IEEE 1588/802.1AS Synchronisation for RTP Streams

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Outline

- What is this all about?
- Technical needs
- Audio Video Bridging (AVB)
- IEEE 1733 anatomy
- How to proceed

What's this all about?

- High performance audio and video signal distribution over IP / Ethernet

- "High performance" means:
  - ±1μs time alignment between network devices
  - Millisecond or lower latency thru network
  - Hundreds of channels
  - Rapid switching (10ms) between streams

- Replacing analogue AV cabling with networks
  - Without loss of performance..

Technical needs

- All devices in the system share a reference clock
  - Media clocks locked to shared time
  - Media clocks locked to a shared signal
    - Analogous to word clock, genlock, .. but via the network.
- Wall clock timestamp accuracy is critical for time alignment and for minimising buffering delay
  - Solved: IEEE 1588 locks quickly and works well in LANs
  - But: Need to know wall clock timestamps can be compared meaningfully in the transport layer
    - Am I using NTP, 1588v2, 802.1AS, or what?
- QoS setup
  - We'll talk about AVB shortly…

AVB in 25 words or less…

- New IEEE 802 standards:
  - 802.1AS   An L2-only 1588v2 profile
  - 802.1Qav Credit based traffic shaping
  - 802.1Qat   Admission control
- Qat+Qav combined provide a latency bound
- Transport standards
  - IEEE 1722 Firewire encapsulated in L2 Ethernet
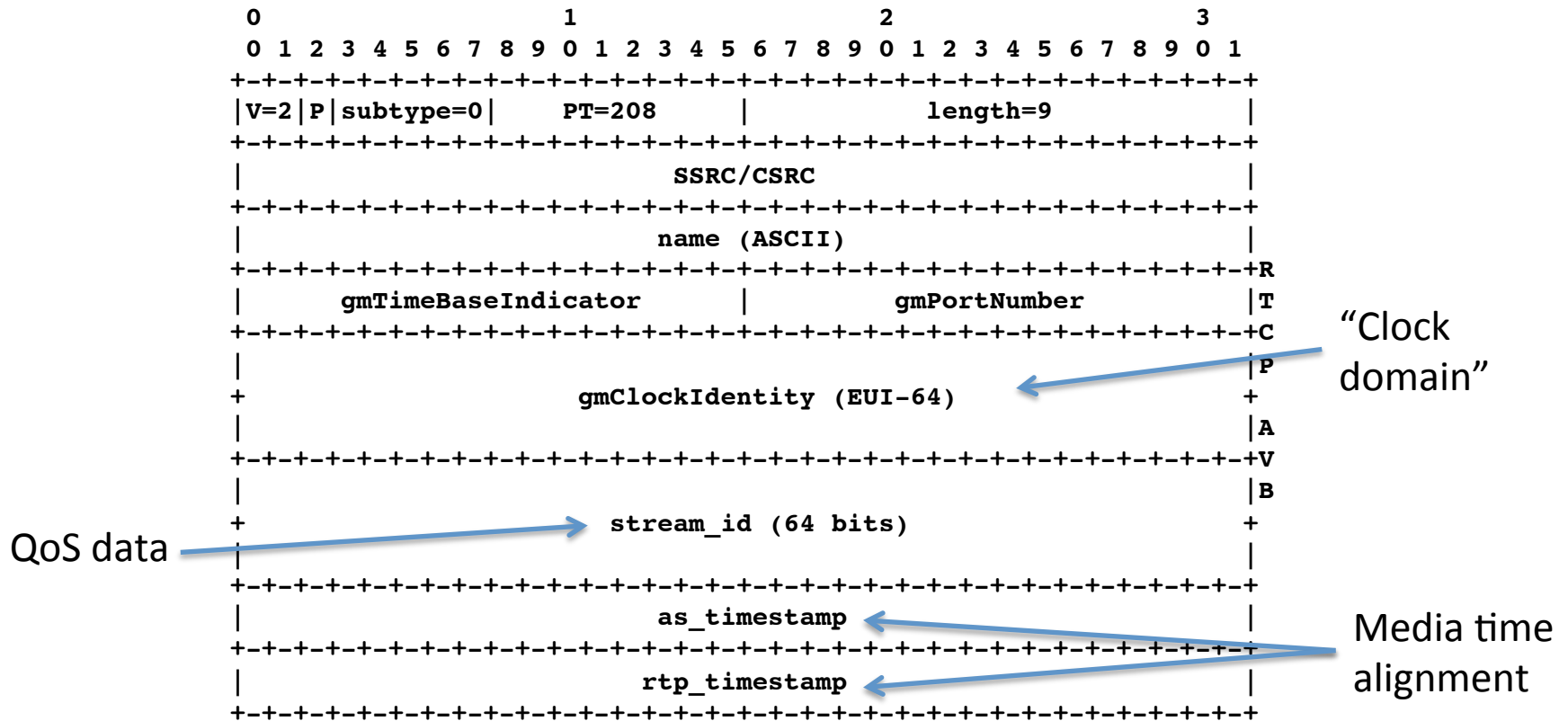 - IEEE 1733 RTCP packet type

IEEE 1733 anatomy

```
 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|subtype=0|    PT=208      |              length=9          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           SSRC/CSRC                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                          name (ASCII)                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+R
|          gmTimeBaseIndicator      |         gmPortNumber       |T
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+C
|                                                               |P
+                    gmClockIdentity (EUI-64)                   +
|                                                               |A
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+V
|                                                               |B
+                      stream_id (64 bits)                      +
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         as_timestamp                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         rtp_timestamp                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

"Clock domain"

QoS data

Media time alignment

Figure 1: IEEE 1733 / AVB RTCP packet format

Issues with IEEE 1733

- Non-NTP format timestamp..
  - Different from RTCP SR
  - Different from RFC 6051
- QoS data should really be signaled at flow setup time via SDP
- Wall clock source / domain is not well defined
- Requires RTCP packets to be sent and processed before time alignment is known
  - Slow switching..

Where to from here..

- The current draft shows one way to do it..
- However an alternative approach is:
  - Use NTP format timestamps
    - Can use RFC 6051 for timing metadata
  - Develop SDP description of clock domains
    - Text already exists in IDMS and this draft
  - Develop SDP signaling for AVB QoS
    - Probably as part of a draft describing how to use RTP with AVB, referring to the above documents