Real-time Application Quality-of-Service Monitoring (RAQMON) MIB

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.
   The document proposes an extension to the Remote Monitoring MIB, RFC
   2819. In particular, it describes managed objects used for real-time
   application Quality of Service (QoS) monitoring.

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1. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in the Internet community.
   In particular, it extends [RFC2819] with managed objects used for
   real-time application QoS monitoring.

   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 [RFC2119].

2. 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].

3. RAQMON Framework

   As outlined in [RFC4710], the RAQMON framework is based on three
   entities:

      - RAQMON Data Source (RDS)

      - RAQMON Report Collector (RRC)

      - RAQMON MIB Structure

   The RAQMON MIB describes information passed between RRCs and a RAQMON
   Application ("RAQMON manager").

4. Structure of the RAQMON MIB

   The RAQMON MIB module is composed of three MIB groups:
   raqmonSession, raqmonException, and raqmonConfig.

   The raqmonSession MIB group incorporates the following tables:

     - The raqmonParticpantTable contains information about
       participants in open and closed (terminated) sessions, including
       parameters of the sessions they are involved in, aggregated
       since the beginning of the session.

     - The raqmonQosTable contains historical information about QoS
       during sessions. The set of parameters represented in this
       table is more restricted, but it includes historical per-
       RAQMON-report information.

     - The raqmonParticpantAddrTable maps participant addresses into
       the indices of the raqmonParticpantTable. This table allows
       management applications to find entries sorted by
       raqmonParticipantAddr rather than raqmonParticipantStartDate.

   The raqmonException MIB group includes a table of filters that
   trigger notifications for sessions with poor QoS.

   The raqmonConfig MIB group includes objects that define the
   configuration of the RAQMON Report Collector.

   This MIB module MUST be implemented by RAQMON Report Collectors.

   A separate MIB module is defined in [RFC4712] for mapping the RAQMON
   PDUs onto an SNMP transport. The MIB module defined in [RFC4712] is
   normally implemented by RAQMON Data Sources (RDS).

5. RAQMON MIB Definitions

   The MIB module herein IMPORTS definitions from the following:
        SNMPv2-SMI [RFC2578]
        SNMPv2-TC [RFC2579]
        SNMPv2-CONF [RFC2580]
        RMON-MIB [RFC2819]
        SNMP-FRAMEWORK-MIB [RFC3411]
        INET-ADDRESS-MIB [RFC4001]

   It also uses REFERENCE clauses to refer to [RFC4710].

