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RTP Control Protocol (RTCP) Extended Report (XR) Block for MPEG2 Transport Stream (TS) Program Specific Information (PSI) Decodability Statistics Metrics Reporting

Abstract

An MPEG2 Transport Stream (TS) is a standard container format used in the transmission and storage of multimedia data. Unicast/multicast MPEG2 TS over RTP is widely deployed in IPTV systems. This document defines an RTP Control Protocol (RTCP) Extended Report (XR) block that allows the reporting of MPEG2 TS decodability statistics metrics related to transmissions of MPEG2 TS over RTP. The metrics specified in the RTCP XR block are related to Program Specific Information (PSI) carried in MPEG TS.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7380.

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1. Introduction

1.1. MPEG2 Transport Stream Decodability Metrics

The European Telecommunications Standards Institute (ETSI) has defined a set of syntax and information consistency tests and corresponding indicators [ETSI] that are recommended for the monitoring of MPEG2 Transport Streams [ISO-IEC.13818-1.2007]. The tests and corresponding indicators are grouped according to priority:

First priority: Necessary for decodability (basic monitoring)

Second priority: Recommended for continuous or periodic monitoring

Third priority: Recommended for application-dependent monitoring

This memo defines a new block type for use with MPEG2 Transport Streams [ISO-IEC.13818-1.2007] to augment those defined in [RFC3611]. The new block type supports reporting of the number of occurrences of each Program Specific Information (PSI) indicator in the first and second priorities listed in Sections 5.2.1 and 5.2.2, respectively, of [ETSI]. The third priority indicators are not supported. The metrics defined here supplement information from the PSI-Independent Decodability Statistics Metrics Block [RFC6990].

1.2. RTCP and RTCP XR Reports

The use of RTCP for reporting is defined in [RFC3550]. [RFC3611] defines an extensible structure for reporting using an RTCP Extended Report (XR). This document defines a new Extended Report block for use with [RFC3550] and [RFC3611].

1.3. Performance Metrics Framework

The Performance Metrics Framework [RFC6390] provides guidance on the definition and specification of performance metrics. The RTP Monitoring Architectures [RFC6792] provides guidelines for RTCP XR block formats. The new report block described in this memo is in compliance with the monitoring architecture specified in [RFC6792] and the Performance Metrics Framework [RFC6390].

1.4. Applicability

These metrics are applicable to any type of RTP application that uses the MPEG2 TS standard format for multimedia data, for example, MPEG4 over MPEG2 TS over RTP. This new block type can be useful for measuring content stream or TS quality by checking TS header information [ETSI] and identifying the existence (and characterizing

the severity) of bitstream packetization problems that may affect users' perception of a service delivered over RTP. It may also be useful for verifying the continued correct operation of an existing system management tool.

2. Terminology

2.1. Standards Language

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 RFC 2119 [RFC2119].

3. MPEG2 TS PSI Decodability Statistics Metrics Block

ETSI TR 101 290 [ETSI] generally defines indicators related to error events whereas the XR block defined in this document contains counts of occurrences of the [ETSI] indicators. The block defined in this document reports MPEG2 TS PSI decodability statistics metrics beyond the information carried in the standard RTCP packet format and PSI-Independent Decodability Statistics Metrics Block [RFC6990], which are measured at the receiving end of the RTP stream. It contains counts of seven metrics defined in ETSI TR 101 290 [ETSI]. Information is reported about basic monitoring parameters necessary to ensure that the TS can be decoded, including:

- Program Association Table (PAT) errors
- PAT2 errors
- Program Map Table (PMT) errors
- PMT2 errors
- Packet Identifier (PID) errors

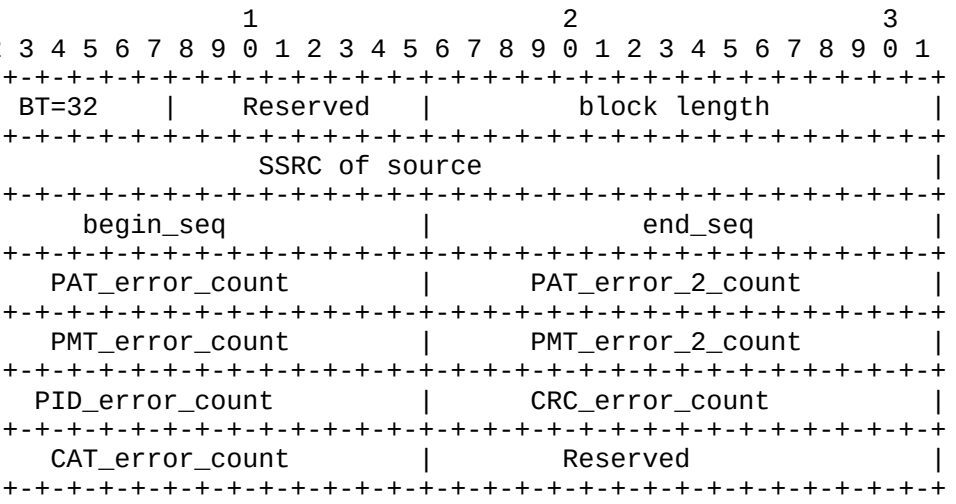
Information is also reported about continuous monitoring parameters necessary to ensure continuous decoding, including:

- Cyclic Redundancy Check (CRC) errors
- Conditional Access Table (CAT) errors

In these parameters, PAT2 errors and PMT2 errors are actually replacements for and improvements on PAT errors and PMT errors, respectively, and are therefore preferred in future implementations. In addition, measurement results for some of these parameters (e.g., PAT errors or PMT errors) may be different based on whether

scrambling is employed. The other parameters defined in Section 5 of [ETSI] are ignored since they do not apply to all MPEG2 implementations. For further detailed information on these parameters, see [ETSI].

The MPEG2 TS PSI Decodability Metrics Block has the following format:



block type (BT): 8 bits

The MPEG2 TS PSI Decodability Metrics Block is identified by the constant 32;.

Reserved: 8 bits

These bits are reserved. They MUST be set to zero by senders ignored by receivers (see Section 4.2 of [RFC6709]).

block length: 16 bits

The constant 6, in accordance with the definition of this field in Section 3 of [RFC3611]. The block MUST be discarded if the block length is set to a different value.

Synchronization Source (SSRC) of source: 32 bits

As defined in Section 4.1 of [RFC3611].

begin_seq: 16 bits

As defined in Section 4.1 of [RFC3611].

end_seq: 16 bits

As defined in Section 4.1 of [RFC3611].

PAT_error_count: 16 bits

A count of the number of PAT errors that occurred in the above sequence number interval. The Program Association Table (PAT) is the only packet with Packet Identifier (PID) 0x0000. A PAT error occurs when (1) a packet with PID 0x0000 does not occur at least every 0.5 seconds, (2) a packet with PID 0x0000 does not contain table_id 0x00 (i.e., a PAT), or (3) the Scrambling_control_field in the TS packet header is not 00 for a packet with PID 0x0000. See Section 5.2.1 of [ETSI]. Every program within the MPEG TS stream is listed in the PAT; if it is missing, then no programs can be decoded.

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported. NOTE 1 of the table in Section 5.2.1 of [ETSI] recommends using PAT_error_2_count. Upon reception, if PAT_error_2_count is available (that is, other than 0xFFFF), then receivers MUST ignore PAT_error_count.

PAT_error_2_count: 16 bits

A count of the number of PAT2 errors that occurred in the above sequence number interval. A PAT2 error occurs when (1) a packet with PID 0x0000 containing table_id 0x00 does not occur at least every 0.5 seconds, (2) a packet with PID 0x0000 contains a table with a table_id other than 0x00, or (3) the Scrambling_control_field in the TS packet header is not 00 for a packet with PID 0x0000. See Section 5.2.1 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported.

PMT_error_count: 16 bits

A count of the number of PMT errors that occurred in the above sequence number interval. A PMT_error occurs when (1) a packet containing a table with table_id 0x02 (i.e., a PMT) does not occur at least every 0.5 seconds on the PID that is referred to in the PAT or (2) the Scrambling_control_field in the TS packet header is not 00 for all packets with PID containing a table with table_id 0x02 (i.e., a PMT). See Section 5.2.1 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, the value 0xFFFF MUST be reported. NOTE 2 of the table in Section 5.2.1 of [ETSI] recommends using PMT_error_2_count. Upon reception, if PMT_error_2_count is available (that is, other than 0xFFFF), then receivers MUST ignore PMT_error_count.

PMT_error_2_count: 16 bits

A count of the number of PMT2 errors that occurred in the above sequence number interval. A PMT2_error occurs when (1) a packet containing table_id 0x02 (i.e., a PMT) does not occur at least every 0.5 seconds on each program_map_PID that is referred to in the PAT or (2) the Scrambling_control_field in the TS packet header is not 00 for all packets containing a table with table_id 0x02 (i.e., a PMT) on each program_map_PID that is referred to in the PAT. See Section 5.2.1 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported.

PID_error_count: 16 bits

A count of the number of PID errors that occurred in the above sequence number interval. A PID error occurs when no data stream is present corresponding to a given PID. This may be caused by multiplexing or demultiplexing, then remultiplexing. See Section 5.2.1 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported.

CRC_error_count: 16 bits

A count of the number of CRC errors that occurred in the above sequence number interval. A CRC_error occurs if data corruption occurred in any of the following tables -- CAT, PAT, PMT, Network Information Table (NIT), Event Information Table (EIT), Bouquet Association Table (BAT), Service Description Table (SDT), or Time Offset Table (TOT), as defined in Section 5.2.2 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported.

