



Zero-byte ROHC RTP

Background, requirements, current status and proposed way forward

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Outline

● Introduction

- ∇ Different models for Voice over IP in 3GPP2
- ∇ Summary of how the models relates to header compression
- ∇ Latest news from 3GPP2 TSG-P

● Requirements for zero-byte ROHC RTP

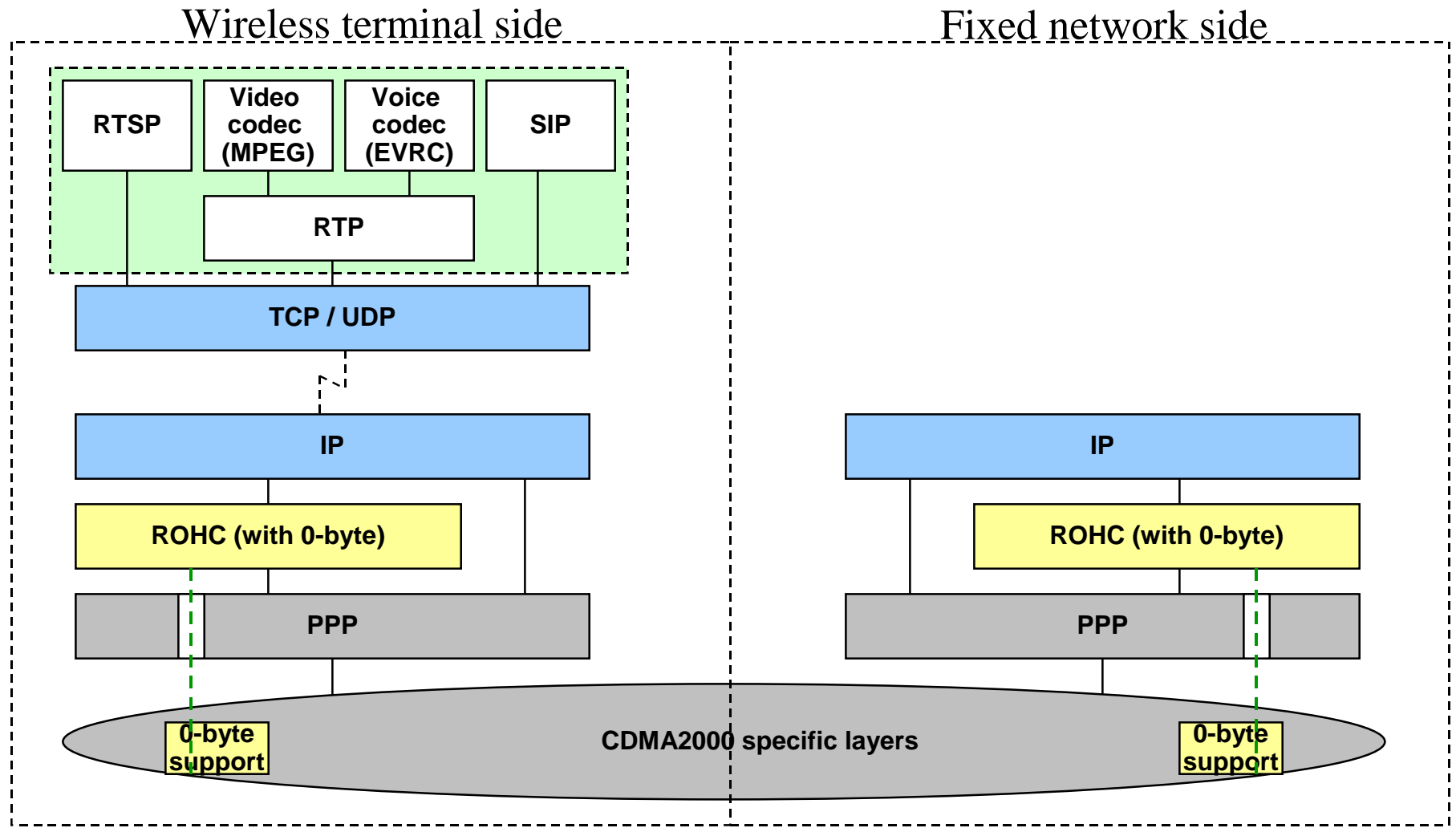
- ∇ Based on inputs from 3GPP2 TSG-P

● LLA ROHC, a zero-byte ROHC RTP profile

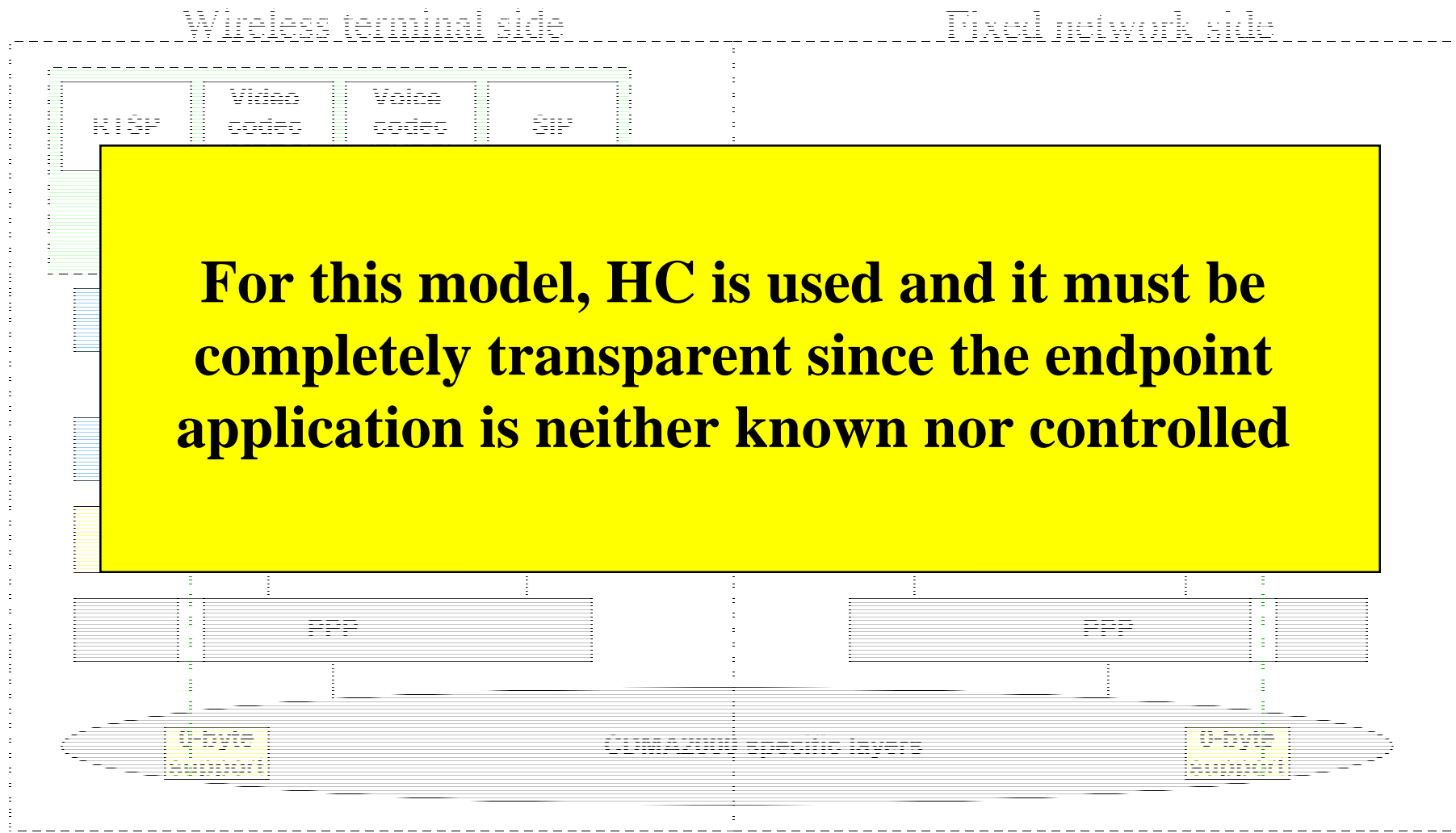
- ∇ Why?
- ∇ How?

