Network Working Group   M. Tuexen
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Expires: August 20, 2013   R. Stewart
                                                          Adara Networks
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SACK-IMMEDIATELY Extension for the Stream Control Transmission Protocol

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Abstract

This document defines a method for the sender of a DATA chunk to indicate that the corresponding SACK chunk should be sent back immediately and not be delayed.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

According to [RFC4960] the receiver of a DATA chunk should use delayed SACKs. This delaying is completely controlled by the receiver of the DATA chunk.

In specific situations the delaying of SACKs results in reduced performance of the protocol. If such a situation can be detected by the receiver, the corresponding SACK can be sent immediately. For example, [RFC4960] recommends the immediate sending if the receiver has detected message loss or message duplication. However, if the situation can only be detected by the sender of the DATA chunk, [RFC4960] provides no method of avoiding the delaying of the SACK. Thus the protocol performance might be reduced.

This document overcomes this limitation and describes a simple extension of the SCTP DATA chunk by defining a new flag, the I-bit. The sender of a DATA chunk indicates by setting this bit that the corresponding SACK chunk should not be delayed.

Upper layers of SCTP using the socket API as defined in [RFC6458] may subscribe to the SCTP_SENDER_DRY_EVENT for getting a notification as soon as no user data is outstanding anymore. To avoid an unnecessary delay while waiting for such an event, the application might set the I-Bit on the last DATA chunk sent before waiting for the event. This enabling is possible using the extension of the socket API described in Section 6.

There are also situations in which the SCTP implementation can set the I-bit without interacting with the upper layer. If the association is in the SHUTDOWN-PENDING state, the I-bit should be set. This reduces the number of simultaneous associations in case of a busy server handling short living associations. Another case is where the sending of a DATA chunk fills the congestion or receiver window. Setting the I-bit in these cases improves the throughput of the transfer. If an SCTP association supports the SCTP Stream Reconfiguration extension defined in [RFC6525], the performance can be improved by setting the I-bit when there are pending reconfiguration requests requiring no outstanding DATA chunks.

2. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. The I-bit in the DATA Chunk Header

The following Figure 1 shows the extended DATA chunk.

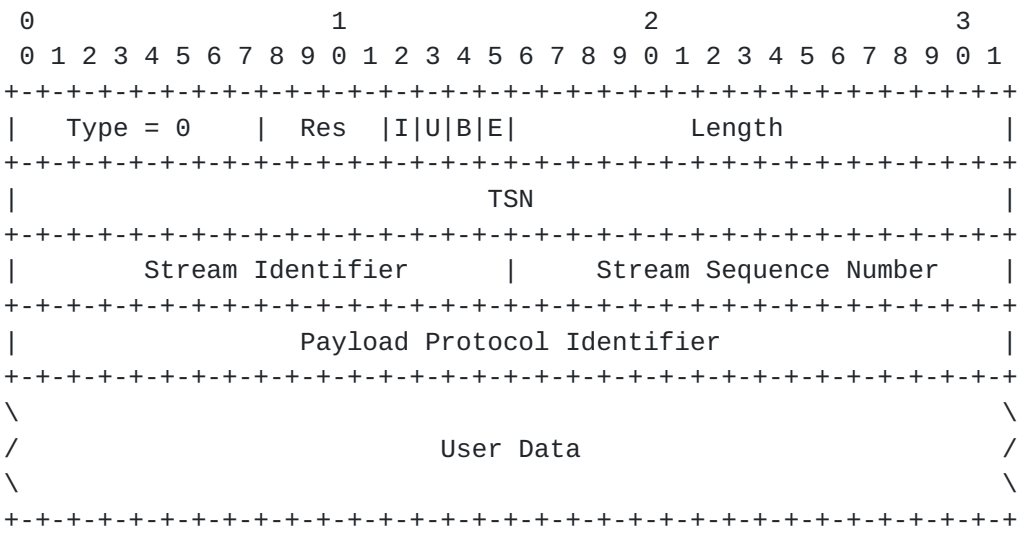

Figure 1: Extended DATA chunk format

The only difference between the DATA chunk in Figure 1 and the DATA chunk defined in [RFC4960] is the addition of the I-bit in the flags field of the chunk header.

