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스마트사이니지포럼 표준(영문표준)
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디지털 사이니지:
이용자 행태 측정 서비스

Digital Signage:
Audience measurement services

스마트사이니지포럼
SMART SIGNAGE FORUM

표준초안 검토 위원회 기술표준분과

표준안 심의 위원회 운영위원회

	성명	소 속	직위	위원회 및 직위	표준번호
표준(과제) 제안	허미영	한국전자통신연구원	책임연구원	기술표준분과-분과원	
표준 초안 작성자	허미영	한국전자통신연구원	책임연구원	기술표준분과-분과원	
사무국 담당	장신석	스마트사이니지포럼	선임연구원	-	

본 표준 발간 이전에 접수된 지식재산권 확약서 정보는 본 표준의 '부록(지식재산권 확약서 정보)'에 명시하고 있으며, 이후 접수된 지식재산권 확약서는 SSF 웹사이트에서 확인할 수 있습니다.
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발행인 : 스마트사이니지포럼 의장
발행처 : 스마트미디어산업진흥협회(스마트사이니지포럼 사무국)
05510, 서울시 송파구 올림픽로35가길 11 한신코아오피스텔 1219호
Tel : 02-529-3001, Fax : 02-529-1913
발행일 : 20xx.xx

서문

1 표준의 목적

이 표준의 목적은 디지털 사이니지 단말 주변의 이용자나 환경 측정 정보를 디지털사이니지 사업자에게 전달함으로써 향상된 서비스 (예, 이용자 맞춤형 서비스나 주변 환경에 최적화된 정보나 광고 서비스 등)를 제공하기 위한 기반 정보를 제공하고자 한다.
이를 위하여, 본 표준에서는 디지털 사이니지 사업자와 디지털 사이니지 단말사이에 디지털 사이니지 단말 주변의 이용자 및 환경 정보의 교환을 위한 오퍼레이션 (예, 측정 환경 설정, 측정 정보 요청, 측정 정보 응답 등)을 정의한다. 오퍼레이션을 통해 상호 교환되는 정보는 메타데이터로 정의하고 있으며, 각 메타데이터에서는 세부 엘리먼트 및 데이터 구조 등을 포함하고 있다.

2 주요 내용 요약

이 표준은 디지털 사이니지 사업자와 디지털 사이니지 단말사이에 디지털 사이니지 단말 주변의 이용자 및 환경 정보의 교환과 관련된 요구 사항, 오퍼레이션, 메타데이터 등을 기술하고 있다.
오퍼레이션은 측정 환경 구성 설정, 측정 정보 요청, 측정 정보 리포트 등이 있으며, 이들 오퍼레이션을 위한 정보는 각각 메타데이터로 기술한다. 메타데이터는 각 오퍼레이션을 위한 측정 환경 설정 정보, 측정 정보 요청 정보, 측정 정보 리포트 정보 등의 컨테이너가 있으며, 이들 컨테이너에서 참조하는 이용자 행태 측정 정보 및 주변 환경 정보 등을 기술하고 있다. 각 컨테이너에서는 세부 엘리먼트 별 의미 및 값, 데이터 타입, 강제 및 선택 여부 등을 표현하고 있다.
본 표준에서 정의한 디지털 사이니지 이용자 행태 측정 서비스 표준은 ITU-T SG 16 (Multimedia)에서 정의한 ITU-T H.783 (2018.XX) 표준을 기반으로 한 TTA 영문 표준이다.

3 인용 표준과의 비교

3.1 인용 표준과의 관련성

이 표준은 ITU-T H.783 ("Digital signage: Audience measurement services“, 2018) 표

준의 영문 전문 전체를 수용하는 표준이다.

3.2 인용 표준과 본 표준의 비교표

SSF-ST-xxx	ITU-T H.783	비고
1. 범위	1. Scope	동일
2. 참조 표준	2. Reference	동일
3. 용어	3. Definition	동일
4. 약어	4. Abbreviations and acronyms	동일
5. 관례	5. Conventions	동일
6. 디지털 사이니지 서비스의 이용자 행태 측정 개요	6. Overview of audience measurement of digital signage services	동일
7. 기능 요구 사항	7. Functional requirements	동일
8. 이용자 행태 측정 데이터를 위한 환경 설정 및 오퍼레이션	8. Configuration and operations to provide audience measurement data	동일
9. 이용자 행태 측정 데이터를 위한 메타데이터	9. Metadata to provide audience measurement data	동일
부 록 I. 이용자 행태 측정 기능이 있는 디지털 사이니지 서비스의 사용 케이스	Appendix I Use cases of digital signage services with audience measurement functionality	동일
부 록 II-4. 참고 문헌	Bibliography	동일

Preface

1 Purpose

The purpose of this standard is to provide base information to provide enhanced services (e.g., customized services or advertising services optimized for the surrounding environment) through the delivery of users or environment measurement information around digital signage terminals.

For this purpose, this standard defines operations for the exchange of user and environment information around digital signage terminals between digital signage operators and digital signage terminals (e.g., setting up measurement preferences, requesting measurement information, responding to measurement information). Information exchanged through the operation is defined as metadata, each of which includes detailed elements and data structures.

2 Summary

This standard describes requirements, operations, and metadata related to the exchange of user and environment information around digital signage terminals between digital signage operators and digital signage terminals.

The operations include configuration of the measurement environment, requests for measurement information, and reports of measurement information, each describing the information as metadata.

Metadata includes containers such as configuration of measurement information, request of measurement information, and report of measurement information, and describes audience measurement information and environment information referenced by these containers.

Each container represents the meaning and value, data type, mandatory and optional attribute of each detail element.

This standard is a TTA standard on defining audience measurement services for digital

signage which is based on ITU-T H.783 (2018.XX) recommendation developed by ITU-T SG SG16 Multimedia.

3 Relationship to Reference Standards

3.1. Relationship of Reference Standards(recommendations)

This standard is fully equivalent to ITU-T H.783 ("Digital signage: Audience measurement services", 2018).

3.2. Differences between Reference Standard(recommendation) and this Standard

TTAE.IT-H.783	ITU-T H.783	Remarks
1. Scope	1. Scope	equivalent
2. Reference	2. Reference	equivalent
3. Definition	3. Definition	equivalent
4. Abbreviations and acronyms	4. Abbreviations and acronyms	equivalent
5. Conventions	5. Conventions	equivalent
6. Overview of audience measurement of digital signage services	6. Overview of audience measurement of digital signage services	equivalent
7. Functional requirements	7. Functional requirements	equivalent
8. Configuration and operations to provide audience measurement data	8. Configuration and operations to provide audience measurement data	equivalent
9. Metadata to provide audience measurement data	9. Metadata to provide audience measurement data	equivalent
Appendix I Use cases of digital signage services with audience measurement functionality	Appendix I Use cases of digital signage services with audience measurement functionality	Equivalent
Bibliography	Bibliography	Equivalent

목 차

디지털 사이니지 이용자 행태 측정 서비스

(Digital Signage: Audience measurement services)

1. Scope

This Recommendation describes functional requirements, configuration and operations, and metadata on audience measurement for digital signage services between audience measurement client and audience measurement aggregation.

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.741.2] Recommendation ITU-T H.741.2 (2012), *IPTV application event handling: Data structures of audience measurement for IPTV services.*

[ITU-T H.780] Recommendation ITU-T H.780 (2012), *Digital Signage: Service requirements and IPTV-based architecture.*

[ITU-T H.781] Recommendation ITU-T H.781 (2015), *Digital Signage: Functional architecture.*

[ITU-T H.782] Recommendation ITU-T H.782 (2017), *Digital Signage: Metadata.*

[ISO 19136] ISO 19136 (2007), *Geographic information -- Geography Markup Language (GML).*

[ISO/IEC 8802-11] ISO/IEC 8802-11(2012), *Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications.*

[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).*

[W3C XMLSchema] W3C Recommendation (2004), *XML Schema Part 2: Datatypes Second Edition*.

3. Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 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.

3.1.2 content [ITU-T H.780]: A combination of audio, still image, graphic, video, or data.

NOTE – Variety of formats is classified as the "data" (e.g., text, encoded values, multimedia description language like HTML)

3.1.3 digital signage [ITU-T H.780]: A form of electronic display that shows information, advertising and other messages in accordance with the time of day and the location of the display. Contents and their relevant information such as display schedules are delivered over networks.

3.1.4 identification [b-ITU-T X.1252]: The process of recognizing an entity by contextual characteristics.

3.1.5 personally identifiable information [b-ITU-T X.1252]: Any information a) that identifies or can be used to identify, contact, or locate the person to whom such information pertains; b) from which identification or contact information of an individual person can be derived; or c) that is or can be linked to a natural person directly or indirectly.

NOTE – In general, this information contains identifiers such as user's name, social identification number, device id, phone number, RFID codes and so on.

3.1.6 playlist [ITU-T H.780]: Composed of a list of contents.

NOTE 1 – This data is created and provided by digital service providers.

NOTE 2 – This data can be selected by an end-user when interactivity is supported in a digital signage terminal device.

NOTE 3 – This data may indicate an order of playing contents.

3.1.7 playlist schedule [ITU-T H.780]: Composed a list of playlists indicated by specific play date and/or time.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 active audience: Audience interacting with terminal devices.

3.2.2 audience: Listeners or viewers engaging in multimedia services**.**

3.2.3 audience information: The overall information about audience behaviour, and the rel ated information, during the time that audience measurement is in active.

3.2.4 audience measurement: The measurement of audience within digital signage services.

