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

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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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 `raqmonParticipantTable` 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 `raqmonParticipantAddrTable` maps participant addresses into the indices of the `raqmonParticipantTable`. 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

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 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
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 In Body: subscribe your_email_address

 Chair: Andy Bierman
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 Editor: Dan Romascanu
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 Email: dromasca@avaya.com"

DESCRIPTION

"Real-Time Application QoS Monitoring MIB.

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 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),
        raqmonPartRepApplicationDelay(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 `raqmonPartRepApplicationDelay` 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"

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,
    raqmonQoS RcvdPackets,
    raqmonQoS RcvdOctets,
    raqmonQoS SentPackets,
    raqmonQoS SentOctets,
    raqmonQoS LostPackets,
    raqmonQoS SessionStatus,
    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
raqmonParticipantAddrTable
```

Unauthorized exposure of these objects may lead to disclosure of the addresses of the participants in applications, or information about the traffic patterns 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 `raqmonParticipantEntry` 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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