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**Delivery and control protocols handled by IPTV
terminal devices**

ITU-T

Summary

This Technical Paper mainly provides an overview of various protocols handled by IPTV services, in particular of delivery and control protocols for basic IPTV services (e.g., Linear TV, VoD).

Keywords

IPTV, delivery protocol, control protocol, Linear TV, VoD

Change Log

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Technical Paper HSTP.IPTV-PITD

Delivery and control protocols handled by IPTV terminal devices

1 Scope

This Technical Paper mainly describes the delivery and control protocols for IPTV terminal devices. There are several ITU-T Recommendations and well-known standards concerning IPTV services. It is therefore useful to summarize the protocols as one of overviews of standards regarding IPTV terminal devices. Various models of IPTV terminal devices in ITU-T Recommendations are based on a generic logical architecture in ITU-T Rec. H.720. This technical paper shows relations between the protocols and reference points of the generic architecture.

2 References

- [ITU-T Y.1901] Recommendation ITU-T Y.1901 (2008), *IPTV Services Requirements*
- [ITU-T Y.1910] Recommendation ITU-T Y.1910 (2008), *IPTV Architecture*
- [ITU-T H.610] ITU-T Recommendation H.610 (2007), Full service VDSL - System architecture and customer premises equipment.
- [ITU-T H.701] Recommendation ITU-T H.720 (2008), *Content delivery error recovery for IPTV services*
- [ITU-T H.720] Recommendation ITU-T H.720 (2008), *Overview of IPTV terminal devices and end systems*
- [ITU-T H.721] Recommendation ITU-T H.721 (2009), *IPTV terminal devices, Basic Model*
- [ITU-T H.740] Recommendation ITU-T H.740 (2010), *Application event handling for IPTV services*
- [ITU-T H.770] Recommendation ITU-T H.770 (2009), *Mechanisms for service discovery up to consumption for IPTV*
- [ITU-T X.1191] Recommendation ITU-T X.1191 (2009), *Functional requirements and architecture for IPTV security aspects*
- [ITU-T Q.3402] ITU-T Recommendation Q.3402 (2008), *NGN UNI Signalling Profile (Protocol Set 1)*
- [ITU-T Q.3040] ITU-T Recommendation Q.3040 (2010), *IPTV Signalling Control Plane Architecture*
- [ITU-T X.1301] ITU-T Recommendation X.1303(2007), *Common alerting protocol (CAP 1.1)*
- [ATIS-0800013] ATIS standard ATIS-0800013 (2008), *Media Formats and Protocols for IPTV services*
- [ATIS-0800017] ATIS standard ATIS-0800017 (2008), *Network Attachment and Initialization of Devices and Client Discovery of IPTV Services*
- [ATIS-0800042] ATIS standard ATIS-0800042 (2010), *IPTV Content on Demand Service*
- [ETSI TS 102 034] ETSI TS 102 034 v1.3.1 (2007), Digital Video Broadcasting (DVB); *Transport of MPEG-2 TS Based DVB Services over IP Based Networks.*

