Lower Layer Guidelines for Robust Header Compression

<draft-ietf-rohc-lower-layer-guidelines-00.txt>

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Changes since previous version 1(2)

- **draft-ietf-rohc-lower-layer-guidelines-00.txt**

- **Handling of header size variation**
  - ***The link layer MUST be able to handle header size variations from 40 or 60 octets down to 1 octet***
  - **Added note that further work is needed to gain a more detailed description of header size variations.**

Changes since previous version 2(2)

- Handover procedures (cellular system specific)
  - Handover SHOULD NOT cause significant long loss
  - System MAY have internal mechanism for transferring context at handover
  - If context is re-initialized by sending “full headers”, the lower layer must indicate handover to the header compression scheme

Added:

- description of handover that is relevant, i.e., hard handover.
- note that it is the longest consecutive packet loss which is most relevant

Planned changes and additions, 1(2)

- **Support for feedback packets**
  - **Nothing is (yet) mentioned about small, stand-alone packets/headers generated, for example ACKs/FEEDBACK. There must be support for such packets to be able to run ROHC in optimistic and reliable mode**
- **Packet duplication - from mail list discussions…**
  - **The ROHC scheme can handle packets which are duplicated before the compressor. It is RECOMMENDED that such duplications are avoided.**
  - **The link MAY NOT duplicate packets between the compressor and the decompressor.**

Planned changes and additions, 2(2)

- **Unequal error detection (UED)**
  - **Clarify that the ROHC scheme does not require UED but it could benefit from UED. Explain possible gain with an example.**
- **Unequal error protection (UEP)**
  - **Clarify that the ROHC scheme does not require UEP but could benefit from UEP if UED is used.**
- **High level description of generated header stream**
  - **Other bodies that wish to include the ROHC scheme into their link layer will probably benefit from a high level description of the generated header stream that needs to be realized with e.g. radio bearers.**

Summary

- Small changes since previous version
- Some changes and additions planned
- Nothing on the TCP/IP part yet
- Time to wrap up and conclude the RTP part

Questions from 3GPP RAN2 and suggested answers 1(3)

- **Q1: 1. Is the ROHC assuming the link to provide separate error detection/protection to the payload and compressed (IP etc.) header parts?**

- ***Unequal error detection and/or protection is not required for the ROHC scheme. It is seen as an optional optimization. The ROHC scheme will most likely gain performance if for example UEP/UEP can be used to protect/detect (compressed) headers. This gain should be illustrated with an example.***

Questions from 3GPP RAN2 and suggested answers 2(3)

- **Q2: 2. Will the header compression work if the error happens to be in the payload part and the packet is delivered to decompressor with indication that there was an error? However, it is not known if the error was in header or payload part.**

- ***The header compression scheme should assume that the header has been damaged if header damage cannot be told apart from payload damage. The header compression scheme might even so, try to make use of the information in the header. This might be implementation dependent. Robust header compression will work independent of cause of packet loss.***

Questions from 3GPP RAN2 and suggested answers 3(3)

- **Q3: 4. Is it assumed that the link carries the header part and payload part over two different radio links (with probably different quality)? What is the effect of the payload part to the link design?**
- ***It is not assumed that the link carries the header part and payload part over two different radio links. The assumptions on the link can be found in the internet draft: draft-ietf-rohc-lower-layer-guidelines-00.txt***

- **Standardize support for unequal error protection/detection for release 00?**
- ***Unequal error protection/detection is not required but can give performance enhancement (combined with suitable example)***

Residual bit error rates

From 3G TS 23.107 version 3.1.0,3GPP QoS Concept and Architecture:

Table 5: Value ranges for Radio Access Bearer Service Attributes

Traffic class	Conversational class	Streaming class	Interactive class	Background class
Maximum bitrate (kbps)	<2000 (1) (2)	<2000 (1) (2)	< 2000 - overhead (2) (3)	<2000 - overhead (2) (3)
Delivery order	Yes/No	Yes/No	Yes/No	Yes/No
Maximum SDU size (octets)	<1500 (4)	<1500 (4)	<1500 (4)	<1500 (4)
SDU format information	(5)	(5)		
Delivery of erroneous SDUs	Yes/No/-	Yes/No/-	Yes/No/-	Yes/No/-
Residual BER	**$5*10^{-2}$, 10^{-2}, 10^{-3}, 10^{-4} (6)**	**$5*10^{-2}$, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6} (6)**	**$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6) (7)**	**$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6) (7)**
SDU error ratio	10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} (6)	10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} (6)	10^{-3}, 10^{-4}, 10^{-6} (6)	10^{-3}, 10^{-4}, 10^{-6} (6)
Transfer delay (ms)	80 – maximum value(6)	500 – maximum value (6)		
Guaranteed bit rate (kbps)	<2000 (1) (2)	<2000 (1) (2)		
Traffic handling priority			1,2,3 (8)	
Allocation/Retention priority	1,2,3 (8)	1,2,3 (8)	1,2,3 (8)	1,2,3 (8)
Source statistic descriptor	Speech/unknown	Speech/unknown		