3.2.5 audience measurement aggregation: The functions that configures audience measurement client, receive audience measurement data from it.

3.2.6 audience measurement client: The functions that sends audience measurement data to audience measurement aggregation functions.

3.2.7 audience measurement data: Audience behaviour data which is related to a service and contents consumption, combined or not with audience information. Audience measurement data is a result from the audience measurement client delivered to the audience measurement aggregation. The data includes results from the audience measurement metric, ambient information of the terminal, etc.

3.2.8 audience measurement metric: A set of information that is extracted through analysis of the raw audience data (e.g., the number of audience, gender, rough ages).

3.2.9 audience measurement report: A report from the audience measurement aggregation to the stakeholder or other applications that represents the effect of advertising contents and characteristics of the venue of the terminal installed with statistical analysis on the series of audience measurement data.

3.2.10 audience measurement system: The system which captures audience raw data, extracts audience measurement metrics and analyse for making audience measurement report on audience behaviour by detecting application events and using raw data from input devices such as camera, microphone, sensor devices and so on within the service.

3.2.11 location owner: A person or organization that owns or manages the venue.

NOTE – It is general that digital signage service provider rents a venue for installation of their terminal.

3.2.12 passive audience: Audience without interacting with terminal devices.

3.2.13 passer-by: A person without stopping nearby locations of multimedia services within the predetermined time and distance.

3.2.14 raw audience data: A raw data that is captured by input devices of a terminal device such as camera, microphone, sensor devices, etc.

3.2.15 venue: A place or location that a terminal device is located.

4. Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AM	Audience Measurement
DS	Digital Signage
DS-AM	Digital signage system with audience measurement functions
IPTV	Internet Protocol Television

NFC	Near Field Communication
PII	Personally Identifiable Information
XML	eXtensible Markup 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 document 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 “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 the specification.

This Recommendation follows the notation described in clause 5 of [ITU-T H.782]. The notation is used in this Recommendation to facilitate the specification of the corresponding schema:

– Element/Attribute: Name of element or attribute

– Definition/Semantics: Definition and semantics of the element / attribute along with notes and value domain

– Support/Type: Describes the number of occurrence and type of the pertaining instance.
The notations for number of occurrence are (1) = (one instance), (0-1) = (zero or one instance), (0-*) = (zero or multiple instances possible), (1-*) = (one or multiple instances possible). The types of the pertaining instance are defined in Table 1.

– Remarks: Describes the notes and the references

Table 1 explains data types used in this Recommendation.

Table 1 – Data types used in this Recommendation

Type	Name	Notes/Reference
ca:civicAddress	Civic address	Used to specify civic location. Defined in [IETF RFC 5139].
gml:Point	GML point	Used to specify simple point geometry in format of geography markup language (GML). A point consists of a <Point> element with a child <coords> element. Within <coords> the latitude

Type	Name	Notes/Reference
		and longitude values are separated by a space. Defined in [ISO 19136].
URL	Uniform Resource Locator (URL)	Used to locate resources by describing its access mechanism. (e.g., its network "location"). Defined in [IETF RFC 3986] as URI= scheme ":" hier-part ["?" query] ["#" fragment].
xs:date	Date	Used to specify date. 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 XMLSchema].
xs:dateTime	Date and time	Used to specify date and time. The format of dateTime is YYYY-MM-DDThh:mm:ss.s+zzzzzz Defined in [W3C XMLSchema].
xs:integer	Integer	Used to specify a numeric value without a fractional component. Defined in [W3C XMLSchema].
xs:NMTOKEN	Normalized String without spaces	Used to specify string after white space replacement. This is, any occurrence of line feeds, carriage returns, contiguous of spaces, and tab are replaced by a single space along with leading or trailing spaces removed. Defined in [W3C XMLSchema].
xs:NMTOKENS	List of NMTOKEN	A whitespace-separated list of NMTOKEN values. Defined in [W3C XMLSchema].
xs:NMTOKEN enumeration	NMTOKEN with enumeration restriction	Used to specify restricted NMTOKEN values Defined in [W3C XMLSchema].
xs:nonNegativeInteger	Non-negative integer	Used to specify integer containing only non-negative values (0,1,2,..) Defined in [W3C XMLSchema].

Type	Name	Notes/Reference
xs:positiveInteger	Positive integer	Used to specify integer containing only positive values (1,2,..) Defined in [W3C XMLSchema].
xs:time	Time	Used to specify 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 XMLSchema].

This Recommendation follows the keyword.

– The keyword "functions" is defined as a collection of functionalities. It is represented by the following symbol in this Recommendation:

Frame borders of "functions", and relational lines among "functions" are drawn with solid lines or dashed lines. The solid lines mean required functionalities or relations. On the other hand, the dashed lines mean optional functionalities or relations.

6. Overview of audience measurement of digital signage services

6.1 Introduction

Figure 1 is the general digital signage architecture from [ITU-T H.780] with emphasis on the functional block for audience measurement.

Figure 2 is the general digital signage architecture from [ITU-T H.781] with emphasis on the functional block for audience measurement.

This Recommendation describes functional requirement, configuration, operations, data structures, and metadata between the audience measurement client and audience measurement aggregation.

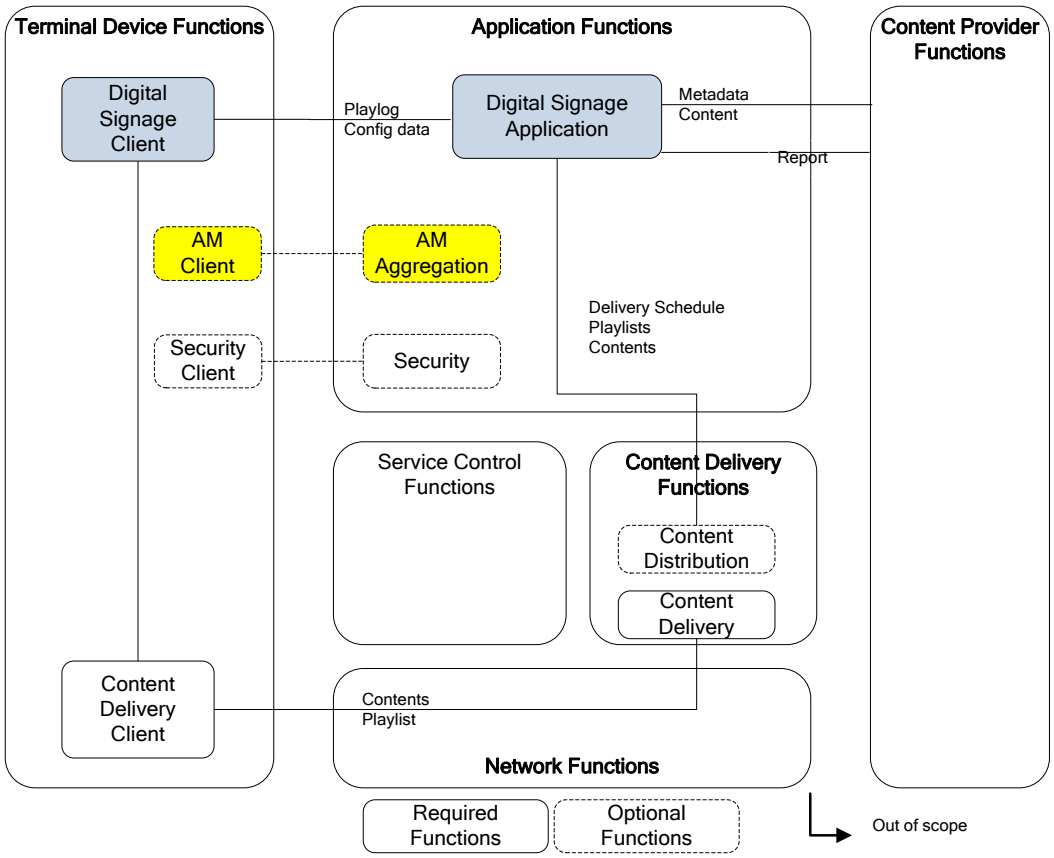

Figure 1 – Audience measurement within digital signage service functional architecture defined in [ITU-T H.780]

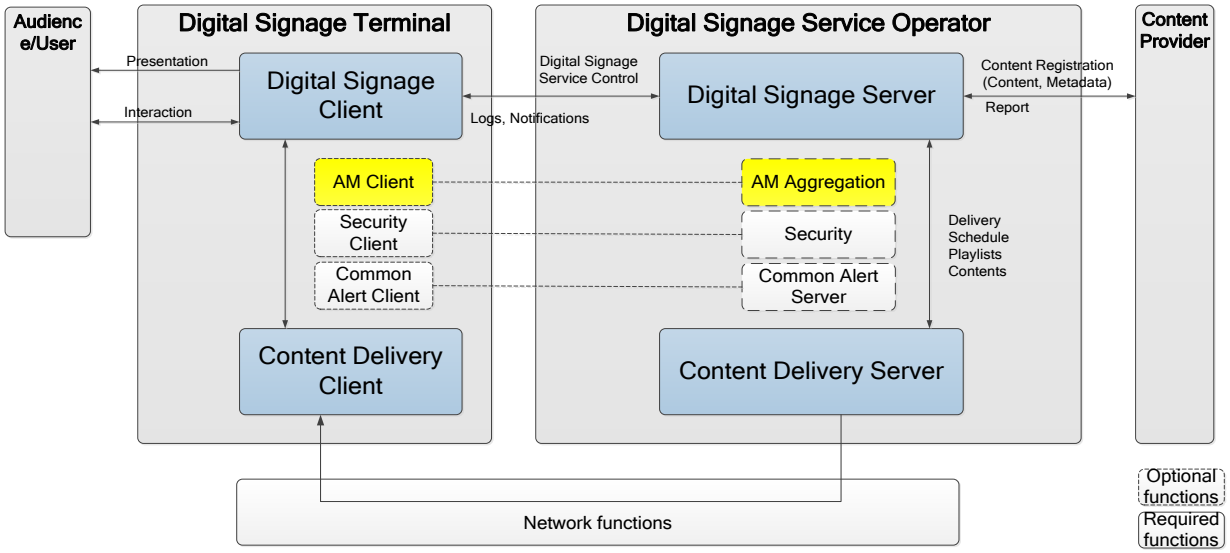

Figure 2 – Audience measurement within digital signage service functional architecture defined in [ITU-T H.781]

The generic flow for the audience measurement of the digital signage service is shown in Figure 3. This flow is an extension of the Figure I.1 of [ITU-T H.780] to describe the additional flow needed for audience measurement.

