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# **Real Time Protocol (RTP) over LANs supporting 802.1 AVB, an overview (A.K.A. IEEE P1733)**

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# Purpose of 1733

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## Answer the question:

Once the local area network supports accurate time and latency/bandwidth reservations & traffic shaping, what's the minimum set of changes to the RTP protocols that is needed to take advantage of these features?

## Objectives:

- **No changes to RTP media formats, existing or future**
- **Correlate RTP timestamp to 802.1AS**
  - Allowing an arbitrary number of media clocks simultaneously
- **Correlate RTP stream to 802.1Qat stream ID**
- **Document interfaces for use by higher layer protocols**

# AVB Overview

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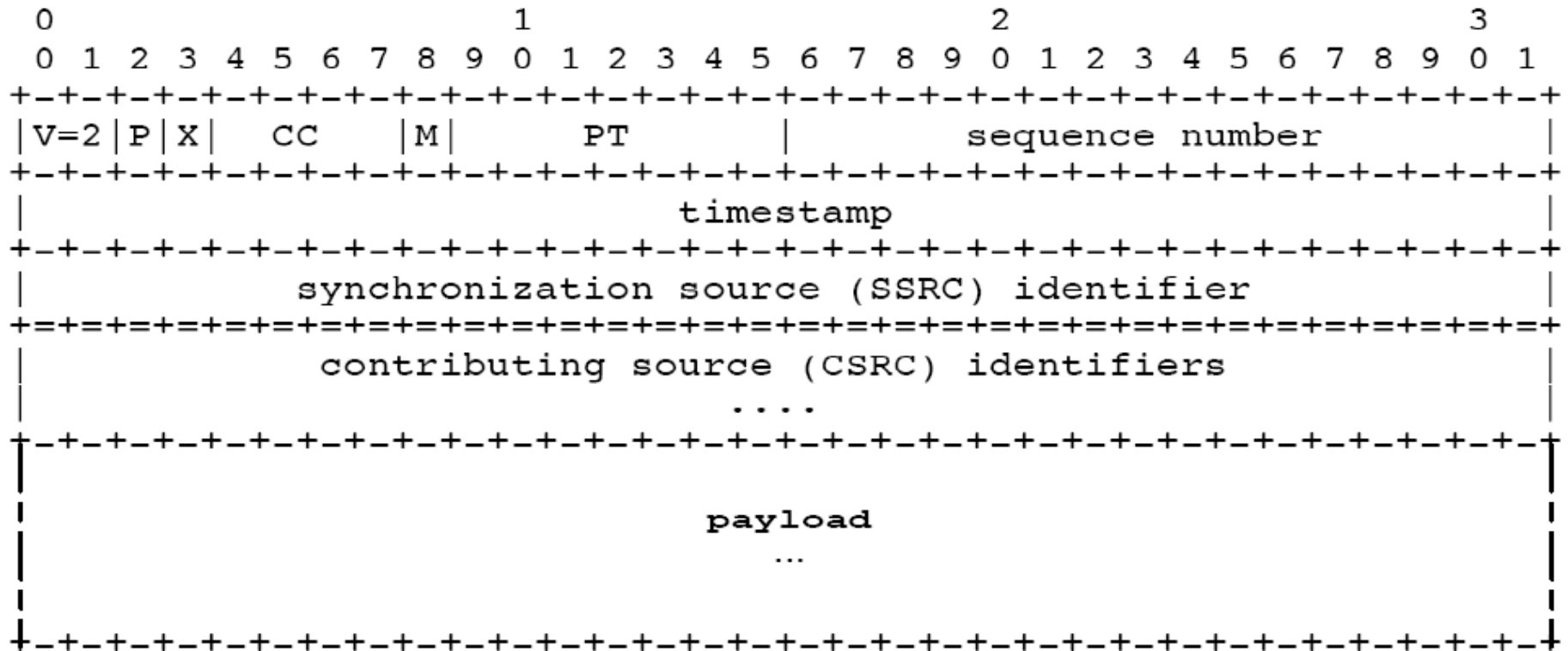
- **IEEE 802.1 Audio Video Bridging (AVB) WG**
- **Three standards, all approaching sponsor ballot**
  - 802.1Qav – traffic shaping for predictable latency
  - 802.1Qat – stream reservations within the LAN
  - 802.1AS – accurate time synchronization
- **Together, give real-time media streaming capabilities to the LAN**

# RTP Overview

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- **History: Published in 1996 as RFC 1889**
- **Addressing: Originally Multicast, Unicast also**
- **Transport: IP/UDP**
- **Original target: Streaming of real-time audio/video**
- **Media formats: too many to count**
- **RTP is supplemented with RTCP, RTSP**
  - E.g. Communicate sender & receiver information out-of-band
- **IP/UDP/RTP header overhead: 40 Bytes**
  - Perhaps 18B with header compression, if applicable

