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SERIES J: CABLE NETWORKS AND TRANSMISSION
OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Secondary distribution of IPTV services

Enablement of current terminal devices for the support of IPTV services

Recommendation ITU-T J.702

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Enablement of current terminal devices for the support of IPTV services

Summary

Recommendation ITU-T J.702 describes an IPTV terminal device (IPTV TD) that enables a migration path for the support of basic IPTV services, for current terminal devices used for other TV delivery services. This Recommendation identifies architectures and functions needed for the IPTV TD to support basic IPTV services, and is intended to meet immediate demands of current TV delivery services to rapidly deploy basic IPTV services.

Source

Recommendation ITU-T J.702 was approved on 29 October 2008 by ITU-T Study Group 9 (2005-2008) under Recommendation ITU-T A.8 procedures.

FOREWORD

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3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 access control [b-ITU-T X.800]: The prevention of unauthorized use of a resource, including the prevention of use of a resource in an unauthorized manner.

3.1.2 accessibility feature [ITU-T Y.1901]: An additional content component that is intended to assist people hindered in their ability to perceive an aspect of the main content. Examples: captions for the hard of hearing, subtitles in various languages, sign-language interpretation video and descriptive audio.

3.1.3 application [b-ITU-T Y.101]: A structured set of capabilities, which provide value-added functionality supported by one or more services.

3.1.4 authentication [b-ITU-T X.800]: See data origin authentication and peer-entity authentication.

3.1.5 authorization [b-ITU-T X.800]: The granting of rights, which includes the granting of access based on access rights.

3.1.6 broadcast [b-ITU-T M.60]: One-way transmission from one point to two or more other points.

3.1.7 data origin authentication [b-ITU-T X.800]: The corroboration that the source of data received is as claimed.

3.1.8 delivery network gateway (DNG) [b-ATIS-0800002]: A device implementing the DNGF.
NOTE – DNG also is commonly referred to as the residential gateway (RG).

3.1.9 end-user (adapted from [b-ITU-T M.3050.1]): The actual user of the products or services.

NOTE – The end-user consumes the product or service. Further, an end-user may or may not be responsible for concluding contracts for the services subscribed to and for paying for these services (i.e., an end-user may or may not be a subscriber).

3.1.10 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 NGN. However, it is also valid for other networks, e.g., networks supporting IPTV.

3.1.11 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.

3.1.12 key [b-ITU-T X.800]: A sequence of symbols that controls the operations of encipherment and decipherment.

3.1.13 key management [b-ITU-T X.800]: The generation, storage, distribution, deletion, archiving and application of keys in accordance with a Security Policy.

3.1.14 peer-entity authentication [b-ITU-T X.800]: The corroboration that a peer entity in an association is the one claimed.

3.1.15 privacy [b-ITU-T X.800]: The right of individuals to control or influence what information related to them may be collected and stored and by whom and to whom that information may be disclosed.

3.1.16 provisioning [b-ITU-T M.2301]: The installation, assignment and commissioning (including bringing-into-service testing) of network resources.

3.1.17 security policy [b-ITU-T X.800]: The set of criteria for the provision of security services.

3.1.18 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 may or may not operate a network. A service provider may or may not be a customer of another service provider.

3.1.19 subscriber [b-ITU-T M.3050.1]: The subscriber is responsible for concluding contracts for the services subscribed to and for paying for these services.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 content protection: Ensuring that end-users can only use the content they have already acquired in accordance with the rights that they have been granted by the rights holder. Content protection includes protecting contents from illegal copying and distribution, interception, tampering, unauthorized use, etc.

3.2.2 content provider: The entity that owns or is licensed to sell content or content assets.

3.2.3 content tracing: A process to enable the identification of the (arbitrary) origin of content, and/or the responsible party (e.g., the end-user), to facilitate subsequent investigation in the event of unauthorized use of content, for example, content copying or redistribution.

NOTE – Content tracing information may be attached to content either as metadata, or as a forensic watermark.

