University
of Glasgow
VIA VERITAS VITA

School of
Computing Science

RTCP Feedback for Congestion Control

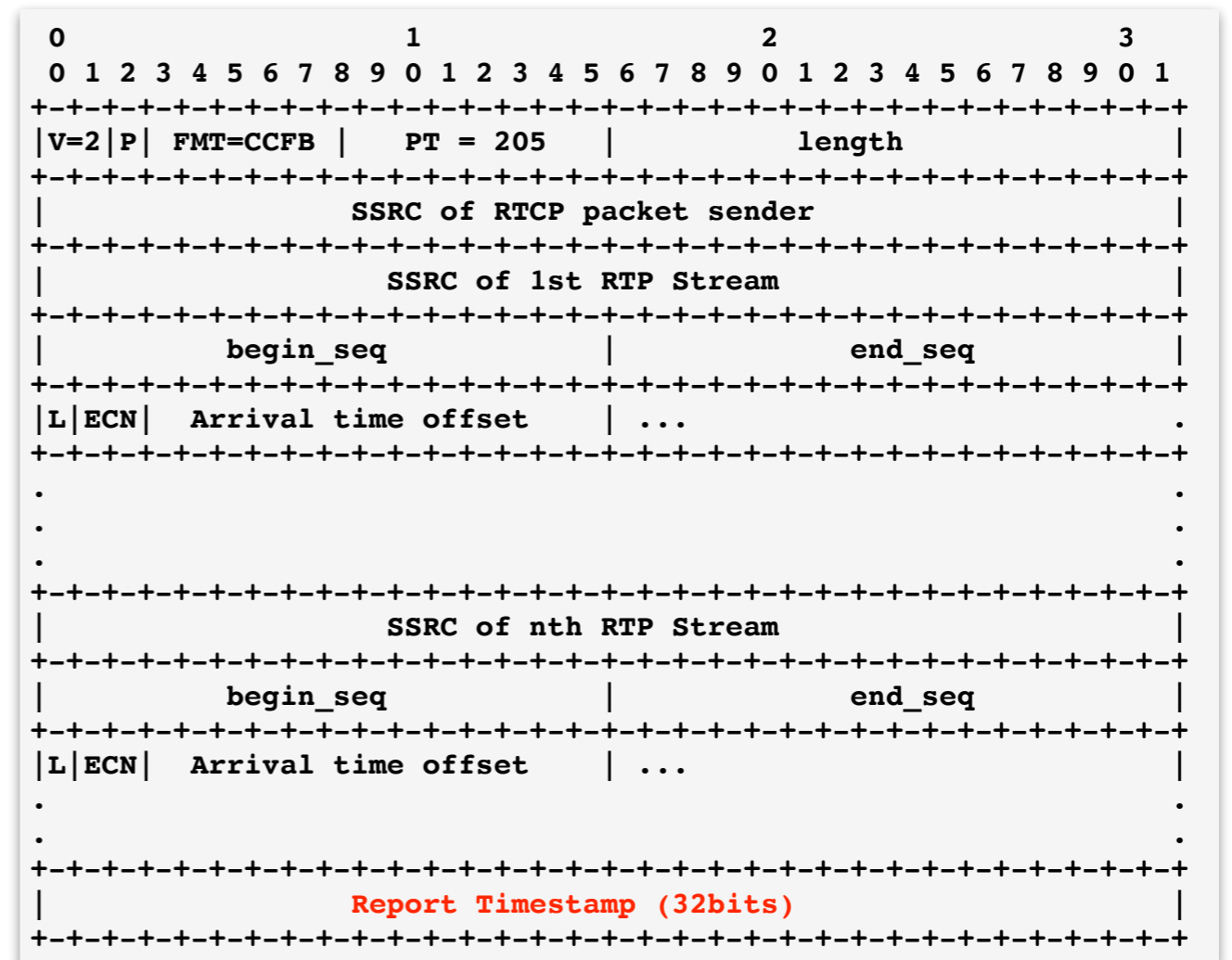draft-ietf-avtcore-cc-feedback-message-01

