Remote Monitoring MIB Extensions for Interface Parameters Monitoring

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.

Copyright Notice

Copyright (C) The Internet Society (2001). All Rights Reserved.

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 with a method of sorting the interfaces of a monitored device according to values of parameters specific to this interface.

Table of Contents

1 Introduction ........................................... 2
2 The SNMP Management Framework .................... 2
3 Overview .............................................. 3
4 MIB Structure ......................................... 4
5 Evolution of the Document, Limitations and Future Work .... 4
6 Definitions ............................................ 5
7 References ............................................ 26
8 Intellectual Property .................................. 28
9 Security Considerations ................................ 29
10 Author’s Address ..................................... 29
11 Full Copyright Statement .............................. 30
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 defines a method of sorting the interfaces of a monitored device according to values of parameters specific to this interface.

This memo also includes a MIB module. This MIB module extends the list of managed objects specified in [RFC2819] and [RFC2613].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMEND", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].
- 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], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].
- 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].
- 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].
- 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.

3. Overview

This document continues the architecture created in the RMON MIB [RFC2819] and extended by the SMON MIB [RFC2613] by providing a method of ordering the interfaces of a device according to the value of a specific parameter that characterizes the interfaces.

The need for such a technique derives from the evolution of the network devices - bridges, routers, etc., into complex entities with a large number of interfaces and with many parameters that need to be monitored on each interface. It is common for certain classes of switching devices to contain hundred of ports, and for each port to instrument and support tens of parameters - usually expressed as counters - for each interface. As a result, it becomes impossible for applications that monitor these devices to provide a view that would allow the user to understand easily what is the status of the device, whether the behavior of a port or interface is in normal boundaries or not, and which are the most congested or problematic interfaces of the device.

This document tries to answer this problem by proposing a method of providing a sorted list of interfaces according to programmable criteria. The result of applying this method will be a shorter list, that includes the most significant interfaces sorted according to the selected criteria. One possible action that can be taken by a network manager could be applying to this interface a copy port operation to a destination port that has a dedicated monitoring device (e.g., a network analyzer) connected to it. A standard MIB interface for performing this operation is described in [RFC2613].
4. MIB Structure

This MIB contains one MIB group:

- The interfaceTopNObjects

The interfaceTopNObjects includes one capability object and two tables:

- The interfaceControlTable
- The interfaceTopNTable

The interfaceControlTable is an RMON-style control table, allowing for the creation of interfaceTopN reports. The parameters specific for each report, like the duration of the report, the number of reports, start time and the characteristics of the variables that are sorted (absolute, ‘deltas’ or percentage of the total bandwidth) are set in this table. An optional operation that is controlled from this table is the normalization of values of the variables, which allows for sorting of variables on the interfaces, despite the basic speed of the interfaces being different on different interfaces.

5. Evolution of the Document, Limitations and Future Work

The RMON MIB Working Group included in its Charter a MIB document that would offer a solution to the problem of quickly determining the most congested (highest utilized) physical ports and links in an RMON-capable device with multiple interfaces.

An initial solution, proposed in the first version of this document included a limited approach. The objects whose values are used as criteria for sorting are elements in tables indexed by an InterfaceIndex type of object, as defined in [RFC2863]. This approach simplifies the search algorithm and the result table, but restricts the method to interface parameters. A more generic ‘usrTopN’ function was initially considered out of the scope of this work.

At the Working Group meeting in Adelaide in March 2000, it was decided to try to define the more generic function of usrTopN. Under this approach, variables belonging to tables with any type of index can be sorted, but at expense of extra processing and sanity checking by the agent.

At the interim meeting of the RMON Working Group in San Francisco, in May 2000, it was decided that the usrTopN solution would not be continued in this phase of the work. One of the reasons is that it is difficult to achieve a normalization factor for a generic
approach. The group agreed it is not desirable to require the application to plug-in the scaling factor for every instance that might be included in a TopN report.