3.2.4 delivery network gateway functions (DNGF): Set of functions that mediate between the network and service provider domains and the IPTV terminal function (ITF).

NOTE – A device implementing the DNGF is commonly referred to as the residential gateway (RG) or delivery network gateway (DNG).

3.2.5 entitlements: Refer to authorization level(s) including conditional access information that a subscriber can use to access certain IPTV services in his/her IPTV TD.

3.2.6 IPTV TD: A terminal device which has ITF functionality, e.g., a set-top box (STB).

3.2.7 IPTV terminal function (ITF): The client-side function(s) associated with a) receiving and responding to network control channel messages regarding session set-up, maintenance, and tear-down, and b) receiving the content of an IP transport from the network and rendering.

3.2.8 linear TV: A television service in which a continuous stream flows in real time from the service provider to the terminal device and where the user cannot control the temporal order in which contents are viewed.

3.2.9 metadata: Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities.

NOTE – EPG metadata has many applications and may vary in depth from merely identifying the content package title or information to populate an EPG to providing a complete index of different scenes in a movie or providing business rules detailing how the content package may be displayed, copied, or sold.

3.2.10 rights: Refer to the ability to perform a pre-defined set of utilization functions on a content item. These utilization functions include the permissions (e.g., to view/hear, copy, modify, record, excerpt, sample, keep for a certain period, distribute), constraints (e.g., play/view/hear multiple times, play/view/hear certain number of hours) and obligations (e.g., payment, content tracing) that apply to the content and provide liberty of use granted to the end-user.

3.2.11 service: A set of functionality enabled by a provider for end users; for example, providing IP connectivity with managed quality of service, providing an IPTV service, providing a content on demand service, etc.

3.2.12 service and content protection: A combination of service protection and content protection, or a system or implementation thereof.

3.2.13 service protection: Ensuring that an end-user can only acquire a service, and, by extension, the content contained therein, that they are entitled to receive. Service protection includes protecting service from unauthorized access as IPTV contents traverse through the IPTV service connections.

3.2.14 terminal device (TD): An end-user device which typically presents and/or processes content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP terminal or an audiovisual media player.

3.2.15 trick mode functionality: The ability to pause, rewind or forward stored content.

3.2.16 video on demand (VoD): A service in which the subscriber can view and/or select a stored video content whenever desired.

4 Abbreviations

This Recommendation uses the following abbreviations:

AL-FEC	Application Level FEC
ARQ	Automatic Repeat reQuest
BC	BroadCast network
BCAST	Broadcast
CDN	Content Delivery Network
CODEC	Coder-Decoder
CP	Content Protection
CPE	Customer Premises Equipment
DCAS	Downloadable Conditional Access System
DEMUX	Demultiplex
DHCP	Dynamic Host Configuration Protocol
DNG	Delivery Network Gateway
DRM	Digital Rights Management
EAS	Emergency Alert System
ECG	Electronic Content Guide
EPG	Electronic Program Guide
ESG	Electronic Service Guide
FEC	Forward Error Correction
GUI	Graphic User Interface

HDMI	High-Definition Multimedia Interface
HN	Home network
HTML	HyperText Mark-up Language
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol Security
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPG	Interactive Program Guide
IPTV	Internet Protocol TV
MIB	Management Information Base
MLD	Multicast Listener Discovery
MPEG	Moving Picture Experts Group
MUX	Multiplex
NACF	Network Attachment Control Functions
NGN	Next Generation Network
NTSC	National Television System Committee
NTP	Network Time Protocol
NW	Network
OD	Output Device
OSD	On-Screen Display
PAL	Phase Alternate Line
PD	Peripheral Device
PID	Packet Identifier
PIN	Personal Identification Number
PPV	Pay Per View
PVR	Personal Video Recorder
QAM	Quadrature Amplitude Modulation
QoE	Quality of Experience
QoS	Quality of Service
RACF	Resource Admission Control Functions
RAL	Resource Abstraction Layer
RAM	Random Access Memory
RF	Radio Frequency
RG	Residential Gateway
RTP	Real-time Transport Protocol

