Changes in RTP Multi-stream

draft-ietf-avtcore-rtp-multi-stream-07

Magnus Westerlund (Ericsson)
Jonathan Lennox (Vidyo)
Colin Perkins (University of Glasgow)
Qin Wu (Huawei)

Outline

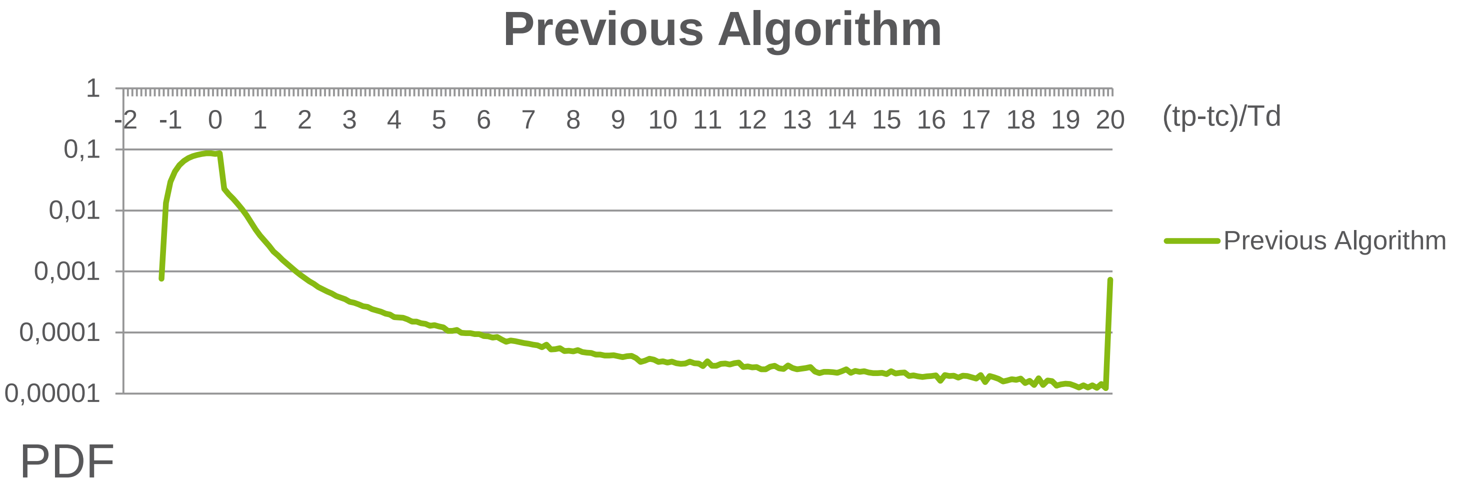
- Changes
  - Scheduling algorithm change
  - Limit for transmission of initial RTCP compound packets
  - Recommendation for mitigating legacy avg_rtcp_size calculation
  - Piggybacking Feedback Packets on other SSRCs’ transmission
  - Rules for determining point to point behavior vs. multiparty
  - Intend no example configurations
- Next Step

Previous algorithm

- Variables as used in RFC3550 and RFC4585
  - ***tp:*** Time of previous RTCP transmission
  - ***tc:*** Current Time
  - ***tn:*** Time of next scheduled RTCP transmission
  - ***Td***: Deterministic transmission interval
- When aggregating: set ***tp*** variable to intended transmission time (***tt***) rather than ***tc***
  - Intended transmission time is derived by calculating ***tn*** and doing consideration and updating ***tn*** until allowed to send.
  - To ensure maintaining bandwidth allocation

Issue with Previous Algorithm

- Simulations of RTP session where the number of SSRCs per endpoint is reduced uncovered an issue:
  - The ***tp*** value can drift into the future
    - Example: ~2% of the ***tp*** values are more than 1.5****Td*** from ***tc***
  - Reverse Reconsideration was applied
  - RTCP sender may go dormant for many reporting intervals



