# The Effnet ROHC Product Portfolio for WiMAX

The Effnet ROHC product portfolio consists of software products based on various RFCs which define RObust Header Compression (ROHC). ROHC is a header compression algorithm and protocol standardized by IETF. Effnet is active in the standardization and development for ROHC RFCs. This expertise and experience is reflected in a high quality software implementation. The Effnet ROHC product portfolio provides significant improvements in link efficiency for TCP traffic e.g. web, file transfers etc., RTP and UDP traffic e.g. real time, interactive and streaming applications and ESP traffic e.g. secure traffic over high BER, long RTT links.

ROHC is recommended by the WiMAX TWG Base Mobility Profile to maximise throughput efficiency. As per the WiMAX Forum Network Architecture Release 1.5 – Stage 3 for Detailed Protocols and Procedures Base specification, ROHC, in WiMAX TWG Base Mobility profile, is mandatory for MS/SS and BS.

- Effnet ROHC implementation supports both IPv4 and IPv6.
- It has advanced feedback rate control mechanism which helps reduce the compression-related information feedback across the airlink.
- With experience from 3GPP MBMS ROHC specification implementation, it efficiently supports broadcast/multicast traffic.
- All the mandatory and optional features specified in the RFCs and additional efficiency improving features.
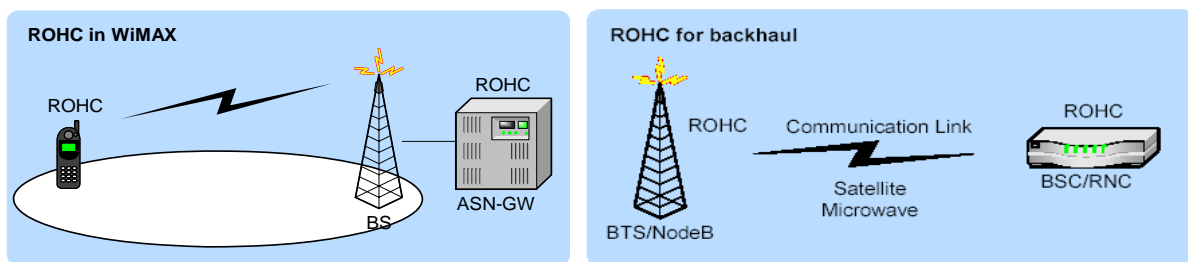
WiMAX Forum Network Architecture Release 1.5 – Stage 3 for Detailed Protocols and Procedures Base specification for ROHC support describes the system architecture and signaling procedure for ROHC. It supports the following ROHC framework and profiles implemented in the form of various Effnet products:

Product	Usage	Profile Identifiers	References
Effnet ROHC^{TM}	No Compression, RTP/UDP/IP, UDP/IP, ESP/IP	0x0000, 0x0001, 0x0002, 0x0003	RFC 3095, RFC 4815
Effnet ROHC-IP^{TM}	IP	0x0004	RFC 3843, RFC 4815
Effnet ROHC-TCP^{TM}	TCP/IP	0x0006	RFC 4996

The Effnet ROHC product portfolio can be optionally complemented with a test environment, *Effnet HC-Sim™,* which can simulate IP traffic on configurable link conditions, e.g. bit errors, packet loss, reordering etc.

Standards Compliance

- IETF standards
    - RFC 3095 "RObust Header Compression (ROHC)"
    - RFC 3843 "RObust Header Compression (ROHC): A Compression Profile for IP"
    - RFC 4815 "RObust Header Compression (ROHC): Corrections and Clarifications to RFC 3095"
    - RFC 4995 "The RObust Header Compression (ROHC) Framework"
    - RFC 4996 "RObust Header Compression (ROHC): A Profile for TCP/IP (ROHC-TCP)"