RTSP	Real-Time Streaming Protocol
SADS	Service and Application Discovery and Selection
SCP	Service and Content Protection
SD	Service Discovery
SECAM	SÉquence Couleur Avec Mémoire
SI	Service Information
SM	Security Module
SNF	Service Navigation Function
SNMP	Simple Network Management Protocol
SP	Service Protection
SSM	Source Specific Multicast
STB	Set-Top Box
SVD	Subscriber Video Device
TD	Terminal Device
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TLS	Transport Layer Security
TS	Transport Stream
UDP	User Datagram Protocol
UPnP	Universal Plug and Play
USB	Universal Serial Bus
VCR	Video Cassette Recorder
VBI	Vertical Blank Interval
XML	eXtensive Mark-up Language

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 "**is prohibited from**" 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 "**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 the specification.

In the body of this Recommendation and its annexes, the words *shall*, *shall not*, *should*, and *may* sometimes appear, in which case they are to be interpreted, respectively, as *is required to*, *is prohibited from*, *is recommended*, and *can optionally*. The appearance of such phrases or keywords in an appendix or in material explicitly marked as *informative* are to be interpreted as having no normative intent.

6 Basic services

Based on requirements and recommendations identified in [ITU-T Y.1901], the basic services that the IPTV TD is recommended to support are defined as follows. For details of service use cases or examples, refer to [b-ITU-T Y-Sup.5].

6.1 Content delivery service

6.1.1 Service navigation

Service navigation is a process of presenting information that allows the end-user to discover, select and consume services.

Service navigation is an integral part of IPTV because it is expected that there are many services possible on IPTV and without service navigation, it is very difficult, if not impossible, to obtain services. A typical means of service navigation is by way of a service navigation interface, a user interface which is intended to provide information on available services, including content that may be accessed by end-users for service navigation. Service navigation interfaces include, but are not limited to, EPG, IPG, ECG, and ESG.

6.1.2 Linear TV

Linear TV is a broadcast TV service that is the same as the classic form of television services that are provided by cable, terrestrial and direct-to-the-home satellite operators, where the programme content is transmitted according to a defined schedule and is intended for real-time consumption by the end-user. The service therefore provides an essentially continuous stream flowing from the content provider to the terminal device.

Linear TV includes (but is not necessarily limited to) the following approaches:

- **Audio and video:** Audio and video (audiovisual) signals are broadcasted and distributed to the downlink without end-user control of the content flow (e.g., without trick play).
- **Audio only:** Audio signals are broadcasted and distributed to the downlink without end-user control of the content flow (e.g., without trick play).
- **Linear TV with audio, video, and data:** These A/V services are combined with interactive data for the related or supplementary information of A/V programs using bidirectional links. The end-user can watch the downlink A/V stream and simultaneously access more detailed or value-added information via the uplink.

6.1.3 Content on-demand

A content on-demand service enables an end-user to select, acquire, and consume from a library of content stored on a remote or local server.

6.2 Interactive services

The IPTV TD is recommended to support an IP-based 2-way communication channel. As described in [b-ITU-T Y-Sup.5], the interactive services may include, but are not limited to, information services, commercial services, entertainment services (e.g., games, karaoke, etc.), learning services, medical services, monitoring services, portal services, and so on. The IPTV TD is recommended to have the ability to communicate with a remote interactive content server via means such as HTTP or HTTPS protocols. Client-side interactive services may also be provided by a resident application.

NOTE 1 – Having a browser indicate direct access to the Internet.

NOTE 2 – Interactive services may include service provider specific customer services, such as subscription, PPV, EPG, etc.

6.3 Public interest services

[ITU-T Y.1901] defines public interest services including:

- Accessibility features, as described in [b-ITU-T Y-Sup.1] and refers to the ITU-T FSTP-TACL telecommunications accessibility checklist [b-ITU-T TP.TACL];
- emergency telecommunications;
- regulatory information services;
- provider selection and number portability.