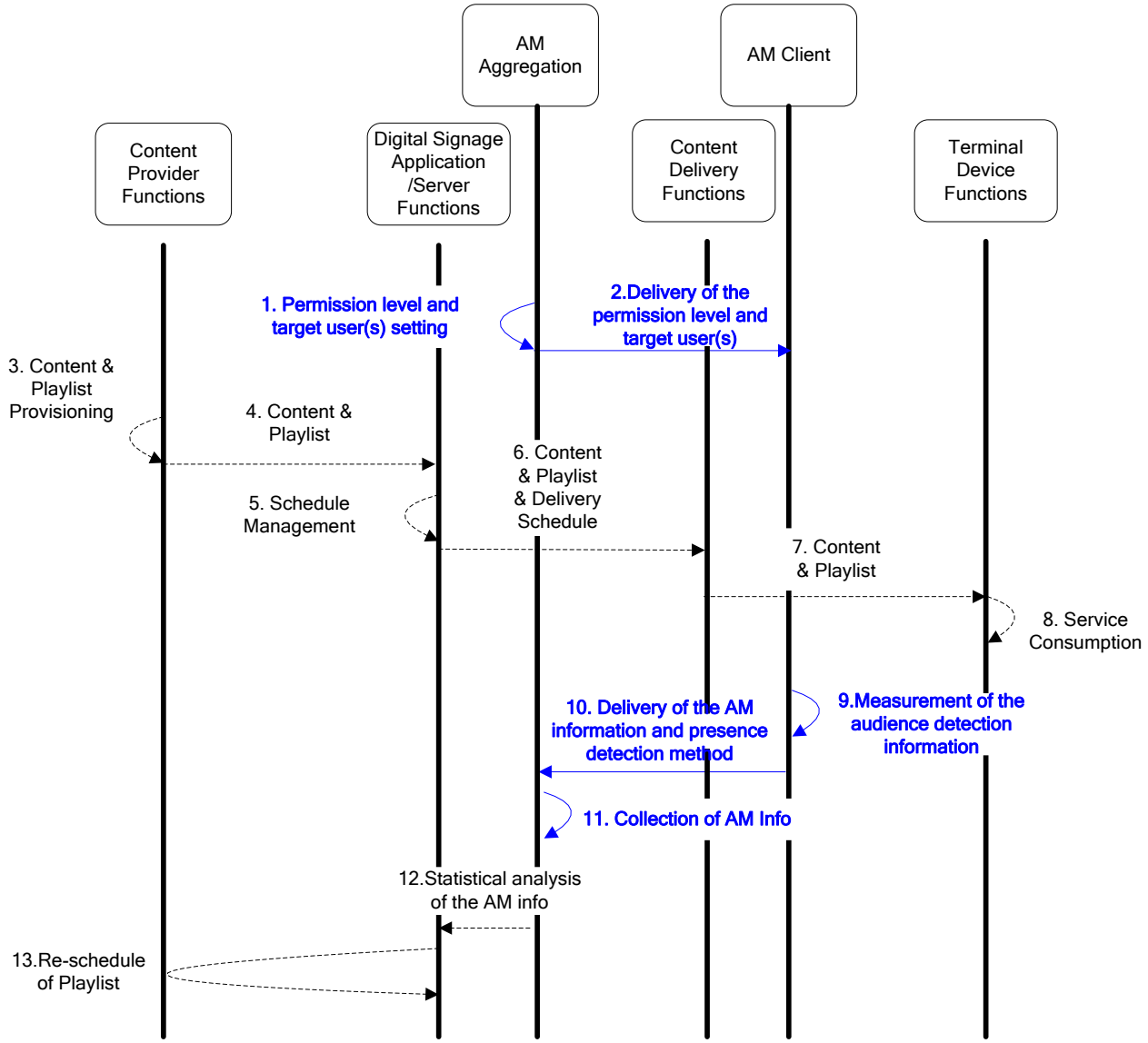

Figure 3 – Generic flow for the audience measurement of the digital signage service

1) Permission level and target user(s) setting: Audience measurement (AM) Aggregation assigns the permission level, scope and properties of the target user(s) for the digital signage service.

2) Delivery of the permission level and target user(s): AM Aggregation delivers the permission level, scope and properties of the target user(s) for the digital signage service to the AM Client.

3) Contents creation: digital signage contents, their relevant metadata and play lists are created;

4) Contents setting: the contents and relevant data are sent to a Digital Signage Application/Digital Signage Server;

5) Schedule management: the Digital Signage Application/Digital Signage Server manages the contents and their delivery schedules;

6) Contents and schedule setting: a content delivery system receives the contents and their deliver schedules;

7) Contents delivery: the contents are delivered to digital signage terminal devices on the schedules;

8) Service consumption: Contents are shown on the display of the terminal devices based on the play list;

9) Measurement of the audience detection information: AM Client measures the audience detection information based on the permission level and target user(s) assigned by the AM Aggregation with its available presence detection method (i.e., sensor, touch screen recognition, voice recognition, image recognition, mobile phone interface, etc.).

10) Delivery of the audience measurement information and presence detection method: AM Client delivers the audience measurement information and the presence detection method to the AM Aggregation. It is also possible to deliver its location information.

11) Collection of the audience measurement information: AM Aggregation collects audience measurement information from AM client(s).

12) Statistical analysis of the audience measurement information (Out of scope of this document): AM Aggregation can provide statistical analysis to the Digital Signage Application/Digital Signage Server upon request. The statistical analysis can be generated based on the display time, place, or other factors. This feature can be developed in any way needed by the digital signage service provider and is out of scope of this document.

13) Reschedule of playlist (Out of scope of this document): The Digital Signage Application/Digital Signage Server can use the statistical analysis to reschedule the content display time to maximise display effect with request from the Contents Provider.

6.2 Functional blocks related to audience measurement

AM Client functions measures the information of the audience, information about the behaviour of audience and environment information around the terminal according to the measurement request of the AM Aggregation, and then transmits the measured information to the AM aggregation functions. AM Aggregation functions requests the AM Client function to measure which information of a terminal according to a schedule and to which schedule the measured information is to be delivered, and then collects the measurement information report delivered from AM Client function.

6.3 Considerations

This clause describes the consideration of audience measurement services for digital signage compared to audience measurement services for IPTV.

1) Permission level of audience measurement information: the permission level of audience is determined by the digital signage service provider (or permitted officials). The digital signage

does not have the concept of subscriber. Therefore, the specific values or methods of permission level are not covered in this Recommendation.

2) Scope and property of the target user(s): The scope and the properties of the target user is public can be composed of people of various natures. The service provider may or may not know of some properties of the target users. The properties can always change.

3) Presence detection method and its detected information: Various methods can exist for presence detection (i.e., sensor, touch screen recognition, voice recognition, image recognition, mobile phone interface, etc.). The property of the detected information should be determined from the detecting devices.

4) Digital signage terminal device location detection method and its usage level: Various methods exist for the location detection. The longitude and latitude can be used along with the jurisdiction.

7. Functional requirements

7.1 General requirements

No	Requirement	Remarks
REQ-GEN-1	The digital signage system with audience measurement functions (DS-AM) architecture is required to support the audience measurement of digital signage services.	This is a basic and logical requirement for digital signage service that supports audience measurement.