● Proposed way forward within the ROHC WG

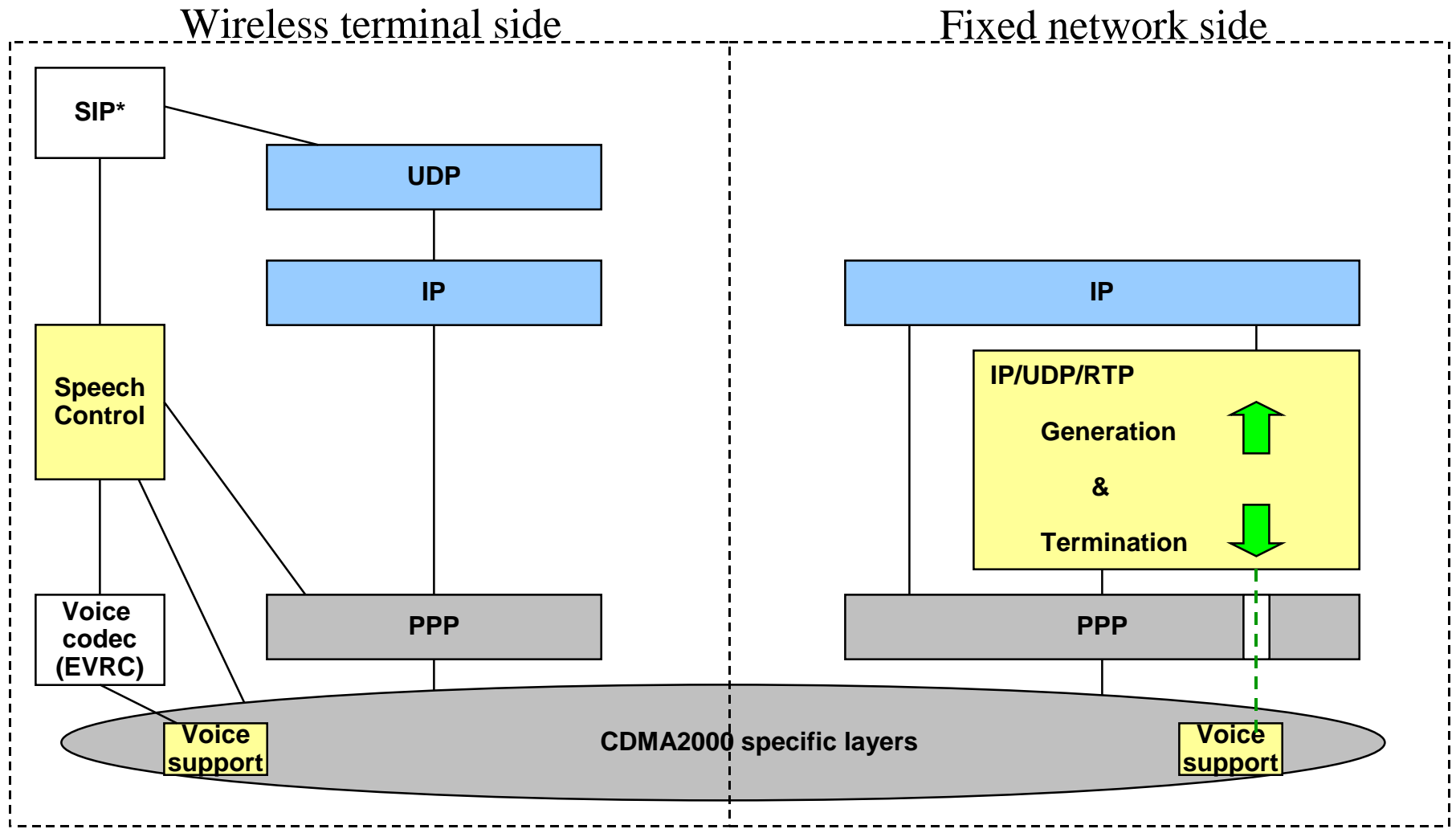
True end-to-end Voice over IP over CDMA2000 (All-IP model)



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Legacy Voice over IP over CDMA2000 (Hybrid model)



Legacy Voice over IP over CDMA2000 (Hybrid model)

- The GEHCO architecture is based on and addresses the Hybrid voice over IP model
- For the Hybrid model, transparency is not an issue since there is never any IP/UDP/RTP headers on the terminal side, and obviously no real header compression/decompression
- Since the Hybrid model is a special solution for a certain kind of terminal used only in CDMA2000, it is not an issue for the ROHC WG
- Header generator/terminator could be implemented with a slightly modified 0-byte ROHC Compressor/Decompressor
- The model IS used in CDMA2000, but that is a 3GPP2 issue

Latest news from 3GPP2 TSG-P

- **As in 3GPP, also 3GPP2 has adopted ROHC as a mandatory header compression scheme for multimedia**
- **3GPP2 asks for a ROHC based transparent 0-byte profile to use for the All-IP model**
- **For the Hybrid model, 3GPP2 will define the mechanisms for termination/generation of IP/UDP headers on the network side and the necessary associated terminal functionality. The termination/generation entity will probably reuse the transparent 0-byte ROHC implementation**
- **Participants of the 3GPP2 TSG-P have provided an input with requirements for a transparent 0-byte compression scheme**

Requirements for 0-byte ROHC RTP header compression

- **Non-official draft pointer sent to the ROHC WG list last week, based on new inputs from 3GPP2 TSG-P**
- **Transparency and Ubiquity requirements not changed**
- **Efficiency requirement stronger and quantitative. During normal operation, no headers should be sent for a majority of the packets**
- **Delay requirements clearer separated, e.g. “Algorithm delay”**
- **Coexistence requirement requires 0-byte to be ROHC compliant**
- **For 0-byte implementations in CDMA2000, the scheme must be able to optimally support the speech codecs EVRC and SMV**

