

# Robust Header Compression Over Hybrid Satellite-Wimax Networks

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# Introduction

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- ▶ Hybrid Wimax-Satellite network naturally come into place to provide broadband connectivity to sparsely populated areas
- ▶ Long propagation delay is one of the main causes of adverse effects on the performance of network protocols such as TCP
- ▶ Deployment of IP protocols in networks where link delay is high often leads to high header overhead
- ▶ The aim is to provide low cost universal broadband access through Wimax in rural areas



# Research Proposal

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- ▶ Objective

To develop suitable system design and protocols for supporting ROHC over end-to-end hybrid Wimax-Satellite network

- ▶ Methodology

Using a simulated Wimax and satellite link testbed to determine the difference between the proposed approach and existing non-ROHC enabled system



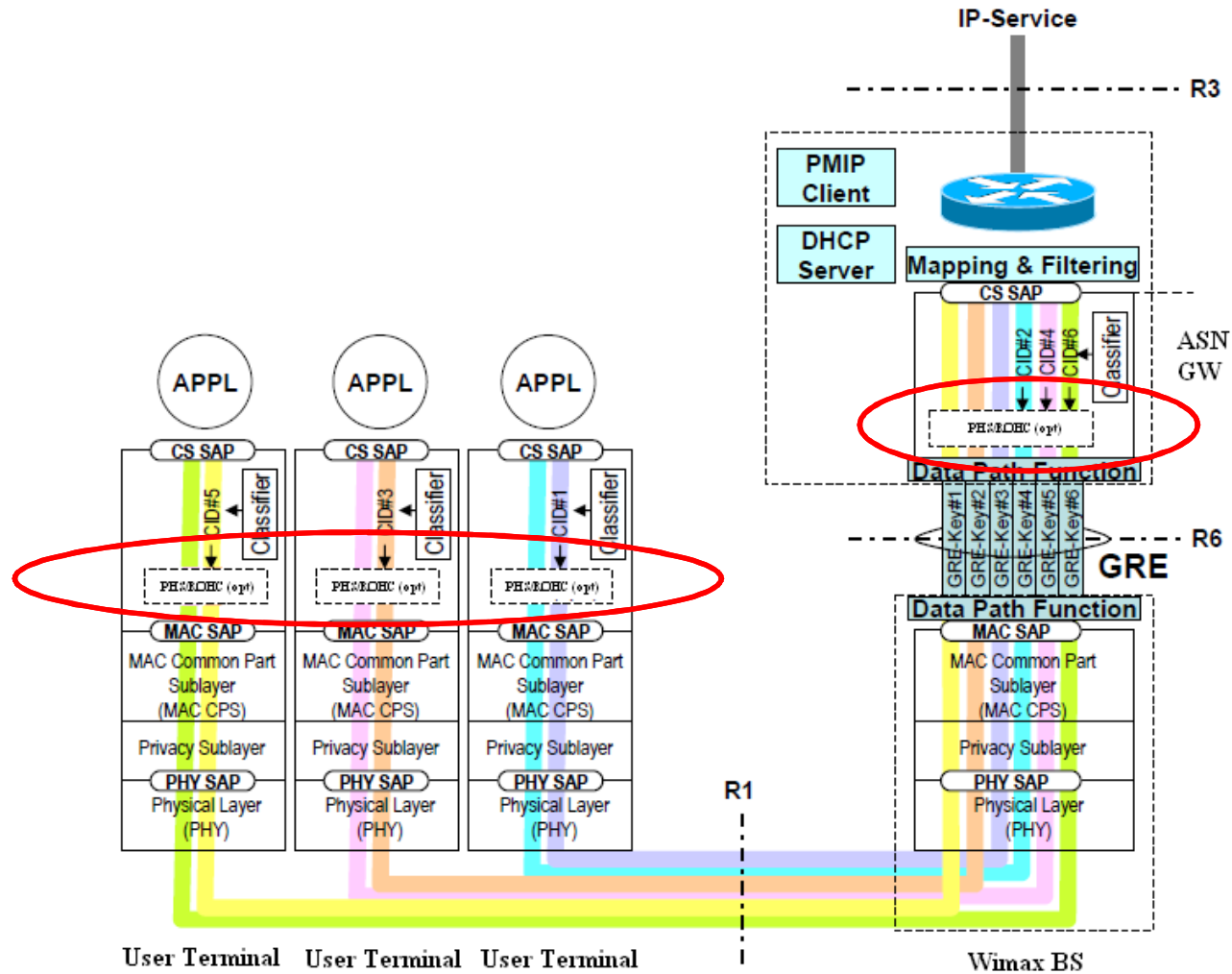
# ROHC in a Nutshell

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- ▶ ROHC is a method to reduce the overhead of the packet header information
- ▶ ROHC uses a connection-oriented approach to remove packet inter and intra-dependencies and thus reduces the header payload significantly
- ▶ The combined headers for a real-time multimedia stream using IPv4 includes the 20-byte IPv4 header, the 8-byte UDP header and the 12-byte RTP header. The headers for IPv6 total 60 bytes
- ▶ Redundancy exists among the different headers (IP, UDP and RTP), but in particular between consecutive packets belonging to the same IP flow. Basic motivation for IP-based header compression is based on the fact that packet header information has significant redundancy.
- ▶ ROHC is located in the standard protocol stack between the IP-based network layer and link layer

