Multimedia Congestion Control: Circuit Breakers for RTP Sessions

draft-ietf-avtcore-rtp-circuit-breakers-07

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Changes in -06

- Editorial fixes to address review comments from Magnus Westerlund
  - http://www.ietf.org/mail-archive/web/avt/current/msg16214.html
- No changes to the mechanisms

Changes in -07

- When to trigger circuit breaker
- Congestion response in low rate sessions
- Impact of layered coding
- Security considerations: RTCP interval
- Assorted editorial fixes

When to trigger the circuit breaker

- Updates and clarifications to circuit breaker rules:
  - Media timeout circuit breaker: require three consecutive reports to trigger
    - Previous version was inconsistent, sometimes saying two reports, sometimes three
  - RTCP timeout circuit breaker: when SR/RR packets are sent round-robin, SHOULD treat receipt of any SR/RR on 5-tuple as indication path is okay
    - MAY → SHOULD
    - In large RTP sessions, receivers may need to send SR/RR packets in round-robin manner, since compound packets otherwise too large to fit into MTU
  - Congestion circuit breaker: wait 3 consecutive intervals before triggering
    - Was previously two intervals, changed to match other circuit breaker conditions
  - Media quality circuit breaker: clarify that receivers can monitor quality and terminate session if unusable

- Improve consistency, but make circuit breaker less likely to trigger

Congestion response in low rate sessions

- Update congestion circuit breaker for low rate RTP sessions:

  - Congestion circuit breaker relies on fraction of packets lost

  - Sampling error rises when number of packets sent during a reporting interval is small

    - Sent 200 packets, 100 were lost → 50% packet loss rate

    - Sent 2 packets, 1 was lost → do you still believe 50% packet loss rate?

  - When sending at less than 1 packet per RTT, a sender MAY ignore a single instance of the congestion circuit breaker, but SHOULD cease transmission if it triggers again immediately

    - i.e., if sending at low rate, cease transmission after six consecutive RTCP intervals where actual sending rate <10x the estimated sending rate, rather than the usual three intervals

    - 1 packet per RTT is the "safe" rate suggested in RFC 5405

- Less likely to trigger circuit breaker by accident for low-rate sessions

Impact of layered coding

- Added section on interactions with layered coding:

  - RTP circuit breaker works on a per-RTP session basis; if layers are split across RTP sessions, each layer is treated independently

  - Within an RTP session, if sending all layers using a single SSRC, MUST apply circuit breaker to that SSRC as usual

    - Response to circuit breaker trigger could be to drop layers to reduce bandwidth by 10x, rather than ceasing transmission

  - Within an RTP session, if layers sent using several SSRCs, MAY treat layers together, so circuit breaker trigger for any layer causes the entire layered flow to either cease transmission or reduce sending rate by 10x

    - i.e., if circuit breaker triggers for SSRC sending the base layer, can leave that SSRC sending and cease transmission of some higher layers to reduce overall rate

- Is this mechanism reasonable?

Security considerations: RTCP interval

- If RTCP reporting interval is configured to a large value, effectiveness of circuit breaker decreases; potential attack if signalling compromised

- Recommendation:
  - Implementations SHOULD impose upper limit on RTCP reporting interval they're willing to negotiate
  - Around 10 seconds suggested as bound on longest reporting interval; exact value not critical

Open issue: scaling triggering interval

- Circuit breaker triggers after fixed number of RTCP reporting intervals – should it trigger after fixed time instead?

  - i.e., scale number of reporting intervals for which circuit breaker condition must hold inversely with duration of reporting interval, to take a fixed time to trigger

  - Current algorithm triggers more quickly for higher rate flows – this might be desirable, or we might want all flows to take same amount of time to trigger