CAT_error_count: 16 bits

A count of the number of CAT errors that occurred in the above sequence number interval. A CAT_error occurs when (1) a packet with PID 0x0001 contains a table with a table_id other than 0x01 (i.e., not a CAT) or (2) a packet does not contain a table with table_id = 0x01 (i.e., a CAT) when scrambling is employed (i.e., the Scrambling_control_field is set as a value other than 00). See Section 5.2.2 of [ETSI].

The measured value is an unsigned value. If the measurement is unavailable, then the value 0xFFFF MUST be reported.

Reserved: 16 bits

These bits are reserved. They MUST be set to zero by senders ignored by receivers (see Section 4.2 of [RFC6709]).

4. SDP Signaling

[RFC3611] defines the use of the Session Description Protocol (SDP) [RFC4566] for signaling the use of RTCP XR blocks. However, XR blocks MAY be used without prior signaling (see Section 5 of [RFC3611]).

4.1. SDP rtcp-xr-attrib Attribute Extension

This session augments the SDP attribute "rtcp-xr" defined in Section 5.1 of [RFC3611] by providing an additional value of "xr-format" to signal the use of the report block defined in this document. The ABNF [RFC5234] syntax is as follows:

```
xr-format =/  xr-tpd-block

xr-tpd-block = "ts-psi-decodability"
```

4.2. Offer/Answer Usage

When SDP is used in Offer/Answer context, the SDP Offer/Answer usage defined in [RFC3611] for unilateral "rtcp-xr" attribute parameters applies. For detailed usage of Offer/Answer for unilateral parameters, refer to Section 5.2 of [RFC3611].

4.3. Usage Outside of Offer/Answer

For usage outside of Offer/Answer, refer to Section 5.3 of [RFC3611].

5. IANA Considerations

New report block types for RTCP XR are subject to IANA registration. For general guidelines on IANA allocations for RTCP XR, refer to Section 6.2 of [RFC3611].

5.1. New RTCP XR Block Type Value

This document assigns the block type value 32 "MPEG2 Transport Stream PSI Decodability Statistics Metrics Block" in the "RTCP XR Block Type" subregistry of the IANA "RTP Control Protocol Extended Reports (RTCP XR) Block Type Registry".

5.2. New RTCP XR SDP Parameter

This document also registers a new parameter "ts-psi-decodability" in the "RTCP XR SDP Parameters" subregistry of the "RTP Control Protocol Extended Reports (RTCP XR) Session Description Protocol (SDP) Parameters Registry".

5.3. Contact Information for Registrations

The contact information for the registrations is:

RAI Area Directors <rai-ads@tools.ietf.org>

6. Security Considerations

This proposed RTCP XR block introduces no new security considerations beyond those described in [RFC3611] and [RFC6990].

7. References

7.1. Normative References

[ETSI] ETSI, "Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems", ETSI TR 101 290, June 2014.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC3550] Schulzrinne, H., "RTP: A Transport Protocol for Real-Time Applications", RFC 3550, July 2003, <http://www.rfc-editor.org/info/rfc3550>.

[RFC3611] Friedman, T., Caceres, R., and A. Clark, "RTP Control Protocol Extended Reports (RTCP XR)", RFC 3611, November 2003, <http://www.rfc-editor.org/info/rfc3611>.

[RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", RFC 4566, July 2006, <http://www.rfc-editor.org/info/rfc4566>.

[RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008, <http://www.rfc-editor.org/info/rfc5234>.

7.2. Informative References

[ISO-IEC.13818-1.2007] ISO/IEC, "Information technology - Generic coding of moving pictures and associated audio information - Part 1: Systems", ISO International Standard 13818-1, 2013.

[RFC6390] Clark, A. and B. Claise, "Guidelines for Considering New Performance Metric Development", BCP 170, RFC 6390, October 2011, <http://www.rfc-editor.org/info/rfc6390>.

[RFC6709] Carpenter, B., Aboba, B., and S. Cheshire, "Design Considerations for Protocol Extensions", RFC 6709, September 2012, <http://www.rfc-editor.org/info/rfc6709>.

[RFC6792] Wu, Q., Hunt, G., and P. Arden, "Guidelines for Use of the RTP Monitoring Framework", RFC 6792, November 2012, <http://www.rfc-editor.org/info/rfc6792>.

[RFC6990] Wu, Q., "RTP Control Protocol (RTCP) Extended Report (XR) Block for MPEG2 Transport Stream (TS) Program Specific Information (PSI) Independent Decodability Statistics Metrics reporting", RFC 6990, May 2013, <http://www.rfc-editor.org/info/rfc6990>.

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