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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

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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

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.

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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.

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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/.

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

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:
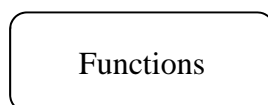
Functions

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:
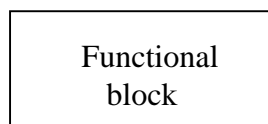
Functional block

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+zzzzzz. 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:
		``<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>```

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 XMLPath].

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
AMFCapability Profile	Container to list capabilities supported by the TD-AMF implementation.	Note 1	
Transport CapabilitiesList	Element of AMFCapabilityProfile Container to list transport protocols and delivery modes supported.	1	
Transport ProtocolMode	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.
Security Capabilities	Element of AMFCapabilityProfile Container to list security capabilities supported.	1	
Cryptographic Protocol	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.
Permission OperationModes	Element of AMFCapabilityProfile 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'.
Configuration PackageDelivery	Element of AMFCapabilityProfile Container to list configuration modes supported.	1	
Configuration Mode	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:

1)   User information that is asserted by a user;

2)   User (related) information that is generated by the AM system.

The AM data elements associated with each of the above categories are included in Tables 3 and 4.

Table 3 – End-user info asserted by end user, service-common elements

Element	Description	Support/ type	Notes or value domain
PermissionLevel	Defines sets of end-user information that are permitted by the end user to be used for audience measurement.	xs:nonNegativeInteger enumeration Default: 0	Values: 0 = No information, 1 = Only distinguishability information, 2 = Distinguishability and non-identifying generic end-user information, 3 = Identifying end-user information and non-identifying generic end-user information. Not "controlled" information.
ControlledUserInfo TypeString	Identifies controlled end-user information type.	0-* nonEmptyString	"Controlled" information NOTE – Used only for permission level 3. repoValues are out of the scope of this Recommendation, e.g., Gender, AgeRange, Nationality, NumberOfChildren, MaritalStatus, Occupation, etc.
ControlledUserInfo ValueString	Attribute of ControlledUserInfoType Identifies controlled end-user information value.	1 nonEmptyString	Values are out of the scope of this Recommendation, e.g., Female, 30-40, Spanish, 6, Married, Engineer, etc.
ControlledUserInfo TypeDate	Identifies controlled end-user information type.	0-* nonEmptyString	"Controlled" information NOTE – Used only for permission level 3. Values are out of the scope of this Recommendation, e.g., Birthday.
ControlledUserInfo ValueDate	Attribute of ControlledUserInfoTypeDate Identifies controlled end-user information value.	1 xs:date	Values are out of the scope of this Recommendation, e.g., 2012-09-24.
ControlledUserInfo TypeAddress	Identifies controlled end-user information type.	0-* nonEmptyString	"Controlled" information NOTE – Used only for permission level 3. Values are out of the scope of this Recommendation, e.g., BirthLocation, UserResidentialAddress.

Table 3 – End-user info asserted by end user, service-common elements

Element	Description	Support/ type	Notes or value domain
ControlledUserInfo ValueAddress	Attribute of ControlledUserInfoType Address Identifies controlled end-user information value.	1 ca:civicAddr	Values are out of the scope of this Recommendation, e.g., Fr 502, Fr 501.
GenericUserInfoType	Identifies generic end-user information type.	0-* nonEmptyString	NOTE – Used only for permission level 2 or 3. Values are out of scope of this Recommendation, e.g., interests, favourite programmes, favourite channels, etc.
GenericUserInfo Value	Attribute of GenericUserInfoType Identifies generic end-user information value.	1 nonEmptyString	Values are out of the scope of this Recommendation, e.g., gardening or a list of interests.

Table 4 – User info generated by system, service-common elements

Element	Description	Type	Notes or value domain
TDLocation	Container for location elements includes latitude and longitude.	gml:Point	"Controlled" information NOTE – TDLocation reports may be filtered when terminal device location changes by less than the reporting distance threshold per NothingNewReportMode or omitted when geographic location data is unavailable.
UserPresent	Container for end-user presence information from one source.		Not "controlled" information NOTE – Multiple sources may provide presence information.
PresenceMethod	Element of UserPresent Indicates method used to detect presence of an end user.	0-1 nonEmpty String Default: remote keypush	Values: remotekeypush (Note 1), others are TBD. Not "controlled" information.
PresenceTime	Element of UserPresent Indicates last time when presence was detected.	0-1 xs:time	

Table 4 – User info generated by system, service-common elements

Element	Description	Type	Notes or value domain
PresenceConfidence	Element of UserPresent Indicates confidence that any end user is present.	0-1 xs:float	%, examples are 100% immediately after any kind of end-user interaction, decreasing as time elapses. Actual values are out of scope of AM.
UserList	Container for one or more end-user(s) information.	0-1	NOTE – Only end users who have given permission levels 1-3 per Table 3 are included. An empty UserList indicates no permitting users or no users.
UserIDInfo	Element of UserList Container for individual end-user information.	0-*	
AnonUserID	Element of UserIDInfo Anonymous end-user ID Generated number which persistently is used for one end user.	0-1 xs:positive Integer (Note 2)	Value: IPTV service provider unique. NOTE – Used for permission level 1 or 2 per Table 3. Generation of this number is outside scope of AM. Not "controlled" information.
UserID	Element of UserIDInfo This element uniquely identifies an end user.	0-1 nonEmpty String (Note 2)	"Controlled" information NOTE – Must be IPTV service provider unique. Generation of this string is outside scope of AM. Used for permission level 3.
UserIDMethod	Element of UserIDInfo Identifies the method used to detect the end user associated with this UserID or AnonUserID.	0-1 nonEmpty String	NOTE – Identity detection methods are outside the scope of AM. Not "controlled" information.
UserIDConfidence	Element of UserIDInfo Indicates estimate of confidence in anonymous or non-anonymous end-user IDs provided.	0-1 xs:float	NOTE – %, examples are 100% for single subscriber mobile phone, 90% for just logged in user on a single user device. 0% if no information on a TV. Actual values are out of scope of AM. Not "controlled" information.
ServiceProvider Identifier	This element contains the identifier of the IPTV service provider for which the audience measurement is proposed by the end user.	H770IdType	NOTE – Examples are defined in [b-ITU-T H.IPTV-MDSD] following [b-ITU-T H.770].

Table 4 – User info generated by system, service-common elements

Element	Description	Type	Notes or value domain
SubscriberID	This element contains the identification of the subscriber to the services of the associated service provider.	Nonempty String	Uniquely assigned by an IPTV service provider. Multiple end-users may be represented by a single SubscriberID.
PermitBlockedInfo	Container for flags indicating that configured measurements were blocked due to a constraining end-user permit.		Not "controlled" information To be reported for any permission level if the PermitBlockedInfo sampleset identifier is configured.
PermissionLevelFlag	Element of PermitBlockedInfo Indicates the permission level which is constraining the configuration. One or more of the following is true: a) Biographic end user info is not reportable; b) Generic end user info is not reportable; c) No AM info is reportable.	0-1 xs:integer enumerated Default: 0	NOTE – Dependent upon the value of DefaultPermissionLevel or PermissionLevel in the user permit as defined in Table 20 and the configured measurements. Values: 0, 1 or 2.
TerminalDevice TypeFlag	Element of PermitBlockedInfo Indicates that the terminal type which is not allowed to report.	0-1	NOTE – Dependent upon the value of TerminalDeviceType in the user permit as defined in Table 20 and the TD-AMF type. Values: as defined by TerminalDeviceType in Table 20.
ChannelFlag	Element of PermitBlockedInfo Indicates that one or more configured linearTV channels are not reportable.	0-1 xs:boolean Default: False	NOTE – Dependent upon the values of ChannelQualifier in the user permit and defined in [ITU-T H.741.3] and the configured measurements.
ContentClassFlag	Element of PermitBlockedInfo Indicates the content classes of the user permit content class restriction which are further constraining the configuration package.	0-1	Defined as AllContentClassExceptList in Table 10. NOTE – Dependent upon the differences in values of AllContentClassExceptList in the user permit and the configuration package.
NOTE 1 – Remote key push is one of several optional methods to indicate presence detection. If supported, any key push on a remote control causes the time of last key push to be recorded. NOTE 2 – Either AnonUserID or UserID must be present.			

