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**HMS VoIP Test
Management Information Base (MIB) Definition
SCTE-HMS-VOIP-MIB**

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1. Scope

This document provides MIB definitions for VoIP testing between two endpoints. It allows an HMS/DOCSIS transponder or any other device that implements it to be used as a test point to validate VoIP service in the network and to report a common basic set of measurements.

2. Copyright

The MIB definition found in this document may be incorporated directly in products without further permission from the copyright owner, SCTE.

3. Normative References

3.1. SCTE Standards

- ANSI/SCTE 37 2002 SCTE-HMS-ROOTS

3.2. Standards from other Organizations

- IETF RFC 3550 RTP: A Transport Protocol for Real-Time Applications
- ITU-T P.800
- ITU-T G.107 “The E-model,” a computational model for use in transmission planning (12/03)

4. Informative References

The following documents may provide valuable information to the reader but are not required when complying with this standard:

ITU-T G.711 Pulse code modulation (PCM) of voice frequencies

- IETF RFC 2578 SNMPv2-SMI
- IETF RFC 2579 SNMPv2-TC
- IETF RFC 2580 SNMPv2-CONF
- IETF RFC 4133 ENTITY-MIB
- IETF RFC 4001 INET-ADDRESS-MIB
- IETF RFC 3411 SNMP-FRAMEWORK-MIB

5. Terms and Definition

This document defines the following terms:

Management Information Base (MIB) - the specification of information in a manner that allows standard access through a network management protocol.

6. Requirements

This section defines the mandatory syntax of the SCTE-HMS-VOIP-MIB. It follows the IETF Simple Network Management Protocol (SNMP) for defining the managed objects.

The syntax is given below.

SCTE-HMS-VOIP-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY,
OBJECT-TYPE, enterprises,
Counter32, Unsigned32
FROM SNMPv2-SMI
OBJECT-GROUP, MODULE-COMPLIANCE
FROM SNMPv2-CONF
DateAndTime, TEXTUAL-CONVENTION
FROM SNMPv2-TC
SnmpAdminString
FROM SNMP-FRAMEWORK-MIB
InetAddress, InetAddressType, InetPortNumber
FROM INET-ADDRESS-MIB
voipIdent
FROM SCTE-HMS-ROOTS;

voipModuleMib MODULE-IDENTITY

LAST-UPDATED "200701291300Z"
ORGANIZATION "SCTE HMS Subcommittee"
CONTACT-INFO "SCTE HMS Subcommittee, Chairman
mail to: standards@scte.org "

DESCRIPTION

"This MIB module, contains the interface for the hms VoIP testing specification. It allows an HMS/DOCSIS transponder or any other device that implements it to be used as a test point to validate VoIP service in the network and to report a common basic set of measurements.

Theory Of operation:

The device controlled by this MIB is called an endpoint. Each endpoint sends or receives a test stream to/from another test

endpoint. A measurement application is responsible for controlling both endpoints to setup compatible test streams and to gather results.

An endpoint can implement a number simultaneous test streams (reported in `voipMaxTestInstance`). Each test stream is controlled by a separate entry in the `voipTestControlTable`. This table contains a series of controls that enable the server to set VoIP tests

The purpose of such a test is to simulate an RTP VoIP connection and estimate the equivalent call quality between two known points in the network. From the endpoint's perspective's, each test stream has three possible directions: transmission, reception or loopback. The direction is inferred from the `voipTestControlSenderAddress` & `voipTestControlReceiverAddress` MIBs. The endpoint will detect its address in one of the two MIB and set itself up accordingly. When none of the two MIB contains the endpoint's address, a mirror (loopback) mode is used."

```
::= { enterprises scteRoot(5591) scteHmsTree (1) voipIdent (12) voipTestGroup (1) 1}
```

```
--
```

```
-- TEXTUAL CONVENTIONS used by this MIB
```

```
--
```

```
Rfactor ::= TEXTUAL-CONVENTION
```

```
DISPLAY-HINT "d"
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Call or transmission quality expressed as an  
R factor in the range 0 to 120. A value of  
127 shall be interpreted as NULL or unsupported."
```

```
REFERENCE "ITU-T G.107"
```

```
SYNTAX Unsigned32 (0..120|127)
```

ScaledMOSscore ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"Call or transmission quality expressed as a MOS score scaled by 10. MOS is typically represented as a 1.0 to 5.0 score with a single decimal place and hence in this representation as 10 to 50. A value of 127 shall be interpreted as NULL or unsupported."