When relevant national regulations apply, the IPTV TD is required to support national regulations.

7 Functional requirements

7.1 Network attachment

This clause describes the network attachment procedures. When the IPTV TD is attached to the network, the initialization processes will begin to set up the network interface for the IPTV TD and provide necessary access to the initial entry point for service discovery, as described below.

- 1) In the first stage, the IPTV TD is required to establish layer-2 connectivity.
- 2) In the second stage, the IPTV is required to obtain an IP address, e.g., using DHCP.
- 3) In the third stage, the IPTV TD is recommended to obtain a service discovery entry point.

The IPTV TD is recommended to support the methods described in clause 7.1 of [ITU-T J.293] for the above three stages.

Note that there are two cases to consider regarding DHCP. In the first case, DNG supports DHCP server capability and thus acts as a network DHCP server in a home network. In the second case, DNG passes DHCP messages from the network to the terminal device directly.

Alternatively, the network attachment control function (NACF), as described in [ITU-T Y.2014] may be used to provide registration at the access level and initialization of end-user functions (DNG, IPTV TDs) for accessing NGN services.

[ITU-T Y.2014] describes the following functionalities for NACF:

- dynamic provisioning of IP addresses and other user equipment configuration parameters;
- by endorsement of user, auto-discovery of user equipment capabilities and other parameters;
- authentication of end user and network at the IP layer (and possibly other layers). Regarding the authentication, mutual authentication between the end user and the network attachment is performed;
- authorization of network access, based on user profiles;
- access network configuration, based on user profiles;
- location management at the IP layer.

The following clause describes service discovery procedures.

7.2 Service discovery

Service discovery is the process by which an IPTV TD becomes aware of the available IPTV services, and learns the location of and the means for obtaining each available IPTV service.

The IPTV TD is required to obtain the service discovery information.

The IPTV TD is recommended to support IP unicast and multicast for service discovery information distribution.

The IPTV TD is recommended to support service discovery information contained in XML-based text, e.g., DVB-IPI [ETSI TS 102 034], and contained in service information (SI) of the MPEG transport stream. Additional information on SI can be found in Appendix IV.

Appendix V provides an explanatory text of service discovery and examples of the service discovery information structure.

7.3 Service navigation

The service navigation function (SNF) provides functionalities relating to service navigation including the collection of the metadata, construction of a program guide, provision of a user interface, etc.

The IPTV TD is recommended to provide a service navigation capability as part of the resident application functionalities, which uses the metadata provided by the service provider to offer the subscriber the capabilities of content retrieval, information presentation, play, a method to purchase the content, and interactivity.

More broadcast centric services, where any information is distributed by way of one-way transmission from one point to two or more other points, conventionally provide service navigation by service information (SI), which is detailed in Appendix IV.

7.3.1 The functions provided by the SNF

The SNF is required to provide at least one of the following functions if the IPTV TD supports SNF:

- retrieval of specific metadata based on search conditions;
- retrieval of metadata from across different (more than one) service providers;
- display of the listing of available content, or the detailed information on the available content, based on received metadata;
- navigation and the means to allow the end user to purchase the content;
- indication of the contents purchased by the end user;
- navigation to allow the end user to view the purchased contents.

7.3.2 Metadata for service navigation

The metadata described in [ITU-T H.750] is recommended as the means for service navigation.

7.3.3 Caching metadata

The IPTV TD is recommended to retrieve metadata and temporarily store it as cache. The exact implementation of the cache mechanism depends on each terminal device, but its envisaged storing capacity varies from the minimum value of the searched content displayed on a monitor, to the maximum value of all the metadata from all the service providers. The storage device may vary, the RAM may be used to temporarily store metadata in memory, or a hard-disk drive may be used to store it more permanently. For better quality of experience, the IPTV TD is recommended to construct a certain metadata database for SNF locally and provide its management.