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Real-Time Transport Protocol
Management Information Base

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. In particular, it defines objects for managing Real-Time Transport Protocol (RTP) systems (RFC1889).

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [RFC2571].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIV2, is described in STD 58, RFC 2578 [RFC2578], RFC 2579 [RFC2579] and RFC 2580 [RFC2580].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPV1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPV2C and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPV3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].
- o A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable

information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

2. Overview

An "RTP System" may be a host end-system that runs an application program that sends or receives RTP data packets, or it may be an intermediate-system that forwards RTP packets. RTP Control Protocol (RTCP) packets are sent by senders and receivers to convey information about RTP packet transmission and reception [RFC1889]. RTP monitors may collect RTCP information on senders and receivers to and from an RTP host or intermediate-system.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

2.1 Components

The RTP MIB is structured around "Session," "Receiver" and "Sender" conceptual abstractions.

2.1.1 An "RTP Session" is the "...association of participants communicating with RTP. For each participant, the session is defined by a particular pair of destination transport addresses (one network address plus a port pair for RTP and RTCP). The destination transport addresses may be common for all participants, as in the case of IP multicast, or may be different for each, as in the case of individual unicast addresses plus a common port pair," as defined in section 3 of [RFC1889].

2.1.2 A "Sender" is identified within an RTP session by a 32-bit numeric "Synchronization Source," or "SSRC", value and is "...the source of a stream of RTP packets" as defined in section 3 of [RFC1889]. The sender is also a source of RTCP Sender Report packets as specified in section 6 of [RFC1889].

2.1.3 A "Receiver" of a "stream of RTP packets" can be a unicast or multicast Receiver as described in 2.1.1, above. An RTP Receiver has an SSRC value that is unique to the session. An RTP Receiver is a source of RTCP Receiver Reports as specified in section 6 of [RFC1889].

2.2 Applicability of the MIB to RTP System Implementations

The RTP MIB may be used in two types of RTP implementations, RTP Host Systems (end systems) and RTP Monitors, see section 3 of [RFC1889]. Use of the RTP MIB for RTP Translators and Mixers, as defined in section 7 of [RFC1889], is for further study.

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

2.2.2 RTP Monitors of multicast RTP sessions may be third-party or may be located in the RTP host. RTP Monitors may use the RTP MIB to collect RTP session and stream statistical data; these data may be used by a network manager for capacity planning and other network-management purposes. An RTP Monitor may use the RTP MIB to collect data to permit a network manager to detect and diagnose faults in RTP sessions or to permit a network manager to configure its operation.

2.2.3 Many host systems will want to keep track of streams beyond what they are sending and receiving. In a host monitor system, a host agent would use RTP data from the host to maintain data about streams it is sending and receiving, and RTCP data to collect data about other hosts in the session. For example, an agent for an RTP host that is sending a stream would use data from its RTP system to maintain the rtpSenderTable, but it may want to maintain a rtpRcvrTable for endpoints that are receiving its stream. To do this the RTP agent will collect RTCP data from the receivers of its stream to build the rtpRcvrTable. A host monitor system MUST set the rtpSessionMonitor object to 'true(1)', but it does not have to accept management operations that create and destroy rows in its rtpSessionTable.

2.3 The Structure of the RTP MIB

There are six tables in the RTP MIB. The rtpSessionTable contains objects that describe active sessions at the host, or monitor. The rtpSenderTable contains information about senders to the RTP session. The rtpRcvrTable contains information about receivers of RTP session data. The rtpSessionInverseTable, rtpSenderInverseTable, and rtpRcvrInverseTable contain information to efficiently find indexes into the rtpSessionTable, rtpSenderTable, and rtpRcvrTable, respectively.

The reverse lookup tables (rtpSessionInverseTable, rtpSenderInverseTable, and rtpRcvrInverseTable) are optional tables to help management applications efficiently access conceptual rows in other tables. Implementors of this MIB SHOULD implement these tables for multicast RTP sessions when table indexes (rtpSessionIndex of rtpSessionTable, rtpSenderSSRC of rtpSenderTable, and the SSRC pair in the rtpRcvrTable) are not available from other MIBs. Otherwise, the management application may be forced to perform expensive tree walks through large numbers of sessions, senders, or receivers.

For any particular RTP session, the rtpSessionMonitor object indicates whether remote senders or receivers to the RTP session are to be monitored. If rtpSessionMonitor is true(1) then senders and receivers to the session MUST be monitored with entries in the rtpSenderTable and rtpRcvrTable. RTP sessions are monitored by the RTP agent that updates rtpSenderTable and rtpRcvrTable objects with information from RTCP reports from remote senders or remote receivers respectively.

rtpSessionNewIndex is a global object that permits a network-management application to obtain a unique index for conceptual row creation in the rtpSessionTable. In this way the SNMP Set operation MAY be used to configure a monitor.