Figures 8 to 10 contain alternative representations of the data structures in Table 4.

```
          UserPresent
          | PresenceMethod (0-1)
          | PresenceTime (0-1)
          | PresenceConfidence (0-1)
```

Figure 8 – Alternative representation of UserPresent data structure

```
          UserList
          | UserIDInfo (0-*)
          | | AnonUserID (0-1) (Note 2)
          | | UserID (0-1) (Note 2)
          | | UserIDMethod (0-1)
          | | UserIDConfidence (0-1)
```

Figure 9 – Alternative representation of UserList data structure

```
          PermitBlockedInfo (0-1)
          | PermissionLevelFlag (0-1)
          | TerminalDeviceTypeFlag (0-1)
          | ChannelFlag (0-1)
```

Figure 10 – Alternative representation of PermitBlockedInfo data structure

6.1.3 Types of service-common events

The AM system may measure the events listed in Table 5. If these are configured they are to be reported. These service-common events may occur across multiple IPTV services.

Table 5 – Types of service-common events

Event	Description	Notes or value domain
VideoResize	Indicates that the end user has collapsed or expanded the video. Causes the VideoResize data structure defined in Table 21 to be reported.	Includes entering or leaving picture in picture (PIP), shrinking for the electronic programme guide (EPG), etc. measured by width and height of video as an integer number of pixels.
VideoZoom	Indicates that the end user has changed the zoom factor. Causes the VideoZoom data structure defined in Table 21 to be reported.	Includes selections of zoom factor.
VideoObscure	Indicates that the video obscuration has changed. Causes the VideoObscure data structure defined in Table 21 to be reported.	Includes application end-user interface obscuring video.
AudioVolume	Indicates that the end user has changed the audio volume. Causes the AudioVolume data structure defined in Table 21 to be reported.	Includes mute and unmute.

Table 5 – Types of service-common events

Event	Description	Notes or value domain
ConfigurationChange	Indicates that the end user has changed their device's configuration or capabilities. Causes the ConfigurationChange data structure defined in Table 21 to be reported.	Includes changes of the following elements defined in Table 2: – AMFCapabilityProfile – TVInformation – AudioAmplifierInformation
UserChange	Indicates that a TD-AMF has detected a change in permitting end user(s) present at an end-user device. Causes the UserList data structure defined in Table 21 to be reported.	NOTE – End users who have given permission levels 1-3 per Table 3 are included.
UserInfoChange	Indicates that an end user has changed their end-user information. Causes the UserInfoChange data structure defined in Table 21 to be reported. UserInfoChange has a reporting parameter to be carried by EventParameter1, which indicates if only non-identifying or both non-identifying and identifying end-user info are to be reported. It is mandatory and only used for external permission mode. It has enumerated values PL2 or PL3 corresponding to permission levels 2 or 3.	NOTE – End users who have given permission levels 2-3 per Table 3 are included.
AudioLanguageChange	Indicates that an end user has changed the audio language. Causes the AudioLanguageChange data structure defined in Table 21 to be reported.	
CaptionLanguageChange	Indicates that an end user has changed the caption language. Causes the CaptionLanguageChange data structure defined in Table 21 to be reported.	
DisplayStatus	Indicates a change in the display status of the IPTV Service output of the terminal device. Causes the DisplayStatus element defined in Table 21 to be reported.	Reportable when the terminal device audience measurement function (TD-AMF) is able to detect a connected screen's display status e.g., if the TV is connected by interfaces such as HDMI v1.3a or higher.

6.1.4 Service-common sample types

The sample set identifiers in Table 6 are used to indicate elements to be reported when scheduled time sampling or service start sampling is used.

Table 6 – Service-common sample set identifiers

Sample set identifier	Description	Scheduled time sampling	Service start sampling
UserPresent	Indicates that the UserPresent data structure, defined in Table 4, is to be reported when sampled.	Applicable	Not applicable
TDLocation	Indicates that the geographic location data structure, TDLocation, defined in Table 4, is to be sampled. TDLocation has a reporting distance threshold parameter to be carried by SampleSetQualifier, which indicates the distance in metres between subsequent locations above which a report is generated. It is optional, of type string with a default value "30".	Applicable	Applicable
DeviceInfo	Indicates that the device information data structure, DeviceInformation, defined in Table 21, is to be reported when sampled.	Applicable	Applicable
UserBioInfo	Indicates that the end-user biographic information data structure, UserBiographicInformation, defined in Table 3, is to be reported when sampled.	Applicable	Applicable
GenericUser Info	Indicates that the GenericUserInfo data structure, defined in Table 2,1 is to be reported when sampled.	Applicable	Applicable
EventCount	Indicates the integer count of events data structure, EventCount, defined in Table 21, is to be reported. The counting period is delimited by either periodicity or "leave-content events" (Note 2). Either will terminate the current event count and start a new event count. The list of events to be counted may be identified by default (Note 1) or explicitly in a parameter list of strings, carried by SampleSetQualifiers in Table 11.	Applicable	Not applicable
UserList	Indicates that the UserList data structure, defined in Table 21, is to be reported when sampled.	Applicable	Applicable
PermitBlocked Info	Indicates that the PermitBlockedInfo data structure, defined in Table 4, is to be reported when sampled. Only to be used with internal or hybrid permission modes.	Applicable	Applicable
NOTE 1 – "In-content" events are any events where the user continues to view the same content after the event. Current "In-content events" include: VideoResize, VideoZoom, VideoObscure, AudioVolume, AudioLanguageChange, CaptionLanguageChange and AudioFocus. NOTE 2 – "Leave-content events" are any events where the user no longer views the same content after the event. Current "Leave-content events" include: LinearChannelStart, LinearChannelStop and DisplayStatus.			

6.2 Data structures for audience measurement

The following data structures include elements and containers defined previously, plus additional elements and containers.

The order of the following data structures is such that later structures build on the earlier structures.

The use of data structures within AM messages is shown in Table 7.

Table 7 – Messages where data structures are used

Message	Error	Acknowledge	Measurement report request	AMF configuration package	Configuration package request	Configuration package request response	Audience measurement report package
Configuration request message					X		
Configuration request error message	X						
Configuration request response message				(X) Note		X	
Configuration response error message	X						
Configuration message				X			
Configuration error message	X						
Configuration ack message		X					
Measurement report request message			X				
Measurement report request error message	X						
Measurement report message							X
Measurement report error message	X						
NOTE – The AMF configuration package data structure is inside Configuration package request response.							

6.2.1 Data structure for "error"

The data structure listed in Table 8 is used to report an AM message error.

Figure 11 contains an alternative representation of an error message data structure.

Table 8 – Data structure for "error message"

Element (Note 2)	Description	Support/ type	Notes or value domain
Error	Container which indicates that the following is an AM error message.	1	
Accepted	Element of Error Indicates that the errored message was partially accepted.	0-1 xs:Boolean Default: true	NOTE – This element is applicable for non-high-level errors for ConfigPackageError, ReportRequestError, or Report Error.
HighLevelError	Element of Error Container for the report of a high level error.	0-1 (Note 1)	

Table 8 – Data structure for "error message"

Element (Note 2)	Description	Support/ type	Notes or value domain
HighLevelError Code	Element of HighLevelError This element indicates the type of high level error.	1 xs:string enumeration	Values: '0' = not well-formed XML message (syntax error), '1' = invalid XML message (not compliant with the schema), '2' = sourced major version is not equal to the receiver's version.
RootElement	Element of HighLevelError This element includes the name of the root element of the erroneous message.	1 nonEmpty String	NOTE – The values include "AMFConfigPackage", "ConfigPackageRequest Response" or the unrecognized element name of a message.
ConfigPackage Error	Element of Error Container for information of an errored configuration package message or configuration package request response message.	0-1 (Note 1)	
PackageID	Element of ConfigPackageError This element contains the identifier of the configuration package with an error.	1	NOTE – Defined in Table 16.
PackageVersion	Element of ConfigPackageError This element contains the version of the configuration package with an error.	0-1	NOTE – Defined in Table 16.
ConfigPackage ErrorInfo	Element of ConfigPackageError Container for information about a single error.	1-*	
ErrorCode	Element of ConfigPackageErrorInfo It identifies the error code.	1 xs: string enumeration	Values : '1' = Element not supported, '2' = Element information not available, '3' = element not permitted, '4' = event not supported.
ErrorElement	Element of ErrorCode Indicates associated element or attribute.	0 - * xpath	Values: path to and including the error element or attribute.
ErrorEvent	Element of ErrorCode Indicates associated event.	0-* xs:string enumeration	Values: One of the defined event names. This element is only used for ErrorCode 4.
ReportRequest Error	Element of Error Indicates that an error was detected in a measurement report request msg.	0-1 (Note 1)	

Table 8 – Data structure for "error message"