7.2 Requirements for audience measurement architecture

No	Requirement	Remarks
REQ-ARC-1	The DS-AM architecture is required to have the ability to receive and process multiple audience inputs from one or more input devices (camera, touch screen, sensors, keyboard, etc.).	-
REQ-ARC-2	The DS-AM architecture is required to have the ability to measure audience behaviour by selection of digital signage terminal devices to be measured.	Refer to requirement 4 in clause 7.1 of [ITU-T H.741.0]
REQ-ARC-3	The DS-AM architecture is required to have the ability to measure audience behaviour by selection of behavioural events to be measured.	Refer to requirement 6 in clause 7.1 of [ITU-T H.741.0]
REQ-ARC-4	The DS-AM architecture is required to have the ability to measure audience behaviour by selection of	Refer to requirement 7 in clause 7.1 of [ITU-T H.741.0]

No	Requirement	Remarks
	periodicity for periodic measurements.	
REQ-ARC-5	The DS-AM architecture is required to support communications with other applications, for audience measurement.	Refer to requirement 10 in clause 7.1 of [ITU-T H.741.0]
REQ-ARC-6	The DS-AM architecture is recommended to support presence detection.	Refer to requirement 6 in clause 7.3 of [ITU-T H.741.0]. In digital signage service, this is recommended because it is important features for saving power.
REQ-ARC-6.1	The DS-AM architecture can optionally support presence detection by speech recognition.	-
REQ-ARC-6.2	The DS-AM architecture can optionally support presence detection by body recognition, face recognition, etc.	-
REQ-ARC-6.3	The DS-AM architecture can optionally support capability of understanding the meaning of speech by Natural Language Processing functionality.	-
REQ-ARC-7	The digital signage (DS) architecture is recommended to support monitoring or communications with AM functions for audience measurement.	Refer to requirement 5 in clause 7.6 of [ITU-T H.741.0]

7.3 Requirements for interfaces between AM aggregation and stakeholder/DS application

No	Requirement	Remarks
REQ-ASA-1	The DS-AM architecture is recommended to have the ability to create requested audience measurement reports for stakeholders, and send those reports to the corresponding stakeholders.	Refer to requirement 3 in clause 7.1 of [ITU-T H.741.0]
REQ-ASA-2	The DS-AM architecture is recommended to support stakeholder input orders, measurements, and stakeholder and other digital signage application reports having measurements of viewing behaviour	Refer to requirement 2 in clause 7.2 of [ITU-T H.741.0]. For DS-AM, it is more appropriate to use ‘sampling

No	Requirement	Remarks
	specified by combinations of: a) time of day; b) audience behaviour; c) measurement interval; d) audience information; e) ambient information; f) digital signage terminal device information; g) digital signage terminal device location.	interval' rather than 'sample time', 'audience' rather than 'end-user'. It is also need to include ambient information.
REQ-ASA-3	The DS-AM architecture can optionally support stakeholder input orders, measurements, stakeholder and other digital signage application reports having measurements of viewing behaviour specified by combinations of: a) day of week; b) content; c) interactive services (applications).	Refer to [ITU-T H.741.0], but end-user information is removed because it may cause some leakage of private information.
REQ-ASA-4	The DS-AM architecture is recommended to have the ability to create requested audience measurement reports for other digital signage applications, and to send those reports to the appropriate digital signage applications.	Refer to requirement 3 in clause 7.1 of [ITU-T H.741.0].

7.4 Requirements for controlling AM clients

No	Requirement	Remarks
REQ-AMC-1	The DS-AM architecture is required to support monitoring or communications with digital signage services, for audience measurement.	Refer to requirement 9 in clause 7.1 of [ITU-T H.741.0]
REQ-AMC-2	The DS-AM architecture is required to support an internal configuration procedure for all AM components which directs measurement, reporting, control and processing operations.	Refer to requirement 11 in clause 7.1 of [ITU-T H.741.0]
REQ-AMC-3	The DS-AM architecture is required to support measurement filtering and summarisation.	Refer to requirement 12 in clause 7.1 of [ITU-T H.741.0]

No	Requirement	Remarks
REQ-AMC-4	The DS-AM architecture is recommended to support at least daily or less frequent changes to configuration without measurement service interruption.	Refer to requirement 4 in clause 7.2 of [ITU-T H.741.0]
REQ-AMC-5	The DS-AM architecture is recommended to support selection of AM clients to be monitored for audience measurement.	Refer to requirement 7 in clause 7.2 of [ITU-T H.741.0]
REQ-AMC-6	The DS-AM architecture is recommended to support scheduling of configuration changes.	Refer to requirement 5 in clause 7.2 of [ITU-T H.741.0]
REQ-AMC-7	The DS-AM architecture can optionally support downloading, installation, updating, and removal of any audience measurement software.	Refer to requirement 4 in clause 7.3 of [ITU-T H.741.0]

7.5 Requirements for interface between AM aggregation and AM clients

No	Requirement	Remarks
REQ-AAC-1	The DS-AM architecture is required to support traffic shaping of audience measurement data.	Refer to requirement 13 in clause 7.1 of [ITU-T H.741.0]
REQ-AAC-2	The DS-AM architecture is required to ensure the integrity of audience measurement information communicated between AM entities.	Refer to requirement 15 in clause 7.1 of [ITU-T H.741.0]
REQ-AAC-3	The DS-AM architecture is required to provide a non-repudiation property to audience measurement information communicated between AM entities.	Refer to requirement 19 in clause 7.1 of [ITU-T H.741.0]
REQ-AAC-4	The DS-AM architecture is recommended to support recovery from storage congestion.	Refer to requirement 9 in clause 7.2 of [ITU-T H.741.0].
REQ-AAC-5	The DS-AM architecture is recommended to support recovery from network congestion.	Refer to requirement 10 in clause 7.2 of [ITU-T H.741.0]

7.6 Requirements for privacy protection

No	Requirement	Remarks
REQ-PRP-1	The DS architecture is required to handle PII and non-PII separately.	Since personally identifiable information must be kept confidentially, it is essential to handle privacy information more robust way.

REQ-PRP-2	Audience measurement data can optionally include identifier with permission from audience.	In case of providing personalized contents to audience, it is necessary to acquire audience's identifier.
REQ-PRP-3	The DS-AM architecture is required not to extract PII from digital signage service raw audience data without audience's permission.	It is possible to extract biological information such as hair style and skin colour, but it should not try to identify a personal with this information without audience's permission.
REQ-PRP-4	The DS terminal is required not to maintain any PII that is acquired by the interaction with user in the local storage of terminal after audience has left.	When an audience leaves terminal after some kinds of interaction, his/her PII should be removed for preventing from leakage of personally identifiable information.
REQ-PRP-5	The DS terminal is recommended to remove information that has been acquired by the interaction with audiences.	In some cases, digital signage service may request more information like preference of audience. Even though this does not contain any PII, it needs to be removed as well.
REQ-PRP-6	The DS-AM architecture is recommended to minimize the acquisition, locations and duration of storage, and transmissions of personal data necessary for delivering the audience measurement services.	Refer to requirement 11 in clause 7.2 of [ITU-T H.741.0]
REQ-PRP-7	The DS-AM architecture is required to acquire PII based on audience's permission.	PII can be acquired by audience's input or audience's smart devices supporting wireless communications such as NFC [ISO/IEC 8802-11]. These procedures shall be performed by audience's permission.
REQ-PRP-8	The DS architecture can optionally ask for the audience's permission	-

REQ-PRP-9	Operators of DS-AM are recommended to provide audiences with clear disclosure and information about data collection and use practices if required by audiences.	Refer to clause 7.5 of [ITU-T H.741.0]. We have removed a conditions regarding end-user permission.
REQ-PRP-10	The DS-AM architecture is recommended to provide notification and permission procedures.	It may request permission to audience directly for further process with notification regarding what kinds of information are gathered, the purpose of gathering and so on
REQ-PRP-11	The DS-AM architecture is required not to identify a individual without the permission from the audience.	Even though audience does not provide his PII explicitly, technically, it is possible to identify by use of facial recognition and big data. Hence, identification should be performed based on permission.
REQ-PRP-12	The DS-AM architecture is recommended to support wireless communication technologies, such as NFC and Infrared ray, for identifying audience.	In this case, it may be assumed that audience has a permission on providing their identification information.
REQ-PRP-13	The DS-AM architecture is required to ensure confidentiality of audience measurement data in transit.	Refer to requirement 14 in clause 7.1 of [ITU-T H.741.0]
REQ-PRP-14	The DS-AM architecture is required to audience privacy against the leakage to unintended parties while performing AM operations.	Refer to requirement 16 in clause 7.1 of [ITU-T H.741.0]
REQ-PRP-15	The DS-AM architecture is required to ensure that peer-entity authentication precedes communication between AM peer entities.	Refer to requirement 17 in clause 7.1 of [ITU-T H.741.0]
REQ-PRP-16	The DS-AM architecture is required to ensure that there is no unauthorized access to audience measurement data.	Refer to requirement 18 in clause 7.1 of [ITU-T H.741.0]
REQ-PRP-17	The DS-AM architecture is required to protect information of location owner.	-

8. Configuration and operations to provide audience measurement data

8.1 Configuration for audience measurement data

In AMConfiguration(), AM Aggregation function transfers Configuration information with the MeasurementRequestID element to AM Client function.

Configuration information describes the target terminals to be measured, the categories of the audience or environment information to be measured, the measurement schedule, and the transmission schedule of the measured information. Configuration information is described in detail in clause 9.3.

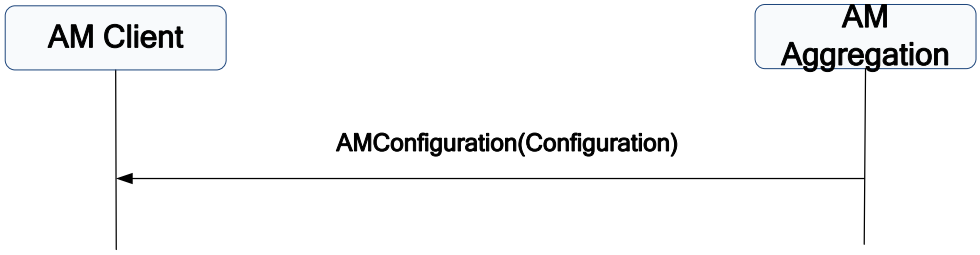

Figure 4 – AM configuration

8.2 Measurement report request for audience measurement data

In AMReportRequest(), AM Aggregation function transfers MeasurementReportRequest information with MeasurementRequestID element to AM Client function.