REFERENCE

"ITU-T P.800"

SYNTAX Unsigned32 (10..50|127)

--

-- **voipIdent Mib Branch root**

--

voipMibObjects OBJECT IDENTIFIER ::= { voipModuleMib 1 }

voipVersion OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE (0..255))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Displays the version of the specification running on this endpoint"

::= { voipMibObjects 1 }

voipMaxTestInstance OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of concurrent tests supported by this endpoint."

::= { voipMibObjects 2 }

--

-- Test Mibs

--

voipTest OBJECT IDENTIFIER ::= { voipMibObjects 3 }

--

-- Test Control table

--

voipTestControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF VoipTestControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of Test Controls

Each entry is used to control a test instance.

**Tests parameters shall be inputed to the endpoint first, then
the voipTestControl MIB must be set the setupTest value and
Ready status verified before starting a test."**

::= { voipTest 1 }

voipTestControlEntry OBJECT-TYPE

SYNTAX VoipTestControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the Table of Test Control. There will be one entry per supported simultaneous tests."

INDEX {voipTestControlIndex}

::= { voipTestControlTable 1 }

VoipTestControlEntry ::= SEQUENCE {
 voipTestControlIndex Unsigned32,
 voipTestControlIdString SnmpAdminString,
 voipTestControl INTEGER,
 voipTestSenderAddressType InetAddressType,
 voipTestSenderAddress InetAddress,
 voipTestSenderUDPPort InetPortNumber,
 voipTestReceiverAddressType InetAddressType,
 voipTestReceiverAddress InetAddress,
 voipTestReceiverUDPPort InetPortNumber,
 voipTestPacketInterval Unsigned32,
 voipTestNumOfPackets Unsigned32,
 voipTestJitterBufferSize Unsigned32,
 voipTestCodecType OCTET STRING,
 voipTestRoundTripTimeEstimate Unsigned32
}

voipTestControlIndex OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Index for this set of test controls.

One set controls one instance of the test."

::= { voipTestControlEntry 1 }

voipTestControlIdString OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE (0..255))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This String can be used by the management entity as a unique test identifier string."

::= {voipTestControlEntry 2}

voipTestControl OBJECT-TYPE

SYNTAX INTEGER {

stopTest(1),

setupTest(2),

startTest(3)

}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Used to control the test engine. Once the control parameter for the test are set, the management entity must set this to setupTest(2) & verify that the test control status returns ready before starting the test with startTest(2). This is necessary to reserve the resources required for the tests such as service flows, etc.

The test will run a for maximum number of packets (voipTestNumOfPackets), or it can be stopped at any time by setting this MIB to stopTest(1)."

::= {voipTestControlEntry 3}

voipTestSenderAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is the address type of the sender endpoint for the test

**stream. To set this device as the transmitter for the test,
set this MIB to its address."**

::= {voipTestControlEntry 4}

voipTestSenderAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is the address of the sender endpoint for the test stream.

**To set this device as the transmitter for the test, set this
MIB to its address."**

::= {voipTestControlEntry 5}

voipTestSenderUDPPort OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS read-write

STATUS current

DESCRIPTION

" Port Number that the sender will use.

**In loopback mode this port number is used as the destination
address by the loopbacking entity, it may also be used as the
source port for the generating entity."**

::= {voipTestControlEntry 6}

voipTestReceiverAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-write

STATUS current

DESCRIPTION

**"This is the address of the receiving endpoint for this test
stream. To set this device as the receiver for the test, set
this MIB to its IP address.**

If both voipTestReceiverIP & voipTestSenderIP do not match the endpoint's own address, it will start a loopback mode test."
::= {voipTestControlEntry 7}

voipTestReceiverAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is the address of the receiving endpoint for this test stream. To set this device as the receiver for the test, set this MIB to its IP address.

If both voipTestReceiverIP & voipTestSenderIP do not match the endpoint's own address, it will start a loopback mode test."
::= {voipTestControlEntry 8}

voipTestReceiverUDPPort OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS read-write

STATUS current

DESCRIPTION

" UDP port number to be used by the receiving entity.

In loopback mode, the receiver Port number is also used as both the reception and source port of the loopbacking entity."
::= {voipTestControlEntry 9}

voipTestPacketInterval OBJECT-TYPE

SYNTAX Unsigned32 (10|20|30)

UNITS "milliseconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Interval in milliseconds between each packets.

This MIB MUST be set to a voip standard 10, 20, or 30 ms interval."