Element (Note 2)	Description	Support/ type	Notes or value domain
ReportRequest ErrorInfo	Element of ReportRequestError Container for information about a single error.	1-*	
ErrorCode	Element of ReportRequestErrorInfo It identifies the error code.	1 xs: string enumeration	Values: "1"= Requested measurement request ID which was not previously configured.
ErrorElement	Element of ErrorCode Indicates associated element or attribute.	0-* xpath	Values: path to and including the error element or attribute.
Measurement RequestID	Element of ErrorCode Requested measurement request Id which was not previously configured.	0-*	Defined in Table 9. This element is only used for ErrorCode 5.
ReportError	Element of Error Indicates that an error was detected in a measurement report msg.	0-1 (Note 1)	
ReportErrorInfo	Element of ReportError Container for information about a single error.	1-*	
ErrorCode	Element of ReportErrorInfo It identifies the error code.	1 xs: string enumeration	Values: "1" = Element or attribute value unknown, "2" = Known but unexpected element or attribute value.
ErrorElement	Element of ErrorCode Indicates associated element or attribute.	0-* xpath	Values: path to and including the error element or attribute.
Measurement RequestID	Element of ErrorCode Report received containing a unrequested MeasurementRequestID.	0-*	Defined in Table 9. This element is only used for ErrorCode 6.
ConfigRequest Error	Element of Error Indicates that an error was detected in a configuration request msg.	0-1 (Note 1)	
ConfigRequest ErrorInfo	Element of ConfigRequestError Container for information about a single error.	1-*	
ErrorCode	Element of ConfigRequestErrorInfo It identifies the error code.	1 xs:string enumeration	Values : "1" = Element or attribute value unknown.
ErrorElement	Element of ErrorCode Indicates associated element or attribute.	0-* xpath	Values: path to and including the error element or attribute.

Table 8 – Data structure for "error message"

NOTE 1 – Only one of these elements is present in a message. NOTE 2 – Sampleset is an element, an error in sampleset is reported by the appropriate element error code.

```
Error (1)
| Accepted (0-1)
| HighLevelError(0-1) (Note 1)
| | HighLevelErrorCode (1)
| | RootElement (1)
| ConfigPackageError (0-1) (Note 1)
| | PackageID (1)
| | PackageVersion (0-1)
| | ConfigPackageErrorInfo (1-*)
| | | ErrorCode (1)
| | | | ErrorElement (0-*)
| | | | ErrorEvent (0-*)
| ReportRequestError (0-1) (Note 1)
| | ReportRequestErrorInfo (1-*)
| | ErrorCode (1)
| | | ErrorElement (0-*)
| | | MeasurementRequestID (0-*)
| ReportError (0-1) (Note 1)
| | ReportErrorInfo (1-*)
| | ErrorCode (1)
| | | ErrorElement (0-*)
| | | MeasurementRequestID (0-*)
| ConfigRequestError (0-1) (Note 1)
| | ConfigRequestErrorInfo (1-*)
| | ErrorCode (1)
| | | ErrorElement (0-*)
```

Figure 11 – Alternative representation of Error data structure

6.2.2 Data structure for "measurement request"

The data structure of measurement request consists of four logical parts; the first part includes the metadata elements to specify which services are to be measured, as shown in Table 9.

Figure 12 contains an alternative representation of Table 9 data structure.

Table 9 – First part of metadata elements in "measurement request"

Element	Description	Support/ type	Notes or value domain
Measurement Request	Container		
Measurement RequestID	Element of MeasurementRequest Identification of the measurement request.	1 xs:positive Integer	Value: AM service provider unique. This ID, to be included in the measurement reports, may be used by the aggregation function to identify all measurement reports related to the same measurement request.
LinearTV Qualifier	Element of MeasurementRequest This element identifies that the LinearTV service is to be measured and contains the qualifiers of the services to be measured.	0-1	NOTE – Defined in [ITU-T H.741.3].

```
MeasurementRequest
 | MeasurementRequestID (1)
 | LinearTVQualifier (0-1)
```

Figure 12 – Alternative representation of first part of MeasurementRequest data structure

Table 10 specifies elements which provide the ability to filter measurements across services based upon content class.

Figure 13 contains an alternative representation of Table 10 data structure.

Table 10 – Data structure for AMF "content filtering"

Element	Description	Support/type	Notes or value domain
AllContentClass ExceptList	Element of MeasurementRequest List of content classes not to be measured.	0-1	NOTE – If AllContentClass ExceptList is not present then measurements are not filtered by content.
ContentClass Domain	Element of AllContentClassExceptList Content class domain identifier.	1-* nonEmptyString	NOTE – Value is the name of a standard or organisation that defines content classes.
ContentClassID	Element of ContentClassDomain Content class identifier.	1-* nonEmptyString	NOTE – Value is the name of a content class.

```
              AllContentClassExceptList (0-1)
         |  ContentClassDomain (1-*)
         |  |  ContentClassID (1-*)
```

Figure 13 – Alternative representation of content filtering data structure

Table 11 describes the next part of the metadata elements for audience measurement request which is about "Measurement schedule".

This measurement schedule section allows the requesting of a service to be measured in the same way at different periods of the day. It allows definition of several measurement periods (MeasurementPeriod) and the method of how a measurement report is to be triggered, either periodically and/or on specific events.

When events and samples cover the same elements, an event which occurs between two sample times delays the next sample time until the subsequent scheduled sample time.

Figure 14 contains an alternative representation of Table 11 data structure.

Table 11 – Measurement schedule metadata for "measurement request"

Element	Description	Support/ type	Notes or Value domain
Measurement Schedule	Element of MeasurementRequest Container for time period for measurement.	1-*	
Measurement Period	Element of MeasurementSchedule Container for a measurement period.	0-*	
DayOfTheWeek	Element of MeasurementPeriod Day of the week at which measurement starts.	0-* xs:nonNega-tiveInteger Default: 0	Value list: 0 = "everyday", 1 = "Monday", 2 = "Tuesday", 3 = "Wednesday", 4 = Thursday", 5 = "Friday", 6 = "Saturday", 7 = "Sunday", 8 = "weekday", 9 = "weekend"
StartTime	Element of MeasurementPeriod Time of the day at which the measurement starts.	0-* xs:time	If omitted refer to DefaultMeasurementStartTime in Table 13.
EndTime	Element of MeasurementPeriod Time of the day at which the measurement stops.	0-* xs:time Default 23:59:59.99	NOTE – Default is at end of day. Omitting both StartTime and EndTime results in measurement for complete day.
EventTrigger	Element of MeasurementSchedule Measurement trigger of event type.	0-*	
Event	Element of EventTrigger Events which trigger a measurement from the TD-AMF.	0-* nonEmpty String	See Table 5 for service-common events and [ITU-T H.741.3] for service dependent events including default events.
EventParameter1	Attribute of Event.	0-1 xs:string	Some events require a parameter which is carried here.

Table 11 – Measurement schedule metadata for "measurement request"

Element	Description	Support/ type	Notes or Value domain
Priority	Element of EventTrigger Priority to consider keeping an event-driven measurement report when storage is congested.	0-1 xs:nonNegativeInteger Default: 0	Value: 0-10 NOTE – Higher integer value indicates higher priority. 0 value indicates not to store the event data. See Note 1.
TimeTrigger	Element of MeasurementSchedule Measurement trigger of time type.	0-1	
SampleSet	Element of TimeTrigger Defined sets of elements to be sampled.	0-*	NOTE – No default service-common sample set identifiers have yet been specified.
SampleSet Identifier	Attribute of SampleSet Defined sets of elements to be sampled. A set may include just one element.	1 xs:string enumeration	The values of service-common sample set identifiers are defined in Table 6. The values of service-specific sample set identifiers are defined in [ITU-T H.741.3].
SampleSet Qualifier	Element of SampleSet	0-* xs:string enumeration	NOTE – Parameters relating to the sample set identifier attribute.
Periodicity	Element of TimeTrigger Periodicity at which a measurement is to be made (expressed in seconds).	1 xs:positive Integer	
Priority	Element of TimeTrigger Priority to consider keeping a time-driven measurement report when storage is congested.	0-1 xs:nonNega-tiveInteger Default: 0	Value: 0-10 NOTE – Higher integer value indicates higher priority. 0 value indicates not to store the sampled data. See Note 1.
NothingNew ReportMode	Element of TimeTrigger This element states what to do in case that there is no change since the last measurement snapshot.	0-1 xs:nonNega-tiveInteger Default: 0	0: ignore AM sample. 1: create empty AM sample (see Note 2). 2: create a complete AM sample.
ServiceStart Trigger	Element of MeasurementSchedule Measurement trigger of time type.	0-1	
Interval	Element of ServiceStartTrigger It indicates in a number of days when the Service Start event is to generate a measurement report.	0-1 xs:positive Integer Default: at each service start	Value: N number of days NOTE – A sample occurs at the first service start every N days.

