ATSC Standard: A/324:2021 Amendment #1, "DSMapping Clarification"

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Revision History

Version	Date
Amendment approved	4 October 2021

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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 describes changes to the overall context of the DSTP Mapping protocol and the specific semantics of the DSMapping XML data structure specified in A/324:2021 Section 7.1.1. This amendment also provides an alternative JSON syntax that implementors may deploy as an alternative to the XML syntax.

1.3 Rationale for Changes

The changes described in this document are in response to questions posed after the A/324:2021 document and the DSMapping schema were published. It was pointed out that some optional parameters had no default values described. Further, there seem to be misunderstandings regarding the overall usage context for the structure, likely due to the similarity of the description to similar schemas in other standards. This amendment clarifies the usage of the DSMapping data structure and relaxes the need for it to be strictly implemented in XML.

This amendment provides a JSON syntax for the DSMapping as an alternative to the XML format since JSON may prove to be more convenient for some implementations, e.g., use of HTTP for control of DSTP to ALP stream routing. The semantic definitions remain identical between the JSON and XML schemas.

1.4 Compatibility Considerations

The changes described in this document are backward-compatible relative to the currently published version of the standard to which this Amendment pertains. There have been no normative changes to the semantics described for the DSMapping data structure, simply clarification of default values and usage.

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 highlighted references indicate the document editor should insert the appropriate internal document references.

2.1 Change Instructions

Replace the current .zip file containing additional elements of this standard with the new .zip file containing multiple files:

Modify the last paragraph of Section 4.2.1 as follows:

Data sources feeding a~~the~~ Broadcast Gateway are identified to it by a~~the~~ System Manager using DSTP Mapping Configurations, as described in Section 7.1. ~~IP addresses and port numbers, with one IP address and port combination (i.e., one Tuple) associated with each Data Source or ALP Stream.~~ These Data Sources also can have separate control IP addresses, in which case the IP addresses of the control connections are indicated to the Broadcast Gateway by the System Manager~~ – at most one per ALP Stream~~. ~~The o~~Operation of the Data Source control interface and ~~the~~ messages that cross it are described in overview in Section 4.9 and in detail in Section 5.5. ~~For each input Data Source or ALP Stream, the System Manager assigns a specific PLP number, which is related to the UDP port address used, as described in Section 7.1.1.~~

In Section 3.4 Terms, add the following definitions, placed in alphabetical order within the list.

Control Plane – The part of a data network that controls how data is forwarded and provides other management and maintenance functions.

Data Source Mapping Configuration – A set of routing instructions to a data switching function that defines the connection of data Streams from specific Data Sources to the inputs of specific ALP Encapsulators for inclusion in the ALP Streams they produce for transmission on their associated PLPs. Such configuration instructions typically are carried in the form of files.

Data Source Tunnel – A Tunnel Stream that carries Tunneled Packets, according to the Data Source Transport Protocol (DSTP), from one or more Data Sources through data routing processes to the input(s) of ALP Encapsulator(s), according to routing instructions carried in a Data Source Mapping Configuration.

Modify Sections 4.8 and 4.9 as follows:

4.8 System Manager Configuration Interface

As described in Section 4.2.1, a System Manager is a conceptual entity that coordinates and controls all broadcaster facilities necessary to produce a specific desired station output configuration and emission. The configuration interface between the System Manager and the Configuration Manager in a Broadcast Gateway transfers information between the two subsystems to enable the system management process with respect to the Scheduler and its associated functions. The System Manager configuration interface may comprise~~s~~ a normal TCP/IP connection between the devices with control functionality structured according to the SMPTE Professional Media Over Managed IP Networks (ST 2110) standards suite [18] and carrying the information described in Section 5.4 herein. The messages are used to negotiate a detailed emission waveform configuration between the System and Configuration Managers and to permit the System Manager to provide instructions to the Configuration Manager with respect to emission requirements and schedules.

