

– impact of new areas of study such as artificial intelligence, bioinformatics (genomics in particular), health software, pharmavigillance, gamification, and virtual reality in standards for e-health;

– consideration of usability of e-health systems and devices;

– roadmap for e-health standards;

– generic architecture for e-health applications;

– specific system characteristics for e-health applications (e.g. video and still picture coding, audio coding, security, directory architecture, safe listening, etc.);

– creation of glossary of e-health (e.g., telehealth and telemedicine);

– consideration of structure and format of data (including metadata) for e-health, and methods for inputting, transmitting, storing, querying, finding, identifying, categorizing and processing them;

– personal connected health devices, and personal health devices, systems and services;

– leverage multimedia and e-health technologies in meeting requirements from, e.g., WHO and other stakeholders (e.g., NCDs, and/or epidemic outbreaks) considerations on how to use multimedia for e-education related to health;

– development of conformance testing specifications and capability maturity models for standards in the above mentioned study items.

### I.3 Tasks

Tasks include, but are not limited to:

– multimedia framework for e-health applications such as IPTV and mobile;

– maintain a high-visibility web page documenting the progress of the Question;

– roadmap for e-health/telemedicine standards, compiling and analysing standardization requirements from e-health stakeholders and identifying standardization items with priorities;

– update the inventory of existing e-health/telemedicine standards;

– support of ITU‑D e-health activities, including capacity building;

– provide inputs for extension and improvement of existing Recommendations on multimedia systems (ITU‑T H.323, H.420, H.700-series; H.264, H.265; V.18, etc.);

– considerations on how accessibility to e-health applications may be enhanced;

– consideration on the application of already existing mature and stable technologies rather than only on future advanced technologies;

– maintenance and expansion of the deliverables under the responsibility of the Question: ITU-T H.800-series; FSTP-RTM, HSTP-H810, HSTP-H810-XCHF.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=28/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=28/16)).

### I.4 Relationships

Recommendations

– ITU‑T H.300-series, H.260-series, H.420-series, H.700-series, T.80-series, T.800-series, V.18

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SGs 9, 12, 13, 17 and 20

– ITU‑R SG5

– ITU‑D SG2

Other bodies

– WHO, ICAO

– HL7, IHE, DICOM, Personal Connected Health Alliance (Continua), GSMA, DAISY Consortium, and other relevant forums and consortia

– ISO (TC215 in particular) IEC (TC100 and TC108 in particular), CEN, CENELEC (TC108X in particular), ETSI, IETF, IEEE (11073 WGs in particular) and other relevant standardization bodies

DRAFT Question J/16

Visual coding

(Continuation of Question 6/16 and part of Question 7/16)

### J.1 Motivation

The goal of this Question is to produce Recommendations for visual signal coding methods appropriate for conversational (e.g. videoconferencing and video telephony) and non-conversational (e.g. multimedia streaming, broadcast TV, IPTV, file download, media storage/playback, remote screen display, digital cinema, or virtual & augmented reality) audiovisual services. Visual signal coding includes the coding of:

– video sequences;

– still images;

– graphics;

– stereoscopic, multi-view, depth maps, and free-viewpoint visual information;

– light fields, point clouds, and volumetric imagery;

– computer displays;

– medical imaging;

– 360 degree/panoramic/spherical-view video sequences.

This Question will focus on the maintenance and extension of existing video and still-image coding Recommendations, and laying the ground for new Recommendations using advanced techniques to significantly improve the trade-offs between bit rate, quality, delay, and algorithm complexity. Video, still-image, and other visual coding standards will be developed with sufficient flexibility to accommodate a diverse number of transport types (Internet, LAN, mobile, ISDN, GSTN, H.222.0, NGN, etc.).

### J.2 Study items

Study items to be considered include, but are not limited to:

– new coding methods in order to achieve the following objectives:

• improvements in compression efficiency;

• robust operation in error/loss-prone environments (e.g. non-guaranteed-bandwidth packet networks or mobile wireless communication);

• reduction of real-time delay, complexity, and of channel acquisition time and random access latency;

– organization of the compressed data format to support packetization and streaming;

– development of supplemental enhancement information to accompany video and image data for enabling enhanced functionality in application environments;

– study and specification of data for image/video annotation, indexing, and searching;

– techniques to permit networks or terminals to adjust the bit rate of video streams efficiently;

– techniques for object coding and multi-view operation;

– techniques to permit terminals to rapidly adjust the region-of-interest and/or field of view of video stream playback;

– techniques for efficient coding of 360 degree/panoramic/spherical-view video sequences, including those formed by stitching video sequences from multiple cameras with projection/rendering warping;