3. Definitions

RTP-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

Counter32, Counter64, Gauge32, mib-2, Integer32,
MODULE-IDENTITY,
OBJECT-TYPE, Unsigned32                FROM SNMPv2-SMI
RowStatus, TAddress,
TDomain, TestAndIncr,
TimeStamp, TruthValue                 FROM SNMPv2-TC
OBJECT-GROUP, MODULE-COMPLIANCE       FROM SNMPv2-CONF
Utf8String                             FROM SYSAPPL-MIB
InterfaceIndex                         FROM IF-MIB;

```

rtpMIB MODULE-IDENTITY

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DESCRIPTION

"The managed objects of RTP systems. The MIB is structured around three types of information.

1. General information about RTP sessions such as the session address.
2. Information about RTP streams being sent to an RTP session by a particular sender.
3. Information about RTP streams received on an RTP session by a particular receiver from a particular sender.

There are two types of RTP Systems, RTP hosts and RTP monitors. As described below, certain objects are unique to a particular type of RTP System. An RTP host may also function as an RTP monitor. Refer to RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' section 3.0, for definitions."

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DESCRIPTION "Initial version of this MIB.
 Published as RFC 2959."

::= { mib-2 87 }

--

-- OBJECTS

--

rtpMIBObjects OBJECT IDENTIFIER ::= { rtpMIB 1 }
 rtpConformance OBJECT IDENTIFIER ::= { rtpMIB 2 }

--

```
-- SESSION NEW INDEX
```

```
--
```

```
rtpSessionNewIndex OBJECT-TYPE
    SYNTAX          TestAndIncr
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
```

```
"This object is used to assign values to rtpSessionIndex
as described in 'Textual Conventions for SMIV2'. For an RTP
system that supports the creation of rows, the network manager
would read the object, and then write the value back in
the Set that creates a new instance of rtpSessionEntry. If
the Set fails with the code 'inconsistentValue,' then the
process must be repeated; If the Set succeeds, then the object
is incremented, and the new instance is created according to
the manager's directions. However, if the RTP agent is not
acting as a monitor, only the RTP agent may create conceptual
rows in the RTP session table."
```

```
::= { rtpMIBObjects 1 }
```

```
--
```

```
-- SESSION INVERSE TABLE
```

```
--
```

```
rtpSessionInverseTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF RtpSessionInverseEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
```

```
"Maps rtpSessionDomain, rtpSessionRemAddr, and rtpSessionLocAddr
TAddress pairs to one or more rtpSessionIndex values, each
describing a row in the rtpSessionTable. This makes it possible
to retrieve the row(s) in the rtpSessionTable corresponding to a
given session without having to walk the entire (potentially
large) table."
```

```
::= { rtpMIBObjects 2 }
```

```
rtpSessionInverseEntry OBJECT-TYPE
    SYNTAX          RtpSessionInverseEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
```

```
"Each entry corresponds to exactly one entry in the
rtpSessionTable - the entry containing the tuple,
rtpSessionDomain, rtpSessionRemAddr, rtpSessionLocAddr
and rtpSessionIndex."
```

```
INDEX { rtpSessionDomain, rtpSessionRemAddr, rtpSessionLocAddr,
        rtpSessionIndex }
```

```
::= { rtpSessionInverseTable 1 }
```

```
RtpSessionInverseEntry ::= SEQUENCE {
    rtpSessionInverseStartTime    TimeStamp
}
```

```
rtpSessionInverseStartTime OBJECT-TYPE
```

```
SYNTAX                TimeStamp
```

```
MAX-ACCESS            read-only
```

```
STATUS                current
```

```
DESCRIPTION
```

```
"The value of SysUpTime at the time that this row was
created."
```

```
::= { rtpSessionInverseEntry 1 }
```

```
--
```

```
--     SESSION TABLE
```

```
--
```

```
rtpSessionTable OBJECT-TYPE
```

```
SYNTAX                SEQUENCE OF RtpSessionEntry
```

```
MAX-ACCESS            not-accessible
```

```
STATUS                current
```

```
DESCRIPTION
```

```
"There's one entry in rtpSessionTable for each RTP session
on which packets are being sent, received, and/or
monitored."
```

```
::= { rtpMIBObjects 3 }
```

```
rtpSessionEntry OBJECT-TYPE
```

```
SYNTAX                RtpSessionEntry
```

```
MAX-ACCESS            not-accessible
```

```
STATUS                current
```

```
DESCRIPTION
```

```
"Data in rtpSessionTable uniquely identify an RTP session. A
host RTP agent MUST create a read-only row for each session to
which packets are being sent or received. Rows MUST be created
by the RTP Agent at the start of a session when one or more
senders or receivers are observed. Rows created by an RTP agent
MUST be deleted when the session is over and there are no
rtpRcvrEntry and no rtpSenderEntry for this session. An RTP
session SHOULD be monitored to create management information on
all RTP streams being sent or received when the
rtpSessionMonitor has the TruthValue of 'true(1)'. An RTP
monitor SHOULD permit row creation with the side effect of
causing the RTP System to join the multicast session for the
purposes of gathering management information (additional
conceptual rows are created in the rtpRcvrTable and
rtpSenderTable). Thus, rtpSessionTable rows SHOULD be created
for RTP session monitoring purposes. Rows created by a
management application SHOULD be deleted via SNMP operations by
```

management applications. Rows created by management operations are deleted by management operations by setting rtpSessionRowStatus to 'destroy(6)'."

