Additional Policies for the Partial Reliability Extension of the Stream Control Transmission Protocol
draft-ietf-tsvwg-sctp-prpolicies-01.txt

Abstract

This document defines policies for the Partial Reliability Extension of the Stream Control Transmission Protocol (PR-SCTP) allowing to limit the number of retransmissions or to prioritize user messages for more efficient send buffer usage.

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1. Introduction

1.1. Overview

The SCTP Partial Reliability Extension (PR-SCTP) defined in [RFC3758] provides a generic method for senders to abandon user messages. The decision to abandon a user message is sender side only and the exact condition is called a PR-SCTP policy. [RFC3758] also defines one particular PR-SCTP policy, called Timed Reliability. This allows the sender to specify a timeout for a user message after which the SCTP stack abandons the user message.

This document specifies two additional PR-SCTP policies:

Limited Retransmission Policy: Allows to limit the number of retransmissions.

Priority Policy: Allows to discard lower priority messages if space for higher priority messages is needed in the send buffer.

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1.2. Data Types

This document uses data types from Draft 6.6 (March 1997) of POSIX 1003.1g: uintN_t means an unsigned integer of exactly N bits (e.g. uint16_t). This is the same as in [RFC6458]

2. Additional PR-SCTP Policies

2.1. Limited Retransmissions Policy

Using the Limited Retransmission Policy allows the sender of a user message to specify an upper limit for the number of retransmissions for each DATA chunk of the given user messages. The sender must abandon a user message if the number of retransmissions of any of the DATA chunks of the user message would exceed the provided limit. Please note that the number of retransmissions includes the fast and the timer based retransmissions.

Limiting the number of retransmissions to 0 is allowed. This will result in abandoning the message when it would get retransmitted for the first time. The use of this setting provides a service similar to UDP, which also does not send any retransmissions either.

The Limited Retransmissions Policy is used for data channels in the RTCWeb protocol stack.

2.2. Priority Policy

Using the Priority Policy allows the sender of a user message to specify a priority. When storing a user message in the send buffer while there is not enough available space, the SCTP stack may abandon other user messages with a priority lower than the provided one. The algorithm for selecting the message being abandoned is implementation specific.

After lower priority messages have been abandoned high priority messages can be transferred without blocking the send call.

The Priority Policy can be used in the IPFIX protocol stack. See [RFC7011] for more information.

3. Socket API Considerations

This section describes how the socket API defined in [RFC6458] is extended to support the newly defined PR-SCTP policies and to provide some statistical information.

Please note that this section is informational only.
3.1. Support for Added PR-SCTP Policies

As defined in [RFC6458], the PR-SCTP policy is specified and configured by using the following sctp_prinfo structure:

```c
struct sctp_prinfo {
    uint16_t pr_policy;
    uint32_t pr_value;
};
```

When the Limited Retransmission Policy described in Section 2.1 is used, `pr_policy` has the value SCTP_PR_SCTP_RTX and the number of retransmissions is given in `pr_value`.

For using the Priority Policy described in Section 2.2, `pr_policy` has the value SCTP_PR_SCTP_PRIO. The priority is given in `pr_value`. The value of zero is the highest priority and larger numbers in `pr_value` denote lower priorities.

The following table summarizes the possible parameter settings defined in [RFC6458] and this document:

<table>
<thead>
<tr>
<th><code>pr_policy</code></th>
<th><code>pr_value</code></th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCTP_PR_SCTP_NONE</td>
<td>Ignored</td>
<td>[RFC6458]</td>
</tr>
<tr>
<td>SCTP_PR_SCTP_TTL</td>
<td>Lifetime in ms</td>
<td>[RFC6458]</td>
</tr>
<tr>
<td>SCTP_PR_SCTP_RTX</td>
<td>Number of retransmissions</td>
<td>Section 2.1</td>
</tr>
<tr>
<td>SCTP_PR_SCTP_PRIO</td>
<td>Priority</td>
<td>Section 2.2</td>
</tr>
</tbody>
</table>

3.2. Socket Option for Getting the PR-SCTP Status (SCTP_PR_STATUS)

This socket option uses IPPROTO_SCTP as its level and SCTP_PR_STATUS as its name. It can only be used with getsockopt(), but not with setsockopt(). The socket option value uses the following structure:

```c
struct sctp_prstatus {
    sctp_assoc_t sprstat_assoc_id;
    uint64_t sprstat_abandoned_unsent;
    uint64_t sprstat_abandoned_sent;
};
```

`sprstat_assoc_id`: This parameter is ignored for one-to-one style sockets. For one-to-many style sockets this parameter indicates for which association the user wants the information. It is an error to use SCTP_(CURRENT|ALL|FUTURE)_ASSOC in `sprstat_assoc_id`. 
sprstat_abandoned_unsent: The number of user messages which have been abandoned, before any part of the user message could be sent.

sprstat_abandoned_sent: The number of user messages which have been abandoned, after a part of the user message has been sent.

There are separate counters for unsent and sent user messages because the SCTP_SEND_FAILED_EVENT supports a similar differentiation. Please note that an abandoned large user messages requiring an SCTP level fragmentation is reported in the sprstat_abandoned_sent counter as soon as at least one fragment of it has been sent. Therefore each abandoned user messages is either counted in sprstat_abandoned_unsent or sprstat_abandoned_sent.

If more detailed information about abandoned user messages is required, the subscription to the SCTP_SEND_FAILED_EVENT is recommended.

sctp_opt_info() needs to be extended to support SCTP_PR_STATUS.

4. IANA Considerations

This document requires no actions from IANA.

5. Security Considerations

This document does not add any additional security considerations in addition to the ones given in [RFC4960], [RFC3758], and [RFC6458].

6. Acknowledgments

The authors wish to thank Ka-Cheong Poon, Irene Ruengeler, Jamal Hadi Salim, and Vlad Yasevich for their invaluable comments.

7. References

7.1. Normative References


7.2. Informative References


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