

RObust Header Compression (ROHC):
A Compression Profile for IP
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Abstract

The original RObust Header Compression (ROHC) RFC, [RFC 3095](#), defines a framework for header compression, along with compression protocols (profiles) for IP/UDP/RTP, IP/ESP, IP/UDP, and also a profile for uncompressed packet streams. However, no profile was defined for compression of IP only, which has been identified as a missing piece in [RFC 3095](#). This document defines a ROHC compression profile for IP, similar to the IP/UDP profile defined by [RFC 3095](#), but simplified to exclude UDP, and enhanced to compress IP header chains of arbitrary length.

INTERNET-DRAFT

A ROHC Profile for IP

January 23, 2003

Table of Contents

1.	Introduction.....	2
2.	Terminology.....	3
3.	ROHC IP Compression (Profile 0x0004).....	3
	3.1. Static chain termination and multiple IP headers.....	3
	3.2. Initialization.....	4
	3.3. Packet types.....	5
4.	Security Considerations.....	6
5.	IANA Considerations.....	6
6.	Acknowledgements.....	6
7.	References.....	6
8.	Author's Address.....	7

[1.](#) Introduction

The original RObust Header Compression (ROHC) RFC [[RFC-3095](#)] defines a framework for header compression, along with compression protocols (profiles) for IP/UDP/RTP, IP/ESP, IP/UDP, and also a profile for uncompressed packet streams. The profile for uncompressed data was defined to provide means to encapsulate all traffic over a link within ROHC packets. Through this profile, the lower layers do not have to provide multiplexing for different packet types, but instead ROHC can handle any packet stream, even if compression profiles for all kinds of packet streams have yet not been defined or implemented over the link.

Although the profile without compression is simple and can tunnel arbitrary packets, it has of course a major weakness in that it does not compress the headers at all. When considering that normally all packets are expected to be IP [[RFC-791](#), [RFC-2460](#)] packets, and that the IP header often represent a major part of the total header, a useful alternative to no compression would for most packets be compression of the IP header only. Unfortunately, such a profile was not defined in [[RFC-3095](#)], and this has thus been identified as an important missing piece in the ROHC toolbox.

This document addresses this missing compression support and defines a ROHC compression profile for IP [[RFC-791](#), [RFC-2460](#)] only, similar to the IP/UDP profile defined by [[RFC-3095](#)], but simplified to exclude UDP. Due to the similarities with the IP/UDP profile, the IP

compression profile is described based on the IP/UDP profile, mainly covering differences. The most important differences are a different way of terminating the static header chain, and the capability to compress IP header chains of arbitrary length.

[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](#) [[RFC-2119](#)].

ROHC UDP

"ROHC UDP" in this document refers to the IP/UDP profile (Profile 0x0002) as defined in [[RFC-3095](#)].

[3.](#) ROHC IP Compression (Profile 0x0004)

In general, there are no major difference between the ROHC UDP profile and the IP profile (ROHC IP) defined in this document, since the removal of UDP has no impact on the compression mechanisms. As for ROHC UDP, the compressor generates a 16-bit sequence number which increases by one for each packet compressed in the packet stream, simply called SN below. The most important difference between this profile and ROHC UDP is about static chain termination and handling of multiple IP headers. Unless stated explicitly below, mechanisms and formats are as for ROHC UDP.

[3.1.](#) Static chain termination and multiple IP headers

The most important difference for IP-only compression, compared to IP/UDP compression, is about how to terminate compression, i.e. how to end the static chain in IR headers. For the UDP profile, the chain always ends with a UDP header part, which per definition terminates compression, and the UDP header is also the last header in the uncompressed packet (except for potential application header). For

the case of IP-only compression, there is no single last header that per profile definition terminates the chain. Instead, the static chain is terminated if the "Next Header / Protocol" field of a static IP header part indicates anything but IP (IPinIP or IPv6).

