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RTP Control Protocol Extended Reports (RTCP XR) VoIP Metrics Management Information Base draft-ietf-avt-rtcp-xr-mib-02.txt

Status of this Memo

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines objects for managing Real-Time Transport Control Protocol Extended Reports (RTCP XR) VoIP Metrics (RFC3611).

Table of Contents

1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

2. Overview

An "RTP System" may be a host end-system that runs an application program that sends or receives RTP data packets, or it may be an intermediate-system that forwards RTP packets. RTP Control Protocol (RTCP) packets are sent by senders and receivers to convey information about RTP packet transmission and reception [RFC3550]. RTCP Extended Report (XR) [RFC3611] packets are sent by receivers to convey additional information about certain types of RTP packet reception.

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.

2.1 Components

The RTCP XR MIB is structured around "Session", "Source", "Destination" and "Receiver" conceptual abstractions.

2.1.1 An RTP Session is an association of two or more participants communicating with RTP. For each participant, the session is defined by a particular pair of destination transport addresses (one network address plus a port pair for RTP and RTCP). The destination transport addresses may be common for all participants, as in the case of IP multicast, or may be different for each, as in the case of individual unicast addresses plus a common port pair," as defined in section 3 of [RFC3550].

2.1.2 A "Sender" is identified within an RTP session by a 32-bit numeric "Synchronization Source," or "SSRC", value and is "...the source of a stream of RTP packets" as defined in section 3 of [RFC3550]. The sender is also a source of RTCP Sender Report packets as specified in section 6 of [RFC3550].

2.1.3 A "Receiver" of a "stream of RTP packets" can be a unicast or multicast Receiver as described in 2.1.1, above. An RTP Receiver has an SSRC value that is unique to the session. An RTP Receiver is a source of RTCP Receiver Reports as specified in section 6 of [RFC3550] and RTCP XR VoIP Metrics Reports as specified in section 4.7 of [RFC3611].

2.2 Applicability of the MIB to RTP System Implementations

The RTCP XR MIB may be used in RTP Host Systems (end systems), see section 3 of [RFC3550], that are supporting Voice over IP (VoIP host systems) or in intermediate systems.

2.2.1 VoIP host Systems are end-systems that may use the RTCP XR MIB to collect RTP Voice over IP session data that the host is sending or receiving; these data may be used by a network manager to detect and diagnose faults that occur over the lifetime of a VoIP session as in a "help-desk" scenario.

2.2.2 Monitors of RTP Voice over IP sessions may be third-party or may be located in the RTP host. Monitors may use the RTCP XR MIB to collect Voice over IP session statistical data; these data may be used by a network manager for planning and other network-management purposes. A Monitor may use the RTCP XR MIB to collect data to permit a network manager to diagnose faults in VoIP sessions.

2.3 The Structure of the RTCP XR MIB

There are four tables in the RTCP XR MIB

The rtcpXrSessionIDtable contains identifying information about each session and about the source and destination.

The rtcpXrBasicParametersTable contains basic packet loss, discard and delay related parameters about a session.

The rtcpXrVoiceQualityMetricTable contains information about the call quality of a session

The rtcpXrHistoryTable contains aggregate information about a group of sessions.

2.4 Relationship to the RTP MIB

The RTP MIB defines a session table, sender and receiver tables and inverse tables to support fast location of session information.

The RTP MIB Version 2 [draft TBD] has a session table that is identical to the session table in the RTCP XR MIB. This is intended to allow implementations that support both the RTP MIB V2 and the RTCP XR MIB to use a common session table.

2.5 Relationship to the RAQMON Architecture

The Real-time Application QoS monitoring (RAQMON) Framework [xxx] defines an architecture that extends the Remote Monitoring (RMON) family of applications for monitoring of application QoS in real time, and an extensible data model with objects carried between RAQMON data sources and RAQMON collectors. The RAQMON work is more generic, and complementary in concept to RTCP-XR, covering a wider range of applications running concurrently, while RTCP-XR focuses on in-depth QoS monitoring of media traffic in VoIP.

The Real-time Application QoS Monitoring (RAQMON) MIB is defined by [xxx] and runs on RAQMON collectors. A performance monitoring application may query (i) RAQMON collectors for RAQMON MIB information about the QoS parameters of multiple concurrent applications (ii) end-points and gateways for in-depth RTCP-XR information about the media QoS of VoIP or (iii) both.

