

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.741.2

(06/2012)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV –
IPTV application event handling

IPTV application event handling: Data structures of audience measurement for IPTV services

Recommendation ITU-T H.741.2

ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.741.2

IPTV application event handling: Data structures of audience measurement for IPTV services

Summary

The ITU-T H.741.x series of Recommendations defines a foundational platform for audience measurement (AM) of IPTV services. They focus on the interface between terminal devices and an audience measurement aggregation function.

The AM platform integrates a method for end users to report personal information, and is designed to easily add time-shifted and interactive services, and non-terminal device measurement points. While the ITU-T H.741.x series allows the implementation of audience measurement for IPTV services, its mechanism may be equally applicable to non-IPTV services.

The design philosophy in the ITU-T H.741.x series is focused on scalability, minimizing the use of resources, security, flexibility to support a variety of service provider deployments, and rich privacy support to meet emerging regulations and legislation.

Recommendation ITU-T H.741.2 specifies the data elements and structures of the payloads used in audience measurement messages.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.741.2	2012-06-29	16

Keywords

Audience measurement, audience rating service, audience viewership, contents rating, data structures, distributed content service, end-user permission, engagement metrics, interactive services, IPTV application event handling, linear TV, metadata, monitoring, personalized service, privacy protection.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2013

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

		Page
1	Scope	1
2	References.....	1
3	Definitions	2
	3.1 Terms defined elsewhere	2
	3.2 Terms defined in this Recommendation.....	4
4	Abbreviations and acronyms	4
5	Conventions	5
6	Data elements and structures for audience measurement	5
	6.1 Data elements for audience measurement	7
	6.2 Data structures for audience measurement.....	21
	Bibliography.....	54

Document Sharing Hub

Document ID: 123456789

Recommendation ITU-T H.741.2

IPTV application event handling: Data structures of audience measurement for IPTV services

1 Scope

This Recommendation describes the data structures of audience measurement for IPTV services. It specifies elements and data structures of the payloads used in audience measurement messages between TD-AMFs and aggregation functions. See [ITU-T H.741.0].

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 H.741.0] | Recommendation ITU-T H.741.0 (2012), <i>IPTV application event handling: Overall aspects of audience measurement for IPTV services.</i> |
| [ITU-T H.741.1] | Recommendation ITU-T H.741.1 (2012), <i>IPTV application event handling: Audience measurement operations for IPTV services.</i> |
| [ITU-T H.741.3] | Recommendation ITU-T H.741.3 (2012), <i>IPTV application event handling: Audience measurement for IPTV distributed content services.</i> |
| [ITU-T H.741.4] | Recommendation ITU-T H.741.4 (2012), <i>IPTV application event handling: Transport mechanisms for audience measurement.</i> |
| [ITU-T X.891] | Recommendation ITU-T X.891 (2005) ISO/IEC 24824-1:2007, <i>Information technology – Generic applications of ASN.1: Fast infoset.</i> |
| [ETSI TS 102 472] | ETSI TS 102 472 V1.3.1 (2009), <i>Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Content Delivery Protocols.</i> |
| [IETF RFC 3986] | IETF RFC 3986 (2005), <i>Uniform Resource Identifier (URI): Generic Syntax.</i> |
| [IETF RFC 5139] | IETF RFC 5139 (2008), <i>Revised Civic Location Format for Presence Information Data Format Location Object (PIDF-LO).</i> |
| [IETF RFC 5246] | IETF RFC 5246 (2008), <i>The Transport Layer Security (TLS) Protocol Version 1.2.</i> |
| [ISO 19136] | ISO 19136:2007, <i>Geographic information – Geography Markup Language (GML).</i> |
| [ISO/IEC 23001-1] | ISO/IEC 23001-1:2006, <i>Information technology – MPEG systems technologies – Part 1: Binary MPEG format for XML.</i> |
| [W3C XPath] | W3C Recommendation (2010), <i>XML Path Language (XPath) 2.0 (Second Edition).</i> |
| [W3C XMLSchemaP2] | W3C Recommendation (2001), <i>XML Schema Part 2: Datatypes.</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 aggregation function [ITU-T H.741.0]: The function that configures audience measurement functions (AMFs), then receives processed events, sample values and end-user information from AMFs. It may participate in the communication of end-user permissions.