- [ETSI TS 102 539] ETSI TS 1-2 539 V1.2.1 (2008), *Digital Video Broadcasting (DVB); Carriage of Broadband Content Guide (BCG) information over Internet Protocol (IP)*
- [ETSI TS 183 063] ETSI TS 183 063 V2.1.0 (2008), *Telecommunications and Internet converged Services and Protocols for Advances Networking (TISPAN); IMS-based IPTV stage 3 specification*
- [BBFF TR069] Broadband Forum TR-069 (2007), *CPE WAN Management Protocol*
- [IETF RFC 768] IETF RFC 768 (1980), *User Datagram Protocol (UDP)*
- [IETF RFC 959] IETF RFC 959 (1985), *File Transfer Protocol (FTP)*
- [IETF RFC 1350] IETF RFC1350 (1992), *The TFTP Protocol (Revision 2)*
- [IETF RFC 2131] IETF RFC 2131(1997), *Dynamic Host Configuration Protocol*
- [IETF RFC 2236] IETF RFC 2236 (1997), *Internet Group Management Protocol, Version 2*
- [IETF RFC 2250] IETF RFC 2250 (1998), *RTP Payload Format for MPEG1/MPEG2 Video*
- [IETF RFC 2326] IETF RFC 2326 (1998), *Real Time Streaming Protocol (RTSP)*
- [IETF RFC 2616] IETF RFC 2616 (1999), *Hypertext Transfer Protocol -- HTTP/1.1*
- [IETF RFC 2782] IETF RFC 2782 (2000), *A DNS RR for specifying the location of services (DNS SRV)*
- [IETF RFC 2818] IETF RFC 2818 (2000), *HTTP over TLS*
- [IETF RFC 3261] IETF RFC 3261 (2002), *SIP: Session Initiation Protocol*
- [IETF RFC 3376] IETF RFC 3376 (2002), *Internet Group Management Protocol, Version 3*
- [IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*
- [IETF RFC 3810] IETF RFC 3810 (2004), *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*
- [IETF RFC3920] IETF RFC3920 (2004), *Extensible Messaging and Presence Protocol (XMPP): Core*
- [IETF RFC3921] IETF RFC3921 (2004), *Extensible Messaging and Presence Protocol (XMPP): Instant Messaging and Presence*
- [IETF RFC3926] IETF RFC3926 (2004), *FLUTE - File Delivery over Unidirectional Transport*
- [IETF RFC4330] IETF RFC 4330 (2006), *Simple Network Time Protocol (SNTP) Version4 for IPv4, IPv6 and OSI*
- [IETF RFC4301] IETF RFC4301 (2005), *Security Architecture for the Internet Protocol*
- [IETF RFC 4825] IETF RFC 4825 (2007), *The Extensible Markup Language (XML) Configuration Access Protocol (XCAP)*
- [W3C XML] World Wide Web Consortium (W3C) Recommendation XML1.0 (2008), *Extensible Markup Language (XML) 1.0, Fifth Edition*
- [W3C SOAP] World Wide Web Consortium (W3C) Recommendation SOAP 1.2 (2007), *Simple Object Access Protocol (SOAP) 1.2*

3 Definitions

3.1 Terms defined elsewhere

This document uses the following terms defined elsewhere:

3.1.1 IPTV [ITU-T Y.1901]: Multimedia services such as television/video/audio/text/graphics /data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability.

3.1.2 IPTV terminal device [ITU-T Y.1901]: A terminal device which has ITF functionality, e.g. a STB.

3.1.3 IPTV Terminal Function (ITF) [ITU-T Y.1901]: The functionality within the home network that is responsible for terminating the IP signal, and converting the content into a renderable [i.e. enabling to be seen and/or heard] format.

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

3.1.5 linear TV [ITU-T Y.1901]: 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.

3.1.6 notification [ITU-T T.174]: A primitive issued by the server on its own initiative to forward information to the client.

3.1.7 rights [ITU-T X.1191]: Referring to the ability to perform a predefined set of utilization functions for a content item; these utilization functions include permissions (e.g., to view/hear, copy, modify, record, excerpt, sample, keep for a certain period, distribute), restrictions (e.g., play/view/hear for multiple number of times, play/view/hear for certain number of hours), and obligations (e.g., payment, content tracing) that apply to the content and provide the liberty of use as granted to the end user.

3.1.8 SCP [ITU Y.1901]: A combination of service protection and content protection

3.1.9 service navigation [ITU-T H.720]: The presentation of information that allows the end-user to discover, select and consume services.

3.1.10 Video-on-Demand (VoD) [ITU-T Y.1901]: A service in which the end-user can , on demand, select and view a video content and where the end-user can control the temporal order in which the video content is viewed (e.g. the ability to start the viewing, pause, fast forward, rewind, etc)

NOTE - The viewing may occur some time after the selection of the video content.

3.2 Terms defined in this document

This document does not define any particular terms.