– techniques for efficient compressed-digital to compressed-digital processing (including transcoding);

– the impact of colorimetry, video and image quality assessment, and quality control requirements on video and image codec development;

– computer graphics compression;

– security aspects that directly affect video and still-image coding (including watermarking techniques);

– coordination of video and still-image coding matters not addressed in other audio/visual coding Questions with other ITU study groups and other bodies;

– harmonization of video and still-image coding activities with other standard development organizations (SDOs);

### J.3 Tasks

Tasks include, but are not limited to:

– work towards development of a future video coding Recommendation with compression capability substantially beyond that of HEVC;

– address needs for signal type identification for use with video and image coding Recommendations, including development and maintenance for H.273;

– develop one or more technical reports describing conversion and coding practices for support of high-dynamic range (HDR) and wide colour gamut (WCG) video content;

– conformance and reference software development and maintenance for ITU‑T H.264 and HEVC, including ITU‑T H.264.1, H.264.2, H.265.1, and H.265.2;

– development of guidelines for effective use of video and still-image compression coding technology;

– in liaison with other ITU‑T standardization groups or SDOs, recommend what video and still-image coding standards should be used in services/applications, networks, devices and specified in related ITU‑T Recommendations;

– development of supplemental enhancement information to accompany video and image data, including data for image/video annotation, indexing, and searching, including maintenance and extension of ITU‑T H.271;

– continued development of new image coding (T.8xx-sub-series) specifications;

– maintain the video and still-image information in the ITU‑T media coding database;

– maintenance of existing H-series video coding Recommendations, including ITU‑T H.120, H.261, H.262 | ISO/IEC 13818-2, H.263, H.264 | ISO/IEC 14496-10, H.264.1, H.264.2, H.265 | ISO/IEC 23008-2 (HEVC), H.265.1, H.265.2, H.271, H.273;

– maintain and extend existing Recommendations and supplements regarding still image coding, including ITU‑T T.44, T.80, T.81, T.82, T.83, T.84, T.85, T.86, T.87, T.88, T.89, T.800, T.801, T.802, T.803, T.804, T.805, T.807, T.808, T.809, T.810, T.812, T.813, T.831, T.832, T.833, T.834, T.835, T.851, T.870, T.871, T.872 and T-series Supplement 2.

An up-to-date status of work under this Question is found in the SG16 work programme ([http://itu.int/ITU-T/workprog/wp\_search.aspx?sp=16&q=6/16](http://itu.int/ITU-T/workprog/wp_search.aspx?sp=15&q=6/16)).

### J.4 Relationships

Recommendations

– ITU‑T H.300 sub-series systems Recommendations

– ITU‑T H.222.0, H.241, H.245 and H.248-series

Questions

– Questions B/16, C/16, K/16, E/16, A/16, I/16

Study groups

– ITU‑T SGs 9, 11, 12, 13

– ITU‑R SG6

Other bodies

– ISO/IEC JTC 1/SC 29 WG 1 (JPEG, JBIG) and WG 11 (MPEG) on video and image coding

– IETF, DVB, ATSC, ARIB, 3GPP, 3GPP2, SMPTE, IMTC, VESA, W3C

DRAFT Question K/16

Speech/audio coding, voiceband modems, facsimile terminals
and network-based signal processing

(Continuation of Questions 10/16, 15/16 and 18/16 and of part of Question 7/16)

### K.1 Motivation

The objectives of this Question are to maintain existing voice related Recommendations and to undertake new voice related studies.

Concerning maintenance, this Question will cover three broad areas:

– speech, audio and sound coding for conversational and non-conversational audiovisual services;

– all aspects of voiceband modem, facsimile terminal and voiceband signal discrimination;

– signal processing network equipment (SPNE), including network-based speech enhancement devices such as electrical network echo control, acoustic network echo control, automatic level control devices, voice enhancement devices, circuit multiplication equipment (CME) and voice gateways.

The Question will also consider the initiation of new studies on:

– speech and audio coding;

– voiceband signal terminal protocols;

– signal processing functions;

– signal processing network equipment and terminals;

– voice gateways;

– control/coordination of signal processing functionalities;

– interaction aspects.

