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Amendment 1
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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

Application event handling for IPTV services

**Amendment 1: New video handling sensor event
scenario in Appendix II**

Recommendation ITU-T H.740 (2010) – Amendment 1

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

Recommendation ITU-T H.740

Application event handling for IPTV services

Amendment 1

New video handling sensor event scenario in Appendix II

Summary

Recommendation ITU-T H.740 provides a framework for application event handling for IPTV, such as emergency alert and audience measurement. This Recommendation provides a basic framework for application event model, application event description and notification, metadata model, delivery methods and security mechanism for application event for IPTV.

Amendment 1 includes a new use case about a video handling sensor event. This event can be used as supplemental information on audience measurement and other IPTV applications.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.740	2010-03-22	16
1.1	ITU-T H.740 (2010) Amend. 1	2011-03-25	16

FOREWORD

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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.

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1   Scope

This Recommendation provides a framework for application event handling for IPTV. An application event is a specific user interaction or an occurrence related with multimedia content in IPTV. This Recommendation describes general aspects for IPTV application event services, such as emergency alert and audience measurement. This Recommendation provides a basic framework for application event model, application event description and notification, metadata model, delivery methods and security mechanism for application event for IPTV.

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.

[IETF RFC 2046]   IETF RFC 2046 (1996), *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*.

3   Definitions

3.1   Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

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

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

3.1.3   content [b-ITU-T T.174]: Encoded generic value, media or non-media data.

3.1.4   end-user [b-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.

3.1.5   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.

3.1.6   IPTV terminal device [b-ITU-T Y.1901]: A terminal device which has ITF functionality, e.g., a set-top box.

3.1.7   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 user cannot control the temporal order in which contents are viewed.

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

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

3.1.10   service provider [b-ITU-T M.1400]: A general reference to an operator that provides telecommunication services to customers and other users either on a tariff or contract basis. A service provider may or may not operate a network. A service provider may or may not be a customer of another service provider.

3.1.11   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 audiovisual media player.

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

NOTE – The viewing may occur sometime after the selection of the video content.

3.2   Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1   application event: An application event is every user interaction or occurrence related with multimedia contents in IPTV applications. It includes an emergency event from event notification services.

3.2.2   audience measurement: Measuring how many people are in an audience, usually in relation to television viewership, but also newspaper and magazine readership, and increasingly, usage of websites and IPTV service.

NOTE – Measurement may include demographic (e.g., age, gender) and sometimes psychographic information (e.g., personality, values, attitude, interests, lifestyles), to help broadcasters and advertisers determine who is listening, rather than just how many.

3.2.3   set-top box (STB): A device that contains demodulator, de-multiplexer, decoder, other functionalities and interfaces related to signal reception and presentation of the distributed programme at the subscriber's site.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CAP   Common Alerting Protocol

EAN   Emergency Alert Notification

IPTV   Internet Protocol Television

SAME   Specific Area Message Encoding

STB   Set-Top Box

TV   Television

VoD   Video on demand

XML   eXtensible Mark-Up Language

5   Conventions

In this Recommendation:

– The keyword "is required to" indicates a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

– The keyword "is recommended" indicates a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

– The keyword "is not recommended" indicates a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this Recommendation can still be claimed even if this requirement is present.

– The keyword "can optionally" indicates an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6   Concept of application events

Every user interaction or every occurrence related to multimedia content in IPTV is called an event. For example, "playing video", "pressing the red button on the remote controller", or "metadata has changed" can be events. Among the vast and diverse number of events, there are events that are specifically related to applications. These are called application events.

New emerging application areas in IPTV require flexible and efficient integration of event information from different sources under various application requirements.

One example of an application area in which application events are utilized is audience measurement. Audience measurement for IPTV tracks viewership data on an IPTV terminal device, e.g., set-top box (STB), for content providers and service providers. The viewership data consists of the user operation history of audience on IPTV terminal devices. Audience measurement, with end user permission, may allow content providers and service providers to provide audience rating service, track popular programs, craft and target specific advertisements to particular groups of users demonstrating certain surfing patterns. Application measurement can be realized by collecting user events and relevant information to help in providing various kinds of IPTV services.