   It also mentions [RFC3737] with respect to the MODULE-IDENTITY OID
   allocation.

```
RAQMON-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        OBJECT-GROUP, NOTIFICATION-GROUP, MODULE-COMPLIANCE
            FROM SNMPv2-CONF
        Integer32, Unsigned32,
        Gauge32, Counter32, OBJECT-TYPE,
        MODULE-IDENTITY, NOTIFICATION-TYPE
            FROM SNMPv2-SMI
        InetAddressType, InetAddress, InetPortNumber
            FROM INET-ADDRESS-MIB
                SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB
        rmon
            FROM RMON-MIB
        RowStatus, TruthValue, DateAndTime, RowPointer
            FROM SNMPv2-TC;

    raqmonMIB MODULE-IDENTITY
        LAST-UPDATED "200610100000Z"      -- October 10, 2006
        ORGANIZATION
            "IETF RMON MIB Working Group"
        CONTACT-INFO
            "WG Charter:
             http://www.ietf.org/html.charters/rmonmib-charter.html

             Mailing lists:
                 General Discussion: rmonmib@ietf.org
                 To Subscribe: rmonmib-requests@ietf.org
                 In Body: subscribe your_email_address

             Chair: Andy Bierman
                    Email: ietf@andybierman.com

             Editor: Dan Romascanu
                     Avaya
                     Email:  dromasca@avaya.com"
        DESCRIPTION
            "Real-Time Application QoS Monitoring MIB.

             Copyright (c) The Internet Society (2006).
             This version of this MIB module is part of
             RFC 4711; See the RFC itself for full legal notices."
        REVISION    "200610100000Z"
        DESCRIPTION
            "Initial version, published as RFC 4711."
        ::= { rmon 31 }
  -- This OID allocation conforms to [RFC3737]
```

```
    --
    -- Node definitions
    --
        raqmonNotifications OBJECT IDENTIFIER ::= { raqmonMIB 0 }

        raqmonSessionAlarm NOTIFICATION-TYPE
            OBJECTS { raqmonParticipantAddr,
                raqmonParticipantName,
                raqmonParticipantPeerAddrType,
                raqmonParticipantPeerAddr,
                raqmonQoSEnd2EndNetDelay,
                raqmonQoSInterArrivalJitter,
                raqmonQosLostPackets,
                raqmonQosRcvdPackets }
            STATUS current
            DESCRIPTION
                "A notification generated by an entry in the
                 raqmonSessionExceptionTable."
            ::= { raqmonNotifications 1 }


        raqmonMIBObjects OBJECT IDENTIFIER ::= { raqmonMIB 1 }

        raqmonSession OBJECT IDENTIFIER ::= { raqmonMIBObjects 1 }

        raqmonParticipantTable OBJECT-TYPE
            SYNTAX SEQUENCE OF RaqmonParticipantEntry
            MAX-ACCESS not-accessible
            STATUS current
            DESCRIPTION
                "This table contains information about participants in
                 both active and closed (terminated) sessions."
            ::= { raqmonSession 1 }

        raqmonParticipantEntry OBJECT-TYPE
            SYNTAX RaqmonParticipantEntry
            MAX-ACCESS not-accessible
            STATUS current
            DESCRIPTION
                "Each row contains information for a single session
                 (application) run by one participant.
                 Indexation by the start time of the session aims
                 to ease sorting by management applications.  Agents MUST
                 NOT report identical start times for any two sessions
                 on the same host.
                 Rows are removed for inactive sessions
                 when implementation-specific age or space limits are
                 reached."
```

```
        INDEX { raqmonParticipantStartDate, raqmonParticipantIndex }
        ::= { raqmonParticipantTable 1 }

    RaqmonParticipantEntry ::=
        SEQUENCE {
            raqmonParticipantStartDate     DateAndTime,
            raqmonParticipantIndex         Unsigned32,
            raqmonParticipantReportCaps    BITS,
            raqmonParticipantAddrType      InetAddressType,
            raqmonParticipantAddr          InetAddress,
            raqmonParticipantSendPort      InetPortNumber,
            raqmonParticipantRecvPort      InetPortNumber,
            raqmonParticipantSetupDelay    Integer32,
            raqmonParticipantName          SnmpAdminString,
            raqmonParticipantAppName       SnmpAdminString,
            raqmonParticipantQosCount      Gauge32,
            raqmonParticipantEndDate       DateAndTime,
            raqmonParticipantDestPayloadType  Integer32,
            raqmonParticipantSrcPayloadType   Integer32,
            raqmonParticipantActive        TruthValue,
            raqmonParticipantPeer          RowPointer,
            raqmonParticipantPeerAddrType  InetAddressType,
            raqmonParticipantPeerAddr      InetAddress,
            raqmonParticipantSrcL2Priority    Integer32,
            raqmonParticipantDestL2Priority   Integer32,
            raqmonParticipantSrcDSCP       Integer32,
            raqmonParticipantDestDSCP      Integer32,
            raqmonParticipantCpuMean       Integer32,
            raqmonParticipantCpuMin        Integer32,
            raqmonParticipantCpuMax        Integer32,
            raqmonParticipantMemoryMean    Integer32,
            raqmonParticipantMemoryMin     Integer32,
            raqmonParticipantMemoryMax     Integer32,
            raqmonParticipantNetRTTMean    Integer32,
            raqmonParticipantNetRTTMin     Integer32,
            raqmonParticipantNetRTTMax     Integer32,
            raqmonParticipantIAJitterMean  Integer32,
            raqmonParticipantIAJitterMin   Integer32,
            raqmonParticipantIAJitterMax   Integer32,
            raqmonParticipantIPDVMean      Integer32,
            raqmonParticipantIPDVMin       Integer32,
            raqmonParticipantIPDVMax       Integer32,
            raqmonParticipantNetOwdMean    Integer32,
            raqmonParticipantNetOwdMin     Integer32,
            raqmonParticipantNetOwdMax     Integer32,
            raqmonParticipantAppDelayMean  Integer32,
            raqmonParticipantAppDelayMin   Integer32,
            raqmonParticipantAppDelayMax   Integer32,
```

```
            raqmonParticipantPacketsRcvd    Integer32,
            raqmonParticipantPacketsSent    Integer32,
            raqmonParticipantOctetsRcvd     Integer32,
            raqmonParticipantOctetsSent     Integer32,
            raqmonParticipantLostPackets    Integer32,
            raqmonParticipantLostPacketsFrct  Integer32,
            raqmonParticipantDiscards       Integer32,
            raqmonParticipantDiscardsFrct   Integer32
          }

    raqmonParticipantStartDate OBJECT-TYPE
        SYNTAX DateAndTime
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The date and time of this entry.
             It will be the date and time
             of the first report received."
        ::= { raqmonParticipantEntry 1 }

    raqmonParticipantIndex OBJECT-TYPE
        SYNTAX Unsigned32 (1..2147483647)
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The index of the conceptual row, which is for SNMP
             purposes only and has no relation to any protocol value.

             There is no requirement that these rows be created or
             maintained sequentially.  The index will be unique for a
             particular date and time."
        ::= { raqmonParticipantEntry 2 }

    raqmonParticipantReportCaps   OBJECT-TYPE
        SYNTAX        BITS {
            raqmonPartRepDsrcName(0),
            raqmonPartRepRecvName(1),
            raqmonPartRepDsrcPort(2),
            raqmonPartRepRecvPort(3),
            raqmonPartRepSetupTime(4),
            raqmonPartRepSetupDelay(5),
            raqmonPartRepSessionDuration(6),
            raqmonPartRepSetupStatus(7),
            raqmonPartRepRTEnd2EndNetDelay(8),
            raqmonPartRepOWEnd2EndNetDelay(9),
            raqmonPartApplicationDelay(10),
            raqmonPartRepIAJitter(11),
            raqmonPartRepIPDV(12),
```

```
            raqmonPartRepRcvdPackets(13),
            raqmonPartRepRcvdOctets(14),
            raqmonPartRepSentPackets(15),
            raqmonPartRepSentOctets(16),
            raqmonPartRepCumPacketsLoss(17),
            raqmonPartRepFractionPacketsLoss(18),
            raqmonPartRepCumDiscards(19),
            raqmonPartRepFractionDiscards(20),
            raqmonPartRepSrcPayloadType(21),
            raqmonPartRepDestPayloadType(22),
            raqmonPartRepSrcLayer2Priority(23),
            raqmonPartRepSrcTosDscp(24),
            raqmonPartRepDestLayer2Priority(25),
            raqmonPartRepDestTosDscp(26),
            raqmonPartRepCPU(27),
            raqmonPartRepMemory(28),
            raqmonPartRepAppName(29)
            }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The Report capabilities of the participant, as perceived
         by the Collector.

         If the participant can report the Data Source Name as
         defined in [RFC4710], Section 5.3, then the
         raqmonPartRepDsrcName bit will be set.

         If the participant can report the Receiver Name as
         defined in [RFC4710], Section 5.4, then the
         raqmonPartRepRecvName bit will be set.

         If the participant can report the Data Source Port as
         defined in [RFC4710], Section 5.5, then the
         raqmonPartRepDsrcPort bit will be set.

         If the participant can report the Receiver Port as
         defined in [RFC4710], Section 5.6, then the
         raqmonPartRepRecvPort bit will be set.

         If the participant can report the Session Setup Time as
         defined in [RFC4710], Section 5.7, then the
         raqmonPartRepSetupTime bit will be set.

         If the participant can report the Session Setup Delay as
         defined in [RFC4710], Section 5.8, then the
         raqmonPartRepSetupDelay bit will be set.
```

If the participant can report the Session Duration as
defined in [RFC4710], Section 5.9, then the
raqmonPartRepSessionDuration bit will be set.

