



*Robust Header Compression increases the amount of resources available to their customers by saving bandwidth and increasing QoS experience, resulting in an improved return on investment.*

*acticom is providing a test and reference system, running the ROHC protocol stack for Linux and Solaris operating systems. A protocol stack evaluation version on top of this system can be supplied to interested customers.*

## *acticom\_RoHC 3.0 protocol stack*

**The acticom Robust Header Compression protocol stack is a fully RFC 3095 compliant implementation of the IETF RoHC specification, including preparation and support for Link Layer Assistance (RFC 4362), the transport of RoHC over PPP (RFC 3241), and recent updates as described in RFC 4815.**

Robust Header Compression (RoHC) supports the efficient use of scarce wireless resources for multimedia data with real-time constraints, reducing the overhead of IP based headers in packet communication networks significantly. Furthermore, RoHC improves the delay and error characteristics. Thus, by employing RoHC, network operators will be able to increase the amount of resources available to their customers by saving bandwidth and increasing Quality of Service (QoS) experience, resulting in an improved *return on investment*.

Robust Header Compression has been standardized by the Internet Engineering Task Force in RFC 3095 and is an integral part of the recent 3GPP/3GPP2 specifications, as used for UMTS or CDMA2000, and Long Term Evolution (LTE), as well as of the IEEE 802.16 specifications for WiMAX. Nevertheless, RoHC may be adopted for other wireless communication systems, such as satellite links or Wi-Fi (IEEE 802.11) networks, which suffer from high error probabilities and delays.

### *licensing the acticom\_RoHC protocol stack source code*

The customer license includes the full C source code. acticom offers a flexible royalty based licensing model covering customer products equipped with acticom\_RoHC.

The current release of the acticom\_RoHC protocol stack supports all RoHC profiles defined in RFC 3095, and supports IPv4 and IPv6. As the software is RFC 3095 compliant, all RoHC modes, packet types, and RFC 3095 features are supported.

Beneath standard features, the acticom product offers parameters, i.e. for VoIP optimization, optimized mode transition logic in parallel to the RFC 3095 behavior, and other extensions, such as IP-ID rewriting or tunable traffic characterization.

All relevant utilities and software required for fast system integration are bundled with the protocol stack at no additional cost and license: Test tool, RoHC simulation tool, example application, and software documentation.

acticom mobile networks is the leading provider for RoHC protocol stack software, having supplied RoHC licenses for infrastructure systems, handset vendors, or independent telecommunication systems integrators.

#### **acticom GmbH**

mobile networks  
Am Borsigturm 50  
13507 Berlin, Germany

#### **acticom GmbH**

mobile applications  
Am Borsigturm 42  
13507 Berlin, Germany

Tel.: +49.30.4303-2510  
Fax: +49.30.4303-2510

<http://www.acticom.de>  
[info@acticom.de](mailto:info@acticom.de)



## Robust Header Compression - RFC3095

The efficient transport of multimedia data over wireless packet oriented data networks has gained much interest in the last years. To meet the requirements in terms of delay, jitter, and latency for interactive communication, e.g. VoIP, beneath sampling and packetization delays the transmission must be minimized.

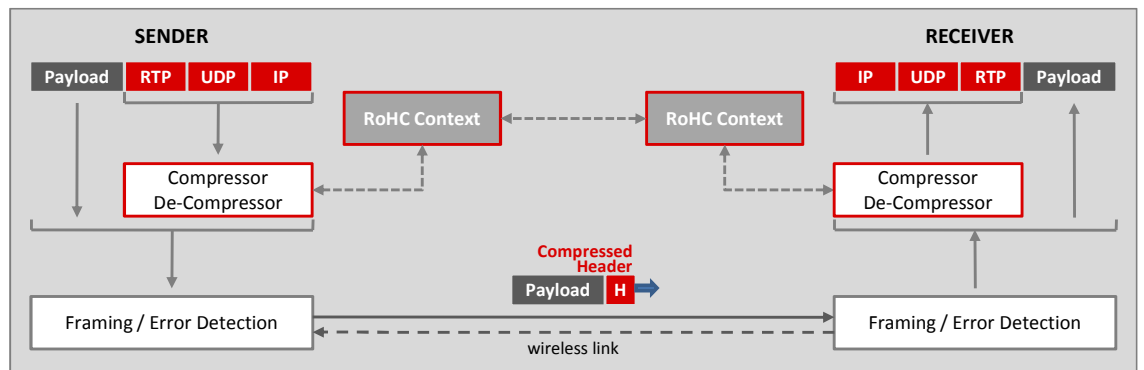
When using the Real-time Transport Protocol (RTP) and IP/UDP/RTP headers for encapsulating voice samples, the ratio between the IP/UDP/RTP header portion and payload size is typically 2:1 (or 3:1 for IPv6). Using RoHC in such scenarios will increase the wireless capacity by the factor of 3 and 5 for IPv4 and IPv6, respectively.

In addition to the bandwidth savings the delay and jitter characteristics are improved and acticom has shown significant perceptual improvements for voice quality in of 3dB for highly error prone links.

Pure IP Header compression is impractical for 3GPP networks, as the existing standard (RFC2507) is inefficient for wireless networks. 3GPP is using the Robust header compression (RoHC, RFC3095) (for IP/UDP/RTP) working group as a means to deliver compression for next release networks.

RoHC will yield benefits in both IPv6 and IPv4, but there are greater benefits with IPv6 due to a fixed-size header and static fields leading to even better compression efficiency gains. Additionally,, there is no fragmentation in the network with IPv6 in the presence of path MTU discovery in IPv6, making every datagram compressible in IPv6.

