ATSC Standard: A/331:2021 Amendment No. 5, "Broadcast-Broadband Configuration Signaling"

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Advanced Television Systems Committee
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Revision History

Version	Date
Amendment approved	9 November 2021

ATSC Standard:
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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 is supported by NPP N-026r1. It addresses service signaling for ROUTE configurations:

    a) Broadcast-only
    b) Broadband-only

This document also anticipates signaling additional configurations. It also clarifies the MMT `@componentId`.

1.3 Rationale for Changes

The changes described in this document are being proposed because an analysis of A/331 provisions for other than broadcast-only content delivery indicates that they are ambiguous and incomplete; and current practices are not interoperable today.

1.4 Compatibility Considerations

The changes described in this document are not all backward-compatible relative to the currently published version of the standard to which this Amendment pertains and any previously approved Amendments for that standard. All attempts will be made to ensure changes do not adversely affect deployed receivers for broadcast-only content. Substantive changes are required for other than broadcast-only content.

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.

2.1 Normative References

Add the following Normative Reference:

[ref] IETF: RFC 4122 "A Universally Unique IDentifier (UUID) URN Namespace," Internet Engineering Task Force, Reston, VA, July, 2005. http://tools.ietf.org/html/rfc4122

2.2 Informative References

[*Enter changes to the Informative Reference section, if any.*]

2.3 Acronyms and Abbreviations

[*Enter changes to the Acronyms and Abbreviations section, if any.*]

2.4 Terms

Broadband Configuration – A Service where all Components are delivered over broadband only (HTTPS).

Broadcast Configuration – A Service where all Components are delivered over ROUTE or MMT only.

Component – Single media coding sequence of Segments of, e.g., video, audio, or captions.

Essential Component – A Component required for a meaningful presentation.

ESG Server – As described in Section 6.9.

Service – A collection of ~~media components~~Components presented to the user in aggregate; ~~components~~ Components can be of multiple media types; a Service can be either continuous or intermittent~~; a Service can be Real Time or Non-Real Time; Real Time Service can consist of a sequence of TV programs~~.

Service Configuration – One of the configurations listed in Section 5.3.

Service Type – One of the types listed in Section 5.3.

Signaling Server – As described in Section 6.9.

2.5 Change Instructions

Change all existing occurrences of the new or revised terms above to the new/proper term and capitalization.

Review all occurrences of "real time" and if not in the context of the standard term of art or a proper noun (e.g., ROUTE), then correct.

Note: Actual implementation of the above two change instructions will not appear in the published amendment. The changes will appear in the A/331:2021 Candidate Standard, which includes a roll up of approved amendments and other updates.

Revise Section 4.2 as follows:

4.2 Features

The protocols specified herein provide support for system features including:
- Real-time streaming of broadcast media (Broadcast Configuration).
- Efficient and robust delivery of file-based objects.
- Support for fast Service acquisition by receivers (fast channel change).
- Support for hybrid (broadcast/broadband) Services.
- Highly efficient Forward Error Correction (FEC).
- Compatibility within the broadcast infrastructure. with formats and delivery methods developed for (and in common use within) the Internet.
- Support for DRM, content encryption, and security.

- Support for Broadband Configuration.~~Service definitions in which all components of the Service are delivered via the broadband path (note that acquisition of such Services still requires access to the signaling delivered in the broadcast)~~.
- Signaling to support state-of-the-art audio and video codecs.
- Non-real-time delivery of media content.
- Non-multiplexed delivery of Service ~~components~~ Components (e.g., video and audio in separate streams).
- Support for adaptive streaming on broadband-delivered streaming content.
- Appropriate linkage to application-layer features such as ESG and Interactive Content.

