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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV –
Digital Signage

Digital signage: Service requirements and IPTV-based architecture

Recommendation ITU-T H.780



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Recommendation ITU-T H.780

Digital signage: Service requirements and IPTV-based architecture

Summary

Recommendation ITU-T H.780 describes a general framework for digital signage (DS) services based on IPTV architecture from the viewpoint of technical and service aspects. First, DS domains, a generic DS architecture and the classification of DS services are introduced. As technical IPTV specifications are close to those of DS, a brief comparison between the two services is provided (e.g., structure of a functional group and detailed media processing). Subsequently, high-level requirements concerning DS services are described. In addition, this Recommendation contains content delivery methods and details of functionalities of both server- and client-side applications for DS services.

History

Edition	Recommendation	Approval	Study Group
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Keywords

Content delivery, content management, digital signage, DS, DS services, playlist, terminal devices.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Recommendation ITU-T H.780

Digital signage: Service requirements and IPTV-based architecture

1 Scope

This Recommendation addresses the high level requirements, architecture and mechanisms for dealing with aspects of digital signage contents, network, metadata and terminal devices on the basis of IPTV architecture [ITU-T Y.1910]. It is expected that requirements and relevant specifications identified in this Recommendation can be applied appropriately according to the digital signage services and their business models.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|-------------------------|---|
| [ITU-T G.1080] | Recommendation ITU-T G.1080 (2008), <i>Quality of experience requirements for IPTV services</i> . |
| [ITU-T G.1081] | Recommendation ITU-T G.1081 (2008), <i>Performance monitoring points for IPTV</i> . |
| [ITU-T H.720] | Recommendation ITU-T H.720 (2008), <i>Overview of IPTV terminal devices and end systems</i> . |
| [ITU-T H.721] | Recommendation ITU-T H.721 (2009), <i>IPTV terminal devices: Basic model</i> . |
| [ITU-T H.750] | Recommendation ITU-T H.750 (2008), <i>High-level specification of metadata for IPTV services</i> . |
| [ITU-T H.760] | Recommendation ITU-T H.760 (2009), <i>Overview of multimedia application frameworks for IPTV</i> . |
| [ITU-T H.770] | Recommendation ITU-T H.770 (2009), <i>Mechanisms for service discovery and selection for IPTV services</i> . |
| [ITU-T X.1191] | Recommendation ITU-T X.1191 (2009), <i>Functional requirements and architecture for IPTV security aspects</i> . |
| [ITU-T Y.1541] | Recommendation ITU-T Y.1541 (2002), <i>Network performance objectives for IP-based services</i> . |
| [ITU-T Y.1901] | Recommendation ITU-T Y.1901 (2009), <i>Requirements for the support of IPTV services</i> . |
| [ITU-T Y.1910] | Recommendation ITU-T Y.1910 (2008), <i>IPTV functional architecture</i> . |
| [ISO/IEC 15938-5] | ISO/IEC 15938-5:2003, <i>Information technology – Multimedia content description interface – Part 5: Multimedia description schemes</i> . |
| [ISO/IEC 15938-5 Amd.2] | ISO/IEC 15938-5:2005/Amd.2:2005, <i>Multimedia description schemes user preference extensions</i> . |

- [ETSI TS 102-822-3-1] ETSI TS 102 822-3-1 V1.7.1 (2011), *Broadcast and On-line Services: Search, select and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 1: Phase 1 – Metadata schemas.*
- [ETSI TS 102 822-3-3] ETSI TS 102 822-3-3 V1.5.1 (2011), *Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 3: Phase 2 – Extended Metadata Schema.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 content provider [ITU-T Y.1910]: The entity that owns or is licensed to sell content or content assets.

3.1.2 distribution [ITU-T Y.1910]: In the context of IPTV architecture, "distribution" is defined as sending the content to appropriate intermediate locations to enable subsequent delivery.

3.1.3 end user [ITU-T Y.1910]: The actual user of the products or services.

NOTE – The end user consumes the product or service. An end user can optionally be a subscriber.

3.1.4 functional architecture [b-ITU-T Y.2012]: A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

NOTE 1 – The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementations and between administrative domains.

NOTE 2 – This definition is taken from [b-ITU-T Y.2012] and therefore relates to NGNs. However, it is also valid for other networks, e.g., networks supporting digital signage terminal devices.