# The RTP header



**IEEE 1733 does NOT change the RTP header**

**Implication: Existing RTP header/payload parsers continue to work, offset of payload is unchanged**

# (Early) Registered RTP Payload Types

## Registry:

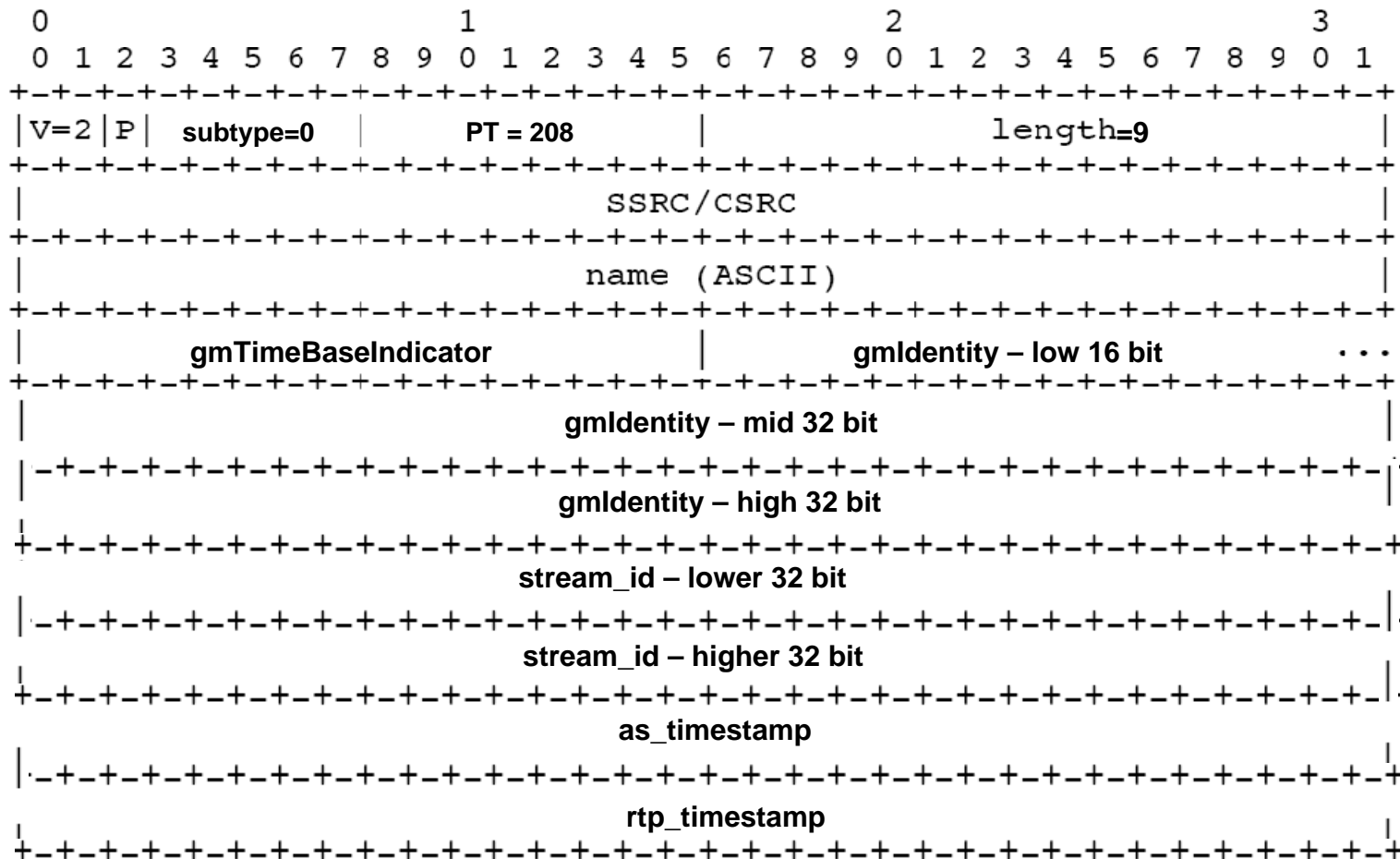
| PT | encoding name | audio/video (A/V) | clock rate (Hz) | channels (audio) | Reference          |
|----|---------------|-------------------|-----------------|------------------|--------------------|
| 0  | PCMU          | A                 | 8000            | 1                | [RFC3551]          |
| 3  | GSM           | A                 | 8000            | 1                | [RFC3551]          |
| 4  | G723          | A                 | 8000            | 1                | [Kumar]            |
| 5  | DVI4          | A                 | 8000            | 1                | [RFC3551]          |
| 6  | DVI4          | A                 | 16000           | 1                | [RFC3551]          |
| 7  | LPC           | A                 | 8000            | 1                | [RFC3551]          |
| 8  | PCMA          | A                 | 8000            | 1                | [RFC3551]          |
| 9  | G722          | A                 | 8000            | 1                | [RFC3551]          |
| 10 | L16           | A                 | 44100           | 2                | [RFC3551]          |
| 11 | L16           | A                 | 44100           | 1                | [RFC3551]          |
| 12 | QCELP         | A                 | 8000            | 1                |                    |
| 13 | CN            | A                 | 8000            | 1                | [RFC3389]          |
| 14 | MPA           | A                 | 90000           |                  | [RFC3551][RFC2250] |
| 15 | G728          | A                 | 8000            | 1                | [RFC3551]          |
| 16 | DVI4          | A                 | 11025           | 1                | [DiPol]            |
| 17 | DVI4          | A                 | 22050           | 1                | [DiPol]            |
| 18 | G729          | A                 | 8000            | 1                |                    |
| 25 | CelB          | V                 | 90000           |                  | [RFC2029]          |
| 26 | JPEG          | V                 | 90000           |                  | [RFC2435]          |
| 28 | nv            | V                 | 90000           |                  | [RFC3551]          |
| 31 | H261          | V                 | 90000           |                  | [RFC2032]          |
| 32 | MPV           | V                 | 90000           |                  | [RFC2250]          |
| 33 | MP2T          | AV                | 90000           |                  | [RFC2250]          |
| 34 | H263          | V                 | 90000           |                  | [Zhu]              |