Revise Section 5 as follows:

5.1 Receiver Protocol Stack

…

For ROUTE/DASH Services delivered over broadcast, the SLS is carried either on a Signaling Server or by ROUTE/UDP/IP in one of the LCT transport channels comprising a ROUTE session, at a suitable carousel rate to support fast channel join and switching. For MMTP/MPU streaming delivered over broadcast, the SLS is carried by MMTP Signaling Messages, at a suitable carousel rate to support fast channel join and switching. ~~In broadband delivery, the SLS is carried over HTTP(S)/TCP/IP.~~

…

5.3 Service Types and Service Configurations

The types of ATSC 3.0 Services that are currently defined are:
1) Linear Audio/Video Service
2) Linear Audio-Only Service
3) App-Based Service
4) ESG Service
5) EA Service
6) DRM Data Service

These Service ~~types~~Types correspond to the values of `SLT.Service@serviceCategory`. New ~~types of ATSC 3.0~~Service Types may be defined in future versions of this Standard.

The Service Configurations of ATSC 3.0 Services that are currently defined are:
1) Broadcast
2) Broadband

NOTE: Other configurations are under development; e.g., "hybrid."

These Service Configurations correspond to the values of `SLT.Service@configuration`. New Service Configurations may be defined in future versions of this Standard. See Section 8.2.1.2 for more information. A Service Configuration applies to the delivery of Components only, and does not apply to signaling or other data delivery (e.g., data from a Signaling Server or an ESG Server).

Revise Section 6.3 as follows:

6.3.1 SLT Syntax Description

While the indicated XML schema specifies the normative syntax of the `SLT` element, informative Table 6.2 describes the structure of the `SLT` element in a more illustrative way. The specifications following the table give the semantics of the elements and attributes.

Table 6.1 SLT XML Format

Element or Attribute Name	Use	Data Type	Short Description
SLT			Root element of the SLT.
@bsid	1	slt:listOfUnsignedShort	Identifies the one or more Broadcast Streams comprising the Services.
SLTCapabilities	0..1	sa:CapabilitiesType	Required capabilities for decoding and meaningfully presenting the content for all the Services in this SLT instance.
SLTInetUrl	0..N	anyURI	Base URL to acquire ESG or SLS ~~service layer signalling~~ files available via broadband for all Services in this SLT.
@urlType	1	unsignedByte	Type of files available with this URL.
Service	1..N		Service information.
@serviceId	1	unsignedShort	Integer number that identifies this Service within the scope of this Broadcast area.
@globalServiceID	0..1	anyURI	A globally unique URI that identifies the ATSC 3.0 Service. This attribute is not present for the ESG, EAS, and DRM Data Services.
@sltSvcSeqNum	1	unsignedByte	Version of SLT Service info for this Service.
@protected	0..1	boolean	Indicates whether one or more components needed for meaningful presentation of this Service are protected (e.g. encrypted).
@majorChannelNo	0..1	unsignedShort 1..999	Major channel number of the Service.
@minorChannelNo	0..1	unsignedShort 1..999	Minor channel number of the Service.
@serviceCategory	1	unsignedByte	Service Type ~~category~~, coded per Table 6.4.
@shortServiceName	0..1	string	Short name of the Service.
@hidden	0..1	boolean	Indicates whether the Service is intended for testing or proprietary use, and is not to be selected by ordinary TV receivers.
@broadbandAccessRequired	0..1	boolean	Indicates whether broadband access is required for a receiver to make a meaningful presentation of the Service.
@essential	0..1	boolean	Indicates if the essential portion of the Service is delivered via this Broadcast Stream.
@drmSystemID	0..1	listOfanyURI	Specifies the DRM System ID(s) related to this service.
@configuration	0..1	token	Declares the Service Configuration.
SimulcastTSID	0..1	unsignedShort	Identifier of an ATSC 1.0 broadcast stream carrying the same programming content.
@simulcastMajorChannelNo	0..1	unsignedShort 1..999	Major channel number of the ATSC 1.0 Service carrying the same programming content.
@simulcastMinorChannelNo	0..1	unsignedShort 1..999	Minor channel number of the ATSC 1.0 Service carrying the same programming content.