3.1.5 functional entity [b-ITU-T Y.2012]: An entity that comprises an indivisible set of specific functions. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

3.1.6 media [b-ITU-T Y.2012]: One or more of audio, video, or data.

3.1.7 multimedia [b-ITU-T T.174]: The property of handling several types of representation media.

3.1.8 service provider [b-ITU-T M.1400]: A general reference to an operator that provides telecommunication services to customers and other users either on a tariff or contract basis. A service provider can optionally operate a network. A service provider can optionally be a customer of another service provider.

NOTE – Typically, the service provider acquires or licenses content from content providers and packages this into a service that is consumed by the end user.

3.1.9 terminal device (TD) [ITU-T Y.1901]: An end-user device which typically presents and/or processes the content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP terminal or an audio-visual media player.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 content: A combination of audio, still image, graphic, video, or data.

NOTE – A variety of formats is classified as the "data" (e.g., text, encoded values, multimedia description language introduced by [ITU-T H.760]).

3.2.2 delivery: Sending of contents to terminal devices.

3.2.3 digital signage (DS): A system that sends information, advertising and other messages to electronic devices (e.g., displays, speakers) in accordance with the time of day and the location of the display, or the actions of audience. Contents and their relevant information, such as display schedules, are delivered over networks.

3.2.4 network provider: The organization that maintains and operates the network components required to support a service or set of services.

3.2.5 playlist: Composed of a list of contents.

NOTE 1 – This data is created and provided by digital service providers.

NOTE 2 – This data can be selected by an end user when interactivity is supported in a digital signage terminal device.

NOTE 3 – This data may indicate an order of playing contents.

3.2.6 playlist schedule: Composed of a list of playlists indicated by a specific play date and/or time.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DS	Digital Signage
DVI	Digital Visual Interface
DVI-A	Digital Visual Interface Analogue
DVI-D	Digital Visual Interface Digital
DVI-I	Digital Visual Interface Integrated
FLUTE	File delivery over unidirectional transport
FTP	File Transfer Protocol
HDMI	High Definition Multimedia Interface
HTTP	Hyper Text Transfer Protocol
HTTPS	HTTP over SSL/TLS
IPTV	Internet Protocol Television
LAN	Local Area Network
LCD	Liquid Crystal Display
LVDS	Low Voltage Differential Signalling
MAC	Media Access Control
OLED	Organic Light Emitting Diode display
PC	Personal Computer
PDA	Personal Digital Assistant
PDP	Plasma Display Panel
PII	Personally Identifiable Information
QoE	Quality of Experience

QoS	Quality of Service
RAM	Random Access Memory
RGB	Red-Green-Blue colour model
RTP	Real-time Transport Protocol
SADS	Service and Application Discovery and Selection
SMS	Short Message Service
SSL	Secure Socket Layer
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security
TS	Transport Stream
TV	Television
USB	Universal Serial Bus

5 Conventions

In this Recommendation:

- The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.
- The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.
- The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.
- The keyword "functions" are defined as a collection of functionalities. It is represented by the following symbol in this Recommendation:



Functions

- The keywords "functional block" are defined as a group of functionalities that has not been further subdivided at the level of detail described in this Recommendation. It is represented by the following symbol in this Recommendation:



Functional
Block

NOTE – In the future, other groups or other Recommendations may possibly further subdivide these functional blocks.

Frame borders of "functions" and "functional block", and relational lines among "functions" and "functional block" are drawn with solid lines or dashed lines. The solid lines mean required

functionalities or relations. On the other hand, the dashed lines mean optional functionalities or relations.

6 Overview

6.1 Digital signage domains

Digital signage (DS) is a system that sends information, advertising and other messages to electronic devices (e.g., displays and loudspeakers) in accordance with the time of day and the location of the display, or the actions of audience. Contents and their relevant information, such as display schedules, are delivered over networks. The services are to be closer to people's lives with the advent of broadband and mobile network infrastructures.

Figure 1 shows the main domains that are involved in the provision of DS services based on [ITU-T Y.1910]. These domains do not define a business model. This decomposition does not preclude that one provider be involved in the support of any given DS services across more than one domain.