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

3.1.3 application event [b-ITU-T H.740 Amd.1]: An application event is every end-user interaction or occurrence related to multimedia contents in IPTV applications. It includes an emergency event from event-notification services.

3.1.4 audience information [ITU-T H.741.0]: The overall information about end-user behaviour and the related end-user information, during the time that IPTV audience measurement is inactive.

3.1.5 audience measurement [ITU-T H.741.0]: The measurement of people's engagement with IPTV services.

3.1.6 audience measurement function (AMF) [ITU-T H.741.0]: The function that, if given permission, measures the end-user behaviour by processing events or samples from IPTV services. AMFs may request and collect end-user information. AMFs transfer processed events, samples and end-user information to aggregation functions.

3.1.7 audience measurement service provider [ITU-T H.741.0]: A service provider providing audience measurement services. An audience measurement service provider configures an audience measurement system to control what audience information the system collects.

3.1.8 audience measurement system [ITU-T H.741.0]: The system which, with end-user permission, measures end-user behaviour by detecting application events within the IPTV service and collecting their data within the IPTV service.

3.1.9 configuration package [ITU-T H.741.0]: A configuration package is the data structure which specifies the target services to be measured, content filtering, measurement schedule, events and samples to be measured, and measurement report delivery.

3.1.10 content (object) [b-ITU-T T.174]: Encoded generic value, media or non-media data.

3.1.11 electronic content guide (ECG) [b-ITU-T H.721]: A service navigation application used especially for streamed and downloaded content. ECG deals with metadata unlike SI used in terrestrial broadcasting.

3.1.12 electronic programme guide (EPG) [b-ITU-T H.721]: A service navigation application which is used especially for scheduled linear programmes.

NOTE – In some traditional broadcast services, EPG is defined as an on-screen guide used to display information on scheduled live broadcast television programmes, allowing a viewer to navigate, select, and discover programmes by time, title, channel, and genre. This traditional definition does not cover "catalogues" for on-demand and download services (sometimes called electronic content guide or broadband content guide) and bi-directional interactive service (sometimes called interactive programme guide) for end-user interaction with a server or head-end.

3.1.13 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.

3.1.14 end-user behavioural information [ITU-T H.741.0]: A part of audience measurement information which includes "application events" and/or "end-user context". An "application event" is information reflecting the behaviour of an IPTV service end user. "End-user context" is information relating to the situation when an "application event" was generated.

3.1.15 end-user information [ITU-T H.741.0]: "End-user info" is information about an IPTV service end user. It includes "identifying end-user information" and "non-identifying generic user information".

3.1.16 Internet Protocol Television (IPTV) [b-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.

3.1.17 IPTV terminal device [b-ITU-T Y.1901]: A terminal device which has IPTV terminal function (ITF) functionality, e.g., an STB.

3.1.18 IPTV terminal function (ITF) [b-ITU-T Y.1901]: The end-user 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.

3.1.19 linear TV [b-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 end user cannot control the temporal order in which contents are viewed.

3.1.20 metadata [b-ITU-T Y.1901]: 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 have 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.

3.1.21 measurement report [ITU-T H.741.0]: The data that the audience measurement function (AMF) generates from an end-user behaviour event or sample.

3.1.22 sample [ITU-T H.741.0]: A sample is a periodic action occurring on a configurable schedule time interval, during a service period, which captures specified information values.

3.1.23 sample set [ITU-T H.741.1]: A sample set contains one or more information fields, captured at a specific instance of periodic action occurring on a configurable schedule time interval, during a service period.

3.1.24 sample time [ITU-T H.741.0]: A sample time is when an instance of the periodic action occurs on a configurable schedule time interval, which captures specified information values, during a service period.