6. Definitions

INTERFACETOPN-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE, Integer32, Gauge32
  FROM SNMPv2-SMI
  RowStatus, TimeStamp, TruthValue
  FROM SNMPv2-TC
  rmon, OwnerString
  FROM RMON-MIB
  CounterBasedGauge64
  FROM HCNUM-TC
  MODULE-COMPLIANCE, OBJECT-GROUP
  FROM SNMPv2-CONF;

interfaceTopNMIB MODULE-IDENTITY
  LAST-UPDATED "200103270000Z"
  ORGANIZATION "IETF RMON MIB Working Group"
  CONTACT-INFO
    "Dan Romascanu
    Avaya Inc.
    Tel: +972-3-645-8414
    Email: dromasca@avaya.com"

  DESCRIPTION
    "The MIB module for sorting device interfaces for RMON and SMON monitoring in a multiple device implementation."
    ::= { rmon 27 }

interfaceTopNOObjects OBJECT IDENTIFIER ::= { interfaceTopNMIB 1 }
interfaceTopNONotifications OBJECT IDENTIFIER ::= { interfaceTopNMIB 2 }
interfaceTopNConformance OBJECT IDENTIFIER ::= { interfaceTopNMIB 3 }

-- The Interface Top N group is used to prepare reports that
-- describe a list of interfaces (data sources)
-- ordered by the values of one
-- of the objects that apply to the interfaces of the respective device.
-- Those objects are defined by standard MIBs. The exact objects that
-- are supported by the agent are described by interfaceTopNCaps
-- The objects must be elements in tables indexed only by an
-- InterfaceIndex object.
-- The objects chosen by the
-- management station may be sampled over a management
-- station-specified time interval, making the report rate based.
-- The management station also specifies the number of interfaces
-- that are reported.
--
-- The interfaceTopNControlTable is used to initiate the generation
-- of a report. The management station may select the parameters
-- of such a report, such as which object, how
-- many interfaces, and the start & stop times of the sampling. When
-- the report is prepared, entries are created in the
-- interfaceTopNTable associated with the relevant
-- interfaceTopNControlEntry. These entries are static for
-- each report after it has been prepared.

interfaceTopNCaps OBJECT-TYPE
SYNTAX    BITS {
    ifInOctets(0),
    ifInUcastPkts(1),
    ifInNUcastPkts(2),
    ifInDiscards(3),
    ifInErrors(4),
    ifInUnknownProtos(5),
    ifOutOctets(6),
    ifOutUcastPkts(7),
    ifOutNUcastPkts(8),
    ifOutDiscards(9),
    ifOutErrors(10),
    ifInMulticastPkts(11),
    ifInBroadcastPkts(12),
    ifOutMulticastPkts(13),
    ifOutBroadcastPkts(14),
    ifHCInOctets(15),
    ifHCInUcastPkts(16),
    ifHCInMulticastPkts(17),
    ifHCInBroadcastPkts(18),
    ifHCOutOctets(19),
    ifHCOutUcastPkts(20),
    ifHCOutMulticastPkts(21),
    ifHCOutBroadcastPkts(22),
    dot3StatsAlignmentErrors(23),
    dot3StatsFCSErrors(24),
    dot3StatsSingleCollisionFrames(25),
    dot3StatsMultipleCollisionFrames(26),
    dot3StatsSQETestErrors(27),
    dot3StatsDeferredTransmissions(28),
    dot3StatsLateCollisions(29),
    dot3StatsExcessiveCollisions(30),
    dot3StatsInternalMacTxErrors(31),
dot3StatsCarrierSenseErrors(32),
dot3StatsFrameTooLongs(33),
dot3StatsInternalMacRxErrors(34),
dot3StatsSymbolErrors(35),
dot3InPauseFrames(36),
dot3OutPauseFrames(37),
dot5StatsLineErrors(38),
dot5StatsBurstErrors(39),
dot5StatsACErrors(40),
dot5StatsAbortTransErrors(41),
dot5StatsInternalErrors(42),
dot5StatsLostFrameErrors(43),
dot5StatsReceiveCongestions(44),
dot5StatsFrameCopiedErrors(45),
dot5StatsTokenErrors(46),
dot5StatsSoftErrors(47),
dot5StatsHardErrors(48),
dot5StatsSignalLoss(49),
dot5StatsTransmitBeacons(50),
dot5StatsRecoverys(51),
dot5StatsLobeWires(52),
dot5StatsRemoves(53),
dot5StatsSingles(54),
dot5StatsFreqErrors(55),
etherStatsDropEvents(56),
etherStatsOctets(57),
etherStatsPkts(58),
etherStatsBroadcastPkts(59),
etherStatsMulticastPkts(60),
etherStatsCRCAlignErrors(61),
etherStatsUndersizePkts(62),
etherStatsOversizePkts(63),
etherStatsFragments(64),
etherStatsJabbers(65),
etherStatsCollisions(66),
etherStatsPkts64Octets(67),
etherStatsPkts65to127Octets(68),
etherStatsPkts128to255Octets(69),
etherStatsPkts256to511Octets(70),
etherStatsPkts512to1023Octets(71),
etherStatsPkts1024to1518Octets(72),
dot1dTpPortInFrames(73),
dot1dTpPortOutFrames(74),
dot1dTpPortInDiscards(75)
"The type(s) of sorting capabilities supported by the agent.

