



**ATSC**

ADVANCED TELEVISION  
SYSTEMS COMMITTEE

# **ATSC Standard: A/331:2019 Amendment No. 1, MMT Hybrid Delivery**

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**Advanced Television Systems Committee**  
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### Revision History

Version	Date
Amendment approved	6 January 2020

# ATSC Standard: A/331:2019 Amendment No. 1, MMT Hybrid Delivery

## 1. OVERVIEW

### 1.1 Definition

An Amendment is generated to document an enhancement, an addition or a deletion of functionality to previously agreed technical provisions in an existing ATSC document. Amendments shall be published as attachments to the original ATSC document. Distribution by ATSC of existing documents shall include any approved Amendments.

### 1.2 Scope

This document updates some sections related to MMT in order to enable switching between MMTP-delivered broadcast service components and HTTP-delivered broadband service components.

### 1.3 Rationale for Changes

For various reasons, a receiver might gain and lose access to an MMTP-delivered broadcast service component. By providing information about related HTTP-delivered broadband service components, receivers can possibly provide uninterrupted services to viewers, even when broadcast access is lost.

### 1.4 Compatibility Considerations

The proposal in this amendment is backwards compatible. The changes add fields to an XML formatted syntax, which is extensible. Receivers of previous versions would ignore the added fields that might be sent by newer services.

## 2. LIST OF CHANGES

Change instructions are given below in *italics*. Unless otherwise noted, inserted text, tables, and drawings are shown in **blue**; deletions of existing text are shown in ~~red-strikeout~~. The text “[ref]” indicates that a cross reference to a cited referenced document should be inserted. Yellow highlighting indicates auto-numbering links be updated.

*Update the standard as follows:*

### 7.2.1 User Service Description for MMTP

The top level or entry point SLS fragment is the USBD fragment. The USBD fragment for ATSC 3.0 is modeled on the USBD fragment as defined by MBMS [14], with the following extensions:

- Child attributes @serviceId and @serviceStatus under the element **UserServiceDescription**;
- Child elements **ContentAdvisoryRating** and **OtherRatings** under the element **UserServiceDescription**;
- Child element **Channel** and its child attributes @serviceGenre, @serviceIcon, and child element **ServiceDescription** and its child attributes @serviceDescrText, @serviceDescrLang under the element **UserServiceDescription**;

- Child element **MPUComponent** and its child attributes @mmtPackageId and @nextMMTPackageId, @contendIdSchemeIdUri, @contentIdvalue, @nextContentIdSchemeIdUri and @nextContentIdvalue under the element **UserServiceDescription**;
- Child element **ROUTEComponent** and its child attributes @stSIDUri, @apdURI @stSIDDestinationIpAddress, @stSIDDestinationUdpPort, @stSIDSourceIPaddress, @stSIDMajorProtocolVersion, @stSIDMinorProtocolVersion under the element **UserServiceDescription**, as service signaling data to support the delivery of locally-cached service content via ROUTE protocol;
- Child element **BroadbandComponent**, and its child attribute @fullMPDUri, and its child element **BroadbandComponentInfo** under the element **UserServiceDescription**; and
- Child element **ComponentInfo** and its child attributes @componentType, @componentRole, @componentProtectedFlag, @componentId, @componentName under the element **UserServiceDescription**.

It is recommended that the same information should not be repeated in the MMTP USBD when it is carried in the service announcement. In this case information in Service Announcement should take precedence.

A large number of the attributes and elements in the MBMS USBD fragment are optional and not relevant to ATSC 3.0. Table 7.6 shows the elements and attributes that would be used in practice for ATSC 3.0 service delivery.

The **BundleDescriptionMMT** shall be represented as an XML document containing a **BundleDescriptionMMT** root element that conforms to the definitions in the XML schema that has namespace:

tag:atsc.org,2016:XMLSchemas/ATSC3/Delivery/MMTUSD/1.0/

The definition of this schema is in the XML schema file, MMTUSD-1.0-20170922.xsd, accompanying this standard, as described in Section 3.6 above. The XML schema xmlns short name should be "mmtusd".

