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Requirements for RoHC IP/SCTP Robust Header Compression
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Abstract

This document contains requirements for the IP/SCTP header compression scheme (profile) to be developed by the ROHC WG. The structure of this document is inherited from the document defining IP/TCP requirements for ROHC.

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1. Introduction

The goal of the ROHC WG is to develop header compression schemes that perform well over links with high error rates and long link round trip times. The schemes must perform well for cellular links, using technologies such as WCDMA, EDGE, and CDMA-2000. However, the schemes should also be applicable to other future link technologies with high loss and long round trip times.

The main objective for ROHC has been robust compression of IP/UDP/ RTP. Next step was IP/TCP compression.

SCTP is the new reliable transport protocol from the IETF. It offers a number of features not available in other reliable transport protocols such as TCP, including multi-streaming, multi-homing and resistance to flooding and masquerade attacks. SCTP is designed to transport PSTN signaling messages over IP networks but its rich feature set makes it capable of many broader applications. Additionally, SCTP is required for reliable server pooling (transport between name servers and between pool elements and name servers) and recommended for SIP signaling. The selection of SCTP for this purpose will improve the quality of these services.

One of the most important innovations of SCTP is the multi-streaming function. This feature allows data to be partitioned into multiple streams where each stream is delivered independently, so in-sequence delivery can be guaranteed for data sent within a single stream. The advantage of this technique is that when a packet is lost, only certain streams are affected.

From the header compression point of view the multi-streaming function raises a number of new issues to solve. Most importantly a SCTP packet consists of a common header followed by a sequence of chunks. User payload is transported in DATA chunks which contain stream specific information. All other chunks do not contain stream specific information. To obtain maximum compression efficiency it is important to maintain a separate context for the stream-specific fields from each stream, but to use a shared context for all general fields.

The remaining requirements will be similar to IP / TCP compression [5].

2. Header compression requirements

The following requirements have, more or less arbitrarily, been divided into five groups.

The first group deals with requirements concerning the impact of a header compression scheme on the rest of the Internet infrastructure. The second group defines what kind of headers that must be compressed efficiently. The third group defines SCTP specific requirements, while the forth and fifth groups concern performance requirements and capability requirements from the properties of the anticipated link technologies.

2.1 Impact on Internet infrastructure

Transparency:

   When a header is compressed and then decompressed, the resulting header must be semantically identical to the original header. If this cannot be achieved, the packet containing the erroneous header must be discarded.

   Justification: The header compression process must not produce headers that might cause problems for any current or future part of the Internet infrastructure.

   Note: The ROHC WG has not found a case where "semantically identical" is not the same as "bitwise identical".

Ubiquity:

   Must not require modifications to existing IP (v4 or v6) or SCTP implementations.

   Justification: Ease of deployment.

2.2 Supported headers

IPv4 and IPv6:

   Must support both IPv4 and IPv6. This means that all possible changes in the IP header fields must be handled by the compression scheme and commonly changing fields should be compressed efficiently.

   Justification: IPv4 and IPv6 will both be around during the foreseeable future.

Mobile IP:

   The kinds of headers used by Mobile IP{v4,v6} must be supported
   and should be compressed efficiently. For IPv4 these include
   headers of tunneled packets. For IPv6 these include headers
   containing the Routing Header, the Binding Update Destination
   Option, and the Home Address option.

   Justification: It is very likely that Mobile IP will be used by
   cellular devices.

IPSEC:

   The scheme should be able to compress headers containing IPSEC
   sub-headers.

   Justification: IPSEC is expected to be used to provide necessary
   end-to-end security.

   Note: It is of course not possible to compress the encrypted part
   of an ESP header, nor the cryptographic data in an AH header.

[2.3](#) **SCTP specific requirements**

Generality:

   Must support efficient compression of the SCTP information in a
   SCTP packet. This means that the scheme must be able to work with
   the protocol structure of the SCTP protocol (SCTP common header,
   chunk-1 header, chunk-1 body, chunk-2 header, chunk-2 body...) in
   a proper way.