3. Definitions

```
RTCPXR-MIB DEFINITIONS ::= BEGIN
IMPORTS
       mib-2, MODULE-IDENTITY, NOTIFICATION-TYPE,
       OBJECT-TYPE, Unsigned32, Integer32,
       Gauge32, Counter32                    FROM SNMPv2-SMI
       OBJECT-GROUP, MODULE-COMPLIANCE,
       NOTIFICATION-GROUP                    FROM SNMPv2-CONF
       TEXTUAL-CONVENTION, RowPointer, TimeStamp
                                             FROM SNMPv2-TC
       SnmpAdminString                       FROM SNMP-FRAMEWORK-MIB
       InetAddressType, InetAddress,
       InetPortNumber                        FROM INET-ADDRESS-MIB
       ItuPerceivedSeverity                  FROM ITU-ALARM-TC-MIB;

rtcpXrMIB MODULE-IDENTITY
    LAST-UPDATED "200507100000Z"
    ORGANIZATION
        "IETF AVT Working Group"
    CONTACT-INFO
        "IETF AVT Working Group
         Chairs: Colin Perkins, Magnus Westerlund
         Working Group Email:  avt@ietf.org

         Editors: Alan Clark
                  Telchemy
                  Email: alan@telchemy.com

                  Amy Pendleton
                  Nortel Networks
                  Email: aspen@nortelnetworks.com"
   DESCRIPTION
                "RTCP Extended Reports MIB
                Copyright (c) The Internet Society (2005)
                This version of the MIB module is part of
                RFC nnnn and is based on RFC3611."

   REVISION      "200507100000Z"
   DESCRIPTION
                "Initial version, published as RFC nnnn"

-- RFC Ed: replace nnnn (2 occurrences) with the actual RFC number and
-- remove this notice

::= { mib-2 nnn }

-- IANA: need assignment of a mib-2 OID for this MIB
-- RFC Ed: replace mmm with IANA assigned number and remove this note
```

```
-- Description
--    This MIB module provides basic voice quality monitoring
--    capabilities for Voice-over-packet systems. The MIB contains
--    4 tables of information:-
--         a table of call records with session identifying information
--         a table of basic parameters for each session
--         a table of call quality metrics for each session
--         a table of aggregate statistics for groups of calls

--
-- TEXTUAL CONVENTIONS
--

LeveldB ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS      current
DESCRIPTION
      "Represents a signal level in decibels (dB)."
SYNTAX      Integer32 (-120..120|127)

Rfactor ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS      current
DESCRIPTION
      "Call or transmission quality expressed as an
       R factor in the range 0 to 120. A value of
       127 shall be interpreted as NULL or unsupported."
REFERENCE
       "ITU-T G.107"
SYNTAX      Unsigned32 (0..120|127)

ScaledMOSscore ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS      current
DESCRIPTION
       "Call or transmission quality expressed as a
       MOS score scaled by 10.  MOS is typically represented
       as a 1.0 to 5.0 score with a single decimal place and
       hence in this representation as 10 to 50. A value of
       127 shall be interpreted as NULL or unsupported."
REFERENCE
       "ITU-T P.800"
SYNTAX      Integer32 (10..50|127)

Percentage ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS       current
DESCRIPTION
       "Percentage expressed as a rounded integer."
```

```
SYNTAX      Unsigned32 (0..100)

--
-- OBJECTS
--
```

```
rtcpXrEvents      OBJECT IDENTIFIER ::= { rtcpXrMIB 0 }
rtcpXrMIBObjects  OBJECT IDENTIFIER ::= { rtcpXrMIB 1 }
rtcpXrConformance OBJECT IDENTIFIER ::= { rtcpXrMIB 2 }

--
-- Table of Session Identifying information
--

rtcpXrSessionIDTable OBJECT-TYPE
    SYNTAX SEQUENCE OF RtcpXrSessionIDEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
     "Table of information about RTP Sessions for which RTCP XR
     parameters and metrics are available. "
    ::= { rtcpXrMIBObjects 1 }

rtcpXrSessionIDEntry OBJECT-TYPE
    SYNTAX RtcpXrSessionIDEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the table of call records.  A row in this table
         is created for each RTP session endpoint participating."
    INDEX { rtcpXrSessionIDCallState, rtcpXrSessionIDIndex }
    ::= { rtcpXrSessionIDTable 1 }

RtcpXrSessionIDEntry ::= SEQUENCE {
    rtcpXrSessionIDCallState                    INTEGER,
    rtcpXrSessionIDIndex                        Unsigned32,
    rtcpXrSessionIDSessionIdentifier            OCTET STRING,
    rtcpXrSessionIDCallStartTime                TimeStamp,
    rtcpXrSessionIDCallStopTime                 TimeStamp,
    rtcpXrSessionIDSourceIPtype                 InetAddressType,
    rtcpXrSessionIDSourceIPaddress              InetAddress,
    rtcpXrSessionIDSourceRTPport                InetPortNumber,
    rtcpXrSessionIDSourceRTCPport               InetPortNumber,
    rtcpXrSessionIDDestIPtype                   InetAddressType,
    rtcpXrSessionIDDestIPaddress                InetAddress,
    rtcpXrSessionIDDestRTPport                  InetPortNumber,
    rtcpXrSessionIDDestRTCPport                 InetPortNumber,
    rtcpXrSessionIDSrceIdenType                 INTEGER,
    rtcpXrSessionIDSrceIdentifier               OCTET STRING,
    rtcpXrSessionIDDestIdenType                 INTEGER,
    rtcpXrSessionIDDestIdentifier               OCTET STRING,
    rtcpXrSessionIDMeasurePt                    INTEGER,
    rtcpXrSessionIDMeasurePtID                  OCTET STRING,
    rtcpXrSessionIDReverseSession               RowPointer,
    rtcpXrSessionIDAltMeasurePt                 RowPointer
```

```
}
```

```
rtcpXrSessionIDCallState OBJECT-TYPE
    SYNTAX INTEGER { active(1),
                     completed(2)
                    }
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index for this session within the Session ID
         table. The value of this parameter shall be 2 if the
         session is complete or inactive and 1 if the session
         is still active."
    ::= { rtcpXrSessionIDEntry 1 }

rtcpXrSessionIDIndex OBJECT-TYPE
    SYNTAX Unsigned32 (0..4294967295)
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index for this session within the Session ID table."
    ::= { rtcpXrSessionIDEntry 2 }

rtcpXrSessionIDSessionIdentifier OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Unique identifier for this session.  Where a billing record
         correlation identifier is not available for a particular call,
         another identifier such as SSRC can be used."
    ::= { rtcpXrSessionIDEntry 3 }

rtcpXrSessionIDCallStartTime OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Call start time for this call. If the start time is not
         known then this represents the earliest known time associated
         with the call."
    ::= { rtcpXrSessionIDEntry 4 }

rtcpXrSessionIDCallStopTime OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Call stop time for this call. If the call is still active
         then this shall have the value 0.  If the call is complete
         but the time is unknown then this shall have the value of the
```

```
          latest time associated with the call."
    ::= { rtcpXrSessionIDEntry 5 }
```

```
rtcpXrSessionIDSourceIPtype OBJECT-TYPE
    SYNTAX InetAddressType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Source IP address type for this session."
    ::= { rtcpXrSessionIDEntry 6 }

rtcpXrSessionIDSourceIPaddress OBJECT-TYPE
    SYNTAX InetAddress
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Source IP address for this session."
    ::= { rtcpXrSessionIDEntry 7 }

rtcpXrSessionIDSourceRTPport OBJECT-TYPE
    SYNTAX InetPortNumber
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Source UDP port for RTP. A value of 0 indicates
         an unknown port number."
    ::= { rtcpXrSessionIDEntry 8 }

rtcpXrSessionIDSourceRTCPport OBJECT-TYPE
