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Real-time Event Signaling and Management API

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Document Types and Tags

Document Type: Specification

Document Tags:

- | | | |
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| ☐ Test or Measurement | ☐ Checklist | ☐ Facility |
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Note: Standards that are released multiple times in the same year use: a, b, c, etc. to indicate normative balloted updates and/or r1, r2, r3, etc. to indicate editorial changes to a released document after the year.

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1. Introduction

1.1. Executive Summary

This standard defines the Real-time Event Signaling and Management (ESAM) API, an interface that allows a Signal Acquisition System (e.g. encoder, transcoder, packager, stream switcher, etc.) to submit signals to a Signal Decision System and receive relevant instructions for processing the signal or associated content. Furthermore, the Signal Decision System has the ability to initiate a set of instructions based on a schedule or event that is not signaled in the content.

There are several kinds of acquisition systems and the possible instruction set will vary based on the purpose and capabilities of the system. An encoder/transcoder will typically receive instructions for conditioning the content for splices or changes in content for either advertising insertion or alternative content due to blackout restriction. A linear stream switcher is responsible for managing an outbound linear stream based on content/blackout requirements for an intended audience. A packager will typically receive instructions about how to segment content and compose a manifest. All systems are eligible to receive instructions about status reporting or how to add or remove in-band signals.

Table 1 – Types of Instructions

Instruction	Encoder / Transcoder	Linear Stream Switcher	Packager
Remove original in-band signal	✓	✓	✓
Insert new in-band signal for downstream consumption	✓		✓
Receive status information regarding a given signal	✓		✓
Receive and use an endpoint for reporting status	✓	✓	✓
Condition stream for a splice (either in or out)	✓		
Switch content	✓	✓	✓
Customize an ABR manifest			✓
Perform instructions on a repeating / ongoing basis	✓		✓

A given environment may be comprised of multiple Signal Acquisition Systems (SAS) and multiple Signal Decision Systems (SDS). Multiple SAS may be employed to process different content or to redundantly process the same content as other systems. Multiple SDS may be employed to handle load of decisions or to provide redundancy.

In a linear acquisition model, the linear stream is acted on by multiple systems, which are capable of acquiring an in-band signal. The SAS extracts the signal and uses it as the basis to request instructions from the SDS (Figure 1). The SDS will respond with instructions appropriate for the particular SAS and its capabilities.

For example, a real-time transcoder acting as a SAS submits an SCTE 35 splice insert message to the SDS. The SDS may consult an SCTE 130 Placement Opportunity Information Service (POIS) to confirm the validity of the signal and return instructions to the transcoder to identify and update the start/end times of the signaled region, condition the video stream at the appropriate splice points and insert a more descriptive signal into the stream for downstream consumption.

The packager will encounter the enhanced signal that was previously confirmed at the transcoder and, again, submit the signal to the SDS. This time, the SDS could provide manifest-specific conditioning instructions. Not shown in the figure is that downstream from the CDN, the client (or a manifest

manipulator acting on behalf of a client) will use the manifest instructions to initiate decisions for ad insertion or alternative content.

The QAM (or multicast IP) use case is to employ an acquisition system, which will traffic streams to geographic zones. The primary instruction for this use case will be a switch from primary content stream to an alternative stream or slate.

