Question 13/16 – Content delivery, multimedia application platforms and end systems for IP-based television services including digital signage

(Continuation of Question 13/16)

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 representation and delivery, IPTV systems, digital signage systems, multimedia security, metadata, multimedia directories and multimedia service description.

Since broadband services over various access technologies are constantly evolving and gaining more and more popularity, in conjunction with the advances on user interfaces and terminal devices, there is a growing need for new integrated multimedia services where users can seamlessly switch amongst the different multimedia consumption experiences available from multiple sources. Specifically, with SG16's success on creating a series of Recommendations covering the diverse aspects of IPTV services, systems and platforms, the market now demands standardized interoperable solutions that encompass all forms of IP-based television services. IPTV is a multimedia service including television, video, audio, text, graphics and data delivered over IP based networks that are managed to provide the required level of QoS and QoE, security, interactivity and reliability. SG16 has noticed how IPTV service providers and network providers are starting to aggregate multiple services beyond those sourced from their managed network with QoS and has the expertise to provide the needed approaches and harmonized solutions for IP-based television services.

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 that target individual audiences through interactions between the audiences and a digital signage system. 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.

This Question is intended to produce deliverables related to study IP-based television and digital signage services, including their support for interactivity, middleware, multimedia applications, enhanced user interfaces, metadata, content formats and their uses, including UHDTV, virtual reality (VR) and augmented reality (AR). The Question will also study the mechanisms for content delivery networks and edge computing needed to facilitate effective and interoperable use of existing and future IP-based television and digital signage services.

2 Study items

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

– identify the use cases and requirements of IP-based television service application platforms and end system aspects;

- review and analyse existing standards and Recommendations to find any gaps seen against the requirements of IP-based television service 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 IP-based television service application platforms and end systems;
- investigate functional architectures for IP-based television service terminals;
- identify services and applications relevant to IP-based service application platforms and end systems;
- identify and investigate the use cases, requirements, functional architecture, and application platforms and terminals for digital signage systems and services;
- 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;
  - IP-based multimedia content distribution and delivery system and networking aiming at low latency and ultra-high bandwidth;
  - open service application platforms and open API for ingesting content and services from other content/service providers;
  - integrated service application platforms for IP-based television service based on the conventional IPTV functional architecture;
  - IP-based television service deployed/enhanced by support of (mobile/multi-access) edge computing;
  - augmented reality (AR) / virtual reality (VR) / mixed reality (MR) / extended reality (XR) / multi-view television services;
  - content processing for IP-based television services such as transcoding, metadata aggregation, 360 video stitching, rendering, content personalization and adaptation;
  - enhanced user interaction in content delivery services and interactive services;
  - multimedia content for IP-based television service from multiple sources and their integration;
  - terminal devices for IP-based television service that support multiple sources of content and delivery, such as hybrid terminals;
  - applications using IP-based television service, such as e-services (e.g. e-health and e-learning);
  - audience measurement;
  - IP-based television service middleware and application frameworks;
  - required aspects of security on IP-based television service applications;
  - IP-based television service end systems, and interworking between them (such as companion screen, multi-screen, head-mounted displays, AR glasses);
  - conformance and interoperability of IP-based television service systems and services;

- considerations on how media accessibility may rely on multiple aspects of IP-based television services, 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;
- consideration on providing emergency information services including early warning by digital signage systems and IP-based television services in the disaster environment;
- consideration on providing accessibility for persons with disabilities and specific needs (including foreign visitors) by digital signage and IP-based television services;
- consideration of new emerging technologies such as artificial intelligence, natural language translation, motion recognition, immersive experiences, UHD including 4K/8K, VR/AR/MR/XR and IMT-2020/5G for providing enhanced digital signage and IP-based television services;
- consider how IP-based television content delivery services (e.g. over-the-top services, IPTV) would integrate with each other and/or take advantage of each of their best features;
- how to enrich user experience and engagement (e.g. IP-based social TV, recommendation systems, supporting targeted content, including targeted advertisement, enhancing audience measurement, use of big data and of video sensors);
- how to provide cinema applications over IP-based television service application platforms;
- considerations on how to help measure power consumption and mitigate disaster and climate change;
- facilitate IP-based television services and applications converging with cross-industry new technologies, help the coordination of standards and evolution of IP-based television service 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 IP-based television and digital signage services as well as enhance them;
- considerations on how the evolution of mobile networks (IMT-2020/5G and beyond) and the mobility capability may impact IP-based television services and digital signage.

3 Tasks

Tasks include, but are not limited to, the development of deliverables on the following areas:
- required aspects of IP-based television service application platform and end systems, such as Connected TV, Smart TV, OTT TV and IPTV;
- required aspects of IP-based television service middleware and application platforms;
- required aspects of IP-based video content distribution and delivery;
- required aspects of open/integrated IP-based television service application platform;
- configuration of IP-based television services;
- content adaptation for IP-based television service;
- IP-based television service deployment scenarios;
- interface between content providers and service providers;
- IP-based television service audience measurement, including the use of video sensors;
- IP-based television service widgets and widget service;
- multiple IP-based television service terminal devices, their interworking and multi-device services;

- IP-based television service terminal device models, including mobile model and virtualized model;
- multimedia application frameworks for IP-based television service;
- enhanced user interface for IP-based television service;
- AR/VR/MR/XR/multi-viewing support in IP-based television service;
- IP-based television service metadata, including scene-based metadata;
- conformance and interoperability testing on IP-based television services;
- use cases, requirements, functional architectures, framework and protocols for digital signage systems and services;
- framework and protocols to provide services having public characteristics, including emergency warning and notification, and accessibility for persons with disabilities and specific needs over digital signage systems;
- enhancement and maintenance of ITU-T H.700-series (including ITU-T H.780, H.781, H.782, H.783, H.784, H.785.0, H.785.1), T.170-series, T.180, H-series Supplement 3 and relevant Technical Papers on IPTV and digital signage systems and services.

An up-to-date status of work under this Question is found in the SG16 work programme (https://www.itu.int/ITU-T/workprog/wp_search.aspx?sp=17&q=13/16).

4 Relationships

Recommendations
- E, 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