4 Abbreviations

CAP	Common alert protocol
DHCP	Dynamic host configuration protocol
DNS	Domain name system
DNS SVR	DNS service records
DVBSTP	DVB Service discovery and selection transport protocol
ECG	Electronic content guide
EPG	Electronic program guide

IPG	Interactive program guide
ET	Emergency telecommunications
FEC	Forward error correction
FLUTE	File delivery over unidirectional transport
FQDN	Fully qualified domain name
FTP	File transfer protocol
HTTP	Hypertext transfer protocol
HTTPS	HTTP over TLS
IGMP	Internet group management protocol
IP	Internet Protocol
IPv4	IP version 4
IPv6	IP version 6
IPsec	Security architecture for Internet Protocol
MLD	Multicast listener discovery
RPC	Remote procedure call
RSVP	Reservation protocol
RTCP	RTP control protocol
RTCP XR	RTP control protocol extended reports
RTP	Real-time transport protocol
RTSP	Real-time streaming protocol
QoS	Quality of service
SADS	Service and application discovery and selection
SCP	Security and content protection
SI	Service information
SIP	Session initiation protocol
SNTP	Simple network time protocol
SOAP	Simple object access protocol
TCP	Transmission control protocol
TFTP	Trivial file transfer protocol
TLS	Transport layer security
TS	Transport stream
UDP	User datagram protocol
VDSL	Very high bitrate digital subscriber line
VoD	Video on demand
XCAP	XML configuration access protocol
XML	Extensible markup language
XMPP	Extensible messaging and presence protocol

5 Protocol Reference Points of IPTV Terminal Device

[ITU-T H.720] describes basic architecture of IPTV terminal devices' functions based on [ITU-T Y.1910]. This document aims to supplement [ITU-T H.720] with protocol-relevant information according to other ITU-T Recommendations concerning IPTV services.

Accordingly, Figure 5-1 shows reference points concerning IPTV terminal devices. Reference points from E1 to E6 fully comply with [ITU-T Y.1910] and [ITU-T Q.3040], E7, E8 and E9 are described in [ITU-T H.720], and E10 are newly defined for application event handling according to [ITU-T H.740].

Left side round-square boxes in this figure are server-side or network-side functionalities.