If the agent can perform sorting of interfaces according to the values of ifInOctets, as defined in [RFC2863], then the 'ifInOctets' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInUcastPkts, as defined in [RFC2863], then the 'ifInUcastPkts' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInNUcastPkts, as defined in [RFC2863], then the 'ifInNUcastPkts' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInDiscards, as defined in [RFC2863], then the 'ifInDiscards' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInErrors, as defined in [RFC2863], then the 'ifInErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInUnknownProtocols, as defined in [RFC2863], then the 'ifInUnknownProtocols' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutOctets, as defined in [RFC2863], then the 'ifOutOctets' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutUcastPackets, as defined in [RFC2863], then the 'ifOutUcastPackets' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutNUcastPackets, as defined in [RFC2863], then the 'ifOutNUcastPackets' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutDiscards, as defined in [RFC2863], then the 'ifOutDiscards' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutErrors, as defined in [RFC2863], then the 'ifOutErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInMulticastPkts, as defined in [RFC2863],
then the 'ifInMulticastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifInBroadcastPkts, as defined in [RFC2863], then the 'ifInBroadcastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutMulticastPkts, as defined in [RFC2863], then the 'ifOutMulticastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifOutBroadcastPkts, as defined in [RFC2863], then the 'ifOutBroadcastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCInOctets, as defined in [RFC2863], then the 'ifHCInOctets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCInMulticastPkts, as defined in [RFC2863], then the 'ifHCInMulticastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCInBroadcastPkts, as defined in [RFC2863], then the 'ifHCInBroadcastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCOutOctets, as defined in [RFC2863], then the 'ifHCOutOctets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCOutUcastPkts, as defined in [RFC2863], then the 'ifHCOutUcastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCOutMulticastPkts, as defined in [RFC2863], then the 'ifHCOutMulticastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of ifHCOutBroadcastPkts, as defined in [RFC2863], then the 'ifHCOutBroadcastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsAlignmentErrors, as defined in [RFC2665], then the 'dot3StatsAlignmentErrors’ bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsFCSErrors, as defined in [RFC2665],
then the 'dot3StatsFCSErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsSingleCollisionFrames, as defined in [RFC2665], then the 'dot3StatsSingleCollisionFrames' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsSQETestErrors, as defined in [RFC2665], then the 'dot3StatsSQETestErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsDeferredTransmissions, as defined in [RFC2665], then the 'dot3StatsDeferredTransmissions' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsLateCollisions, as defined in [RFC2665], then the 'dot3StatsLateCollisions' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsExcessiveCollisions, as defined in [RFC2665], then the 'dot3StatsExcessiveCollisions' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsInternalMacTxErrors, as defined in [RFC2665], then the 'dot3StatsInternalMacTxErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsCarrierSenseErrors, as defined in [RFC2665], then the 'dot3StatsCarrierSenseErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsFrameTooLongs, as defined in [RFC2665], then the 'dot3StatsFrameTooLongs' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsInternalMacRxErrors, as defined in [RFC2665], then the 'dot3StatsInternalMacRxErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3StatsSymbolErrors, as defined in [RFC2665], then the 'dot3StatsSymbolErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3InPauseFrames, as defined in [RFC2665],
then the 'dot3InPauseFrames' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot3OutPauseFrames, as defined in [RFC2665], then the 'dot3OutPauseFrames' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsLineErrors, as defined in [RFC1748], then the 'dot5StatsLineErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsBurstErrors, as defined in [RFC1748], then the 'dot5StatsBurstErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsACErrors, as defined in [RFC1748], then the 'dot5StatsACErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsAbortTransErrors, as defined in [RFC1748], then the 'dot5StatsAbortTransErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsInternalErrors, as defined in [RFC1748], then the 'dot5StatsInternalErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsLostFrameErrors, as defined in [RFC1748], then the 'dot5StatsLostFrameErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsReceiveCongestionErrors, as defined in [RFC1748], then the 'dot5StatsReceiveCongestionErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsFrameCopiedErrors, as defined in [RFC1748], then the 'dot5StatsFrameCopiedErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsTokenErrors, as defined in [RFC1748], then the 'dot5StatsTokenErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsSoftErrors, as defined in [RFC1748], then the 'dot5StatsSoftErrors' bit will be set.
values of dot5StatsHardErrors, as defined in [RFC1748], then the 'dot5StatsHardErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsSignalLoss, as defined in [RFC1748], then the 'dot5StatsSignalLoss' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsTransmitBeacons, as defined in [RFC1748], then the 'dot5StatsTransmitBeacons' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsRecoverys, as defined in [RFC1748], then the 'dot5StatsRecoverys' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsLobeWires, as defined in [RFC1748], then the 'dot5StatsLobeWires' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsRemoves, as defined in [RFC1748], then the 'dot5StatsRemoves' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsSingles, as defined in [RFC1748], then the 'dot5StatsSingles' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot5StatsFreqErrors, as defined in [RFC1748], then the 'dot5StatsFreqErrors' bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsDropEvents, as defined in [RFC2819], then the 'etherStatsDropEvents' bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsOctets, as defined in [RFC2819], then the 'etherStatsOctets' bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts, as defined in [RFC2819], then the 'etherStatsPkts' bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsBroadcastPkts, as defined in [RFC2819], then the 'etherStatsBroadcastPkts' bit will be set.