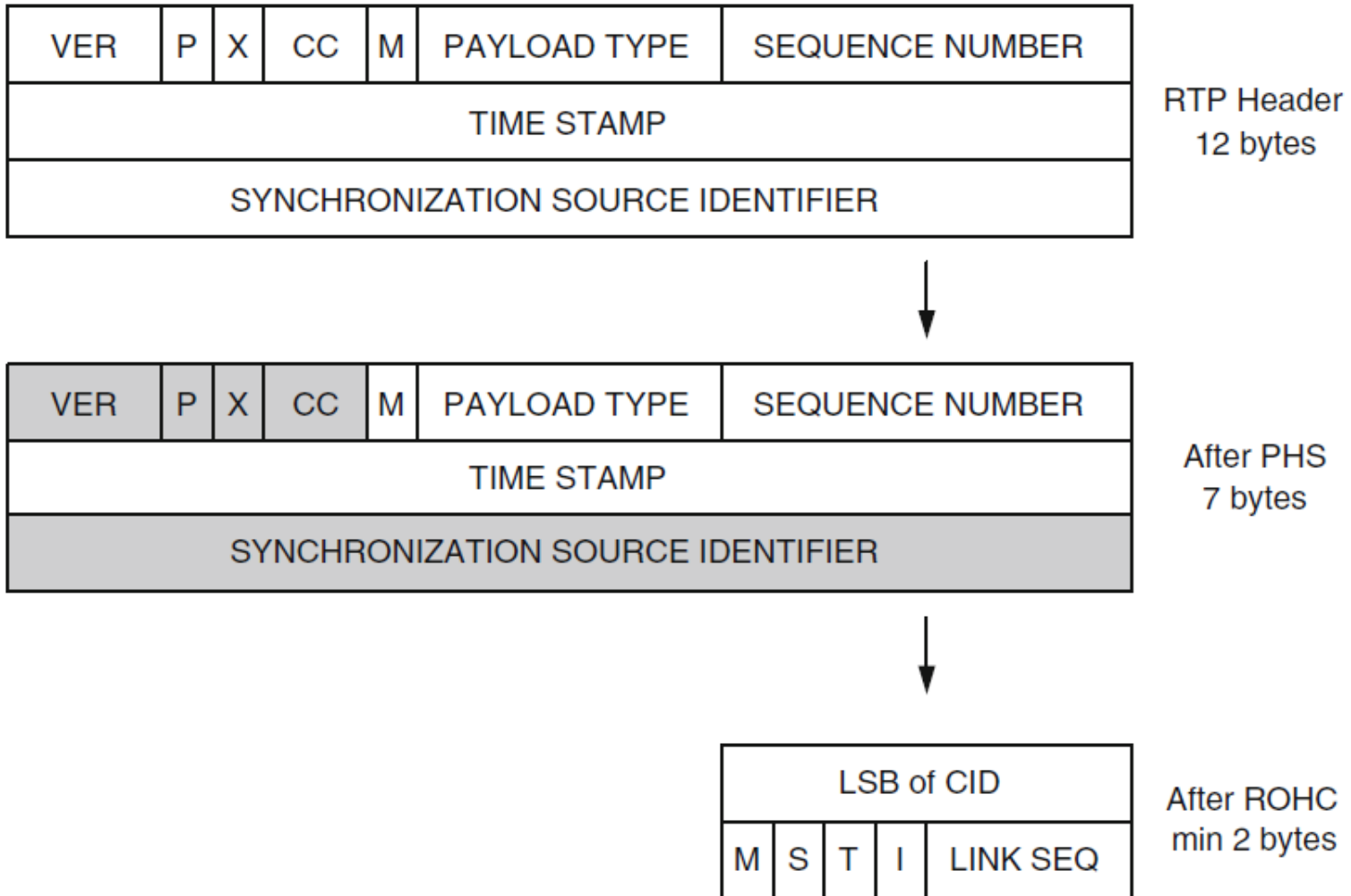


# Existing header suppression implementation in Wimax Network



\*Source: Wimax Forum

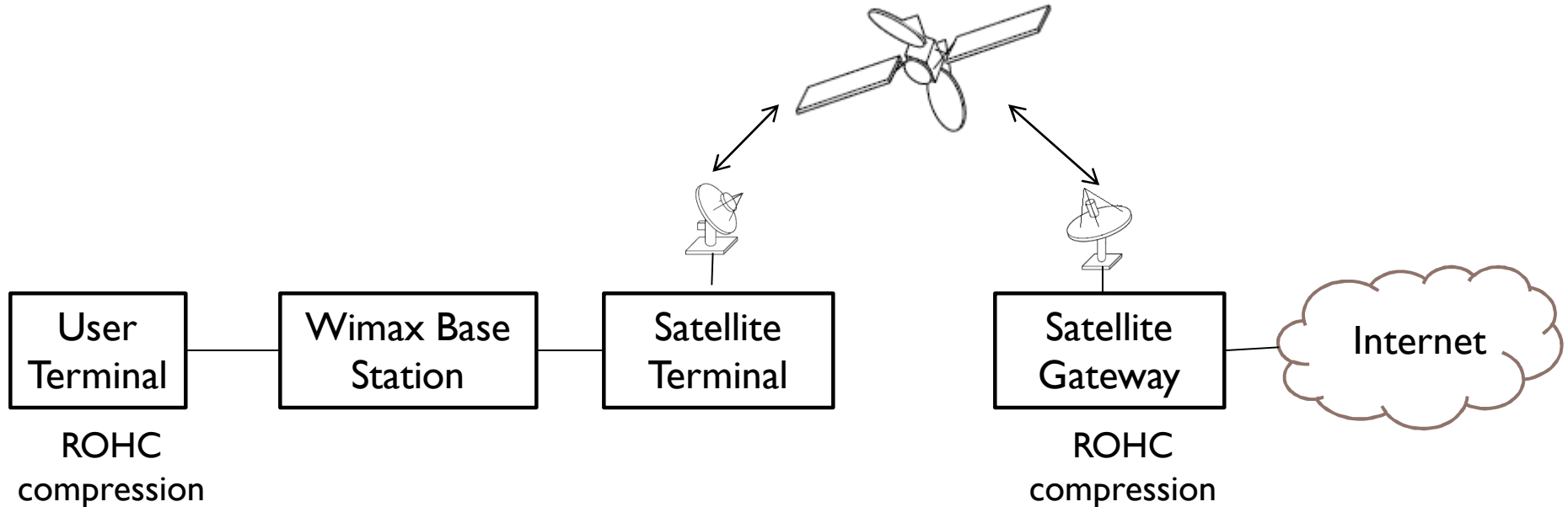