Table 11 – Measurement schedule metadata for "measurement request"

Element	Description	Support/ type	Notes or Value domain
SampleSet	Element of ServiceStartTrigger Defined sets of elements to be sampled.	0-*	NOTE – No default service-common sample set identifiers have yet been specified.
SampleSet Identifier	Attribute of SampleSet Defined sets of elements to be sampled. A set may include just one element.	1 xs:string enumeration	The values of service-common sample set identifiers are defined in Table 6. The values of service-specific sample set identifiers are defined in [ITU-T H.741.3].
SampleSet Qualifier	Element of SampleSet	0-* xs:string enumeration	NOTE – Parameters relating to the sample set identifier attribute.
Priority	Element of ServiceStartTrigger Priority to consider keeping a time-driven measurement report when storage is congested.	0-1 xs:nonNega-tiveInteger Default: 0	Value: 0-10 NOTE – Higher integer value indicates higher priority. 0 value indicates not to store the service start data. See Note 1.
NOTE 1 – The priorities of EventTrigger, TimeTrigger and ServiceStartTrigger use the same scale. NOTE 2 – An empty report includes only the mandatory elements of the measurement report.			

```
MeasurementSchedule (1-*)
| MeasurementPeriod (0-*)
| | DayOfTheWeek (0-*)
| | StartTime (0-*)
| | EndTime (0-*)
| EventTrigger (0-*)
| | Event (0-*) [EventParameter1 (0-1)]
| | Priority (0-1)
| TimeTrigger (0-1)
| | SampleSet (0-*) [SampleSetIdentifier (1)]
| | | SampleSetQualifier (0-*)
| | Periodicity (1)
| | Priority (0-1)
| | NothingNewReportMode (0-1)
| ServiceStartTrigger (0-1)
| | Interval (0-1)
| | SampleSet (0-*) [SampleSetIdentifier (1) ]
| | | SampleSetQualifier (0-*)
| | Priority (0-1)
```

Figure 14 – Alternative representation of MeasurementSchedule data structure

Table 12 describes the next part of the metadata elements for audience measurement request which is about "Measurement delivery metadata".

This measurement delivery schedule section allows aggregation functions to specify how measurement reports are delivered to the aggregation function.

Figure 15 contains an alternative representation of the measurement delivery schedule data structure.

Table 12 – Measurement delivery metadata for "measurement request"

Element	Description	Support/type	Notes or value domain
Measurement Delivery Schedule	Element of MeasurementRequest Description of the mechanism to be used to decide on how to make the measurement report available to the aggregation function.	0-1 Note 1	
DeliveryAddress	Element of MeasurementDeliverySchedule URL to be used to send measurement reports from the TD-AMF.	0-* URL	NOTE – A delivery address may already be specified in the AM aggregation function discovery process or in the measurement request set structure. There is no specific order or preference in the address list if there are different URL types specified. If multiple addresses are of the same URL type, then the preference is given by the order.
Retransmit Number	Element of MeasurementDeliverySchedule Number of transmission retries when a measurement report is not acknowledged by the aggregation function.	0-1 xs:positive Integer	NOTES – A retransmit number may already be specified in the measurement request set structure. – The maximum number of transmission attempts to deliver a measurement report is "RetransmitNumber" + 1.
Storage Congestion Policy	Element of MeasurementDeliverySchedule This element indicates what the TD-AMF does in case of storage congestion for this measurement request.	0-1	0 = immediately push the oldest measurement reports to free up storage sufficiently, and if push fails, apply the following. 1 = drop enough of the lowest priority events and/or sample values to free space for new higher priority events and/or sample values. Age of lowest priority events and/or sample values is to be used as a tie-breaking criteria.

Table 12 – Measurement delivery metadata for "measurement request"

Element	Description	Support/ type	Notes or value domain
ImmediatePush	Element of MeasurementDeliverySchedule This element indicates that the measurement delivery takes place immediately with possible grouping of measurement reports.	0-1 See Note 2	
Measurement ReportNumber ByPush	Element of "ImmediatePush" This element indicates the number of measurement reports which are to be grouped together before a push delivery is attempted.	0-1 xs:positive Integer	1 = each measurement report is pushed as soon as produced.
MaxTime Between Delivery	Element of "ImmediatePush" This element indicates the maximum delay in seconds between two measurement report delivery.	0-1 xs:nonNega-tiveInteger	0 = infinite NOTES: – This allows sending the last measurement reports without waiting for the number of stored measurement reports to reach the number required for measurement groupings. – This makes sense only if MeasurementReportNumber ByPush is bigger than 1.
DelayedDelivery	Element of MeasurementDeliverySchedule This element indicates that the measurement delivery is to take place during specific delivery windows.	0-1 See Note 2	
DeliveryWindow	Element of "DelayedDelivery" This element is a container for the start and end time of a measurement delivery window.	0-*	NOTE – Several delivery windows are possible.
StartDelivery WindowTime	Element of "DeliveryWindow" Time of the day at which the stored audience measurement reports could start to be delivered.	0-1 xs:time	
EndDelivery WindowTime	Element of "DeliveryWindow" Last time of the day at which the audience measurement report could be delivered.	0-1 xs:time	
Pull	Element of MeasurementDeliverySchedule This element indicates that the measurement reports are to be delivered only on request from the aggregation functions.	0-1 See Note 2	

Table 12 – Measurement delivery metadata for "measurement request"

Element	Description	Support/ type	Notes or value domain
DelayedPush AndPull	Element of MeasurementDeliverySchedule This element indicates that measurement reports are to be delivered on request from the aggregation functions or during delivery windows.	0-1 See Note 2	
DeliveryWindow	Element of "DelayedPushAndPull" This element is a container for the start and end time of a measurement delivery window.	0-*	NOTE – Several delivery windows are possible.
StartDelivery WindowTime	Element of "DeliveryWindow" Time of the day at which the stored audience measurement reports could start to be delivered.	0-1 xs:time	
EndDelivery WindowTime	Element of "DeliveryWindow" Last time of the day at which the audience measurement report could be delivered.	0-1 xs:time	
NOTE 1 – If MeasurementDeliverySchedule is not present then the default is immediatePush mode. The associated elements (delivery address, retransmit number and storage congestion policy) are specified in the AM aggregation function discovery process, or as configured in the measurement request set, or by default. NOTE 2 – If MeasurementDeliverySchedule is present, one of either immediatePush, delayedPush, pull, or delayedPushAndPull may be present. If none of them is present, then the default is immediatePush mode.			

```
MeasurementDeliverySchedule (0-1)
| DeliveryAddress (0-*)
| RetransmitNumber (0-1)
| StorageCongestionPolicy (0-1)
| ImmediatePush (0-1)
| | MeasurementReportNumberByPush (0-1)
| | MaxTimeBetweenDelivery (0-1)
| DelayedDelivery (0-1)
| | DeliveryWindow (0-*)
| | | StartDeliveryWindowTime (0-1)
| | | EndDeliveryWindowTime (0-1)
| Pull (0-1)
| DelayedPushAndPull (0-1)
| | DeliveryWindow (0-*)
| | | StartDeliveryWindowTime (0-*)
| | | EndDeliveryWindowTime (0-*)
```

Figure 15 – Alternative representation of MeasurementDeliverySchedule data structure

6.2.2.1   "Delayed push" measurement reporting policy

When the report delivery period starts for a measurement request or a set of measurement requests, the TD-AMF selects a random delivery time for reporting between the delivery window start time and end time.

When the randomly selected delivery time is reached, the TD-AMF pushes all stored measurement reports corresponding to this or these measurement requests in time order to the aggregation function. Following completion of delivery, the TD-AMF stops pushing further measurement reports until the next report delivery window. New measurement reports for this or these measurement requests are stored again after the last stored measurement report has been delivered.

6.2.3   Data structure for "measurement request set"

As some elements may be repeated in a number of measurement requests with the same value, a measurement request set is defined to provide an optimization mechanism to include default values for elements which have the same value in a number of measurement requests. Multiple measurement request sets may be present in a configuration package.

There are four possible levels to set values:

– Highest priority level – configured in an individual measurement request

– Second level – default in a measurement request

– Third level – configured in a measurement request set

– Fourth level – default in a measurement request set

The values configured in each measurement request supersede those configured here.

Figure 16 contains an alternative representation of the metadata elements of Table 13 in a measurement request set.