If the agent can perform sorting of interfaces according to the
values of etherStatsMulticastPkts, as defined in [RFC2819], then the ‘etherStatsMulticastPkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsCRCAlignErrors, as defined in [RFC2819], then the ‘etherStatsCRCAlignErrors’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsUndersizePkts, as defined in [RFC2819], then the ‘etherStatsUndersizePkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsOversizePkts, as defined in [RFC2819], then the ‘etherStatsOversizePkts’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsFragments, as defined in [RFC2819], then the ‘etherStatsFragments’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsJabbers, as defined in [RFC2819], then the ‘etherStatsJabbers’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsCollisions, as defined in [RFC2819], then the ‘etherStatsCollisions’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts64Octets, as defined in [RFC2819], then the ‘etherStatsPkts64Octets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts65to127Octets, as defined in [RFC2819], then the ‘etherStatsPkts65to127Octets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts128to255Octets, as defined in [RFC2819], then the ‘etherStatsPkts128to255Octets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts256to511Octets, as defined in [RFC2819], then the ‘etherStatsPkts256to511Octets’ bit will be set.

If the agent can perform sorting of interfaces according to the values of etherStatsPkts512to1023Octets, as defined in [RFC2819], then the ‘etherStatsPkts512to1023Octets’ bit will be set.
values of etherStatsPkts1024to1518Octets, as defined in [RFC2819], then the 'etherStatsPkts1024to1518Octets' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot1dTpPortInFrames, as defined in [RFC1493], then the 'dot1dTpPortInFrames' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot1dTpPortOutFrames, as defined in [RFC1493], then the 'dot1dTpPortOutFrames' bit will be set.