# ROHC vs. PHS



# ROHC implementation in Hybrid Wimax-Satellite Network Architecture

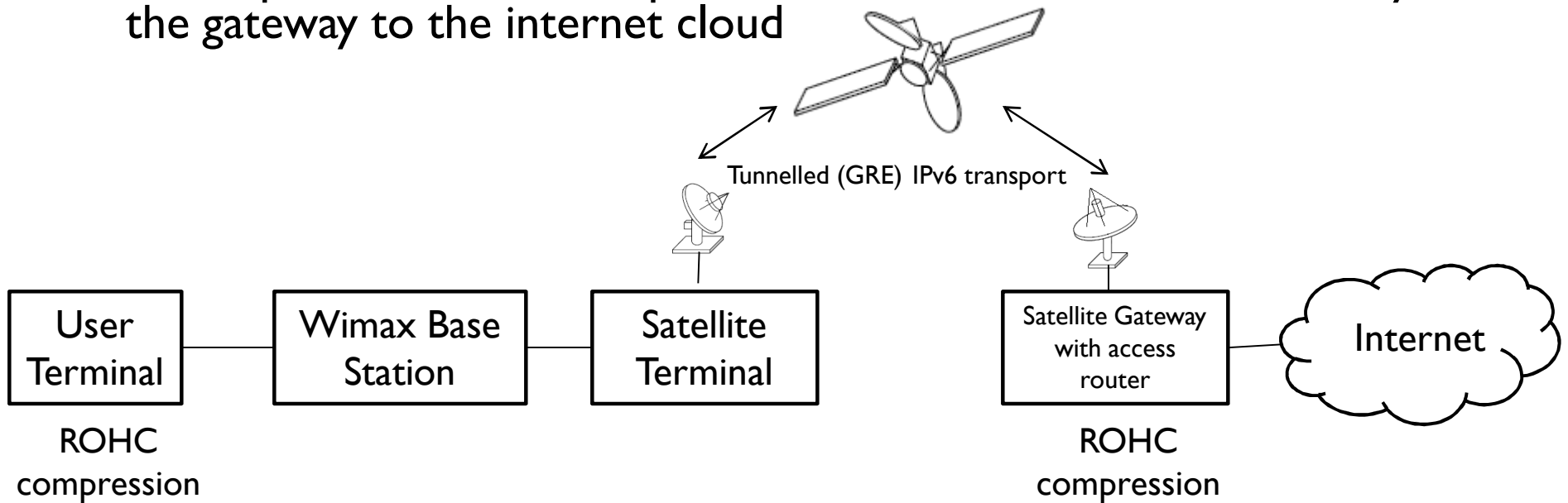
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- ▶ Compression/decompression