Table 13 – Metadata elements in "measurement request set"

Element	Description	Support/ type	Notes or value domain
Measurement RequestSet	This element is a container for a general default section containing elements with identical values for a set of measurement requests and the corresponding set of measurement requests.	1-*	NOTE – Extended in [ITU-T H.741.3].
DefaultAll ContentClass ExceptList	Element of MeasurementRequestSet Default list of content classes not to be measured.	0-1	NOTE – Refer to "AllContentClassExceptList" element in Table 10.
Default Measurement Period	Element of MeasurementRequestSet Default Measurement Period.	0-*	Defined as MeasurementPeriod in Table 11.
DefaultDayOf TheWeek	Element of MeasurementRequestSet Default DayOfTheWeek for measurement.	0-*	NOTE – For encoding, refer to "DayOfTheWeek" element in Table 11.
Default Measurement StartTime	Element of MeasurementRequestSet Default start time for measurement.	0-1 Default: 00:00:00.00	NOTES – Default is at 0000 hours (12 am) at start of day. For encoding, refer to "StartTime" element in Table 11. – Omitting both Default Measurement StartTime and Default Measurement EndTime results in measurement for complete day.
Default Measurement EndTime	Element of MeasurementRequestSet Default end time for measurement.	0-1	NOTE – For encoding, refer to "EndTime" element in Table 11.
DefaultTime Driven Measurement Periodicity	Element of MeasurementRequestSet Default periodicity for time driven audience measurement.	0-1	NOTE – For encoding, refer to "Periodicity" element in "TimeTrigger" element of Table 11.
DefaultNothing NewReportMode	Element of MeasurementRequestSet Default behaviour when there is no change since the last measurement snapshot.	0-1	NOTE – For encoding, refer to "NothingNewReportMode" element in "TimeTrigger " element of Table 11.
DefaultInterval	Element of MeasurementRequestSet Default Interval	0-1	NOTE – For encoding, refer to " Interval" element in Table 11.

Table 13 – Metadata elements in "measurement request set"

Element	Description	Support/ type	Notes or value domain
DefaultDelivery Address	Element of MeasurementRequestSet Default URL to be used to send measurement report packages from the TD-AMF.	0-*	NOTE – For encoding, refer to "DeliveryAddress" element in MeasurementDeliverySchedule element of Table 12.
Default Retransmit Number	Element of MeasurementRequestSet Default number of transmission retries when a measurement report package is not acknowledged at the transport layer by the aggregation function.	0-1	NOTE – For encoding, refer to "RetransmitNumber" element in MeasurementDeliverySchedule element of Table 12.
DefaultStorage Congestion Policy	Element of MeasurementRequestSet Default storage congestion policy.	0-1 Default: 1	NOTE – For encoding, refer to the "StorageCongestionPolicy" element in Table 12.
Default Measurement ReportNumber ByPush	Element of MeasurementRequestSet Default MeasurementReportNumberBy Push.	0-1 Default: 1	NOTE – For encoding, refer to "MeasurementReportNumberBy Push" element in Table 12.
DefaultMaxTime Between Delivery	Element of MeasurementRequestSet Default MaxTimeBetweenDelivery	0-1 Default: 0	NOTE – For encoding, refer to "MaxTimeBetweenDelivery" element in Table 12.
DefaultDelivery Window	Element of MeasurementRequestSet Element to group default start and end times of delivery window	0-*	As defined by DeliveryWindow of Table 12.
DefaultStart DeliveryWindow Time	Element of MeasurementRequestSet Default StartDeliveryWindowTime	0-1 Default: 00:00:00.00	NOTES – For encoding, refer to "StartDeliveryWindowTime" element in Table 12. – Default is start of day. Omitting both StartDelivery WindowTime and End DeliveryWindowTime results in permitting reporting for complete day.
DefaultEnd DeliveryWindow Time	Element of MeasurementRequestSet Default EndDeliveryWindowTime	0-1 Default: 23:59:59.99	NOTES – For encoding, refer to "EndDeliveryWindowTime" element in Table 12. – Default is at end of day. Omitting both StartDelivery WindowTime and End DeliveryWindowTime results in permitting reporting for complete day.

Table 13 – Metadata elements in "measurement request set"

Element	Description	Support/ type	Notes or value domain
DefaultService StartPermit BlockedInfo	Element of MeasurementRequestSet Default sampleset identifier for service start trigger sampling	0-1	NOTE – Refer to PermitBlockedInfo element in Table 6.
DefaultTime TriggerPermit BlockedInfo	Element of MeasurementRequestSet Default sampleset identifier for time trigger sampling	0-1	NOTE – Refer to PermitBlockedInfo element in Table 6.
Measurement Request	Element of MeasurementRequestSet Individual measurement requests	1-*	NOTE – For encoding, refer to "measurement request" data structure of Table 9.

```
MeasurementRequestSet (1-*)
 | DefaultMeasurementPeriod (0-*)
 | DefaultAllContentClassExceptList (0-1)
 | DefaultDayOfTheWeek (0-*)
 | DefaultMeasurementStartTime (0-1)
 | DefaultMeasurementEndTime (0-1)
 | DefaultTimeDrivenMeasurementPeriodicity (0-1)
 | DefaultNothingNewReportMode (0-1)
 | DefaultInterval (0-1)
 | DefaultDeliveryAddress (0-*)
 | DefaultRetransmitNumber (0-1)
 | DefaultStorageCongestionPolicy (0-1)
 | DefaultMeasurementReportNumberByPush (0-1)
 | DefaultMaxTimeBetweenDelivery (0-1)
 | DefaultDeliveryWindow (0-*)
 | DefaultStartDeliveryWindowTime (0-1)
 | DefaultEndDeliveryWindowTime (0-1)
 | DefaultServiceStartPermitBlockedInfo (0-1)
 | DefaultTimeTriggerPermitBlockedInfo (0-1)
 | MeasurementRequest (1-*)
```

Figure 16 – Alternative representation of MeasurementRequestSet data structure

6.2.4 Data structure for "measurement request set filter"

The following filters support different sets of measurement requests in a single AMF configuration package for different TD-AMFs.

Table 14 – Metadata elements in "measurement request set filter request"

Element	Description	Support/ type	Notes or value domain
Measurement RequestSetFilter	This a container for filters which conditionally indicate measurement requests to be processed.	0-*	
UserInfoTarget	Element of MeasurementRequestSetFilter Container for elements specifying user info to be used for targeting TD-AMFs.	1-*	Defined in [ITU-T H.741.4].
Measurement RequestID	Element of MeasurementRequestSetFilter Individual measurement requests conditionally processed by filters.	1-*	NOTE – For encoding, refer to "measurement request" data structure of Table 9.

6.2.5 Data structure for "measurement report request"

Table 15 – Metadata elements in "measurement report request"

Element	Description	Support/ type	Notes or value domain
Measurement ReportRequest	Container for a measurement report request.	1	NOTE – A measurement report request with no MeasurementRequestIDs indicates that a TD-AMF is to respond with available data from all measurement requests.
Measurement RequestID	Element of MeasurementReportRequest Identification of the measurement request.	0-* xs:positive Integer	NOTE – indicates that a TD-AMF is to respond with available data from this specific measurement request.

6.2.6 Data structure for "AMF configuration package"

The AMF configuration package in Table 16 is a set of elements provided by the aggregation function to configure the operation of the audience measurement function.

Figure 17 contains an alternative representation of the AMF configuration package data structure.

Table 16 – Data structure of the "AMF configuration package"

Element	Description	Support/ type	Notes or value domain
AMFConfig Package	Container for all the elements of the AMF configuration package.	1	
PackageID	Element of AMFConfigPackage Identification of the AMF configuration package.	1 xs:positive Integer	Value: AM service provider unique.

Table 16 – Data structure of the "AMF configuration package"

Element	Description	Support/ type	Notes or value domain
PackageVersion	Attribute of PackageID This attribute contains the version of the configuration package	0-1 xs:positiveInt eger	
EffectivityDate AndTime	Element of AMFConfigPackage This element identifies the date and time at which this AMF configuration package is to be applied to the TD-AMF operation.	0-1 xs:dateTime Default: immediately	
UserPermitInfo	Element of AMFConfigPackage This element is a container for an end-user permit with end-user identifier and last update date.	0-*	NOTE – This element is only for hybrid permission mode and is mandatory for this mode. It is not to be present in internal permission mode.
LastUpdateDate AndTime	Element of UserPermitInfo This element indicates the date and time of the creation or last update of the end-user permit.	0-1 xs:dateTime	
UserPermit	Element of UserPermitInfo This element includes all end-user permissions for the audience measurement of the IPTV service provider.	1	NOTE – For encoding, refer to Table 20.
Measurement RequestSet	Element of AMFConfigPackage Container for an individual measurement request set.	1-*	NOTE – For encoding, refer to Table 13.
Measurement RequestSetFilter	Element of AMFConfigPackage This a container for filters which conditionally indicate measurement requests to be processed.	0-*	NOTE – For encoding, refer to Table 14.

```
AMFConfigPackage (1)
| PackageID (1)[ PackageVersion (0-1)]
| EffectivityDateAndTime (0-1)
| UserPermitInfo (0-*)
| | LastUpdateDateAndTime (0-1)
| | UserPermit (1)
| MeasurementRequestSet (1-*)
| MeasurementRequestSetFilter (0-*)
```

Figure 17 – Alternative representation of AMFConfigPackage data structure

6.2.7 Data structure for "acknowledge"

The data structure in Table 17 is used to report an AM message acknowledge.