```
INDEX { rtpSessionIndex }
 ::= { rtpSessionTable 1 }
```

```
RtpSessionEntry ::= SEQUENCE {
    rtpSessionIndex      Integer32,
    rtpSessionDomain    TDomain,
    rtpSessionRemAddr   TAddress,
    rtpSessionLocAddr   TAddress,
    rtpSessionIfIndex   InterfaceIndex,
    rtpSessionSenderJoins Counter32,
    rtpSessionReceiverJoins Counter32,
    rtpSessionBytes     Counter32,
    rtpSessionStartTime TimeStamp,
    rtpSessionMonitor   TruthValue,
    rtpSessionRowStatus RowStatus
}
```

```
rtpSessionIndex OBJECT-TYPE
    SYNTAX      Integer32 (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 are created or maintained
        sequentially."
    ::= { rtpSessionEntry 1 }
```

```
rtpSessionDomain OBJECT-TYPE
    SYNTAX      TDomain
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The transport-layer protocol used for sending or receiving
        the stream of RTP data packets on this session.
        Cannot be changed if rtpSessionRowStatus is 'active'."
    ::= { rtpSessionEntry 2 }
```

```
rtpSessionRemAddr OBJECT-TYPE
    SYNTAX      TAddress
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The address to which RTP packets are sent by the RTP system.
        In an IP multicast RTP session, this is the single address used
```

by all senders and receivers of RTP session data. In a unicast RTP session this is the unicast address of the remote RTP system. 'The destination address pair may be common for all participants, as in the case of IP multicast, or may be different for each, as in the case of individual unicast network address pairs.' See RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' sec. 3. The transport service is identified by rtpSessionDomain. For snmpUDPDomain, this is an IP address and even-numbered UDP Port with the RTCP being sent on the next higher odd-numbered port, see RFC 1889, sec. 5."

```
::= { rtpSessionEntry 3 }
```

rtpSessionLocAddr OBJECT-TYPE

```
SYNTAX          TAddress
MAX-ACCESS      read-only
STATUS          current
```

DESCRIPTION

"The local address used by the RTP system. In an IP multicast RTP session, rtpSessionRemAddr will be the same IP multicast address as rtpSessionLocAddr. In a unicast RTP session, rtpSessionRemAddr and rtpSessionLocAddr will have different unicast addresses. See RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' sec. 3. The transport service is identified by rtpSessionDomain. For snmpUDPDomain, this is an IP address and even-numbered UDP Port with the RTCP being sent on the next higher odd-numbered port, see RFC 1889, sec. 5."

```
::= { rtpSessionEntry 4 }
```

rtpSessionIfIndex OBJECT-TYPE

```
SYNTAX          InterfaceIndex
MAX-ACCESS      read-create
STATUS          current
```

DESCRIPTION

"The ifIndex value is set to the corresponding value from IF-MIB (See RFC 2233, 'The Interfaces Group MIB using SMIV2'). This is the interface that the RTP stream is being sent to or received from, or in the case of an RTP Monitor the interface that RTCP packets will be received on. Cannot be changed if rtpSessionRowStatus is 'active'."

```
::= { rtpSessionEntry 5 }
```

rtpSessionSenderJoins OBJECT-TYPE

```
SYNTAX          Counter32
MAX-ACCESS      read-only
STATUS          current
```

DESCRIPTION

"The number of senders that have been observed to have joined the session since this conceptual row was created"

(rtpSessionStartTime). A sender 'joins' an RTP session by sending to it. Senders that leave and then re-join following an RTCP BYE (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' sec. 6.6) or session timeout may be counted twice. Every time a new RTP sender is detected either using RTP or RTCP, this counter is incremented."

::= { rtpSessionEntry 6 }

rtpSessionReceiverJoins OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The number of receivers that have been observed to have joined this session since this conceptual row was created (rtpSessionStartTime). A receiver 'joins' an RTP session by sending RTCP Receiver Reports to the session. Receivers that leave and then re-join following an RTCP BYE (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' sec. 6.6) or session timeout may be counted twice."

::= { rtpSessionEntry 7 }

rtpSessionByes OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A count of RTCP BYE (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications,' sec. 6.6) messages received by this entity."

::= { rtpSessionEntry 8 }

rtpSessionStartTime OBJECT-TYPE

SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The value of SysUpTime at the time that this row was created."

::= { rtpSessionEntry 9 }

rtpSessionMonitor OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"Boolean, Set to 'true(1)' if remote senders or receivers in addition to the local RTP System are to be monitored using RTCP. RTP Monitors MUST initialize to 'true(1)' and RTP Hosts SHOULD initialize this 'false(2)'. Note that because 'host monitor' systems are receiving RTCP from their remote participants they MUST set this value to 'true(1)'."