3.1.25 sample value [ITU-T H.741.0]: The content of an information field, captured at a specific instance of periodic action occurring on a configurable schedule time interval, during a service period.

3.1.26 service [b-ITU-T Y.101]: A structure set of capabilities intended to support applications.

3.1.27 service-common [ITU-T H.741.1]: Qualifier of measurements, such as events and elements, and reports to indicate that these measurements and reports are commonly applicable to two or more distributed content or interactive services.

3.1.28 service navigation [b-ITU-T H.720]: A process of presenting information that allows the end user to discover, select and consume services.

3.1.29 service provider [b-ITU-T M.1400]: A general reference to an operator that provides telecommunication services to customers and other end 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.

3.1.30 set-top box (STB) [b-ITU-T J.183]: A hardware box that contains digital signal demodulator, de-multiplexer, MPEG-2 decoder, and other functionalities and interfaces related to digital signal reception and presentation of the distributed programme at the subscriber's site.

3.1.31 stream [b-ITU-T J.200]: A unidirectional continuous flow of content.

3.1.32 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.

3.1.33 terminal device (TD) [b-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 term:

3.2.1 broadcast (based on [b-ITU-T M.60]): One-way transmission of TV signals from one point to two or more other points.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AM	Audience Measurement
AMF	Audience Measurement Function
BEEP	Block Extensible Exchange Protocol
EDID	Extended Display Identification Data
EISA	Extended Industry Standard Architecture
EPG	Electronic Programme Guide
HMAC	Hash-based Message Authentication Code
ID	IDentifier
OTP	One Time Password
OUI	Organizational Unique Identifier
PC	Personal Computer
PIP	Picture In Picture
QoE	Quality of Experience
QoS	Quality of Service
RFC	Request for Comments
SOAP	Simple Object Access Protocol
SP	Service Provider
TD-AMF	Terminal Device Audience Measurement Function
TFTP	Trivial File Transfer Protocol

TLS	Transport Layer Security
TLS-SRP	Transport Layer Security – Secure Remote Password
TV	Television
UTC	Coordinated Universal Time
VESA	Video Equipment Standards Association
XML	Extensible Markup Language
XMPP	Extensible Messaging and Presence Protocol ([b-IETF RFC 6120], [b-IETF RFC 6121] and [b-IETF RFC 6122])

5 Conventions

In this Recommendation, the following conventions apply.

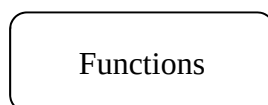
The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

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.

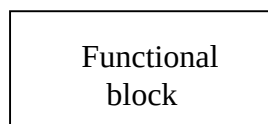
The keywords "is not recommended" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this specification can still be claimed even if this requirement is present.

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.

The keyword "functions" is defined as a collection of functionalities. It is represented by the following symbol in the context of IPTV architecture:



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



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

6 Data elements and structures for audience measurement

This clause specifies the data elements used in audience measurement in terms of identifying name, format, values, and in some cases defaults and/or privacy classification. Data elements may be newly defined or are re-used from other sources. This clause also defines data structures in terms of relationships among the data elements. The data structures are defined for use in messages between

a terminal device audience measurement function (TD-AMF) and aggregation functions, and for information to be provided to a TD-AMF independently of those messages. Data structures are defined for messages for unicast and multicast delivery.

The notation is used in the following tables to facilitate the specification of the corresponding schema:

- *Support*: 1 = mandatory (one instance), 0-1 = optional (maximum one instance), 0-* = (optional and multiple instances possible), 1-* = mandatory and multiple instances possible).
- *Type*: string, integer, float, etc.
- *Container* elements are defined to group associated elements.

In the following tables containing data structures, an alternative representation may be shown which illustrates the data structure. In the event of discrepancy between an alternative representation and the previous table, the correct information is to be found in the table.

Data types used in clause 6.1 are shown in Table 1.

