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G. Hunt
BT

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BT's eXtended Network Quality RTP Control Protocol Extended Reports (RTCP XR XNQ)

Status of This Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

IESG Note

The IESG has concerns about vendor code points allocation in this small namespace and might not approve similar documents in the future.

Abstract

This document describes an RTCP XR report block, which reports packet transport parameters. The report block was developed by BT for pre-standards use in BT's next-generation network. This document has been produced to describe the report block in sufficient detail to register the block type with IANA in accordance with the Specification Required policy of RFC 3611. This specification does not standardise the new report block for use outside BT's network.

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1. Introduction

A set of metrics of packet-transport quality has been defined by BT for pre-standards use in its network. These metrics are known as "XNQ" for "eXtended Network Quality". This document defines an RTCP-XR Report Block to transport the XNQ measures from an RTP end system to its peer, using the extension mechanism defined in [1].

The metrics are designed to supplement the packet-loss metric in RTCP [2] and the roundtrip delay measurement provided by RTCP. They provide metrics for IP Packet Delay Variation based on the IPDV metric defined in [3], metrics reporting the activity of the RTP end system's receiver's jitter buffer, and metrics reporting "errored" and "severely errored" seconds.

This document has been produced to describe the report block in sufficient detail to register the block type with IANA in accordance with the Specification Required policy of [1]. This specification does not standardise the new report block for use outside BT's network.

Work in progress on RTCP HR [5] is likely to obsolete these metrics and the RTCP-XR Report Block defined here.

2. Requirements Notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [4].

3. Extended Network Quality (XNQ) Report Block

A set of metrics of packet-transport quality has been defined by BT for pre-standards use in its network. These metrics are known as "XNQ" for "eXtended Network Quality".

This document defines an RTCP-XR Report Block using the extension mechanism defined in [1]. The new Report Block provides transport of the XNQ measures from an RTP end system to its peer.

The metrics are described in the following text. However, some additional explanation is required for the metrics vmaxdiff, vrange, vsum, and c, which measure aspects of packet delay variation. The metrics are based on the measure known as IP Packet Delay Variation (IPDV) defined in [3]. The IPDV of a packet is the amount by which the packet was delayed in the network, minus the amount a reference packet was delayed in the network. The reference packet is usually the first packet of the connection. IPDV is a signed quantity.

The metric vrange is the difference (longest minus shortest) between the longest and shortest network packet delays seen over the duration of the connection to date. The metric vrange is usually a positive quantity, but may be zero if the packet delay is exactly constant over the lifetime of the connection to date.

The metric vmaxdiff is found as follows. For each RTCP measurement cycle, find the difference (longest minus shortest) between the longest and shortest network packet delays within that measurement cycle. These differences are usually all positive quantities, but a difference may be zero if the packet delay is exactly constant throughout the measurement cycle. Take the set of these differences and find the maximum, which is vmaxdiff. The metric vmaxdiff is also usually a positive quantity, but will be zero if all the members of the set of per-cycle differences are zero.

The metric vsum is simply the sum of the per-RTCP-cycle differences, which were obtained to find vmaxdiff as described above. The metric c is the number of per-RTCP-cycle differences, that is, the cardinality of the set of differences. The two metrics vsum and c allow calculation of vsum/c, the average IPDV per RTCP measurement cycle.

The format of the report is as shown in Figure 1.

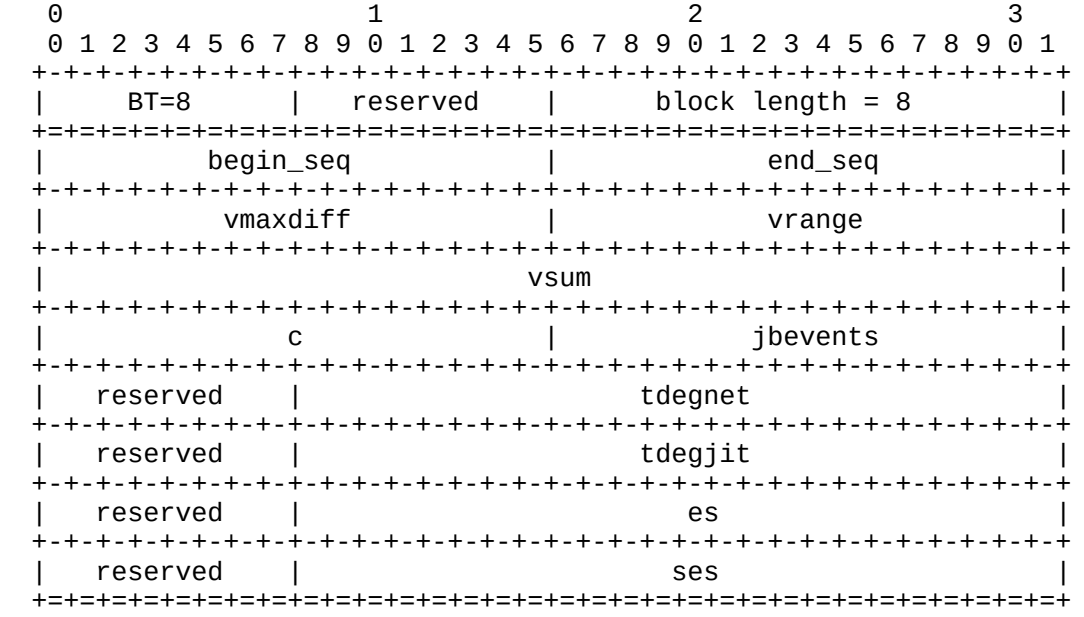

Figure 1

The report consists of an RTCP-XR block header and a single 8-word sub-block.