DEFVAL {10}

::= {voipTestControlEntry 10 }

voipTestNumOfPackets OBJECT-TYPE

SYNTAX Unsigned32 (0..86400000)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Maximum duration of the test expressed in number of packets.

A sender will stop the transmitting when it reaches this amount.

A receiver can use this parameter to know how many packets to expect. The test can be stopped by the management entity before that number is reached."

::= {voipTestControlEntry 11}

voipTestJitterBufferSize OBJECT-TYPE

SYNTAX Unsigned32 (0..500)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Jitter buffer size in millisecond to be implemented by the receiving endpoint. This will impact the total delay and the discarded packet count."

DEFVAL {20}

::= {voipTestControlEntry 12}

voipTestCodecType OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (0..32))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The Codec type to be used for the voip test.

It is used by sender to set the appropriate value in the rtp header. The receiver can use this parameter in the computation of the R-Factor.

Note that the list of supported codecs is device specific.

The format used shall be ITU-T G.7xx or similar.

Each endpoint must at least support the ITU-T G.711 codec."

::= { voipTestControlEntry 13 }

voipTestRoundTripTimeEstimate OBJECT-TYPE

SYNTAX Unsigned32 (0..60000)

UNITS "milliseconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The round trip time (in milliseconds) is used by the receiving endpoint in the computation of the CQE R-Factor. It must be estimated by the management entity and supplied to the endpoint via the use of this MIB for the RCQE result to be accurate.

Note that the one way delay used by the endpoint in its computation will be RoundTripTime / 2.

Writing a value of zero to this MIB will cause the round-trip

delay to be NULL and the resulting R-Factor will be
Listening Quality Equivalent (LQE)"
::= {voipTestControlEntry 14}

--

-- Test Result table

--

voipTestResultTable OBJECT-TYPE

SYNTAX SEQUENCE OF VoipTestResultEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of Test Results

Each entry is used to display the results a test instance."

::= { voipTest 2 }

voipTestResultEntry OBJECT-TYPE

SYNTAX VoipTestResultEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

**"An entry in the Table of Test Control. There will be one entry
per supported simultaneous tests."**

INDEX {voipTestResultIndex}

::= { voipTestResultTable 1 }

VoipTestResultEntry ::= SEQUENCE {

```

voipTestResultIndex      Unsigned32,
voipTestResultIdString  SnmpAdminString,
voipTestStatus          INTEGER,
voipTestStatusString    SnmpAdminString,
voipTestDuration        Unsigned32,
voipTestStartTime       DateAndTime,
voipTestStopTime        DateAndTime,
voipTestProcessedPacketCount Counter32,
voipTestLossPacketCount   Counter32,
voipTestDiscardedPacketCount Counter32,
voipTestMinJitterLevel    Counter32,
voipTestMaxJitterLevel    Counter32,
voipTestAvgJitterLevel    Counter32,
voipTestRfactor         Rfactor,
voipTestMOS             ScaledMOSscore
}

```

voipTestResultIndex OBJECT-TYPE

SYNTAX **Unsigned32**

MAX-ACCESS **not-accessible**

STATUS **current**

DESCRIPTION

"Index for this set of test controls. One set controls one instance of the test."

::= {voipTestResultEntry 1}

voipTestResultIdString OBJECT-TYPE

SYNTAX **SnmpAdminString (SIZE (0..255))**

MAX-ACCESS **read-only**

STATUS **current**

DESCRIPTION

"This String is copied over from the associated control table entry identifier string."

::= {voipTestResultEntry 2}

voipTestStatus OBJECT-TYPE

SYNTAX INTEGER {

na(0),

running(1),

completed(2),

resourceUnavailable(3),

invalidParameter(4),

ready(5),

other(6)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This MIB indicates the test status. A value of N/A(0) is returned before the test is run.

A value of Running (1) is returned while the test is in progress.

A value of Completed (2) is returned when the test is stopped by the TestControl MIB or by the end-point when the voipTestNumOfPackets is reached.

A value of ResourceUnavailable (3) is returned when the end-point is not able to start the test due to internal or network limitations. A value of InvalidParameters(4) is returned if the test parameters cannot be accepted by the end-point.

A value of Ready(5) is reported if the SetUpTest command succeeded.

A value of other(6) is a device specific error code. When other(6) is reported,

a custom error message is reported in the voipTestStatusString."

::= { voipTestResultEntry 3 }

voipTestStatusString OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE (0..255))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This field is used by the device to further explain the Status of the test. and its content is device specific.

"

::= { voipTestResultEntry 4 }

voipTestDuration OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total Duration of the test in milliseconds.