MeasurementReportRequest information describes the report request of measured information that is related to the MeasurementRequestID element specified in the Configuration information. MeasurementReportRequest information is described in detail in clause 9.4.

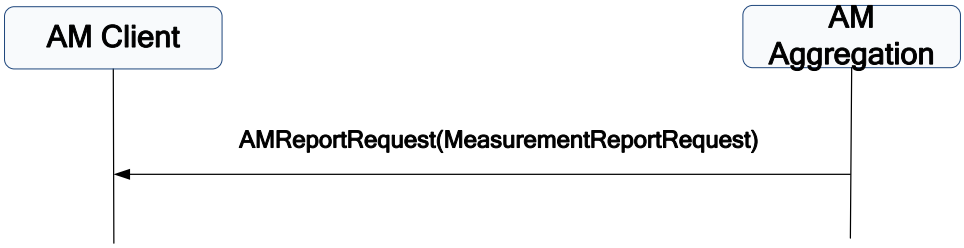

Figure 5 – AM measurement report request

8.3 Measurement report for audience measurement data

In AMReport(), AM Client function transfers MeasurementReportPackage information which includes several MeasurementReport information with MeasurementRequestID element to AM Aggregation function.

MeasurementReportPackage information describes the collection of measured information that is

related the same MeasurementRequestID element. MeasurementReportPackage information is described in detail in clause 9.5.

MeasurementReport information describes the report of measured information that is related to the MeasurementRequestID element specified in the Configuration information. MeasurementReport information is described in detail in clause 9.6.

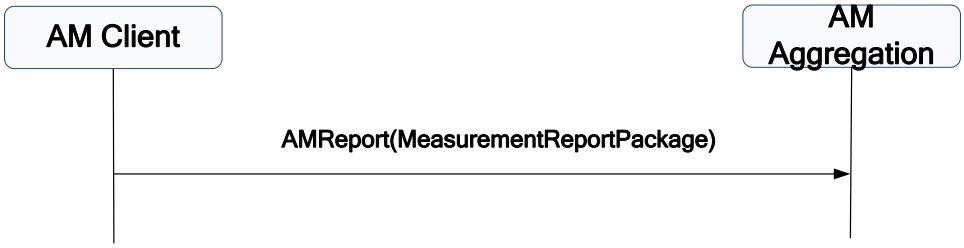

Figure 6 – AM measurement report

9. Metadata to provide audience measurement data

9.1 Metadata for audience information

Table 2 – Metadata for "audience information"

Element / Attribute	Definition/Semantics	Support/type	Remarks
Audience	Container for audience information.		
AgeGroup	Element of AudienceInformation. Container for age group type.	0-1	
ChildNumber	Element of AgeGroup. Identifies number of children in audience.	0-1 xs: nonNegativeInteger	
YoungAdult	Element of AgeGroup. Identifies number of young adults in audience.	0-1 xs: nonNegativeInteger	
AdultNumber	Element of AgeGroup. Identifies number of adults in audience.	0-1 xs: nonNegativeInteger	

Element / Attribute	Definition/Semantics	Support/type	Remarks
SeniorNumber	Element of AgeGroup. Identifies number of seniors in audience.	0-1 xs: nonNegativeInteger	
GenderGroup	Element of AudienceInformation. Container for gender group type.	0-1	
MaleNumber	Element of GenderGroup. Identifies number of males in audience.	0-1 xs: nonNegativeInteger	
FemaleNumber	Element of GenderGroup. Identifies number of females in audience.	0-1 xs: nonNegativeInteger	
Relation	Element of AudienceInformation. Container for relation type.	0-1	
FamilyGroupNumber	Element of Relation. Identifies number of families in audience.	0-1 xs: nonNegativeInteger	
FriendsGroupNumber	Element of Relation Identifies number of friends in audience.	0-1 xs: nonNegativeInteger	
Activity	Element of AudienceInformation. Container for Activity.	0-1	
ActiveAudienceNumber	Element of Activity. Identifies number of active audience.	0-1 xs: nonNegativeInteger	

Element / Attribute	Definition/Semantics	Support/type	Remarks
PassiveAudienceNumber	Element of Activity. Identifies number of passive audience.	0-1 xs: nonNegativeInteger	
PasserByNumber	Element of Activity. Identifies number of passer-by.	0-1 xs: nonNegativeInteger	
AverageViewingTime	Element of Activity. Describes the averaged viewing time of the active audience and passive audience.	0-1 xs: nonNegativeInteger	
AudienceDistance	Element of AudienceInformation. Describes averaged distance between digital signage terminal and audience. The suggested unit is meters.	0-1 xs:nonNegativeInteger	
VehicleNumber	Element of AudienceInformation. Describes the average number of vehicles passed-by.	0-1 xs: nonNegativeInteger	

9.2 Metadata for environmental information

Table 3 – Metadata for "environmental information"

Element / Attribute	Definition/Semantics	Support/type	Remarks
EnvironmentInformation	Container for environment information.		
BrightnessLevel	Element of EnvironmentInformation. Describes the brightness level of the surrounding.	0-1 xs: nonNegativeInteger	

Element / Attribute	Definition/Semantics	Support/type	Remarks
SoundLevel	Element of EnvironmentInformation. Sound level value of the surrounding and its unit.	0-1 xs: nonNegative	
unit	Attribute of SoundLevel. Unit of SoundLevel. Unit can be dB, and other. Suggested unit is in dB.	0-1 xs:NMTOKEN enumeration	
Temperature	Element of EnvironmentInformation. Temperature value of the surrounding and its unit.	0-1 xs:Integer	
unit	Attribute of Temperature. Unit of Temperature. Unit can be Celsius, Fahrenheit, and other. Suggested unit is in Celsius.	0-1 xs:NMTOKEN enumeration	
Humidity	Element of EnvironmentInformation. Humidity value of the surrounding and its unit	0-1 xs:nonNegativeInteger	
unit	Attribute of Humidity. Unit of Humidity. Unit can be percentage, absolute, and other. Suggested unit is in percentage (%).	0-1 xs:NMTOKEN enumeration	
WeatherDescriptionList	Element of EnvironmentInformation. Describes the weather condition of the surrounding Values: snowy, rainy, sunny, cloudy, windy	0-1 xs:NMTOKENS	

9.3 Metadata for configuration information

Table 4 defines the metadata for a configuration information. Configuration describes the information such as target terminal to be measured, category to be measured, schedule of measurement and delivery schedule of measured information.

Table 4 – Metadata for "configuration"

Element / Attribute	Description/Semantics	Support/type	Remarks
Configuration	Container for a configuration.		Refer to Table 9 in clause 6.2.2 of [ITU-T H.741.2]
measurementRequestId	Attribute of Configuration. Identification of the configuration for measurement request. Value is unique in aggregation function. 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 configuration.	1 xs:NMTOKEN	Refer to Table 9 in clause 6.2.2 of [ITU-T H.741.2]
aggregationFunctionIdref	Attribute of Configuration. Identification of aggregation function requesting for audience measurement.	1 xs:NMTOKEN	
Measurement	Element of Configuration. Describes the target terminals for measurement. If MeasurmentTarget is not present then configuration are not filtered.	0-1	Defined in Table 5
MeasurmentCategory	Element of Configuration. Describes the category of audience or ambient information for measurement. If MeasurmentCategory is not present then configuration are not filtered.	0-1	Defined in Table 6
MeasurementSchedule	Element of Configuration. Describes the time period and interval for measurement.	1-*	Defined in Table 7
MeasurementDelivery	Element of Configuration. Describes the address, timing and method of delivering the measurement report.	0-1	Defined in Table 8

Table 5 describes the metadata elements for "MeasurementTarget" to specify which one is to be

measured.

Table 5 – Metadata for "measurement target"

Element / Attribute	Description/Semantics	Support/Type	Remarks
MeasurementTarget	Element of Configuration. Container for measurement target.		
TargetTerminalDeviceList	Element of MeasurementTarget. Describes the terminal device list of target for measuring.	0-1 xsNMTOKENS	TerminalID is defined in [ITU-T H.782]
TargetTerminalGroupList	Element of MeasurementTarget. Describes the terminal group list of target for measuring.	0-1 xs:NMTOKENS	GroupID is defined in Table 9 of [ITU-T H.782].

Table 6 describes the metadata elements for "MeasurementCategory" to specify which category of audience or ambient information is to be measured.

Table 6 – Metadata for "measurement category"

Element / Attribute	Description/Semantics	Support/Type	Remarks
MeasurementCategory	Element of Configuration. Container for measurement category.		
MeasurementCategoryAudience	Element of MeasurementCategory. Describes the category list of audience for measuring.	0-*	
AudienceCategoryList	Element of MeasurementCategoryAudience List of audience category to be measured. Values: AgeGroup, GenderGroup, Relation, Activity, AudienceDistance, VehicleNmber, etc. (Category values of audience information can be obtained from Table 1)	0-1 xs:NMTOKENS	If AudienceCategoryList and All AudienceCategoryExceptList are not present then measurements are not filtered by audience category.

