ROHC: compress your VoIP traffic

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Agenda

1. Header compression
2. The ROHC protocol
3. The ROHC library
4. Perspectives
2000-2001: newbie
2003-2005: diploma from ENSEEIHT
2005: daily job on Linux at Viveris Technologies
http://www.viveris.fr/
2013: Open Source workgroup at Viveris
http://opensource.viveris.fr/
Header compression

1. Problem statement
2. Existing protocols

The ROHC protocol

3. The ROHC library

Perspectives
Header compression: why?

Header size

Header size is a concern on network links

- For VoIP traffic, only 20 of 60 bytes for useful data
- Is header compression still useful?
- An old idea... designed for low-speed serial links in 1990
- Today network links are much larger
- Slow links still exist (GSM, UMTS...)
- Larger links are congested
- Data traffic may be expensive on links (satellite)
Header compression: why?

**Header size**

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- An old idea...
  - designed for low-speed serial links in 1990
  - today network links are much larger
- ...but still useful
  - slow links still exists (GSM, UMTS...)
  - larger links are congested
  - data traffic may be expensive on links (satellite)
Protocols defined by the IETF

- RFC 1144, 1990: Compressing TCP/IP Headers for Low-Speed Serial Links
- RFC 2507, 1999: IP Header Compression (IPHC)
- RFC 2508, 1999: Compressing IP/UDP/RTP Headers for Low-Speed Serial Links (CRTP)
- RFC 3095, 2001: ROObust Header Compression (ROHC)
1. Header compression

2. The ROHC protocol
   - definition
   - protocol

3. The ROHC library

4. Perspectives
RObust Header Compression (ROHC)

A network protocol that compresses away protocol headers
What ROHC is?

RObust Header Compression (ROHC)

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Objectives

- efficient & robust on cellular links
- extensible framework IPv4, IPv6, UDP, UDP-Lite, RTP, TCP, ESP, GRE...
What ROHC is?

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Standard
- IETF standard: http://www.ietf.org/
- RFC 3095 and 22 others
- 2 versions: ROHCv1 and ROHCv2

Viveris Technologies
ROHC: compress your VoIP traffic
Main principles: headers only

Only headers are compressed
Main principles: information redundancy

Information redundancy:
- within one single network packet, eg. IP/UDP lengths
- several network packets in one stream, eg. IP addresses

![Diagram showing header compression with examples of header and payload in packets #1 and #2.](image)
Main principles: packet classification

Classify packets into streams:
- IPv4 / IPv6
- IP addresses
- UDP/TCP ports
- RTP SSRC
- ...

Exemples:
- RTP packets of a VoIP call,
- TCP packets of a TCP connection...
Modes of operation

Several way to operate:

- the Unidirectional mode (U-mode),
- the Bidirectional Optimistic mode (O-mode),
- the Bidirectional Reliable mode (R-mode).

![Diagram showing ROHC protocol with Compressor and Decompressor blocks.](image)
Compression states

Stateful protocol:

- IR state: low compression, context establishment
- FO state: medium compression, transmit small irregular changes
- SO state: high compression, transmit only the sequence number
Profiles

Compression profiles:

- Uncompressed
- IP-only
- IP/UDP
- IP/UDP-Lite
- IP/UDP/RTP
- IP/UDP-Lite/RTP
- IP/ESP
- IP/TCP

IPv6 extension headers are handled
1. Header compression

2. The ROHC protocol

3. The ROHC library
   - genesis
   - performances
   - applications

4. Perspectives
Genesis

History:

- 2003: initial version by Lulea University of Technologies
  http://www.ltu.se/
- 2007: internal fork by TAS, CNES, and Viveris Technologies
- 2009: public version of the fork (GPLv2+)
- 2014: LGPLv2+ license
Genesis

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Latest version 1.7.0 released on June 2014:

- ROHCv1 mostly supported
- ROHCv2 not supported yet
- portable
30-minute VoIP call

90000 60-byte IPv4/UDP/RTP packets every 20 ms
Compressing one IP/UDP/RTP packet

```c
struct rohc_comp *compressor;
...
compressor = rohc_comp_new2(ROHC_SMALL_CID, ROHC_SMALL_CID_MAX, gen_random_num, NULL);
rohc_comp_enable_profile(compressor, ROHC_PROFILE_RTP);
...
rohc_compress4(compressor, ip_packet, &rohc_packet);
...
rohc_comp_free(compressor);
```

API documentation, tutorials and examples on http://rohc-lib.org/support/documentation/
Applications using ROHC

- tools in sources:
  - stats
  - perf
  - sniffer
  - fuzzer
- IP/ROHC tunnel (on Launchpad)
- used for internal projects by large companies in telecommunications
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### Perspectives

- **new features:**
  - stable TCP profile,
  - R-mode
  - GRE
  - ROHCv2
- **better CPU performances**
- **wider usage:** SIP phones? IPBX?

### Project resources

- **Website:** http://rohc-lib.org/
- **Mailing-list:** rohc@lists.launchpad.net
- **IRC:** #rohc on freenode