Standards referral

- IETF standards
    - RFC 3759 "RObust Header Compression (ROHC): Terminology and Channel Mapping Examples"
    - RFC 3816 "Definitions of Managed Objects for RObust Header Compression"
    - RFC 4224 "RObust Header Compression (ROHC): ROHC over Channels that can Reorder Packets"
- Other standards
    - Compliant with 3GPP Multimedia Broadcast Multicast Service (MBMS) requirements

Portability and ease of integration

Effnet's ROHC product portfolio has been ported to and integrated on many different platforms. The operating systems include VxWorks, Nucleus, Linux, Windows (2000/XP), Solaris, FreeBSD and processors include PowerPC, MIPS, ARM, SPARC and x86. The product can be easily ported to many other operating systems, both real-time and generic as well as to other processors, both 32-bit and 64-bit regardless of byte-order.

- Highly portable code
    - is written in ANSI C, alignment safe and endianess independent.
    - has variable types defined such that the variables behave the same way across different compilers.
    - does not require OS timers and does not have OS dependencies.
- A well defined Application Programming Interface (API)
    - provides control of memory management.
    - provides control over multi-threading of the application.
- Small memory footprint and low CPU processing requirement
    - makes it suitable for both mobile terminals as well as large systems like ASN-GW.
- Interoperable
    - Has been extensively tested during field tests by customers, all the ROHC interoperability tests conducted by IETF and internal rigorous quality process.

Additional features
In addition to the features specified in the standards, the Effnet ROHC product portfolio has the following efficiency and robustness improving features:

- Full featured and efficient classification and context management module.
- Highly efficient compression and decompression using field pattern change detection algorithm and link layer information when available.
- Support for handover via context re-initialization.
- Support for AT reboot via feedback options, the decompressor reinstates the compressor context information.

- Mechanisms to reduce usage of feedback channel.
- Support for chained memory buffer.
- Interactive statistics and callback functions.
  - User can read and/or reset statistical information at desired time intervals. The callback functions provide useful state information.
- Dynamic channel parameter configuration.
- Adaptive mechanisms for improved compression efficiency & context damage detection under various channel conditions.
- List Compression and many of the channels and flow specific parameters, are highly configurable.

All additional features above are transparent with regard to interoperability.

Effnet Classifier and context manager

Packet classification and context management is essential to header compression. Effnet provides this additional module together with the Effnet ROHC product family.

Effnet ROHC^{TM}

The VoIP enabler on wireless networks! Effnet ROHC^{TM} is an important component to run VoIP services efficiently over wireless networks. Most of the RTP applications use UDP for signaling purposes and there are many stand-alone UDP applications, so the support for IP/UDP compression adds further to the efficiency. There is significant demand for secure exchange of information which leads to increased header overhead. The capability to compress IP/ESP, the header overhead in secure connections, makes it possible to run secure networks without additional bandwidth.

Effnet ROHC-IP^{TM}

As more and more networks are moving to support IP based communications, the number of nodes that require IP address are increasing rapidly. The introduction of IPv6 should address this concern but at least during transition time, a lot of traffic will be sent via tunnels across networks. Effnet ROHC-IP^{TM} is capable of compressing layers of IP headers thus making it possible to run tunneled traffic without need for additional bandwidth.

Effnet ROHC-TCP^{TM}

Multiple Internet packet size studies are in agreement that at least 40% of all IPv4 packets carry no or only a few bytes of payload i.e. packet sizes are at or very near to header size (IPv4+TCP). One study of IPv6 packets shows the same trend. Even more remarkable in that study is that for IPv6, 60-80% packets carry more header data than packet data. Effnet ROHC-TCP^{TM} would be very beneficial in these cases.

Maintenance and support
The Effnet ROHC product portfolio is offered with a full range of support services, including problem reporting, bug fixes, updates, training, consulting and integration services. A team of engineers experienced in standardization of header compression technology, implementation and testing of product portfolio is available for support and consulting services.

Licensing
For licensing of the Effnet ROHC product portfolio, complete or individual products, please contact us at info@effnet.com.