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SACK-IMMEDIATELY Extension for the Stream Control Transmission Protocol
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Abstract

This document updates [RFC 4960](#) by defining 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. It is done by specifying a bit in the DATA chunk header, called the I-bit, which can get set either by the SCTP implementation or by the application using an SCTP stack. Since unknown flags in chunk headers are ignored by SCTP implementations, this extension does not introduce any interoperability problems.

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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 and remains the default behavior.

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 a delay in sending the SACK.

This document 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. Use-cases are described in [Section 4](#).

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.

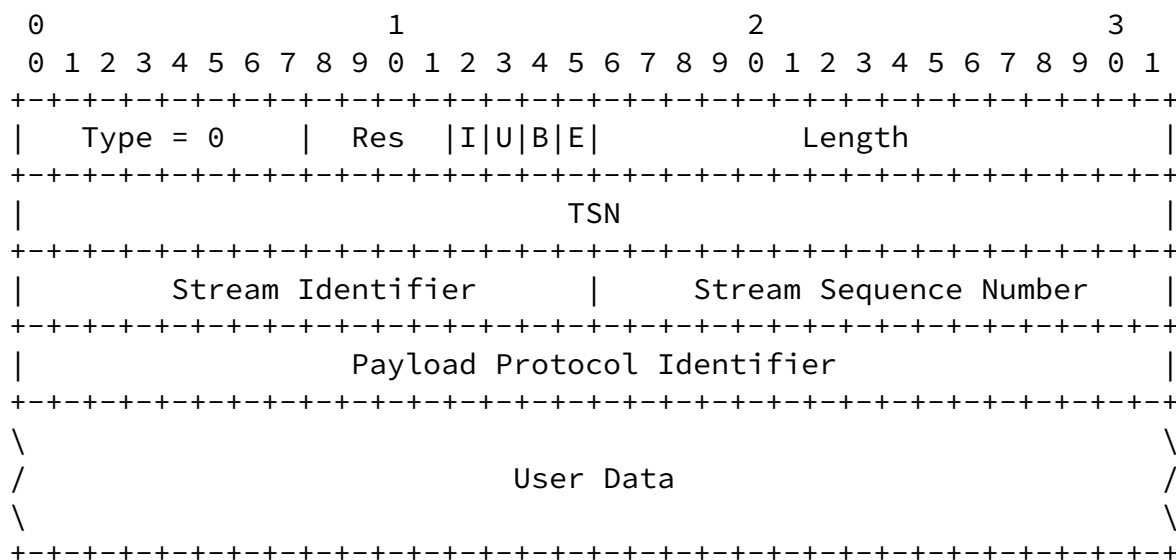


Figure 1: Extended DATA chunk format

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 DATA chunk header.

4. Use Cases

The setting of the I-bit can either be triggered by the application using SCTP or by the SCTP stack itself.

4.1. Triggering at the Application Level

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 7](#).

[4.2](#). Triggering at the SCTP Level

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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.

[5](#). Procedures

[5.1](#). 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 (see [Section 4](#) for the benefits):

- o 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 7](#)).

- o The sender is in the SHUTDOWN-PENDING state.
- o The sending of a DATA chunk fills the congestion or receiver window.
- o 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 [\[RFC6525\]](#).

[5.2](#). 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 send it back immediately.

[6](#). 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.

[7](#). 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 [\[RFC6458\]](#) needs to be extended to allow the application to set the I-bit of the last DATA chunk when sending each user message.

This can be done by setting a flag called Sctp_SACK_IMMEDIATELY in the `snd_flags` field of the struct `sctp_sndinfo` structure when using `sctp_sendv()` or `sendmsg()`. If the deprecated struct `sctp_sndrcvinfo`

structure is used instead when calling `sctp_send()`, `sctp_sendx()`, or `sendmsg()`, the `SCTP_SACK_IMMEDIATELY` flags can be set in the `sinfo_flags` field. When using the deprecated function `sctp_sendmsg()` the `SCTP_SACK_IMMEDIATELY` flag can be in the `flags` parameter.

8. 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 should be RFCXXXX.

9. Security Considerations

This document does not add any additional security considerations in addition to the ones given in [[RFC4960](#)]. It should be noted that a malicious sender can force its peer to send packets containing a SACK chunk for each received packet containing DATA chunks instead of every other. This could impact the network, resulting in more

packets sent on the network, or the peer because the generating and sending of the packets has some processing cost. However, the additional packets can only contain the most simplest SACK chunk (no gap reports, no duplicate TSNs), since in case of packet drop or reordering in the network a SACK chunk would be sent immediately anyway. Therefore this does neither introduce a significant additional processing cost on the receiver side nor does it cause congestion on the network.

10. Acknowledgments

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11. References

11.1. Normative References

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