SCTE · ISBE

STANDARDS

Network Operations Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 131 2017

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

NOTICE

The Society of Cable Telecommunications Engineers (SCTE) / International Society of Broadband Experts (ISBE) Standards and Operational Practices (hereafter called "documents") are intended to serve the public interest by providing specifications, test methods and procedures that promote uniformity of product, interchangeability, best practices and ultimately the long-term reliability of broadband communications facilities. These documents shall not in any way preclude any member or non-member of SCTE•ISBE from manufacturing or selling products not conforming to such documents, nor shall the existence of such standards preclude their voluntary use by those other than SCTE•ISBE members.

SCTE•ISBE assumes no obligations or liability whatsoever to any party who may adopt the documents. Such adopting party assumes all risks associated with adoption of these documents, and accepts full responsibility for any damage and/or claims arising from the adoption of such documents.

Attention is called to the possibility that implementation of this document may require the use of subject matter covered by patent rights. By publication of this document, no position is taken with respect to the existence or validity of any patent rights in connection therewith. SCTE•ISBE shall not be responsible for identifying patents for which a license may be required or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Patent holders who believe that they hold patents which are essential to the implementation of this document have been requested to provide information about those patents and any related licensing terms and conditions. Any such declarations made before or after publication of this document are available on the SCTE•ISBE web site at http://www.scte.org.

Contents

1. Scope

This document is identical to SCTE 131 2007 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

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 simultate 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
"Mimimum 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
```