If the participant can report the Setup Status as
defined in [RFC4710], Section 5.10, then the
raqmonPartRepSetupStatus bit will be set.

If the participant can report the Round-Trip End-to-end
Network Delay as defined in [RFC4710], Section 5.11,
then the raqmonPartRepRTEnd2EndNetDelay bit will be set.

If the participant can report the One-way End-to-end
Network Delay as defined in [RFC4710], Section 5.12,
then the raqmonPartRepOWEnd2EndNetDelay bit will be set.

If the participant can report the Application Delay as
defined in [RFC4710], Section 5.13, then the
raqmonPartApplicationDelay bit will be set.

If the participant can report the Inter-Arrival Jitter
as defined in [RFC4710], Section 5.14, then the
raqmonPartRepIAJitter bit will be set.

If the participant can report the IP Packet Delay
Variation as defined in [RFC4710], Section 5.15, then
the raqmonPartRepIPDV bit will be set.

If the participant can report the number of application
packets received as defined in [RFC4710], Section 5.16,
then the raqmonPartRepRcvdPackets bit will be set.

If the participant can report the number of application
octets received as defined in [RFC4710], Section 5.17,
then the raqmonPartRepRcvdOctets bit will be set.

If the participant can report the number of application
packets sent as defined in [RFC4710], Section 5.18, then
the raqmonPartRepSentPackets bit will be set.

If the participant can report the number of application
octets sent as defined in [RFC4710], Section 5.19, then
the raqmonPartRepSentOctets bit will be set.

If the participant can report the number of cumulative
packets lost as defined in [RFC4710], Section 5.20, then
the raqmonPartRepCumPacketsLoss bit will be set.

If the participant can report the fraction of packet
loss as defined in [RFC4710], Section 5.21, then the
raqmonPartRepFractionPacketsLoss bit will be set.

If the participant can report the number of cumulative
discards as defined in [RFC4710], Section 5.22, then the
raqmonPartRepCumDiscards bit will be set.

If the participant can report the fraction of discards
as defined in [RFC4710], Section 5.23, then the
raqmonPartRepFractionDiscards bit will be set.

If the participant can report the Source Payload Type as
defined in [RFC4710], Section 5.24, then the
raqmonPartRepSrcPayloadType bit will be set.

If the participant can report the Destination Payload
Type as defined in [RFC4710], Section 5.25, then the
raqmonPartRepDestPayloadType bit will be set.

If the participant can report the Source Layer 2
Priority as defined in [RFC4710], Section 5.26, then the
raqmonPartRepSrcLayer2Priority bit will be set.

If the participant can report the Source DSCP/ToS value
as defined in [RFC4710], Section 5.27, then the
raqmonPartRepSrcToSDscp bit will be set.

If the participant can report the Destination Layer 2
Priority as defined in [RFC4710], Section 5.28, then the
raqmonPartRepDestLayer2Priority bit will be set.

If the participant can report the Destination DSCP/ToS
Value as defined in [RFC4710], Section 5.29, then the
raqmonPartRepDestToSDscp bit will be set.

If the participant can report the CPU utilization as
defined in [RFC4710], Section 5.30, then the
raqmonPartRepCPU bit will be set.

If the participant can report the memory utilization as
defined in [RFC4710], Section 5.31, then the
raqmonPartRepMemory bit will be set.

If the participant can report the Application Name as
defined in [RFC4710], Section 5.32, then the
raqmonPartRepAppName bit will be set.

                    The capability of reporting of a specific metric does
                    not mandate that the metric must be reported permanently
                    by the data source to the respective collector. Some
                    data sources MAY be configured not to send a metric, or
                    some metrics may not be relevant to the specific
                    application."
               ::= { raqmonParticipantEntry 3 }

        raqmonParticipantAddrType OBJECT-TYPE
               SYNTAX InetAddressType
               MAX-ACCESS read-only
               STATUS current
               DESCRIPTION
                    "The type of the Internet address of the participant for
                    this session."
               ::= { raqmonParticipantEntry 4 }

        raqmonParticipantAddr OBJECT-TYPE
               SYNTAX InetAddress
               MAX-ACCESS read-only
               STATUS current
               DESCRIPTION
                    "The Internet Address of the participant for this
                    session. Formatting of this object is determined
                    by the value of raqmonParticipantAddrType."
               ::= { raqmonParticipantEntry 5 }

        raqmonParticipantSendPort OBJECT-TYPE
               SYNTAX InetPortNumber
               MAX-ACCESS read-only
               STATUS current
               DESCRIPTION
                    "Port from which session data is sent.
                    If the value was not reported to the collector,
                    this object will have the value 0."
               REFERENCE
                    "Section 5.5 of the [RFC4710]"
               ::= { raqmonParticipantEntry 6 }