### K.2 Study items

Study items to be considered include, but are not limited to:

̶ speech and audio coding algorithms to extend existing ITU‑T speech and audio coding Recommendations or to create new ones such as codecs for voice over LTE;

– how to use open source for maintenance and future audio related standardization projects;

– identification of applications (other than speech transmission) and definition of associated performance requirements for generic voiceband signal discrimination;

– definition of algorithm(s) suitable for generic voiceband signal discrimination meeting the applications and performance requirements;

– study for SPNE/terminals used in next generation networks (SPNE/terminals interworking between GSTN and packet/IP networks);

– specification of functionality, interfaces, performance requirements and functional tests to provide good network performance for transport network equipment when interconnecting various type of networks;

– logic and protocol requirements needed for control and coordination of signal processing functionalities in networks and terminals. Such logic may be used to get the optimal arrangements of signal processing functionalities in the networks and terminals used in a connection, or to configure their parameters for optimum performance;

– functional characteristics and requirements that are necessary for network-based speech enhancement devices (e.g. network and acoustic echo cancellers, automatic level control, automatic listener enhancement, noise reduction) to provide good performance in existing GSTN and emerging ATM/IP and cellular networks;

– interaction between: similar and different SPNE/terminals; SPNE and other voiceband traffic technologies including text telephony; SPNE/terminals and transport systems; and SPNE/terminals in networks that include satellite links.

### K.3 Tasks

Tasks include, but are not limited to:

– maintenance of existing G-series regarding speech/audio coding and signal processing Recommendations including ITU‑T G.711, G.711.0, G.711.1, G.718, G.719, G.720.1, G.722, G.722.1, G.722.2, G.723.1, G.726, G.727, G.728, G.729 and G.729.1;

– maintain the voice/audio information in the ITU‑T media coding database;

– development of new speech and audio coding Recommendations;

– maintenance of related Recommendations to voiceband signal discrimination and modem/facsimile terminal protocols: ITU‑T F.162, F.163, F.170, F.171, F.182 *bis*, F.185, F.190, T.4-T.6, T.22-T.24, T.30-T.33, T.35, T.36-T.39, T.42, T.43, T.45, T.503, T.563, V.8, V.8 *bis*, V.17, V.21, V.22, V.22 *bis*, V.24, V.27, V.27 *bis*, V.27 *ter*, V.29, V.32, V.32 *bis*, V.34, V.42, V.42 *bis*, V.43, V.44, V.56 *bis*, V.56 *ter*, V.59, V.61, V.70, V.75, V.76, V.80, V.90-V.92, V.110, V.120, V.130, V.150.0, V.150.1, V.151-V.153, V.250-V.254;

– maintenance of related Recommendations to signal processing network equipment and functions: ITU‑T G.160, G.161, G.161.1, G.164, G.165, G.168, G.169, Q50-series, Q.115-series, G.799.1, G.799.2, G.799.3, G.776.1, G.776.4, G.763, G.764, G.765, G.766, G.767, G.768, G.769/Y.1242 and I.733.

An up-to-date status of work under this Question is found in the SG16 work programme (<http://itu.int/ITU-T/workprog/wp_search.aspx?sp=16&q=10/16>)

### K.4 Relationships

Recommendations

– ITU‑T G.70x-series, G.710-series, G.720-series, G.760-series, G.799-series, G.160-series, Q.115-series

– ITU‑T H.300-series system Recommendations

– ITU‑T P.800-series

– ITU‑T E.450-series, E.460, F.162, F.163, F.170, F.182*bis*, F.185, H.225, H.323, H.245, H.248, I.366.2, I.741, T.6, T.22, T.23, T.24, T.31, T.32, T.33, T.35, T.36, T.39, T.66, T.400-series, T.80-series, T.800-series, X.3, X.38 and X.39

– ITU‑T G.108.2, G.114, G.131, G.136, G.173, G.175, G.177, G.827, G.828, P.330, P.340, P.342, P.1010, P.1100, P.1110, P.501, P.502, P.82, P.84, V.18; ITU-R S.1522

Questions

– All Questions of Study Group 16

Study groups

– ITU‑T SG2 on operational aspects of networks and performance and network management

– ITU‑R SGs 4 and 5 on voice on mixed terrestrial/satellite networks

– ITU‑R SG6 on broadcasting services

– ITU‑T SG9 on speech and audio coding aspects of digital cable systems and IPTV

– ITU‑T SG11 on signalling requirements, protocols, conformance and interoperability

– ITU‑T SG12 for speech and audio coding quality performance assessment and software tools matters

– ITU‑T SG13 on network architecture, speech and audio coding in IMT and IP-based networks, FN and Internetworking

– ITU‑T SG15 on access, core network architecture, and management and control of transport systems and equipment

Other bodies

– ETSI

– 3GPP and 3GPP2

– ISO/IEC JTC 1, CIE, ICC

– IETF

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