Element or Attribute Name	Use	Data Type	Short Description
SvcCapabilities	0..1	sa:CapabilitiesType	Required capabilities for decoding and meaningfully presenting content of this Service.
BroadcastSvcSignaling	0..1		Location, protocol, address, id information for broadcast signaling.
@slsProtocol	1	unsignedByte	Protocol used to deliver the ~~s~~Service ~~l~~Layer ~~s~~Signal~~l~~ing for this Service.
@slsMajorProtocolVersion	0..1	unsignedByte	Major version number of protocol used to deliver Service Layer Signal~~l~~ing for this Service.
@slsMinorProtocolVersion	0..1	unsignedByte	Minor version number of protocol used to deliver Service Layer Signal~~l~~ing for this Service.
@slsDestinationIpAddress	1	IPv4address	A string containing the dotted-IPv4 destination address of the packets carrying broadcast SLS data for this Service.
@slsDestinationUdpPort	1	unsignedShort	Port number of the packets carrying broadcast SLS data for this Service.
@slsSourceIpAddress	0..1	IPv4address	A string containing the dotted-IPv4 source address of the packets carrying broadcast SLS data for this Service.
SvcInetUrl	0..N	anyURI	URL to acquire ESG or SLS files available via broadband for ~~URL to access Internet signalling for~~this Service.
@urlType	1	unsignedByte	Type of files available with this URL.
OtherBsid	0..N	slt:listOfUnsignedShort	Identifier(s) of other Broadcast Stream(s) that deliver duplicates or portions of this Service.
@type	1	unsignedByte	Indicates whether the Broadcast Stream identified by the OtherBsid delivers a duplicate or a portion of this Service.

6.3.2 SLT Semantics

The following text specifies the semantics of the elements and attributes in the SLT.

…

SLTInetUrl – Base URL to acquire ESG or ~~s~~Service ~~l~~Layer ~~s~~Signaling files for all Services in this **SLT** via broadband, if available.

@urlType – Type of files available with the sltInetUrl (ESG or ~~s~~Service ~~l~~Layer ~~s~~Signaling). See Table 6.3 for values. Note that for urlType=1 (SLS Signaling Server) this does not provide a mechanism to define how the Components referenced in the MPD are delivered. See Section 8.2.1.2 for more information.

Table 6.3 Code Values for `urlType`

urlType	Meaning
0	ATSC Reserved
1	URL of ~~Service Layer~~Signaling Server (providing access to the Service Layer Signaling, as specified in Section ~~7~~ 6.9).
2	URL of ESG ~~server~~Server (providing access to the ESG data, as specified in A/332, Section 5.5.2 [5]).
3	URL of Service Usage Data Gathering Report server (for use in reporting Service usage, as specified in A/333 [6]).
4	URL of Dynamic Event WebSocket Server (providing access to the dynamic events via WebSocket protocol, as specified in A/337 [7]).
Other values	ATSC Reserved

…

`SvcInetUrl` – Base URL to access ESG or ~~s~~Service ~~l~~Layer ~~s~~Signaling files for this Service via broadband, if available.

`@urlType` – Type of files available with `SvcInetUrl`. See Table 6.3 for values. Note that for `urlType`=1 (Signaling Server) this does not provide a mechanism to define how the Components referenced in the MPD are delivered. See Section 8.2.1.2 for more information.

…

`@serviceCategory` – 8-bit integer that indicates the ~~category of this~~Service Type. The value shall be coded according to Table 6.4.