While the XML schemas identified above specify the normative syntax of the elements specified in this ATSC 3.0 standard, informative Table 7.6 below describes the structure of the **BundleDescriptionMMT** element in a more illustrative way.

The media type corresponding to fragments containing these files shall be as specified in Annex H3.

**Table 2.1 XML Format of the User Service Bundle Description Fragment for MMTP**

Element or Attribute Name	Use	Data Type	Description
<b>BundleDescriptionMMT</b>			Root element of the User Service Bundle Description for MMTP.
<b>UserServiceDescription</b>	1		A single instance of an ATSC 3.0 Service.
@serviceId	1	unsignedShort	Reference to corresponding service entry in LLS(SLT).
@serviceStatus	0..1	boolean	Specify the status of this service as active or inactive.
<b>Name</b>	0..N	string	Name of the ATSC 3.0 service.

@lang	1	lang	Language of the ATSC 3.0 service name.
<b>ServiceLanguage</b>	0..N	lang	Available languages of the ATSC 3.0 service
<b>ContentAdvisoryRating</b>	0..N	sa:CARatingType	Specifies the RRT-based content advisory rating, as defined in the ATSC 3.0 Service Announcement specification A/332 [5].
<b>OtherRatings</b>	0..N	sa:OtherRatingType	Specifies the Non-RRT content advisory rating, as defined in the ATSC 3.0 Service Announcement specification
<b>channel</b>	1		Contains information about the service
@serviceGenre	0..1	unsignedByte	Attribute indicates primary genre of the service.
@serviceIcon	1	anyURI	Attribute indicates the Uniform Resource Locator (URL) for the icon used to represent this service.
<b>ServiceDescription</b>	0..N		Contains service description possibly in multiple languages.
@serviceDescrText	1	string	Attribute indicates description of the service.
@serviceDescrLang	0..1	lang	Attribute indicates the language of the serviceDescrText.
<b>MPUComponent</b>	0..1		A description about the <b>contents components</b> content components of ATSC 3.0 Service delivered as MPUs
@mmtPackageId	1	string	Reference to a MMT Package for content components of the ATSC 3.0 Service delivered as MPUs.
@contentIdSchemeIdUri	0..1	anyURI	Attribute indicates a URI to identify the scheme for Content ID associated to the current MMT Package.
@contentIdValue	0..1	string	Attribute indicates the value for Content ID associated to the current MMT Package.
@nextMMTPackageId	0..1	string	Reference to a MMT Package to be used after the one referenced by @mmtPackageId in time for content components of the ATSC 3.0 Service delivered as MPUs.
@nextContentIdSchemeIdUri	0..1	anyURI	Attribute indicates a URI to identify the scheme for Content ID associated to the next MMT Package.
@nextContentIdValue	0..1	string	Attribute indicates the value for Content ID associated to the next MMT Package.
<b>ROUTEComponent</b>	0..1		A description about locally-cached service content -of ATSC 3.0 Service delivered by ROUTE.
@sTSIDUri	1	anyURI	Reference to the S-TSID fragment which provides access related

