- Support for Ethernet, GTP-U, IPv4, IPv6, RTP, TCP and UDP headers
- Easily extended with additional header support, e.g. MPLS, L2TP, PPP
- Robustness against packet loss, both in the network and over the compressed link
- Robustness against jitter and packet reordering in the network
- Resilience against jitter and packet reordering over the compressed link
- Feedback fast recovery
- Easy to use API
- CPU and memory efficient implementation suitable for all types of devices
- Highly portable ISO/IEC 9899:1999 (C99) code with no operating system dependencies
- Platform and endianness (byte-order) independent
- Support for compiler link time optimization

Background

The current header compression schemes IPHC (RFC 2507: IP Header Compression), CRTP (RFC 2508: Compressed RTP) and ROHC (RFC 3095 and RFC 5225: Robust Header Compression) compress single headers or one of protocol header chains in IP packets. These schemes are very efficient in compressing these header chains and ROHC is particularly compression efficient as well as robust against bit errors and packet losses.
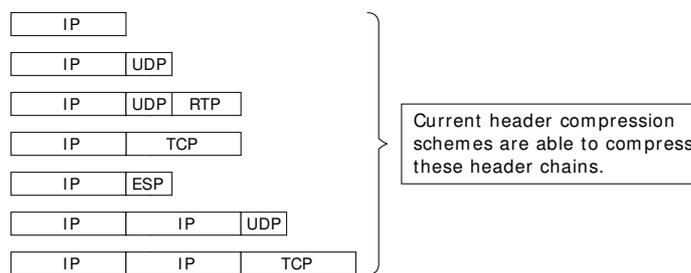

Figure 1: Examples of single layer protocol header chains in an IP packet

There are many situations where multiple IP header chains are present in an IP packet, e.g. in 3GPP LTE backhaul, relay base stations and many such variants on satellite networks or microwave networks. The existing header compression schemes must be applied twice to compress two protocol layers and they are not able to compress headers such as Ethernet, GTP-U, L2TP, PPP etc. Some of these links are high bandwidth high packet rate links and others are typical home broadband connections being used for cellular small cell connectivity.
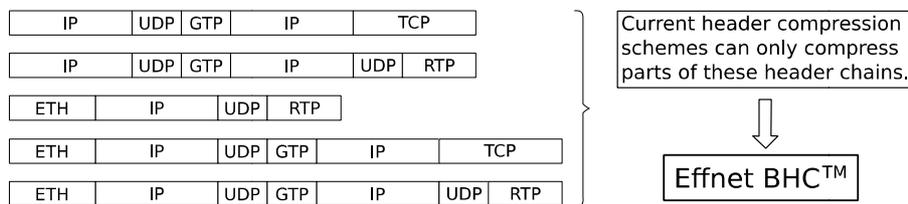

Figure 2: Examples of multiple layer protocol header chains in an IP packet

Solution: Effnet BHC™

Effnet has developed a new header compression scheme, Effnet BHC™, to be able to compress both one layer of IP header chains like all the existing header compression schemes and also compress multiple layers of IP header chains, including headers which are not supported by existing header compression schemes. Our long experience with header compression and ROHC has enabled us to develop Effnet BHC™ with the following three key properties.

Compression and System Efficiency

Effnet BHC™ is 2-3 times more system efficient than ROHC (requires far fewer CPU cycles) and is still capable of delivering a compression efficiency comparable with ROHC. Most importantly, it is a flexible and modular scheme that can be easily extended to add support for many other header types and tuned to achieve a desired balance of compression and system efficiency on the target link based on its bandwidth and packet rate.
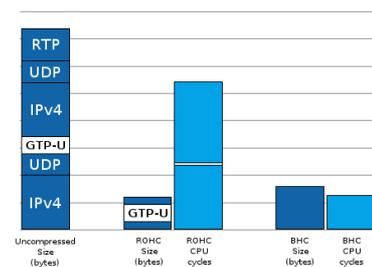

Figure 3: ROHC and Effnet BHC™ comparison

Robustness

Effnet BHC™ is robust against and packet loss. It has advanced header field encoding mechanisms coupled with feedback and error recovery to keep the compressor and decompressor in synchronization. It can efficiently handle reordering of packets on the link.