Table 1 – Data types used in ITU-T H.741.2

Type	Name	Notes/reference
ca:civicAddr	Civic Address	Defined in [IETF RFC 5139].
URL	URL	Defined in [IETF RFC 3986] as URI= scheme ":" hier-part ["?" query] ["#" fragment]. Examples of official IANA-registered (URI) schemes include FTP, TFTP, SOAP, BEEP and XMPP.
xs:date	Date	Defines a date value. The lexical form is CCYY-MM-DD where "CC" represents the century, "YY" the year, "MM" the month and "DD" the day. Defined in [W3C XMLSchemaP2].
xs:dateTime	Date and time	The format of dateTime is YYYY-MM-DDThh:mm:ss.s+zzzzz. Defined in [W3C XMLSchemaP2].
xs:float	Float	Float is patterned after the IEEE single-precision 32-bit floating point type. Defined in [W3C XMLSchemaP2].
gml:Point	Point	A point consists of a <Point> element with a child <coords> element. Within <coords> the latitude and longitude values are separated by a space. Defined in [ISO 19136].

Table 1 – Data types used in ITU-T H.741.2

Type	Name	Notes/reference
isd:H770IDType	Identifier	An example following [b-ITU-T H.770] is: <pre><xsd:simpleType name="H.770IDType"> <xsd:union> <xsd:simpleType> <restriction base="gt:IIFIDType"/> </xsd:simpleType> <xsd:simpleType> <restriction base="gt:ipAddressType"/> </xsd:simpleType> </xsd:union> </xsd:simpleType></pre>
xs:integer	Integer	The integer data type is used to specify a numeric value without a fractional component. Defined in [W3C XMLSchemaP2].
nonEmptyString	Non-empty string	A string having at least one character. Defined as xs:string with restriction of minLength = 1.
xs:hexbinary	Hexadecimal	Represents binary data as hexadecimal digits. Defined in [W3C XMLSchemaP2].
xs:integer enumeration	Integer with enumeration restriction	Restricted integer values. Defined in [W3C XMLSchemaP2].
xs:nonNegativeInteger	Non-negative integer	An integer containing only non-negative values (0,1,2,...). Defined in [W3C XMLSchemaP2].
xs:positiveInteger	Positive integer	An integer containing only positive values (1,2,...). Defined in [W3C XMLSchemaP2].
xs:string	String	The string data type can contain characters, line feeds, carriage returns, and tab characters. Defined in [W3C XMLSchemaP2].
xs:string enumeration	String with enumeration restriction	Restricted string values. Defined in [W3C XMLSchemaP2]
xs:time	Time	The format of time is "hh:mm:ss" where: hh indicates the hour, mm indicates the minute, ss indicates the second. Defined in [W3C XMLSchemaP2].
xs:unsignedShort	Unsigned short	Integer with maximum value of 65'535. Defined in [W3C XMLSchemaP2].
xpath	Xpath	Path to and including the target element or attribute. Defined in [W3C XPath].

6.1 Data elements for audience measurement

The data elements for audience measurement fall into the following categories:

- 1) Data elements related to the user (user device information, user information).
- 2) Data elements related to the capture of measurements of end-user behaviours.

- 3) Data elements related to privacy.
- 4) Data elements related to messaging.

Data elements related to categories 1) and 2) above are specified in the following clauses; those relating to categories 3) and 4) above are specified in clause 6.2.

6.1.1 User device data elements

The AM data elements associated with a user's device, including capabilities, identification, configuration and usage, are included in Table 2.