			parameters of the Transport sessions (i.e., LCT channel(s) of ROUTE session(s)) carrying contents of this ATSC 3.0 Service.
@apdUri	0..1	anyURI	Reference to the APD fragment which contains file repair related information.
@sTSIDDestinationIpAddress	0..1	IPv4address	A string containing the dotted-IPv4 destination address of the packets carrying S-TSID for this service.
@sTSIDDestinationUdpPort	1	unsignedShort (port)	Port number of the packets carrying S-TSID for this service.
@sTSIDSourceIpAddress	1	IPv4address	A string containing the dotted-IPv4 source address of the packets carrying S-TSID for this service.
@sTSIDMajorProtocolVersion	0..1	unsignedByte	Major version number of the protocol used to deliver the S-TSID for this service.
@sTSIDMinorProtocolVersion	0..1	unsignedByte	Minor version number of the protocol used to deliver the S-TSID for this service.
<b>BroadbandComponent</b>	0..1		A description about the <del>contents</del> <del>components</del> <del>content</del> <del>components</del> of ATSC 3.0 Service delivered by broadband.
@fullMPDUri	1	anyURI	Reference to an MPD fragment which contains descriptions for <del>contents</del> <del>components</del> <del>content</del> <del>components</del> of the ATSC 3.0 Service delivered over broadband.
<b>BroadbandComponentInfo</b>	0..N		A description of the relationship among content components of ATSC 3.0 Service delivered by broadcast and broadband, respectively.
@repId	1	stringNoWhitespace	Representation ID of the DASH Representation delivered by broadband.
@complementaryAssetId	0..1	listOfStringType	All complementary MMT Assets that the DASH Representation depends upon in the decoding and/or presentation process as a whitespace-separated list of values of complementary asset ID.
@dependentAssetId	0..1	listOfStringType	All dependent MMT Assets that depend upon the DASH Representation in the decoding and/or presentation process as a whitespace-separated list of values of dependent asset ID.
@simulcastAssetId	0..1	string	Asset ID of an MPU component carrying the same content with the DASH Representation.
<b>ComponentInfo</b>	0..N		Contains information about components available in the service. For each component includes information about

				component type, component role, component name, component identifier, component protection flag.
	@componentType	1	unsignedByte	Attribute indicates the type of this component.
	@componentRole	1	unsignedByte	Attribute indicates the role or kind of this component.
	@componentProtectedFlag	0..1	boolean	Attribute indicates if this component is protected
	@componentId	1	string	Attribute indicates the identifier of this component.
	@componentName	0..1	string	Attribute indicates the human readable name of this component.

### 7.2.1.1 User Service Description for MMTP – Semantics

The following text specifies the semantics of the elements and attributes in the User Service Description for MMTP.

**BundleDescriptionMMT** – Root element of the User Service Bundle Description for MMTP.

**UserServiceDescription** – Single instance of an ATSC 3.0 Service.

@serviceId – Reference to corresponding service entry in LLS (SLT). The value of this attribute is the same value of serviceId assigned to the service entry. (Same as given in [Table 7.1](#)).

@serviceStatus – A Boolean attribute which shall convey the current status of this service as being active or inactive. A value of "true" shall indicate that the service is active. A value of "false" shall indicate that the service is inactive. The default value shall be "true". (Same as given in [Table 7.1](#)).

**Name** – Name of the ATSC 3.0 service in the language specified by @lang attribute. (Same as given in [Table 7.1](#)). When **Name** is not present, there is no default value for the name of the ATSC 3.0 service.

@lang – Language of the ATSC 3.0 service name. The language shall be specified according to BCP 47 [\[32\]](#). (Same as given in [Table 7.1](#)).

**ServiceLanguage** – This element is for backwards compatibility and should not be present in XML encodings that conform to this standard. Decoders should ignore it when present.

**ContentAdvisoryRating** – Specifies the content advisory rating, as defined in the ATSC 3.0 Service Announcement specification A/332 [\[5\]](#). The syntax and semantics of this element shall be the same as the **ContentAdvisoryRatings** element specified in the Service fragment of the ATSC 3.0 Service Announcement specification A/332 [\[5\]](#). When **ContentAdvisoryRating** is not present, there is no default value for the RRT-based content advisory rating of the service.

**OtherRatings** – Specifies the non-RRT content advisory rating, as defined in the ATSC 3.0 Service Announcement specification A/332 [\[5\]](#). The syntax and semantics of this element shall be the same as the **OtherRatings** element specified in the Service fragment of the ATSC 3.0 Service Announcement specification A/332 [\[5\]](#). Each **OtherRatings** element shall have a unique @ratingsScheme value. When **OtherRatings** is not present, there is no default value for the non-RRT based content advisory rating of the service.