        raqmonParticipantRecvPort OBJECT-TYPE
               SYNTAX InetPortNumber
               MAX-ACCESS read-only
               STATUS current
               DESCRIPTION
                    "Port on which session data is received.
                    If the value was not reported to the collector,
                    this object will have the value 0."
               REFERENCE

```
             "Section 5.6 of the [RFC4710]"
         ::= { raqmonParticipantEntry 7 }

     raqmonParticipantSetupDelay OBJECT-TYPE
         SYNTAX Integer32 (-1|0..2147483647)
         UNITS  "milliseconds"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Session setup time.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.8 of the [RFC4710]"
         ::= { raqmonParticipantEntry 8 }

     raqmonParticipantName OBJECT-TYPE
         SYNTAX SnmpAdminString
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "The data source name for the participant."
         REFERENCE
             "Section 5.3 of the [RFC4710]"
        ::= { raqmonParticipantEntry 9 }

     raqmonParticipantAppName OBJECT-TYPE
         SYNTAX SnmpAdminString
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "A string giving the name and possibly the version
              of the application generating the stream, e.g.,
              'videotool 1.2.'

              This information may be useful for debugging purposes
              and is similar to the Mailer or Mail-System-Version SMTP
              headers.  The tool value is expected to remain constant
              for the duration of the session."
         REFERENCE
             "Section 5.32 of the [RFC4710]"
         ::= { raqmonParticipantEntry 10 }

     raqmonParticipantQosCount OBJECT-TYPE
         SYNTAX Gauge32
         UNITS  "entries"
         MAX-ACCESS read-only
         STATUS current
```

```
        DESCRIPTION
            "The current number of entries in the raqmonQosTable
             for this participant and session."
        ::= { raqmonParticipantEntry 11 }

    raqmonParticipantEndDate OBJECT-TYPE
        SYNTAX DateAndTime
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The date and time of the most recent report received."
        ::= { raqmonParticipantEntry 12 }

    raqmonParticipantDestPayloadType OBJECT-TYPE
        SYNTAX Integer32 (-1|0..127)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Destination Payload Type.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "RFC 3551 and Section 5.25 of the [RFC4710]"
        ::= { raqmonParticipantEntry 13 }

    raqmonParticipantSrcPayloadType OBJECT-TYPE
        SYNTAX Integer32 (-1|0..127)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Source Payload Type.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "RFC 3551 and Section 5.24 of the [RFC4710]"
        ::= { raqmonParticipantEntry 14 }

    raqmonParticipantActive OBJECT-TYPE
        SYNTAX TruthValue
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Value 'true' indicates that the session
             for this participant is active (open).
             Value 'false' indicates that the session
             is closed (terminated)."
        ::= { raqmonParticipantEntry 15 }
```

```
     raqmonParticipantPeer OBJECT-TYPE
         SYNTAX RowPointer
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "The pointer to the corresponding entry in this table for
              the other peer participant.  If there is no such entry
              in the participant table of the collector represented by
              this SNMP agent, then the value will be { 0 0 }.
             "
         ::= { raqmonParticipantEntry 16 }

      raqmonParticipantPeerAddrType OBJECT-TYPE
         SYNTAX InetAddressType
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "The type of the Internet address of the peer participant
              for this session."
         ::= { raqmonParticipantEntry 17 }

     raqmonParticipantPeerAddr OBJECT-TYPE
         SYNTAX InetAddress
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "The Internet Address of the peer participant for this
              session.  Formatting of this object is determined by
              the value of raqmonParticipantPeerAddrType."
         ::= { raqmonParticipantEntry 18 }

     raqmonParticipantSrcL2Priority OBJECT-TYPE
         SYNTAX Integer32 (-1|0..7)
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Source Layer 2 Priority.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.26 of the [RFC4710]"
         ::= { raqmonParticipantEntry 19 }

      raqmonParticipantDestL2Priority OBJECT-TYPE
         SYNTAX Integer32 (-1|0..7)
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
```

```
             "Destination Layer 2 Priority.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.28 of the [RFC4710]"
         ::= { raqmonParticipantEntry 20 }

   raqmonParticipantSrcDSCP OBJECT-TYPE
         SYNTAX Integer32 (-1|0..63)
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Source Layer 3 DSCP value.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.27 of the [RFC4710]"
         ::= { raqmonParticipantEntry 21 }

   raqmonParticipantDestDSCP OBJECT-TYPE
         SYNTAX Integer32  (-1|0..63)
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Destination Layer 3 DSCP value."
         REFERENCE
             "Section 5.29 of the [RFC4710]"
         ::= { raqmonParticipantEntry 22 }

   raqmonParticipantCpuMean OBJECT-TYPE
         SYNTAX Integer32 (-1|0..100)
         UNITS  "percents"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Mean CPU utilization.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.30 of the [RFC4710]"
         ::= { raqmonParticipantEntry 23 }

   raqmonParticipantCpuMin OBJECT-TYPE
         SYNTAX Integer32 (-1|0..100)
         UNITS  "percents"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
```

```
         "Minimum CPU utilization.
          If the value was not reported to the collector,
          this object will have the value -1."
     REFERENCE
         "Section 5.30 of the [RFC4710]"
     ::= { raqmonParticipantEntry 24 }

raqmonParticipantCpuMax OBJECT-TYPE
    SYNTAX Integer32 (-1|0..100)
    UNITS  "percents"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Maximum CPU utilization.
         If the value was not reported to the collector,
         this object will have the value -1."
    REFERENCE
        "Section 5.30 of the [RFC4710]"
    ::= { raqmonParticipantEntry 25 }

raqmonParticipantMemoryMean OBJECT-TYPE
    SYNTAX Integer32 (-1|0..100)
    UNITS  "percents"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Mean memory utilization.
         If the value was not reported to the collector,
         this object will have the value -1."
    REFERENCE
        "Section 5.31 of the [RFC4710]"
    ::= { raqmonParticipantEntry 26 }

raqmonParticipantMemoryMin OBJECT-TYPE
    SYNTAX Integer32 (-1|0..100)
    UNITS  "percents"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Minimum memory utilization.
         If the value was not reported to the collector,
         this object will have the value -1."
    REFERENCE
        "Section 5.31 of the [RFC4710]"
    ::= { raqmonParticipantEntry 27 }

raqmonParticipantMemoryMax OBJECT-TYPE
    SYNTAX Integer32 (-1|0..100)
```

