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RTP Congestion Control: Circuit Breakers for Unicast Sessions

draft-ietf-avtcore-rtp-circuit-breakers-01

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Status

- Adopted as working-group draft at IETF 84
  - Submitted draft-ietf-avtcore-rtp-circuit-breakers-00 to update status
  - No technical changes in this version
- Submitted -01 draft with the following changes:
  - Add RTCP timeout circuit breaker
  - Clarify what it means to cease transmission
  - Clarify behaviour with RTP/AVPF early feedback
  - Clarify behaviour with RTCP XR
  - Clarify behaviour with ECN
  - Expand security considerations

RTCP Timeout Circuit Breaker

- If RTP data packets are being sent, but no RTCP packets are returned, an RTCP timeout occurred
  - Either the receiver has failed, or there is a problem with the return path
  - Timeout after two RTCP reporting intervals, and cease transmission

- Open issue:
  - Clarify that RTCP timeout doesn’t occur if RTP data packets have been received, to handle devices that don’t support RTCP

The Meaning of “Cease Transmission”

- Clarify the meaning of cease transmission:
  - “What it means to cease transmission depends on the application, but the intention is that the application will stop sending RTP data packets until the user makes an explicit attempt to restart the call (RTP flows halted by the circuit breaker SHOULD NOT be restarted automatically unless the sender has received information that the congestion has dissipated).”

- Open issues:
  - Is this clear that explicit user action is required to restart most RTP flows?
  - Do we need additional guidance on when it’s appropriate to automatically restart a flow?
  - Do we need to specify the initial sending rate after a restart?

Behaviour with RTP/AVPF Early Feedback

- RTP/AVPF allows RTCP reports to be sent early in some cases, to report on unusual events
  - Currently used for codec control, etc., and is likely to be used by RTP congestion control protocols to report the onset of congestion
- Response to early RTCP reports:
  - If reduced-size RTCP is not used, early reports contain SR or RR packets; RTP circuit breaker responds to these in the usual manner
  - If reduced-size RTCP used, ignore reports that don't contain an SR or RR
    - Open issue: clarify that such reports prevent the RTCP Timeout circuit breaker from triggering
  - Rationale: allows use of low-overhead early RTP/AVPF feedback without triggering the circuit breaker, and so is suitable for RTP congestion control algorithms that need to quickly report loss events between regular reports, but still triggers circuit breaker for regular feedback

Behaviour with RTCP XR

- For consistency and ease of implementation, the RTP circuit breaker ignores RTCP XR reports – they might be useful for RTP congestion control protocols, however

Behaviour with ECN

- If RFC 6670 ECN support has been negotiated for the session, and successfully initiated on the path, treat ECN-CE marks as lost when calculating the congestion circuit breaker
- Ignore ECN-CE marks for the media timeout or RTCP time circuit breakers

Security Considerations

- Noted: if non-authenticated RTCP reports are used, an attacker can generate fake reports showing high loss rate and trigger the circuit breaker
  - Trivial for an on-path attacker; harder for off-path attackers since need to guess the SSRC and sequence number offset, but still possible
  - Use of authentication (e.g., via SRTP) resolves this

Next Steps

- Address open issues and continue editorial fixes
- Simulations to determine the performance of the RTP circuit breaker are starting
  - Based around both packet traces from real-world applications, and simulated packet loss models; hope to have results at next meeting
- Believe algorithms are now stable: implementation experience would be desirable