**Channel** – This element contains information about the service.

@serviceGenre – This optional attribute indicates the primary genre category of the service. The <classificationSchemeURI> is <http://www.atsc.org/XMLSchemas/mh/2009/1.0/genre-cs/> and the value of serviceGenre shall match a termID value from the classification schema

in Annex B of A/153 Part 4 [2]. When @serviceGenre is not present, there is no default value for the primary genre of the service.

@serviceIcon – This attribute indicates the Uniform Resource Locator (URL) for the icon used to represent this service.

**ServiceDescription** – Contains service description possibly in multiple languages.

@serviceDescrText – This attribute indicates description of the service.

@serviceDescrLang – This attribute indicates the language of the @serviceDescrText. Semantics of xml:lang shall be followed. When @serviceDescrLang is not present, the language is identified to be “en”.

**MPUComponent** – A description about the ~~contents-components~~ content components of ATSC 3.0 Service delivered as MPUs.

@mmtPackageId – Reference to a MMT Package for content components of the ATSC 3.0 Service delivered as MPUs.

@contentIdschemeIduri – This attribute shall indicate a URI to identify the scheme for Content ID associated to the current MMT Package. The semantics of @contentIdvalue attribute are specific to the scheme specified by this attribute. The allowed values are:

- urn:eidr for EIDR Content ID; and
- the “Designator” for either the “full” or “compact” encoding as defined in SMPTE 2092-1 [41].

Other schemes may be used, including user private schemes, by using appropriately unique values of @contentIdschemeIduri.

When @contentIdschemeIduri is not present, there is no default value and there is no information present in this User Service Description about content ID for the current MMT package.

@contentIdvalue – This attribute shall specify the value of Content ID associated to the current MMT Package according to the Content ID system identified by @contentIdschemeIduri attribute. The “EIDR Content ID” shall be a valid canonical EIDR entry as defined in [42]. The “Ad-ID Content ID” shall be a valid Ad-ID entry as defined in [41].

When @contentIdschemeIduri is not present, @contentIdschemeIdvalue shall not be present. When @contentIdschemeIduri is present, @contentIdschemeIdvalue shall be present.

When @contentIdschemeIdvalue is not present, there is no default value and there is no information present in this User Service Description about content ID for the current MMT Package.

@nextMmtPackageId – Reference to a MMT Package to be used after the one referenced by @mmtPackageId in time for content components of the ATSC 3.0 Service delivered as MPUs.

@nextContentIdschemeIduri – This attribute shall indicate a URI to identify the scheme for Content ID associated to the next MMT Package. The semantics of @nextContentIdvalue attribute are specific to the scheme specified by this attribute. The allowed values are:

- urn:eidr for EIDR Content ID; and
- the “Designator” for either the “full” or “compact” encoding as defined in SMPTE 2092-1 [41].

Other schemes may be used, including user private schemes, by using appropriately unique values of @nextContentIdschemeIduri.



When @nextContentIdSchemeIdUri is not present there is no default value and there is no information present in this User Service Description about Content ID for the next MMT Package.

@nextContentIdValue – This attribute shall specify the value of Content ID associated to the next Package according to the Content ID system identified by @nextContentIdSchemeIdUri attribute. The “EIDR Content ID” shall be a valid canonical EIDR entry as defined in [42]. The “Ad-ID Content ID” shall be a valid Ad-ID entry as defined in [41].

When @nextContentIdSchemeIdUri is not present, @nextContentIdSchemeIdValue shall not be present. When @nextContentIdSchemeIdUri is present, @nextContentIdSchemeIdValue shall be present.

When @nextContentIdSchemeIdValue is not present, there is no default value and there is no information present in this User Service Description about Content ID for the current MMT Package.