Element / Attribute	Description/Semantics	Support/Type	Remarks
All	Element of MeasurementCategoryAudience List of audience category not to be measured. Values: AgeGroup, GenderGroup, Relation, Activity, AudienceDistance, VehicleNmber, etc. (Category values of audience information can be obtained from Table 1)	0-1 xs:NMTOKENS	If AudienceCategory List and All AudienceCategory ExceptList is not present then measurements are not filtered by audience category.
MeasurementCategoryAmbient	Element of MeasurementCategory. Describes the category list of ambient information for measuring.	0-*	
AmbientCategoryList	Element of MeasurementCategoryAmbient List of ambient category to be measured. Values: Brightness, SoundLevel, Temperature, Weather, Humidity, etc. (Category values of ambient information can be obtained from Table 2.)	0-1 xs:NMTOKENS	If AmbientCategory List and All AmbientCategory ExceptList are not present then measurements are not filtered by ambient category.
All	Element of MeasurementCategoryAmbient List of ambient category not to be measured. Values: Brightness, SoundLevel, Temperature, Weather, Humidity, etc. (Category values of ambient information can be obtained from Table 2.)	0-1 xs:NMTOKENS	If AmbientCategory List and All AmbientCategory ExceptList are not present then measurements are not filtered by ambient category.

Element / Attribute	Description/Semantics	Support/Type	Remarks
MeasurmentLocationInclusion	Element of MeasurementCategory. Describes whether to include location measured by digital signage terminal Values: Inclusion, Exclusion	0-1 xs:NMTOKEN enumeration	This element is expected to be used for mobile terminals.

Table 7 describes the metadata elements for "MeasurementSchedule". This MeasurementSchedule allows definition of several measurement periods and the method of how a measurement report is to be triggered, either periodically and/or on specific periods.

Table 7 – Metadata for "measurement schedule"

Element / Attribute	Description/Semantics	Support/type	Remarks
MeasurementSchedule	Element of Configuration. Container for time period for measurement.	-	Refer to Table 11 in clause 6.2.2 of [ITU-T H.741.2]
MeasurementPeriod	Element of MeasurementSchedule. Describes the measurement period.	0-*	Refer to Table 11 in clause 6.2.2 of [ITU-T H.741.2]
startDay	Attribute of MeasurementPeriod. Start date in which the measurement starts.	0-1 xs:date	
endDay	Attribute of MeasurementPeriod. End date in which the measurement ends.	0-1 xs:date	
startTime	Attribute of MeasurementPeriod. Time of the day at which the measurement starts.	0-1 xs:time	Refer to Table 11 in clause 6.2.2 of [ITU-T H.741.2]
endTime	Attribute of MeasurementPeriod. Time of the day at which the measurement stops. Default is at end of day	0-1 xs:time Default 23:59:59.99	Refer to Table 11 in clause 6.2.2 of [ITU-T H.741.2]

Element / Attribute	Description/Semantics	Support/type	Remarks
AppliedDayOfTheWeekList	Element of MeasurementPeriod. Day of the week to which measurement is applied. Value list: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, Weekday, Weekend, PublicHodiday, Everyday, Other.	0-* xs:NMTOKENS Default: Everyday	Refer to Table 11 in clause 6.2.2 of [ITU-T H.741.2]
MeasurmentInterval	Element of MeasurementSchedule. This is a container for measurement interval value and unit during the measurement period.	0-1 xs:nonNegativeInteger	
unit	Attribute of MeasurmentInterval. Unit of measurement interval. Value: Hour, Minute, Second, etc.	0-1 xs:NMTOKEN enumeration	

Table 8 describes the metadata elements for "MeasurementDeliverySchedule". This MeasurementDeliverySchedule allows AM Aggregation function to specify how measurement reports are delivered to the AM Aggregation function.

Table 8 – Metadata for "measurement delivery schedule"

Element / Attribute	Description/Semantics	Support/type	Remarks
MeasurementDelivery	Element of Configuration Description of the mechanism to be used to decide on how to make the measurement report available to the AM Aggregation function.		Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
Delivery	Element of MeasurementDeliverySchedule. URL to be used to send measurement reports from the AM Client function.	0-* URL	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]

Element / Attribute	Description/Semantics	Support/type	Remarks
ImmediatePush	Element of MeasurementDeliverySchedule. This element indicates that the measurement delivery takes place immediately with possible grouping of measurement reports.	0-1 See NOTE 1	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
MeasurementReportNumberByPush	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:positiveInteger	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
DelayedDelivery	Element of MeasurementDeliverySchedule. This element indicates that the measurement delivery is to take place during specific delivery windows.	0-1 See NOTE 1	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
DeliveryWindow	Element of DelayedDelivery. This element is a container for the start and end time of a measurement delivery window.	0-*	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
startTime	Attribute of DeliveryWindow. Time of the day at which the stored audience measurement reports could start to be delivered.	0-1 xs:time	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]
endTime	Attribute of DeliveryWindow. Last time of the day at which the audience measurement report could be delivered.	0-1 xs:time	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]

Element / Attribute	Description/Semantics	Support/type	Remarks
Pull	Element of MeasurementDeliverySchedule. This element indicates that the measurement reports are to be delivered only on request from the AM Aggregation function.	0-1 See NOTE 1	Refer to Table 12 in clause 6.2.2 of [ITU-T H.741.2]

NOTE 1 – If MeasurementDeliverySchedule is present, one of either ImmediatePush, DelayedDelivery, or Pull may be present. If none of them is present then the default is ImmediatePush mode.

9.4 Metadata for measurement report request information

Table 9 – Metadata for "measurement report request"

Element / Attribute	Description/Semantics	Support/type	Remarks
MeasurementReportRequest	Container for a measurement report request. NOTE 1 - A measurement report request with no MeasurementRequestIDs indicates that a AM Client function is to respond with available data from all measurement requests	1	Refer to Table 15 in clause 6.2.5 of [ITU-T H.741.2]
measurementRequestIdrefs	Attribute of MeasurementReportRequest. Identification of the measurement request. NOTE 2 - indicates that a AM Client function is to respond with available data from this specific measurement request.	1 xs: NMTOKENS	Refer to Table 15 in clause 6.2.5 of [ITU-T H.741.2]

9.5 Metadata for measurement report package information

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

Table 10 – Metadata for "measurement report package"

Element / Attribute	Description/Semantics	Support/type	Remarks
MeasurementReportPackage	Container for a set of measurement reports.	1	Refer to Table 22 in clause 6.2.11 of [ITU-T H.741.2]
terminalDeviceIdref	Attribute of MeasurementReportPackage. This element uniquely identifies the digital signage terminal device based on the device's MAC address.	1 xs:NMTOKEN	Refer to Table 22 in clause 6.2.11 of [ITU-T H.741.2]. TerminaID for device is defined in [ITU-T [ITU-T H.782].
MeasurementReport	Element of MeasurementReportPackage. Container for a measurement report.	1-*	Refer to Table 22 in clause 6.2.11 of [ITU-T H.741.2]

9.6 Metadata for measurement report information

Table 11 defines the metadata for a measurement report. Multiple elements which are associated with a single trigger time may be included in a particular instance of MeasurementReport.

Table 11 – Metadata for "measurement report"

Element / Attribute	Description/Semantics	Support/	Remarks
MeasurementReport	Container for a measurement report.	0-1	Refer to Table 21 in clause 6.2.11 of [ITU-T H.741.2]
measurementRequestIdref	Attribute of MeasurementReport. This element identifies the measurement request which generated this measurement report.	1 xs:MTOKENS	Refer to Table 21 in clause 6.2.11 of [ITU-T H.741.2]

Element / Attribute	Description/Semantics	Support/	Remarks
MeasurementReportTriggerTime	Element of MeasurementReport. This element identifies the time at which the measurement report was created or the measurement period ended.	1 xs:date	Refer to Table 21 in clause 6.2.11 of [ITU-T H.741.2]
MeasuringTime	Element of MeasurementReport. This element identifies the specific date and time measured by terminal device.	0-1 xs:dateTime	
MeasuringLocation	Element of MeasurementReport. This element identifies the specific location measured by terminal device.	0-1	
GeoLocation	Element of MeasureingLocation. The geographical location of the terminal device.	0-1 gml:Point	
PostalLocation	Element of MeasureingLocation. Location of the terminal other than geographic information (e.g., ZIP code, postal address).	0-1 ca:civicAddress	
MeasuringInformation	Element of MeasurementReport. This is a container for audience and environment information.	1	
AudienceInformation	Element of MeasuringInformation. This is a container for audience information.	0-*	Audience information is defined in Table 1.
AudienceDetectionMethod	Element of Audience Information. Indicates method used to detect audience. Values: camera, microphone, touch screen, RFID reader, etc.	0-1 xs:NMTOKEN Default: camera	

Element / Attribute	Description/Semantics	Support/	Remarks
EnvironmentInformation	Element of MeasuringInformation. This is a container for environment information.	0-*	Environment information is defined in Table 2.
EnvironmentDetectionMethod	Element of Environment Information. Indicates method used to detect environment information surrounding terminal device. Values: thermometer, etc.	0-1 xs:NMTOKEN	

Appendix I
Use cases of digital signage services with audience measurement functionality

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

This appendix describes some use case for audience measurement in digital signage service.

I.1 Audience measurement without user interaction from the public users

As an assumption, Content Provider provides the contents and the preferred schedule to be played in the digital signage terminal.

The digital signage terminal has various sensing capabilities such as voice recognition, image recognition, etc.

