Multimedia Congestion Control: Circuit Breakers for RTP Sessions

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

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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, Td, without the randomization factor, and using the fixed minimum interval of Tmin=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 Td 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(floor(3+(2.5/Td)), 30) RTCP reporting intervals
Adaptive Time to Trigger (2)

If CB_INTERVAL = 3:

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

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(floor(3+(2.5/Td)), 30) RTCP reporting intervals
  - Non-linear, so sessions with lower reporting intervals take proportionally more reporting intervals to trigger:

<table>
<thead>
<tr>
<th>Td</th>
<th>CB_INTERVAL</th>
<th>time to trigger</th>
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</thead>
<tbody>
<tr>
<td>0.016</td>
<td>30</td>
<td>0.48</td>
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<tr>
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<td>4.00</td>
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<tr>
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<td>8.00</td>
</tr>
<tr>
<td>5.000</td>
<td>3</td>
<td>15.00</td>
</tr>
<tr>
<td>10.000</td>
<td>3</td>
<td>30.00</td>
</tr>
</tbody>
</table>
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