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
AMFCAbilityProfile	Container to list capabilities supported by the TD-AMF implementation.	Note 1	
TransportCapabilitiesList	Element of AMFCAbilityProfile Container to list transport protocols and delivery modes supported.	1	
TransportProtocolMode	Element of TransportCapabilitiesList Indicates the combination(s) of transport protocol and delivery mode(s) supported.	1- xs:string enumeration	Values are out of the scope of AM.
SecurityCapabilities	Element of AMFCAbilityProfile Container to list security capabilities supported.	1	
CryptographicProtocol	Element of SecurityCapabilities Indicates the cryptographic protocol(s) supported.	1- xs:string enumeration Note 4	Values: 'TLS','TLS-SRP', 'OTP', 'HMAC' NOTE – 'TLS' is TLS 1.2 [IETF RFC 5246], 'TLS-SRP' is TLS-SRP [b-IETF RFC 5054], 'OTP' is [b-ITU-T X.1153], 'HMAC' is [b-FIPS PUB 198-1]. Only 'TLS' is mandatory.
PermissionOperationModes	Element of AMFCAbilityProfile Container to list permission modes supported.	1	
PermissionMode	Element of PermissionOperationModes Indicates the permission mode(s) supported.	1- xs:string enumeration	Values: 'External', 'Internal', 'Hybrid'.
ConfigurationPackageDelivery	Element of AMFCAbilityProfile Container to list configuration modes supported.	1	
ConfigurationMode	Element of ConfigurationPackageDelivery Indicates the configuration mode(s) supported.	1- xs:string enumeration	Values: 'Push', 'Pull', 'Hybrid'.

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
Measurement TriggerMethod	Element of AMFCapabilityProfile Container to list measurement trigger(s) supported.	1	
EventTrigger	Element of MeasurementTriggerMethod Indicates the event triggers supported.	0- * xs:string enumeration	Values: "VideoResize", "VideoZoom", "VideoObscure", "AudioVolume", "Configuration Change", "UserChange", "UserInfoChange", "DisplayStatus", "AudioLanguageChange", and "CaptionLanguageChange" NOTE – Service start and service stop events specified in [ITU-T H.741.3] must be supported so they do not need to be explicitly listed here.
TimeSample Trigger	Element of MeasurementTriggerMethod Indicates the time sample triggers supported.	0- * xs:string enumeration	Values: "UserPresent", "TDLocation", "DeviceInfo", "UserBioInfo", "GenericUser Info", "EventCount", "UserList", "PermitBlockedInfo" and "ChannelPlaying" NOTE – The "ChannelPlaying" capability is specified in [ITU-T H.741.3].
ServiceStart Trigger	Element of MeasurementTriggerMethod Indicates the service start sample triggers supported.	0- * xs:string enumeration	Values: "TDLocation", "DeviceInfo", "UserBioInfo", "GenericUserInfo", "UserList", and "PermitBlockedInfo".
ReportDelivery Modes	Element of AMFCapabilityProfile Container to list report delivery mode(s) supported.	1	
DeliveryMode	Element of ReportDeliveryModes Indicates the report delivery mode(s) supported.	1- * xs:string enumeration	Values: 'ImmediatePush', 'Delayed Push', 'Pull', 'DelayedPushAndPull'.
Operational Management Capabilities	Element of AMFCapabilityProfile Container to list operational management capabilities supported.	1	

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
Operational Management	Element of OperationalManagement Capabilities Indicates the operational management capabilities supported.	1-* xs:string enumeration	Values: 'Acknowledgements', 'MulticastThresholdRanges', 'MulticastErrorReporting', 'MulticastUserInfo', 'MulticastDeviceType', 'MulticastMAC', 'ContentFiltering', 'ChannelsMeasured', 'ChannelChangeFilter', 'NavMethodReporting' and 'ControlDeviceReporting' NOTE – "ChannelsMeasured", "ChannelChangeFilter", "NavMethodReporting" and "ControlDeviceReporting" capabilities are specified in [ITU-T H.741.3].
Compression	Element of AMFCapabilityProfile Container to list compression/decompression algorithms supported for XML payloads.	0-* xs:string enumeration Default 'EXI'	Values: 'None', 'BiM', 'ZLIB', 'InfoSet', or 'EXI'. See Note 5.
ServiceInstance ID	Identifies the instance of a specific IPTV service. Distinguishes among services when multiple services are displayed.	xs:integer	A ServiceInstanceID is allocated by a TD-AMF to each specific service when it starts providing unrestricted content, or when a service providing previously restricted content starts providing unrestricted content. It is de-allocated when that specific service ends, or when that service provides restricted content. ServiceInstanceID has an initial value of 0, and is incremented by 1, before allocation.
Caption Language	It identifies the caption language now being used for the indicated service.	xml:lang	
AudioLanguage	It identifies the audio language now being used for the indicated service.	xml:lang	
TVInformation	Container for TV information.		Elements related to a TV connected to a STB.
TVManuf	Element of TVInformation Identifies TV device manufacturer.	0-1 2 bytes	NOTE – EISA 3-character Plug and Play ID (PNPID) assigned by Microsoft. See [b-VESA EDID].