1) **Bitrate of 2000 kbps requires that UTRAN operates in transparent RLC protocol mode, in this case the overhead from layer 2 protocols is negligible.**
2) **The granularity of the bit rate parameters must be studied. Although the UMTS network has capability to support a large number of different bitrate values, the number of possible values must be limited not to unnecessarily increase the complexity of for example terminals, charging and interworking functions. Exact list of supported values shall be defined together with S1, N1, N3 and R2.**
3) **Impact from layer 2 protocols on maximum bitrate in non-transparent RLC protocol mode shall be estimated.**
4) **Maximum SDU size shall at least allow UMTS network to support external PDUs having as high MTU as Internet/Ethernet (1500 octets). The need for higher values must be investigated by N1, N3, S1, R2, R3.**
5) **Definition of possible values of exact SDU sizes for which UTRAN can support transparent RLC protocol mode, is the task of RAN WG3.**
6) **Values are indicative. Exact values on Residual BER, SDU error ratio and transfer delay shall defined together with S1, N1, N3 and R2.**
7) **Values are derived from CRC lengths of 8, 16 and 24 bits on layer 1.**
8) **Number of priority levels shall be further analysed by S1, N1 and N3.**

Suggested questions to 3GPP RAN2

- When will packet loss due to handover and visible for HC occur and how often? How large will the longest loss event be (in number of packets or time)?
- How can small separate feedback packets be realised? What are the costs/difficulties to realize such packets?
- Additional questions …?

Summary

- No big changes to the lower layer guidelines draft.
- 3GPP, ETSI, etc might need information/high level overview on robust header compression. How does the header stream to realize look like?
- Questions from 3GPP RAN2:
  - Propose to finalize answers via the maillist.
  - Make some questions from ROHC to RAN2.
- Nothing in the TCP/IP part still.

Old slides from here….
Background

- All header compression schemes (RFC1144, RFC2507, RFC2508) rely on some functionality from underlying lower layer. For example:
  - Low residual bit error rate
  - Inferred length fields
  - Packet type indication
- Important to be aware of required functionality from lower layers ...
  - … to be able to prepare for incorporation of header compression into a system without knowing the exact details of the final scheme. For example in systems like 3GPP, 3GPP2, ETSI, etc.
  - … to be able to correctly incorporate header compression into a system
- Draft corresponds to *Layer-2 design guidelines* planned in the charter.

Guidelines for robust RTP/UDP/IP compression 1(3)

- **Error detection**
  - **Lower layer MUST provide error detection for compressed headers to the decompressor if the compressed header doesn't have an internal checksum for that purpose**
  - **The residual bit error rate in headers passed up to the decompressor should be very close to zero. Value to be defined.**
- **Indication of erroneous headers**
  - **It is RECOMMENDED that erroneouos headers are passed up to the decompressor.**
  - **If so, an indication of that the header is erroneouos MUST be included to the decompressor.**

Guidelines for robust RTP/UDP/IP compression 2(3)

- **Inferred header field information**
  - **The decompressor MUST be notified about the length of the received packet including the (compressed) header to make it possible to determine length fields: Packet length (IPv4), Payload length (IPv6) and Length (UDP)**
- **Handling of header size variation**
  - **The link layer MUST be able to handle header size variations from 40 or 60 octets down to 1 octet**
- **Negotiation of parameters**
  - **Lower layer MUST be able to negotiate header compression parameters in a initial setup phase**
  - **Support for re-negotiations is RECOMMENDED**

Guidelines for robust RTP/UDP/IP compression 3(3)

- Demultiplexing of flows
  - It is RECOMMENDED that flows may be demultiplexed onto logically separated channels if possible
    - This reduces the need for context identification at header compression level
- Packet type identification
  - Identification of packets is not needed since it is incorporated in the header compression scheme
- Handover procedures (cellular system specific)
  - Handover SHOULD NOT cause significant long loss
  - System MAY have internal mechanism for transferring context at handover
  - If context is re-initialized by sending “full headers”, the lower layer must indicate handover to the header compression scheme

Guidelines for robust TCP/IP compression

To Be Written

Summary

- **Lower layer guidelines for robust header compression**
  - **To enable incorporation of ROHC schemes into systems**
  - **First set of guidelines for RTP/UDP/IP compression**
  - **Nothing on TCP/IP compression yet**

- **From the charter:**
  Sep 00 ***Layer-2 design guidelines submitted to IESG for publication as Informational***

- **What's next…**
  - **Make an *draft-ietf-rohc-lower-layer-guidelines-00* submission**
  - **Continue work on existing guidelines for RTP/UDP/IP compression**
  - **Need input on TCP/IP compression**