Another case of an application area in which application events are utilized is "intelligent charging". The multimedia industry could release content onto IPTV and charge subscribers for the content in a trusted way that they actually use by taking advantage of application event concepts. Usage-based charging can be enabled by notifying the event to accounting, charging, and billing systems. Similarly, IPTV could enable pay-per-play charging models for games downloaded to a mobile device by applying event notification services. If users lose interest in the game, they could remove the game and find a better one without incurring additional charges or any financial penalty.

Another use of application event handling could be in enhancing bandwidth usage by the service provider. It is critical for the telecommunication service providers to manage their bandwidth properly. If content can be adapted to the terminal before it is transmitted, it will result in an optimal usage of the bandwidth. Service providers could ask the terminal to notify on its current state such as currently available bandwidth, display capacity, and storage capacity.

The application event and event notification service can be used for different purposes such as target marketing, personalized service by user's behaviour or preference, commerce, monitoring of illegal copies, proof of purchase, managing of network bandwidth, or an emergency alert notification (EAN).

7 Application event handling model

By using an application event, application can know what happened. But to do this, an application event has to have at least two associated concepts: one is the description of the application event, and the other is a way to communicate the application event between functional entities that utilize that application event. For example, a remote controller may describe key events by certain codes, and it notifies the IPTV terminal of that event using that description. Thus, the specification of an application event comprises two components: application event description and application event notification.

7.1 General requirements of application event handling

This clause describes requirements on IPTV terminal device for generating and notifying or receiving application events.

7.1.1 Requirements when receiving an application event

– IPTV terminal device is recommended to have the function to enable the end-user to select whether the terminal receives and processes the application event from another device.

– IPTV terminal device is required to have the function preventing the end-user from turning off, receiving, and processing an emergency event when the emergency information service is available for IPTV terminal device.

7.1.2 Requirements when generating and notifying an application event

– IPTV terminal device is recommended to have the function that the end-user can turn on or off the notification of the application event with the privacy information.

– IPTV terminal device is required to have the function to generate and notify emergency events.

7.2 Application event handling architecture

Figure 1 shows the high level architecture of application event handling from the viewpoint of an application event life cycle. Each component is described and illustrated in Table 1.
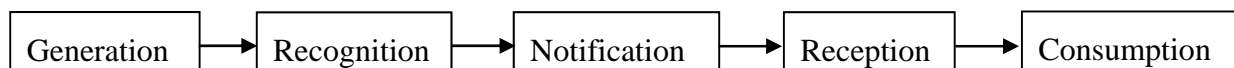

Figure 1 – High level architecture of application event handling

Table 1 – Components of the high level architecture for application event handling

Component	Description	Remote controller example
Generation	Designates the application event generation	When an end-user pushes the channel selection button on the remote controller
Recognition	When a device recognizes that an application event is meaningful	The device recognizes that the end-user wants to change the channel when the channel button is pressed on the remote controller
Notification	Delivery of application events	–
Reception	Designates the reception of application event from other parties.	–
Consumption	Processing and acting upon the application event that was received.	An event is consumed when the TV set changes the channel by acting upon a remote controller application event.