```
::= { rtpSessionEntry 10 }
```

```
rtpSessionRowStatus OBJECT-TYPE
```

```
SYNTAX          RowStatus
MAX-ACCESS      read-create
STATUS          current
```

```
DESCRIPTION
```

"Value of 'active' when RTP or RTCP messages are being sent or received by an RTP System. A newly-created conceptual row must have the all read-create objects initialized before becoming 'active'.

A conceptual row that is in the 'notReady' or 'notInService' state MAY be removed after 5 minutes."

```
::= { rtpSessionEntry 11 }
```

```
--
```

```
-- SENDER INVERSE TABLE
```

```
--
```

```
rtpSenderInverseTable OBJECT-TYPE
```

```
SYNTAX          SEQUENCE OF RtpSenderInverseEntry
MAX-ACCESS      not-accessible
STATUS          current
```

```
DESCRIPTION
```

"Maps rtpSenderAddr, rtpSessionIndex, to the rtpSenderSSRC index of the rtpSenderTable. This table allows management applications to find entries sorted by rtpSenderAddr rather than sorted by rtpSessionIndex. Given the rtpSessionDomain and rtpSenderAddr, a set of rtpSessionIndex and rtpSenderSSRC values can be returned from a tree walk. When rtpSessionIndex is specified in the SNMP Get-Next operations, one or more rtpSenderSSRC values may be returned."

```
::= { rtpMIBObjects 4 }
```

```
rtpSenderInverseEntry OBJECT-TYPE
```

```
SYNTAX          RtpSenderInverseEntry
MAX-ACCESS      not-accessible
STATUS          current
```

```
DESCRIPTION
```

"Each entry corresponds to exactly one entry in the rtpSenderTable - the entry containing the index pair, rtpSessionIndex, rtpSenderSSRC."

```
INDEX { rtpSessionDomain, rtpSenderAddr, rtpSessionIndex,
```

```

        rtpSenderSSRC }
 ::= { rtpSenderInverseTable 1 }

RtpSenderInverseEntry ::= SEQUENCE {
        rtpSenderInverseStartTime      TimeStamp
        }

rtpSenderInverseStartTime OBJECT-TYPE
    SYNTAX          TimeStamp
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value of SysUpTime at the time that this row was
        created."
 ::= { rtpSenderInverseEntry 1 }

--
-- SENDERS TABLE
--

rtpSenderTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF RtpSenderEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "Table of information about a sender or senders to an RTP
        Session. RTP sending hosts MUST have an entry in this table
        for each stream being sent. RTP receiving hosts MAY have an
        entry in this table for each sending stream being received by
        this host. RTP monitors MUST create an entry for each observed
        sender to a multicast RTP Session as a side-effect when a
        conceptual row in the rtpSessionTable is made 'active' by a
        manager."
 ::= { rtpMIBObjects 5 }

rtpSenderEntry OBJECT-TYPE
    SYNTAX          RtpSenderEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "Each entry contains information from a single RTP Sender
        Synchronization Source (SSRC, see RFC 1889 'RTP: A Transport
        Protocol for Real-Time Applications' sec.6). The session is
        identified to the the SNMP entity by rtpSessionIndex.
        Rows are removed by the RTP agent when a BYE is received
        from the sender or when the sender times out (see RFC
        1889, Sec. 6.2.1) or when the rtpSessionEntry is deleted."
    INDEX { rtpSessionIndex, rtpSenderSSRC }
 ::= { rtpSenderTable 1 }

```

```
RtpSenderEntry ::= SEQUENCE {
    rtpSenderSSRC          Unsigned32,
    rtpSenderCNAME        Utf8String,
    rtpSenderAddr         TAddress,
    rtpSenderPackets      Counter64,
    rtpSenderOctets       Counter64,
    rtpSenderTool         Utf8String,
    rtpSenderSRs          Counter32,
    rtpSenderSRTime       TimeStamp,
    rtpSenderPT           INTEGER,
    rtpSenderStartTime    TimeStamp
}
```

rtpSenderSSRC OBJECT-TYPE

```
SYNTAX          Unsigned32
MAX-ACCESS      not-accessible
STATUS          current
```

DESCRIPTION

"The RTP SSRC, or synchronization source identifier of the sender. The RTP session address plus an SSRC uniquely identify a sender to an RTP session (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications' sec.3)."