Table 17 – Data structure for "acknowledge message"

Element	Description	Support/type	Notes or value domain
Ack	Container which indicates that the following is an AM message acknowledge message.	1	

6.2.8 Data structure for "configuration package request"

The configuration package request may be used by audience measurement function to ask for an AMF configuration package or to check if the current or future configuration package at the TD-AMF is still valid.

The data structure of the AMF configuration package request is specified in Table 18.

Figure 18 contains an alternative representation of the AMF configuration package request data structure.

Table 18 – Data structure of "configuration package request"

Element	Description	Support/type	Notes or value domain
ConfigPackage Request	This element is a container for the configuration package request.	1	
Terminal DeviceID	Element of ConfigPackageRequest This element uniquely identifies the end user's terminal device based on the device's MAC address.	1 xs:hexBinary length = 16 octets (128 bits)	
TerminalDevice Type	Element of ConfigPackageRequest This element identifies a specific type of IPTV terminal device.	1	Defined in Table 20.
ServiceProvider Identifier	Element of ConfigPackageRequest This element contains the identifier of the IPTV service provider for which the Audience Measurement is proposed by the end user.	0-1	Defined in Table 4.
SubscriberID	Element of ConfigPackageRequest This element contains the identification of the subscriber to the services of the above service provider.	1	Defined in Table 4.
UserPermitInfo	Element of ConfigPackageRequest This element is a container for an end-user permit with end-user identifier and last update date.	0-*	NOTE – This element is only for hybrid permission mode and is mandatory for this mode. It is not to be present in internal permission mode. As defined in Table 16.
AMFCapability Profile	Element of ConfigPackageRequest This element indicates the AM profile supported by the IPTV terminal device.	0-1	NOTE – Defined in Table 2.

Table 18 – Data structure of "configuration package request"

Element	Description	Support/ type	Notes or value domain
Current Measurement	Element of ConfigPackageRequest Container for all the elements related to the current measurement.	0-1	
PackageID	Element of CurrentMeasurement This element contains the identifier of the configuration package currently in use in the TD-AMF.	1	NOTE – Defined in Table 16.
PackageVersion	Attribute of PackageID This attribute contains the version of the configuration package.	0-1	NOTE – Defined in Table 16.
Future Measurement	Element of ConfigPackageRequest Container for all the elements related to the future measurement.	0-1	
PackageID	Element of FutureMeasurement This element contains the identifier of the configuration package to be used in the future by the TD-AMF.	1	NOTE – Defined in Table 16.
PackageVersion	Attribute of PackageID This attribute contains the version of the configuration package to be used in the future by the TD-AMF.	0-1	NOTE – Defined in Table 16.

```
ConfigPackageRequest (1)
| TerminalDeviceID (1)
| TerminalDeviceType (1)
| ServiceProviderIdentifier (0-1)
| SubscriberID (1)
| UserPermitInfo (0-*)
| AMFCapabilityProfile (0-1)
| CurrentMeasurement (1)
| | PackageID (1)[ PackageVersion (0-1)]
| FutureMeasurement (0-1)
| | PackageID (1)[ PackageVersion (0-1)]
```

Figure 18 – Alternative representation of ConfigPackageRequest data structure

6.2.9 Data structure for "configuration package request response"

The response from the aggregation function to the configuration package request is defined in Table 19.

Figure 19 contains an alternative representation of the configuration package request response data structure.

**Table 19 – Data structure of the "configuration package request response"**

Element	Description	Support/type	Notes or value domain
ConfigPackage Request Response	Container for all the elements of the response to the configuration package request.	1	
Configuration PackageCheck Delay	Element of ConfigPackageRequestResponse Identifies the delay (days) from activation of the first configuration package until availability of a new one is to be checked for.	0-1 xs:positive Integer	Used for configuration pull mode and configuration hybrid mode, Not used for push (only) mode.
Immediate Measurement Directive	Element of ConfigPackageRequestResponse Container for all the elements of the response about audience measurement to be made now.	0-1	
Code	Element of ImmediateMeasurementDirective This element includes the response for immediate measurement.	0-1 xs:string enumeration Default: "1"	"1" = No AM required: means no audience measurement is required now by the aggregation function. "2" = No Conf Package Change: no change to the TD-AMF configuration package currently used in the TD-AMF. "3" = Conf Package Present: configuration package included in this response is to be taken into account from now on.
AMFConfig Package	Element of ImmediateMeasurementDirective This element is a container for a configuration package. This element is present only if Response = '3' (Conf Package Present).	0-1	NOTE – Defined in Table 16.
Future Measurement Directive	Element of ConfigPackageRequestResponse Container for all the elements of the response about audience measurement to be made in the future.	0-1	

Table 19 – Data structure of the "configuration package request response"

Element	Description	Support/type	Notes or value domain
Code	Element of FutureMeasurementDirective This element includes the response for future measurements.	0-1 xs:string enumeration Default: "1"	"1" = No Future Conf Package: means that there is no configuration package with a future effectivity date and time. "2" = No Conf Package Change: no change to the future TD-AMF configuration package(s) already available in the TD-AMF. "3" = Conf Package Present: means that this response includes a configuration package to be taken into account for future measurement.
AMFConfig Package	Element of FutureMeasurementDirective This element is a container for a configuration package. This element is present only if Response = "3" (Conf Package Present).	0-1	NOTE – Defined in Table 16.
NOTE 1 – To deactivate the current configuration package or to not require measurement, either use the "1" (No AM required code) for ImmediateMeasurementDirective or an empty "ConfigPackageRequest Response". NOTE 2 – To keep the current configuration package and to provide a future one, configure the ImmediateMeasurement Code as "2" (No Conf Package Change) and FutureMeasurementDirective Code as "3" (configuration package present).			

```
ConfigPackageRequestResponse (1)
| ConfigurationPackageCheckDelay (0-1)
| ImmediateMeasurementDirective (0-1)
| | Code (0-1)
| | AMFConfigPackage (0-1)
| FutureMeasurementDirective (0-1)
| | Code (0-1)
| | AMFConfigPackage (0-1)
```

Figure 19 – Alternative representation of ConfigPackageRequestResponse data structure

6.2.10 Data structure for "user permit"

Table 20 defines the data structure for "user permit".

Figure 20 contains an alternative representation of the user permit data structure.

Table 20 – Data structure of "user permit"

Element	Description	Support/ type	Notes or value domain
UserPermit	Container for all sets of end-user permission associated to services of a IPTV service provider.	1	
ExpirationDate	Element of UserPermit Indicates the end date for which permission was given.	0-1 xs:date	NOTE – This field may be regulated in certain countries.
Default PermissionLevel	Element of UserPermit Identification of the end-user permission level for all services offered by a IPTV service provider accessed from all IPTV terminal devices.	0-1	NOTE – Defined as Permission Level in Table 3.
DefaultAll ContentClass ExceptList	Element of UserPermit List of content classes not to be measured.	0-1	NOTE – Defined as AllContent ClassExceptList in Table 10.
AnonUserID	Element of UserPermit. Anonymous end-user ID Generated number which is persistently used for one end user	0-*	Defined in Table 4 NOTE – To be included if there is a permission level in this permit with a value less than 3.
UserID	Element of UserPermit This element uniquely identifies an end user.	0-*	Defined in Table 4 NOTE – To be included if there is a permission level in this permit with a value of more than 2.
UserPermission Set	Element of UserPermit Container for an end-user permission set associated with specific services.	0-*	
PermissionLevel	Element of UserPermissionSet Identification of the end-user permission level as specified in this Recommendation.	0-1	NOTE – If not present then refer to DefaultPermissionLevel.
UserPermission	Element of UserPermissionSet Container for an end-user permission.	1-*	
ChannelQualifier	Element of UserPermission Container for the elements allowing to select the specific services for which this end-user permission is granted among all LinearTV services of this IPTV service provider.	0-1	NOTE – Defined in [ITU-T H.741.3].
TerminalDevice Set	Element of UserPermission This container identifies the list of IPTV terminal devices for which this end-user permission applies.	0-1 Default: all of them	