    SYNTAX InetPortNumber
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Source UDP port for RTCP.A value of 0 indicates
         an unknown port number."
    ::= { rtcpXrSessionIDEntry 9 }

rtcpXrSessionIDDestIPtype OBJECT-TYPE
    SYNTAX InetAddressType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Destination IP address type for this session."
    ::= { rtcpXrSessionIDEntry 10 }

rtcpXrSessionIDDestIPaddress OBJECT-TYPE
    SYNTAX InetAddress
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Destination IP address for this session."
    ::= { rtcpXrSessionIDEntry 11 }
```

```
rtcpXrSessionIDDestRTPport OBJECT-TYPE
    SYNTAX InetPortNumber
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Destination UDP port for RTP. A value of 0 indicates
         an unknown port number."
    ::= { rtcpXrSessionIDEntry 12 }

rtcpXrSessionIDDestRTCPport OBJECT-TYPE
    SYNTAX InetPortNumber
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Destination UDP port for RTCP.A value of 0 indicates
         an unknown port number."
    ::= { rtcpXrSessionIDEntry 13 }

rtcpXrSessionIDSrceIdenType  OBJECT-TYPE
    SYNTAX INTEGER {dialedNumber (1),
                    urlID (2),
                    other (3) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Defines the type of address in parameter
        rtcpXrSessionIDSourceIdentifier"
    ::= { rtcpXrSessionIDEntry 14 }

rtcpXrSessionIDSrceIdentifier OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Alternate identifier to the IP address.  This can be E.164,
         DN, or URL."
    ::= { rtcpXrSessionIDEntry 15 }

rtcpXrSessionIDDestIdenType  OBJECT-TYPE
    SYNTAX INTEGER {dialedNumber (1),
                    urlID (2),
                    other (3) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Defines the type of address in parameter
         rtcpXrSessionIDDestIdentifier."
    ::= { rtcpXrSessionIDEntry 16 }
```

```
rtcpXrSessionIDDestIdentifier OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Alternate identifier to the IP address.  This can be E.164,
         DN, or URL."
    ::= { rtcpXrSessionIDEntry 17 }

rtcpXrSessionIDMeasurePt OBJECT-TYPE
    SYNTAX INTEGER {    localEndpoint (1),
                        remoteEndpoint (2),
                        midStream (3)
                   }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Place that these metrics were measured - this endpoint,
         remote endpoint (i.e. reported through XR), or midstream.
         If this MIB is supported in a midstream device (e.g. probe)
         then data from the IP endpoint reported to this device
         using RFC3611 would be described as 'remoteEndpoint' and
         data measured locally would be described as 'midStream'.
         If this MIB is supported in an IP endpoint then the metrics
         obtained from measurement of the incoming stream would be
         'localEndpoint' and those reported via RFC3611 from the
         remote end would be 'remoteEndpoint'.
         This MIB could therefore report both remote and local
         data if located in an IP endpoint or both remote and
         midstream data if located in a probe, router or other
         mid-network device."
    ::= { rtcpXrSessionIDEntry 18 }

rtcpXrSessionIDMeasurePtID OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Information describing the identity of the endpoint that
         measured the data in this row. If the data was measured
         locally then this would be the identity of this system,
         if measured remotely and reported via RFC3611 then this
         would be the identity of the remote measurement point,
         if known."
    ::= { rtcpXrSessionIDEntry 19 }
```

```
rtcpXrSessionIDReverseSession OBJECT-TYPE
    SYNTAX RowPointer
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A pointer to the corresponding entry in this table for
        the reverse direction of transmission. For example, if
        this row contained locally measured metrics for the A->B
        direction of transmission then the reverse session would
        be the row containing locally measured metrics for the
        B->A direction of transmission."
    ::= { rtcpXrSessionIDEntry 20 }

rtcpXrSessionIDAltMeasurePt OBJECT-TYPE
    SYNTAX RowPointer
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A pointer to the corresponding entry in this table for
        alternate measurement point data. For example, if this
        MIB was located in a midstream devices and this row
        contained metrics measured midstream then the alternate
        measurement point would refer to the metrics reported
        by the remote endpoint, and vice versa."
    ::= { rtcpXrSessionIDEntry 21 }


--
-- Table of basic call parameters
--

rtcpXrBaseParamTable OBJECT-TYPE
    SYNTAX SEQUENCE OF RtcpXrBaseParamEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
     "Table of basic parameters related to RTP sessions in
      the Session table. "
    ::= { rtcpXrMIBObjects 2 }

rtcpXrBaseParamEntry OBJECT-TYPE
    SYNTAX RtcpXrBaseParamEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the table of basic parameters. A row in this table
         is created for each RTP session endpoint participating."
    INDEX { rtcpXrSessionIDIndex, rtcpXrSessionIDCallState }
    ::= { rtcpXrBaseParamTable 1 }
```

```
RtcpXrBaseParamEntry ::= SEQUENCE {
    rtcpXrBaseParamVocoderType                  OCTET STRING,
    rtcpXrBaseParamVocoderRate                  Unsigned32,
    rtcpXrBaseParamFrameDuration                Unsigned32,
    rtcpXrBaseParamFramesPerPacket              Unsigned32,
    rtcpXrBaseParamSampleRate                   Unsigned32,
    rtcpXrBaseParamDurationMs                   Counter32,
    rtcpXrBaseParamNetworkLossRate              Percentage,
    rtcpXrBaseParamAvgDiscardRate               Percentage,
    rtcpXrBaseParamBurstLossDensity             Percentage,
    rtcpXrBaseParamBurstLenMs                   Gauge32,
    rtcpXrBaseParamGapLossDensity               Percentage,
    rtcpXrBaseParamGapLenMs                     Gauge32,
    rtcpXrBaseParamAvgOWDelay                   Gauge32,
    rtcpXrBaseParamAvgEndSysDelay               Gauge32,
    rtcpXrBaseParamPlcType                      INTEGER,
    rtcpXrBaseParamJBuffAdaptMode               INTEGER,
    rtcpXrBaseParamJBuffAdaptRate               Unsigned32,
    rtcpXrBaseParamJBuffAverageDelay            Gauge32,
    rtcpXrBaseParamJBuffMaximumDelay            Gauge32,
    rtcpXrBaseParamJBuffAbsMaxDelay             Gauge32,
    rtcpXrBaseParamJitterLevel                  Gauge32
}

rtcpXrBaseParamVocoderType OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..32))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Vocoder type used on this call. The format used shall be
         ITU-T G.7xx, GSM FR, GSM EFR, GSM HR, AMR, AMR WB, iLBC
         or similar.  For example 'ITU G.729A'. "
    ::= { rtcpXrBaseParamEntry 1 }

rtcpXrBaseParamVocoderRate OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Vocoder rate in use at the time this data was captured
         expressed in bits per second.  For example G.711 would
         have the rate 64000 and G.729 would have the rate 8000."
    ::= { rtcpXrBaseParamEntry 2 }
```

```
rtcpXrBaseParamFrameDuration OBJECT-TYPE
    SYNTAX Unsigned32 (0..16384)
    UNITS "sample clock ticks"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Companion information to vocoder type.  This represents the
         duration of the time interval represented by a frame, which
         is generally equivalent to the nominal spacing of frames.
         This is expressed in sample clock ticks as defined under
         rtxpXrSampleRate.