4. Procedures

4.1. Sender Side Considerations

Whenever the sender of a DATA chunk can benefit from the corresponding SACK chunk being sent back without delay, the sender MAY set the I-bit in the DATA chunk header. Please note that it is irrelevant to the receiver why the sender has set the I-bit.

Reasons for setting the I-bit include but are not limited to the following:

- The application requests to set the I-bit of the last DATA chunk of a user message when providing the user message to the SCTP implementation (see Section 6).
- The sender is in the SHUTDOWN-PENDING state.
- The sending of a DATA chunk fills the congestion or receiver window.

- The sending of an Outgoing SSN Reset Request Parameter or an SSN/TSN Reset Request Parameter is pending, if the association supports the Stream Reconfiguration extension defined in [RFC6525].

4.2. Receiver Side Considerations

On reception of an SCTP packet containing a DATA chunk with the I-bit set, the receiver SHOULD NOT delay the sending of the corresponding SACK chunk and SHOULD send it back immediately.

5. Interoperability Considerations

According to [RFC4960] the receiver of a DATA chunk with the I-bit set should ignore this bit when it does not support the extension described in this document. Since the sender of the DATA chunk is able to handle this case, there is no requirement for negotiating the support of the feature described in this document.

6. Socket API Considerations

This section describes how the socket API defined in [RFC6458] is extended to provide a way for the application to set the I-bit.

Please note that this section is informational only.

A socket API implementation based on [RFC6458] is extended by supporting a flag called SCTP_SACK_IMMEDIATELY, which can be set in the snd_flags field of the struct sctp_sndinfo structure or the sinfo_flags field of the struct sctp_sndrcvinfo structure, which is deprecated.

If the SCTP_SACK_IMMEDIATELY flag is set when sending a user message, the I-bit of the last DATA chunk of the corresponding user message is set.

7. IANA Considerations

[NOTE to RFC-Editor:

"RFCXXXX" is to be replaced by the RFC number you assign this document.

]

Following the chunk flag registration procedure defined in [RFC6096] IANA should register a new bit, the I-bit, for the DATA chunk. The suggested value is 0x08. The reference for the new chunk flag in the chunk flags table for the DATA chunk available at sctp-parameters [1] should be RFCXXXX.

8. Security Considerations

This document does not add any additional security considerations in addition to the ones given in [RFC4960] and [RFC6458].

9. Acknowledgments

The authors wish to thank Mark Allmann, Brian Bidulock, Janardhan Iyengar, and Kacheong Poon for their invaluable comments.

10. References

10.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4960] Stewart, R., "Stream Control Transmission Protocol", RFC 4960, September 2007.

[RFC6096] Tuexen, M. and R. Stewart, "Stream Control Transmission Protocol (SCTP) Chunk Flags Registration", RFC 6096, January 2011.

[RFC6525] Stewart, R., Tuexen, M., and P. Lei, "Stream Control Transmission Protocol (SCTP) Stream Reconfiguration", RFC 6525, February 2012.

10.2. Informative References

[RFC6458] Stewart, R., Tuexen, M., Poon, K., Lei, P., and V. Yasevich, "Sockets API Extensions for the Stream Control Transmission Protocol (SCTP)", RFC 6458, December 2011.

URIs

[1] <http://www.iana.org/assignments/sctp-parameters>

Authors' Addresses

Michael Tuexen
Muenster University of Applied Sciences
Stegerwaldstr. 39
48565 Steinfurt
DE

Email: tuexen@fh-muenster.de

Irene Ruengeler
Muenster University of Applied Sciences
Stegerwaldstr. 39
48565 Steinfurt
DE

Email: i.ruengeler@fh-muenster.de

Randall R. Stewart
Adara Networks
Chapin, SC 29036
US

Email: randall@lakerest.net