of the IP headers takes place at the user terminal and gateway



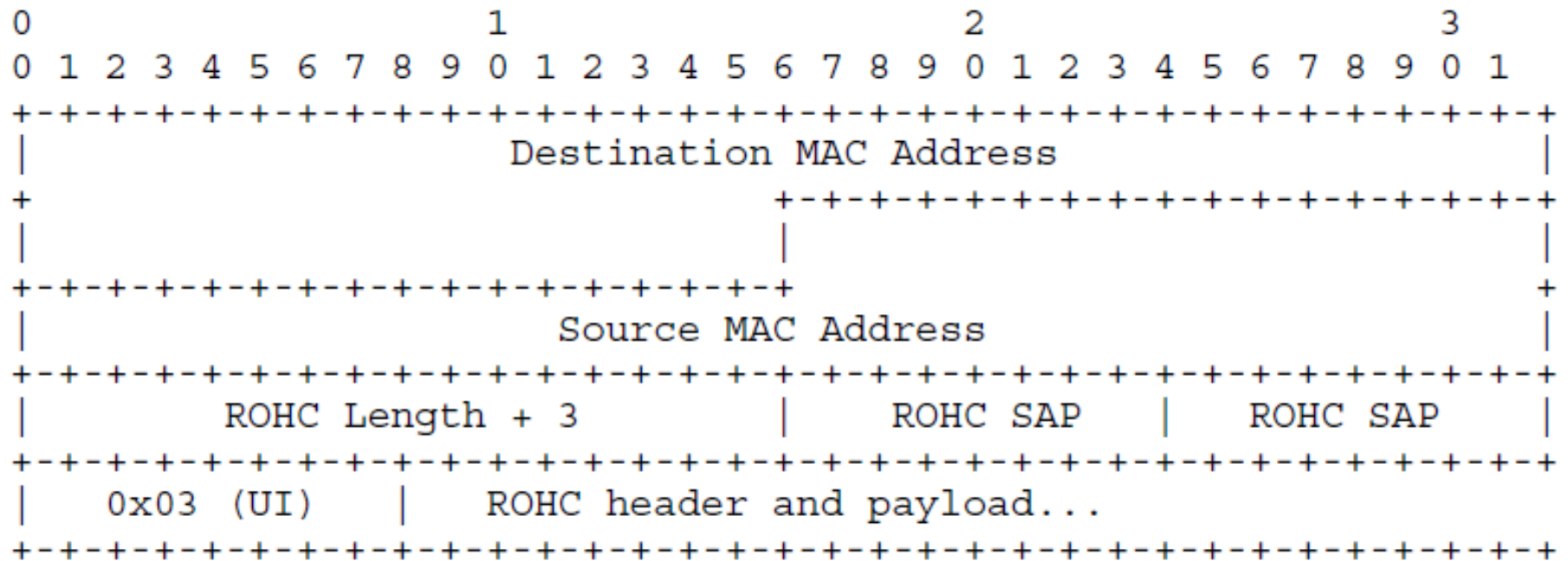
# Case 1: WiMAX with access router located at satellite gateway (separated from BS)