Each component in Figure 1 can be located in end-user functions in Figure 2 (Figure 2 is the same as Figure 10-4 of [b-ITU-T Y.1910]). For some applications, the components from "Generation" to "Notification" may be located out of Figure 2. For example, under emergency communication circumstances, public authorities and community groups generally act as emergency message providers. These emergency providers are located out of components in Figure 2 of [b-ITU-T Y-Sup.5].
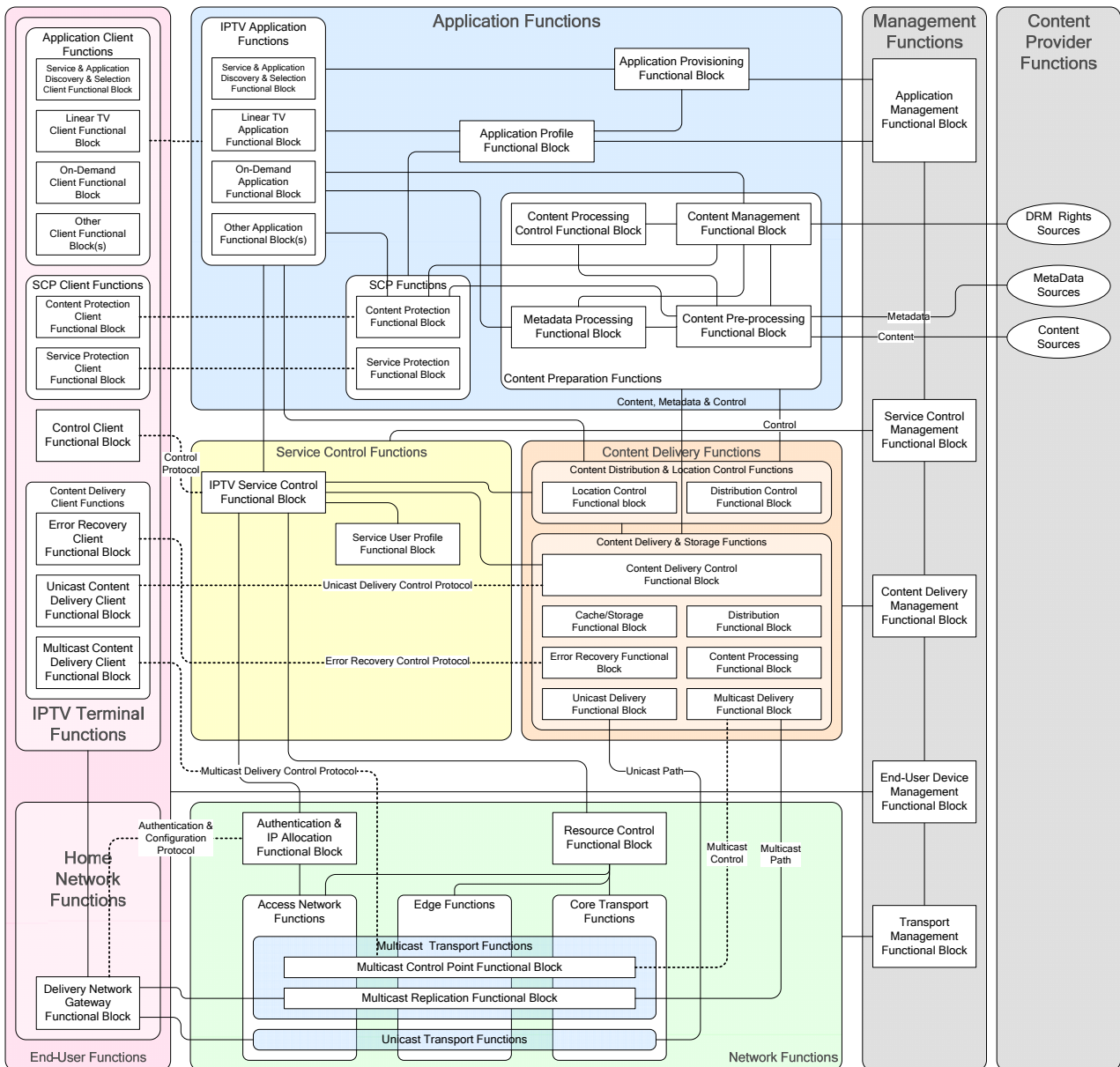
Figure 2 – Detailed IPTV functional architecture as per [b-ITU-T Y.1910]

8 Application event description

The following provides major aspects that an application event description has to include. Note that this list is not comprehensive:

– Action holder of application event

– Application event occurrence time

– Transport/delivery mechanism of application event

– Payload data that describes the application event

For the event description for emergency event handling, the common alerting protocol (CAP) can be used.

For applications other than emergency event handling, it is recommended that the application event be clearly described.

