IAB/IRTF Workshop on Congestion Control for Interactive Real-Time Communication
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June 24, 2012

Congestion Control Considerations for Data Channels

Abstract

This document describes requirements and implementation constraints for the congestion control algorithm controlling the data channels.

1. Introduction

An RTCWeb connection contains in addition to the media streams a number of data channels, which can dynamically be opened and closed during the lifetime of the RTCWeb connection, as specified in [W3C.WD-webrtc-20120209].

As described in [I-D.ietf-rtcweb-data-channel], each data channel consists of two SCTP streams, one stream for each direction and all SCTP streams belong to a single SCTP association. SCTP is encapsulated in DTLS (see [I-D.tuexen-tsvwg-sctp-dtls-encaps]), and the DTLS packets are encapsulated in UDP.

[RFC3758] is used to provide a partial reliable service as described in [W3C.WD-webrtc-20120209] and [RFC6525] is used to close channels during the lifetime of the RTCWeb connection.

SCTP, as specified in [RFC4960], provides a TCP friendly congestion control, which is very similar to TCP's loss based congestion control.

2. Requirements

The RTCWeb connection can be competing with other traffic flows on a bottleneck link. Since all data channels of a RTCWeb connection share a single SCTP association, the data channels are TCP friendly. However, other competing traffic flows might affect the RTCWeb flow (for example by adding substantial delays) and there is no easy way to mitigate this.

On the other hand, if media streams and data channels are used in parallel within an RTCWeb connection, the data channels should not have a substantial negative impact on the media streams. The currently defined congestion control for SCTP adds the same buffering

delay as competing TCP flows would do. To avoid this, an appropriate congestion control has to be used.

Using explicit congestion signals like ECN are not usable as described in Section 3. Therefore delay based congestion controls should be considered. It is not sufficient to just use [I-D.ietf-ledbat-congestion], because

- the added delay would be too large, and
- the data channels are not aggressive enough if there are other competing TCP flows.

Thus modifications of this and other delay based congestion controls focusing on coexistence with loss based flows should be considered.

For implementing a delay-based congestion control, it might be necessary to add some timestamp functionality to SCTP. This would require the definition of a new chunk type.

If more than one congestion control for SCTP is needed, there must be a way to negotiate the one to be used. This negotiation can either be integrated into the SCTP handshake or be done externally via SDP, for example.

3. Implementation Constraints

Accessing the ECN bits of received UDP packets from user programs is not supported by all currently widely deployed operating systems (assuming the usage of IPv4). Therefore the congestion control used for data channels should not rely on ECN.

4. Conclusion

The usage of data channels in an RTCWeb connection should not have a substantially negative impact to the media streams of the connection. Therefore the following SCTP extensions are required for a seamless integration of media streams and data channels:

- An appropriate delay sensitive congestion control needs to be defined for SCTP. This might require the addition of a new SCTP chunk type for time stamps.
- The usage of the appropriate congestion control needs to be negotiated (either in-band during the SCTP handshake or out-band using SDP).

5. References

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[I-D.ietf-rtcweb-data-channel] Jesup, R., Loreto, S., and M. Tuexen, "RTCWeb Datagram Connection", draft-ietf-rtcweb-data-channel-00 (work in progress), March 2012.

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