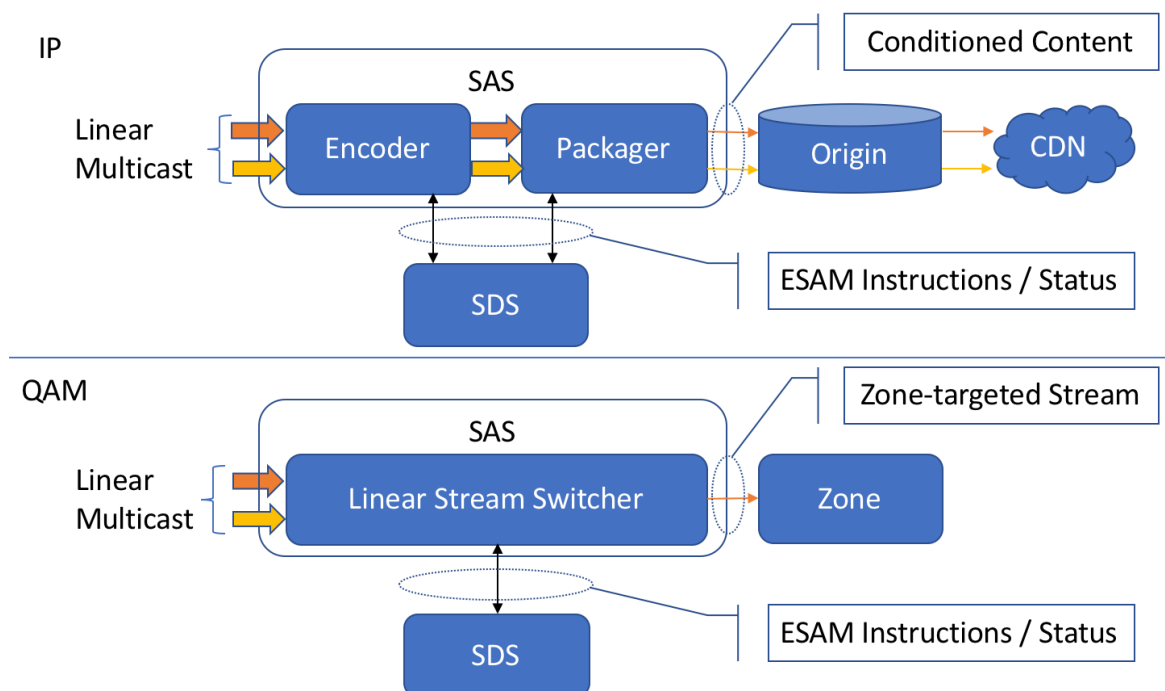


Figure 1 - Example Real-time Video Applications

For VOD content, a transcoder can operate in one of two operational modes (Figure 2). In mode A, the transcoder is triggered to call the SDS to obtain signal regions for content in a file. In mode B, the transcoder is directed to process the file-based content based on directives in the request.

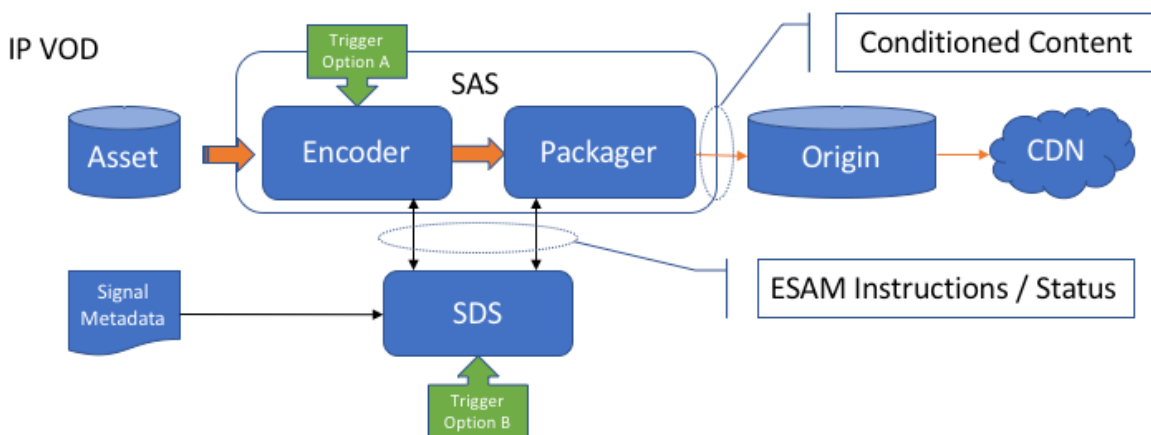


Figure 2 - Example file-based IP Video Application

To fully understand the ABR conditioning portions of this document, the reader is expected to be familiar with and understand the different ABR delivery formats and their individual terminology.

The Event Signaling and Management API supports both JSON and XML event and notification message payload formats with the caller controlling the payload format using standard HTTP semantics.

