Requirements for IP/UDP/RTP header compression

To become

<draft-ietf-rohc-rtp-requirements-00.txt>

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Input: Charter, 3GPP requirements, contribution from 3G.IP, Editors central nervous system.

From charter:

- Cellular links: WCDMA, EDGE, CDMA-2000
  - Long link roundtrip times, high error rates.
- Unidirectional links
- Minimal loss propagation
- Minmal added delay
- Voice, low-bandwidth video

We must keep the schedule!

- Several standardization efforts in the cellular wireless arena depend on us.
- Deadlines:
  - Requirements to IESG in June.
  - Layer-2 guidelines to IESG in September.
  - IP/UDP/RTP scheme to IESG in September.

1.1 Transparency

- When a header is compressed and then decompressed, the resulting header must be semantically identical to the original header. If this cannot be achieved, the packet containing the erroneous header must be discarded.

- Justification: The header compression process must not produce headers that might cause problems for any current or future part of the Internet infrastructure

1.2. Ubiquity

- Must not require modifications to existing IP (v4 or v6), UDP, or RTP implementations.
- Justification: Ease of deployment

2.1. Ipv4 and Ipv6

- Must support both IPv4 and IPv6
- Justification: IPv4 and IPv6 will both be around during the foreseeable future.

2.2. Mobile IP

- The kinds of headers used by Mobile IP{v4,v6} should be compressed efficiently. For IPv4 these include headers of tunneled packets. For IPv6 these include headers containing the Routing Header and the Binding Update Destination Option.

- Justification: It is very likely that Mobile IP will be used by cellular devices.

2.3. Genericity

- Must support compression of headers of arbitrary RTP streams.
- Justification: There must be a generic scheme which can compress reasonably well for any payload type and traffic pattern. This does not preclude optimizations for certain media types where the traffic pattern is known, e.g., for low-bandwidth voice and low-bandwidth video.

3.1. Performance/Spectral Efficiency

- Must provide low relative overhead under expected operating conditions; compression efficiency should be better than for RFC2508 under equivalent error conditions. The error rate should only marginally increase the overhead under expected operating conditions.

- Justification: Spectrum efficiency is a primary goal. RFC2508 does not perform well enough. Notes: the relative overhead is the average header overhead relative to the payload. Any auxiliary (e.g., control or feedback) channels used by the scheme should be taken into account when calculating the header overhead.

3.2. Error propagation

- Error propagation due to header compression should be kept at an absolute minimum. Error propagation is defined as the loss of packets subsequent to packets damaged by the link, even if those subsequent packets are not damaged.

- Justification: Error propagation reduces spectral efficiency and reduces voice quality. CRTP suffers severely from error propagation.

3.3. Cellular handover

- Cellular handover must be supported. The header compression scheme should not cause packet loss after handover.

- Justification: Handover can be a frequent operation in cellular systems. Failure to handle it well can adversely impact spectrum efficiency and voice quality.

Delay

- 3.4. Link delay: Must operate under all expected link delay conditions.
- 3.5. Processing delay: The scheme must not contribute significantly to system delay budget.

3.6. Multiple links

- The scheme must perform well when there are two or more cellular links in the end-to-end path.
- Justification: Such paths will occur. Note: loss on previous links will cause irregularities in the RTP stream reaching the compressor. Such irregularities should only marginally affect performance.

3.7. Packet Misordering

- The scheme must tolerate moderate misordering in the packet stream reaching the compressor. No misordering is expected on the link between compressor and decompressor.
- Justification: Misordering happens regularly in the Internet.

3.8. Unidirectional links/multicast

- Must operate (possibly with less efficiency) over links where there is no feedback channel or where there are several receivers.

3.9. Configurable header size fluctuation

- It should be possible to restrict the number of different header sizes used by the scheme.
- Justification: Some radio technologies support only a limited number of frame sizes efficiently. Note: Somewhat degraded performance is to be expected when such restrictions are applied.

Others?

- Omitted from 3GPP reqs or 3G.IP contribution:
  - Call type (subsumed by multiple links)
  - Jitter (?)
  - Complexity (covered by Processing delay)
  - Generic Applicability (covered by intro)
  - Compatibility with other schemes (not a *protocol* requirement)

Requirements for IP/TCP HC

- Must compress SACK and Timestamp options.
- No Error propagation, please!
  - Allows fast retransmit to work well
- Must deal with irregularities in TCP stream.

(Very) Preliminary investigation of TCP stream properties

- Data from modem pool at Lulea U
  - So, relatively low bandwidth
- Total of 263000 packets
  - About 8500 flows
- Irregularities:
  - IP ID delta = +1: 22 %
  - IP ID delta != +1: 78%
  - IP ID <0: 5%
  - seq delta>0 AND WIN delta != 0
  - ack delta>0 AND seq delta>0: 7%