8.1 Common alerting protocol

The common alerting protocol (CAP) [b-ITU-T X.1303] is an extensible mark-up language (XML) [b-W3C XML] based data format for exchanging public warnings and emergencies between alerting technologies. CAP allows a warning message to be consistently disseminated simultaneously over many different warning systems to many applications. The CAP format is compatible with emerging technologies such as the web services, as well as existing formats including the specific area message encoding (SAME), while offering enhanced capabilities that include:

– Flexible geographic targeting using latitude/longitude "boxes" and other geospatial representations in three dimensions;

– Multilingual and multi-audience messaging;

– Phased and delayed effective times and expirations;

– Enhanced message update and cancellation features;

– Template support for framing complete and effective warning messages;

– Digital encryption and signature capability; and

– Facility for digital images, audio and video.

Each CAP Alert Message consists of an `<alert>` segment, which may contain one or more `<info>` or `<area>` segments. Under most circumstances, CAP messages with a `<msgType>` value of "Alert" should include at least one `<info>` element.

9 Application event notification

Application event description and notification can be used with different IPTV terminal devices and may be generalized and utilized across IPTV functional domains. For example, "playing video" is an instance of the end user's content consumption that is an application event, and it is usually described and notified to several entities, such as content providers and service providers. The application event notification can be used for a core of concerns: access, delivery and management of content, repurposing content based on user preferences and device capabilities.

Examples where application event notification may be requested include:

– Service/content usage notification

– Metadata change notification

– Financial notification

– Proof of purchase

– License purchase and delivery

The following are the requirements of the application event handling:

– It is recommended that an application event notification be able to communicate events amongst IPTV functional domains beyond a functional domain.

– It is recommended that an application event notification do not cause increase but minimize processing time and load on traffic.

– It is recommended that an application event notification mechanism be able to specify the condition under which an application event is deemed to have occurred.

10 Metadata for application event handling

Application event metadata are descriptive information that can be parsed by applications for analysing an event. It is recommended that service providers, content providers, and all other functional entities in an IPTV domain be able to acquire the desired information through event notification and description.

It is recommended that an application event description provide sender information, recipient information, event information, and other descriptive metadata about the event.

The elements identified in Table 2 are recommended in application event metadata.

Table 2 – Recommended elements for application event metadata

Element	Purpose	Presence
Identifier	Uniquely identifies a certain event description message	Mandatory
Message type	Denotes the nature of the event description message. For example, "Message type" may be among "Notification", "Update", "Cancel", "Ack", and "Error", as follows: – "Notification" means initial event information notifying targeted recipients. – "Update" means updating and superseding the earlier message. The relevant earlier message can be identified in "Reference Message Identifier" described below. – "Cancel" means cancellation of an earlier message. The relevant earlier message can be identified in "Reference Message Identifier". – "Ack" means acknowledgement of reception and acceptance of the message. The relevant earlier message can be identified in "Reference Message Identifier". – "Error" indicates rejection of the messages identified in "Reference Message Identifier".	Mandatory
Reference message identifier	Denotes the message identifier of an earlier event description message referenced by current event description message. It is possible that multiple messages are referenced in a message by the use of "Reference message identifier".	Mandatory
Event information	Describes an event including some of following elements: – "Description" means additional text describing the subject event. – "Event data" means the place for inclusion of "payload" data for describing an event. It is recommended to consist of pairs of parameter (parameter name) and its value (parameter value) which are notified to the recipients. – "Event time" means the time and the date of the event occurrence. – "Resource" refers to an additional file with supplemental information related with this "Event information", e.g., a video, audio, or image file. – "Description" means the text describing the content and the kind of the resource file, e.g., "photo", "map". – "MIME Type" means the identifier of MIME [IETF RFC 2046] content type and sub-type describing the resource file. – "Size" means the approximate size of the resource file. – "URI" means the identifier of the hyperlink for the resource file.	Mandatory
Expiry date	The purpose of "Expiry date" is to indicate the expiry time of the information of the event description message.	Optional

Table 2 – Recommended elements for application event metadata

Element	Purpose	Presence
Sender information	Identifies the originator of the event description message. It is recommended to have a globally unique identifier and some additional elements such as sender's name, location and descriptive information.	Optional
Recipient information	Identifies the recipient of the event description message. It is possible that recipients of the event description message are multiple. It is recommended that "Recipient information" have a globally unique identifier and some additional elements such as sender's name, location and descriptive information. It is recommended that "Recipient information" have the same metadata structure with the sender.	Optional
Forward information	Identifies an entity which receives the forwarded event description message. As for "Sender information" and "Recipient information", it is recommended that "Forward information" have a globally unique identifier and some additional elements such as sender's name, location and descriptive information. It is recommended that "Forward information" have the same metadata structure with the sender and recipient.	Optional

11   Delivery methods

Details of delivery protocols concerning application event handling are left for further study. Appendix I shows relevant information.