**ROUTEComponent** – A description about the ~~contents-components~~ content components of ATSC 3.0 Service delivered by ROUTE.

@STSIDUri – Reference to the S-TSID fragment which provides service access related parameters to the Transport sessions carrying contents of this ATSC 3.0 Service.

@apdUri – This optional attribute shall provide a reference to the APD fragment which provides file repair related information for the content components of ATSC 3.0 Service delivered by ROUTE. This attribute points to an APD fragment as described in Section 7.1.7.

When @apdUri is present, at least one **Alternate-Content-Location-1** element shall be present in the **EFDT** element of the S-TSID fragment pointed by the **ROUTEComponent@STSIDUri**. When @apdUri is not present, there is no default value.

@STSIDDestinationIpAddress – A string containing the dotted-IPv4 destination address of the packets carrying S-TSID for this service. When not present the value of this attribute is inferred to be current MMTP session’s destination IP address. The syntax shall be as defined in RFC 3986 [19] Section 3.2.2.

@STSIDDestinationUdpPort – A string containing the UDP port number of the packets carrying S-TSID for this service.

@STSIDSourceIpAddress – A string containing the dotted-IPv4 source address of the packets carrying S-TSID for this service. The syntax shall be as defined in RFC 3986 [19] Section 3.2.2.

@STSIDMajorProtocolVersion – Major version number of the protocol used to deliver the S-TSID for this service. When not present the value of this attribute is inferred to be 1.

@STSIDMinorProtocolVersion – Minor version number of the protocol used to deliver the S-TSID for this service. When not present the value of this attribute is inferred to be 0.

**BroadbandComponent** – A description about the ~~contents-components~~ content components of ATSC 3.0 Service delivered by broadband. At least one of **MPUComponent**, **ROUTEComponent** or **BroadbandComponent** shall be present.

@fullMPDUri – Reference to an MPD fragment which contains descriptions for content components of the ATSC 3.0 Service delivered over broadband.

**BroadbandComponentInfo** – A description of the relationship between content components of the ATSC 3.0 Service delivered by broadcast and broadband, respectively. This element shall be present when there is a dependency between the DASH representation delivered over

broadband and the MMT Asset over broadcast or when the DASH representation delivered over broadband carries the same content as the MMT Asset over broadcast.

**@repId** – This attribute indicates the representation ID of DASH Representation delivered by broadband.

**@complementaryAssetId** – This attribute indicates all complementary MMT Assets that the DASH Representation depends on in the decoding and/or presentation process as a whitespace-separated list of values of complementary asset ID. This attribute is used when the DASH representation delivered over broadband depends on the MMT Asset(s) over broadcast. When **@complementaryAssetId** is not present, there is no default value. Dependent assets depend on complementary assets. For example, a complementary asset might be a base layer while a dependent asset might be the related enhancement layer.

**@dependentAssetId** – This attribute indicates all dependent MMT Assets that depend on the DASH Representation in the decoding and/or presentation process as a whitespace-separated list of values of dependent asset ID. This attribute is used when the MMT Asset(s) delivered over broadcast depends on the DASH representation over broadband. When **@dependentAssetId** is not present, there is no default value. For the definition of a dependent asset, see subclause 3.1 of ISO/IEC 23008-1 [37]. For example, a complementary asset might be a base layer while a dependent asset might be the related enhancement layer.

**@simulcastAssetId** - This attribute indicates the asset ID of an MPU component carrying the same content as the DASH Representation. When **@simulcastAssetId** is not present, there is no default value.

**ComponentInfo** – Contains information about components, available in the service and delivered as MPUs. For each component, this includes information about the component type, component role, component name, component identifier, and the component protection flag. This element shall be present when **MPUComponent** is present.

**@componentType** – This attribute indicates the type of this component. Value of 0 indicates an audio component. Value of 1 indicates a video component. Value of 2 indicates a closed caption component. Values 3 to 7 are ATSC Reserved.