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
TVModel	Element of TVInformation Identifies the model number of the TV.	0-1 2 bytes	NOTE – Vendor assigned code. See [b-VESA EDID].
TVSerialNum	Element of TVInformation Identifies the serial number of the TV.	0-1 4 bytes	NOTE – Vendor assigned code. See [b-VESA EDID].
IPTV-TV Information	Container for IPTV-capable TV information.		Elements related to an IPTV-capable TV.
IPTV-TVManuf	Element of IPTV-TVInformation Identifies TV device manufacturer.	0-1 6 Hex ASCII characters	NOTE – IEEE 24-bit organizationally unique identifier OUI requiring registration with the IEEE Registration Authority.
IPTV-TVModel	Element of IPTV-TVInformation Identifies the model number of the TV.	0-1 xs:string	Manufacturer assigned value.
IPTV-TV SerialNum	Element of IPTV-TVInformation Identifies the serial number of the TV.	0-1 xs:string	Manufacturer assigned value.
AudioAmplifier Information	Container for audio system information. Note 2.		Elements related to an audio system connected to a STB.
AudioAmplifier Manuf	Element of AudioAmplifierInformation Identifies audio system device manufacturer.	0-1 2 bytes	NOTE – EISA 3-character Plug and Play ID (PNPID) assigned by Microsoft. See [b-VESA EDID].
AudioAmplifier Model	Element of AudioAmplifierInformation Identifies the model number of the audio system device.	0-1 2 bytes	NOTE – Vendor assigned code See [b-VESA EDID].
AudioAmplifier SerialNum	Element of AudioAmplifierInformation Identifies the serial number of the audio system device.	0-1 4 bytes	NOTE – Vendor assigned code See [b-VESA EDID].
STBInformation	Container for STB information.		
STBManuf	Element of STB information Identifies STB device manufacturer.	0-1 6-byte Hex ASCII character	NOTE – IEEE 24-bit organizational unique identifier (OUI) value assigned to the manufacturer by the IEEE Registration Authority.
STBModel	Element of STB information Identifies STB model.	0-1 nonEmpty String	Manufacturer assigned value.

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
STBSerialNum	Element of STB information Identifies STB serial number.	0-1 nonEmpty String	Manufacturer assigned value.
MobileDevice Information	Container for Mobile device information.		
MobileDevice Manuf	Element of MobileDeviceInformation Identifies mobile device manufacturer.	0-1 6-byte Hex ASCII character	NOTE – IEEE 24-bit organizational unique identifier (OUI) value assigned to the manufacturer by the IEEE Registration Authority.
MobileDevice Model	Element of MobileDeviceInformation Identifies mobile device model.	0-1 nonEmpty String	Manufacturer assigned value.
MobileDevice SerialNum	Element of MobileDeviceInformation Identifies mobile device serial number.	0-1 nonEmpty String	Manufacturer assigned value.
PCInformation	Container for PC information.		
PCManuf	Element of PCInformation Identifies PC manufacturer.	0-1 6-byte Hex ASCII character	NOTE – IEEE 24-bit organizational unique identifier (OUI) value assigned to the manufacturer by the IEEE Registration Authority.
PCModel	Element of PCInformation Identifies PC model.	0-1 nonEmpty String	Manufacturer assigned value.
PCSerialNum	Element of PCInformation Identifies PC serial number.	0-1 nonEmpty String	Manufacturer assigned value.
ImageSize	Container for size of image.		Image corresponds to the video stream rendered on the screen.
ImageWidth	Element of ImageSize Image width.	xs:positive Integer	Number of pixels in width of image.
ImageHeight	Element of ImageSize Image height.	xs:positive Integer	Number of pixels in height of image.
ZoomFactor	Indicates the factor by which the contents of the image is zoomed.	xs:float	A value of 1.0 indicates that no zoom is applied.
Obscuration	Indicates the percentage of image obscured.	xs:float	NOTE – % based on number of pixels obscured (not related to transparency).
Volume Direction	Indicates a rise or fall in audio volume setting.	xs:string enumeration	Values: up, down, mute, unmute.