         This parameter may be equated to the SDP ptime parameter
         which is expressed in milliseconds (however which cannot
         represent certain vocoder types, e.g. those with 2.5mS
         frames)."
    ::= { rtcpXrBaseParamEntry 3 }

rtcpXrBaseParamFramesPerPacket OBJECT-TYPE
    SYNTAX Unsigned32 (0..65535)
    UNITS "frames per packet"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Number of vocoder frames for this RTP session contained
         in a single IP packet. The duration of speech per IP
         packet is the product of Frame Duration and Frames Per
         Packet."
    ::= {rtcpXrBaseParamEntry 4 }

rtcpXrBaseParamSampleRate OBJECT-TYPE
    SYNTAX Unsigned32 (0..16777215)
    UNITS "samples per second"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Companion information to vocoder type.  This represents the
         rate at which media was sampled (e.g. 8000 for narrowband
         voice, 16000 for wideband voice)."
    ::= { rtcpXrBaseParamEntry 5 }

rtcpXrBaseParamDurationMs OBJECT-TYPE
    SYNTAX Counter32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Current duration of call in milliseconds if still active,
         duration of call in milliseconds if complete."
```

```
    ::= { rtcpXrBaseParamEntry 6 }
```

```
rtcpXrBaseParamNetworkLossRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average rate of network packet loss."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 7 }

rtcpXrBaseParamAvgDiscardRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average rate of discards due to jitter."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 8 }

rtcpXrBaseParamBurstLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Density of loss and discarded packets during burst periods."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 9 }

rtcpXrBaseParamBurstLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average length of bursts in milliseconds."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 10 }

rtcpXrBaseParamGapLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
```

```
    DESCRIPTION
        "Density of loss and discarded packets during gap periods."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 11 }
```

```
rtcpXrBaseParamGapLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average length of gaps in milliseconds."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 12 }

rtcpXrBaseParamAvgOWDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average (symmetric) one way RTCP delay on call. A value of
         zero may indicate that this value has not yet been determined."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 13 }

rtcpXrBaseParamAvgEndSysDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average end system delay on call. A value of zero may
         indicate that this value has not yet been determined."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 14 }

rtcpXrBaseParamPlcType OBJECT-TYPE
    SYNTAX INTEGER { disabled(1),
                     enhanced(2),
                     standard(3),
                     unspecified (4)}
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Defines type of packet loss concealment used on this call."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry  15 }
```

```
rtcpXrBaseParamJBuffAdaptMode OBJECT-TYPE
    SYNTAX INTEGER { reserved (1),
                     nonAdaptive (2),
                     adaptive (3),
                     unknown (4) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Defines if jitter buffer is in fixed or adaptive mode."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry  16 }

rtcpXrBaseParamJBuffAdaptRate OBJECT-TYPE
    SYNTAX Unsigned32 (0..15)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Estimated adaptation rate of jitter buffer."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= {  rtcpXrBaseParamEntry 17 }

rtcpXrBaseParamJBuffAverageDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average size of jitter buffer in mS."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry 18 }

rtcpXrBaseParamJBuffMaximumDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Maximum delay through jitter buffer at current size in mS."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry  19 }

rtcpXrBaseParamJBuffAbsMaxDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
        "Absolute maximum size jitter buffer can reach in mS."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrBaseParamEntry  20 }
```

```
rtcpXrBaseParamJitterLevel OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Average jitter level measured according to RFC3550 and
         represented in terms of milliseconds."
    REFERENCE
         "See RFC3550 Section 6.4."
    ::= { rtcpXrBaseParamEntry  21 }


--
-- Table of Call Quality Metrics
--

rtcpXrCallQualityTable OBJECT-TYPE
    SYNTAX SEQUENCE OF RtcpXrCallQualityEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
     "Table of voice quality metrics. A row is created
      in this table for each row in the Session table."
    ::= { rtcpXrMIBObjects 3 }

rtcpXrCallQualityEntry OBJECT-TYPE
    SYNTAX RtcpXrCallQualityEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the table of voice quality metrics.  A row in
         this table is created for each row in the Session
         table."
    INDEX { rtcpXrSessionIDIndex, rtcpXrSessionIDCallState }
    ::= { rtcpXrCallQualityTable 1 }

RtcpXrCallQualityEntry ::= SEQUENCE {
    rtcpXrCallQualityNoiseLeveldBm                LeveldB,
    rtcpXrCallQualitySignalLeveldBm               LeveldB,
    rtcpXrCallQualityLocalRERLdB                  LeveldB,
    rtcpXrCallQualityRemoteRERLdB                 LeveldB,
    rtcpXrCallQualityRCQ                          Rfactor,
    rtcpXrCallQualityRLQ                          Rfactor,
    rtcpXrCallQualityExternalRCQ                  Rfactor,
    rtcpXrCallQualityMOSCQ                        ScaledMOSscore,
    rtcpXrCallQualityMOSLQ                        ScaledMOSscore,
    rtcpXrCallQualityAlgorithm                    OCTET STRING
}
```

```
rtcpXrCallQualityNoiseLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Measured received silent period noise level in dBm.
         A value of 127 indicates that this parameter is not
         available.
         In midpoint applications this parameter may not be
         available.  If this is a midstream device and call
         quality metrics were calculated using the value of
         this parameter reported from the endpoint in an
         RTCP XR payload then the value used in this
         calculation MAY be reported."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrCallQualityEntry 1 }

rtcpXrCallQualitySignalLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Measured received signal level during talkspurts in dBm.
         A value of 127 indicates that this parameter is not
         available.
         In midpoint applications this parameter may not be
         available. If this is a midstream device and call
         quality metrics were calculated using the value of
         this parameter reported from the endpoint in an
         RTCP XR payload then the value used in this
         calculation MAY be reported."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrCallQualityEntry 2 }

rtcpXrCallQualityLocalRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Residual Echo Return Loss measured at this endpoint,
         or at the terminating endpoint of this RTP session.
         This relates to the echo level from the network beyond
         the terminating endpoint and may be interpreted as either
         line echo in the case of a gateway or acoustic echo in the
```