```
::= { rtpSenderEntry 1 }
```

rtpSenderCNAME OBJECT-TYPE

```
SYNTAX          Utf8String
MAX-ACCESS      read-only
STATUS          current
```

DESCRIPTION

"The RTP canonical name of the sender."

```
::= { rtpSenderEntry 2 }
```

rtpSenderAddr OBJECT-TYPE

```
SYNTAX          TAddress
MAX-ACCESS      read-only
STATUS          current
```

DESCRIPTION

"The unicast transport source address of the sender. In the case of an RTP Monitor this address is the address that the sender is using to send its RTCP Sender Reports."

```
::= { rtpSenderEntry 3 }
```

rtpSenderPackets OBJECT-TYPE

```
SYNTAX          Counter64
MAX-ACCESS      read-only
STATUS          current
```

DESCRIPTION

"Count of RTP packets sent by this sender, or observed by

an RTP monitor, since rtpSenderStartTime."
 ::= { rtpSenderEntry 4 }

rtpSenderOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Count of non-header RTP octets sent by this sender, or observed
by an RTP monitor, since rtpSenderStartTime."
 ::= { rtpSenderEntry 5 }

rtpSenderTool OBJECT-TYPE
SYNTAX Utf8String (SIZE(0..127))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Name of the application program source of the stream."
 ::= { rtpSenderEntry 6 }

rtpSenderSRs OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the number of RTCP Sender Reports that have
been sent from this sender, or observed if the RTP entity
is a monitor, since rtpSenderStartTime."
 ::= { rtpSenderEntry 7 }

rtpSenderSRTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"rtpSenderSRTime is the value of SysUpTime at the time that
the last SR was received from this sender, in the case of a
monitor or receiving host. Or sent by this sender, in the
case of a sending host."
 ::= { rtpSenderEntry 8 }

rtpSenderPT OBJECT-TYPE
SYNTAX INTEGER (0..127)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Payload type from the RTP header of the most recently received
RTP Packet (see RFC 1889, 'RTP: A Transport Protocol for

Real-Time Applications' sec. 5)."
 ::= { rtpSenderEntry 9 }

rtpSenderStartTime OBJECT-TYPE
 SYNTAX TimeStamp
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The value of SysUpTime at the time that this row was
 created."
 ::= { rtpSenderEntry 10 }

--
 -- RECEIVER INVERSE TABLE
 --

rtpRcvrInverseTable OBJECT-TYPE
 SYNTAX SEQUENCE OF RtpRcvrInverseEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Maps rtpRcvrAddr and rtpSessionIndex to the rtpRcvrSRCSSRC and
 rtpRcvrSSRC indexes of the rtpRcvrTable. This table allows
 management applications to find entries sorted by rtpRcvrAddr
 rather than by rtpSessionIndex. Given rtpSessionDomain and
 rtpRcvrAddr, a set of rtpSessionIndex, rtpRcvrSRCSSRC, and
 rtpRcvrSSRC values can be returned from a tree walk. When
 rtpSessionIndex is specified in SNMP Get-Next operations, one or
 more rtpRcvrSRCSSRC and rtpRcvrSSRC pairs may be returned."
 ::= { rtpMIBObjects 6 }

rtpRcvrInverseEntry OBJECT-TYPE
 SYNTAX RtpRcvrInverseEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Each entry corresponds to exactly one entry in the
 rtpRcvrTable - the entry containing the index pair,
 rtpSessionIndex, rtpRcvrSSRC."
 INDEX { rtpSessionDomain, rtpRcvrAddr, rtpSessionIndex,
 rtpRcvrSRCSSRC, rtpRcvrSSRC }
 ::= { rtpRcvrInverseTable 1 }

RtpRcvrInverseEntry ::= SEQUENCE {
 rtpRcvrInverseStartTime TimeStamp
 }

rtpRcvrInverseStartTime OBJECT-TYPE
 SYNTAX TimeStamp

```

MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
  "The value of SysUpTime at the time that this row was
  created."
 ::= { rtpRcvrInverseEntry 1 }

```

```
--
```

```
-- RECEIVERS TABLE
```

```
--
```

```
rtpRcvrTable OBJECT-TYPE
```

```

SYNTAX          SEQUENCE OF RtpRcvrEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
  "Table of information about a receiver or receivers of RTP
  session data. RTP hosts that receive RTP session packets
  MUST create an entry in this table for that receiver/sender
  pair. RTP hosts that send RTP session packets MAY create
  an entry in this table for each receiver to their stream
  using RTCP feedback from the RTP group. RTP monitors
  create an entry for each observed RTP session receiver as
  a side effect when a conceptual row in the rtpSessionTable
  is made 'active' by a manager."
 ::= { rtpMIBObjects 7 }

```