block type (BT): 8 bits

An XNQ Metrics Report Block is identified by the constant 8.

reserved: 8 bits

These fields are reserved for future definition. In the absence of such a definition, the bits in these fields MUST be set to zero and MUST be ignored by the receiver.

block length: 16 bits

Defined in Section 3 of [1].

begin_seq: 16 bits

As defined in Section 4.1 of [1].

end_seq: 16 bits

As defined in Section 4.1 of [1].

vmaxdiff: 16 bits unsigned

Largest IPDV difference seen to date within a single RTCP measurement cycle, measured in RTP timestamp units. If the measured value exceeds 0xFFFE, the value 0xFFFF should be reported to indicate an over-range measurement.

vrange: 16 bits unsigned

Largest IPDV difference over the lifetime of the RTP flow to date, measured in RTP timestamp units. If the measured value exceeds 0xFFFE, the value 0xFFFF should be reported to indicate an over-range measurement.

vsum: 32 bits unsigned

Sum of the peak IPDV difference values within each RTCP cycle, summed over RTCP cycles over the lifetime of the RTP flow to date. If the measured value exceeds 0xFFFFFFFE, the value 0xFFFFFFFF should be reported to indicate an over-range measurement.

c: 16 bits unsigned

Number of RTCP cycles over which vsum was accumulated. If the measured value exceeds 0xFFFE, the value 0xFFFF should be reported to indicate an over-range measurement.

jbevents: 16 bits unsigned

Cumulative number of jitter buffer adaptation events over the lifetime of the RTP flow to date. If the measured value exceeds 0xFFFE, the value 0xFFFF should be reported to indicate an over-range measurement.

tdegnet: 24 bits unsigned

The total time in sample periods affected either by packets unavailable due to network loss, or late delivery of packets, since the start of transmission. If the measured value exceeds 0xFFFFFE, the value 0xFFFFFF should be reported to indicate an over-range measurement.

tdegjit: 24 bits unsigned

The total time in sample periods degraded by jitter buffer adaptation events, e.g., where the jitter buffer either plays out a sample sequence not originating at the transmitter, repeats samples, or chooses not to play out a sample sequence that was sent by the transmitter. If the measured value exceeds 0xFFFFFE, the value 0xFFFFFF should be reported to indicate an over-range measurement.

es: 24 bits unsigned

cumulative seconds affected by "unavailable packet" events over the lifetime of this ephemeral, to date. If the measured value exceeds 0xFFFFFE, the value 0xFFFFFF should be reported to indicate an over-range measurement.

ses: 24 bits unsigned

cumulative seconds affected by severe "unavailable packet" events over the lifetime of this ephemeral, to date. If the measured value exceeds 0xFFFFFE, the value 0xFFFFFF should be reported to indicate an over-range measurement.

4. IANA Considerations

IANA has allocated the number 8 within the registry "RTP Control Protocol Extended Reports (RTCP XR) Block Types" to the RTCP XR report block described here. This registry is defined in [1].

5. Security Considerations

It is believed that this proposed RTCP XR report block introduces no new security considerations beyond those described in [1]. Some of the considerations in [1] do not apply to this report block. Specifically, XNQ does not provide per-packet statistics so the risk to confidentiality documented in Section 7, paragraph 3 of [1] does not apply, and XNQ packets cannot be very large so the risk of denial of service documented in Section 7, paragraph 7 of [1] does not apply.

6. References

6.1. Normative References

[1] Friedman, T., "RTP Control Protocol Extended Reports (RTCP XR)", RFC 3611, November 2003.

[2] Schulzrinne, H., "RTP: A Transport Protocol for Real-Time Applications", RFC 3550, July 2003.

[3] ITU-T, "Recommendation Y.1540, Internet protocol data communication service -- IP packet transfer and availability performance parameters", December 2002.

[4] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, BCP 14, March 1997.

6.2. Informative References

[5] Clark, A., "RTCP HR - High Resolution VoIP Metrics Report Blocks", Work in Progress, November 2007.

Author's Address

Geoff Hunt
BT
Orion 1 PP9
Adastral Park
Martlesham Heath
Ipswich, Suffolk IP5 3RE
United Kingdom

Phone: +44 1473 608325
EMail: geoff.hunt@bt.com

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