4.9 Real-Time Control Interface

As mentioned in Section 4.2.1, the System Manager directs the Broadcast Gateway ~~Scheduler~~ through the Configuration Manager to control data delivery from various Data Sources by providing a DSTP Mapping Configuration ~~an address and port number combination (a Tuple)~~ for each Data Source Transport Protocol Stream feeding data to the Broadcast Gateway for delivery through ~~a~~ various PLPs. The Broadcast Gateway ~~Scheduler~~ communicates with the Data Source(s) at the address(es) and port number(s) assigned by the System Manager using a Real Time Control

Interface that employs SMPTE Professional Media Over Managed IP Networks (ST 2110) methods [18] and carries ~~carrying~~ the information described in Section 5.5 herein. Messages that can be communicated between the Broadcast Gateway ~~Scheduler~~ and the various Data Sources are defined in Section 5.5. The Real-Time Control Interface provides such functions as discovery of the capabilities of a Data Source, setting a target bit rate for a Data Source, and managing the speed of data delivery from a Data Source in real time, i.e., updating rates of data delivery as necessary to maintain control of buffer fullness throughout the Physical Layer system.

Modify Section 5.3, Table 5.1, as follows: In the "Per Frame Data" (first) section, on the seventh row – labelled "Frame length" – in the middle column – labelled "Instructions from System Manager" – remove the check mark. This will leave a single check mark on the row, in the right-hand column. See cyan mark in example below indicating check mark to be removed.

Table 5.1 Preamble Parameters and Their Sources

	Parameters	Instructions from System Manager	Scheduler Generated
Per Frame Data	Channel bandwidth	✓	
		✓	
	Major and Minor version values	✓	
	Emergency Alert Wakeup		✓
	L1B Preamble Structure indicator		✓
			✓
	Frame length	✓	✓
			✓
	Number of symbols in the Preamble		✓
	Frame alignment	✓	
	Frame PAPR	✓	
	BSID (L1D)	✓	
	CRC values (L1B)		✓
			✓
	Preamble NoC	✓	
	FEC Mode for L1-Detail	✓	
	Additional parity for next frame		✓
		✓	
	Center frequency of channels involved in bonding	✓	
		✓	
	Return Channel flag	✓	
	LLS flag		✓
			✓
Per Subframe Data	Subframe size	✓	
	Subframe PLP count	✓	
	Subframe MIMO/MISO/SISO	✓	
	Subframe FFT size	✓	
	Subframe NoC	✓	
	Subframe GI	✓	
	Subframe pilot pattern	✓	
	Subframe pilot boost	✓	

		✓ ✓	
Per PLP Data	PLP ID	✓	
	PLP type		✓
	PLP size		✓
	PLP start position		✓
	PLP number of subslices		✓
	PLP subslice interval		✓
	PLP LLS flag		✓
	PLP scrambler type	✓	
	PLP FEC mode	✓	
	PLP position of first complete FEC Block		✓
	PLP code rate	✓	
	PLP modulation	✓	
	PLP time interleaver mode	✓	
	PLP CTI depth		✓
	PLP CTI start row		✓
	PLP CTI position of first complete FEC block		✓
	PLP HTI inter-subframe interleaving flag		✓
	PLP HTI number of TI blocks or subframes		✓
	PLP HTI max interleaving FEC blocks per interleaving frame		✓
	PLP HTI number of FEC blocks in the current interleaving frame		✓
	PLP HTI Cell Interleaver flag		✓
	PLP LDM layer	✓	
	PLP LDM injection level	✓	
	PLP Channel BSIDs involved in channel bonding	✓	
	PLP Center frequency of channels involved in bonding	✓	

Modify Section 5.4 as follows:

5.4 ~~Scheduler~~ Broadcast Gateway Management Protocol

The interface between the ~~Scheduler~~ Broadcast Gateway and System Management functions may ~~shall~~ use SMPTE Broadcast eXchange Format (BXF) protocol as described in [9] or another appropriate syntax. Note that the Broadcast Gateway described here combines the Scheduler and internal ALP Generator functions as shown in Figure 4.2.

The parameters that use this protocol are those listed in Table 5.1 under the parameter column with a check mark in the "Instructions from System Manager" column. These parameters are quasi-static in nature and do not routinely change between Physical Layer frames. Scheduler function configurations and constraints are set with these parameters, which are allowed to change quasi-statically. An emission schedule for a set of parameters can be similar to a program schedule, in which the parameters can change over the course of a day. Detailed description of these parameters is provided in ~~Section 5.4~~ Annex A.

