

Lower Layer Guidelines for Robust Header Compression
<[draft-ietf-rohc-lower-layer-guidelines-00.txt](#)>

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Abstract

This document describes lower layer guidelines for robust header compression (HC). The purpose of this document is to support the incorporation of robust header compression algorithms, as specified in the ROHC working group, into different systems such as those specified by 3GPP, 3GPP2, ETSI, etc. This document treats general guidelines as well as guidelines specific for cellular systems.

TABLE OF CONTENTS

1.	Introduction.....	3
2.	Terminology.....	3
3.	Guidelines for robust RTP/UDP/IP header compression.....	3
3.1	General guidelines.....	3
3.1.1	Error detection on (compressed) headers.....	3
3.1.2	Indication of erroneous headers.....	4
3.1.3	Inferred header field information.....	4
3.1.4	Handling of header size variation.....	4
3.1.5	Negotiation of header compression parameters.....	5
3.1.6	Demultiplexing of flows onto logically separated channels.....	5
3.1.7	Packet type identification.....	5
3.2	Cellular system specific guidelines.....	5
3.2.1	Handover procedures.....	6
4.	Guidelines for Robust TCP/IP Header Compression.....	7
5.	Author's addresses.....	7
6.	References.....	7

1. Introduction

Almost all header compression algorithms [RFC1144, [RFC2507](#), [RFC2508](#)] rely on some functionality from underlying link layer. Headers (compressed or not) are expected to be delivered without any residual bit errors, IP length fields are inferred from link layer length fields and packet type identification may be separated from the header compression scheme and instead done at underlying link layer. [[RFC2509](#)], for example, elaborates on how to incorporate IP header compression [[RFC2507](#)] in PPP [[RFC1661](#)].

It is important to be aware of such assumptions on required functionality from underlying layers when incorporating a header compression scheme into a system. The functionality required by a specific header compression scheme from lower layers may also be needed if incorporation of a header compression scheme is to be prepared without knowing the exact details of the final scheme.

This document describes lower layer guidelines for robust header compression as being specified by the ROHC working group. These guidelines should simplify incorporation of the robust header compression algorithms into cellular system like those standardized by 3GPP, 3GPP2, ETSI, etc, and also into specific link layer protocols such as PPP. The document should also enable preparation of this incorporation without requiring detailed knowledge about the final header compression scheme. Relevant standardization groups standardizing link layers should, aided by this document, include required functionality in "their" link layers to support robust header compression.

2. Terminology

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 [RFC 2119](#).

3. Guidelines for robust RTP/UDP/IP header compression

This chapter treats guidelines for robust RTP/UDP/IP header compression.

3.1 General guidelines

3.1.1 Error detection on (compressed) headers

All current header compression schemes [RFC1144, [RFC2507](#), [RFC2508](#)] rely on lower layers to detect errors in (compressed) headers. The link layer underlying header compression MUST provide error detection to the de-compressor if the compressed header do not have an internal

error detection. Headers passed up to the header decompressor should have a residual bit error rate (undetected bit error rate) very close

to zero. (Further work is needed to find a numerical value or interval on the required residual bit error rate.)

3.1.2 Indication of erroneous headers

It is RECOMMENDED that erroneous headers are passed up to the decompressor, but in that case an indication that the header has errors MUST be included to the decompressor together with erroneous headers.

3.1.3 Inferred header field information

Some fields of the RTP/UDP/IP headers may be classified as inferred, that is their values are to be inferred from other values or from an underlying link layer. An underlying link layer MUST therefore provide the header decompressor with the following information:

Packet Length (IPv4)

Information about the received packet (with the compressed header) length MUST be provided by the link layer.

Payload Length (IPv6)

Information about the received packet (with the compressed header) length MUST be provided by the link layer.

Length (UDP)

This field is redundant with the Packet Length (IPv4) or the Payload Length (IPv6) field. Hence, the value of this field MUST in some way be provided to the decompressor.

In summary, all of the fields above relate to the length of the packet the compressed header is included in. All three fields may thus be inferred by the decompressor if one packet length value is signaled from the link layer to the decompressor on a per packet basis. This packet length value should be the length of the received packet including the (compressed) header.

3.1.4 Handling of header size variations

It is desirable for many cellular link layer technologies that bit rate variations are minimized. However, there will always be some variation in compressed header sizes since there is a trade-off between header size variations and compression efficiency, and also due to events in the header flow and on the channel. The link layer MUST in some manner support varying header sizes from 40 bytes (full RTP/UDP/IPv4 header) or 60 bytes (full RTP/UDP/IPv6) down to 1 byte

for the minimal compressed header. It is likely that the small compressed headers are dominating the flow of headers, and that the

largest headers are sent rarely, e.g. only a few times in the initialization phase of the header compression scheme.