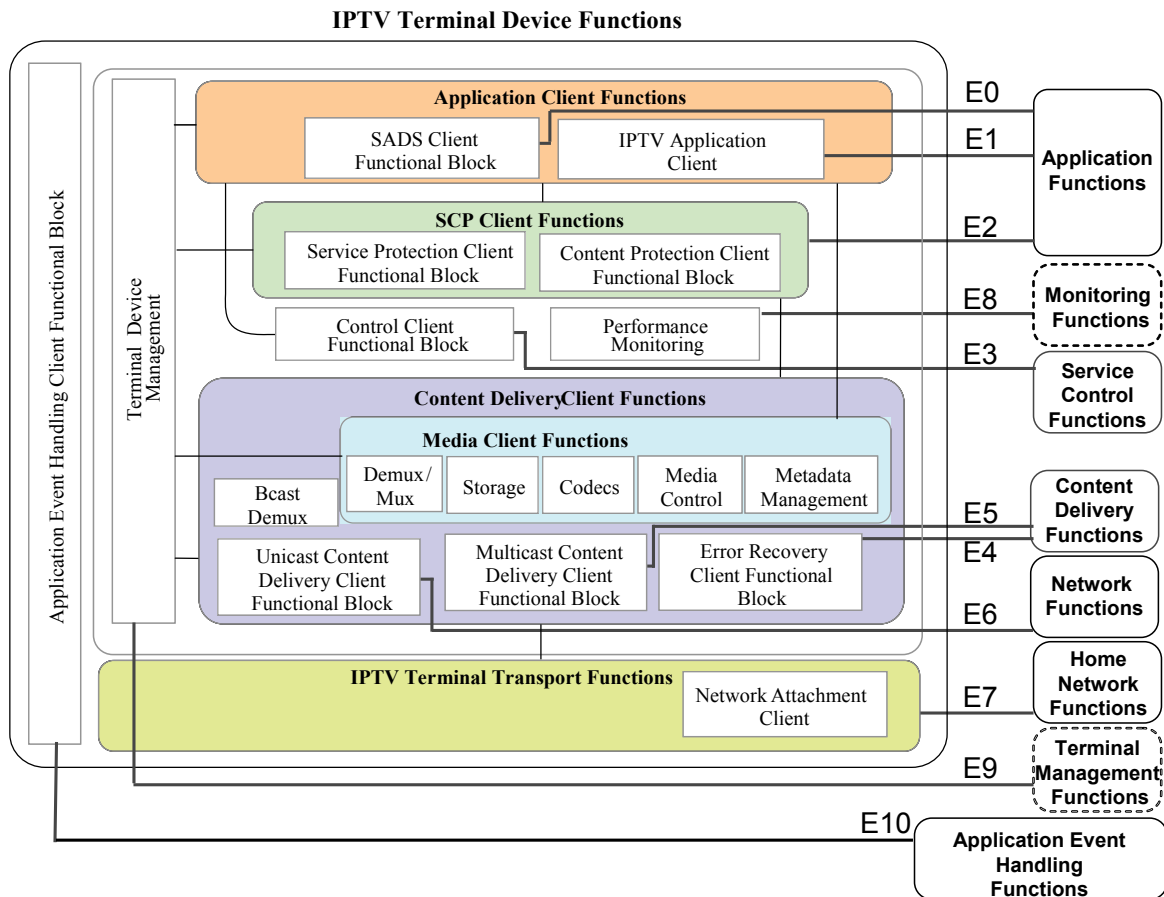


Figure 5-1: Reference points on protocols of IPTV terminal devices

NOTE – For details of functionalities in this document, see [ITU-T Y.1910].

5.1 Reference point E0

The E0 reference point is between service and application discovery and selection (SADS) client functional block and the server-side SADS functional block.

This reference point is used to discover service providers/services themselves, and select IPTV services and applications. For details of service discovery, see [ITU-T H.770].

5.2 Reference point E1

The E1 reference point is between IPTV terminal devices' application client functional block and server-side IPTV application functional block.

This reference point is used to support service and application configuration.

5.3 Reference point E2

The E2 reference point is between service and content protection (SCP) client functions and server-side SCP functions.

This reference point is used for delivering security information (e.g., rights object or keys) from SCP functions to SCP client functions. For details of SCP, see [ITU-T X.1191]

5.4 Reference point E3

The E3 reference point is between the control client functional block and the IPTV service control functional block.

This reference point is used to exchange session signalling information (e.g., session establishment, modification, and termination). It can optionally be used to exchange:

- content control messages, such as content recording commands;
- service and application discovery information.

5.5 Reference point E4

The E4 reference point is between error recovery functional block and error recovery client functional block.

This reference point is used to exchange messages for requesting and delivering error recovery information (e.g., forward error correction (FEC) repair data or retransmission data). For details of FEC and retransmission, see [ITU-T H.701].

5.6 Reference Point E5

The E5 reference point is between the multicast content delivery client functional block and the server-side multicast control functional block.

This reference point is used to exchange messages for joining multicast channels (e.g., IGMP messages).

NOTE - This reference point is called E5-Cm in [ITU-T Q.3040].

5.7 Reference point E6

The E6 reference point is between the unicast content delivery client functional block and the server-side content delivery control functional block.

This reference point is used to exchange content control message (e.g., video recording commands).

NOTE 1 - The information exchanged between the unicast content delivery client functional block and the content delivery control functional block can optionally be transferred via the IPTV service control functions, e.g. in the case where the IPTV service control functions proxy all requests between the unicast content delivery client functional block and the content delivery control functional block.

NOTE 2 - This reference point is equivalent to E5-Cu of [ITU-T Q.3040].

5.8 Reference point E7

The E7 reference point is between content delivery client functions and the delivery network gateway functional block.

This reference point is used to deliver control messages and content streams.

5.9 Reference point E8

The E8 reference point is between performance monitoring client functions and the relevant server-side functional block. Details concerning this reference point are for further study.