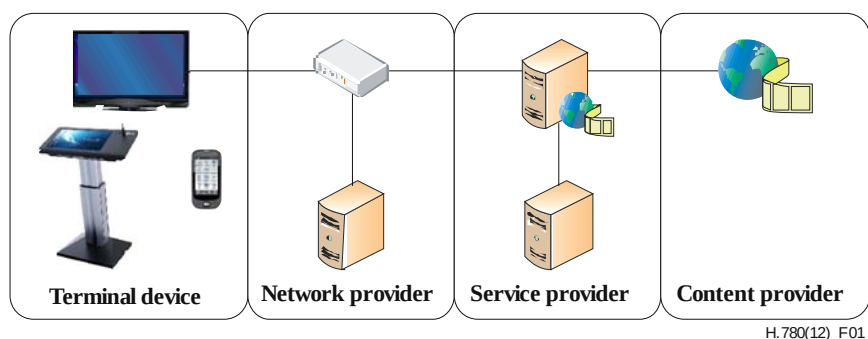


Figure 1 – Generic digital signage domains as per [ITU-T Y.1910]

The four digital signage domains, the definitions of which are provided in clause 3, are:

- Content provider
- Service provider
- Network provider
- Terminal device.

Many of the basic technologies for digital signage are similar to those for IPTV, e.g., image processing and data delivery. There are, however, differences between IPTV and DS.

A linear TV service, which is one of the typical IPTV services, is premised on broadcasting. On the other hand, DS may be referred to as "digital-out-of-home", "in-store media", "narrowcasting" and "electronic billboards" – reflecting the nature of the DS services. For example, the meaning of narrowcasting is delivery of information to specified audiences as defined by certain values, preferences, or demographic attributes. In analogy with narrowcasting, DS services can offer timely local promotional campaigns through displays aimed at impacting on an audience. In this case, a DS system creates and/or delivers different playlists and contents to individual devices, or to groups of them, according to their detailed geographic attributes. Examples would be device location and region by using audience or location profiles: contents varying depending on the area within a complex; distinction between indoors and outdoors; different contents displayed at the entrance and at the exit of a shopping centre; and differentiation for screens at eye-level and for those above eye-level. In addition to the profile, the delivered contents are played at designated times according to the playlists. As it can be seen, key features of DS are an elaborated, geographic-based content tailoring control, and a detailed scheduling for content delivery and layout (temporal control).

In addition, particular events may change the contents of DS services along with the geographical and temporal controls. Important examples of this category are alert services for natural disasters and public/building security announcements.

NOTE 1 – [b-ITU-T TechWatch] provides an outline of DS (e.g., the overview of digital signage relevant technologies and their major applications in the market).

NOTE 2 – For reference, Appendix of [b-ITU-T E.106] describes the criteria for selection of audience that a national authority may wish to consider for emergency and disaster relief operations (e.g., information on transportation, medical and public utilities).

From a revenue model viewpoint, there is another difference between IPTV and DS. While IPTV services are mainly provided according to a business-to-consumer subscription-based business model, the DS services are basically offered based on a business-to-business model.

DS services are categorized into four classes by the number of potential audiences in the services:

- Class A: services in public spaces (e.g., railways and convention centres)
- Class B: services in major distributors and service industry (e.g., banks and supermarkets)
- Class C: services in relatively small offices and retailer shops; and
- Class D: services in the home as communication tools.

NOTE 3 – In Classes A and B, services are mainly used for advertisements or information services, and these use cases are relatively clear. On the other hand, a variety of other use cases is expected to emerge in Classes C and D (e.g., effective sales promotion, novelty space production, and communication tools in communities). Common specification of the services in each class, which mainly consist of contents delivery and presentation methods, can be based on the first two classes.

This Recommendation describes requirements and functionalities of basic DS services (i.e., in the Classes A and B) in order to be used as a foundation for deployment of the services. The functional elements constituting these domains are described in more detail in clause 8.

6.2 Architecture overview

Figure 2 depicts a general digital signage architecture based on ITU-T IPTV architecture [ITU-T Y.1910]. Major technologies of IPTV services allow a DS system to use methods of contents delivery over a network.

Figure 2 identifies the principal functional groups for DS services. These functional groups provide a more detailed breakdown of the digital signage domains that are defined in clause 6.1. The content provider and terminal device domains remain the same as in Figure 1. The service provider and network provider domains in Figure 1 are not used in the architecture since commercial and operational boundaries are not appropriate to an architectural decomposition.