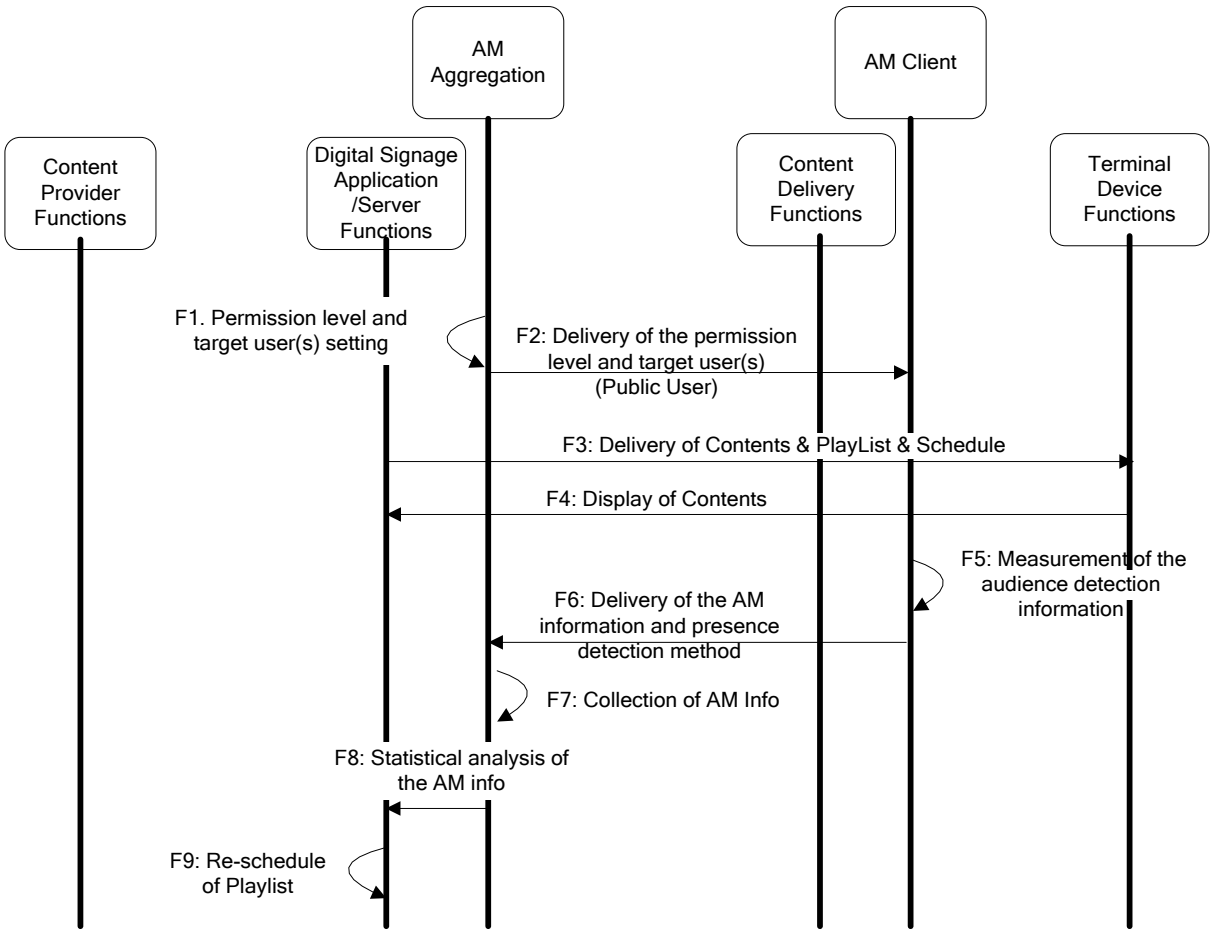

Figure I-1 – Generic flow for the audience measurement without user interaction (public user)

F1) Permission level and target user(s) setting: AM Aggregation assigns the permission level, scope and properties of the target user(s) for the digital signage service.

F2) AM Aggregation delivers the permission level, scope and properties of the target users to the DS client. The properties may include existence of public user, sex, age of public users.

F3) Digital Signage Application/Digital Signage Server delivers contents, playlist, and playlist schedule to the DS Terminal.

F4) DS Terminal displays content accordingly to the assigned playlist, and playlist schedule.

F5) AM Client measures the audience properties of the public users with its available presence detection method.

F6) AM Client delivers the audience measurement information and the presence detection method to the AM Aggregation.

F7) AM Aggregation collects the audience measurement information from AM client(s).

F8) AM Aggregation provides statistical analysis to the Digital Signage Application/Digital Signage Server of public users properties. The statistical analysis can be generated based on the display time, place, or other factors.

F9) The Digital Signage Application/Digital Signage Server can use the statistical analysis to reschedule the content display time to maximise display effect with request from the Contents Provider. If the contents playlist or playlist schedule is modified, repeat from F3. If not, repeat from F4.

I.2 Audience measurement with user interaction from the active users

As an assumption, Content Provider provides the contents and the preferred schedule to be played in the digital signage terminal. The contents should include features for user-interaction.

Digital signage terminal has various sensing capabilities such as touch screen recognition, voice recognition, image recognition, mobile device interface, etc.

Digital signage terminal also has input device such as touch panel, keyboard, mouse, mobile device interface module, etc.

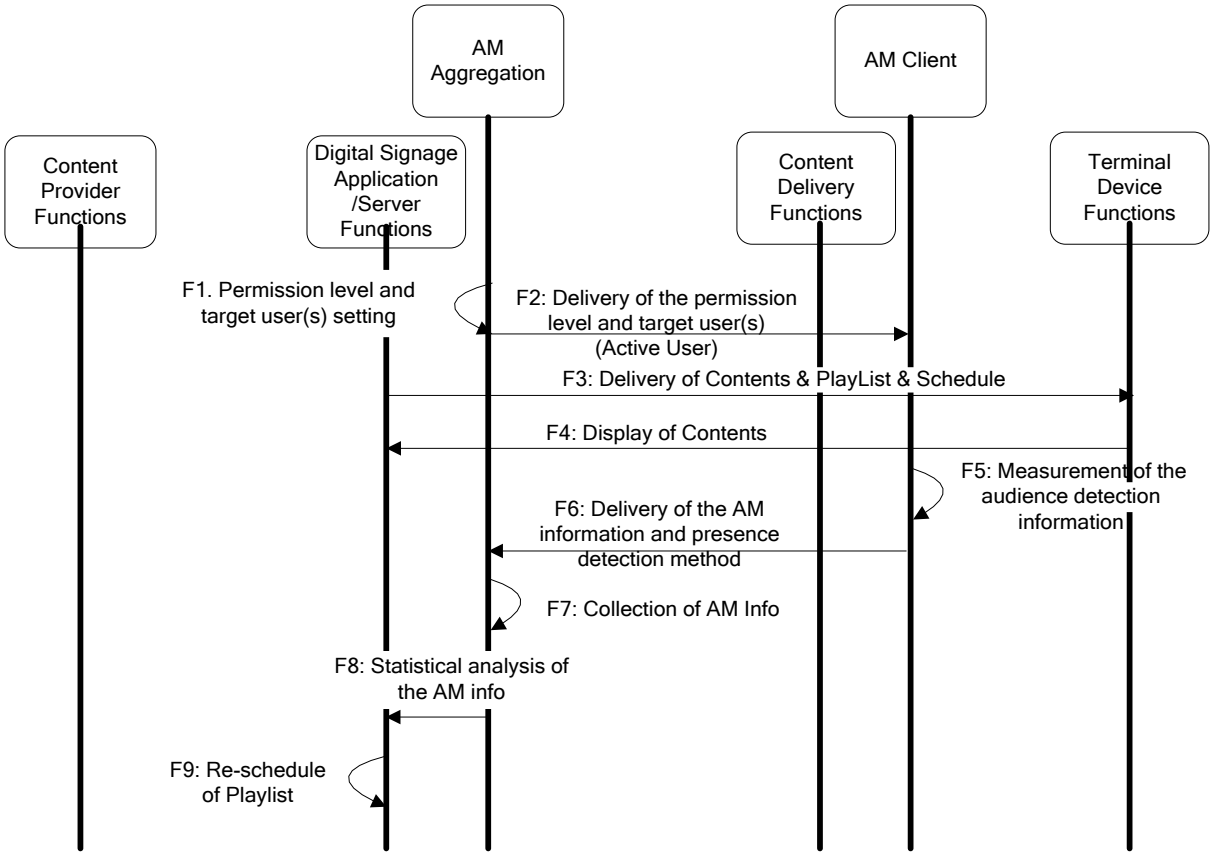

Figure I-2 – Generic flow for the audience measurement with user interaction (active user)

F1) Permission level and target user(s) setting: AM Aggregation assigns the permission level, scope and properties of the target user(s) for the digital signage service.

F2) AM Aggregation delivers the permission level, scope and interaction properties of the active users to the DS client. The interaction properties may include sex, age, preference, etc.

F3) Digital Signage Application/Digital Signage Server delivers contents, playlist, and playlist schedule to the DS Terminal.

F4) DS Terminal displays content accordingly to the assigned playlist, and playlist schedule.

F5) AM Client measures the audience properties of the active users with its available presence detection method. AM client can also acquire preference information from the active user though interaction from the input device.

F6) AM Client delivers the audience measurement information and the presence detection method to the AM Aggregation.

F7) AM Aggregation collects the audience measurement information from AM client(s).

F8) AM Aggregation provides statistical analysis to the Digital Signage Application/Digital Signage Server of active users properties. The statistical analysis can be generated based on the display time, place, or other factors.

F9) The Digital Signage Application/ Digital Signage Server can use the statistical analysis to reschedule the content display time to maximise display effect with request from the Contents Provider. If the contents playlist or playlist schedule is modified, repeat from F3. If not, repeat from F4.

I.3 Audience measurement based on ambient information from digital signage terminal

As an assumption, Content Provider provides the contents, the preferred schedule to be played in the digital signage terminal.