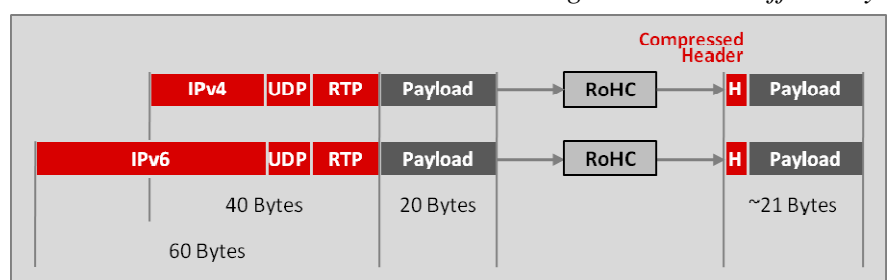
Figure 1: RoHC compression



RoHC uses a connection oriented approach to remove packet inter- and intra-dependencies and reduces header-payload significantly. In a multimedia scenario with real-time voice services and IPv6, the overall bandwidth can be reduced by a factor of four.

The error characteristics on wireless links differ dramatically from wired access. RoHC was designed to operate in error-prone environments by providing error detection and correction mechanisms in combination with robustness for IP-based data streams, resulting in much less error propagation probability than other header compression standards such as RFC 2507.

Figure 2: RoHC efficiency





## RoHC protocol stack source code

acticom offers a full featured RFC 3095 compliant RoHC stack that enables network operators, handset vendors, or chipset manufacturers to efficiently compress data streams with real-time constraints, such as VoIP, on wireless links. Based on ANSI-C the stack is available as full source code distribution to meet the requirements for fast and seamless integration as well as for easy portability to the target platforms.

The software module features a generic and incomplex API for simple usage. Additional features or profiles will just extend the API and will not require developers to re-think integration - therefore granting short development circles. The implementation in pure C with small system dependencies ensures portability and optimized performance even on low-end systems with strict memory and processing requirements. The stack has been successfully deployed on infrastructure systems and handset platforms.

*RoHC will yield benefits in both IPv6 and IPv4, but there are greater benefits with IPv6 due to a fixed-size header and static fields leading to compression efficiency gains.*

*Additionally,, there is no fragmentation in the network with IPv6 through path MTU discovery in IPv6, making every datagram compressible in IPv6.*

### protocol stack key data

- IETF RFC 3095 compliant protocol stack, incl. RFC 4815
- Pure C implementation
- Can be used as library
- Attaches to external timer systems
- Small system dependencies

### platform support

- Runs on ARM, SPARC, and x86 processors
- ported to MIPS and PowerPC platforms
- Runs on Big and Little Endian CPUs

### extensions included

- LLA (RFC 4362) support
- RoHC-over-PPP (RFC3241) support
- Updated RoHC (RFC4815) compliance

### test and simulation: tool access

- acticom *rpr* and *rsim* tools
- source code included
- C (*rpr*) and c++ (*rsim*) implementation
- *videometer* and *netmeter* tools

### RoHC features

- All RFC 3095 profiles:
  - 0: uncompressed profile
  - 1: RTP/UDP/IP compression
  - 2: UDP/IP compression
  - 3: ESP/IP compression
- List compression
- Timer based compression
- Support for IPv4 and IPv6 compression
- Complete packet types and extensions
- All RoHC feedback options
- Complete support for all RoHC states and modes
- Mode transitions and special mode transitions beyond RFC 3095
- Traffic characterization / classification
- RoHC segmentation and reassembly
- IP-ID rewriting, VoIP optimization
- Context repair mechanisms
- Additional parameter set for stack control at runtime.
- RoHC parameters following 3GPP TS 44.065 and TS 25.323
- Threading support (platform dependent)
- RoHC statistics interface
- Log- and trace functionality



*acticom offers adaptation and integration services to match the customer requirements and the target platform and software environment.*

*Licensing the RoHC protocol stack also includes basic integration support. Additional support services beyond integration can easily be added to the RoHC license.*

## *RoHC support services*

The integration of a acticom protocol stack software into mobile or fixed communication systems shall be accompanied by support and development services. acticom mobile networks offers direct support from the protocol stack development team, collaboration with the customer in testing and verification of the ported and integrated protocol stack, as well as support and maintenance after integration. Training and introductory sessions are also available.

### **requirements**

Neither target platform equals the other. The mobile end-system systems and its software environment may have different requirements than infrastructure network systems, e.g. such as memory constraints, timer sub-systems, or API usage.

The customer design and development team discusses and defines all relevant requirements in cooperation with the acticom team for definition of a mutual understanding, specification, and integration roadmap.

### **extensions and modifications**

acticom offers adaptation of existing functionality to match specific customer requirements, i.e. addition of features, optimization of interfaces or API, as well as modification of the RoHC protocol stack software before or during integration. This also includes porting support, verification vs. reference systems, and optimization for the target platform.

Various customers have defined additional requirements beyond pure protocol stack functionality that the acticom development team has specified, implemented, and tested along mutually defined test criteria and plan.

### **support and maintenance**

acticom offers to accompany the customer beyond integration of the protocol stack software. This offer includes continued support for development, fixing of errors, or updates along a mutually designed integration path.

Interoperability is important for the integrator of a protocol stack. acticom offers to create the shortcut between RoHC users - of course even anonymous - for interoperability testing and verification of system behavior or protocol efficiency. The recently deployed acticom RoHC test center and services help to even support remote testing of Robust Header Compression enabled communication systems.

**acticom GmbH**

mobile networks  
Am Borsigturm 50  
13507 Berlin, Germany

**acticom GmbH**

mobile applications  
Am Borsigturm 42  
13507 Berlin, Germany

Tel.: +49.30.4303-2510  
Fax: +49.30.4303-2510

<http://www.acticom.de>  
[info@acticom.de](mailto:info@acticom.de)