           UNITS "percents"
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
               "Maximum memory utilization.
                If the value was not reported to the collector,
                this object will have the value -1."
           REFERENCE
               "Section 5.31 of the [RFC4710]"
           ::= { raqmonParticipantEntry 28 }

       raqmonParticipantNetRTTMean OBJECT-TYPE
           SYNTAX Integer32 (-1|0..2147483647)
           UNITS "milliseconds"
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
               "Mean round-trip end-to-end network
                delay over the entire session.
                If the value was not reported to the collector,
                this object will have the value -1."
           REFERENCE
               "Section 5.11 of the [RFC4710]"
           ::= { raqmonParticipantEntry 29 }

       raqmonParticipantNetRTTMin OBJECT-TYPE
           SYNTAX Integer32 (-1|0..2147483647)
           UNITS "milliseconds"
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
               "Minimum round-trip end-to-end network delay
                over the entire session.
                If the value was not reported to the collector,
                this object will have the value -1."
           REFERENCE
               "Section 5.11 of the [RFC4710]"
           ::= { raqmonParticipantEntry 30 }

       raqmonParticipantNetRTTMax OBJECT-TYPE
           SYNTAX Integer32 (-1|0..2147483647)
           UNITS "milliseconds"
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
               "Maximum round-trip end-to-end network delay
                over the entire session.
                If the value was not reported to the collector,

```
            this object will have the value -1."
        REFERENCE
            "Section 5.11 of the [RFC4710]"
        ::= { raqmonParticipantEntry 31 }


    raqmonParticipantIAJitterMean OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Mean inter-arrival jitter over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.14 of the [RFC4710]"
        ::= { raqmonParticipantEntry 32 }


    raqmonParticipantIAJitterMin OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Minimum inter-arrival jitter over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.14 of the [RFC4710]"
        ::= { raqmonParticipantEntry 33 }


    raqmonParticipantIAJitterMax OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Maximum inter-arrival jitter over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.14 of the [RFC4710]"
        ::= { raqmonParticipantEntry 34 }


    raqmonParticipantIPDVMean OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
```

```
        STATUS current
        DESCRIPTION
            "Mean IP packet delay variation over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.15 of the [RFC4710]"
        ::= { raqmonParticipantEntry 35 }

    raqmonParticipantIPDVMin OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Minimum IP packet delay variation over the entire
             session.  If the value was not reported to the
             collector, this object will have the value -1."
        REFERENCE
            "Section 5.15 of the [RFC4710]"
        ::= { raqmonParticipantEntry 36 }

    raqmonParticipantIPDVMax OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Maximum IP packet delay variation over the entire
             session.  If the value was not reported to the
             collector, this object will have the value -1."
        REFERENCE
            "Section 5.15 of the [RFC4710]"
        ::= { raqmonParticipantEntry 37 }

    raqmonParticipantNetOwdMean OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Mean Network one-way delay over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.12 of the [RFC4710]"
        ::= { raqmonParticipantEntry 38 }
```

```
      raqmonParticipantNetOwdMin OBJECT-TYPE
          SYNTAX Integer32 (-1|0..2147483647)
          UNITS  "milliseconds"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Minimum Network one-way delay over the entire session.
               If the value was not reported to the collector,
               this object will have the value -1."
          REFERENCE
              "Section 5.12 of the [RFC4710]"
          ::= { raqmonParticipantEntry 39 }

      raqmonParticipantNetOwdMax OBJECT-TYPE
          SYNTAX Integer32 (-1|0..2147483647)
          UNITS  "milliseconds"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Maximum Network one-way delay over the entire session.
               If the value was not reported to the collector,
               this object will have the value -1."
          REFERENCE
              "Section 5.1 of the [RFC4710]"
          ::= { raqmonParticipantEntry 40 }

      raqmonParticipantAppDelayMean OBJECT-TYPE
          SYNTAX Integer32 (-1|0..2147483647)
          UNITS  "milliseconds"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Mean application delay over the entire session.
               If the value was not reported to the collector,
               this object will have the value -1."
          REFERENCE
              "Section 5.13 of the [RFC4710]"
          ::= { raqmonParticipantEntry 41 }

      raqmonParticipantAppDelayMin OBJECT-TYPE
          SYNTAX Integer32 (-1|0..2147483647)
          UNITS  "milliseconds"
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Minimum application delay over the entire session.
               If the value was not reported to the collector,
               this object will have the value -1."
```

```
        REFERENCE
            "Section 5.13 of the [RFC4710]"
        ::= { raqmonParticipantEntry 42 }

    raqmonParticipantAppDelayMax OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Maximum application delay over the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.13 of the [RFC4710]"
        ::= { raqmonParticipantEntry 43 }

    raqmonParticipantPacketsRcvd OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Count of packets received for the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.16 of the [RFC4710]"
        ::= { raqmonParticipantEntry 44 }

    raqmonParticipantPacketsSent OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Count of packets sent for the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.17 of the [RFC4710]"
        ::= { raqmonParticipantEntry 45 }

    raqmonParticipantOctetsRcvd OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS  "Octets"
        MAX-ACCESS read-only
        STATUS current
```

        DESCRIPTION
            "Count of octets received for the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.18 of the [RFC4710]"
        ::= { raqmonParticipantEntry 46 }

    raqmonParticipantOctetsSent OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS "Octets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Count of octets sent for the entire session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.19 of the [RFC4710]"
        ::= { raqmonParticipantEntry 47 }

    raqmonParticipantLostPackets OBJECT-TYPE
        SYNTAX Integer32 (-1|0..2147483647)
        UNITS "packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Count of packets lost by this receiver for the entire
             session.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.20 of the [RFC4710]"
        ::= { raqmonParticipantEntry 48 }