Effnet BHC™ Applications

Effnet BHC™ on LTE backhaul links

Effnet BHC™ is a good choice for the high bandwidth link between the Small Cell and the Core Network. It could be either a microwave link or a satellite or broadband link. With the low CPU and memory usage of Effnet BHC™ such a solution can support more users or traffic flows than other more complex header compression schemes.
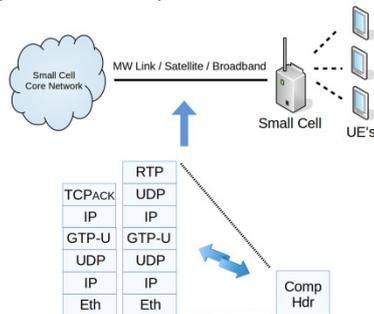

Figure 4: Effnet BHC™ application on a backhaul link

Effnet BHC™ on LTE relay links

The *Un* interface, the interface between relay base stations, carries packets with multiple layers of IP header chains, including the GTP-U header, as shown below. 3GPP recognizes this substantial overhead particularly when the payload is small e.g. VoIP, TCP acknowledgements etc. Many alternatives for header compression schemes have been presented in 3GPP TR 36.806.

Effnet offers a better alternative, Effnet BHC™, which is highly compression efficient and system efficient. It is as robust as ROHC and avoids application of double compression using ROHC which would be prohibitively costly from a system efficiency point of view.
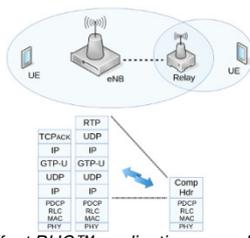

Figure 5: Effnet BHC™ application on an LTE relay link

Effnet BHC™ on satellite links

Satellite links carry all sorts of traffic including packets that carry multiple layers of IP header chains e.g. enterprise traffic that is encrypted and/or tunneled, GSM/CDMA/LTE backhaul etc.

Effnet BHC™ can be configured and/or easily extended to support various types of headers e.g. PPP, L2TP etc.
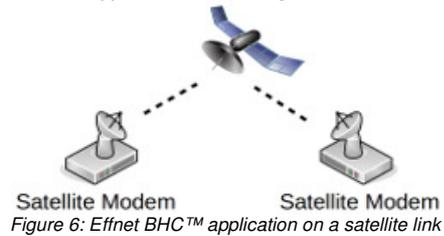

Figure 6: Effnet BHC™ application on a satellite link

Effnet BHC™ on microwave links

Microwave links typically serve specific applications e.g. inter-office (enterprise) or inter-nodal (industrial) connectivity, cellular backhaul etc. Most of the microwave links are high bandwidth, high packet rate links that carry IP traffic point-to-point or point-to-multipoint. In the case of some applications, the IP packets carry significant amount of IP header overhead due to the multiple layers of IP header chains present in a packet. In order to improve efficiency, it is necessary to apply header compression but the challenge is to balance between compression efficiency and system efficiency. The header compression function cannot consume too many CPU cycles per packet thus affecting throughput of the system.

Effnet BHC™ is highly system efficient and requires significantly less CPU cycles per packet compared to other header compression schemes such as ROHC. Still it is highly compression efficient due to its capability to compress multiple layers of IP header chains. It is also robust against packet loss and bit errors.

Figure 7: Effnet BHC™ application on a microwave link

Platforms

Effnet BHC™ has been tested on ARM, PowerPC, MIPS and x86 platforms, and its portable design makes it straightforward to port to other platforms as well.

Support

Effnet products are offered with a full range of support services, including problem reporting, bug fixes, updates, training, consulting and integration services. Sample application code is provided which demonstrates the use of the API and helps to speed-up the integration process.

For more information and references about header compression and Effnet BHC™, see our library of white papers and data sheets at www.effnet.com