Digital signage terminal has sensing module to collect ambient information such brightness, noise, temperature, weather, traffic. This ambient information can be used to control DS terminal through interaction between AM Aggregation and AM client. Also, DS terminal can use this ambient information to control itself.

The digital signage server will need to provide control condition of the digital signage terminal or displayed contents based on ambient information.

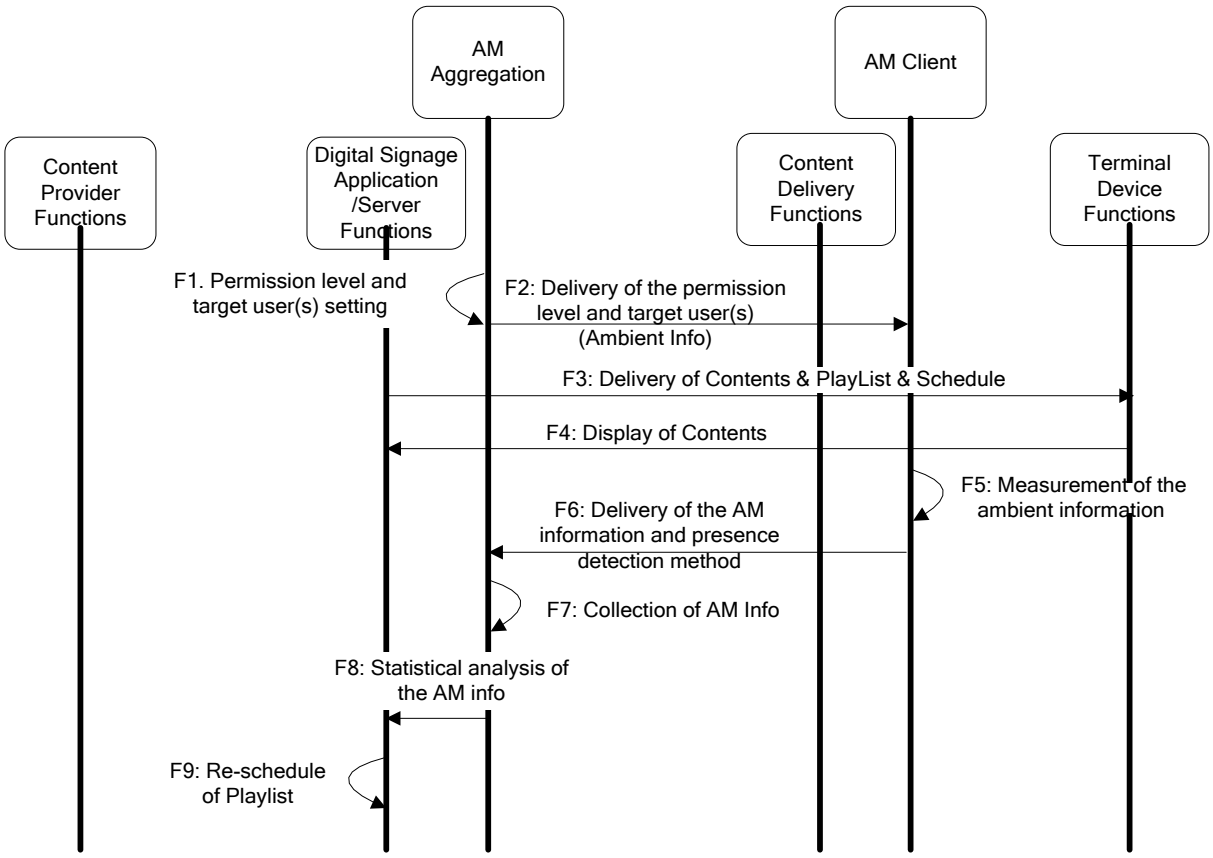

Figure I-3 – Generic flow for the audience measurement based on ambient information

F1) Permission level and target user(s) setting: AM Aggregation assigns the permission level, scope and properties of the target user(s) for the digital signage service.

F2) AM Aggregation delivers the permission level, scope and ambient properties to the DS client. The ambient properties may include brightness, noise, temperature, weather, traffic, etc.

F3) Digital Signage Application/Digital Signage Server delivers contents, playlist, and playlist schedule to the DS Terminal.

F4) DS Terminal displays content accordingly to the assigned playlist, and playlist schedule.

F5) AM Client measures the ambient properties with its available sensing method.

F6) AM Client delivers the audience measurement information and the presence detection method to the AM Aggregation.

F7) AM Aggregation collects the audience measurement information based on the ambient properties from AM client(s).

F8) AM Aggregation provides statistical analysis to the Digital Signage Application/Digital Signage Server of the ambient properties. The statistical analysis can be generated based on the display time, place, or other factors.

F9) The Digital Signage Application/Digital Signage Server can use the statistical analysis to reschedule the content display time to maximise display effect with request from the Contents Provider. If the contents playlist or playlist schedule is modified, repeat from F3. If not, repeat from F2.

부 록 II-1

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

지식재산권 확약서 정보

II-1.1 지식재산권 확약서(1)

해당 사항 없음

※ 상기 기재된 지식재산권 확약서 이외에도 본 표준이 발간된 후 접수된 확약서가 있을 수 있으니, SSF 웹사이트에서 확인하시기 바랍니다.

부 록 II-2

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

시험인증 관련 사항

II-2.1 시험인증 대상 여부

해당 사항 없음

II-2.2 시험표준 제정 현황

해당 사항 없음

부 록 II-3

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

본 표준의 연계(family) 표준

해당 사항 없음

부 록 II-4

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

참고 문헌

[b-ITU-T X.1252] Recommendation ITU-T X.1252 (2010), Baseline identity management terms and definitions.

부 록 II-5

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

영문표준 해설서

II-5.1. 범위

본 표준의 범위에 대해 설명하며 본 표준에서는 이용자 행태 측정 클라이언트 (AM Client)와 이용자 행태 측정 수집기 (AM Aggregation) 사이에 디지털 사이니지 이용자 행태 측정 서비스를 위한 기능 요구 사항, 환경 설정 및 오퍼레이션, 메타데이터 등을 기술한다.

II-5.2. 인용 표준

참조 문서들을 기술하며 본 표준에서는 ITU-T H.741.0, H.741.2, H.780, H.781, H.782, ISO 19136, ISO/IEC 8802-11, IETF RFC 3986, IETF RFC 5139, W3C XML Schema 등 표준을 직접 참조한다.

II-5.3. 용어

본 표준에서는 15개의 신규 용어를 정의하고 있으며, 다른 표준에서 7개의 용어를 참조한다.

II-5.4. 약어

본 표준에서 사용되는 약어 7개를 정의하고 있다.

II-5.5. 관례

본 표준에서는 정의하고 있는 요구 사항에서 사용되는 용어 및 메타데이터를 표현하기 위해 사용되는 기호에 대한 규약을 정의하고 또한 본 표준에서 사용하고 있는 데이터 타입에 대한 규약도 정의한다.

II-5.6. 디지털 사이니지 서비스의 이용자 행태 측정 개요

본 표준의 범위를 디지털 사이니지 서비스 요구 사항 표준 (TTAE.IT-H.781)과 디지털 사이니지 구조 표준 (TTAE.IT-H.781)의 참조 구조를 바탕으로 표현하고 있다.

II-5.7. 기능 요구 사항

본 표준의 기능 요구 사항을 일반적인 측면, 이용자 행태 측정 아키텍쳐 측면, 이용자 행태 측정 수집기와 상위 응용과의 인터페이스 측면, 이용자 행태 측정 클라이언트 제어 측면, 이용자 행태 측정 클라이언트와 이용자 행태 측정 수집기 사이의 인터페이스 측면, 프라이버시 보호 측면에서 기술한다.

II-5.8. 이용자 행태 측정 데이터를 제공하기 위한 환경 설정 및 오퍼레이션

이용자 행태 측정 데이터를 제공하기 위한 환경설정과 측정 데이터 요청 및 측정 데이터 리포트 등의 오퍼레이션에 대하여 기술한다.

II-5.9. 이용자 행태 측정 데이터를 제공하기 위한 메타데이터

이용자 행태 측정 데이터를 제공하기 위하여 이용자 행태 측정 클라이언트와 이용자행태 측정 수집기 사이에 정의된 각 오퍼레이션 별로 해당되는 메타데이터가 있으며, 이는 측정 환경 설정 정보, 측정 정보 요청 정보, 측정 정보 리포트 정보 등의 컨테이너로 표현된다. 본 표준에서는 이들 컨테이너에서 참조하는 이용자 행태 측정 정보 및 주변 환경 정보 등을 기술하고 있다. 각 컨테이너에서는 세부 엘리먼트 별 의미 및 값, 데이터 타입, 강제 및 선택 여부 등을 표현하고 있다.

II-5.부 록 I. 이용자 행태 측정 기능이 있는 디지털 사이니지 서비스 사용 케이스

일반 대중이 사용자 인터랙션이 없는 경우, 적극적인 인터랙션이 있는 경우, 디지털 사이니지 단말 주변 환경 정보에 근거한 이용자 행태 측정 서비스에 대한 사용 케이스를 기술하고 있다.

부 록 II - 6

(본 부록은 표준을 보충하기 위한 내용으로 표준의 일부는 아님)

표준의 이력

판수	채택일	표준번호	내용	담당 위원회
제1판	2018.12.03.	SSF-ST-006(2018)	-	기술표준분과