```
rtpRcvrEntry OBJECT-TYPE
```

```

SYNTAX          RtpRcvrEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
  "Each entry contains information from a single RTP
  Synchronization Source that is receiving packets from the
  sender identified by rtpRcvrSRCSSRC (SSRC, see RFC 1889,
  'RTP: A Transport Protocol for Real-Time Applications'
  sec.6). The session is identified to the the RTP Agent entity
  by rtpSessionIndex. Rows are removed by the RTP agent when
  a BYE is received from the sender or when the sender times
  out (see RFC 1889, Sec. 6.2.1) or when the rtpSessionEntry is
  deleted."
INDEX { rtpSessionIndex, rtpRcvrSRCSSRC, rtpRcvrSSRC }
 ::= { rtpRcvrTable 1 }

```

```

RtpRcvrEntry ::= SEQUENCE {
    rtpRcvrSRCSSRC      Unsigned32,
    rtpRcvrSSRC        Unsigned32,
    rtpRcvrCNAME        Utf8String,
    rtpRcvrAddr         TAddress,

```

```

    rtpRcvrRTT           Gauge32,
    rtpRcvrLostPackets  Counter64,
    rtpRcvrJitter       Gauge32,
    rtpRcvrTool         Utf8String,
    rtpRcvrRRS          Counter32,
    rtpRcvrRRTime      TimeStamp,
    rtpRcvrPT           INTEGER,
    rtpRcvrPackets      Counter64,
    rtpRcvrOctets       Counter64,
    rtpRcvrStartTime    TimeStamp
  }

```

rtpRcvrSRCSSRC OBJECT-TYPE

```

SYNTAX      Unsigned32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

"The RTP SSRC, or synchronization source identifier of the sender. The RTP session address plus an SSRC uniquely identify a sender or receiver of an RTP stream (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications' sec.3)."

```
 ::= { rtpRcvrEntry 1 }
```

rtpRcvrSSRC OBJECT-TYPE

```

SYNTAX      Unsigned32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

"The RTP SSRC, or synchronization source identifier of the receiver. The RTP session address plus an SSRC uniquely identify a receiver of an RTP stream (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications' sec.3)."

```
 ::= { rtpRcvrEntry 2 }
```

rtpRcvrCNAME OBJECT-TYPE

```

SYNTAX      Utf8String
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The RTP canonical name of the receiver."

```
 ::= { rtpRcvrEntry 3 }
```

rtpRcvrAddr OBJECT-TYPE

```

SYNTAX      TAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The unicast transport address on which the receiver is receiving RTP packets and/or RTCP Receiver Reports."
 ::= { rtpRcvrEntry 4 }

rtpRcvrRTT OBJECT-TYPE

SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The round trip time measurement taken by the source of the RTP stream based on the algorithm described on sec. 6 of RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications.' This algorithm can produce meaningful results when the RTP agent has the same clock as the stream sender (when the RTP monitor is also the sending host for the particular receiver). Otherwise, the entity should return 'noSuchInstance' in response to queries against rtpRcvrRTT."

::= { rtpRcvrEntry 5 }

rtpRcvrLostPackets OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"A count of RTP packets lost as observed by this receiver since rtpRcvrStartTime."

::= { rtpRcvrEntry 6 }

rtpRcvrJitter OBJECT-TYPE

SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"An estimate of delay variation as observed by this receiver. (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications' sec.6.3.1 and A.8)."

::= { rtpRcvrEntry 7 }

rtpRcvrTool OBJECT-TYPE

SYNTAX Utf8String (SIZE(0..127))
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"Name of the application program source of the stream."

::= { rtpRcvrEntry 8 }

rtpRcvrRRs OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A count of the number of RTCP Receiver Reports that have been sent from this receiver, or observed if the RTP entity is a monitor, since rtpRcvrStartTime."

::= { rtpRcvrEntry 9 }

rtpRcvrRRTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"rtpRcvrRRTime is the value of SysUpTime at the time that the last RTCP Receiver Report was received from this receiver, in the case of a monitor or RR receiver (the RTP Sender). It is the value of SysUpTime at the time that the last RR was sent by this receiver in the case of an RTP receiver sending the RR."

::= { rtpRcvrEntry 10 }

rtpRcvrPT OBJECT-TYPE

SYNTAX INTEGER (0..127)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Static or dynamic payload type from the RTP header (see RFC 1889, 'RTP: A Transport Protocol for Real-Time Applications' sec. 5)."

::= { rtpRcvrEntry 11 }

rtpRcvrPackets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Count of RTP packets received by this RTP host receiver since rtpRcvrStartTime."

::= { rtpRcvrEntry 12 }

rtpRcvrOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Count of non-header RTP octets received by this receiving RTP host since rtpRcvrStartTime."

::= { rtpRcvrEntry 13 }