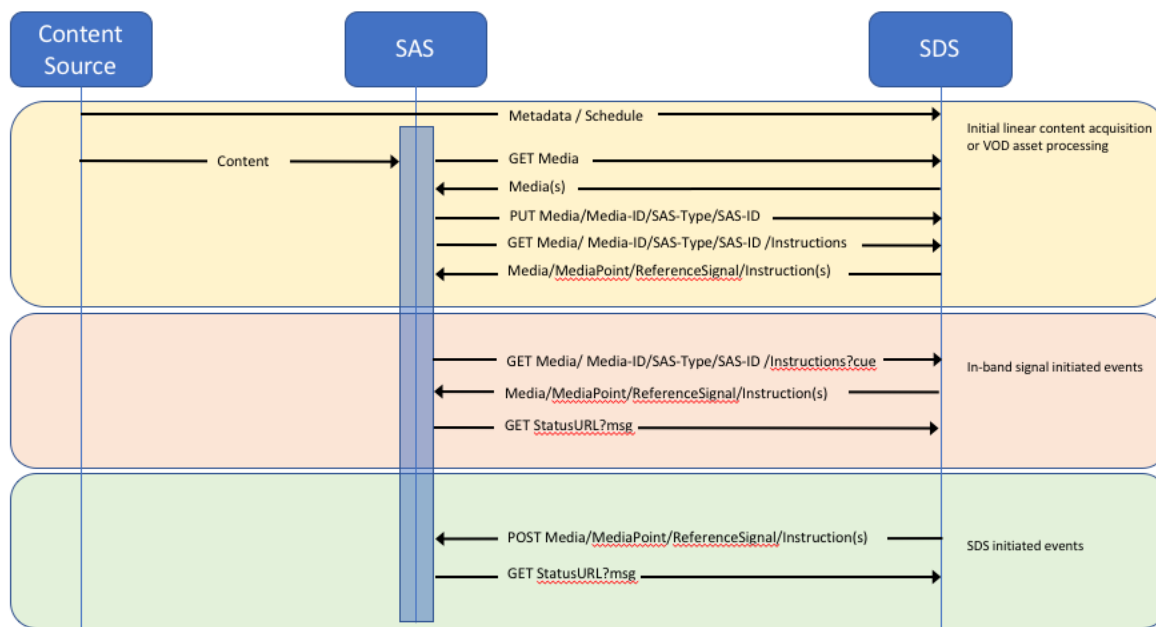


Figure 3 – Interaction between SAS and SDS

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of subcommittee approval, the editions indicated were valid. All documents are subject to revision; and while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1. SCTE References

- ANSI/SCTE 35 2019, Digital Program Insertion Cueing Message for Cable.
- ANSI/SCTE 214-1 2016, MPEG DASH for IP-Based Cable Services Part 1: MPD Constraints and Extensions

2.2. Standards from Other Organizations

- ISO 8601:2004, Data elements and interchange formats -- Information interchange -- Representation of dates and times (Coordinated Universal Time).

- ISO 8601-1:2019, Date and time — Representations for information interchange — Part 1: Basic rules
- IETF RFC 3986, Uniform Resource Identifier (URI): Generic Syntax. T. Berners-Lee, R. Fielding, L. Masinter. January 2005.
- IETF RFC 4648, The Base16, Base32, and Base64 Data Encodings. S. Josefsson. October 2006.
- IETF RFC 7230, Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing. R. Fielding, J. Reschke. June 2014.
- IETF RFC 7231, Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content. R. Fielding, J. Reschke. June 2014.
- W3C XML Base (Second Edition). W3C Recommendation 28 January 2009. <http://www.w3.org/TR/xmlbase/>.
- W3C XML Schema Part 2: Datatypes Second Edition. W3C Recommendation 28 October 2004. <http://www.w3.org/TR/xmlschema-2/>.
- W3C XML Path Language (XPath) 2.0 (Second Edition). W3C Recommendation 14 December 2010. <http://www.w3.org/TR/xpath20/>.
- W3C XML Linking Language (XLink) Version 1.1. W3C Recommendation 06 May 2010. <http://www.w3.org/TR/xlink11/>.