Table 6.4 Code Values for `SLT.Service`@`serviceCategory`

serviceCategory	~~Meaning~~Service Type
0	ATSC Reserved
1	Linear A/V Service
2	Linear audio only Service
3	App-~~based~~Based Service
4	ESG Service (program guide)
5	~~EAS~~ EA Service (emergency alert)
6	DRM Data Service (DRM Data)
Other values	ATSC Reserved

…

`@configuration` – This attribute identifies the Service Configuration. It should be present always, but when not present the default Service Configuration can be determined as described in Section 8.2.1.2. When present it shall be one of the following string tokens:

- Broadband
- Broadcast

    NOTE: Other configurations are under development; e.g. "hybrid."

…

Revise Section 7 as follows:

7.   SERVICE LAYER SIGNALING

For Service delivery using ROUTE, the SLS for each Service describes characteristics of the Service, such as a list of its components and where to acquire them, the receiver capabilities required to make a meaningful presentation of the Service, and the availability and associated rules regarding access to file repair services by receivers.

[new paragraph] In ROUTE ~~delivery of a DASH formatted streaming Service~~, the ~~The~~ SLS shall include the tables based on Service Type and Configuration as shown in Tables 7.x through Table 7.y below. ~~User Service Bundle Description (USBD), the S-TSID and the DASH Media Presentation Description (MPD). Broadcast Services, Hybrid Services and Fallback Services shall also include the User Service Bundle Description (USBD), and the S-TSID. All Services and may include the HTML Entry pages Location Description (HELD), the Distribution Window Description (DWD) and the Regional Service Availability Table (RSAT) (see A/200 [47]). ROUTE delivery of data Services (e.g., the ESG Service, the EAS or the DRM Data Service), app-based Services or app-based feature in Linear Services, the SLS shall include the USBD and the S-TSID and may include the MPD, the HELD, the DWD and the RSAT.~~

Table 7.x SLS Table Requirements per Service Type for Broadcast Configuration

Table Service Type	S-TSID	USBD[1]	MPD	HELD App/no App	DWD App/no App	RSAT	APD
Linear A/V	M	O	M	M/na	O/na	O	O
Linear Audio	M	O	M	M/na	O/na	O	O
App Based	M	O	O	M/na	O/O	O	O
ESG	M	O	na	na/na	na/na	O	O
EA	M	O	na	na/na	na/na	O	O
DRM Data	M	O	na	na/na	na/na	O	O

M = Mandatory, O = Optional, na = Not Applicable (and no defined semantics)

Table 7.y SLS Table Requirements per Service Type for Broadband Configuration

Table Service Type	S-TSID[1]	USBD[1]	MPD	HELD App/no App	DWD App/no App	RSAT	APD
Linear A/V	O	O	M	M/na	O/na	O	O
Linear Audio	O	O	M	M/na	O/na	O	O
App Based	O	O	O	M/na	O/O	O	O
ESG	O	O	na	na/na	na/na	O	O
EA	O	O	na	na/na	na/na	O	O
DRM Data	O	O	na	na/na	na/na	O	O

M = Mandatory, O = Optional, na = Not Applicable (and no defined semantics)

…

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[1] A/331:2020 required this SLS table.

Revise Section 7.1 as follows:

7.1 ROUTE/DASH Service Layer Signaling

Service Layer Signaling provides detailed technical information to an ATSC 3.0 receiver to enable the discovery and access of ATSC 3.0 user Services and their content ~~c~~Components. It comprises a set of XML-encoded metadata fragments ~~carried over a dedicated LCT channel~~. ~~That LCT channel~~ SLS can be acquired using the bootstrap information contained in the SLT as described in Section 6.3. The SLS is defined on a per-Service level, and it describes the characteristics and access information of the Service, such as a list of its content ~~c~~Components and how to acquire them, and the receiver capabilities required to make a meaningful presentation of the Service, and the means to recover partially-received objects. ~~In the ROUTE/DASH system, for linear Services delivery, the SLS consists of the following metadata fragments: (ROUTE-specific) USBD, S-TSID, DASH MPD, DWD and the HELD. The SLS may also include an RSAT metadata fragment (see A/200 [47]) signaling upcoming changes in broadcast Service availability.~~ When SLS is delivered via ROUTE, the ~~The~~SLS fragments shall be delivered on a dedicated LCT transport channel with TSI = 0.