    raqmonParticipantLostPacketsFrct OBJECT-TYPE
        SYNTAX Integer32 (-1|0..100)
        UNITS "percents"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Fraction of lost packets out of total packets received.
             If the value was not reported to the collector,
             this object will have the value -1."
        REFERENCE
            "Section 5.21 of the [RFC4710]"
        ::= { raqmonParticipantEntry 49 }

```
     raqmonParticipantDiscards OBJECT-TYPE
         SYNTAX Integer32 (-1|0..2147483647)
         UNITS  "packets"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Count of packets discarded by this receiver for the
              entire session.
              If the value was not reported to the collector,
              this object will have the value -1."
         REFERENCE
             "Section 5.22 of the [RFC4710]"
         ::= { raqmonParticipantEntry 50 }

     raqmonParticipantDiscardsFrct OBJECT-TYPE
         SYNTAX Integer32 (-1|0..100)
         UNITS  "percents"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Fraction of discarded packets out of total packets
              received.  If the value was not reported to the
              collector, this object will have the value -1."
         REFERENCE
             "Section 5.23 of the [RFC4710]"
         ::= { raqmonParticipantEntry 51 }


 raqmonQosTable OBJECT-TYPE
         SYNTAX SEQUENCE OF RaqmonQosEntry
         MAX-ACCESS not-accessible
         STATUS current
         DESCRIPTION
             "Table of historical information about quality-of-service
              data during sessions."
         ::= { raqmonSession 2 }

     raqmonQosEntry OBJECT-TYPE
         SYNTAX RaqmonQosEntry
         MAX-ACCESS not-accessible
         STATUS current
         DESCRIPTION
             "Each entry contains information from a single RAQMON
              packet, related to a single session
              (application) run by one participant.
              Indexation by the start time of the session aims
              to ease sorting by management applications.  Agents MUST
              NOT report identical start times for any two sessions
```

```
            on the same host.
            Rows are removed for inactive sessions when
            implementation-specific time or space limits are
            reached."
        INDEX { raqmonParticipantStartDate,
              raqmonParticipantIndex,
              raqmonQosTime }
        ::= { raqmonQosTable 1 }

   RaqmonQosEntry ::=
        SEQUENCE {
            raqmonQosTime           Unsigned32,
            raqmonQoSEnd2EndNetDelay          Integer32,
            raqmonQoSInterArrivalJitter       Integer32,
            raqmonQosRcvdPackets    Integer32,
            raqmonQosRcvdOctets     Integer32,
            raqmonQosSentPackets    Integer32,
            raqmonQosSentOctets     Integer32,
            raqmonQosLostPackets    Integer32,
            raqmonQosSessionStatus SnmpAdminString
            }

   raqmonQosTime OBJECT-TYPE
        SYNTAX Unsigned32 (0..2147483647)
        UNITS  "seconds"
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "Time of this entry measured from the start of the
             corresponding participant session."
        ::= { raqmonQosEntry 1 }

   raqmonQoSEnd2EndNetDelay OBJECT-TYPE
        SYNTAX Integer32 (-1 | 0..2147483647)
        UNITS  "milliseconds"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The round-trip time.
             Will contain the previous value if there was no report
             for this time, or -1 if the value has never
             been reported."
        REFERENCE
            "Section 5.11 of the [RFC4710]"
        ::= { raqmonQosEntry 2 }

   raqmonQoSInterArrivalJitter OBJECT-TYPE
        SYNTAX Integer32 (-1 | 0..2147483647)
```

```
         UNITS  "milliseconds"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "An estimate of delay variation as observed by this
              receiver.  Will contain the previous value if there
              was no report for this time, or -1 if the value
              has never been reported."
         REFERENCE
             "Section 5.14 of the [RFC4710]"
         ::= { raqmonQosEntry 3 }

     raqmonQosRcvdPackets OBJECT-TYPE
         SYNTAX Integer32 (-1 | 0..2147483647)
         UNITS  "packets"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Count of packets received by this receiver since the
              previous entry.  Will contain the previous value if
              there was no report for this time, or -1 if the value
              has never been reported."
         REFERENCE
             "Section 5.16 of the [RFC4710]"
     ::= { raqmonQosEntry 4 }

     raqmonQosRcvdOctets OBJECT-TYPE
         SYNTAX Integer32 (-1 | 0..2147483647)
         UNITS  "octets"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Count of octets received by this receiver since the
              previous report.  Will contain the previous value if
              there was no report for this time, or -1 if the value
              has never been reported."
             REFERENCE
                   "Section 5.18 of the [RFC4710]"
         ::= { raqmonQosEntry 5 }

     raqmonQosSentPackets OBJECT-TYPE
         SYNTAX Integer32 (-1 | 0..2147483647)
         UNITS  "packets"
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
             "Count of packets sent since the previous report.
              Will contain the previous value if there
```

                 was no report for this time, or -1 if the value
                 has never been reported."
           REFERENCE
               "Section 5.17 of the [RFC4710]"
        ::= { raqmonQosEntry 6 }

        raqmonQosSentOctets OBJECT-TYPE
            SYNTAX Integer32 (-1 | 0..2147483647)
            UNITS "octets"
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "Count of octets sent since the previous report.
                 Will contain the previous value if there
                 was no report for this time, or -1 if the value
                 has never been reported."
            REFERENCE
                "Section 5.19 of the [RFC4710]"
            ::= { raqmonQosEntry 7 }

        raqmonQosLostPackets OBJECT-TYPE
            SYNTAX Integer32 (-1 | 0..2147483647)
            UNITS "packets"
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "A count of packets lost as observed by this receiver
                 since the previous report. Will contain the previous
                 value if there was no report for this time, or -1 if
                 the value has never been reported."
            REFERENCE
                "Section 5.20 of the [RFC4710]"
        ::= { raqmonQosEntry 8 }

        raqmonQosSessionStatus OBJECT-TYPE
            SYNTAX SnmpAdminString
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "The session status. Will contain the previous value
                 if there was no report for this time or the zero-length
                 string if no value was ever reported."
            REFERENCE
                "Section 5.10 of the [RFC4710]"
            ::= { raqmonQosEntry 9 }