In addition to providing the quasi-static Preamble parameters, the System Manager ~~shall~~ is expected to identify for the ~~Scheduler~~ Broadcast Gateway:

1) The Data Source Mapping Configuration, as defined in Section 7.1, which describes the mapping of Tunneled Data Source Packets from one or more incoming DSTP Streams into ALP Streams. This mapping is performed by a data switch positioned between the

incoming DSTP Streams and the ALP Generator function of the Broadcast Gateway or a standalone ALP Generator when external ALP Generators are used.~~Source and Destination Multicast IP addresses of each Data Source associated with each ALP Stream. Only one Data Source shall be selected for a given ALP Stream at a time.~~

2) The Destination Multicast IP address associated with each ALP Stream, where the port number used indicates the particular ALP / PLP pair.
3) Whether an ALPTP stream is to be generated and, if so, the ALPTP Destination Multicast IP address and port number and other configuration parameters to be used to generate the ALPTP output. When an external ALP Generation function is used, the same instructions and Data Source Mapping Configuration shall apply to it.
~~4) 3) The Control IP address for each Data Source providing data for each ALP Stream. Redundant Data Sources for any given ALP Stream are possible, but only one can be selected for use at a time.~~

Modify Section 7.1.1 as follows:

7.1.1 ~~DSTP~~ Data Source Mapping Configuration Description

The Data Source Mapping Configuration is provided by the System Manager to the Broadcast Gateway ALP Generator function through protocols that are out of scope of the present document as described in Section 4.2.1. Two syntax definitions are provided herein, XML and JSON, to normatively define the semantics and syntax of the configuration regardless of the communication protocol that is used. Note that this configuration information is intended for carriage on a Control Plane and does not transit the normal broadcast data paths (i.e., via DSTP, ALPTP or STLTP).

The ~~DSTP~~ Data Source Mapping Configuration provided to the ALP Generator ~~shall~~may be represented as an XML document containing a **`DSMapping`** root element that conforms to the definitions in the XML Schema Definition (XSD) file that has namespace:

```
tag:atsc.org,2021:XMLSchemas/ATSC3/Delivery/DS_MAPPING/1.0/
```

The definition of this schema is contained in an XML Schema Definition (XSD) file, `DSMapping-1.0-20210~~11~~4512.xsd`, accompanying this standard, as described in Section 3.6 above. The XML schema xmlns short name should be `"dsm"`.

Alternatively, the Data Source Mapping Configuration may be provided to the ALP Generator in the form of a JSON schema file. The definition of this JSON schema can be found in the JSON schema file, `dsmapping-20210512.json`, accompanying this standard.

The semantics ~~schema~~ provided in Table 7.1 shall be used to capture the Data Source Mapping ~~e~~Configuration information. While the indicated XSD or JSON schema files specify~~ies~~ the normative syntax of the **`DSMapping`** element, informative Table 7.1 below describes the structure of the **`DSMapping`** element, expressed as both XML and JSON data types, in a more illustrative way. The specifications following the table give the semantics of the elements and attributes applicable to both forms of representation.

Table 7.1 Data Source Mapping ~~XML Format~~Configuration Semantics

Element or Attribute Name	Use	XML Data Type (JSON Data Type)	Short Description
`DSMapping`			Root element of the Data Source Mapping configuration.

Element or Attribute Name	Use	XML Data Type (JSON Data Type)	Short Description
DSTunnel	1..N		Defines one or more incoming Data Source Tunnel Streams.
@destAddr	1	IPv4address (string / ipv4)	The destination IPv4 address of the incoming DSTP Tunnel Stream.
@destPort	1	unsignedShort (integer)	The destination IP port of the incoming DSTP Tunnel Stream.
@srcAddr	0..1	IPv4address (string / ipv4)	The optional source IPv4 address of the incoming DSTP Tunnel Stream.
@igmpVersion	0..1	unsignedByte 2..3 (integer 2..3)	The optional IGMP version number. Absence of this attribute indicates IGMP is not in use.
@defaultPLP	0..1	unsignedShort (integer)	Optionally, supplies the PLP where any unspecified Tunneled Packet within the Data Source Tunnel should be routed.
DSTBackup	0..N		An optional collection of backup Data Source Tunnel Streams.
@srcAddr	1	IPv4address (string / ipv4)	The source IPv4 address of an optional incoming DSTP backup Tunnel Stream.
TPS	0..N		Element defining each Tunneled Packet Stream.
@destAddr	1	IPv4address (string / ipv4)	Defines the IPv4 destination address of a Tunneled Packet Stream within the DSTP Tunnel Stream. This address is matched with the value found in the Tunneled Packet Information Header (see Section 7.2.1).
@destPort	1	unsignedShort (integer)	Defines the IPv4 destination port of a Tunneled Packet Stream within the DSTP Tunnel Stream. This port is matched with the value found in the Tunneled Packet Information Header (see Section 7.2.1).
@plp	1	unsignedShort (integer)	Supplies the PLP where the associated Tunneled Packet Stream should be routed.