If the agent can perform sorting of interfaces according to the values of dot1dTpPortInDiscards, as defined in [RFC1493], then the 'dot1dTpPortInDiscards' bit will be set."

::= { interfaceTopNObjects 1 }

interfaceTopNControlTable OBJECT-TYPE
SYNTAX     SEQUENCE OF InterfaceTopNControlEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
"A table of control records for reports on the top 'N' interfaces for the value or rate of a selected object. The number of entries depends on the configuration of the agent. The maximum number of entries is implementation dependent."
::= { interfaceTopNObjects 2 }

interfaceTopNControlEntry OBJECT-TYPE
SYNTAX     InterfaceTopNControlEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
"A set of parameters that control the creation of a report of the top N ports according to several metrics."
INDEX     { interfaceTopNControlIndex }
::= { interfaceTopNControlTable 1 }

InterfaceTopNControlEntry ::= SEQUENCE {
  interfaceTopNControlIndex
    Integer32,
  interfaceTopNObjectVariable
    INTEGER,
interfaceTopNObjectSampleType
  INTEGER,
interfaceTopNNNormalizationReq
  TruthValue,
interfaceTopNNNormalizationFactor
  Integer32,
interfaceTopNTimeRemaining
  Integer32,
interfaceTopNDuration
  Integer32,
interfaceTopNRequestedSize
  Integer32,
interfaceTopNGrantedSize
  Integer32,
interfaceTopNStartTime
  TimeStamp,
interfaceTopNOwner
  OwnerString,
interfaceTopNLastCompletionTime
  TimeStamp,
interfaceTopNRowStatus
  RowStatus
}

interfaceTopNControlIndex OBJECT-TYPE
SYNTAX       Integer32 (1 .. 65535)
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  
  "An index that uniquely identifies an entry in the
  interfaceTopNControl table. Each such entry defines
  one top N report prepared for a probe."
::= { interfaceTopNControlEntry 1 }

interfaceTopNObjectVariable OBJECT-TYPE
SYNTAX       INTEGER  
            {  
             ifInOctets(0),
             ifInUcastPkts(1),
             ifInNUcastPkts(2),
             ifInDiscards(3),
             ifInErrors(4),
             ifInUnknownProtos(5),
             ifOutOctets(6),
             ifOutUcastPkts(7),
             ifOutNUcastPkts(8),
             ifOutDiscards(9),
             ifOutErrors(10),
            }
ifInMulticastPkts(11),
ifInBroadcastPkts(12),
ifOutMulticastPkts(13),
ifOutBroadcastPkts(14),
ifHCInOctets(15),
ifHCInUcastPkts(16),
ifHCInMulticastPkts(17),
ifHCInBroadcastPkts(18),
ifHCOutOctets(19),
ifHCOutUcastPkts(20),
ifHCOutMulticastPkts(21),
ifHCOutBroadcastPkts(22),
dot3StatsAlignmentErrors(23),
dot3StatsFCSErrors(24),
dot3StatsSingleCollisionFrames(25),
dot3StatsMultipleCollisionFrames(26),
dot3StatsSQUErrors(27),
dot3StatsDeferredTransmissions(28),
dot3StatsLateCollisions(29),
dot3StatsExcessiveCollisions(30),
dot3StatsInternalMacTxErrors(31),
dot3StatsCarrierSenseErrors(32),
dot3StatsFrameTooLongs(33),
dot3StatsInternalMacRxErrors(34),
dot3StatsSymbolErrors(35),
dot3InPauseFrames(36),
dot3OutPauseFrames(37),
dot5StatsLineErrors(38),
dot5StatsBurstErrors(39),
dot5StatsACErrors(40),
dot5StatsAbortTransErrors(41),
dot5StatsInternalErrors(42),
dot5StatsLostFrameErrors(43),
dot5StatsReceiveCongestions(44),
dot5StatsFrameCopiedErrors(45),
dot5StatsTokenErrors(46),
dot5StatsSoftErrors(47),
dot5StatsHardErrors(48),
dot5StatsSignalLoss(49),
dot5StatsTransmitBeacons(50),
dot5StatsRecoverys(51),
dot5StatsLobeWires(52),
dot5StatsRemoves(53),
dot5StatsSingles(54),
dot5StatsFreqErrors(55),
etherStatsDropEvents(56),
etherStatsOctets(57),
etherStatsPkts(58),