12   Security mechanism for application event

When application events are related to user privacy information, privacy protection laws in each country, region and/or those described in specifications or standards such as [b-OECD PPTFPD], [b-ISO/IEC 27001] and [b-ISO/IEC 27002], and IPTV or interactive broadcasting related Recommendations such as [b-ITU-T X.1191] and [b-ITU-R BT.2052] need to be respected. This means end-user permission is required when collecting, transferring, and using the user privacy data in audience measurement servers and e-commerce servers.

Appendix I

Delivery methods

(This appendix does not form an integral part of this Recommendation.)

Relevant standards for format and encoding of application event record or metadata in this Recommendation are as follows:

– Metadata is encoded in XML [b-W3C XML].

– Application event record can optionally be encoded in XML.

– Metadata and application event record encoded in XML can optionally be compressed by using Fast Infoset [b-ITU-T X.891], ZLIB including GZIP format [b-ETSI TS 102 472] or BiM [b-ISO/IEC 23001-1].

Relevant standards of transport mechanisms for the delivery of application event and metadata over IP in this Recommendation are as follows:

– HTTP version 1.1 [b-IETF RFC 2616] for application event or metadata delivery over unicast.

– HTTP over TLS [b-IETF RFC 2818] for application event or metadata delivery over secured unicast.

– TFTP [b-IETF RFC 1350] for application event or metadata delivery over unicast.

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

Appendix II

Scenarios for application event handling

(This appendix does not form an integral part of this Recommendation.)

II.1   Emergency alert notification scenario

Natural or man made disasters such as earthquakes, fires, typhoons, snow storms, or catastrophic flooding can happen and the public needs to be notified. These emergencies need to have timely notification mechanisms to inform people about their occurrence and to instruct them on the appropriate course of action to be taken. IPTV can be one of the effective means for such communications.

Figure II.1 shows an example event notification scenario for emergency alert service on IPTV.

As depicted in the figure, when an emergency happens, an emergency monitoring client instantly sends the emergency alert notification to an emergency-handling server including the information on the kind of emergency that has occurred, where it has occurred, how severe it is, etc. The emergency handling server aggregates and possibly analyses the emergent alert information from many monitoring clients, and sends them to IPTV users.
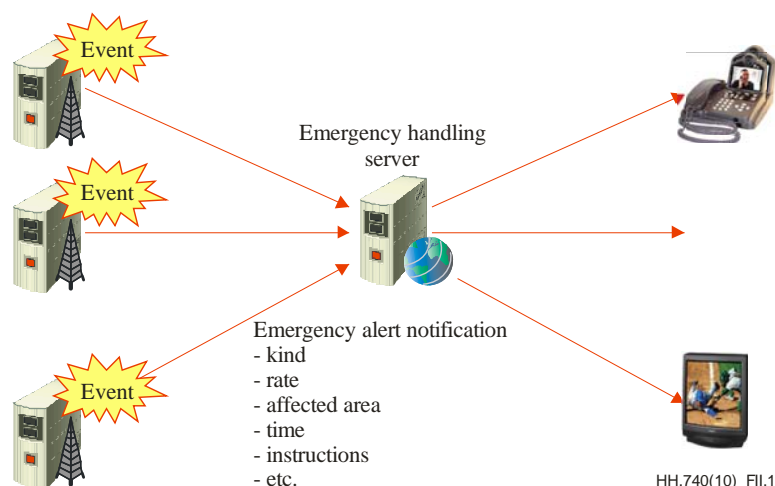

Figure II.1 – Application event notification scenario for emergency alert

II.2   Interactive advertisement and T-commerce notification scenario

On IPTV, enhanced advertisements are possible for audience-participating event advertisement, surveying advertisement, and product selling T-commerce advertisement.

