

# Multimedia Congestion Control: Circuit Breakers for RTP Sessions

draft-ietf-avtcore-rtp-circuit-breakers-09

Colin Perkins – University of Glasgow  
Varun Singh – Aalto University

# Changes since the -08 draft

- Interval for the RTCP timeout circuit breaker
- Enforce minimum sending rate below which circuit breaker will not trigger
- Adapt time-to-trigger based on the RTCP reporting interval

# Interval for RTCP Timeout Circuit Breaker

- When sending, if no RTCP is received for 3 RTCP reporting intervals, then terminate the session
- Issue: this depends on the RTCP reporting interval chosen by the remote system, which is not known
- Solve using fixed RTCP reporting interval:
  - “When calculating the timeout, the deterministic RTCP reporting interval,  $T_d$ , without the randomization factor, and using the fixed minimum interval of  $T_{min}=5$  seconds, MUST be used” (was “SHOULD be used”)
  - “To reduce the risk of premature timeout, implementations SHOULD NOT configure the RTCP bandwidth such that  $T_d$  is larger than 5 seconds”
    - Plus equivalent for RTP/AVPF profile using  $T_{rr\_interval}$
  - Matches timeout behaviour in RFC 3550 as updated by Section 6.1.4 of draft-ietf-avtcore-rtp-multi-stream

# Minimum Sending Rate

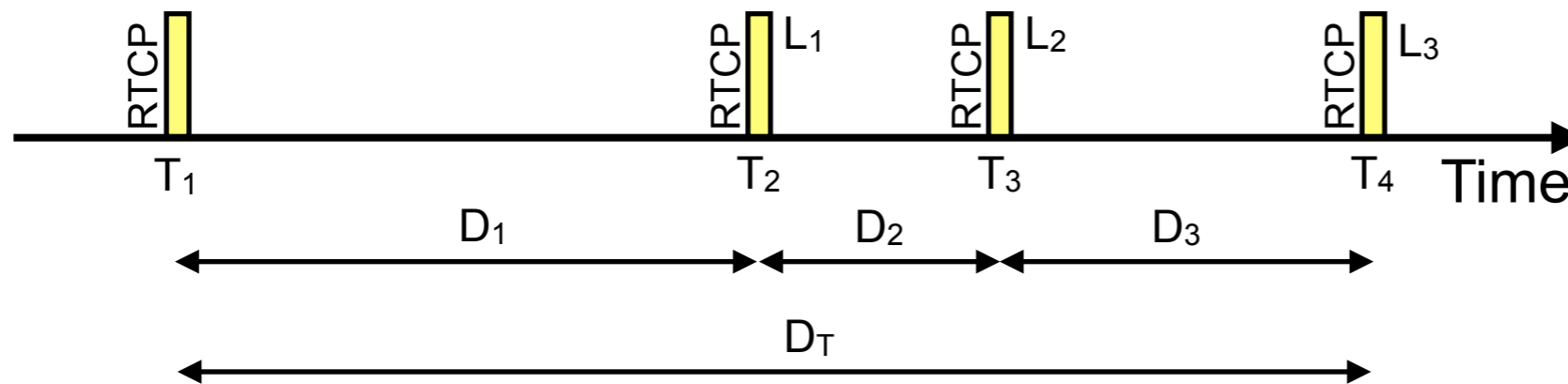
- For media timeout and congestion circuit breakers, disable circuit breaker when sending less than one packet per RTT
- Some applications send few packets per reporting interval, and granularity of reported loss fraction is poor – change prevents accidental triggers
- Open issue: do we need to specify a minimum RTT or other bounds?

# Adaptive Time to Trigger (1)

- Previous versions could trigger media timeout or congestion circuit breaker after 3 RTCP reports, irrespective of RTCP reporting interval
- This version is adaptive, based on RTCP reporting interval:
  - Timeout if sending media and RTCP reports show no data received for  $CB\_INTERVAL$  reporting intervals
  - For the congestion circuit breaker, when  $>CB\_INTERVAL$  reports have been received, on each report calculate weighted average loss fraction over last  $CB\_INTERVAL$  reports, and derive a TCP throughput estimate based on that average; terminate if actual sending rate  $>10x$  estimate
  - $CB\_INTERVAL = \min(\text{floor}(3+(2.5/Td)), 30)$  RTCP reporting intervals

# Adaptive Time to Trigger (2)

If CB\_INTERVAL = 3:



Average loss rate,  $L_{avg} = (L_1 * D_1 / D_T) + (L_2 * D_2 / D_T) + (L_3 * D_3 / D_T)$

Unlike previous versions, trigger when the average loss rate exceeds a threshold, rather than if loss rate in each interval exceeds threshold

# Adaptive Time to Trigger (3)

- Scale time-to-trigger so higher rate sessions trigger circuit breaker more rapidly
- $CB\_INTERVAL = \min(\text{floor}(3+(2.5/Td)), 30)$  RTCP reporting intervals
- Non-linear, so sessions with lower reporting intervals take proportionally more reporting intervals to trigger:

Td = 0.016	CB_INTERVAL = 30	time to trigger = 0.48
Td = 0.033	CB_INTERVAL = 30	time to trigger = 0.99
Td = 0.100	CB_INTERVAL = 28	time to trigger = 2.80
Td = 0.500	CB_INTERVAL = 8	time to trigger = 4.00
Td = 1.000	CB_INTERVAL = 5	time to trigger = 5.00
Td = 2.000	CB_INTERVAL = 4	time to trigger = 8.00
Td = 5.000	CB_INTERVAL = 3	time to trigger = 15.00
Td = 10.000	CB_INTERVAL = 3	time to trigger = 30.00

# Next Steps

- Feedback from the working group
- Simulate the new mechanisms to ensure they work as expected
- Hopefully can proceed to working group last call before IETF 93