Zaheduzzaman Sarker – Ericsson
Colin Perkins – University of Glasgow
Varun Singh – Callstats
Michael A. Ramalho – Cisco

Changes Since IETF 100

- Submitted -00 in October 2017
  - Adopted as AVTCORE work item
  - Content identical to draft-dt-rmcat-feedback-message-04
- Submitted -01 in March 2018
  - Specify the Report Timestamp (RTS) field uses the same clock as used for RTCP SR/RR NTP timestamp fields, and is formatted as the middle 32 bits of an NTP format timestamp
  - Use 1024Hz rather than 1000Hz clock for arrival timestamp
  - Clarify behaviour if no packets received for an SSRC in a reporting interval
  - Give guidance on what sequence number ranges to include in each report
  - Expand guidance on feedback timing; cite draft-ietf-rmcat-rtp-cc-feedback
  - Clarify how to handle sequence number wrap-around
  - Expand security considerations
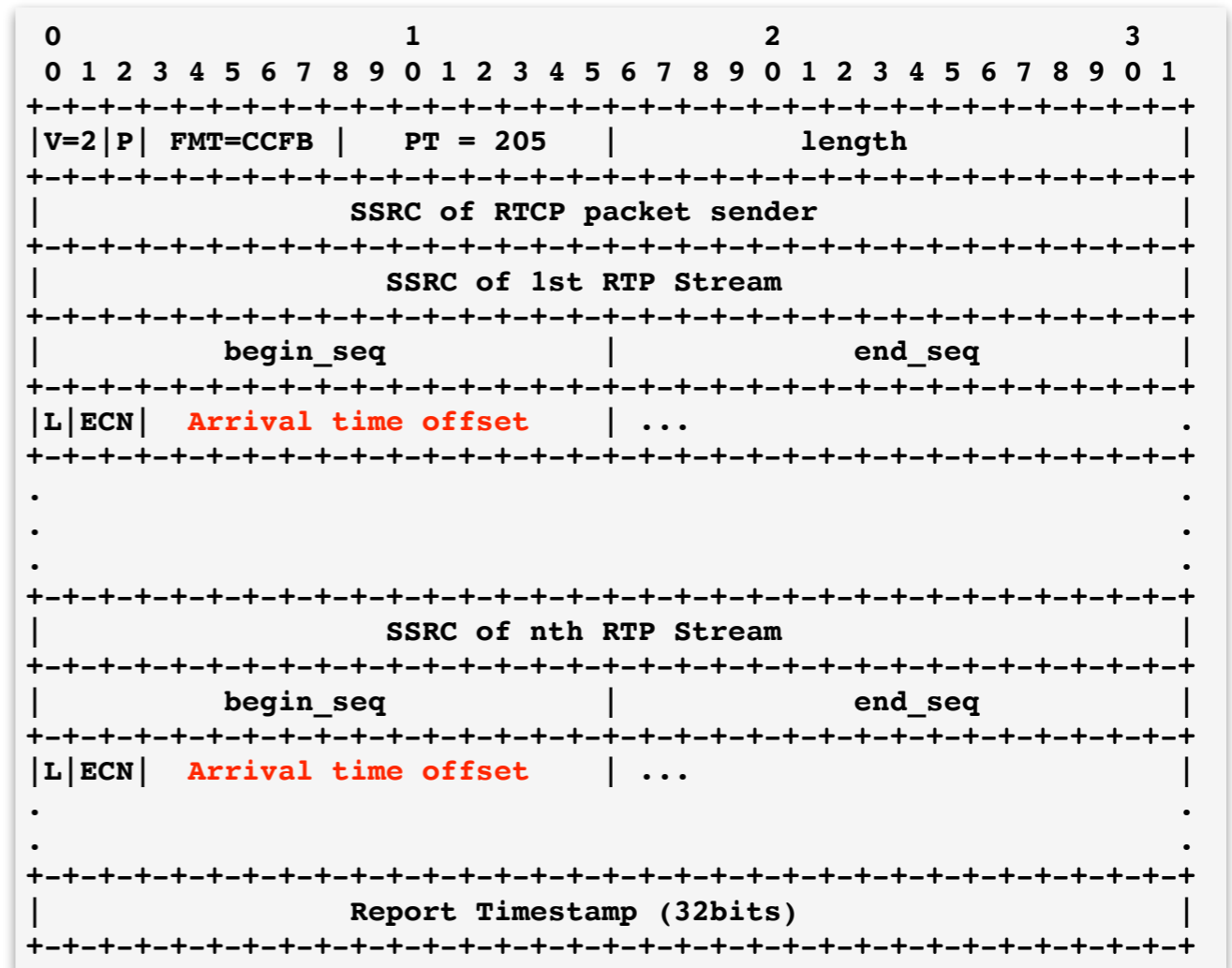 - Editorial fixes and clarifications throughout