**NOTE: Additional static assignments for this (small) 7-bit field has been halted by RFC 3551. Thus, most payload encodings use a dynamic Payload Type, e.g. RFC 3190 defines “RTP Payload Format for 12-bit DAT Audio and 20- and 24-bit Linear Sampled Audio”, MIDI over RTP is defined in RFC 4695.**

# If we don't change RTP, how can it use AVB?

- **RTCP, the RTP Control Protocol (RFC 3550) typically carries:**
  - Sender report (from the talker)
  - Receiver report (from the listeners)
  - [and others]
- **These are used to collect relevant statistics, and to provide out-of-band stream information**
- **1733 defines a new RTCP payload to correlate a RTP stream with its underlying AVB parameters**

# New RTCP payload format



Periodically, the sender sends RTCP packets containing:

- Correlation (cross-timestamp) between RTP header timestamp and 802.1AS time
- Correlation between 802.1Qat “streamID” and RTP SSRC



# RTCP Types

From <http://www.iana.org/assignments/rtp-parameters>

## Registry:

| Value   | Abbrev. | Name                                 | Reference         |
|---------|---------|--------------------------------------|-------------------|
| 0       |         | Reserved                             |                   |
| 1-191   |         | Unassigned                           |                   |
| 192     | FIR     | full INTRA-frame request             | [RFC2032]         |
| 193     | NACK    | negative acknowledgement             | [RFC2032]         |
| 194     | SMPTETC | SMPTE time-code mapping              | [RFC5484]         |
| 195     | IJ      | Extended inter-arrival jitter report | [RFC-ietf-avt...] |
| 196-199 |         | Unassigned                           |                   |
| 200     | SR      | sender report                        | [RFC3551]         |
| 201     | RR      | receiver report                      | [RFC3551]         |
| 202     | SDES    | source description                   | [RFC3551]         |
| 203     | BYE     | goodbye                              | [RFC3551]         |
| 204     | APP     | application-defined                  | [RFC3551]         |
| 205     | RTPFB   | Generic RTP Feedback                 | [RFC4585]         |
| 206     | PSFB    | Payload-specific                     | [RFC4585]         |
| 207     | XR      | extended report                      | [RFC3611]         |
| 208     | AVB     | AVB RTCP packet                      | [IEEE1733]        |



# Summary

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**802.1 AVB is defining new LAN features for accurate time, stream reservations, and traffic shaping for latency & bandwidth**

**RTP supports IP-based real-time media streaming**

**A new RTCP type that correlates RTP with relevant AVB information is specified in IEEE P1733**

**...Allowing RTP to utilize 802.1 AVB features**

**IEEE P1733 is approaching Sponsor Ballot.**

**Sign up to participate at:**

**<http://standards.ieee.org/db/balloting/ballotform.html>**

**Weekly phone calls held Tuesdays 1:00PM Pacific Time**

**For more information see: <http://grouper.ieee.org/groups/1733>**