Table 20 – Data structure of "user permit"

Element	Description	Support/ type	Notes or value domain
TerminalDevice Type	Element of TerminalDeviceSet This element identifies a specific type of IPTV terminal device.	1-* xs:hexBinary enumeration	Values: 0=STB, 1=TV, 2=Mobile, 3=PC, 4=Tablet, 5=Other.
AllContentClass ExceptList	Element of UserPermission List of content classes not to be measured.	0-1	NOTES – Defined in Table 10. – If not present then refer to DefaultAllContentClass ExceptList.

```
UserPermit (1)

| ExpirationDate (0-1)

| DefaultPermissionLevel (0-1)

| DefaultAllContentClassExceptList (0-1)

| AnonUserID (0-1)

| UserID (0-1)

| UserPermissionSet (0-*)

| | PermissionLevel (0-1)

| | UserPermission (1-*)

| | | ChannelQualifier (0-1)

| | | TerminalDeviceSet (0-1)

| | | | TerminalDeviceType (1-*)

| | | AllContentClassExceptList (0-1)
```

Figure 20 – Alternative representation of UserPermit data structure

6.2.11 Data structure for "measurement report" with service-common events and/or samples

Table 21 defines the data structure for a measurement report including service-common events and/or samples. Multiple elements which are associated with a single trigger time may be included in a particular instance of MeasurementReport.

Figure 21 contains an alternative representation of the "MeasurementReport" data structure.

Table 21 – Data structure for "measurement report" with service-common events and/or samples

Element	Description	Support/ type	Notes or value domain
MeasurementReport	Element of AMReportPackage Container for a measurement report .	0-1	NOTE – Extended in [ITU-T H.741.3].
MeasurementRequestID	Element of MeasurementReport This element identifies the measurement request which generated this measurement report.	1	NOTE – Defined in Table 9.
MeasurementReport TriggerTime	Element of MeasurementReport This element identifies the time at which the measurement report was created or the measurement period ended.	1 xs:date Time	NOTE – This is the time that an event or sample value was measured, or the start or end of a measurement period. Specify an offset from the UTC time.
DisplayStatus	Element of MeasurementReport Element to report DisplayStatus event which occurs when there is a change in the display status of the IPTV Service output of the terminal device.	0-1 xs:string enume- ration	Values: 'turned off', 'turned on' NOTE – Services being displayed may be determined by correlation with ServiceStart and ServiceStop events.
AudioFocus	Element of MeasurementReport Container to report AudioFocus event which occurs when the audio focus of the IPTV terminal device changes among multiple concurrent IPTV or other services such that the audio of a particular service is presented.	0-1	
ServiceInstanceID	Element of AudioFocus Identifies the instance of the specific IPTV service which is/was last presenting audio.	1 (Note 2)	Defined in Table 2.
IPTVFocus	Element of AudioFocus Indicates whether the audio focus is associated with an IPTV service.	0-1 xs: boolean Default: True	True, False.
CaptionLanguage Change	Element of MeasurementReport Container to report CaptionLanguageChange event.	0-1	
ServiceInstanceID	Element of CaptionLanguageChange Identifies the instance of a specific service.	1	Defined in Table 2.

**Table 21 – Data structure for "measurement report" with service-common
events and/or samples**

Element	Description	Support/ type	Notes or value domain
CaptionLanguage	Element of CaptionLanguageChange It identifies the caption language now being used for the indicated service.	1	Defined in Table 2.
AudioLanguageChange	Element of MeasurementReport Container to report AudioLanguageChange event.	0-1	
ServiceInstanceID	Element of AudioLanguageChange Identifies the instance of a specific service.	1	Defined in Table 2.
AudioLanguage	Element of AudioLanguageChange Identifies the audio language now being used for the indicated service.	1	Defined in Table 2.
AudioVolume	Element of MeasurementReport Indicates that the end user has changed the audio volume.	0-1	This element is activated by configuring event AudioVolume of Table 5.
ServiceInstanceID	Element of AudioVolume Identifies the instance of a specific service.	1	Defined in Table 2.
VolumeDirection	Element of AudioVolume Indicates how the end user has changed the audio volume.	1	Defined in Table 2.
ConfigurationChange	Element of MeasurementReport Indicates that the end user has changed their device's configuration or capabilities.	0-1	This element is activated by configuring event ConfigurationChange of Table 5.
AMFCapabilityProfile	Element of ConfigurationChange This element indicates the AM profile supported by the IPTV terminal device.	0-1	Defined in Table 2.
TVInformation	Element of ConfigurationChange Container for TV information.	0-1	Defined in Table 2.
AudioAmplifier Information	Element of ConfigurationChange Container for audio system information.	0-1	Defined in Table 2.
VideoObscure	Element of MeasurementReport Indicates that the end user has changed the amount of video obscured.	0-1	This element is activated by configuring event VideoObscure of Table 5.

Table 21 – Data structure for "measurement report" with service-common events and/or samples

Element	Description	Support/ type	Notes or value domain
ServiceInstanceID	Element of VideoObscure Identifies the instance of a specific service.	1	Defined in Table 2.
Obscuration	Element of VideoObscure Indicates the percentage of image obscured.	1	Defined in Table 2.
VideoZoom	Element of MeasurementReport Indicates that the end user has changed the zoom factor.	0-1	This element is activated by configuring event VideoZoom of Table 5.
ServiceInstanceID	Element of VideoZoom Identifies the instance of a specific service.	1	Defined in Table 2.
ZoomFactor	Element of VideoZoom Indicates video image zoom factor multiple.	1	Defined in Table 2.
VideoResize	Element of MeasurementReport Indicates that the end user has collapsed or expanded the video.	0-1	This element is activated by configuring event VideoResize of Table 5.
ServiceInstanceID	Element of VideoResize Identifies the instance of a specific service.	1	Defined in Table 2.
ImageWidth	Element of VideoResize Width of video.	1	Defined in Table 2.
ImageHeight	Element of VideoResize Height of video.	1	Defined in Table 2.
EventCount	Element of MeasurementReport Indicates the number of events during eventcount period.	0-*	This element is activated by configuring sample set identifier EventCount of Table 6.
EventsCounted	Element of EventCount Indicates the number of events during EventCount period.	0-1 xs: nonNega- tive Integer Default: 0	
ServiceInstanceID	Element of EventCount Identifies the instance of a specific service.	1	Defined in Table 2.
StartTime	Element of EventCount Time when EventCount period started.	1 xs:time	

Table 21 – Data structure for "measurement report" with service-common events and/or samples

Element	Description	Support/ type	Notes or value domain
DeviceInformation	Element of MeasurementReport This is a container for device information of STB, TV, IPTV-TV, Mobile, PC and audio system devices.	0-1	This element is activated by configuring sample set identifier DeviceInfo of Table 6.
STBInformation	Element of DeviceInformation Container for STB information.	0-1	Defined in Table 2.
AudioAmplifier Information	Element of DeviceInformation Container for audio system information.	0-1	Defined in Table 2.
TVInformation	Element of DeviceInformation Container for TV information.	0-1	Defined in Table 2.
IPTV-TVInformation	Element of DeviceInformation Container for IPTV TV information.	0-1	Defined in Table 2.
MobileDevice Information	Element of DeviceInformation Container for Mobile device information.	0-1	Defined in Table 2.
PCInformation	Element of DeviceInformation Container for PC information.	0-1	Defined in Table 2.
UserBiographic Information	Element of MeasurementReport This is a container for an end-users' biographic information.	0-1	This element is activated by configuring sample set identifier UserBioInfo of Table 6. Used for permission level 3.
UserIdBioInfo	Element of UserBiographicInformation This is a container for an end-users' biographic information.	1-*	
UserId	Element of UserIdBioInfo This element uniquely identifies an end user.	0-1	Defined in Table 4.
ControlledUserInfo TypeString	Element of UserIdBioInfo Identifies controlled end-user information type.	0-*	Defined in Table 3.
ControlledUserInfo TypeDate	Element of UserIdBioInfo Identifies controlled end-user information type.	0-*	Defined in Table 3.
ControlledUserInfo TypeAddress	Element of UserIdBioInfo Identifies controlled end-user information type.	0-*	Defined in Table 3.