        raqmonParticipantAddrTable OBJECT-TYPE

```
        SYNTAX SEQUENCE OF RaqmonParticipantAddrEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "Maps raqmonParticipantAddr to the index of the
             raqmonParticipantTable.  This table allows
             management applications to find entries
             sorted by raqmonParticipantAddr rather than
             raqmonParticipantStartDate."
        ::= { raqmonSession 3 }

    raqmonParticipantAddrEntry OBJECT-TYPE
        SYNTAX RaqmonParticipantAddrEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "Each entry corresponds to exactly one entry in the
             raqmonParticipantEntry: the entry containing the
             index pair raqmonParticipantStartDate,
             raqmonParticipantIndex.

             Note that there is no concern about the indexation of
             this table exceeding the limits defined by RFC 2578,
             Section 3.5.  According to [RFC4710], Section
             5.1, only IPv4 and IPv6 addresses can be reported as
             participant addresses."
        INDEX { raqmonParticipantAddrType,
                raqmonParticipantAddr,
                raqmonParticipantStartDate,
                raqmonParticipantIndex }
        ::= { raqmonParticipantAddrTable 1 }

    RaqmonParticipantAddrEntry ::=
        SEQUENCE { raqmonParticipantAddrEndDate DateAndTime }

    raqmonParticipantAddrEndDate OBJECT-TYPE
        SYNTAX DateAndTime
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The value of raqmonParticipantEndDate for the
             corresponding raqmonParticipantEntry."
        ::= { raqmonParticipantAddrEntry 1 }


    raqmonException OBJECT IDENTIFIER ::= { raqmonMIBObjects 2 }

    raqmonSessionExceptionTable OBJECT-TYPE
```

```
        SYNTAX SEQUENCE OF RaqmonSessionExceptionEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "This table defines thresholds for the management
             station to get notifications about sessions that
             encountered poor quality of service.

             The information in this table MUST be persistent
             across agent reboots."
        ::= { raqmonException 2 }

    raqmonSessionExceptionEntry OBJECT-TYPE
        SYNTAX RaqmonSessionExceptionEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "A conceptual row in the raqmonSessionExceptionTable."
        INDEX { raqmonSessionExceptionIndex }
        ::= { raqmonSessionExceptionTable 1 }

    RaqmonSessionExceptionEntry ::=
        SEQUENCE {
            raqmonSessionExceptionIndex                Unsigned32,
            raqmonSessionExceptionIAJitterThreshold    Unsigned32,
            raqmonSessionExceptionNetRTTThreshold      Unsigned32,
            raqmonSessionExceptionLostPacketsThreshold Unsigned32,
            raqmonSessionExceptionRowStatus            RowStatus
            }

    raqmonSessionExceptionIndex OBJECT-TYPE
        SYNTAX Unsigned32 (1..65535)
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "An index that uniquely identifies an
             entry in the raqmonSessionExceptionTable.
             Management applications can determine unused indices
             by performing GetNext or GetBulk operations on the
             Table."
        ::= { raqmonSessionExceptionEntry 2 }

    raqmonSessionExceptionIAJitterThreshold OBJECT-TYPE
        SYNTAX Unsigned32
        UNITS  "milliseconds"
        MAX-ACCESS read-create
        STATUS current
        DESCRIPTION
```

```
            "Threshold for jitter.
             The value during a session must be greater than or
             equal to this value for an exception to be created."
        ::= { raqmonSessionExceptionEntry 3 }

raqmonSessionExceptionNetRTTThreshold OBJECT-TYPE
    SYNTAX Unsigned32
    UNITS  "milliseconds"
    MAX-ACCESS read-create
    STATUS current
    DESCRIPTION
        "Threshold for round-trip time.
         The value during a session must be greater than or
         equal to this value for an exception to be created."
    ::= { raqmonSessionExceptionEntry 4 }

raqmonSessionExceptionLostPacketsThreshold OBJECT-TYPE
    SYNTAX Unsigned32 (0..1000)
    UNITS  "tenth of a percent"
    MAX-ACCESS read-create
    STATUS current
    DESCRIPTION
        "Threshold for lost packets in units of tenths
         of a percent.  The value during a session must
         be greater than or equal to this value for an
         exception to be created."
    ::= { raqmonSessionExceptionEntry 5 }

raqmonSessionExceptionRowStatus OBJECT-TYPE
    SYNTAX RowStatus
    MAX-ACCESS read-create
    STATUS current
    DESCRIPTION
        "This object has a value of 'active' when
         exceptions are being monitored by the system.
         A newly-created conceptual row must have all
         the read-create objects initialized before
         becoming 'active'.  A conceptual row that is in
         the 'notReady' or 'notInService' state MAY be
         removed after 5 minutes.  No writeable objects
         can be changed while the row is active."
    ::= { raqmonSessionExceptionEntry 7 }


raqmonConfig OBJECT IDENTIFIER ::= { raqmonMIBObjects 3 }

raqmonConfigPort OBJECT-TYPE
    SYNTAX InetPortNumber
```

```
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "The UDP port to listen on for RAQMON reports,
             running on transport protocols other than SNMP.
             If the RAQMON PDU transport protocol is SNMP,
             a write operation on this object has no effect, as
             the standard port 162 is always used.
             The value of this object MUST be persistent across
             agent reboots."
        ::= { raqmonConfig 1 }

    raqmonConfigPduTransport OBJECT-TYPE
      SYNTAX BITS
        {
            other(0),
            tcp(1),
            snmp(2)
        }
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
          "The PDU transport(s) used by this collector.
           If other(0) is set, the collector supports a
           transport other than SNMP or TCP.
           If tcp(1) is set, the collector supports TCP as a
           transport protocol.
           If snmp(2) is set, the collector supports SNMP as a
           transport protocol."
      ::= { raqmonConfig 2 }


    raqmonConfigRaqmonPdus OBJECT-TYPE
        SYNTAX Counter32
        UNITS  "PDUs"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "Count of RAQMON PDUs received by the Collector."
        ::= { raqmonConfig 3 }

    raqmonConfigRDSTimeout OBJECT-TYPE
        SYNTAX Unsigned32
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "The number of seconds since the reception of the
             last RAQMON PDU from a RDS after which a session
```

                between the respective RDS and the collector will be
                considered terminated.
                The value of this object MUST be persistent across
                agent reboots."
            ::= { raqmonConfig 4 }

        raqmonConformance OBJECT IDENTIFIER ::= { raqmonMIB 2 }

        raqmonCompliances OBJECT IDENTIFIER ::= { raqmonConformance 1 }
        raqmonGroups OBJECT IDENTIFIER ::= { raqmonConformance 2 }

        raqmonCompliance MODULE-COMPLIANCE
            STATUS   current
            DESCRIPTION
                "Describes the requirements for conformance to the
                 RAQMON MIB."
            MODULE -- this module
            MANDATORY-GROUPS { raqmonCollectorGroup,
                               raqmonCollectorNotificationsGroup
                             }

            OBJECT raqmonParticipantAddrType
            SYNTAX InetAddressType { ipv4(1), ipv6(2) }
            DESCRIPTION
                "Only IPv4 and IPv6 addresses need to be supported."