5.10 Reference point E9

The E9 reference point is between network attachment client functions and the relevant server-side functional block. Details concerning this reference point are for further study.

5.11 Reference point E10

The E10 reference point is between an application event handling client function block and a relevant server-side function. This reference point is used to deliver application event handling data (e.g., viewership information) [ITU-T H.740].

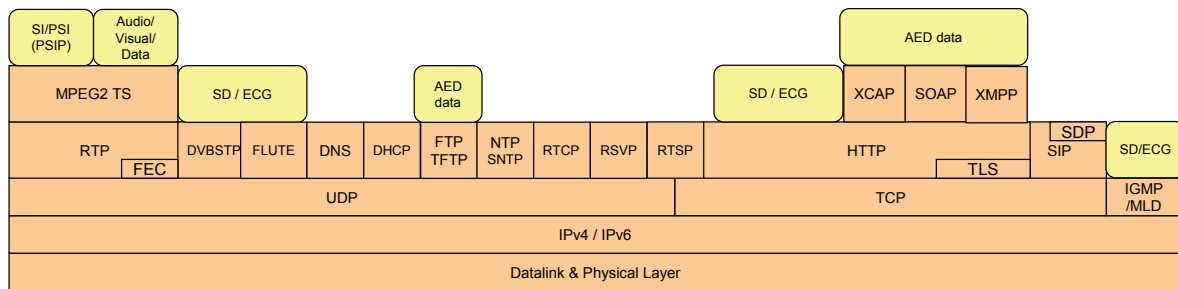
6 Protocols and methods

Protocols introduced in this clause are used from initialization of IPTV terminal devices up to consumption of IPTV services.

NOTE – Details of requirement levels of each protocol for IPTV services should be consulted with relevant ITU-T Recommendations.

6.1 Protocol stack

Figure 6-1 shows a diagram of typical protocol stack mentioned-below. Each protocol is deeply related with processes of IPTV services such as an initiation and consumption of IPTV services.



SD: Service discovery Information AED: Application Event Handling data

Figure 6-1: Major protocols regarding IPTV terminal devices

6.2 Network Attachment: E9

The followings are protocols for handling entry data of service discovery. Entry point data is an initial address for access to the server-side SADS functions [ATIS-0800017][ETSI TS 183 063];

- Preconfigured methods
 - IPTV terminal device may be preconfigured or manually configured with service discovery information
- DHCP-based methods
 - DHCP [IETF RFC 2131] By using “Container Option” service discovery information can be delivered when IPTV terminal device acquires network information such as its own IP address from a DHCP server

NOTE 1- There is a lot of variation of the usage of “Container Option” and details of these have not been authorised by IETF.

- Download methods (aka Pull mode)
- IPTV terminal device may download information using unicast based procedure such as TFTP [IETF RFC 1350], HTTP.
- TR-069-protocol based method

- Remote management system can provide addressing information of service providers with TR-069 protocol [BBF TR069].
- Multicast delivery method (aka Push mode):
 - SI delivery using IGMP/MLD and/or DVBSTP is the popular way to deliver service discovery information.
 - FLUTE multicast stream can deliver service information files to IPTV devices [ETSI TS 102 472].
- DNS Service Records (SRV)-based method
 - The result of DNS SRV [IETF 2782] lookup can provide available IPTV service servers within the specified Domain Name.

NOTE 2 - This method is often used when SIP server find the locations of services as FQDN.

6.3 Service Discovery:

Service Discovery contains two processes: service provider discovery and service discovery. The former process used service provider information, the later uses detailed service offer information.