```

rtpRcvrStartTime OBJECT-TYPE
    SYNTAX          TimeStamp
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value of SysUpTime at the time that this row was
        created."
    ::= { rtpRcvrEntry 14 }

--
-- MODULE GROUPS
--
--
-- There are two types of RTP Systems, RTP hosts and RTP Monitors.
-- Thus there are three kinds of objects: 1) Objects common to both
-- kinds of systems, 2) Objects unique to RTP Hosts and 3) Objects
-- unique to RTP Monitors. There is a fourth group, 4) Objects that
-- SHOULD be implemented by Multicast hosts and RTP Monitors

rtpGroups OBJECT IDENTIFIER ::= { rtpConformance 1 }
rtpSystemGroup OBJECT-GROUP
    OBJECTS
        {
            rtpSessionDomain,
            rtpSessionRemAddr,
            rtpSessionIfIndex,
            rtpSessionSenderJoins,
            rtpSessionReceiverJoins,
            rtpSessionStartTime,
            rtpSessionByes,
            rtpSessionMonitor,
            rtpSenderCNAME,
            rtpSenderAddr,
            rtpSenderPackets,
            rtpSenderOctets,
            rtpSenderTool,
            rtpSenderSRs,
            rtpSenderSRTime,
            rtpSenderStartTime,
            rtpRcvrCNAME,
            rtpRcvrAddr,
            rtpRcvrLostPackets,
            rtpRcvrJitter,
            rtpRcvrTool,
            rtpRcvrRRs,
            rtpRcvrRRTime,
            rtpRcvrStartTime
        }
    STATUS          current

```

DESCRIPTION

"Objects available to all RTP Systems."

::= { rtpGroups 1 }

```
rtpHostGroup OBJECT-GROUP
OBJECTS {
    rtpSessionLocAddr,
    rtpSenderPT,
    rtpRcvrPT,
    rtpRcvrRTT,
    rtpRcvrOctets,
    rtpRcvrPackets
}
```

STATUS current

DESCRIPTION

"Objects that are available to RTP Host systems, but may not be available to RTP Monitor systems."

::= { rtpGroups 2 }

```
rtpMonitorGroup OBJECT-GROUP
OBJECTS {
    rtpSessionNewIndex,
    rtpSessionRowStatus
}
```

STATUS current

DESCRIPTION

"Objects used to create rows in the RTP Session Table. These objects are not needed if the system does not create rows."

::= { rtpGroups 3 }

```
rtpInverseGroup OBJECT-GROUP
OBJECTS {
    rtpSessionInverseStartTime,
    rtpSenderInverseStartTime,
    rtpRcvrInverseStartTime
}
```

STATUS current

DESCRIPTION

"Objects used in the Inverse Lookup Tables."

::= { rtpGroups 4 }

--

-- Compliance

--

```
rtpCompliances OBJECT IDENTIFIER ::= { rtpConformance 2 }
```

```
rtpHostCompliance MODULE-COMPLIANCE
STATUS current
```

DESCRIPTION

"Host implementations MUST comply."

MODULE RTP-MIB

MANDATORY-GROUPS {
 rtpSystemGroup,
 rtpHostGroup
 }

GROUP rtpMonitorGroup

DESCRIPTION

"Host systems may optionally support row creation and deletion.

This would allow an RTP Host system to act as an RTP Monitor."

GROUP rtpInverseGroup

DESCRIPTION

"Multicast RTP Systems SHOULD implement the optional tables."

OBJECT rtpSessionNewIndex
 MIN-ACCESS not-accessible

DESCRIPTION

"RTP system implementations support of row creation and deletion is OPTIONAL so implementation of this object is OPTIONAL."

OBJECT rtpSessionDomain
 MIN-ACCESS read-only

DESCRIPTION

"RTP system implementation support of row creation and deletion is OPTIONAL. When it is not supported so write access is OPTIONAL."

OBJECT rtpSessionRemAddr
 MIN-ACCESS read-only

DESCRIPTION

"Row creation and deletion is OPTIONAL so read-create access to this object is OPTIONAL."

OBJECT rtpSessionIfIndex
 MIN-ACCESS read-only

DESCRIPTION

"Row creation and deletion is OPTIONAL so read-create access to this object is OPTIONAL."

OBJECT rtpSessionRowStatus
 MIN-ACCESS not-accessible

DESCRIPTION

"Row creation and deletion is OPTIONAL so read-create access to this object is OPTIONAL."

OBJECT rtpSessionInverseStartTime
 MIN-ACCESS not-accessible

DESCRIPTION

"Multicast RTP Systems SHOULD implement the optional tables."

OBJECT rtpSenderInverseStartTime
 MIN-ACCESS not-accessible
 DESCRIPTION
 "Multicast RTP Systems SHOULD implement the optional
 tables."

OBJECT rtpRcvrInverseStartTime
 MIN-ACCESS not-accessible
 DESCRIPTION
 "Multicast RTP Systems SHOULD implement the optional
 tables."

::= { rtpCompliances 1 }

rtpMonitorCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Monitor implementations must comply. RTP Monitors are not
 required to support creation or deletion."

MODULE RTP-MIB

MANDATORY-GROUPS {
 rtpSystemGroup,
 rtpMonitorGroup
 }

GROUP rtpHostGroup

DESCRIPTION

"Monitor implementations may not have access to values in the
 rtpHostGroup."

GROUP rtpInverseGroup

DESCRIPTION

"Multicast RTP Systems SHOULD implement the optional
 tables."

OBJECT rtpSessionLocAddr
 MIN-ACCESS not-accessible
 DESCRIPTION

"RTP monitor sourcing of RTP or RTCP data packets
 is OPTIONAL and implementation of this object is
 OPTIONAL."

OBJECT rtpRcvrPT
 MIN-ACCESS not-accessible
 DESCRIPTION

"RTP monitor systems may not support
 retrieval of the RTP Payload Type from the RTP
 header (and may receive RTCP messages only). When
 queried for the payload type information"

OBJECT rtpSenderPT
 MIN-ACCESS not-accessible
 DESCRIPTION

"RTP monitor systems may not support
 retrieval of the RTP Payload Type from the RTP

