it was suggested for the P in this acronym to stand for "Professional" instead of "Production"

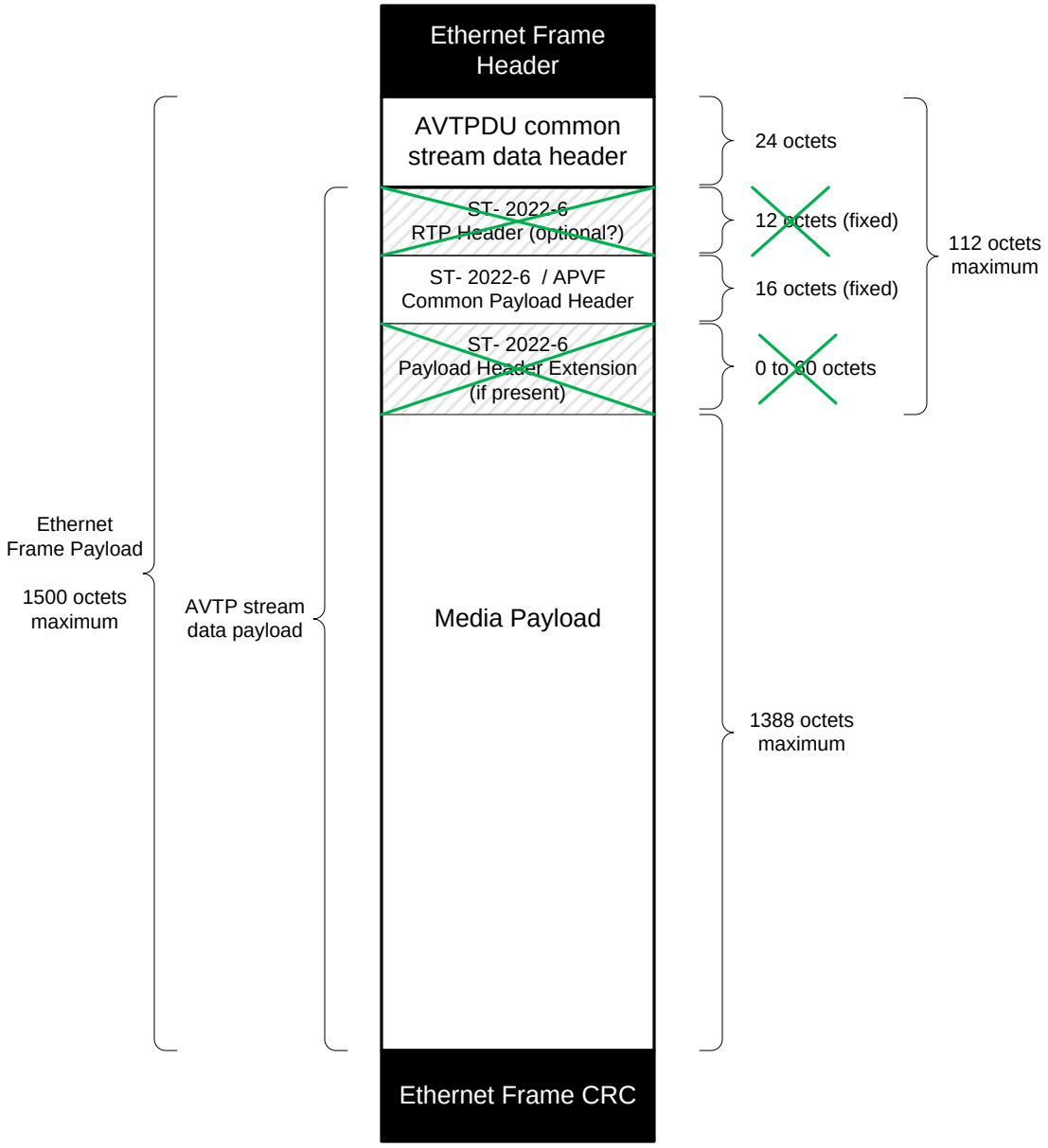
AVTP Production Video Format (APVF) Stream Packetization Proposal

v1b 3-Dec-2012

Author / Presenter:
Rob Silfvast

Contributors:
Willem-Jan Dirks
Eldridge Mount
Jan-Willem De Groot
Bob Edge
Chuck VanDusen

Notes taken during 1722a Working Group F2F meeting appear in green bold text



AVTP common header for stream data PDUs

From IEEE 1722-2011

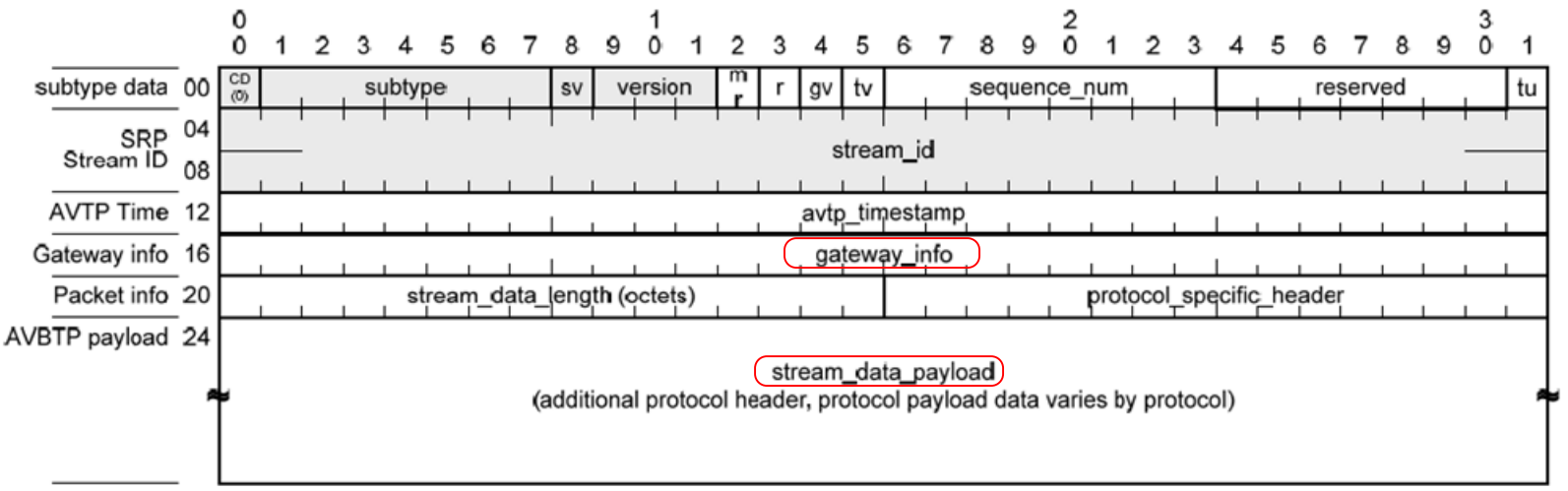


Figure 5.3 – AVTP common stream header format (cd field set to zero (0))

- **mr** (media clock restart): 1 bit
- **r** (reserved): 1 bit
- **gv** (gateway_info valid): 1 bit
- **tv** (avtp_timestamp_valid): 1 bit
- **sequence_num** (sequence number): 8 bits
- **reserved**: 7 bits
- **tu** (timestamp_uncertain): 1 bit
- **avtp_timestamp**: 32 bits
- **gateway_info**: 32 bits => re-defined as "Format info" in 1722A, AVTP Audio format
- **stream_data_length**: 16 bits => conveys length of AVTP payload, including ST2022-6 headers
- **protocol_specific_header**: 16 bits => see fields defined on later page
- **stream_payload_data**: 0 to n octets (where n does not cause the packet to exceed the MTU)

denoted as "stream_data_payload" in Fig 5.3 (we should correct this in 1722A)

Is there any applicability for "gateway info" in AVTP video considering the desire to easily bridge APVF to/from SMPTE 2022-6 streams carried over IP or WAN networks?

=> 1722a working group consensus: No, we should <u>not</u> use this for APVF. This field was defined for bridging between 1722 and 1394 (Firewire) and is not in use by any relevant implementations, according to all meeting participants. If we do choose to create header info for bridging between APVF and ST 2022-6, we should define a completely new field for this.

SMPTE 2022-6 RTP Header

Not required to be supported. If not supported, should be zero-stuffed.

We could define a “ST2022-6 info” field in APVF header, which could indicate whether this field is valid or not.

1722a Working Group consensus: Do not include this header in APVF. People who want to carry RTP video in AVTP should use the “RTP payloads” format under AVTP, instead of APVF.

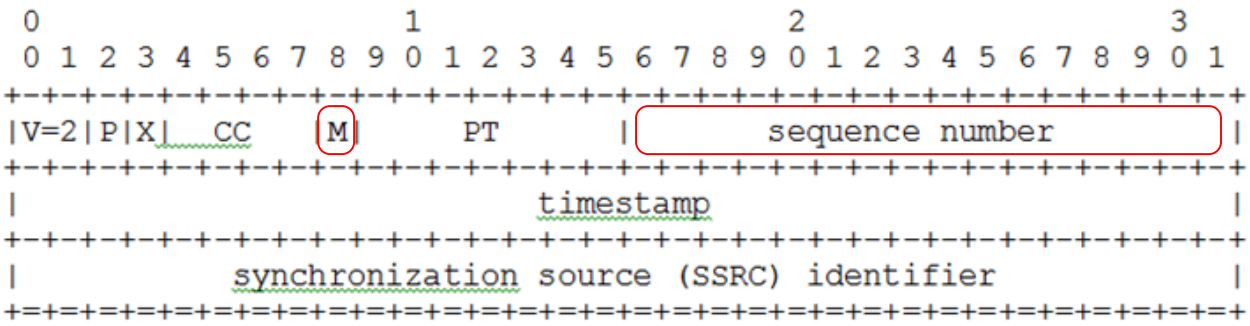


Figure 2. RTP Header

Version (V): 2 bits

This field identifies the version of RTP. The version defined by this Standard shall be two (2).

Padding (P): 1 bit

Set to 0 no padding used

Set to 1 padding used

Usage: If the padding bit is set, the datagram shall contain one or more additional padding octets at the end, which are not part of the payload. The last octet of the padding contains a count of how many padding octets should be ignored, including itself.

Extension (X): 1 bit

Set to (0) no header extension

CSRC Count (CC): 4 bits

This field shall be set to 0.

Note: There are no CSRC lists present in the Media Datagrams.

shall we consider this EOF bit optional, and use in in this RTP header fleld only? Or do we want to have an EOF bit for AVTP Production Video streams that do not carry RTP header?

Marker (M): 1 bit

The marker bit shall be set to 1 to denote the last Media Datagram of the video frame, and shall be set to zero for all other Media Datagrams (as defined in RFC 3497).

Payload Type (PT): 7 bits

This field identifies the format of the RTP payload and determines its interpretation by the application. A receiver shall ignore datagrams with payload types that it does not understand.

High bit rate Media Datagrams shall utilize a dynamically allocated payload type field to designate the clock frequency used to timestamp RTP packets. The payload type should be set to one of the values defined below. Alternatively, payload types may be set by other means in accordance with RFC3550.

- PT = 98 – High bit rate media transport / 27MHz Clock
- PT = 99 – High bit rate media transport FEC / 27MHz Clock

Note: The list of RTP payload types above is constrained. The intention of the RTP payload type is to identify the frequency of the RTP clock and to allow the receiver to reject datagrams with payload types it is not prepared to accept. Indications of specific payload characteristics or parameters are covered in separate layers, i.e. payload header, and it is not the intention to mix functionality between layers.

Sequence number (low bits): 16 bits

The low order bits for RTP sequence counter. The sequence number shall increment by one for each RTP data datagram sent.

=> due to payload length differences between APVF and AAF, this sequence number, if used, will skip or repeat values in APVF

Timestamp: 32 bits

The timestamp reflects the sampling instant of the first octet in the RTP datagram. The transmission instant shall be derived from a clock that increments monotonically and linearly in time to allow synchronization and jitter calculations. The RTP timestamp assists with datagram buffer management at the receiver and optionally with identification of received datagrams for protection switching. Time stamp frequency per payload type description is indicated above under payload type.

Note: To identify Media Datagrams in case of rollover, the sequence number and timestamp value can both be utilized.

SSRC: 32 bits

The SSRC field identifies the synchronization source. This shall be set compliant to RFC 3550.

SMPTE 2022-6 / APVF “Common Payload Header”

Required to be supported, although some fields may be unused (invalid) if the stream is not intended for “2022-6 compatibilty.” The idea here is to avoid unnecessary redundancy (and possible ambiguity) for fields that are needed for both ST2022-6 and AVTP Production Video Format

Content of this page has been obtained with implied permission from a draft version of SMPTE 2022-6.

6.4 High Bit Rate Media Payload Header

Source Format Info
Directly usable in APVF

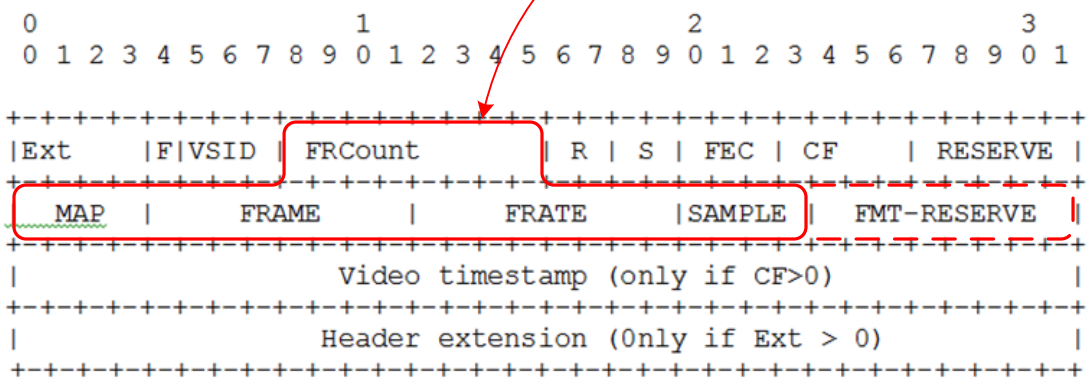


Figure 3. Payload Header

1722a Working Group consensus: Only use the Source Format Info fields and nothing else from this header. In particular, having this different timestemp field in the packet will likely confuse implementers more than it will help them.

Extension field: (Ext) 4 bits *required for SMTPE and APVF (must match media_data_offset in AVTP header)*
“0000” = No extension
“0001- 1111” = Payload header is extended by this number x 4 octets

Video source format flag: (F) 1 bit.
The F bit is set to
”0” = Video source format is not present
“1” = Video source format is present *required for SMTPE and AVTP-PVF*

For the method specified in this document, the F bit shall be set to 1, and the video source format shall be transmitted.

The F bit setting and the presence or absence of the video Source Format shall be constant for the duration of the session

Video source ID (VSID) Protection profile: 3 bits *optional for AVTP-PVF*
Set to 000 - primary stream
Set to 001 - protect stream
010-111 - reserved

Frame Count (FRCount): 8 bits *required for AVTP-PVF*
This field identifies a video frame counter value. The counter shall increment to a new value for the next RTP sequence numbered datagram immediately after the end of video frame M marker bit and shall roll over after 256 frames.

Reference for time stamp (R): 2 bit *not required / not used when SMPTE-2022-6 usage is FALSE*
Specific reference to the source of the time stamp
Set to 00 - not locked
Set to 01 - reserved
Set to 10 - locked to UTC time/frequency reference
Set to 11 - locked to a private time frequency reference

S field: Used to indicate scrambling (only can be set to ‘00’ in ST 2022-6

FEC field *FEC is disallowed (not supported) in AVTP-PVF*

Video timestamp (sampling instant of first data in this packet) *unlikely to be useful, due to payload size differences between APVF and 2022-6*

CF, MAP, FRAME, FRATE, SAMPLE, FMT-RESERVE fields:
these are the Video Source Format fields

ST 2022-6 Header field definition – continued
Format Info Fields

Content of this page has been obtained with implied permission from a draft version of SMPTE 2022-6.

st2022-6-20xx

MAP

This four-bit field shall indicate the top-level structure of the data stream.

MAP code	Structure
0x00	Direct sample structure as per ST 292, ST 425 Level A, etc.
0x01	ST 425 Level B-DL Mapping of ST 372 Dual-Link
0x02	ST 425 Level B-DS Mapping of two ST 292-1 Streams
0x03-0x0F	reserved

FRAME

This eight-bit field shall indicate the luminance active pixel structure of the payload as per the table below:

FRAME code	Horizontal Active	Vertical Active	Vertical Total	Sampling Structure	Transport Structure
0x00	Unknown/Unspecified Frame Structure				
0x01 – 0x0F	reserved				
0x10	720	486	525	Interlace	Interlace
0x11	720	576	625	Interlace	Interlace
0x12 – 0x1F	reserved				
0x20	1920	1080	1125	Interlace	Interlace
0x21	1920	1080	1125	Progressive	Progressive
0x22	1920	1080	1125	Progressive	Interlace (Segmented)
0x23	2048	1080	1125	Progressive	Progressive
0x24	2048	1080	1125	Progressive	Interlace (Segmented)
0x25-0x2F	reserved				
0x30	1280	720	750	Progressive	Progressive
0x31-0xFF	reserved				

1722a Working Group agreed that we should preserve these source formatting fields, to maximize consistency with SMPTE-defined and supported formats

ST 2022-6 Header field definition – continued
Format Info Fields

Content of this page has been obtained with implied permission from a draft version of SMPTE 2022-6.

FRATE

This eight-bit field shall indicate the frame rate of the payload:

FRATE code	Frame Rate (Hz)
0x00	Unknown/Unspecified frame rate 2.970 GHz signal
0x01	Unknown/Unspecified frame rate 2.970/1.001 GHz signal
0x02	Unknown/Unspecified frame rate 1.485 GHz signal
0x03	Unknown/Unspecified frame rate 1.485/1.001 GHz signal
0x04	Unknown/Unspecified frame rate 0.270 GHz signal
0x04-0x0f	reserved
0x10	60
0x11	60/1.001
0x12	50
0x13	reserved
0x14	48
0x15	48/1.001
0x16	30
0x17	30/1.00 ***<= Typo. Should be 30 / 1.001***
0x18	25
0x19	reserved
0x1A	24
0x1B	24/1.001
0x1C-0xFF	reserved

SAMPLE

This four-bit field shall indicate the component pixel sampling structure and bit depth of the payload as per the table below:

SAMPLE code	Sampling Structure	Bit Depth
0x00	Unknown/Unspecified	
0x01	4:2:2	10 bits
0x02	4:4:4	10 bits
0x03	4:4:4:4	10 bits
0x04	reserved	
0x05	4:2:2	12 bits
0x06	4:4:4	12 bits
0x07	4:4:4:4	12 bits
0x08	4:2:2:4	12 bits
0x09-0x0F	Reserved for future use	

FMT-RESERVE

This 8-bit field is reserved for future use and shall be set to 0 by the sender.

1722a Working Group agreed that we should preserve these source formatting fields, to maximize consistency with SMPTE-defined and supported formats. We should also allocate an 8-bit reserved field just in case SMPTE puts this to use in a future revision of ST 2022-6.

AVTP Video Header Format, as currently proposed in 1722a-d2

Note: We are defining “APVF” as a format underneath general “AVTP Video” subtype of 1722a

9.2. Common AVTP Video Stream data encapsulation

The AVTP Video Stream data encapsulation is used for carrying video streams defined by this clause.

This encapsulation uses a **cd** field of zero (0) and a subtype field of three (3).

This encapsulation also uses the **gateway_info** field to contain 3 fields that are common for all AVTP Video Streams. These fields consist of the following:

—**format** field: 1 octet <= use the value 0x01 for APVF (formerly assigned to raw sensor video which is no longer supported)
—**drm** field: 4 bits <= drm field is no longer used in latest 1722a definition
—**format_subtype** field: 2 octets

This encapsulation also uses the **protocol_specific_header** to contain 2 additional fields. These fields consist of the following:

—**M1** field: 1 bit
—**M0** field: 1 bit

These fields are shown in Figure 9.1, “AVTP Video PDU format” :

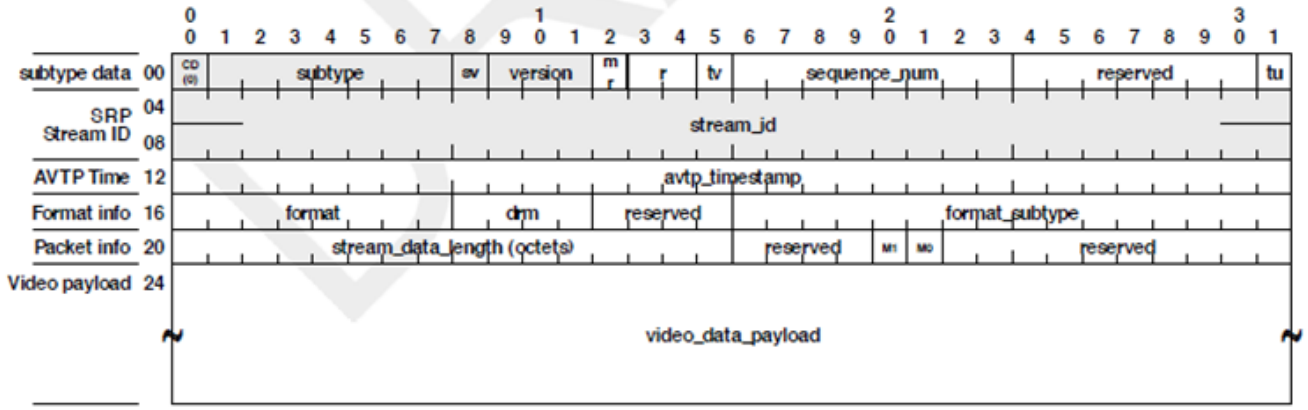
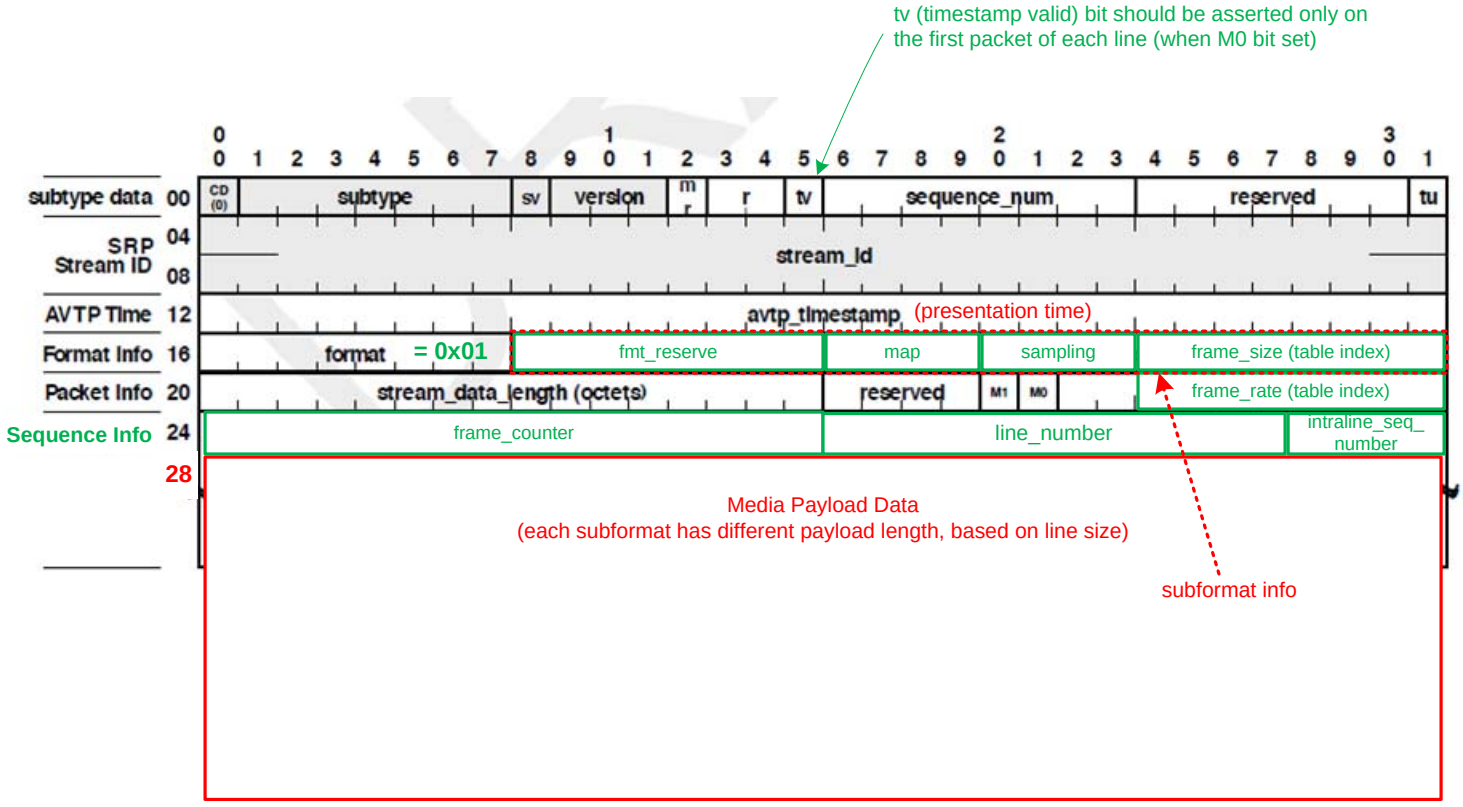


Figure 9.1. AVTP Video PDU format

AVTP Production Video Format (APVF)

Proposed Formatting



frame_counter: 16 bits. increments on the first packet of a new frame (note: ST2022-6 FRCOUNT field is 8 bits)

line_number: 12 bits. All media samples in this packet are from the same line number

intraline_seq_num: 4 bits. Conveys the value N, where this is the (N+1)th packet in the continuation of a line. When N = 0, the first data in the Media Payload Data is the first sample of a line.