Figure II.2 describes a T-commerce use case scenario which can associate a particular event on application with advertisement.

While a user is watching a drama on IPTV, the user may decide to purchase (order or download) the background music. Then, the service provider and/or content (music) provider has to know about that event and do the appropriate processing to let the user purchase (e.g., download) the music. The event information can be sent to the server via the event notification from the IPTV terminal.

When the user presses the "ok" button to purchase the music, the application event occurs and notifies the server with information such as user ID, purchased item, price, relevant movie, and advertisement. Then the content provider can send the music to the terminal so that the user can download it. The event notification can also be sent to the interactive advertisement provider as well, for example, to calculate the advertisement cost per the content purchase.

This scenario shows how application event notification can be used for T-commerce service and for analysing the advertisement effectiveness based on audience activity on IPTV. By utilizing the application event notification, the service provider can target the advertisement to a particular action associated with the content or application.
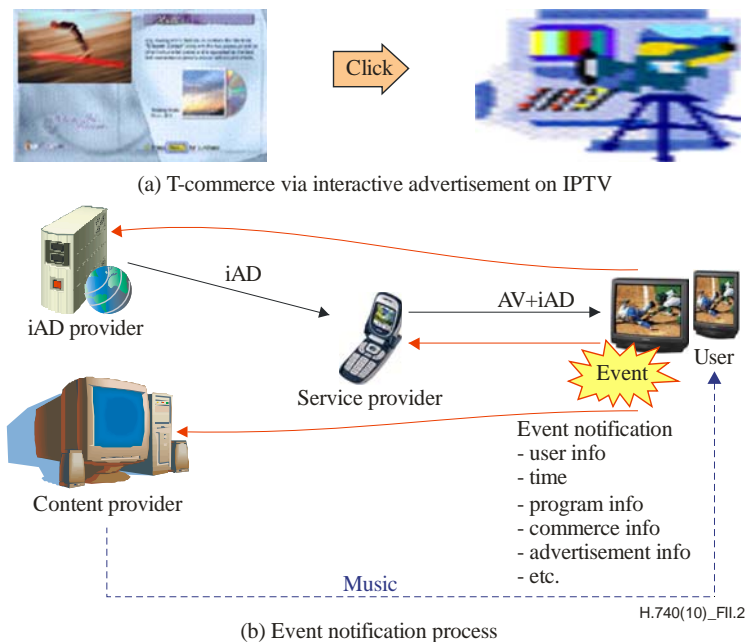

(a) T-commerce via interactive advertisement on IPTV

(b) Event notification process

Figure II.2 – Application event notification scenario for interactive advertisement

II.3 Audience measurement application scenario

Audience measurement surveys audience behaviour with end-user permission by detecting application events in IPTV services. Audience measurement application may allow the content provider and the service provider to provide audience rating service, tracking popular programs, crafting and targeting specific advertisements to particular groups of users demonstrating certain surfing patterns.

Privacy protection laws in each country or region or those identified in specifications and standards such as [b-OECD PPTFPD], [b-ISO/IEC 27001] and [b-ISO/IEC 27002], and IPTV or interactive broadcasting related Recommendations such as [b-ITU-T X.1191] and [b-ITU-R BT.2052] need to be respected. End-user permission is necessary when collecting, transferring, and using user privacy data into or in a viewership data tracking server.

Audience measurement can be used on various IPTV services such as linear TV, VoD, etc. One of the audience measurement applications is audience rating service for linear TV that handles the channel transition event information indicating when an end-user watches a TV program. Ideally, this event information consists of a channel number before and after channel change, time of change, and end-user information (e.g., a unique identifier). With end-user permission, information can be collected at several points, such as terminal device (STB, PC, or TV), home gateway, and network component. As the IPTV network is used for TV service in IPTV, the home gateway and/or network component may also detect channel transition information by monitoring IP packets between terminals and the network. The IPTV network is used to upload the collected information to the content distribution side at predetermined timing intervals.