```
        header (and may receive RTCP messages only).  When
        queried for the payload type information."
OBJECT   rtpRcvrOctets
MIN-ACCESS not-accessible
DESCRIPTION
    "RTP monitor systems may receive only the RTCP messages
    and not the RTP messages that contain the octet count
    of the RTP message.  Thus implementation of this
    object is OPTIONAL."
OBJECT   rtpRcvrPackets
MIN-ACCESS not-accessible
DESCRIPTION
    "RTP monitor systems may receive only the RTCP messages
    and not the RTP messages that contain the octet count
    of the RTP message.  Thus implementation of this
    object is OPTIONAL."
OBJECT   rtpSessionIfIndex
MIN-ACCESS read-only
DESCRIPTION
    "Row creation and deletion is OPTIONAL so
    read-create access to this object is OPTIONAL."
OBJECT   rtpSessionInverseStartTime
MIN-ACCESS not-accessible
DESCRIPTION
    "Multicast RTP Systems SHOULD implement the optional
    tables."
OBJECT   rtpSenderInverseStartTime
MIN-ACCESS not-accessible
DESCRIPTION
    "Multicast RTP Systems SHOULD implement the optional
    tables."
OBJECT   rtpRcvrInverseStartTime
MIN-ACCESS not-accessible
DESCRIPTION
    "Multicast RTP Systems SHOULD implement the optional
    tables."
 ::= { rtpCompliances 2 }
END
```

4. Security Considerations

In most cases, MIBs are not themselves security risks; if SNMP security is operating as intended, the use of a MIB to view information about a system, or to change some parameter at the system, is a tool, not a threat. However, there are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. 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.

None of the read-only objects in this MIB reports a password, though some SDES [RFC1889] items such as the CNAME [RFC1889], the canonical name, may be deemed sensitive depending on the security policies of a particular enterprise. If access to these objects is not limited by an appropriate access control policy, these objects can provide an attacker with information about a system's configuration and the services that that system is providing. Some enterprises view their network and system configurations, as well as information about usage and performance, as corporate assets; such enterprises may wish to restrict SNMP access to most of the objects in the MIB. This MIB supports read-write operations against rtpSessionNewIndex which has the side effect of creating an entry in the rtpSessionTable when it is written to. Five objects in rtpSessionEntry have read-create access: rtpSessionDomain, rtpSessionRemAddr, rtpSessionIfIndex, rtpSessionRowStatus, and rtpSessionIfAddr identify an RTP session to be monitored on a particular interface. The values of these objects are not to be changed once created, and initialization of these objects affects only the monitoring of an RTP session and not the operation of an RTP session on any host end-system. Since write operations to rtpSessionNewIndex and the five objects in rtpSessionEntry affect the operation of the monitor, write access to these objects should be subject to the appropriate access control policy.

Confidentiality of RTP and RTCP data packets is defined in section 9 of the RTP specification [RFC1889]. Encryption may be performed on RTP packets, RTCP packets, or both. Encryption of RTCP packets may pose a problem for third-party monitors though "For RTCP, it is allowed to split a compound RTCP packet into two lower-layer packets, one to be encrypted and one to be sent in the clear. For example, SDES information might be encrypted while reception reports were sent in the clear to accommodate third-party monitors [RFC1889]."

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), 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. It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended. It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

5. Acknowledgements

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