case of a handset.

```
          Note that this echo affects conversational quality as
          perceived by the user at the originating end of this
          RTP session.
          A value of 127 indicates that this parameter is not
          available.
          In midpoint applications this parameter may not be
          available.  If this is a midstream device and call
          quality metrics were calculated using the value of
          this parameter reported from the endpoint in an
          RTCP XR payload then the value used in this
          calculation MAY be reported."
      REFERENCE
          "See RFC3611 Section 4.7."
      ::= { rtcpXrCallQualityEntry 3 }

rtcpXrCallQualityRemoteRERLdB OBJECT-TYPE
      SYNTAX LeveldB
      UNITS "dBm"
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
          "Residual Echo Return Loss measured at originating endpoint
          of this RTP session (i.e. the remote endpoint if this MIB
          is implemented in an endpoint).
          Note that this affects the conversational quality
          metrics reported by the terminating (this) endpoint, hence
          is useful in understanding what has affected the reported
          call quality metrics
          A value of 127 indicates that this parameter is not
          available.
          In midpoint applications this parameter may not be
          available.  If this is a midstream device and call
          quality metrics were calculated using the value of
          this parameter reported from the endpoint in an
          RTCP XR payload then the value used in this
          calculation MAY be reported."
      REFERENCE
          "See RFC3611 Section 4.7."
      ::= { rtcpXrCallQualityEntry 4 }

rtcpXrCallQualityRCQ OBJECT-TYPE
      SYNTAX Rfactor
      UNITS "R factor"
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
          "Conversational quality R factor for this call. This value
          SHOULD be calculated using ITU G.107 (The E Model) or
          extended versions thereof."
```

```
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrCallQualityEntry 5 }
```

```
rtcpXrCallQualityRLQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Listening quality R factor for this call. This value
         SHOULD be calculated using ITU G.107 (The E Model) or
         extended versions thereof."
    ::= { rtcpXrCallQualityEntry 6 }

rtcpXrCallQualityExternalRCQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "External R factor for this call. This value
         SHOULD be calculated using ITU G.107 (The E Model) or
         extended versions thereof.
         The External R factor relates to the quality of an
         incoming voice from another network segment.  For example
         if a conference bridge terminates and re-creates voice
         streams then an R factor would be calculated at the bridge
         for the endpoint A to bridge segment and relayed to the
         subsequent bridge to endpoint B as an External R factor.
         This allows endpoint B to estimate the end-to-end call
         quality."
    ::= { rtcpXrCallQualityEntry 7 }

rtcpXrCallQualityMOSCQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Estimated conversational quality MOS for this call
        expressed in MOS x 10 (e.g. 41 = MOS of 4.1). This value
        MAY be calculated by converting the R-CQ value to a MOS."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrCallQualityEntry 8 }

rtcpXrCallQualityMOSLQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
```

```
        "Estimated listening quality MOS for this call
       expressed in MOS x 10 (e.g. 41 = MOS of 4.1). This value
        MAY be calculated by converting the R-CQ value to a MOS."
    REFERENCE
         "See RFC3611 Section 4.7."
    ::= { rtcpXrCallQualityEntry 9 }
```

```
rtcpXrCallQualityAlgorithm OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Call quality algorithm used to determine R factors
        and MOS scores. For example, 'ITU-T G.107' for the
        E model. If any localized parameter scaling is used
        (for example Japan's TTC MOS scaling) then this
        MUST also be reported."
    ::= { rtcpXrCallQualityEntry 10 }
```

```
--
-- History Table
--
--

rtcpXrHistoryTable OBJECT-TYPE
    SYNTAX SEQUENCE OF RtcpXrHistoryEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
     "Table of aggregate measurement data for groups
      of RTP sessions.  A group may be a flow or any
      other logical association of streams."
    ::= { rtcpXrMIBObjects 4 }

rtcpXrHistoryEntry OBJECT-TYPE
    SYNTAX RtcpXrHistoryEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in the table of call history records."
    INDEX { rtcpXrHistoryIndex }
    ::= { rtcpXrHistoryTable 1 }

RtcpXrHistoryEntry ::= SEQUENCE {
    rtcpXrHistoryIndex                      Unsigned32,
    rtcpXrHistoryGroupName                  OCTET STRING,
    rtcpXrHistoryStartTime                  TimeStamp,
    rtcpXrHistoryStopTime                   TimeStamp,
    rtcpXrHistoryNumOfSessions              Counter32,
    rtcpXrHistoryMinDurationMs              Gauge32,
    rtcpXrHistoryMaxDurationMs              Gauge32,
    rtcpXrHistoryAvgDurationMs              Gauge32,
    rtcpXrHistoryMaxNetworkLossRate         Percentage,
    rtcpXrHistoryAvgNetworkLossRate         Percentage,
    rtcpXrHistoryMaxDiscardRate             Percentage,
    rtcpXrHistoryAvgDiscardRate             Percentage,
    rtcpXrHistoryMaxBurstLossDensity        Percentage,
    rtcpXrHistoryAvgBurstLossDensity        Percentage,
    rtcpXrHistoryMinBurstLenMs              Gauge32,
    rtcpXrHistoryMaxBurstLenMs              Gauge32,
    rtcpXrHistoryAvgBurstLenMs              Gauge32,
    rtcpXrHistoryMaxGapLossDensity          Percentage,
    rtcpXrHistoryAvgGapLossDensity          Percentage,
    rtcpXrHistoryMinGapLenMs                Gauge32,
    rtcpXrHistoryMaxGapLenMs                Gauge32,
    rtcpXrHistoryAvgGapLenMs                Gauge32,
    rtcpXrHistoryMinOneWayDelay             Gauge32,
    rtcpXrHistoryMaxOneWayDelay             Gauge32,
```

```
    rtcpXrHistoryAvgOneWayDelay                 Gauge32,
    rtcpXrHistoryOneWayDelayCount               Counter32,
    rtcpXrHistoryMinEndSystemDelay              Gauge32,
    rtcpXrHistoryMaxEndSystemDelay              Gauge32,
```

```
    rtcpXrHistoryAvgEndSystemDelay              Gauge32,
    rtcpXrHistoryEndSystemDelayCount            Counter32,
    rtcpXrHistoryMinJitterLevel                 Gauge32,
    rtcpXrHistoryMaxJitterLevel                 Gauge32,
    rtcpXrHistoryAvgJitterLevel                 Gauge32,
    rtcpXrHistoryMinNoiseLeveldBm               LeveldB,
    rtcpXrHistoryMaxNoiseLeveldBm               LeveldB,
    rtcpXrHistoryAvgNoiseLeveldBm               LeveldB,
    rtcpXrHistoryNoiseLevelCount                Counter32,
    rtcpXrHistoryMinSignalLeveldBm              LeveldB,
    rtcpXrHistoryMaxSignalLeveldBm              LeveldB,
    rtcpXrHistoryAvgSignalLeveldBm              LeveldB,
    rtcpXrHistorySignalLevelCount               Counter32,
    rtcpXrHistoryMinLocalRERLdB                 LeveldB,
    rtcpXrHistoryMaxLocalRERLdB                 LeveldB,
    rtcpXrHistoryAvgLocalRERLdB                 LeveldB,
    rtcpXrHistoryLocalRERLCount                 Counter32,
    rtcpXrHistoryMinRemoteRERLdB                LeveldB,
    rtcpXrHistoryMaxRemoteRERLdB                LeveldB,
    rtcpXrHistoryAvgRemoteRERLdB                LeveldB,
    rtcpXrHistoryRemoteRERLCount                Counter32,
    rtcpXrHistoryMinRCQ                         Rfactor,
    rtcpXrHistoryMaxRCQ                         Rfactor,
    rtcpXrHistoryAvgRCQ                         Rfactor,
    rtcpXrHistoryRCQCount                       Counter32,
    rtcpXrHistoryMinRLQ                         Rfactor,
    rtcpXrHistoryMaxRLQ                         Rfactor,
    rtcpXrHistoryAvgRLQ                         Rfactor,
    rtcpXrHistoryRLQCount                       Counter32,
    rtcpXrHistoryMinMOSCQ                       ScaledMOSscore,
    rtcpXrHistoryMaxMOSCQ                       ScaledMOSscore,
    rtcpXrHistoryAvgMOSCQ                       ScaledMOSscore,
    rtcpXrHistoryMOSCQCount                     Counter32,