            OBJECT raqmonParticipantAddr
            SYNTAX InetAddress (SIZE(4|16))
            DESCRIPTION
                "Only IPv4 and IPv6 addresses need to be supported."

            OBJECT raqmonParticipantPeerAddrType
            SYNTAX InetAddressType { ipv4(1), ipv6(2) }
            DESCRIPTION
                "Only IPv4 and IPv6 addresses need to be supported."

            OBJECT raqmonParticipantPeerAddr
            SYNTAX InetAddress (SIZE(4|16))
            DESCRIPTION
                "Only IPv4 and IPv6 addresses need to be supported."

              ::= { raqmonCompliances 1 }

```
     raqmonCollectorGroup OBJECT-GROUP
         OBJECTS {
             raqmonParticipantReportCaps,
             raqmonParticipantAddrType,
             raqmonParticipantAddr,
             raqmonParticipantSendPort,
             raqmonParticipantRecvPort,
             raqmonParticipantSetupDelay,
             raqmonParticipantName,
             raqmonParticipantAppName,
             raqmonParticipantQosCount,
             raqmonParticipantEndDate,
             raqmonParticipantDestPayloadType,
             raqmonParticipantSrcPayloadType,
             raqmonParticipantActive,
             raqmonParticipantPeer,
             raqmonParticipantPeerAddrType,
             raqmonParticipantPeerAddr,
             raqmonParticipantSrcL2Priority,
             raqmonParticipantDestL2Priority,
             raqmonParticipantSrcDSCP,
             raqmonParticipantDestDSCP,
             raqmonParticipantCpuMean,
             raqmonParticipantCpuMin,
             raqmonParticipantCpuMax,
             raqmonParticipantMemoryMean,
             raqmonParticipantMemoryMin,
             raqmonParticipantMemoryMax,
             raqmonParticipantNetRTTMean,
             raqmonParticipantNetRTTMin,
             raqmonParticipantNetRTTMax,
             raqmonParticipantIAJitterMean,
             raqmonParticipantIAJitterMin,
             raqmonParticipantIAJitterMax,
             raqmonParticipantIPDVMean,
             raqmonParticipantIPDVMin,
             raqmonParticipantIPDVMax,
             raqmonParticipantNetOwdMean,
             raqmonParticipantNetOwdMin,
             raqmonParticipantNetOwdMax,
             raqmonParticipantAppDelayMean,
             raqmonParticipantAppDelayMin,
             raqmonParticipantAppDelayMax,
             raqmonParticipantPacketsRcvd,
             raqmonParticipantPacketsSent,
             raqmonParticipantOctetsRcvd,
             raqmonParticipantOctetsSent,
             raqmonParticipantLostPackets,
```

```
              raqmonParticipantLostPacketsFrct,
              raqmonParticipantDiscards,
              raqmonParticipantDiscardsFrct,
              raqmonQoSEnd2EndNetDelay,
              raqmonQoSInterArrivalJitter,
              raqmonQosRcvdPackets,
              raqmonQosRcvdOctets,
              raqmonQosSentPackets,
              raqmonQosSentOctets,
              raqmonQosLostPackets,
              raqmonQosSessionStatus,
              raqmonParticipantAddrEndDate,
              raqmonConfigPort,
              raqmonSessionExceptionIAJitterThreshold,
              raqmonSessionExceptionNetRTTThreshold,
              raqmonSessionExceptionLostPacketsThreshold,
              raqmonSessionExceptionRowStatus,
              raqmonConfigPduTransport,
              raqmonConfigRaqmonPdus,
              raqmonConfigRDSTimeout}
          STATUS current
          DESCRIPTION
              "Objects used in RAQMON by a collector."


          ::= { raqmonGroups 1 }

      raqmonCollectorNotificationsGroup NOTIFICATION-GROUP
          NOTIFICATIONS { raqmonSessionAlarm }
          STATUS current
          DESCRIPTION
              "Notifications emitted by a RAQMON collector."
          ::= { raqmonGroups 2 }

    END
```

6. Security Considerations

   There are a number of management objects defined in this MIB module
   with a MAX-ACCESS clause of read-write. Such objects may be
   considered sensitive or vulnerable in some network environments. The
   support for SET operations in a non-secure environment without proper
   protection can have a negative effect on network operations.

   Setting the value of the object raqmonRDSTimeout to too low a value
   would result in RDS sessions being terminated sooner than necessary,
   while setting at too high a value may result in terminated sessions
   continuing to be managed, with unnecessary memory allocations.

Setting the following object to incorrect values can result in the
collectors either flooding the management applications with
unnecessary notifications, or not sending notifications when the QoS
in the network may be degraded.

    raqmonSessionExceptionIAJitterThreshold
    raqmonSessionExceptionRTTThreshold
    raqmonSessionExceptionLostPacketsThreshold

Setting the raqmonConfigPort object to incorrect values can result in
the collector not being able to receive RAQMON PDUs from the data
sources.

Some of the readable objects in this MIB module (i.e., objects with a
MAX-ACCESS other than not-accessible) may be considered sensitive or
vulnerable in some network environments. These are:

    raqmonParticipantTable
    raqmonQoSTable
    raqmonParticpantAddrTable

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.

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.

The structure of the RAQMON tables limits what can be usefully done
for access control configuration using View-based Access Control
Model (VACM). For example, with these structures it would not be
possible to provide a group, with access to performance data for a
specific group of devices, since the index values for
raqmonParticpantEntry cannot be known in advance. Likewise,
raqmonSessionExceptionEntries apply to all entries in the
raqmonQoSTable.

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.

7. IANA Considerations

   No requirements from IANA are defined in this document. The root OID
   of the MIB module defined in this document belongs to the RMON
   subtree, as reserved in [RFC3737].

8. Acknowledgements

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