The following text specifies the semantics of the elements and attributes in a~~the~~ Data Source Mapping ~~e~~Configuration ~~fragment~~.

DSMapping – The root element of a~~the~~ Data Source Mapping ~~e~~Configuration ~~structure~~.

DSTunnel – The DSTunnel element shall contain the configuration of each of the Data Source Tunnel Streams to be received and processed by an~~the~~ ALP Generator. Each DSTunnel element contains the address of the incoming DSTP packet Stream with mapping information for each Stream of Tunneled Packets within it.

@dstAddr – The required destination address of the DSTP Tunnel Stream. This may be a multicast or unicast address.

@dstPort – The required destination port of the DSTP Tunnel Stream.

Note that according to A/331 Section 6.1 [4], all destination address and port~~s~~ combinations must be unique across the broadcast. Therefore, each Data Source packet Stream received by an ALP Generator must have a unique address/port and shall ~~may only~~be routed only to a single PLP.

@srcAddr – An~~the~~ optional source address for ~~of~~ the DSTP Tunnel Stream. This attribute is required if IGMP version 3 is being used by the routing system to identify the desired source of the DSTP packet Stream.

@igmpVersion – The optional @igmpVersion attribute allows the version of IGMP to be specified. If '2' is specified, then IGMP version 2 is being used to route the DSTP Tunnel Stream. A value of '3' indicates that IGMP version 3 is being used and Source-Specific Multicast (SSM) is available. If this attribute is provided, has value '3', and Source-Specific Multicast (SSM) is in use, then @srcAddr shall be provided. If this attribute is not provided, then IGMP is not being used.

@defaultPLP – The optional @defaultPLP attribute ~~shall~~ provides the PLP ID to which any unspecified Tunneled Packet Streams ~~should~~ shall be routed. An unspecified Tunneled Packet Stream is any set of Tunneled Packets that ~~which~~ have a Tunneled Packet Information Header that has dest_address and port_number values that do not correspond to any of those identified by TPS elements within the DSTunnel element. Packets from each unspecified Tunneled Packet Stream shall be routed to the PLP specified by this attribute. If this attribute is not provided, the default PLP shall be PLP 0.

DSTBackup – The optional DSTBackup element defines a backup Data Source Tunnel Stream that may be sourced from an alternate Data Source. The single, required @srcAddr attribute specifies the IP source address of the backup Data Source Tunnel.

@srcAddr – The required source address of the backup ~~DSTP~~ Data Source Tunnel Stream. This attribute is used in IGMP version 3 to join the backup ~~DSTP~~ Data Source Tunnel Stream if the primary Tunnel Stream is not available.

TPS – The TPS element contains three attributes that specify the Tunneled Packet Stream and where that Stream shall be routed to. Note that if the TPS ~~structure~~ element is missing then all packets within the tunnel are routed to the PLP specified in the @defaultPLP attribute.

@dstAddr – The required IPv4 destination address of the Tunneled Packet Stream within the DSTP Tunnel Stream. This address is matched with the value found in the Tunneled Packet Information Header (see Section 7.2.1) to determine into which PLP packets from this Stream should be placed.

@dstPort – The required destination port of the Tunneled Packet Stream within the DSTP Tunnel Stream. This port is matched with the value found in the Tunneled Packet Information Header (see Section 7.2.1) to determine into which PLP packets from this Stream should be placed.

@plp – The required @plp attribute shall provide the PLP ID to which the Tunneled Packet Streams should be routed. Packets from the Tunneled Packet Stream shall be routed to the PLP specified by this attribute.

– End of Document –