(Further work is needed to gain more accurate numbers on header size distributions; the number of different header sizes and the distribution among these sizes in typical cases.)

3.1.5 Negotiation of header compression parameters

The ROHC header compression scheme will have some parameters that needs to be set at an initial setup phase. For instance, the header compression profile to use may have to be determined [[ROCCO](#)]. Compressor and decompressor capabilities may also be negotiated. Hence, the link layer supporting robust header compression **MUST** include mechanisms for negotiating header compression parameters such as, header compression profiles, compressor and decompressor capabilities.

It also **RECOMMENDED** that the link layer have mechanisms that support re-negotiations of such parameters.

3.1.6 Demultiplexing of flows onto logically separated channels

In some cellular technologies there are a demultiplexing of flows onto radio bearers suitable to the particular flows, i.e., onto logically separated channels. For instance, real-time flows such as voice and video may be carried on logically separated bearers. It is **RECOMMENDED** that this kind of demultiplexing is done in the link layer technology supporting robust header compression. By doing so, the need for context identification in the header compression scheme is reduced. If there is a one to one mapping between flow and logical channel, there is no need at all for context identification at the header compression level.

3.1.7 Packet type identification

Header compression schemes like [RFC2507, [RFC2508](#)] have relied on the underlying link layer to identify different kinds of headers. This kind of mechanism is not necessary for robust RTP/UDP/IP header compression. The packet type identification will be incorporated in the header compression scheme and there is thus, no need for such a mechanism in the link layer.

3.2 Cellular system specific guidelines

An important group of link layer technologies where robust header compression will be needed are future cellular systems, which may have a very large number of users in some years. The need for header compression is large in these kinds of systems to achieve spectrum

efficiency. Hence, it is important that future cellular systems can efficiently incorporate the robust header compression scheme.

3.2.1 Handover procedures

One cellular specific property that may affect header compression is mobility and thus, handover (i.e., change of serving base station or radio network controller).

The main characteristics of handovers relevant for robust header compression are: the length of the longest packet loss event due to handover (i.e. the number of consecutive packet losses); relocation of header compression context when necessary.

Depending on the location of the header compressor/decompressor in the radio access network and the type of handover, handover may or may not cause disruptions or packet loss events in the (compressed) header flow relevant for the header compression scheme. For instance, if soft handover is used and if the header compressor/decompressor resides above the combining point for soft handover, there will be no extra packet losses visible to the decompressor due to handover. In hard handovers, where packet loss events due to handover is introduced, the length of the longest consecutive packet loss is most relevant and should thus, be minimized.

Handover SHOULD NOT cause significant long events of consecutive packet loss. Significant in this context relates to the kind of loss tolerable for the carried real-time application.

If hard handovers are performed, which may cause significant long events of consecutive packet loss, it is RECOMMENDED that the radio access network notifies the compressor that such a handover is occurring.

The cellular system supporting robust header compression MAY also have internal mechanisms for transferring the header compression context between nodes where contexts may reside, at or before handover.

If the cellular system does not have any internal mechanism for transferring header compression context between nodes, the transfer of context may be done by the header compression scheme. The header compression scheme may perform a new header compression initialization, e.g. by sending "full" headers. This will, however, introduce an increase in the average header size dependent on how often a transfer of context is needed.

In this latter case, the lower layers MUST indicate to the header compressor that a handover has occurred, so that it knows when to perform the initialization.

4. Guidelines for Robust TCP/IP Header Compression

This chapter treats guidelines for robust TCP/IP header compression.

To be written.

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6. References

- [RFC1144] Van Jacobson, "Compressing TCP/IP Headers for Low-Speed Serial Links", [RFC 1144](#), February 1990.
- [RFC2507] Mikael Degermark, Bjorn Nordgren, Stephen Pink, "IP Header Compression", [RFC 2507](#), February 1999.
- [RFC2508] Steven Casner, Van Jacobson, "Compressing IP/UDP/RTP Headers for Low-Speed Serial Links", [RFC 2508](#), February 1999.
- [RFC2509] Mattias Egan, Steven Cassner, "IP Header Compression over PPP", [RFC2509](#), February 1999
- [RFC1661] Simpson, W., Ed., "The Point-To-Point Protocol (PPP)", STD 51, [RFC 1661](#), July 1994.
- [ROCCO] Lars-Erik Jonsson, Mikael Degermark, Hans Hannu, Krister Svanbro, "RObust Checksum-based header COmpression ROCCO", Internet-Draft (work in progress), May 2000. [<draft-ietf-rohc-rtp-rocco-00.txt>](#)

This Internet-Draft expires in November 2000.