Comments on and suggestions for requirements draft

- A new chapter has been proposed to cover assumptions about the environment 0-byte compression is addressing
- Q: The “algorithmic delay” requirement prevents schemes that adds delay to provide robustness. Does this mean that buffering is not allowed at decompressor side? A: Not clear, maybe we should not restrict the text to robustness. Modification??
- Packet reordering (3b) should of course talk about RTP streams
- 3GPP2 would like to see a note about the fact that they will do a special implementation for the Hybrid model and reuse the 0-byte profile for that. The 0-byte profile should not in any way prevent them from doing so

A link-layer assisted (LLA) ROHC profile for IP/UDP/RTP

- ***draft-jonsson-rohc-lla-rtp-00.txt***

- **Why?**

- ∨ **The main argument is to support efficient usage of existing inflexible 2G links for transport of voice traffic from certain already deployed speech applications and thereby make an IP based speech service economically feasible compared to CS solution**

- **How?**

- ∨ **Utilize available link-layer functionality and characteristics to replace certain header compression functionality**

- **Purpose of the LLA draft**

- ∨ **Defines how ROHC RTP is extended with a new profile to support 0-byte header compression in a general way with necessary header compression functionality, interfaces to the lower layers and requirements on lower layers for the 0-byte header compression**

LLA - The basic principles

- **Header compression MUST still be completely transparent and work independent of application**
- **The 0-byte scheme is build on normal ROHC RTP, with some additions incorporating support for a 0-byte header format that during normal operation can replace the 1-byte header**
- **For the 0-byte header, some HC functionality MUST instead be provided by the link layer**
- **The 0-byte header MUST NOT be used if this functionality can not be provided or if reliability can not be guaranteed**

LLA - ROHC packet types and header formats

- **IR**

- ▽ Initialization
- ▽ Complete update

About 40/60 octets

- **IR-DYN / EXT. COMPR.**

- ▽ Dynamic update
- ▽ Compressed packets with non-trivial extensions

3-... octets

- **COMPR. 1**

- ▽ CRC + Sequence number + Timestamp

2 octets

- **COMPR. 0**

- ▽ CRC + Sequence number

1 octet

A no-header-packet is defined to replace this packet in most cases

LLA - Sequence number replacement

- **The sequence number is used to detect reasonable packet losses between compressor and decompressor. If no loss has occurred, it will increase with 1 for each packet as long as no packets have been lost before the compression point**
- **To replace the sequence number, the link layer MUST provide information about packet losses**
- **Packet arriving to the decompressor MUST be provided in order, otherwise an indication of packet loss MUST be given**

LLA - CRC replacement

- **The ROHC CRC is used for:**

- ▽ **Detection of significant packet losses between compressor and decompressor**
- ▽ **Protection against residual bit errors**
- ▽ **Protection against errors due to faulty implementations and other causes**

- **The CRC is not provided with a 0-byte header:**

- ▽ **The link MUST therefore guarantee detection of long losses**
- ▽ **No residual bit errors can damage a header that is never sent**
- ▽ **For header packets, strict rules must be defined to avoid residual errors**
- ▽ **Periodical verifications should be used**

LLA - Packet type identification

- In normal ROHC headers, a packet type identifier is included
- Since a 0-byte header can not include a packet type identifier, the link layer **MUST** provide an identification whether the packet is 0-byte or a normal ROHC packet
 - ▽ 0-byte packets will be decompressed using the additional information provided by the link layer
 - ▽ Normal ROHC packets will not utilize any additional information from the link layer
- If the link layer can not provide this, the **ALWAYS_PAD** option could be used. With that option, all header packets will begin with at least one octet of ROHC padding and indicate presence of header

LLA - CID implementation

- The 0-byte profile **MUST** only be used for CID 0

LLA - Missing pieces and comments received

- **Example section describing how this profile could be implemented over an artificial link layer of the kind this profile is targeting**
- **Requirement on optimistic approach agreement MUST be added**
 - ∇ **Compressor and decompressor must agree on how the optimistic approach works in U and O mode**
- **Decompressor rules for improved verification of updates in optimistic and unidirectional mode should be defined**
- **NHP_PACKET is not an implementation parameter, it is part of the interface**
- **Can / should timing characteristics be used to improve efficiency even more? Studied, but no gain identified so far...**

Proposed way forward for 0-byte within the ROHC WG

- **Make 0-byte header compression part of the ROHC charter**
- **Start with a requirements and assumptions document**
 - ▽ First official version should be available before April 6th
 - ▽ Stable version before end of April
- **Make the LLA ROHC a WG document for definition of the generic, link layer independent, 0-byte profile**
- **Encourage work on how to realize 0-byte compression over at least CDMA2000 and GERAN in a cooperative manner. With a non-open competitive approach, we would not be able to finalize this in time**