- ▶ The user terminal will perform the ROHC compression of IP/UDP/RTP streams and packets will be sent to the gateway via satellite terminal
- ▶ The satellite terminal will act as an Ethernet bridge for the base station.
- ▶ At the gateway the packet is unpacked and each ROHC packet is decompressed. The uncompressed packets are then forwarded by the gateway to the internet cloud



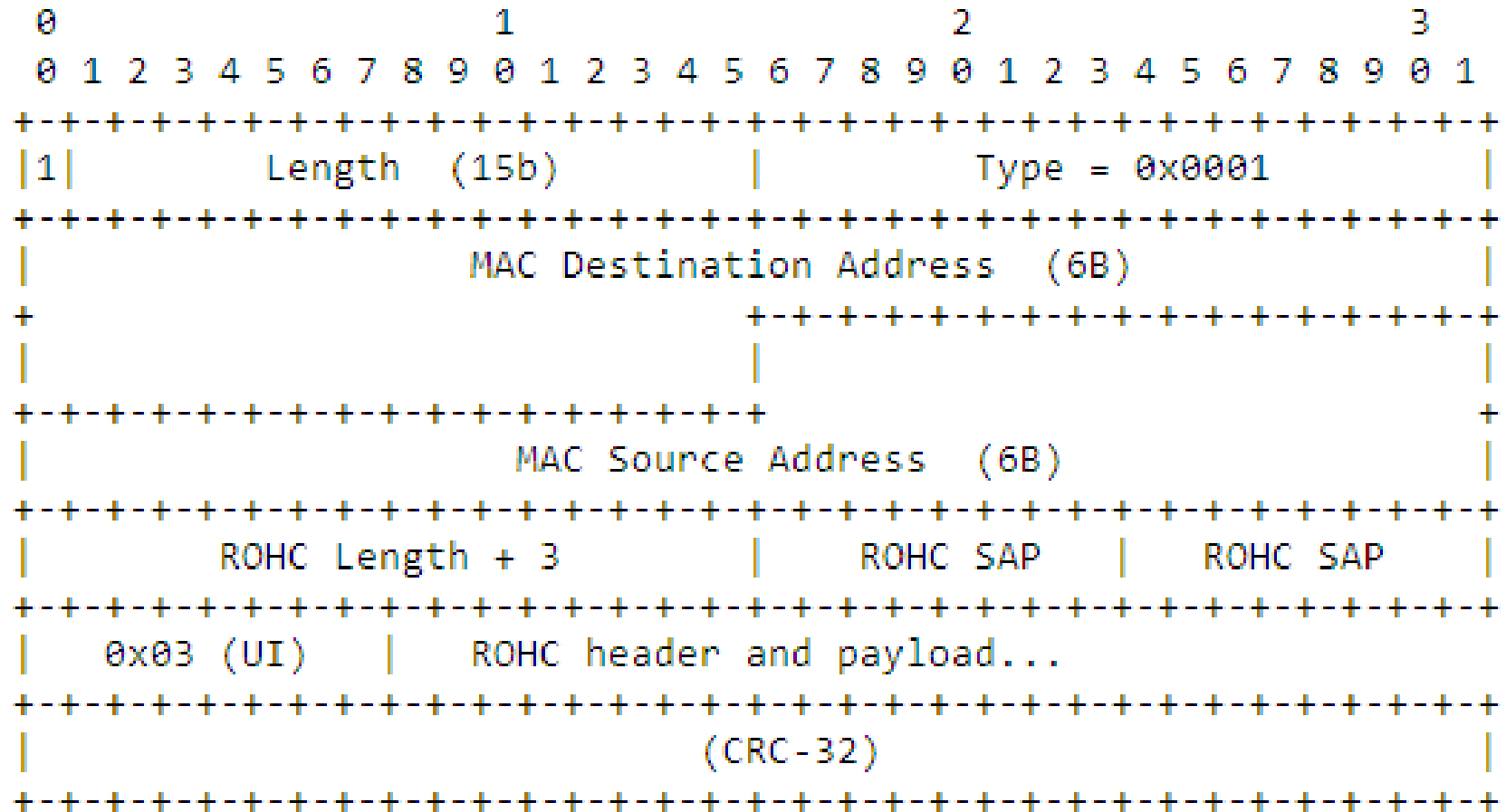
# LLC encapsulation of ROHC packets over hybrid network