Report Timestamp

- Report Timestamp was ill-specified in previous draft:
  - Should be derived from the same wall clock used to time-stamp RTP packet arrival
  - Clock resolution 0.1ms suggested
  - Signalling needed, but not specified
- The -01 draft mandates a clock:
  - "The value of RTS field is derived from the same wall clock used to generate the NTP timestamp field in RTCP SR and RR packets. It is formatted as the middle 32 bits of an NTP format timestamp"
  - Signalling the clock rate only introduces complexity for no benefit

```
 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| FMT=CCFB  |    PT = 205   |            length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               SSRC of RTCP packet sender                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               SSRC of 1st RTP Stream                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          begin_seq            |            end_seq            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|L|ECN|   Arrival time offset   | ...                           .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
.                                                               .
.                                                               .
.                                                               .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               SSRC of nth RTP Stream                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          begin_seq            |            end_seq            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|L|ECN|   Arrival time offset   | ...                           |
.                                                               .
.                                                               .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Report Timestamp (32bits)                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Arrival Time Offset

- Arrival time offset indicates start of report block, relative to the Report Timestamp

- Previously specified as an offset in $1/1000$ of a second units

- Changed to $1/1024$ of a second units in this version – align with changed definition of Report Timestamp

```
 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| FMT=CCFB |    PT = 205    |             length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    SSRC of RTCP packet sender                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    SSRC of 1st RTP Stream                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          begin_seq          |            end_seq              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|L|ECN|   Arrival time offset  | ...                            .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
.                                                                .
:                                                                :
.                                                                .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    SSRC of nth RTP Stream                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          begin_seq          |            end_seq              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|L|ECN|   Arrival time offset  | ...                            |
.                                                                .
:                                                                :
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Report Timestamp (32bits)                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Behaviour if no Packets Received

- Two changes in this version:

  - Clarify that if no packets are received from an SSRC in a reporting interval, then no report block is sent for that SSRC

  - Suggest that regular SR/RR packet SHOULD be sent instead in this case, since the non-increased extended highest sequence number received field of that SR/RR packet will inform the sender that no packets have been received

- Alternative might be to send a report with `begin_seq = end_seq`

  - i.e., repeat report on last packet received
  - Problematic is no packets ever received

Sequence Number Ranges to Include in Reports

- Give guidance on what sequence number range should be included in each report: sequence number ranges reported on in consecutive reports for an SSRC SHOULD be consecutive and SHOULD NOT overlap
  - If overlapping reports are sent, the information in the later report updates that in any previous reports for packets included in both reports
  - Reports more than one quarter of the sequence number space ahead or behind the previous report MUST be ignored

- Alternatively reports could overlap, which would provide robustness to packet loss
  - But, the second copy would likely arrive too late for congestion control

Other Changes

- More explicitly delegate discussion of when to send reports to draft-ietf-rmcat-rtp-cc-feedback

- Specify throughout that modulo arithmetic is to be used, to account for the case where the sequence number wraps around

- Expand security considerations

- Editorial fixes and clarifications throughout

Next Steps

- Please review draft-ietf-avtcore-cc-feedback-message-01

- Aiming to move this forward to WG last call at IETF 102