**@componentRole** – This attribute indicates the role or kind of this component.

For audio (when **componentType** attribute above is equal to 0): values of **componentRole** attribute are as follows: 0 = Complete main, 1 = Music and Effects, 2 = Dialog, 3 = Commentary, 4 = Visually Impaired, 5 = Hearing Impaired, 6 = Voice-Over, 7-254= ATSC Reserved, 255 = unknown.

For Video (when **componentType** attribute above is equal to 1) values of **componentRole** attribute are as follows: 0 = Primary video, 1-254 = ATSC Reserved, 255 = unknown.

For Closed Caption component (when **componentType** attribute above is equal to 2) values of **componentRole** attribute are as follows: 0 = Normal, 1 = Easy reader, 2-254 = ATSC Reserved, 255 = unknown.

When **@componentType** attribute above has a value between 3 to 7, inclusive, the **@componentRole** value shall be equal to 255.

**@componentProtectedFlag** – This attribute indicates if this component is protected (e.g. encrypted). When this flag is set to a value of 1 this component is protected (e.g. encrypted). When this flag is set to a value of 0 this component is not protected (e.g. encrypted). When not present the value of **componentProtectedFlag** attribute is inferred to be equal to 0.

@componentId – This attribute indicates the identifier of this component. The value of this attribute shall be the same as the asset\_id in the MP table corresponding to this component.

@componentName – This attribute indicates the human readable name of this component. When @componentName is not present, there is no default value.

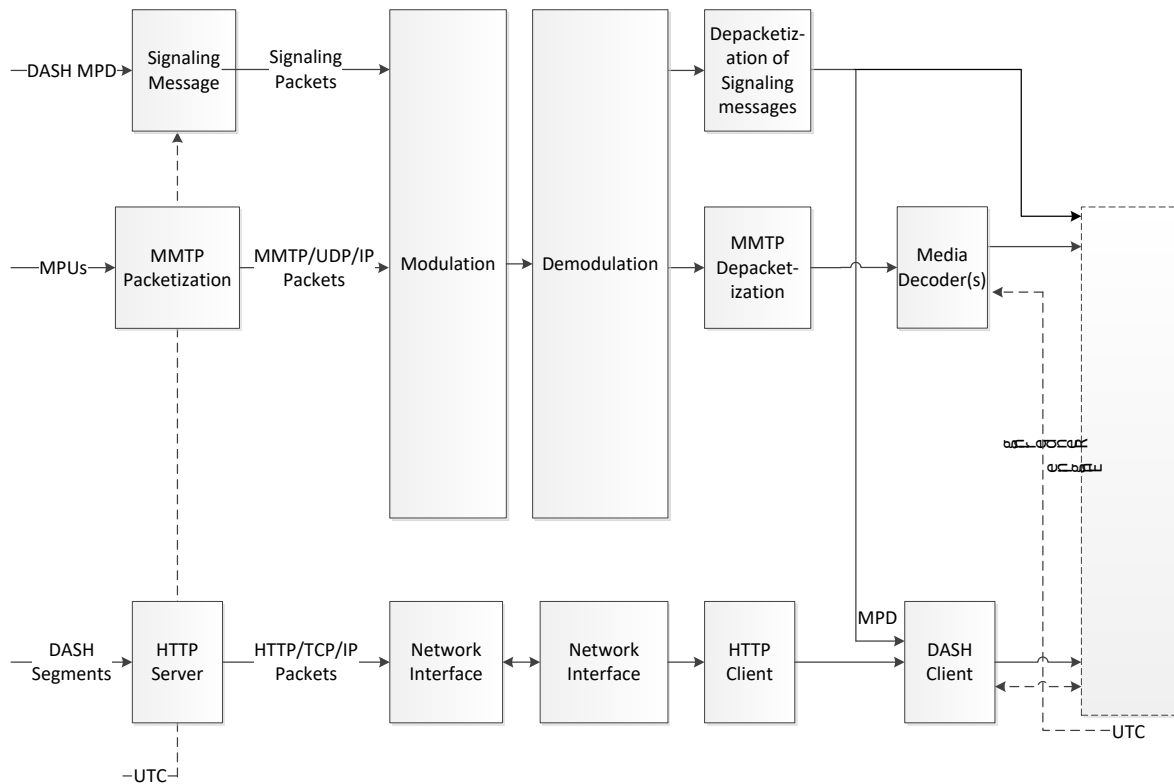
## 8.2.2 MMTP/MPU Modes of Hybrid Service Access