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# SNDU Format for a Bridged Payload

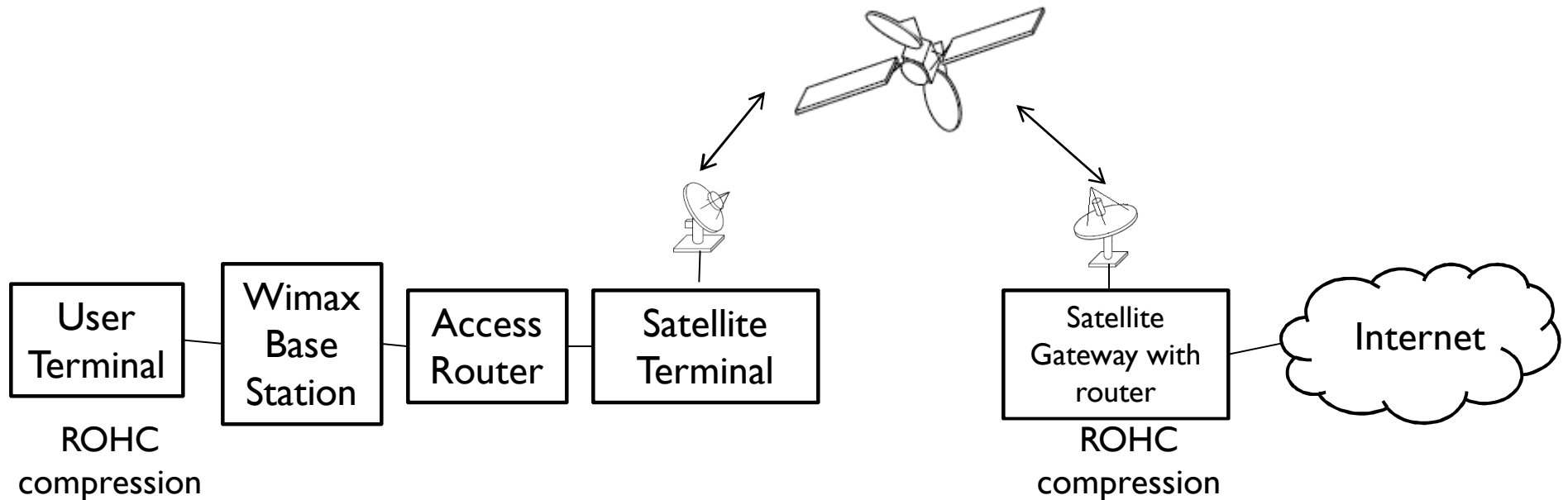
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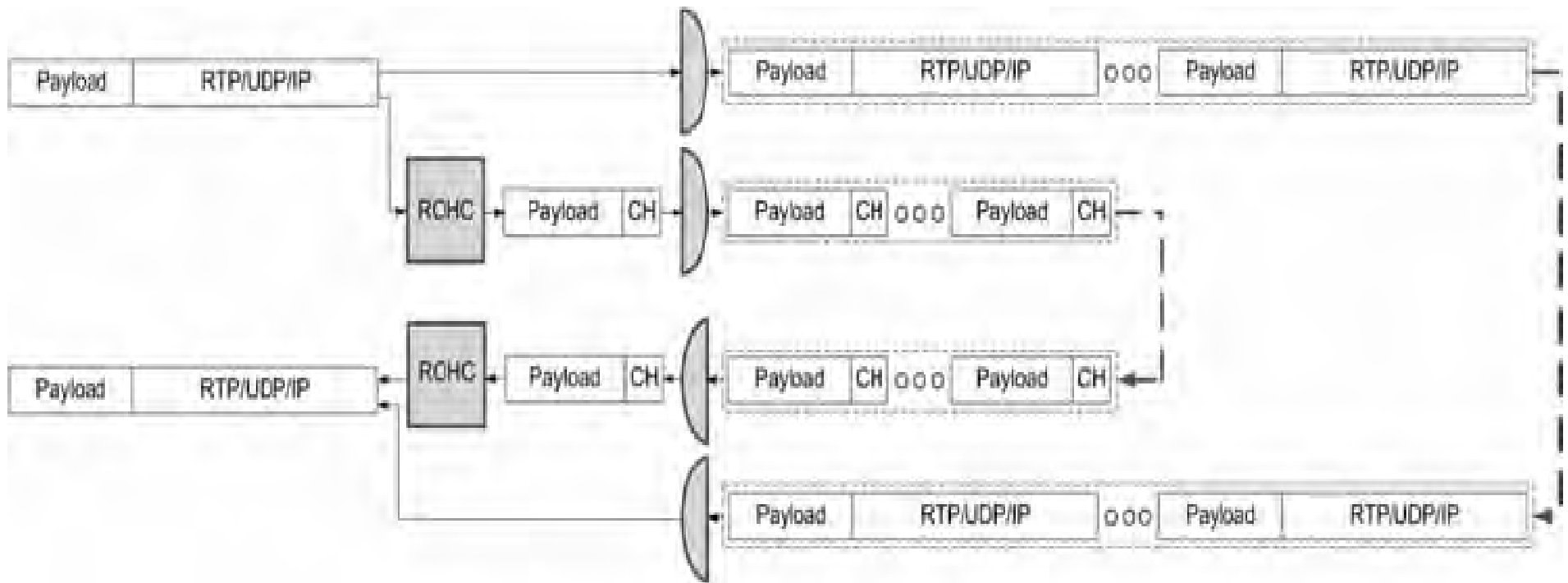
## Case 2: WiMAX with access router located at satellite terminal (connected to BS)

- ▶ Gateway will perform the ROHC compression of IP/UDP/RTP streams and aggregate those packets into one larger container packet
- ▶ In case of downlink traffic, aggregated packet will be sent to the user terminal via base station where the packet is unpacked and each ROHC packet is decompressed. The uncompressed packets are then forwarded by the user terminal to dedicated mobile device
- ▶ In case of uplink traffic, the procedure is reversed



# Aggregation of compressed packets

CH, Compressed Header



## References

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- ▶ C. Bormann et al., *RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed*, IETF RFC 3095, July 2001
- ▶ S. Hong S. Jung and P.Park, *Effect of RObust Header Compression (ROHC) and Packet Aggregation on Multi-hop Wireless Mesh Networks*, In Proc, IEEE CIT'06, Seoul, Korea, September 2006
- ▶ Piri, E., et al. (2008) *ROHC and aggregated VoIP over fixed WiMAX: an empirical evaluation*. Proceedings of the IEEE Symposium on Computers and Communications (ISSC), May 2008.



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▶ **THANK YOU**

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