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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
SnmAdminString
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"

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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,
                  raqmonQoSRecvPackets }
        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 `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"

```

        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,
    raqmonQoSReceivedPackets      Integer32,
    raqmonQoSReceivedOctets       Integer32,
    raqmonQoSENTPackets           Integer32,
    raqmonQoSENTOctets            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,
    raqmonQoSReceivedPackets,
    raqmonQoSReceivedOctets,
    raqmonQoSReceivedPackets,
    raqmonQoSReceivedOctets,
    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.

ragmonSessionExceptionIAJitterThreshold
ragmonSessionExceptionRTTThreshold
ragmonSessionExceptionLostPacketsThreshold

Setting the ragmonConfigPort 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:

ragmonParticipantTable
ragmonQoSTable
ragmonParticipantAddrTable

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 ragmonParticipantEntry cannot be known in advance. Likewise, ragmonSessionExceptionEntries apply to all entries in the ragmonQoSTable.

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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9. Normative References

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