### 8.2.2.1 Introduction

The overall hybrid streaming over broadcast and broadband delivery architecture for both the transmission system and the receiver system is shown in Figure 2.1. All the components of the system are locked to UTC for synchronization.

For the broadcast network, media data are encapsulated into MPUs, which are packetized into MMTP packets as specified in Section 8.1.2 of this document. For the broadband network, media data are encapsulated into DASH Segments. DASH Segments are delivered by an HTTP session through the network interface by a regular HTTP server while a DASH MPD is delivered via the broadcast network. The URI reference for a DASH MPD shall be provided by an **BroadbandComponent** element in the MMTP-specific USBD as defined in Table 7.6. When there is a dependency between an MPU delivered by broadcast and a DASH Segment delivered by broadband, the MMTP-specific USBD contains child element **BroadbandComponentInfo** under **BroadbandComponent** element as defined in Section 7.2.1.1.

For the client it is assumed that the MMTP packets delivered through the broadcast network are de-packetized and the media data are decoded by the appropriate media decoders, and that the DASH Segments are delivered through the broadband network. To synchronize the presentation of a DASH Segment delivered via the broadband network with an MPU delivered via the broadcast network, the presentation time of the DASH Segment is represented by a timestamp referencing UTC.



**Figure 2.1** Conceptual hybrid service architecture.

#### 8.2.2.2 Constraints on DASH

DASH Segments shall be used as the encapsulation format for broadband streaming media delivery.

#### 8.2.2.3 Synchronization

The synchronization of streaming media shall use timestamps referencing UTC. The `MPU_timestamp_descriptor` as defined in subclause 10.5.2 of ISO/IEC 23008-1 [37] shall be used to represent the presentation time of the first media sample in presentation order in each MPU.

The presentation timing for DASH Segments delivered through HTTP shall be based on the DASH Media Presentation timeline referencing UTC. The DASH MPD shall provide attributes for calculating the presentation time of the first sample in presentation order.

Frame-level media timing of both MPUs and DASH Segments shall be as per the DASH-IF [12] profile.

#### 8.2.2.4 Acquisition

Acquisition of broadcast MPU streaming shall be as specified as in Section 8.1.2. Acquisition of broadband content accessed through HTTP shall be as specified as in Section 8.2.1.2.

#### 8.2.2.5 Broadband-Only Service (Signaled by Broadcast)

When all content components are delivered by broadband exclusively, media data is encapsulated into DASH Segments. DASH MPDs are delivered via the broadcast network by a signaling message and DASH Segments are delivered via the broadband network by an HTTP session through the network interface by a regular HTTP server.

#### 8.2.2.6 Hand-off from Broadcast to Broadband Service Access

This operational scenario involves an ATSC 3.0 receiver, which due to user mobility or changing reception conditions, might temporarily cease to receive broadcast coverage and whereby a fallback to service reception via broadband is possible. Furthermore, these broadcast and unicast delivered components can be substituted for one another in the case of hand-off from broadcast to broadband service access, or vice versa, from broadband to broadcast service access. In order to support this component-level hand-off, **BroadbandComponentInfo** elements can further include the `@simulcastAssetId` attribute which represents the asset ID of an MPU component that carries the same content as the DASH Representation delivered over broadband and is identified by the `@repId` attribute under the **BroadbandComponentInfo** element.

– End of Document –