Table 21 – Data structure for "measurement report" with service-common events and/or samples

Element	Description	Support/ type	Notes or value domain
TDLocation	Element of MeasurementReport Container for location elements.	0-1	Defined in Table 4.
UserList	Element of MeasurementReport Container for one or more end-user(s) information.	0-1	Defined in Table 4. NOTE – Only end users who have given permission levels 1-3 per Table 3 are included.
UserPresent	Element of MeasurementReport Container for end-user presence information from one source.	0-*	Defined in Table 4.
GenericUserInfo	Element of MeasurementReport This element is a container for end user and generic end-user info to be reported for end users present.	0-1	This element is activated by configuring sample set identifier GenericUserInfo of Table 6. Used for permission levels 2 or 3.
UserIDGenericInfo	Element of GenericUserInfo Container for individual end-user information.	1-*	
AnonUserID	Element of UserIDGenericInfo Generated number which persistently is used for one end user.	0-1 (Note 1)	Defined in Table 4.
UserID	Element of UserIDGenericInfo This element uniquely identifies an end user.	0-1 (Note 1)	Defined in Table 4.
GenericUserInfoType	Element of UserIDGenericInfo Identifies generic end-user information type.	0-*	Defined in Table 4.
GenericUserInfoValue	Attribute of GenericUserInfoType Identifies generic end-user information value.	1	Defined in Table 4.
UserInfoChange	Element of MeasurementReport Indicates that an end user has changed their end-user information. Container for end-user ID and end-user info.	0-1	NOTE – End users who have given permission levels 2-3 per Table 3 are included.
AnonUserID	Element of UserInfoChange Generated number which persistently is used for one end user.	0-1 (Note 1)	Defined in Table 4.

Table 21 – Data structure for "measurement report" with service-common events and/or samples

Element	Description	Support/ type	Notes or value domain
UserID	Element of UserInfoChange This element uniquely identifies an end user.	0-1 (Note 1)	Defined in Table 4.
ControlledUserInfo TypeString	Element of UserInfoChange Identifies controlled end-user information type.	0-*	Defined in Table 3.
ControlledUserInfo TypeDate	Element of UserInfoChange Identifies controlled end-user information type.	0-*	Defined in Table 3.
ControlledUserInfo TypeAddress	Element of UserInfoChange Identifies controlled end-user information type.	0-*	Defined in Table 3.
GenericUserInfoType	Element of UserInfoChange Identifies generic end-user information type.	0-*	Defined in Table 3.
GenericUserInfoValue	Attribute of GenericUserInfoType Identifies generic end-user information value.	1	Defined in Table 3.
PermitBlockedInfo	Element of MeasurementReport Container for flags indicating that configured measurements were blocked due to a constraining end-user permit.	0-1	NOTE – Defined in Table 4.
NOTE 1 – Either AnonUserID or UserID must be present. NOTE 2 – The ServiceInstanceID of an IPTV service is reported when it becomes the audio focus of the end user, the ServiceInstanceID of an IPTV service which loses audio focus is reported only when a non-IPTV service or an IPTV service which is not to be reported becomes the focus.			

```
MeasurementReport (0-1)
| MeasurementRequestID (1)
| MeasurementReportTriggerTime (1)
| DisplayStatus (0-1)
| AudioFocus (0-1)
| | ServiceInstanceID (1)
| | IPTVFocus (0-1)
| CaptionLanguageChange (0-1)
| | ServiceInstanceID (1)
| | CaptionLanguage (1)
| AudioLanguageChange (0-1)
| | ServiceInstanceID (1)
| | AudioLanguage (1)
| AudioVolume(0-1)
| | ServiceInstanceID (1)
| | VolumeDirection (1)
| VideoObscure (0-1)
| | ServiceInstanceID (1)
| | Obscuration (1)
| VideoZoom (0-1)
| | ServiceInstanceID (1)
| | ZoomFactor (1)
| VideoResize (0-1)
| | ServiceInstanceID (1)
| | ImageWidth (1)
| | ImageHeight (1)
| EventCount (0-*)
| | EventsCounted (0-1)
| | ServiceInstanceID (1)
| | StartTime (1)
| DeviceInformation (0-1)
| | STBInformation (0-1)
| | AudioAmplifierInformation (0-1)
| | TVInformation (0-1)
| | MobileDeviceInformation (0-1)
| | PCInformation (0-1)
| UserBiographicInformation (0-1)
| | UserIdBioInfo (1-*)
| | | UserId(0-1)
| | | ControlledUserInfoTypeString (0-*) [ ControlledUserInfoValueString (1) ]
| | | ControlledUserInfoTypeDate (0-*) [ ControlledUserInfoValueDate (1) ]
| | | ControlledUserInfoTypeAddress (0-*) [ ControlledUserInfoValueAddress (1) ]
```

```
| TDLocation (0-1)
| UserList (0-1)
| | UserIDInfo (1-*)
| | | AnonUserID (0-1)
| | | UserID (0-1)
| | | UserIDMethod (0-1)
| | | UserIDConfidence(0-1)
| UserPresent (0-*)
| | PresenceMethod (0-1)
| | PresenceTime (0-1)
| | PresenceConfidence (0-1)
| GenericUserInfo (0-1)
| | UserIDGenericInfo (1-*)
| | | AnonUserID (0-1)
| | | UserID(0-1)
| | | GenericUserInfoType (0-*) [ GenericUserInfoValue (1) ]
| UserInfoChange (0-1)
| | AnonUserID (0-1)
| | UserID (0-1)
| | ControlledUserInfoTypeString (0-*) [ ControlledUserInfoValueString (1) ]
| | ControlledUserInfoTypeDate (0-*) [ ControlledUserInfoValueDate (1) ]
| | ControlledUserInfoTypeAddress (0-*) [ ControlledUserInfoValueAddress (1) ]
| | GenericUserInfoType (0-*) [ GenericUserInfoValue (1) ]
| PermitBlockedInfo (0-1)
| | PermissionLevelFlag (0-1)
| | TerminalDeviceTypeFlag (0-1)
| | ChannelFlag (0-1)
```

Figure 21 – Alternative representation of MeasurementReport data structure

6.2.11.1   Metadata for identification of end users

It may be assumed that the user of a single-end-user device is the same most of the time: as an example, a single mobile phone subscriber. However, a set of family mobile phones may only have the associated subscriber identity rather than the end user of each phone. In the case of a shared device such as a TV, it is less evident that it is the subscriber who is watching rather than others. For shared devices like TVs, multiple simultaneous viewers may be watching. Furthermore, certain devices, such as TVs, may be left playing out content without any viewer present.

This is why the following elements are defined: "UserIDConfidence", support for multiple simultaneous end-user information, and code flags to identify techniques used to detect the presence of one or more end users, to distinguish among anonymous end users, and to identify end users.

6.2.12   Data structure for "audience measurement report package"

As there may be several measurement reports ready for delivery to the aggregation functions, a data structure for measurement reporting is defined to be able to include one or more measurement reports if necessary.

Figure 22 contains an alternative representation of the "audience measurement report package" data structure.

Table 22 – Data structure for audience measurement report package

Element	Description	Support/ type	Notes or value domain
AMReport Package	Container for a set of measurement reports.	1	
SubscriberID	Element of AMReportPackage This element contains the identification of the subscriber to the services of the associated service provider.	0-1	Defined in Table 4. Required when configuration push mode is used.
Terminal DeviceID	Element of AMReportPackage This element uniquely identifies the end user's terminal device based on the device's MAC address.	1 xs:hexBinary length = 16 octets (128 bits)	
Storage Congestion ImpactedService	Element of AMReportPackage ServiceInstanceID impacted by dropping information due to storage congestion policy and priority since the previous measurement report message.	0-*	Defined as ServiceInstanceID in Table 2.
ServiceStop Dropped	Attribute of StorageCongestionImpacted Service Indicates that the ServiceStop event has been dropped for this ServiceInstanceID.	0-1 xs:boolean Default: False	
Measurement Report	Element of AMReportPackage Container for a measurement report.	1-* (Note)	Defined in Table 21 and extended in [ITU-T H.741.3].
NOTE – If an empty report is ready to be sent and there are no non-empty reports ready to be sent, then the empty report is sent in the measurement report package. If a non-empty report is ready to be sent, then it is recommended to ignore the empty report . When there are multiple empty reports ready, only the most recent empty report is required to be sent in the measurement report package.			

```
AMReportPackage (1)
 | SubscriberID (0-1)
 | TerminalDeviceID (1)
 | StorageCongestionImpactedService (0-*) [ ServiceStopDropped (0-1) ]
 | MeasurementReport (1-*)
```

Figure 22 – Alternative representation of AMReportPackage data structure

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