   Justification: There must be a generic scheme which reflects the
   structure of SCTP packets.

Streams:

   Multi-streaming function of SCTP has to be kept in most of the
   cases.

   Justification: The independent transport of multiple streams is a
   big advantage of SCTP. In case of a packet loss at the compressed
   link, two cases have to be differentiated:

   Case 1: The verification of the decompression via CRC compression
      checksum went well. In this case, uncompressed SCTP packets
      will be forwarded and the SCTP endpoints will take care about

multi-streaming functionality.

Case 2: The verification of the decompression via CRC compression
    checksum fails. In this case, the release of the related SCTP
    packet could influence unrelated streams as well. The only way
    to avoid this would be the generation of a new SCTP packet by
    the decompressor (without the data chunks from the involved
    stream) - in violation to the transparency transport
    requirement.

The compression stream must support the multiple streams feature
in a way that head of line blocking is introduced by RoHC only in
very rare cases. Context update should be restricted to a minimum.

Extensions:

SCTP extensions as described in ADDIP [2] and PRSCTP [3] should be
compressed efficiently.

Justification: SCTP extensions will be a normal part of the
protocol. To reach good efficiency for SCTP, these extension have
to be handled in an appropriate way.

Extendibility:

Generic extendibility describes the handling of yet not defined
chunks, the compression scheme must be able to handle this chunks.

Justification: The compression scheme must support full SCTP
functionality.

2.4 Performance issues

Performance/Spectral Efficiency:

Must provide low relative overhead under expected operating
conditions.

Justification: Spectrum efficiency is the primary goal here.

Error propagation:

For SCTP traffic, link layer retransmissions should be applied to
make use of the bandwidth in the most efficient way. Lost or
damaged headers should thus not occur and therefore it is not a
primary goal to have mechanisms for error propagation avoidance in

case of such events.

Justification: To provide robustness against loss or damage
introduced by the link, efficiency must be sacrificed. Since loss
or damage is not expected for SCTP traffic, efficiency should
instead be prioritized. This does not mean that some robustness
should not be provided, if efficiency can still be optimized.

Note: In general, error propagation due to header compression
should be kept at an absolute minimum. Error propagation is
defined as the loss or damage of headers subsequent to headers
lost or damaged by the link, even if those subsequent headers are
not lost or damaged.

Note: There are at least two kinds of error propagation; loss
propagation, where a lost header causes subsequent headers to be
lost or damaged, and damage propagation, where a damaged header
causes subsequent headers to be lost or damaged.

Moderate Packet Reordering:

The scheme should efficiently handle moderate reordering (2-3
packets) in the packet stream reaching the compressor.

Justification: This kind of reordering is common.

Packet Reordering:

The scheme should be able to compress when there are reordered
packets in the packet stream reaching the compressor.

Justification: Reordering happens regularly in the Internet.
However, since the Internet is engineered to run SCTP reasonably
well, excessive reordering will not be common and need not be
handled with optimum efficiency.

Processing delay:

The scheme must not contribute significantly to system delay
budget.

2.5 Capability requirements related to link layer characteristics

Unidirectional links:

Must be possible to implement (possibly with less efficiency)
without explicit feedback messages from decompressor to

compressor.

Justification: There are links that do not provide a feedback
channel or feedback is not desirable for other reasons.

Link delay:

Must operate under all expected link delay conditions.

Header compression coexistence:

The scheme must fit into the ROHC framework together with other
ROHC profiles.

3. IANA Considerations

A protocol which meets these requirements will require the IANA to
assign various numbers. This document by itself, however, does not
require any IANA involvement.

[4](#). Security Considerations

   A protocol specified to meet these requirements must be able to
   compress packets containing IPSEC headers according to the IPSEC
   requirement, 2.2.4. The efficiency of the compression may be
   influenced by encrypted protocol header elements. This document by
   itself, however, does not add any security risks.

References

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