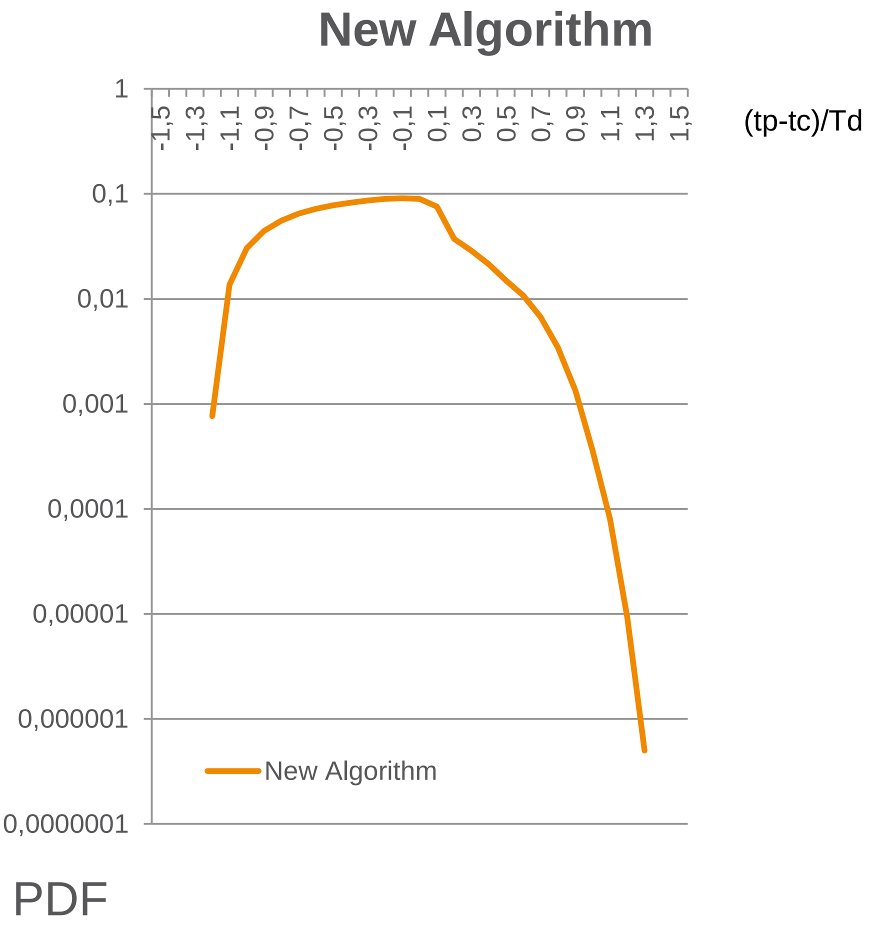
Previous Algorithm

Issue depends on #SSRCs

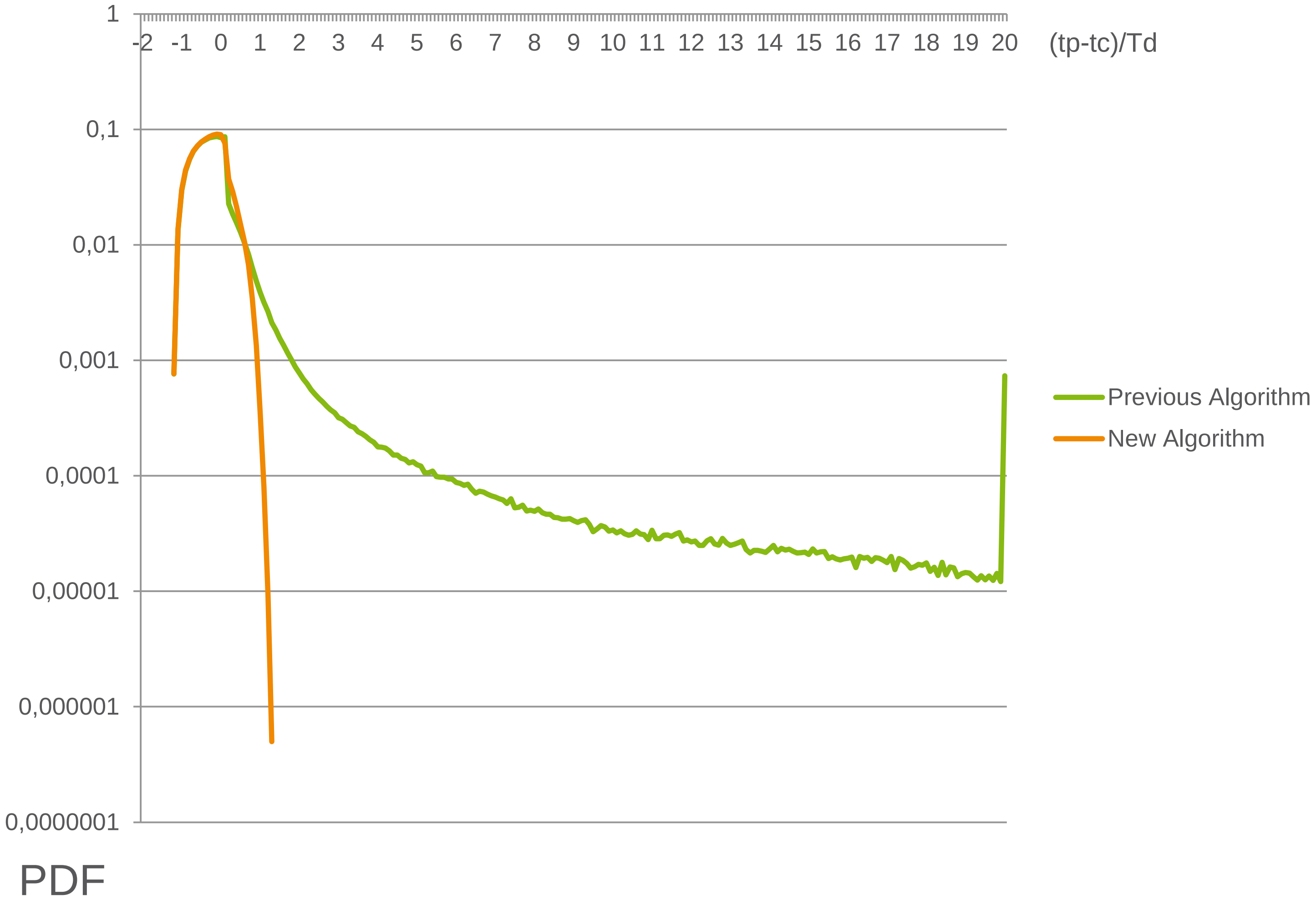
- When the number of SSRCs on an endpoint is more than what can be aggregated in one RTCP compound packet:
  - Then an SSRC with ***tn*** further into the future is skipped in the current packet
  - But, that SSRC is likely to be sender in the next, thus updating ***tp*** to ***tc***
  - Thus drift unlikely
- When the number of SSRCs all fit in one aggregate:
  - Algorithm picks the SSRC(s) that gets low random number * ***Td***
  - A SSRC not picked for a couple of cycles can get ***tp*** further than 1.5/1.21828****Td*** and will never be picked
- Issue arises when the SSRC or SSRCs picked are removed
  - Then ***tp*** for the remaining SSRCs is far into the future

