                  RTP Payload for SMPTE ST 291 Ancillary Data
                    draft-ietf-payload-rtp-ancillary-10

Abstract

   This memo describes a real-time transport protocol (RTP) payload
   format for the Society of Motion Picture and Television Engineers
   (SMPTE) Ancillary data, as defined by SMPTE ST 291-1. SMPTE
   Ancillary data is generally used along with professional video
   formats to carry a range of ancillary data types, including time
   code, Closed Captioning, and the Active Format Description (AFD).

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1. Introduction

   This memo describes a real-time transport protocol (RTP) payload
   format for the Society of Motion Picture and Television Engineers
   (SMPTE) Ancillary data (ANC), as defined by SMPTE ST 291-1 [ST291].
   ANC data is transmitted in the ancillary space of serial digital
   video interfaces, the space outside of the active video region of
   images intended for users to view. Ancillary space roughly
   corresponds to vertical and horizontal blanking periods of cathode
   ray tube type displays. ANC can carry a range of data types,
   including time code, Closed Captioning, and the Active Format
   Description (AFD).

   ANC is generally associated with the carriage of metadata within the
   bit stream of a Serial Digital Interface (SDI) such as SMPTE ST 259
   [ST259], the standard definition (SD) Serial Digital Interface (with
   ANC data inserted as per SMPTE ST 125 [ST125]), or SMPTE ST 292-1
   [ST292], the 1.5 Gb/s Serial Digital Interface for high definition
   (HD) television applications.

   ANC data packet payload definitions for a specific application are
   specified by a SMPTE Standard, Recommended Practice, Registered
   Disclosure Document, or by a document generated by another
   organization, a company, or an individual (an Entity). When a

payload format is registered with SMPTE, it is identified by a
registered data identification word.

This memo describes an RTP payload that supports carriage of ANC data
packets with origin from any location within any SMPTE defined SDI
signal, or even if the ANC packets did not originate in an SDI
signal. Sufficient information is provided to enable the ANC data
packets at the output of the decoder to be restored to their original
locations in the serial digital video signal raster (if that is
desired). An optional Media Type parameter allows for signaling of
carriage of one or more types of ANC data as specified by Data
Identification (DID) or Secondary Data Identification (SDID) words.
Another optional Media Type parameter allows for the identification
of the Video Payload ID (VPID) Code of the source interface of ANC
data packets.

Note that the ancillary data flag (ADF) word is not specifically
carried in this RTP payload. The ADF might be specified in a
document defining an interconnecting digital video interface,
otherwise a default ADF is specified by SMPTE ST 291-1 [ST291].

This ANC payload can be used by itself, or used along with a range of
RTP video formats. In particular, it has been designed so that it
could be used along with RFC 4175 [RFC4175] "RTP Payload Format for
Uncompressed Video" or RFC 5371 [RFC5371] "RTP Payload Format for
JPEG 2000 Video Streams."

The data model in this document for the ANC data RTP payload is based
on the data model of SMPTE ST 2038 [ST2038], which standardizes the
carriage of ANC data packets in an MPEG-2 Transport Stream.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in RFC 2119 [RFC2119].

2. RTP Payload Format for SMPTE ST 291 Ancillary Data

An example of the format of an RTP packet containing SMPTE ST 291
Ancillary Data is shown below:

```
        0                   1                   2                   3
        0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |V=2|P|X|  CC   |M|     PT      |       sequence number         |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |                           timestamp                           |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |           synchronization source (SSRC) identifier            |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |     Extended Sequence Number      |            Length         |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       | ANC_Count       | F |                 reserved                |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |C|   Line_Number       |   Horizontal_Offset   |S|  StreamNum  |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |      DID        |      SDID       |    Data_Count    |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                         User_Data_Words...
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                 |   Checksum_Word   |        word_align         |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |C|   Line_Number       |   Horizontal_Offset   |S|  StreamNum  |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
       |      DID        |      SDID       |    Data_Count    |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                         User_Data_Words...
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                                 |  Checksum_Word   |word_align |
       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
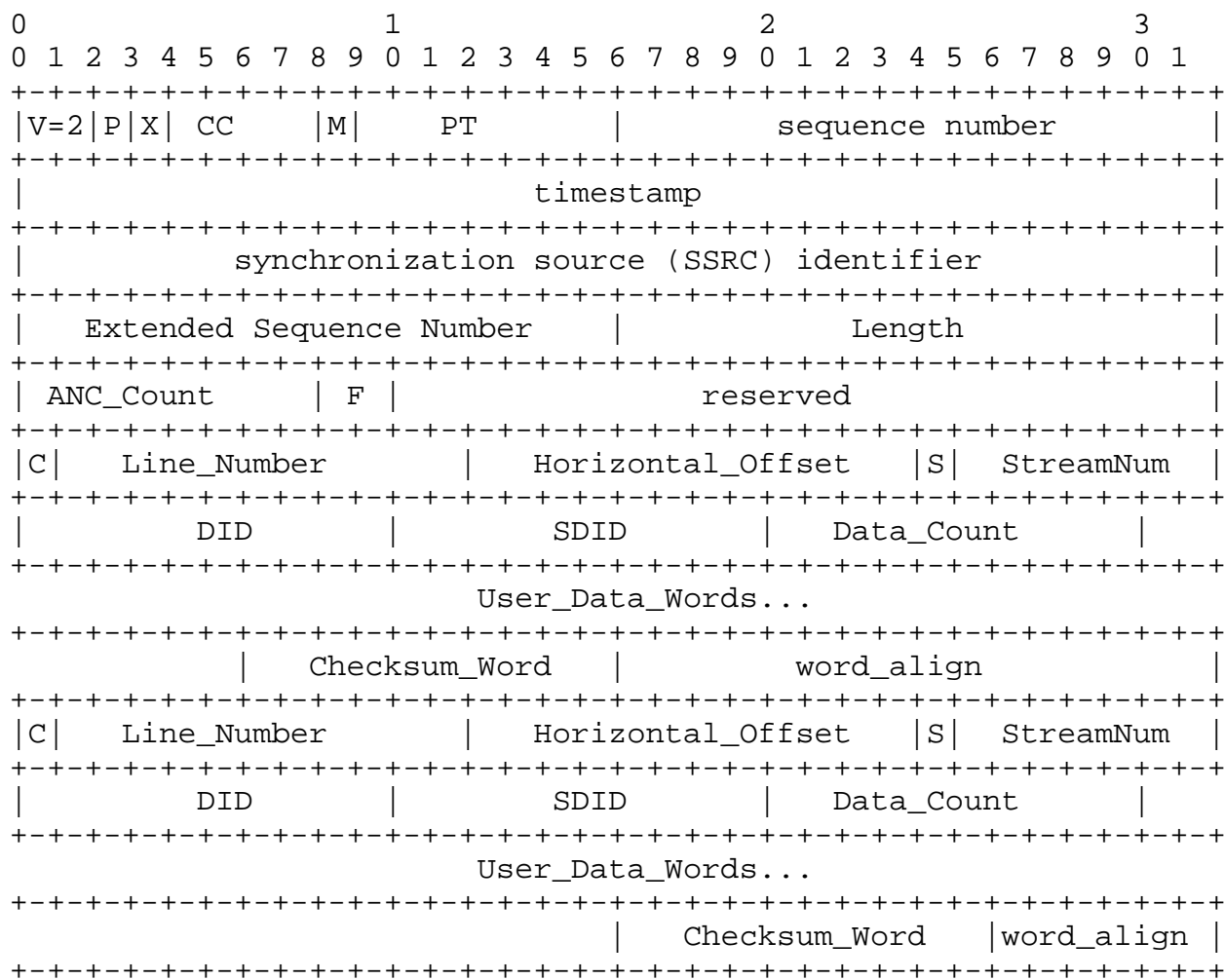
            Figure 1: SMPTE Ancillary Data RTP Packet Format

   In this example, two ANC data packets are present. The first has
   four 10-bit User Data Words, and the second has five 10-bit User Data
   Words.

   The term "network byte order" in the payload format SHALL refer to
   the Data Transmission Order as defined in Appendix B of RFC 791
   [RFC0791].

   RTP packet header fields SHALL be interpreted as per RFC 3550
   [RFC3550], with the following specifics:

   Timestamp: 32 bits
         The timestamp field is interpreted in a similar fashion to
         RFC 4175 [RFC4175]:

For progressive scan video, the timestamp denotes the
sampling instant of the frame to which the ancillary data in
the RTP packet belongs. RTP packets MUST NOT include ANC
data from multiple frames, and all RTP packets with ANC data
belonging to the same frame MUST have the same timestamp.

For interlaced video, the timestamp denotes the sampling
instant of the field to which the ancillary data in the RTP
packet belongs. RTP packets MUST NOT include ANC data from
multiple fields, and all RTP packets belonging to the same
field MUST have the same timestamp.

If the sampling instant does not correspond to an integer
value of the clock, the value SHALL be truncated to the next
lowest integer, with no ambiguity. Section 3.1 describes
timestamp clock rates.

Marker bit (M): 1 bit
        The marker bit set to "1" indicates the last ANC RTP packet
        for a frame (for progressive scan video) or the last ANC RTP
        packet for a field (for interlaced video).

2.1. Payload Header Definitions

   The ANC RTP payload header fields are defined as:

   Extended Sequence Number: 16 bits
        The high order bits of the extended 32-bit sequence number,
        in network byte order. This is the same as the Extended
        Sequence Number field in RFC 4175 [RFC4175].

   Length: 16 bits
        Number of octets of the ANC RTP payload, beginning with the
        "C" bit of the first ANC packet data, as an unsigned integer
        in network byte order. Note that all word_align fields
        contribute to the calculation of the length field.

   ANC_Count: 8 bits
        This field is the count of the total number of ANC data
        packets carried in the RTP payload, as an unsigned integer.
        A single ANC RTP packet payload cannot carry more than 255
        ANC data packets.

        If more than 255 ANC data packets need to be carried in a
        field or frame, additional RTP packets carrying ANC data MAY
        be sent with the same RTP timestamp but with different
        sequence numbers. ANC_Count of 0 indicates that there are no
        ANC data packets in the payload (for example, for an RTP

packet with the marker bit set indicating the last ANC RTP
packet in a field/frame, even if that RTP packet carries no
actual ANC data packets.) If ANC_Count is 0, Length will
also be 0.

F: 2 bits
     These two bits relate to signaling the field specified by the
     RTP timestamp in an interlaced SDI raster. A value of 0b00
     indicates that either the video format is progressive or that
     no field is specified. A value of 0b10 indicates that the
     timestamp refers to the first field of an interlaced video
     signal. A value of 0b11 indicates that the timestamp refers
     to the second field of an interlaced video signal. The value
     0b01 is not valid.

     Note that some multi-stream SDI interfaces might use multiple
     interlaced signal streams to transmit progressive images, in
     which case the "F" bits would refer to the field of the
     interlaced stream used for transport of the ANC data packet.

reserved: 22 bits
     The 22 reserved bits of value "0" follow the F field to
     ensure that the first ANC data packet header field in the
     payload begins 32-bit word-aligned to ease implementation.

For each ANC data packet in the payload, the following ANC data
packet header fields MUST be present:

C: 1 bit
     This flag, when set to "1", indicates that the ANC data
     corresponds to the color-difference data channel (C). When
     set to "0", this flag indicates either that the ANC data
     corresponds to the luma (Y) data channel, that the ANC data
     source is from an SD signal, or that the ANC data source has
     no specific luma or color-difference data channels. For ANC
     data from a multi-stream interface source, the C flag SHALL
     refer to the channel of the stream used to transport the ANC
     packet. For situations where there is no SDI source, if the
     ANC data type definition specifically requires the use of the
     C or Y data channel, the C flag SHALL reflect that
     requirement.

Line_Number: 11 bits
     This field contains the line number (as defined in ITU-R
     BT.1700 [BT1700] for SD video or ITU-R BT.1120 [BT1120] for
     HD video) that corresponds to the location of the ANC data
     packet in an SDI raster as an unsigned integer in network
     byte order. A value of 0x7FF (all bits in the field are '1')

indicates that the ANC data is carried without a specific
line location within the field or frame. A value of 0x7FE
indicates that the ANC data is intended to be placed into any
legal area of VANC, specifically.

Note that the lines that are available to convey ANC data are
as defined in the applicable sample structure specification
(e.g., SMPTE 274M [ST274], SMPTE ST 296 [ST296], ITU-R BT.656
[BT656]) and possibly further restricted per SMPTE RP 168
[RP168].

In multi-stream interfaces, this field refers to the line
number that an ANC packet is carried on within a particular
data stream in the interface.

Horizontal_Offset: 12 bits
        This field defines the location of the ANC data packet in an
        SDI raster relative to the start of active video (SAV) as an
        unsigned integer in network byte order. A value of 0 means
        that the Ancillary Data Flag (ADF) of the ANC data packet
        begins immediately following SAV. For HD, this is in units
        of luma sample numbers as specified by the defining document
        of the particular image (e.g., SMPTE 274M [ST274] for 1920 x
        1080 active images, or SMPTE ST 296 [ST296] for 1280 x 720
        progressive active images). For SD, this is in units of
        (27MHz) multiplexed word numbers, as specified in SMPTE ST
        125 [ST125]. A value of 0xFFF (all bits in the field are
        '1') indicates that the ANC data is carried without any
        specific location within the line. A value of 0xFFE
        indicates that the ANC data is intended to be placed into any
        legal area of HANC, specifically.

In multi-stream interfaces, this field refers to the
horizontal location where an ANC packet is placed on a line
carried within a particular data stream in the interface.

Note that HANC space in the digital blanking area will
generally have higher luma sample numbers than any samples in
the active digital line.

S (Data Stream Flag): 1 bit
        This field indicates whether the data stream number of a
        multi-stream data mapping used to transport the ANC data
        packet is specified. If the S bit is '0', then the StreamNum
        field provides no guidance regarding the source data stream
        number of the ANC data packet. If the S bit is '1', then the
        StreamNum field carries information regarding the source data
        stream number of the ANC data packet.

StreamNum: 7 bits
        If the S (Data Stream Flag) bit is '1', then the StreamNum
        field MUST carry identification of the source data stream
        number of the ANC data packet. If the data stream is
        numbered, then the StreamNum field SHALL carry the number of
        the source data stream minus one. If the source multi-stream
        interface does not have numbered data streams, the following
        numbers SHALL be used in this field: '0' for link A data
        stream, '1' for link B data stream. For stereoscopic multi-
        stream interface formats that do not have numbered streams,
        the following numbers SHALL be used in this field: '0' for
        left eye stream, '1' for right eye stream.

        Note that in multi-link SDI connections, the physical link
        that a particular stream utilizes is typically specified by
        the interface standard. Also note that numbering of data
        streams is across the interface as a whole. For example in
        the SMPTE ST 425-3 dual-link 3 Gb/s interface, the data
        streams are numbered 1-4 with data streams 1 and 2 on link 1
        and data streams 3 and 4 on link 2.

An ANC data packet with the header fields Line_Number of 0x7FF and
Horizontal_Offset of 0xFFF SHALL be considered to be carried without
any specific location within the field or frame.

For each ANC data packet in the payload, immediately after the ANC
data packet header fields, the following data fields MUST be present,
with the fields DID, SDID, Data_Count, User_Data_Words, and
Checksum_Word representing the 10-bit words carried in the ANC data
packet, as per SMPTE ST 291-1 [ST291]:

DID: 10 bits
        Data Identification Word

SDID: 10 bits
        Secondary Data Identification Word. Used only for a "Type 2"
        ANC data packet. Note that in a "Type 1" ANC data packet,
        this word will actually carry the Data Block Number (DBN).

Data_Count: 10 bits
        The lower 8 bits of Data_Count, corresponding to bits b7
        (MSB) through b0 (LSB) of the 10-bit Data_Count word, contain
        the actual count of 10-bit words in User_Data_Words. Bit b8
        is the even parity for bits b7 through b0, and bit b9 is the
        inverse (logical NOT) of bit b8.

User_Data_Words: integer number of 10 bit words

User_Data_Words (UDW) are used to convey information of a
type as identified by the DID word or the DID and SDID words.
The number of 10-bit words in the UDW is defined by the
Data_Count field. The 10-bit words are carried in order
starting with the most significant bit and ending with the
least significant bit.

Checksum_Word: 10 bits
The Checksum_Word can be used to determine the validity of
the ANC data packet from the DID word through the UDW. It
consists of 10 bits, where bits b8 (MSB) through b0 (LSB)
define the checksum value and bit b9 is the inverse (logical
NOT) of bit b8. The checksum value is equal to the nine
least significant bits of the sum of the nine least
significant bits of the DID word, the SDID word, the
Data_Count word, and all User_Data_Words in the ANC data
packet. The checksum is initialized to zero before
calculation, and any end carry resulting from the checksum
calculation is ignored.

At the end of each ANC data packet in the payload:

word_align: bits as needed to complete 32-bit word
Word align contains enough "0" bits as needed to complete the
last 32-bit word of ANC packet's data in the RTP payload. If
an ANC data packet in the RTP payload ends aligned with a
word boundary, there is no need to add any word alignment
bits. Word align SHALL be used even for the last ANC data
packet in an RTP packet. Word align SHALL NOT be used if
there are zero ANC data packets being carried in the RTP
packet.

When reconstructing an SDI signal based on this payload, it is
important to place ANC data packets into the locations indicated by
the ANC payload header fields C, Line_Number and Horizontal_Offset,
and also to follow the requirements of SMPTE ST 291-1 [ST291]
Section 7 "Ancillary Data Space Formatting (Component or Composite
Interface)", which include rules on the placement of initial ANC data
into allowed spaces as well as the contiguity of ANC data packet
sequences within those spaces in order to assure that the resulting
ANC data packets in the SDI signal are valid. The optional Media
Type parameter VPID_Code can inform receivers of the type of
originating SDI interface. For multi-stream originating interfaces,
the StreamNum field can provide information regarding which stream an
ANC data packet can be placed in to match the ANC data location in
the originating SDI interface.

Senders of this payload SHOULD transmit available ANC data packets as soon as practical to reduce end-to-end latency, especially if receivers will be embedding the received ANC data packet into an SDI signal emission. One millisecond is a reasonable upper bound for the amount of time between when an ANC data packet becomes available to a sender and the emission of an RTP payload containing that ANC data packet.

ANC data packets with headers that specify specific location within a field or frame SHOULD be sent in raster scan order, both in terms of packing position within an RTP packet and in terms of transmission time of RTP packets.

3. Payload Format Parameters

   This RTP payload format is identified using the video/smpte291 media type, which is registered in accordance with RFC 4855 [RFC4855], and using the template of RFC 6838 [RFC6838].

   Note that the Media Type Definition is in the "video" tree due to the expected use of SMPTE ST 291 Ancillary Data along with video formats.

3.1. Media Type Definition

   Type name: video

   Subtype name: smpte291

   Required parameters:

      Rate:
         RTP timestamp clock rate.

         When an ANC RTP stream is to be associated with an RTP video stream, the RTP timestamp rates SHOULD be the same to ensure that ANC data packets can be associated with the appropriate frame or field. Otherwise, a 90 kHz rate SHOULD be used.

         Note that techniques described in RFC 7273 [RFC7273] can provide a common reference clock for multiple RTP streams intended for synchronized presentation.

   Optional parameters:

      DID_SDID:
         Data identification and Secondary data identification words.

The presence of the DID_SDID parameters signals that all
ancillary data packets of this stream are of a particular type
or types, i.e., labeled with a particular DIDs and SDIDs. DID
and SDID values of SMPTE Registered ANC packet types can be
found on the at the SMPTE Registry for Data Identification Word
Assignments [SMPTE-RA] web site.

"Type 1" ANC packets (which do not have SDIDs defined) SHALL be
labeled with SDID=0x00.

DID and SDID values can be registered with SMPTE as per SMPTE
ST 291-1 [ST291].

The absence of the DID_SDID parameter signals that
determination of the DID and SDID of ANC packets in the payload
can only be achieved through direct inspection of the ANC data
packet fields.

VPID_Code:
   This integer parameter specifies the Video Payload ID (VPID)
   Code of the source interface of ANC data packets using the
   value from byte 1 of the VPID as defined in SMPTE ST 352
   [ST352]. The integer SHALL be made with bit 7 of VPID byte 1
   being the most significant bit, and bit 0 of VPID byte 1 being
   the least significant bit. For example, 132 refers to SMPTE ST
   292-1, 720-line video payloads on a 1.5 Gbps (nominal) serial
   digital interface.

Encoding considerations: This media type is framed and binary; see
Section 4.8 of RFC 6838 [RFC6838].

Security considerations: See Section 7 of [this RFC]

Interoperability considerations: Data items in smpte291 can be very
diverse. Receivers might only be capable of interpreting a subset of
the possible data items. Some implementations might care about the
location of the ANC data packets in the SDI raster, but other
implementations might not care.

Published specification: [this RFC]

Applications that use this media type: Devices that stream real-time
professional video, especially those that interoperate with legacy
serial digital interfaces (SDI).

Additional Information:

   Deprecated alias names for this type: N/A

     Magic number(s): N/A

     File extension(s): N/A

     Macintosh file type code(s): N/A

   Person & email address to contact for further information: T.
   Edwards <thomas.edwards@fox.com>, IETF Payload Working Group
   <payload@ietf.org>

   Intended usage: COMMON

   Restrictions on usage: This media type depends on RTP framing, and
   hence is only defined for transfer via RTP RFC 3550 [RFC3550].
   Transport within other framing protocols is not defined at this time.

   Author: T. Edwards <thomas.edwards@fox.com>

   Change controller: The IETF PAYLOAD working group, or other party as
   designated by the IESG.

4. SDP Considerations

   The mapping of the above defined payload format media type and its
   parameters SHALL be done according to Section 3 of RFC 4855
   [RFC4855].

   o   The type name ("video") goes in SDP "m=" as the media name.

   o   The subtype name ("smpte291") goes in SDP "a=rtpmap" as the
       encoding name, followed by a slash ("/") and the rate parameter.

   o   The optional parameters VPID_Code and DID_SDID, when present, are
       included in the "a=fmtp" attribute line of SDP as a semicolon-
       separated list of parameter=value pairs.

   DID and SDID values SHALL be specified in hexadecimal with a "0x"
   prefix (such as "0x61"). The ABNF as per RFC 5234 [RFC5234] of the
   DID_SDID optional parameter SHALL be:

        TwoHex = "0x" 1*2(HEXDIG)
        DidSdid = "DID_SDID={" TwoHex "," TwoHex "}"

   For example, EIA 608 Closed Caption data would be signalled with the
   parameter DID_SDID={0x61,0x02}. If a DID_SDID parameter is not
   specified, then the ancillary data stream might potentially contain
   ancillary data packets of any type.

Multiple DID_SDID parameters can be specified (separated by semicolons) to signal the presence of multiple types of ANC data in the stream. DID_SDID={0x61,0x02};DID_SDID={0x41,0x05}, for example, signals the presence of EIA 608 Closed Captions as well as AFD/Bar Data. Multiple DID_SDID parameters do not imply any particular ordering of the different types of ANC packets in the stream.

If the optional parameter VPID_Code is present, it SHALL be present only once in the semicolon-separated list, taking a single integer value.

A sample SDP mapping for ancillary data is as follows:

```
m=video 30000 RTP/AVP 112
a=rtpmap:112 smpte291/90000
a=fmtp:112 DID_SDID={0x61,0x02};DID_SDID={0x41,0x05};VPID_Code=132
```

In this example, a dynamic payload type 112 is used for ancillary data. The 90 kHz RTP timestamp rate is specified in the "a=rtpmap" line after the subtype. In the "a=fmtp:" line, DID 0x61 and SDID 0x02 are specified (registered to EIA 608 Closed Caption Data by SMPTE), and also DID 0x41 and SDID 0x05 (registered to AFD/Bar Data). The VPID_Code is 132 (referring to SMPTE ST 292-1, 720-line video payloads on a 1.5 Gbps serial digital interface).

4.1. Grouping ANC Streams with other Media Streams

To associate an ANC RTP stream with other media streams, implementers can use the Lip Synchronization (LS) grouping defined in RFC 5888 [RFC5888], which states that media streams whose corresponding "m" lines are grouped together using LS semantics are to be played back in a synchronized manner.

A sample SDP mapping for grouping ANC data with RFC 4175 video using LS semantics is as follows:

```
      v=0
      o=Al 123456 11 IN IP4 host.example.com
      s=Professional Networked Media Test
      i=A test of synchronized video and ANC data
      t=0 0
      a=group:LS V1 M1
      m=video 50000 RTP/AVP 96
      c=IN IP4 233.252.0.1/255
      a=rtpmap:96 raw/90000
      a=fmtp:96 sampling=YCbCr-4:2:2; width=1280; height=720; depth=10
      a=mid:V1
      m=video 50010 RTP/AVP 97
      c=IN IP4 233.252.0.2/255
      a=rtpmap:97 smpte291/90000
      a=fmtp:97 DID_SDID={0x61,0x02};DID_SDID={0x41,0x05}
      a=mid:M1
```

5. Offer/Answer Model and Declarative Considerations

5.1. Offer/Answer Model

   Receivers might wish to receive ANC data streams with specific
   DID_SDID parameters. Thus when offering ANC data streams using the
   Session Description Protocol (SDP) in an Offer/Answer model
   [RFC3264], the offeror MAY provide a list of ANC streams available
   with specific DID_SDID parameters in the fmtp line. The answerer MAY
   respond with all or a subset of the streams offered along with fmtp
   lines with all or a subset of the DID_SDID parameters offered. Or
   the answerer MAY reject the offer. There are no restrictions on
   updating DID_SDID parameters in a subsequent offer.

5.2. Declarative SDP Considerations

   For declarative use of SDP, nothing specific is defined for this
   payload format. The configuration given by the SDP MUST be used when
   sending and/or receiving media in the session.

6. IANA Considerations

   One media type (video/smpte291) has been defined and needs
   registration in the media types registry. See Section 3.1

7. Security Considerations

   RTP packets using the payload format defined in this specification
   are subject to the security considerations discussed in the RTP
   specification [RFC3550], and in any applicable RTP profile such as
   RTP/AVP [RFC3551], RTP/AVPF [RFC4585] RTP/SAVP [RFC3711] or RTP/SAVPF

[RFC5124].   However, as "Securing the RTP Protocol Framework: Why RTP
Does Not Mandate a Single Media Security Solution" [RFC7202]
discusses, it is not an RTP payload format's responsibility to
discuss or mandate what solutions are used to meet the basic security
goals like confidentiality, integrity and source authenticity for RTP
in general.   This responsibility lays on anyone using RTP in an
application.   They can find guidance on available security mechanisms
and important considerations in Options for Securing RTP Sessions
[RFC7201].   Applications SHOULD use one or more appropriate strong
security mechanisms.   The rest of this security consideration section
discusses the security impacting properties of the payload format
itself.

To avoid potential buffer overflow attacks, receivers SHOULD validate
that the ANC data packets in the RTP payload are of the appropriate
length (using the Data_Count field) for the ANC data type specified
by DID & SDID.   Also the Checksum_Word SHOULD be checked against the
ANC data packet to ensure that its data has not been damaged in
transit, but the Checksum_Word is unlikely to provide a payload
integrity check in case of a directed attack.

Some receivers will simply move the ANC data packet bits from the RTP
payload into a serial digital interface (SDI).   It might still be a
good idea for these "re-embedders" to perform the above mentioned
validity tests to avoid downstream SDI systems from becoming confused
by bad ANC data packets, which could be used for a denial of service
attack.

"Re-embedders" into SDI SHOULD also double check that the Line_Number
and Horizontal_Offset leads to the ANC data packet being inserted
into a legal area to carry ancillary data in the SDI video bit stream
of the output video format.

8. References

8.1. Normative References

   [BT1120]   ITU-R, "BT.1120-8, Digital Interfaces for HDTV Studio
               Signals", January 2012.

   [BT1700]   ITU-R, "BT.1700, Characteristics of Composite Video
               Signals for Conventional Analogue Television Systems",
               February 2005.

   [RFC0791]   Postel, J., "Internet Protocol", STD 5, RFC 791,
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