    rtcpXrHistoryMinMOSLQ                       ScaledMOSscore,
    rtcpXrHistoryMaxMOSLQ                       ScaledMOSscore,
    rtcpXrHistoryAvgMOSLQ                       ScaledMOSscore,
    rtcpXrHistoryMOSLQCount                     Counter32,
    rtcpXrHistoryCQAlgorithm                    OCTET STRING,
    rtcpXrHistoryReset                          Integer32
}


rtcpXrHistoryIndex OBJECT-TYPE
    SYNTAX Unsigned32 (0..4294967295)
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index for this set of aggregate data."
    ::= { rtcpXrHistoryEntry 1 }
```

```
rtcpXrHistoryGroupName OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..128))
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "Name of this set of aggregate data. Examples may include
         a flow, an interface or some other logical grouping of
         RTP sessions."
    ::= { rtcpXrHistoryEntry 2 }

rtcpXrHistoryStartTime OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Time at which this history was reset or started."
    ::= {rtcpXrHistoryEntry 3 }

rtcpXrHistoryStopTime OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Time at which this history was stopped."
    ::= {rtcpXrHistoryEntry 4 }

rtcpXrHistoryNumOfSessions OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of calls included in this history."
    ::= {rtcpXrHistoryEntry 5 }

rtcpXrHistoryMinDurationMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum duration of calls."
    ::= {rtcpXrHistoryEntry 6 }

rtcpXrHistoryMaxDurationMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
```

```
      "Maximum duration of calls."
    ::= {rtcpXrHistoryEntry 7 }
```

```
rtcpXrHistoryAvgDurationMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average duration of calls."
    ::= {rtcpXrHistoryEntry 8 }

rtcpXrHistoryMaxNetworkLossRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum loss rate per call."
    ::= {rtcpXrHistoryEntry 9 }

rtcpXrHistoryAvgNetworkLossRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average loss rate across calls."
    ::= {rtcpXrHistoryEntry 10 }

rtcpXrHistoryMaxDiscardRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum discard rate per call."
    ::= {rtcpXrHistoryEntry 11 }

rtcpXrHistoryAvgDiscardRate OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average discard rate across calls."
    ::= {rtcpXrHistoryEntry 12 }

rtcpXrHistoryMaxBurstLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
      "Maximum density of bursts if loss/discard."
    ::= {rtcpXrHistoryEntry 13 }
```

```
rtcpXrHistoryAvgBurstLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average density of bursts of loss/discard."
    ::= {rtcpXrHistoryEntry 14 }

rtcpXrHistoryMinBurstLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum length of bursts."
    ::= {rtcpXrHistoryEntry 15 }

rtcpXrHistoryMaxBurstLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum length of bursts."
    ::= {rtcpXrHistoryEntry 16 }

rtcpXrHistoryAvgBurstLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average length of bursts."
    ::= {rtcpXrHistoryEntry 17 }

rtcpXrHistoryMaxGapLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum loss/discard density in gaps."
    ::= {rtcpXrHistoryEntry 18 }

rtcpXrHistoryAvgGapLossDensity OBJECT-TYPE
    SYNTAX Percentage
    UNITS "percent"
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
      "Average loss/discard density in gaps."
    ::= {rtcpXrHistoryEntry 19 }
```

```
rtcpXrHistoryMinGapLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum average per-call gap length."
    ::= {rtcpXrHistoryEntry 20 }

rtcpXrHistoryMaxGapLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum average per-call gap length."
    ::= {rtcpXrHistoryEntry 21 }

rtcpXrHistoryAvgGapLenMs OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average per-call gap length."
    ::= {rtcpXrHistoryEntry 22 }

rtcpXrHistoryMinOneWayDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum one way delay."
    ::= {rtcpXrHistoryEntry 23 }

rtcpXrHistoryMaxOneWayDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum one way delay."
    ::= {rtcpXrHistoryEntry 24 }

rtcpXrHistoryAvgOneWayDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
      "Average one way delay."
    ::= {rtcpXrHistoryEntry 25 }
```

```
rtcpXrHistoryOneWayDelayCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the One Way Delay
       history values (as Delay may not be available on
       all calls."
    ::= {rtcpXrHistoryEntry 26 }

rtcpXrHistoryMinEndSystemDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum end system delay."
    ::= {rtcpXrHistoryEntry 27 }

rtcpXrHistoryMaxEndSystemDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum end system delay."
    ::= {rtcpXrHistoryEntry 28 }

rtcpXrHistoryAvgEndSystemDelay OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average end system delay."
    ::= {rtcpXrHistoryEntry 29 }

rtcpXrHistoryEndSystemDelayCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the End System
       Delay history values (as End System Delay
       may not be available on all calls."
    ::= {rtcpXrHistoryEntry 30 }

rtcpXrHistoryMinJitterLevel OBJECT-TYPE
    SYNTAX Gauge32
```

```
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum jitter level."
    ::= {rtcpXrHistoryEntry 31 }
```

```
rtcpXrHistoryMaxJitterLevel OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum jitter level."
    ::= {rtcpXrHistoryEntry 32 }

rtcpXrHistoryAvgJitterLevel OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "milliseconds"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average jitter level."
    ::= {rtcpXrHistoryEntry 33 }

rtcpXrHistoryMinNoiseLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum noise level."
    ::= {rtcpXrHistoryEntry 34 }

rtcpXrHistoryMaxNoiseLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum noise level."
    ::= {rtcpXrHistoryEntry 35 }

rtcpXrHistoryAvgNoiseLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average noise level."
    ::= {rtcpXrHistoryEntry 36 }

rtcpXrHistoryNoiseLevelCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
```

```
    DESCRIPTION
      "Number of sessions included in the Noise Level
       history values (as Noise Level is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 37 }
```

```
rtcpXrHistoryMinSignalLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum signal level."
    ::= {rtcpXrHistoryEntry 38 }

rtcpXrHistoryMaxSignalLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum signal level."
    ::= {rtcpXrHistoryEntry 39 }

rtcpXrHistoryAvgSignalLeveldBm OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm0"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average signal level."
    ::= {rtcpXrHistoryEntry 40 }

rtcpXrHistorySignalLevelCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the Signal Level
       history values (as Signal Level is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 41 }

rtcpXrHistoryMinLocalRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum local Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 42 }

rtcpXrHistoryMaxLocalRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
```

```
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum local Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 43 }
```

```
rtcpXrHistoryAvgLocalRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average local Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 44 }

rtcpXrHistoryLocalRERLCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the Local RERL
       history values (as Local RERL is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 45 }

rtcpXrHistoryMinRemoteRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum remote Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 46 }

rtcpXrHistoryMaxRemoteRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum remote Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 47 }

rtcpXrHistoryAvgRemoteRERLdB OBJECT-TYPE
    SYNTAX LeveldB
    UNITS "dBm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum remote Residual Echo Return Loss."
    ::= {rtcpXrHistoryEntry 48 }

rtcpXrHistoryRemoteRERLCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
      "Number of sessions included in the Remote RERL