Another difference with IP-only compression is related to the potential compression of multiple IP headers. ROHC UDP can compress at most two IP headers, but additional IP headers would completely disable the use of header compression, since the compressed chain must end with the UDP header part. However, as there is no single packet type that ends the compressed chain with the IP profile, additional IP headers would not have to cause header compression to be disabled. By implicitly terminating the chain after at most 2 IP headers, additional IP headers could just be left uncompressed.

The IP profile defined in this document goes one step further, and supports compression of an arbitrary number of IP headers. The static chain can obviously be of an arbitrary length, and is simply terminated through the presence of a non-IP header (not IPinIP nor IPv6). The dynamic chain is structured analogously. In compressed

packet headers, header information related to the initial two IP headers are carried as in the IP/UDP profile, while a dynamic header chain is added at the end of the compressed header for each and every additional IP header. The data structure used for these header portions in compressed headers is thus exactly the same as the one used in IR and IR-DYN packets.

The following sections describe how the IP profile differs from the IP/UDP profile, providing the details of the general principles described in the previous paragraph.

[3.2.](#) Initialization

The static context for ROHC IP compression can be initialized in either of two ways:

- 1) By using an IR packet as in ROHC UDP, where the profile is 0x0004, and the static chain ends with the static part of an IP header, where the Next Header/Protocol field has any value but IPinIP (4) or IPv6 (41) [[PROTOCOL](#)]. At the compressor, SN is initialized to a random value when the first IR packet is sent.

- 2) By reusing an existing context. This is done with an IR-DYN packet, identifying profile 0x0004, where the dynamic chain corresponds to the prefix of the existing static chain, ending with an IP header where the Next Header/Protocol field has any value but IPinIP (4) or IPv6 (41) [[PROTOCOL](#)]. At the compressor, SN is initialized to a random value when the first IR-DYN packet is sent.

For ROHC IP, the dynamic part of an IR or IR-DYN packet is similar to the one for ROHC UDP, with a two-octet field containing the SN present at the end of the dynamic chain in IR and IR-DYN packets. It should be noted that the static and dynamic chains have an arbitrary length, and the SN is added only once, at the end of the dynamic chain in IR and IR-DYN packets. Note further that additional dynamic chains in compressed packets do not have this sequence number at the end of the chain, as SN is present within compressed base headers.

[3.3](#). Packet types

The only packet format that differs from ROHC UDP is the general format for compressed packets, which has no UDP checksum in the end. Instead, it ends with a list of dynamic header portions, one for each IP header above the initial two (if any, as indicated by the presence of corresponding header portions in the static chain).

The general format for a compressed header is thus as follows:

0 1 2 3 4 5 6 7

The security considerations of [[RFC-3095](#)] apply equally to this document, without exceptions or additions.

5. IANA Considerations

ROHC profile identifier 0x0004 has been reserved by the IANA for the profile defined in this document.

{ NOTE TO IANA - TO BE REMOVED BEFORE PUBLICATION }

A ROHC profile identifier must be reserved by the IANA for the profile defined in this document. Profile number 0x0004 has previously been saved for this purpose, and should thus be used. As for previous ROHC profiles, profile numbers 0xnn04 must also be reserved for future variants of this profile. A suggested registration in the "Robust Header Compression (ROHC) Profile Identifiers" name space would then be:

OLD:	0xnn04	To be Assigned by IANA	
NEW:	0x0004	ROHC IP	[RFCXXXX (this)]
	0xnn04	Reserved	

{ END OF NOTE }

6. Acknowledgements

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7. References

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- [RFC-791] Postel, J., "Internet Protocol", [RFC 791](#), September 1981.
- [RFC-2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), December 1998.
- [PROTOCOL] "Assigned Internet Protocol Numbers", IANA registry at: <http://www.iana.org/assignments/protocol-numbers>

INTERNET-DRAFT

A ROHC Profile for IP

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INTERNET-DRAFT

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