2.3. Published Materials

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. SCTE References

- ANSI/SCTE 67, Recommended Practice for SCTE 35 Digital Program Insertion Cueing Message for Cable.
- ANSI/SCTE 172, Constraints on AVC and HEVC Structured Video Coding for Digital Program Insertion.
- ANSI/SCTE 236, Content Metadata
- SCTE 224, Event Scheduling and Notification Interface (ESNI).

3.2. Standards from Other Organizations

- IETF RFC 8216, HTTP Live Streaming, <https://tools.ietf.org/html/rfc8216>, R. Pantos, August 2017.
- IETF RFC 6749, The OAuth 2.0 Authorization Framework. D. Hardt. October 2012.

3.3. Published Materials

- Flash® Media Manifest (F4M) Format Specification Version 3.0 FINAL, <http://www.images.adobe.com/content/dam/Adobe/en/devnet/hds/pdfs/adobe-media-manifest-specification.pdf>
- JavaScript Object Notation (JSON), <http://www.json.org>.

4. Compliance Notation

<i>shall</i>	This word or the adjective “ required ” means that the item is an absolute requirement of this document.
<i>shall not</i>	This phrase means that the item is an absolute prohibition of this document.
<i>forbidden</i>	This word means the value specified shall never be used.
<i>should</i>	This word or the adjective “ recommended ” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
<i>should not</i>	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
<i>may</i>	This word or the adjective “ optional ” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
<i>deprecated</i>	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of this document. Implementations should avoid use of deprecated features.

5. Abbreviations and Definitions

5.1. Abbreviations

ABR	adaptive bitrate
API	application programming interface
DASH	MPEG Dynamic Adaptive Streaming over HTTP
GUID	Global Unique Identifier
HDS	HTTP Dynamic Streaming (Adobe Zeri)
HLS	HTTP Live Streaming (Apple)
HSS	HTTP Smooth Streaming (Microsoft Smooth)
HTTP	Hypertext Transfer (or Transport) Protocol
JSON	JavaScript Object Notation
LAN	local area network
NTP	Network Time Protocol
POIS	Placement Opportunity Information System
REST	Representational state transfer
SAS	Signal Acquisition System
SPS	Signal Processing System
URI	Uniform Resource Identifier

URL	Uniform Resource Locator
UTC	Coordinated Universal Time
VOD	video on demand
WAN	wide area network
XML	eXtensible Markup Language

5.2. Definitions

Base64 Binary	Binary contents coded in Base64 format
Segment	Unit of data associated with an HTTP URL and optionally a byte range that is specified by a manifest.
Media	Any form of on-demand, time-shifted or linear content.
HLS Media Segment	SegmentThe M3U8 extended record commencing with the #EXTINF tag through to its paired URI line inclusive of any line in between that starts with #EXT.
RESTful	Web service that conforms to the REST architectural style
Signal Point	A particular point of interest within a video essence.
Signal Region	A region of interest within a video essence.

6. Common Conventions

Note 1: Unless noted as optional, all attributes, elements, and objects are required.

Note 2: In all cases, unrecognized attributes, elements, and objects are to be ignored.

As a convention used throughout this API, a JSON array is identified using a plural name like 'spots' or 'segments'. The XML equivalent utilizes an XML element sequence with a singular element tag that is capitalized., for example, 'Spot' or 'Segment'. In documentation situations, herein where duplicating the element name is redundant or confusing, the XML value is utilized and the JSON equivalent is to be assumed by the reader.

6.1. XML Namespaces

The XML namespace for the API defined in this specification is **`http://www.scte.org/schemas/250/bn1`**.

The XML schema version corresponding to this specification is “20220419”.

To improve readability, all XML examples in this document are assumed to have the following namespace declarations:

```
xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
xmlns="http://www.scte.org/schemas/250/bn1"
```

6.2. Standard data formats

All duration and date and time values in this API **shall** use the formats specified in ISO 8601.

Binary contents **shall** be coded in Base64 format per section 6.8 of IETF RFC 4648.