       history values (as Remote RERL is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 49 }
```

```
rtcpXrHistoryMinRCQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum conversational R factor."
    ::= {rtcpXrHistoryEntry 50 }

rtcpXrHistoryMaxRCQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum conversational R factor"
    ::= {rtcpXrHistoryEntry 51 }

rtcpXrHistoryAvgRCQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average conversational R factor"
    ::= {rtcpXrHistoryEntry 52 }

rtcpXrHistoryRCQCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the R CQ
       history values (as R CQ is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 53 }

rtcpXrHistoryMinRLQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum listening quality R factor."
    ::= {rtcpXrHistoryEntry 54 }

rtcpXrHistoryMaxRLQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
```

```
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum listening quality R factor."
    ::= {rtcpXrHistoryEntry 55 }
```

```
rtcpXrHistoryAvgRLQ OBJECT-TYPE
    SYNTAX Rfactor
    UNITS "R factor"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average listening quality R factor."
    ::= {rtcpXrHistoryEntry 56 }

rtcpXrHistoryRLQCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the R LQ
       history values (as R LQ is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 57 }

rtcpXrHistoryMinMOSCQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum conversational quality MOS."
    ::= {rtcpXrHistoryEntry 58 }

rtcpXrHistoryMaxMOSCQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum conversational quality MOS."
    ::= {rtcpXrHistoryEntry 59 }

rtcpXrHistoryAvgMOSCQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average conversational quality MOS."
    ::= {rtcpXrHistoryEntry 60 }

rtcpXrHistoryMOSCQCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
      "Number of sessions included in the MOS CQ
       history values (as MOS CQ is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 61 }
```

```
rtcpXrHistoryMinMOSLQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Minimum listening quality MOS."
    ::= {rtcpXrHistoryEntry 62 }

rtcpXrHistoryMaxMOSLQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Maximum listening quality MOS."
    ::= {rtcpXrHistoryEntry 63 }

rtcpXrHistoryAvgMOSLQ OBJECT-TYPE
    SYNTAX ScaledMOSscore
    UNITS "MOS x 10"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Average listening quality MOS."
    ::= {rtcpXrHistoryEntry 64 }

rtcpXrHistoryMOSLQCount OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Number of sessions included in the MOS LQ
       history values (as MOS LQ is an optional
       parameter and may not be present on all calls."
    ::= {rtcpXrHistoryEntry 65 }

rtcpXrHistoryCQAlgorithm OBJECT-TYPE
    SYNTAX OCTET STRING (SIZE(0..32))
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
      "Call quality algorithm used - must be consistent
       for all calls in this history."
    ::= {rtcpXrHistoryEntry 66 }
```

```
rtcpXrHistoryReset OBJECT-TYPE
    SYNTAX INTEGER { running (1),
                     stop (2),
                     reset (3)
                    }
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
      "Status of this row in the history table.
       Writing a value of 2 to this object MUST cause
       history updates to be stopped for this row. Writing
       a value of 3 to this object MUST cause the history
       row to be reset.
       Reads MUST return a value of 1 if the row is still
       being updated or 2 if the row update has stopped."
    ::= {rtcpXrHistoryEntry 67 }

--
-- Notifications
--

rtcpXrVoipThresholdViolation NOTIFICATION-TYPE
    OBJECTS { rtcpXrVoipAlertSeverity, rtcpXrVoipAlertType,
              rtcpXrVoipAlertInfoType, rtcpXrVoipAlertPointer }
    STATUS current
    DESCRIPTION
        "Notification that voice quality has changed
         Sent immediately when the condition is detected."
    ::= { rtcpXrEvents 1}


rtcpXrEventParam OBJECT IDENTIFIER ::= { rtcpXrEvents 2 }

rtcpXrVoipAlertType OBJECT-TYPE
    SYNTAX SnmpAdminString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Text description of the type of alert.  Where possible,
        this parameter should be populated with the correct
        rtcpXrVoipEntry or rtcpXrVoipHistory description."
    ::= { rtcpXrEventParam 1 }

rtcpXrVoipAlertInfoType OBJECT-TYPE
    SYNTAX INTEGER {  adminStringOnly (1),
                      sessionPointer (2),
                      historyPointer (3)
                   }
    MAX-ACCESS read-only
```

```
    STATUS current
    DESCRIPTION
         "Indicates the type of information returned in the
          rtcpXrVoipAlertInfo parameter."
    ::= { rtcpXrEventParam 2 }
```

```
rtcpXrVoipAlertPointer OBJECT-TYPE
    SYNTAX RowPointer
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
         "Pointer to the table of call session information to
         identify the specific call that triggered the alert."
    ::= { rtcpXrEventParam 3 }

rtcpXrVoipAlertSeverity OBJECT-TYPE
    SYNTAX ItuPerceivedSeverity
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The severity of the alert as defined in ITU-T X.733 and
        RFC3877."
    REFERENCE
        "See Alarm MIB - RFC3877."
    ::= { rtcpXrEventParam 4 }


--
--  MODULE GROUPS
--
-- There are four types of RTCP XR VoIP Metrics System.
--
-- RTCP XR VOIP Metrics Systems MUST implement one of the four
-- identified types of system and SHOULD NOT implement the
-- rtcpXrMinimalCompliance system, which is included only
-- for reasons of compatibility with RFC3611's minimal
-- requirements.
--

       rtcpXrCompliances OBJECT IDENTIFIER ::= { rtcpXrConformance 1 }
       rtcpXrGroups OBJECT IDENTIFIER ::= { rtcpXrConformance 2 }


       rtcpXrFullMetricsCompliance MODULE-COMPLIANCE
           STATUS  current
           DESCRIPTION
               "Describes the requirements for conformance to the
                rtcpXr MIB for VoIP devices that support basic
                reporting."
           MODULE  -- this module
           MANDATORY-GROUPS { rtcpXrSessionIDGroup,
                              rtcpXrBaseParamGroup,
                              rtcpXrCallQualityGroup
                            }
           ::= { rtcpXrCompliances 1 }
```

```
       rtcpXrMetricsAlertsCompliance MODULE-COMPLIANCE
           STATUS  current
           DESCRIPTION
               "Describes the requirements for conformance to the
                rtcpXr MIB for VoIP devices that support reporting
                and alerts."
           MODULE  -- this module
           MANDATORY-GROUPS { rtcpXrSessionIDGroup,
                              rtcpXrBaseParamGroup,
                              rtcpXrCallQualityGroup,
                              rtcpXrNotificationParmsGroup,
                              rtcpXrNotificationsGroup
                            }
           ::= { rtcpXrCompliances 2 }

       rtcpXrMetricsHistoryCompliance MODULE-COMPLIANCE
           STATUS  current
           DESCRIPTION
               "Describes the requirements for conformance to the
                rtcpXr MIB for VoIP devices that support reporting,
                call history and alerts."
           MODULE  -- this module
           MANDATORY-GROUPS { rtcpXrSessionIDGroup,
                              rtcpXrBaseParamGroup,
                              rtcpXrCallQualityGroup,
                              rtcpXrMIBHistoryGroup,
                              rtcpXrNotificationParmsGroup,
                              rtcpXrNotificationsGroup }
           ::= { rtcpXrCompliances 3 }

       rtcpXrHistoryCompliance MODULE-COMPLIANCE
           STATUS  current
           DESCRIPTION
               "Describes the requirements for conformance to the
                rtcpXr MIB for VoIP devices that support only
                call history."
           MODULE  -- this module
           MANDATORY-GROUPS { rtcpXrMIBHistoryGroup
                              }
           ::= { rtcpXrCompliances 4 }

      rtcpXrMinimalCompliance MODULE-COMPLIANCE
           STATUS  current
           DESCRIPTION
               "Describes the minimal requirements for conformance to