6.3.1 Service Provider Information delivery protocol(s): E0, E3, E5

Available transport mechanisms for the delivery of the descriptions of IPTV service providers over IP networks are as follows:

- HTTP version 1.1 [IETF RFC 2616] for "Service Provider Information" delivery over unicast ("pull mode")
- HTTP over TLS [IETF RFC 2818] for "Service Provider Information" delivery over unicast with secure manner ("pull mode")
- IGMP version 2 [IETF RFC 2236] for "Service Provider Information" delivery over IPv4 multicast ("push mode")
- IGMP version 3 [IETF RFC 3376] for "Service Provider Information" delivery over IPv4 multicast ("push mode")
- MLD version 2 [IETF RFC 3810] for "Service Provider Information" delivery over IPv6 multicast ("push mode")
- DVBSTP [ETSI TS 102 034]: a light protocol specified by DVB, used for delivery over multicast (push mode)
- FLUTE [ETSI TS 102 472] for "Service Provider Information" delivery over IPv4/IPv6 multicast (push mode)
- SIP [IETF RFC 3261] for "Service Provider Information" delivery over SIP ("push mode" or "pull mode")
- TR-069 [BBF TR069] for "Service Provider Information" delivery

6.3.2 Detailed Service Offer Information delivery protocol: E0, E5, E6

Available transport mechanisms for delivery of the descriptions of IPTV services offered by an IPTV service provider are as follows:

- HTTP 1.1 [IETF RFC 2616] for "Detailed Service Offer" delivery over unicast ("pull mode")
- HTTP over TLS (to be confirmed for the use of HTTPS)
- IGMP version 2 [IETF RFC 2236] for "Detailed Service Offer" delivery over IPv4 multicast ("push mode")

- IGMP version 3 [IETF RFC 3376] for "Detailed Service Offer" delivery over IPv4 multicast ("push mode")
- MLD version 2 [IETF RFC 3810] for "Detailed Service Offer" delivery over IPv6 multicast ("push mode")
- DVBSTP [ETSI TS 102 534]: a light protocol specified by DVB, used for delivery over multicast ("push mode")
- FLUTE [ETSI TS 102 472] for "Detailed Service Offer" delivery over IPv4/IPv6 multicast (push mode)
- SIP [IETF RFC 3261] for "Detailed Service Offer" delivery over SIP ("push mode" or "pull mode")
- TR-069[BBF TR069] for "Detailed Service Offer" delivery

6.4 Service Navigation: E0

Following query mechanism is optionally used to access ECG/EPG/IPG information.

- SOAP[W3C SOAP] over HTTP
 - This is a possible approach for acquiring and retrieving service discovery information using remote procedure call (RPC) [ATIS-0800017] [ETSI TS 102 539].

NOTE 1 - W3C specified simple object access protocol (SOAP 1.2) as a W3C Recommendation for a framework of exchanging XML structured data between peers.

- XCAP [IETF RFC4825] over HTTP
 - XCAP over HTTP is another method for direct manipulation of elements and attributes within service discovery information [ETSI TS 183 063].

NOTE 2 - XCAP is a lightweight protocol based on HTTP for real-time aspects.

6.5 Service consumption

This clause describes protocols depending on IPTV services (e.g., Linear TV, VoD).

6.5.1 Linear TV services

6.5.1.1 Linear TV service delivery protocol: E5

Linear TV services (characterized as the equivalent of the traditional broadcast like TV and radio) are streamed continuously over IP multicast. The element "Service Location" in the "Detailed Service offer" records gives all the information required to access Linear TV services.

IPTV terminal devices can receive or stop the reception of Linear TV services simply by issuing the appropriate multicast control messages.

Linear TV services may be encoded as MPEG-2 Transport Streams, encapsulated either in RTP or directly in UDP.

Relevant standards are as follows:

- MPEG-2 TS [ETSI TS 101 154] Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream.
- UDP [IETF RFC 768] simply for delivery of data
- RTP payload format [IETF RFC 2250] specifies a data format for MPEG1/MPEG2 Video
- RTP [IETF RFC 3550] specifies a transport protocol for real-time applications

- Full service VDSL [ITU-T H.610] specifies system architecture and customer premises equipment for VDSL.