…

Revise Section 7.1.5 as follows:

7.1.5   DASH Media Presentation Description (MPD)

The MPD is only applicable to a Service containing DASH-formatted content. It contains a formalized description of the DASH-IF [12] profile of a DASH Media Presentation, corresponding to a linear Service of a given duration defined by the broadcaster (for example a single TV program, or the set of contiguous linear TV programs over a period of time). The contents of the MPD provide the resource identifiers for Segments and the context for the identified resources within the Media Presentation. The data structure and semantics of the MPD fragment shall be identical to the data structure and semantics of the DASH Media Presentation Description as defined in DASH-IF [12].

~~In the context of ATSC 3.0 Services, one or more of the DASH Representations conveyed in the MPD are carried over broadcast. The MPD may describe additional Representations delivered over broadband, e.g. in the case of a hybrid Service, or to support Service continuity in handoff from broadcast to broadcast due to broadcast signal degradation (e.g. driving through a tunnel).~~

…

Revise Section 7.2.1.1 as follows:

@componentId – This attribute indicates the identifier of this Component. The (string) value of this attribute shall be either a URI, or an RFC 4122 [ref] canonical string representation of a UUID (e.g., "11111111-1111-1111-1111-111111111111"). If this value is a UUID, the "urn:uuid:" shall be omitted. The value of this attribute shall be the same as the asset_id in the MP table corresponding to this Component. As a result, the asset_id in the MP table corresponding to this component is required to be a string value (whether URI or UUID), and if the asset_id value is a UUID, it is required to be formatted in the RFC 4122 [ref] canonical string representation.

Revise Section 8.2.1.2 as follows:

8.2.1.2 ROUTE ~~Broadband Service~~ Configurations ~~DASH-only Service Access~~

8.2.1.2.1   Broadcast

In this Service Configuration, all Components shall be carried exclusively over broadcast (ROUTE); i.e., no Components are delivered over broadband (HTTPS). This Service Configuration is signaled by `SLT.Service`@configuration="Broadcast". If @configuration is not present, and `MPD.BaseURL` is not present, then it is expected that the Receiver will assume the Service Configuration to be "Broadcast".

8.2.1.2.2   ~~Exclusive Delivery of Service Components via~~ Broadband

In this ~~mode~~ Service Configuration, all ~~content components~~ Components ~~of the ATSC 3.0 Service~~ shall be carried exclusively over broadband (HTTPS) – i.e., no ~~content components~~ Components are delivered via broadcast. ~~Such an implementation is indicated by Service Layer Signaling (SLS) as specified in Section 7, specifically, by the combination of the unified MPD fragment and the~~ `UserServiceDescription.DeliveryMethod` ~~element of the User Service Bundle Description fragment. In this case, only the child element~~ `UnicastAppService` ~~shall be present under the~~ `DeliveryMethod` ~~element (i.e.~~ `BroadcastAppService` ~~is absent)~~. This Service Configuration is signaled by `SLT.Service`@configuration="Broadband". If @configuration is not present and `MPD.BaseURL` is present, then it is expected that the Receiver will assume the Service Configuration to be "Broadband".

Access to the service should be protected in a manner that reasonably precludes viewing broadband content outside the authorized geographic area. The Essential Components should be encrypted.

In addition:

- `SLT.Service`@broadbandAccessRequired shall be set to "true".

If the USBD is present, then:

- `BundleDescriptionROUTE.UserServiceDescription.DeliveryMethod.BroadcastAppService` shall be absent.

- `BundleDescriptionROUTE.UserServiceDescription.DeliveryMethod.UnicastAppService` shall be present and `BasePattern` shall be set to the value of `MPD.BaseURL`.

– End of Document –