Proposed change

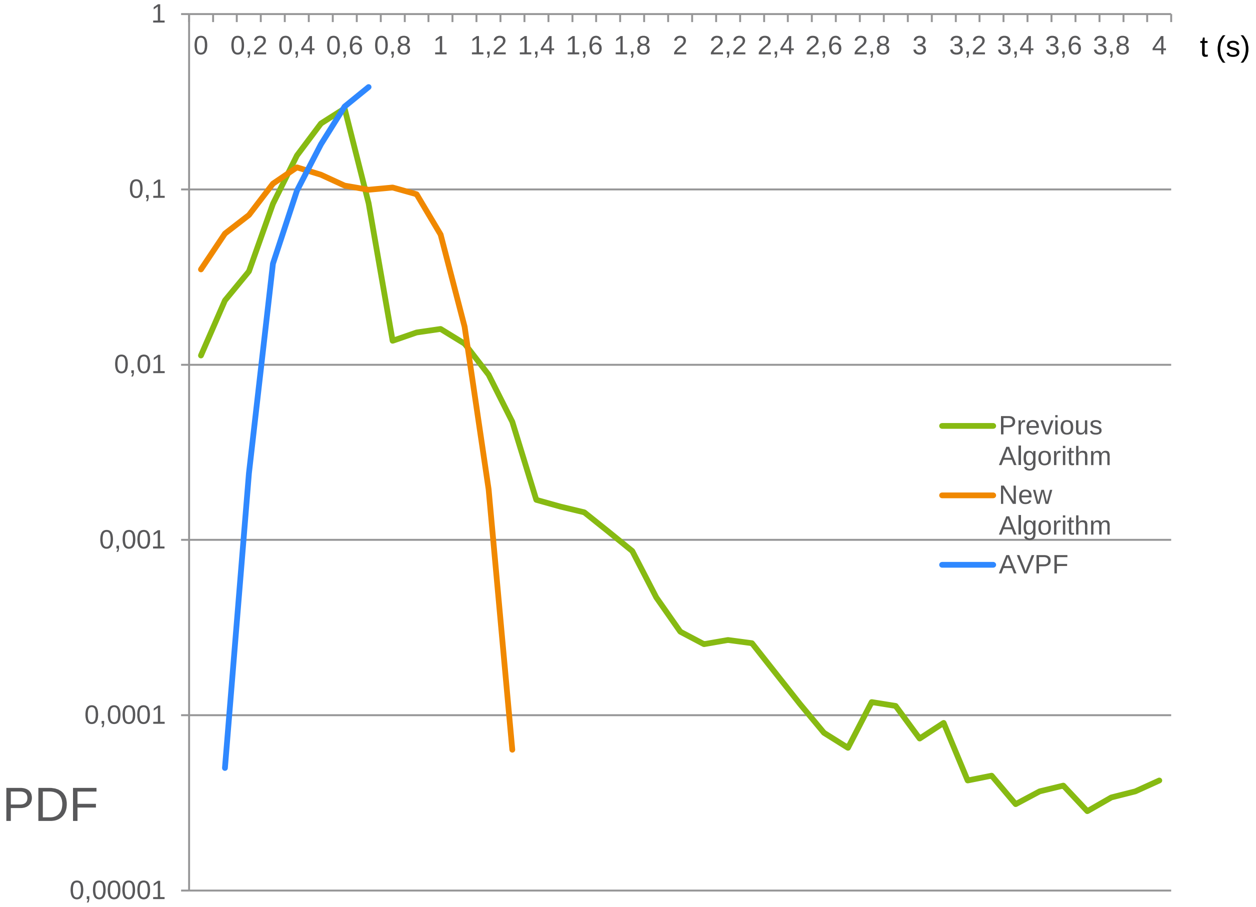
- Set ***tp*** to the average of all aggregated SSRCs' transmission time (***tt***)
  - SSRC triggering transmission has ***tt*** = ***tc***
  - Other SSRCs calculate ***tt*** = intended transmission time
- Maintains bandwidth consumption
- Ensures that ***tp*** is worst case set to ***tc*** + 1.5/1.21828*Td
  - This prevents drift



Comparison: ***tp*** distributions



Transmission interval



	Average
AVPF	0.639
Previous Algorithm	0.589
New Algorithm	0.591

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Limit initial transmission

- When an endpoint joins an “unicast” session it may use a zero delay before sending the initial compound RTCP packet.
- We propose a limit to this behaviour to a maximum of 4 RTCP compound packets
  - These RTCP compound packets can be aggregates
- Limit chosen based on the TCP Initial Window