Table 2 – End-user device elements used in audience measurement

Element	Description	Support/ type (Note 3)	Notes or value domain
ControlDevice	Indicates the device type used to navigate to a service.	xs:integer enumeration	Values: 0=STB remote control, 1=STB, 2=STB keyboard, 10=PC, 20=tablet, 30=mobile phone, 40=other.
NOTE 1 – The listed capabilities are supported by a TD-AMF. If a capability is not listed then it is not supported, unless otherwise specified. NOTE 2 – The audio system corresponds to components such as the A/V Receiver/Amplifier referred to in [b-HDMI]. NOTE 3 – The value of "other" for enumerated valued elements indicates that the element information is available but does not match one of the defined enumerated values. NOTE 4 – 'TLS' or 'SRPTLS' is required to be present. NOTE 5 – For BiM see [ISO/IEC 23001-1], for ZLIB (including GZIP) see [ETSI TS 102 472], for (Fast) InfoSet see [ITU-T X.891], and for EXI see [b-W3C EXI].			

Figures 1 to 7 contain alternative representations of the data structures in Table 2.

```

AMFCapabilityProfile
| TransportCapabilitiesList (1)
| | TransportProtocolMode (1-*)
| SecurityCapabilities (1)
| | CryptographicProtocol (1-*)
| PermissionOperationModes (1)
| | PermissionMode (1-*)
| ConfigurationPackageDelivery (1)
| | ConfigurationMode (1-*)
| MeasurementTriggerMethod (1)
| | EventTrigger (0-*)
| | TimeSampleTrigger (0-*)
| | ServiceStartTrigger (0-*)
| ReportDeliveryModes (1)
| | DeliveryMode (1-*)
| OperationalManagementCapabilities (1)
| | OperationalManagement (1-*)
| Compression (0-*)

```

Figure 1 – Alternative representation of AMFCapabilityProfile data structure

```

TVInformation
| TVManuf (0-1)
| TVModel (0-1)
| TVSerialNum (0-1)

```

Figure 2 – Alternative representation of TVInformation data structure

```

IPTV-TVInformation
| IPTV-TVManuf (0-1)
| IPTV-TVModel (0-1)
| IPTV-TVSerialNum (0-1)

```

Figure 3 – Alternative representation of IPTV-TVInformation data structure

```

AudioAmplifierInformation
| AudioAmplifierManuf (0-1)
| AudioAmplifierModel (0-1)
| AudioAmplifierSerialNum (0-1)

```

Figure 4 – Alternative representation of AudioAmplifierInformation data structure

```

STBInformation
| STBManuf (0-1)
| STBModel (0-1)
| STBSerialNum (0-1)

```

Figure 5 – Alternative Representation of STBInformation data structure

```

MobileDeviceInformation
| MobileDeviceManuf (0-1)
| MobileDeviceModel (0-1)
| MobileDeviceSerialNum (0-1)

```

Figure 6 – Alternative representation of MobileDeviceInformation data structure

```

PCInformation
| PCManuf (0-1)
| PCModel (0-1)
| PCSerialNum (0-1)

```

Figure 7 – Alternative representation of PCInformation data structure

6.1.2 User information data elements

The AM data elements associated with a user's information fall into the following categories: