Draft AVBTP over IEEE 802.3 AVB stream data format

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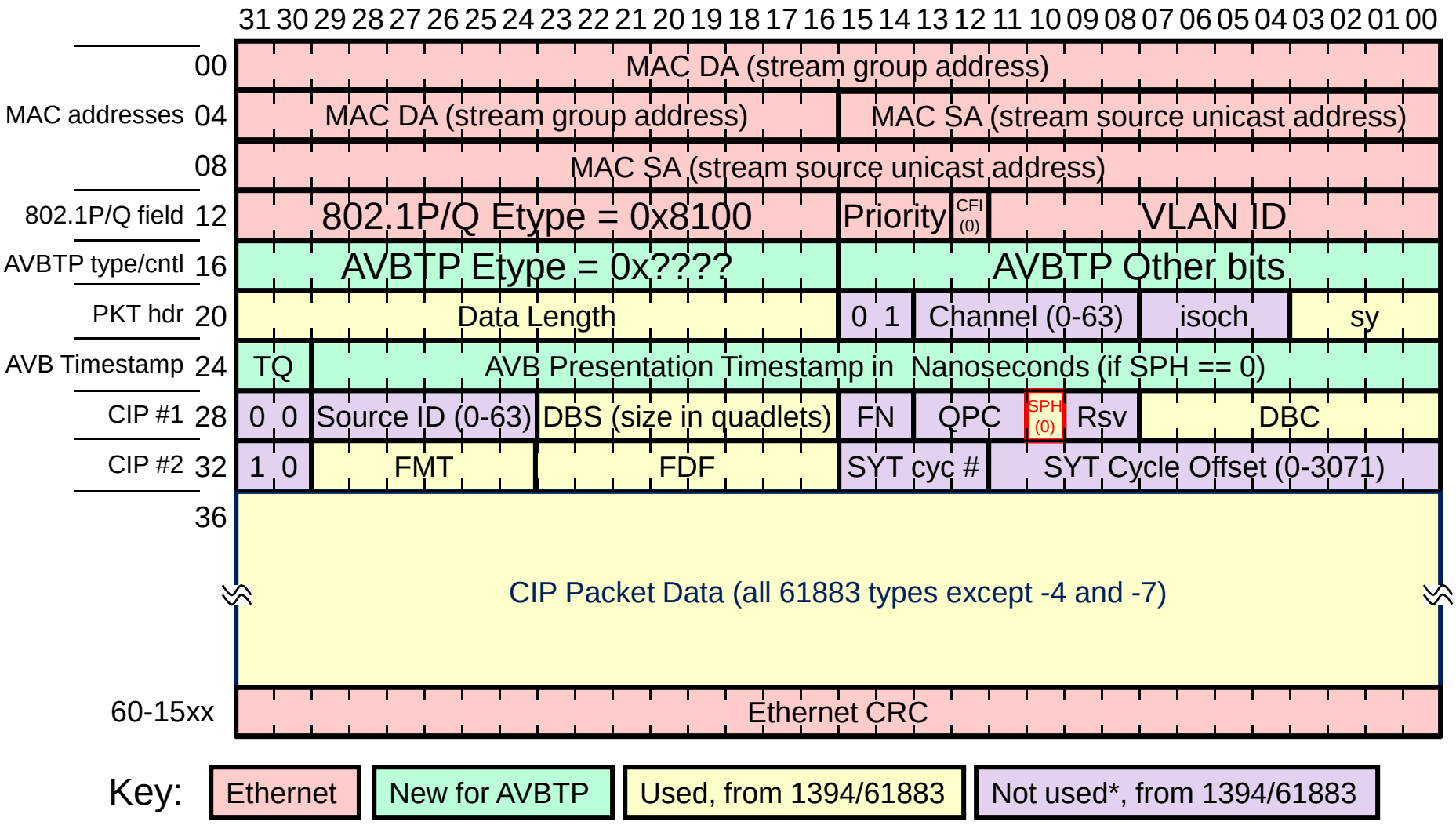
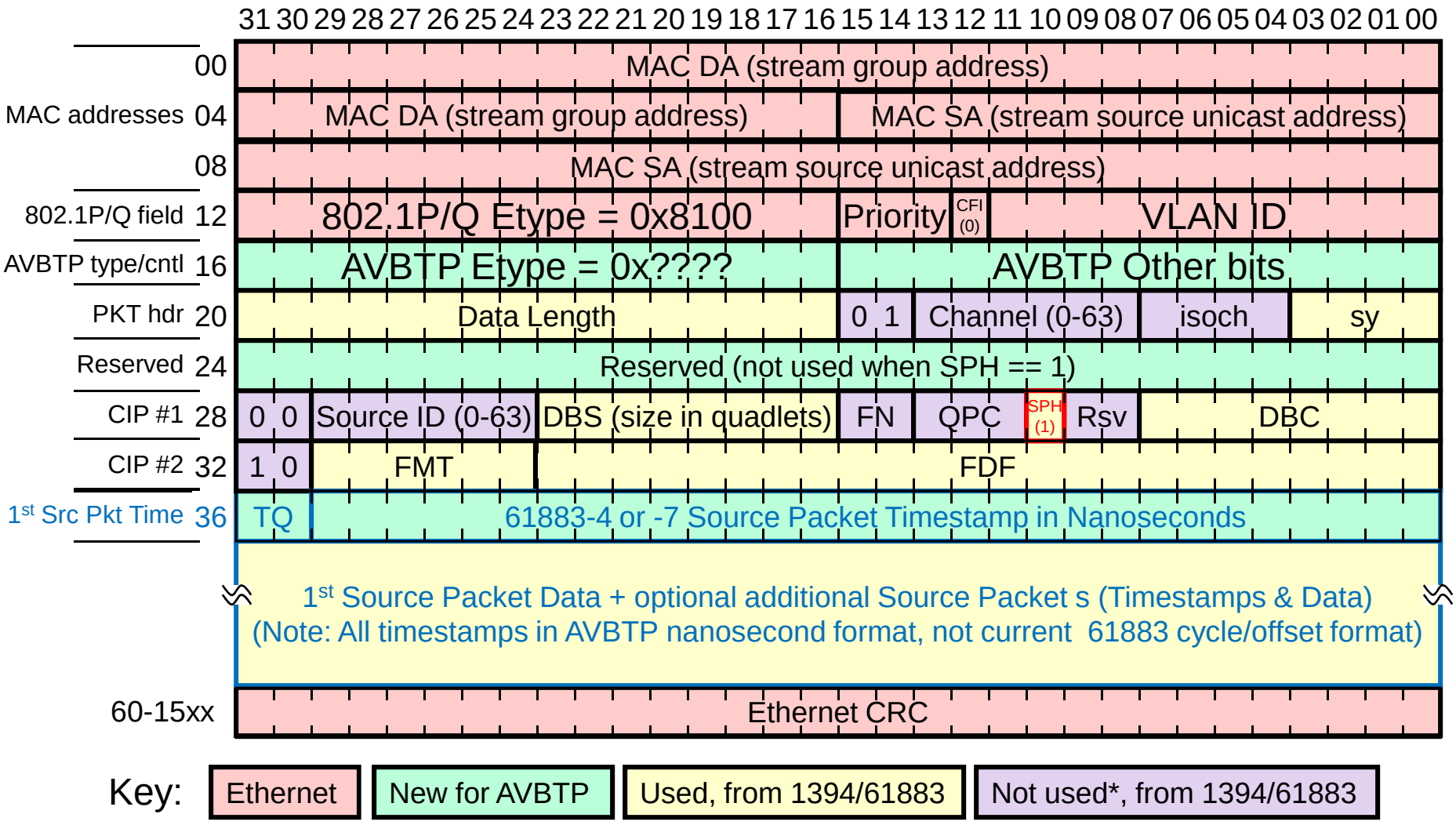
Draft AVBTP Stream Data packet, SPH(0)



Key: Ethernet | New for AVBTP | Used, from 1394/61883 | Not used*, from 1394/61883

Draft AVBTP Stream Data packet, SPH(1)



Field definitions' proposals

- Offset 0: MAC Destination Address (DA)
  - For AVBTP over AVB, MAC Destination Addresses shall always be multicast addresses and shall be unique for the Layer 2 network.
- Offset 6: MAC Source Address (SA)
  - MAC address of the unicast source MAC sending the stream
- Offset 8: 802.1 P/Q Ethertype
  - For AVBTP, the sender shall always send frames with 1st Ethertype field set to 0x8100 for 802.1 P/Q type.
  - For switches hooked up to listener, an AVB switch shall not strip this header
    - i.e. We will make it mandatory that AVB switches never strip VLAN tags for AVBTP streams.

Field definitions' proposals

- Offset 14: Priority-CFI-VLAN_ID
  - Priority, 3 bits:
    - For data streams, AVBTP shall always specify class 5 or class 4 traffic.
  - Canonical Format Indicator (CFI), 1 bit
    - AVBTP will only support CFI of zero.
  - VLAN ID, 12 bits:
    - AVBTP stations must support VLAN ID of zero to send or receive.
    - AVBTP stations are recommended to support other VLAN IDs, but it is not required.
    - Receiving AVBTP stations not supporting or configured for a given VLAN shall discard any frames for which it is not a member of the specified VLAN.

Field definitions' proposals

- Offset 16: AVBTP Ethertype
  - AVBTP Shall use a unique Ethertype to identify an AVBTP stream
    - Value of the Ethertype is TBD
- Offset 18, 16 bits: AVBTP reserved / to be defined.
  - Here are 16 bits for use by AVBTP
    - Editor's note: May want to consider using only 8 bits here and reserving another 8 bits for Application Data. May be useful if we need format differences between IEEE 802 and RTP/UDP/IP

Field definitions' proposals

- Offset 20: Data Length
  - This is the exact same definition as used for isochronous packets in 1394. This specifies the length in bytes starting at offset 28 (CIP Header start)
    - Editor's note: 1394 allows a length of zero in this field. I do not believe that would be needed in IEEE 802 or RTP encapsulation, but I could be wrong…
    - If zero is allowed, then an AVBTP station must ignore and discard any Empty data packets.

Field definitions' proposals

- Offset 22: Other fields from 1394 isochronous packet
  - CIP header present field, 2 bits:
    - Set to 01 binary, indicates CIP header is present
    - For AVBTP stations, this field shall always be set to 01
  - Stream Channel, 6 bits:
    - For 1394 to AVB interworking, this field shall contain channel ID from 1394 isochronous packet from the source 1394 bus.
    - TBD if it has any use in AVBTP end stations
  - Tcode, 4 bits: Isochronous Packet type
    - Shall be fixed value of 0101 binary (same as 1394)
    - Editor's note: I'm assuming for an interworking function, we should only "interwork" isochronous streams as 1394 asynchronous data should probably be out of scope for us (e.g. IP over 1394 to IP over Ethernet would be a typical 1394 asynchronous conversion)
  - Sy field, 4 bits:
    - Reserved for use by DTCP (same as 1394)

Field definitions' proposals

- Offset 24: AVBTP Presentation timestamp for packets with Source Packet Header (SPH) Filed of zero.
  - Time-field Qualifier (TQ) field, 2 bits
    - 00 binary: Timestamp is valid presentation time in Nanoseconds
      - Editor's note: AVBTP will not use cycle time / offset as does the 61883 over 1394 does.
      - This will make AVBTP different, but compliant with the new way we are doing timing in 802.1AS
    - 11 binary: Timestamp field contains no data
      - If set to 11 binary, then the Timestamp field shall also be set to all ones
        - » Editor's note: This is to mimic the behavior of 61883 timestamps.
    - 01 and 10 binary are reserved for possible future use.
  - Presentation time: 30 bits
    - Global time subset from 802.1AS time
      - TBD if Max value of 999,999,999 (i.e. using sub seconds from 802.1AS TimeStamp) or 0x3F-FF-FF-FF (i.e. using subset from 802.1AS TimeInterval (or other ??))
        - » HW folks tend to prefer modulo 2^N pure binary counters.
        - » Seconds and sub seconds probably best for human understanding, protocol traces from sniffers, etc.
        - » 1394 uses seconds (0-127), cycles (0-7999) and cycle offset (0-3071)
      - 30 bits allows us for at least one second resolution
        - » Editor's note: This actually may be two much. If we want the same restriction as currently used in 1394 for non MPEG traffic, then we should limit this field to 18 bits which would give us approximately 2 milliseconds max value which is the max for those types of streams in 61883.

Field definitions' proposals

- Offset 28: CIP header qualdet #1, 1st 2 octets
  - CIP header 1st quadlet indicator, 2 bits
    - Fixed at 00 binary
  - CIP header source ID, 6 bits
    - Source ID of stream talker
      - TBD if useful in AVBTP end stations or 1394 to AVB interworking units.
        - » Editor's note: Useful for debugging if nothing else, and in general the more we can keep fields "as is" for CIP headers in AVBTP, including ones not used for IEEE 802 or RTP, the more likely we are to succeed IMHO.
  - Data Block Size (DBS), 8 bits
    - Same definition as currently in 61883, size of Data Blocks in Quadlets
      - 0: 256 quadlets
      - 1-255: 1-255 quadlets
      - Editor's note: Would like to change DBS values for -4 and -7 to size of source packet as I don't want to support FN field. This would give us better use/resolution of the DBC field.

Field definitions' proposals

- Offset 30: CIP header qualdet #1, 3rd octet
  - Fraction Number (FN), 2 bits
    - Same use as 61883, although it is only used today to fragment -4 and-7 source packets for low bandwidth streams.
    - Editor's note: As discussed at Orlando, I and others believe we should drop support of stream fragmentation in IEEE 802 and RTP of MPEG type source packets.
      - If necessary for 1394 to Ethernet interworking, then this should be done at the interworking function and only on the 1394 side.
      - My recommendation for AVBTP is to only support FN == 0 (no fragments)
  - Quadlet Padding Count (QPC), 3 bits
    - For all types of 61883 as defined today, this field is always zero.
      - Editor's note: For AVBTP, we may just want to specify it as such, or at least say that the value is zero and it is reserved for future use.
  - Source Packet Header (SPH) indicator, 1 bit
    - If one
      - Then AVBTP packet contains 61883-4 or 61883-7 (or future) source packets.
      - AVBTP timestamp at offset 24 shall be ignored and instead, timestamps with the source packet(s) shall be used instead.
    - If zero
      - Then AVBTP packet does not contain source packets (contains Data Blocks)
      - AVBTP timestamp at offset 24 shall be parsed and processed (as specified above).
  - Reserved (Rsv), 2 bits
    - Reserved (not used by 61883), set to zero
    - Editor's note: From what I can tell, there are no specified protocols I've seen currently or in previous research that use or plan to use this field. Does anyone working closer to the 1394 community know of any planned use for these bits?? This is only a 2 bit field, so IMHO we probably should leave this field alone.

Field definitions' proposals

- Offset 31: CIP header quadlet #1, 4th octet
  - Data Block Count, 8 bits
    - Sequence number of 1st Data Block in the packet
    - Same meaning as in 61883 over 1394
      - Editor's note: The one change I'd like to see for AVBTP is as I've said before eliminate Fragmentation at the AVBTP layer. This would mean that MPEG Data Block Sizes are set equal to the Source Packet size and that Data Block Count now will also count packets instead of fragments.
        - » This has the added side benefit of allowing higher bandwidth MPEG streams and still keeping an 8 bit sequence field useful (i.e. 61883 as defined for -4 and -7 has fixed data block sizes and in cases where you have full MPEG packets in an isochronous packets, the lower 3 bits of the DBC field basically become unused leaving only 5 bits for sequence number which wraps very fast).

Field definitions' proposals

- Offset 32: CIP header quadlet #2
  - CIP header 2nd quadlet indicator, 2 bits
    - Fixed at 10 binary
  - Stream Format, 6 bits
    - Same values as currently defined for 61883
  - Format Dependent Field (FDF), 8 bits if SPH=0, 24 bits if SPH=1
    - Same values as currently defined for 61883
  - SYT field (1394 cycle time based presentation time)
    - Not mandatory for use by AVBTP end stations
    - Can be used by 1394 to AVB interworking units
      - Should specify 1394 type presentation time as set by originating 1394 attached talker/source in AVB cloud
        - » Adjusted if necessary on AVB to 1394 translation.
    - Could be used to help transition existing 1394/61883 SW and HW to AVBTP
      - On Egress, existing 61883 application could optionally specify 1394 time format and egress AVBTP layer could translate that to 802.1AS time
      - On Ingress, AVBTP layer could optionally translate 802.1AS time from offset 24 to 1394 type cycle and cycle offset and insert it into the packet prior to sending to application.

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  - Stream Format, 6 bits
    - Same values as currently defined for 61883
  - Format Dependent Field (FDF), 8 bits if SPH=0, 24 bits if SPH=1
    - Same values as currently defined for 61883
  - SYT field (1394 cycle time based presentation time), 12 bits after 8 bit FDF if SPH=0
    - Not mandatory for use by AVBTP end stations
    - Can be used by 1394 to AVB interworking units
      - Should specify 1394 type presentation time as set by originating 1394 attached talker/source in AVB cloud
        - » Adjusted if necessary on AVB to 1394 translation.
    - Could be used to help transition existing 1394/61883 SW and HW to AVBTP
      - On Egress, existing 61883 application could optionally specify 1394 time format and egress AVBTP layer could translate that to 802.1AS time and put into the timestamp at offset 24.
      - On Ingress, AVBTP layer could optionally translate 802.1AS time from offset 24 to 1394 type cycle and cycle offset and insert it into the packet prior to sending to application.

Data Payload proposal

- For AVBTP (IEEE 802 and RTP) All data after the CIP header will be the same 61883 format used for payload except for a new Source Packet Header (1st quadlet of the source packet) will be defined to use 802.1AS timing (nanoseconds) instead of 1394 timing (8 kHz cycle and 24.576 MHz cycle offset).
  - For AVBTP same format as used in offset 24
    - 2 Bit Timestamp Qualifier
    - 30 bit Timestamp in Nanoseconds
      - Editor's note: For this case, we will need a full 30 bits if we do nanoseconds to get an equivalent 1 second resolution as is currently used by 1394/61883