6.5.1.2 Linear TV service control protocol: E5

Relevant standards are as follows:

- IGMP version 2 [IETF RFC 2236] for Linear TV delivery over multicast (“push mode”)
- IGMP version 3 [IETF RFC 3376] for Linear TV delivery over multicast (“push mode”)
- MLD version 2 [IETF RFC 3810] for Linear TV delivery over multicast (“push mode”)

6.5.2 VoD services: E1, E6

6.5.2.1 Video on Demand service delivery Protocol: E6

Video on demand services (VoD) are encoded as MPEG-2 Transport Streams encapsulated either in RTP or directly in UDP.

Relevant standards are as follows:

- MPEG-2 TS [ETSI TS 101 154] Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream
- UDP [IETF RFC 768] for simply content delivery
- RTP payload format [IETF RFC 2250] specifies a RTP payload format for MPEG1/MPEG2 Video
- RTP [IETF RFC 3550][ATIS-0800042] specifies a transport protocol for real-time applications
- Full service VDSL [ITU-T H.610] specifies system architecture and customer premises equipment

6.5.2.2 Video-on-demand service control protocol: E6

IPTV terminal devices can receive or stop the reception of VoD services simply by issuing the appropriate control messages.

Relevant standards are as follows:

- RTSP [IETF RFC 2326][ATIS-0800042] for handling real time data streaming

6.5.3 Download services

Content download services allow for download of contents to local storages of the IPTV terminal devices. The content download services may support two different download modes:

- Push download mode that is defined as distribution of contents where the distribution decision is taken by the service providers, without explicit requests from the users
- Pull download mode provides download services at explicit request of users

This implies the supports of both multicast and unicast download.

Download of a file from a single server and download of the files in chunks from multiple servers are supported. A reception reporting procedure allows the IPTV terminal devices to report the successful download of content.

6.5.3.1 Download service delivery protocol: E5, E6

Relevant standards are as follows:

- FTP [IETF RFC 959] for delivery over unicast

- FLUTE [IETF RFC 3926] for acquiring data over multicast
 - This protocol may be combined with a file repair mechanisms
- HTTP/1.1 [IETF RFC 2616][ATIS-0800042] for delivery over unicast
- HTTPS [IETF RFC 2818][ATIS-0800042] for data delivering over HTTP in a secure manner

6.5.3.2 Download service control protocol: E5, E6

Relevant standards are as follows:

- FTP [IETF RFC 959] for controlling delivery over unicast
- HTTP/1.1 [IETF RFC 2616][ATIS-0800042] for controlling delivery over unicast

6.5.4 Other services

Details are for further study.

7 Other relevant-protocols

Well-known protocols for supporting IPTV services are introduced in this clause.

7.1 Time synchronization

It is useful to synchronize automatically all timers of IPTV terminal devices connecting a IP network. Following well-known protocol provides such functionality.

Relevant standards are as follows:

- [IETF RFC 4330] Simple network time protocol (SNTP)

7.2 Security/Privacy

IPTV terminal devices are required to support secure communication depending on types of IPTV services (e.g., e-commerce).

Relevant standards are as follows:

- HTTPS [IETF RFC 2818] for data delivering over HTTP in a secure manner

7.3 Performance monitoring: E6

IPTV terminal devices can periodically send performance monitoring reports to a network side management functionality by issuing the appropriate RTSP or RTCP messages (via Interface E6).

Relevant standards are as follows:

- RTSP [IETF RFC 2326] for reporting the status of IPTV terminal devices
- RTCP XR [IETF RFC 3611] for reporting a set of status relevant to QoS

7.4 Terminal device management

Details of this item are for further study.

7.5 Application event handling

7.5.1 Notification

7.5.1.1 General notification delivery methods: E10

Relevant standards of transport mechanisms for the delivery of application event data and metadata over an IP network are as follows:

- HTTP version 1.1 [IETF RFC 2616] for application event or metadata delivery over unicast,
- HTTP over TLS [IETF RFC 2818] for application event or metadata delivery over unicast in a secure manner,
- TFTP [IETF RFC1350] for application event or metadata delivery over unicast,
- FLUTE [IETF RFC 3926] for application event or metadata delivery over multicast

The transports mechanisms for the delivery are not limited in the above lists.