"

::= { voipTestResultEntry 5 }

voipTestStartTime OBJECT-TYPE

SYNTAX DateAndTime

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"System time at the beginning of the test.

"

::= { voipTestResultEntry 6 }

voipTestStopTime OBJECT-TYPE

SYNTAX DateAndTime

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"System time at the end of the test.

The value of this MIB is valid only if the voipTestStatus is complete(2)

"

::= { voipTestResultEntry 7 }

voipTestProcessedPacketCount OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of packets that have been processed by the endpoint.

In transmission this indicates the number of packets sent

In reception this is the sum of the good packets and the discarded packets."

::= { voipTestResultEntry 8 }

voipTestLossPacketCount OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of packets lost in the network before their arrival to this endpoint.

The value reported by this MIB is valid only in the receiving

endpoint.

The sending endpoint shall report zero.

"

::= { voipTestResultEntry 9 }

voipTestDiscardedPacketCount OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of packets discarded by this device because they arrived too late or too early to be played out by the codec.

The value reported by this MIB is valid only in the receiving endpoint.

"

::= { voipTestResultEntry 10 }

voipTestMinJitterLevel OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Minimum of the Jitter level computed as per rfc3550.

The value reported by this MIB is valid only in the receiving endpoint.

"

::= { voipTestResultEntry 11 }

voipTestMaxJitterLevel OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Maximum of the Jitter level computed as per rfc3550.

The value reported by this MIB is valid only in the receiving endpoint.

"

::= { voipTestResultEntry 12 }

voipTestAvgJitterLevel OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Average of the Jitter level computed as per rfc3550.

The value reported by this MIB is valid only in the receiving endpoint.

"

::= { voipTestResultEntry 13 }

voipTestRfactor OBJECT-TYPE

SYNTAX Rfactor

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Computed R-Factor - Conversationnal Quality Equivalent as per ITU G.107

The value reported by this MIB is valid only in the receiving endpoint.

"

::= { voipTestResultEntry 14 }

voipTestMOS OBJECT-TYPE

SYNTAX ScaledMOSScore

MAX-ACCESS read-only

STATUS current

DESCRIPTION

**"Computed MOS - Conversationnal Quality Equivalent as per
ITU G.107**

**The value reported by this MIB is valid only in the receiving
endpoint.**

"

::= { voipTestResultEntry 15 }

--

-- **hmsVoip Conformance / Compliance statements**

--

voipMibConformance OBJECT IDENTIFIER ::= { voipModuleMib 2 }

voipMibCompliances OBJECT IDENTIFIER ::= { voipMibConformance 1 }

voipMibGroups OBJECT IDENTIFIER ::= { voipMibConformance 2 }

-- **Compliance statements**

voipCompliances MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The minimum compliance statement for VOIP Testing."

MODULE

```
MANDATORY-GROUPS { voipMibObjectsGroup, voipTestControlGroup,
voipTestResultGroup }
 ::= { voipMibCompliances 1 }
```

-- this module

voipMibObjectsGroup OBJECT-GROUP

OBJECTS { voipVersion, voipMaxTestInstance }

STATUS current

DESCRIPTION

"voipMibObjectsGroup defines mandatory objects of the voipMibObjects
mib."

::= { voipMibGroups 1 }

voipTestControlGroup OBJECT-GROUP

OBJECTS {

voipTestControlIdString,

voipTestControl,

voipTestSenderAddressType,

voipTestSenderAddress,

voipTestSenderUDPPort,

voipTestReceiverAddressType,

voipTestReceiverAddress,

voipTestReceiverUDPPort,

voipTestPacketInterval,

voipTestNumOfPackets,

voipTestJitterBufferSize,

voipTestCodecType,

voipTestRoundTripTimeEstimate

}

STATUS current

DESCRIPTION

"voipTestControlGroup defines mandatory objects of the
voipTestControlTable."

::= { voipMibGroups 2 }

voipTestResultGroup OBJECT-GROUP

OBJECTS {

voipTestResultIdString,

voipTestStatus,

voipTestStatusString,

voipTestDuration,

voipTestStartTime,

voipTestStopTime,

voipTestProcessedPacketCount,

voipTestLossPacketCount,

voipTestDiscardedPacketCount,

voipTestMinJitterLevel,

voipTestMaxJitterLevel,

voipTestAvgJitterLevel,

voipTestRfactor,

voipTestMOS

}

STATUS current

DESCRIPTION

**"voipTestControlGroup defines mandatory objects of the
voipTestResultTable."**

::= { voipMibGroups 3 }

END