Legacy avg_rtcp_size

- Legacy endpoint that doesn't calculate avg_rtcp_size as in this document:
  - Will arrive on a ***Td*** value that is ***N*** times longer
  - ***N*** is the number of reporting SSRCs in each compound packet
- Results in lower reporting rate
- Timeout modification should prevent timeout as long as non-legacy has ***Td*** no larger than 1 second
- For cases where legacy endpoints are likely
  - Limit aggregation to two SSRCs per compound, or
  - Turn off aggregation

Piggyback FB packets

- When an FB packet can’t trigger early transmission of the SSRC(s) that is suitable to report
  - AVPF says schedule regular RTCP, if that is prior to T_max_fb_delay, else
  - Drop FB packet
- We propose that it can be queued to be included (piggybacked) on the first of any other SSRCs’ compound packet which may be sent within T_max_fb_delay.
  - Source of FB packet will still be suitable SSRC (Section 5.4.1)

P2P vs. Multiparty

- Provide clear rule for how to judge Point-to-point vs. Multiparty in scheduling algorithm
  - Not based on number of SSRCs
- If Reporting groups are used:
  - If only one external reporting group then P2P, else multiparty
- Else if number of endpoint external CNAMEs seen on Media sending SSRCs are:
  - Only one then P2P, else multiparty
- Will classify mixer cases as P2P
  - Ok: Mixer will insulate the other legs or multiparty domain from endpoint.

Skipping Examples

- We have for a while considered configuration examples
  - Was a TBD in Section 6.2.2
- In the interest of completing this work we intended to skip this.

Next Step

- Please review!

- Intended to request WG last call soon
  - Giving you some time to review and consider changes

- Related documents are ready for WG last call:
  - draft-ietf-avtcore-multi-media-rtp-session-07
  - draft-ietf-avtcore-rtp-multi-stream-optimisation-05

BACKUP SLIDES

Simulation Setup

- 2 Endpoint, each starts with 16 SSRCs each
- RR: 15000 bps, RS: 10000 bps, T_rr_int = 0, transport delay between endpoints 100 ms (Static: no jitter)
- Simulation loop
  1. Send 300 RTCP packets
  2. Remove one SSRC per endpoint
  3. Perform reverse reconsideration due to the local SSRC
  4. Sample the values of ***tp***
  5. Goto 1 unless there is only one SSRC per Endpoint
- The shown plots contains all sample values over 50000 repetitions of the above
  - For the old algorithm, the furthest drift that occurred in a specific run was 75,6*Td

Gain Matrix

SSRCs	1	2	3	4	5	8	12	16	24	31	32	64	128	256
AVPF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AVPF-AGG	0.37%	-9.52%	-8.64%	-8.56%	-7.11%	-4.00%	-1.96%	0.43%	-0.17%	-0.02%	0.33%	0.03%	-0.28%	-0.10%
AVPF-RG	17.16%	-21.48%	-40.46%	-52.22%	-59.99%	-73.04%	-81.07%	-85.37%	-85.26%	-85.31%	-84.53%	-84.04%	-83.32%	-81.44%
AVPF-RG-AGG	17.38%	-30.72%	-49.37%	-60.18%	-67.11%	-78.66%	-85.42%	-88.76%	-88.27%	-87.30%	-86.49%	-85.54%	-83.98%	-81.91%

- Reduction in average reporting interval compared to AVPF
- Report groups for endpoints with many SSRCs (>16):
  - Under utilize bandwidth
  - Reason is IIR filtering of avg_rtcp_size
  - Example: AVPF-RG with 64 SSRCs per endpoint
    - Packets with Reporting is 2.85% of total number of packets
    - Report packets are ~8 times bigger (big report blocks)