7.5.1.2 Emergency telecommunications (ET)

Emergency telecommunications (ET) means any emergency related service that requires special handling from networks or specific service organizations relative to other services. This includes government authorized emergency services and public safety services.

7.5.1.2.1 Common alerting protocol

The Common alerting protocol (CAP) [ITU-T X.1303] is an XML [W3C XML] based data format for exchanging public warnings and emergencies between alerting technologies. CAP allows a warning message to be consistently disseminated simultaneously over many different warning systems to many applications. Detailed relation between CAP and an emergency alert service as an event handling application is consulted in [ITU-T H.740].

7.5.1.2.2 Delivery methods: E10

Relevant standards of transport mechanisms for the delivery of emergency alert data over IP are as follows:

- RTP [IETF RFC 3350]/UDP [IETF RFC 768] for ET event or metadata delivery over unicast,

The transports mechanisms for the delivery are not limited in the above.

7.5.2 Event gathering

This section describes an interface for aggregation of events from the IPTV terminal devices. One example of such an event gathering is audience measurement (For general explanation of audience measurement, see [ITU-T H.740]).

7.5.2.1 Event gathering protocols: E10

Relevant standards of transport mechanisms for gathering data from IPTV terminal devices are as follows:

- SOAP[W3C SOAP] over HTTP/HTTPS
- TFTP [IETF RFC1350] for delivery of data if the event data is file-based format;
- XMPP [IETF RFC3920][IETF RFC3921] for delivery of data when it transmits small messages in real time, rather than storing files into batches like TFTP;
- UDP over IPsec [IETF RFC4301] for delivery of event data in a secure manner.

The transports mechanisms for the gathering are not limited in the above.

Appendix I

RTSP methods for VoD

RTSP provides the way of VoD control via reference point E6 in Figure 5-1. [IETF RFC 2236] specifies several methods for controlling contents delivery and also describes requirement levels of those methods. However there are varieties of practical sets of requirements of the methods for VoD services. Following table shows the profiles of RTSP methods for VoD services according to well-known standards [ETSI TS 102 034], [ETSI TS 183 063].

Table A-1: Profile of RTSP methods (M: mandatory, O: optional, -: not used)

Method	Direction C: Client S: Server	RFC 2326	DVB-IPTV profile	Other possible profile	General action of IPTV terminal device per method
DESCRIBE	C → S	Recommended	Recommended	O (Note 1)	Retrieve description of a presentation
ANNOUNCE	C → S	Optional	Optional	-	Post description of a presentation
ANNOUNCE	S → C	Optional	Recommended	M	Receipt session description are updated
GET_PARAMETER	C → S	Optional	Recommended	-	Retrieve playback information
GET_PARAMETER	S → C	Optional	Optional	-	
OPTIONS	C → S	Required	Required	O (Note 2)	Get a list of methods implemented in a VOD server
OPTIONS	S → C	Optional	Optional	-	
PAUSE	C → S	Recommended	Required	M	Interrupt streaming temporarily
PLAY	C → S	Required	Required	M	Start or resume sending data
RECORD	C → S	Optional	-	-	Initiate recording range
REDIRECT	S → C	Optional	Required (Note3)	-	Connect to another server
SETUP	C → S	Required	Required	M	Request the server to allocate resources for a stream and start an RTSP session.
SET_PARAMETER	C → S	Optional	-	-	Set playback position parameters
SET_PARAMETER	S → C	Optional	-	-	
TEARDOWN	C → S	Required	Required	M	Stop streaming delivery

NOTE 1 - In case IPTV terminal devices do not get content information (e.g., URL, delivery protocol), it is required to request description of the media (e.g. SDP [b_IETF RFC4566]) via DESCRIBE message [ETSI TS 183 063].

NOTE 2 - Option methods may not be used in case all the specified methods are mandatory. The OPTION methods is included simply to allow for future compatibility and easier introduction of new optional methods [ETSI TS 183 063].

NOTE 3 – DVB assumes that REDIRECT method is a way to treat load balancing issues.

Bibliography

[b_IETF RFC 4566] IETF RFC4566 (2006), *SDP: Session Description Protocol*