Figure II.3 shows an audience measurement scenario applying application event notification on IPTV.
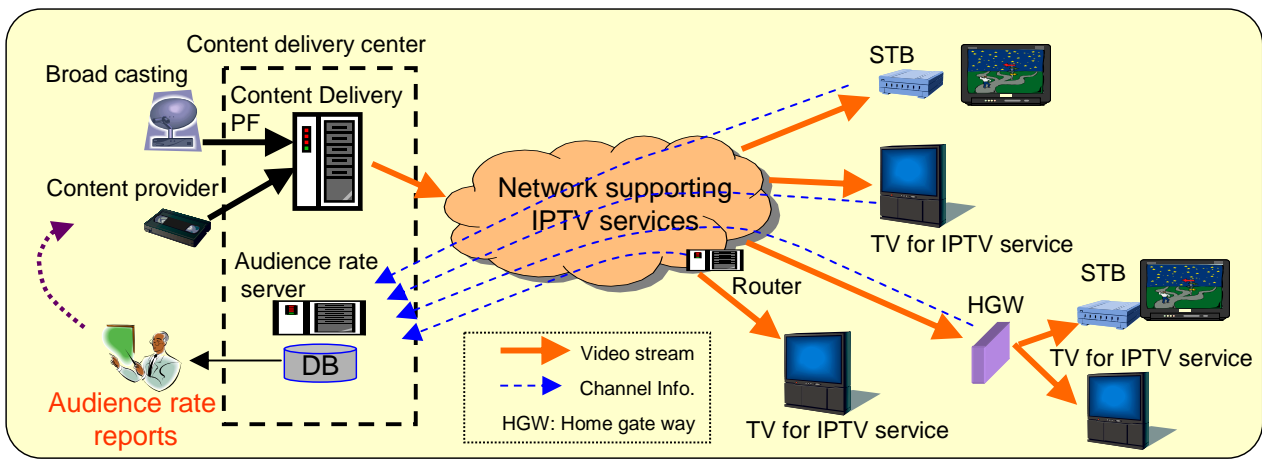
Figure II.3 – Application event notification scenario for audience measurement

II.4 Video sensor devices event scenario

A video sensor is a device that generates useful information concerning, for example, gender and age of persons, their emotions, or their number and movements, by processing video data captured by a camera. When combined with this device, IPTV terminal devices can, for example, recognize the state and attributes of the end-user.

The permission by an end-user that sensor server functions collect such information will be useful for new IPTV services, such as targeted advertising and interactive programmes. Gender information may be useful in creating gender-specific advertisements, and motion and gesture recognition may facilitate the collection of users' responses to questionnaires or quizzes (see Figure II.4-1).

With regard to home use, if an application on the home gateway implements the sensor server functions, then, for example, tablet terminals connected with such sensor server functions may indicate whether end-users are watching television or not, by counting the audience (see Figure II.4-2). Switching off unwatched television sets helps managing electric power consumption. This application must not deliver information to a network outside of the home without the end-user's permission.

Video sensor information is not video information, but video-derived information. Video sensor information is more serious and private than audience measurement based on usage history of IPTV services. Video sensor information must, therefore, be treated more securely to ensure that privacy is safeguarded against extraction or opening of personal data. To avoid running the risk of revealing private information, the following items must be studied:

– Standardization of metadata transmitted between IPTV terminal devices measuring information and servers aggregating such information.
– Clarification of the risks when processing this information.
– Requirements and functions to avoid the risk of privacy infringements.
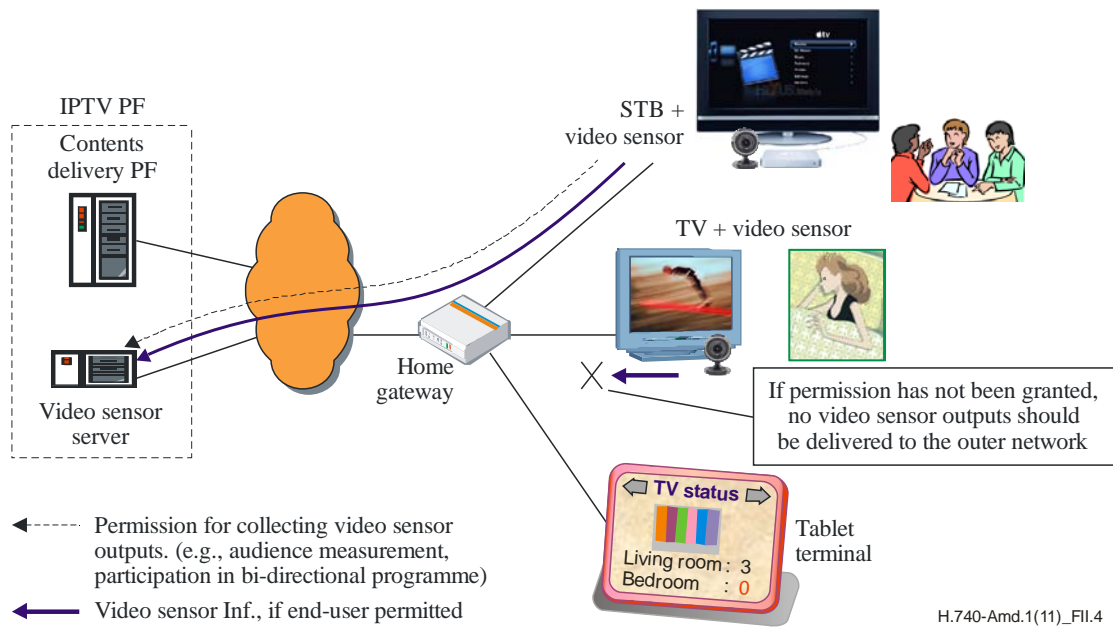
Figure II.4 – Video sensor device event scenario for audience measurement or bi-directional program
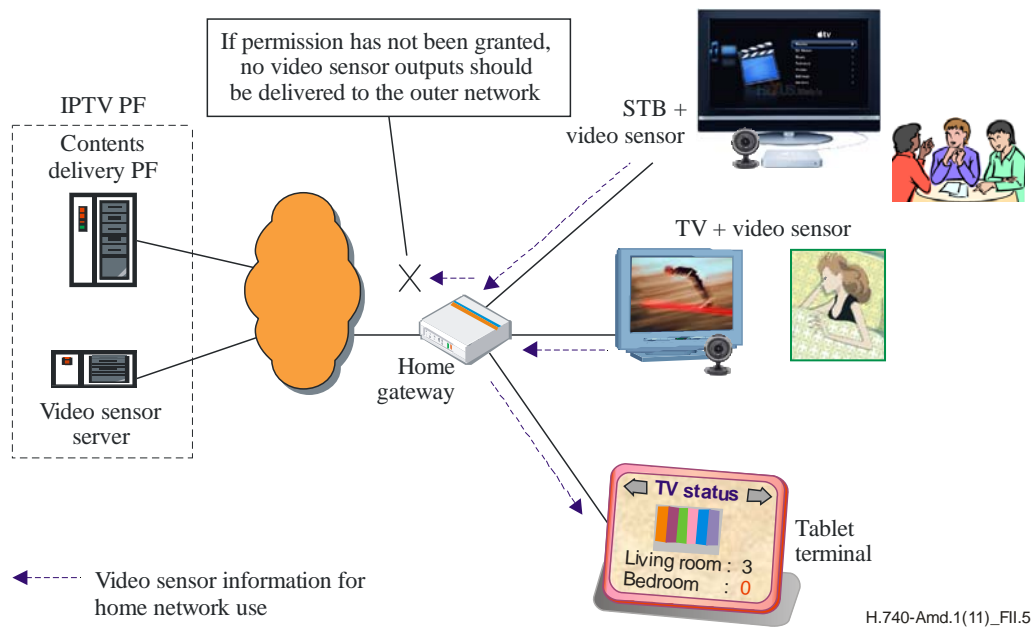

Figure II.5 – Video sensor device event scenario for in-house electric power management

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