                the rtcpXr MIB - NOT RECOMMENDED."
           MODULE  -- this module
           MANDATORY-GROUPS { rtcpXrSessionIDGroup,
                              rtcpXrBaseParamGroup
```

```
                        }
        ::= { rtcpXrCompliances 5 }
```

```
      rtcpXrSessionIDGroup OBJECT-GROUP
           OBJECTS {
                   rtcpXrSessionIDSessionIdentifier,
                   rtcpXrSessionIDCallStartTime,
                   rtcpXrSessionIDCallStopTime,
                   rtcpXrSessionIDSourceIPtype,
                   rtcpXrSessionIDSourceIPaddress,
                   rtcpXrSessionIDSourceRTPport,
                   rtcpXrSessionIDSourceRTCPport,
                   rtcpXrSessionIDDestIPtype,
                   rtcpXrSessionIDDestIPaddress,
                   rtcpXrSessionIDDestRTPport,
                   rtcpXrSessionIDDestRTCPport,
                   rtcpXrSessionIDDestIdentifier,
                   rtcpXrSessionIDDestIdenType,
                   rtcpXrSessionIDSrceIdentifier,
                   rtcpXrSessionIDSrceIdenType,
                   rtcpXrSessionIDMeasurePt,
                   rtcpXrSessionIDMeasurePtID,
                   rtcpXrSessionIDReverseSession,
                   rtcpXrSessionIDAltMeasurePt
                   }
           STATUS current
           DESCRIPTION
               "Session ID objects used in rtcpXr VoIP Metrics MIB"
           ::= { rtcpXrGroups 1 }

      rtcpXrBaseParamGroup OBJECT-GROUP
           OBJECTS {
                   rtcpXrBaseParamVocoderType,
                   rtcpXrBaseParamVocoderRate,
                   rtcpXrBaseParamFrameDuration,
                   rtcpXrBaseParamFramesPerPacket,
                   rtcpXrBaseParamSampleRate,
                   rtcpXrBaseParamDurationMs,
                   rtcpXrBaseParamNetworkLossRate,
                   rtcpXrBaseParamAvgDiscardRate,
                   rtcpXrBaseParamBurstLossDensity,
                   rtcpXrBaseParamBurstLenMs,
                   rtcpXrBaseParamGapLossDensity,
                   rtcpXrBaseParamGapLenMs,
                   rtcpXrBaseParamAvgOWDelay,
                   rtcpXrBaseParamAvgEndSysDelay,
                   rtcpXrBaseParamPlcType,
                   rtcpXrBaseParamJBuffAdaptMode,
                   rtcpXrBaseParamJBuffAdaptRate,
                   rtcpXrBaseParamJBuffAverageDelay,
                   rtcpXrBaseParamJBuffMaximumDelay,
                   rtcpXrBaseParamJBuffAbsMaxDelay,
```

```
            rtcpXrBaseParamJitterLevel
            }
        STATUS current
        DESCRIPTION
            "Objects used in rtcpXr VoIP Metrics MIB"
        ::= { rtcpXrGroups 2 }
```

```
      rtcpXrCallQualityGroup OBJECT-GROUP
           OBJECTS {
                   rtcpXrCallQualityNoiseLeveldBm,
                   rtcpXrCallQualitySignalLeveldBm,
                   rtcpXrCallQualityLocalRERLdB,
                   rtcpXrCallQualityRemoteRERLdB,
                   rtcpXrCallQualityRCQ,
                   rtcpXrCallQualityRLQ,
                   rtcpXrCallQualityExternalRCQ,
                   rtcpXrCallQualityMOSCQ,
                   rtcpXrCallQualityMOSLQ,
                   rtcpXrCallQualityAlgorithm
                   }
           STATUS current
           DESCRIPTION
               "Call quality objects used in rtcpXr VoIP Metrics MIB"
           ::= { rtcpXrGroups 3 }

       rtcpXrMIBHistoryGroup OBJECT-GROUP
           OBJECTS {
                   rtcpXrHistoryGroupName,
                   rtcpXrHistoryStartTime,
                   rtcpXrHistoryStopTime,
                   rtcpXrHistoryNumOfSessions,
                   rtcpXrHistoryMinDurationMs,
                   rtcpXrHistoryMaxDurationMs,
                   rtcpXrHistoryAvgDurationMs,
                   rtcpXrHistoryMaxNetworkLossRate,
                   rtcpXrHistoryAvgNetworkLossRate,
                   rtcpXrHistoryMaxDiscardRate,
                   rtcpXrHistoryAvgDiscardRate,
                   rtcpXrHistoryMaxBurstLossDensity,
                   rtcpXrHistoryAvgBurstLossDensity,
                   rtcpXrHistoryMinBurstLenMs,
                   rtcpXrHistoryMaxBurstLenMs,
                   rtcpXrHistoryAvgBurstLenMs,
                   rtcpXrHistoryMaxGapLossDensity,
                   rtcpXrHistoryAvgGapLossDensity,
                   rtcpXrHistoryMinGapLenMs,
                   rtcpXrHistoryMaxGapLenMs,
                   rtcpXrHistoryAvgGapLenMs,
                   rtcpXrHistoryMinOneWayDelay,
                   rtcpXrHistoryMaxOneWayDelay,
                   rtcpXrHistoryAvgOneWayDelay,
                   rtcpXrHistoryOneWayDelayCount,
                   rtcpXrHistoryMinEndSystemDelay,
                   rtcpXrHistoryMaxEndSystemDelay,
                   rtcpXrHistoryAvgEndSystemDelay,
                   rtcpXrHistoryEndSystemDelayCount,
```

```
                    rtcpXrHistoryAvgJitterLevel,
                    rtcpXrHistoryMinJitterLevel,
```

```
                rtcpXrHistoryMaxJitterLevel,
                rtcpXrHistoryMinNoiseLeveldBm,
                rtcpXrHistoryMaxNoiseLeveldBm,
                rtcpXrHistoryAvgNoiseLeveldBm,
                rtcpXrHistoryNoiseLevelCount,
                rtcpXrHistoryMinSignalLeveldBm,
                rtcpXrHistoryMaxSignalLeveldBm,
                rtcpXrHistoryAvgSignalLeveldBm,
                rtcpXrHistorySignalLevelCount,
                rtcpXrHistoryMinLocalRERLdB,
                rtcpXrHistoryMaxLocalRERLdB,
                rtcpXrHistoryAvgLocalRERLdB,
                rtcpXrHistoryLocalRERLCount,
                rtcpXrHistoryMinRemoteRERLdB,
                rtcpXrHistoryMaxRemoteRERLdB,
                rtcpXrHistoryAvgRemoteRERLdB,
                rtcpXrHistoryRemoteRERLCount,
                rtcpXrHistoryMinRCQ,
                rtcpXrHistoryMaxRCQ,
                rtcpXrHistoryAvgRCQ,
                rtcpXrHistoryRCQCount,
                rtcpXrHistoryMinRLQ,
                rtcpXrHistoryMaxRLQ,
                rtcpXrHistoryAvgRLQ,
                rtcpXrHistoryRLQCount,
                rtcpXrHistoryMinMOSCQ,
                rtcpXrHistoryMaxMOSCQ,
                rtcpXrHistoryAvgMOSCQ,
                rtcpXrHistoryMOSCQCount,
                rtcpXrHistoryMinMOSLQ,
                rtcpXrHistoryMaxMOSLQ,
                rtcpXrHistoryAvgMOSLQ,
                rtcpXrHistoryMOSLQCount,
                rtcpXrHistoryCQAlgorithm,
                rtcpXrHistoryReset
              }
        STATUS current
        DESCRIPTION
            "Objects used in rtcpXr VoIP History MIB"
        ::= { rtcpXrGroups 4 }

    rtcpXrNotificationParmsGroup OBJECT-GROUP
        OBJECTS {
                rtcpXrVoipAlertSeverity,
                rtcpXrVoipAlertType,
                rtcpXrVoipAlertInfoType,
                rtcpXrVoipAlertPointer
                }
        STATUS current
```

```
            DESCRIPTION
                "Notification parameters emitted by a rtcpXr endpoint."
            ::= { rtcpXrGroups 5 }
```

```
      rtcpXrNotificationsGroup NOTIFICATION-GROUP
          NOTIFICATIONS {
                  rtcpXrVoipThresholdViolation
                  }
          STATUS current
          DESCRIPTION
              "Notifications emitted by a rtcpXr endpoint."
          ::= { rtcpXrGroups 6 }


  END
```

4. Security Considerations

Certain MIB objects contain endpoint identifying information:

```
rtcpXrSessionIDSourceIPaddress
rtcpXrSessionIDDestIPaddress
rtcpXrSessionIDSrceIdentifier
rtcpXrSessionIDDestIdentifier
```

Unauthorized exposure of these objects may lead to disclosure of the addresses of the participants in applications, or information about the traffic patents of the applications, which may be considered sensitive in certain environments.

Access to rtcpXrHistoryReset can result in resetting the table of aggregate call quality information, which results in the loss of useful management data.

It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt their values when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

5. IANA Considerations

An OID within the mib-2 tree is requested, following which this note may be deleted.

6. Acknowledgements

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8. Normative References

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