etherStatsBroadcastPkts(59),
etherStatsMulticastPkts(60),
etherStatsCRCAlignErrors(61),
etherStatsUndersizePkts(62),
etherStatsOversizePkts(63),
etherStatsFragments(64),
etherStatsJabbers(65),
etherStatsCollisions(66),
etherStatsPkts64Octets(67),
etherStatsPkts65to127Octets(68),
etherStatsPkts128to255Octets(69),
etherStatsPkts256to511Octets(70),
etherStatsPkts512to1023Octets(71),
etherStatsPkts1024to1518Octets(72),
dot1dTpPortInFrames(73),
dot1dTpPortOutFrames(74),
dot1dTpPortInDiscards(75)
}

MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The particular variable to be sampled.

Values between 0 and 22, point to MIB objects defined in IF-MIB [RFC2863].

Values between 23 and 37, point to MIB objects defined in EtherLike-MIB [RFC2665].

Values between 38 and 55, point to MIB objects defined in TOKENRING-MIB [RFC1748].

Values between 56 and 72, point to MIB objects defined in RMON-MIB [RFC2819].

Values between 73 and 75, point to MIB objects defined in BRIDGE-MIB [RFC1493].

Because SNMP access control is articulated entirely in terms of the contents of MIB views, no access control mechanism exists that can restrict the value of this object to identify only those objects that exist in a particular MIB view. Because there is thus no acceptable means of restricting the read access that could be obtained through the TopN mechanism, the probe must only grant write access to this object in those views that have read access to all objects on the probe.
During a set operation, if the supplied variable name is not available in the selected MIB view, or does not conform the other conditions mentioned above, a badValue error must be returned.

This object may not be modified if the associated interfaceTopNControlStatus object is equal to active(1)."

::= { interfaceTopNControlEntry 2 }

interfaceTopNObjectSampleType OBJECT-TYPE
SYNTAX INTEGER {
   absoluteValue(1),
   deltaValue(2),
   bandwidthPercentage(3)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The method of sampling the selected variable for storage in the interfaceTopNTable.

If the value of this object is absoluteValue(1), the value of the selected variable will be copied directly into the topNValue.

If the value of this object is deltaValue(2), the value of the selected variable at the last sample will be subtracted from the current value, and the difference will be stored in topNValue.

If the value of this object is bandwidthPercentage(3), the agent records the total number of octets sent over an interval divided by the total number of octets that represent '100% bandwidth' for that interface. This ratio is multiplied by 1000 to retain a 3 digit integer (0..1000) in units of 'tenth of one percent'. This type of computation is accurate for the octet counters. The usage of this option with respect to packets or error counters is not recommended.

This object may not be modified if the associated interfaceTopNControlStatus object is equal to active(1)."

::= { interfaceTopNControlEntry 3 }

interfaceTopNNormalizationReq OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates whether normalization is required in the

Romascanu Standards Track [Page 18]
computation of the selected value.

If the value of this object is 'true', the value of the selected variable will be multiplied by a factor equal to the interfaceTopNNormalizationFactor divided by the value of effective speed of the interface

If the value of this object is 'false', the value of the selected variable will be taken 'as is' in the TopN computation.

If the value of the object interfaceTopNSampleType is bandwidthPercentage(3), the object interfaceTopNNormalizationReq cannot take the value 'true'.

The value of this object MUST be false if the effective speed of the interface sub-layer as determined from ifSpeed is zero. This conforms to the ifSpeed definition in [RFC2863] for a sub-layer that has no concept of bandwidth.

This object may not be modified if the associated interfaceTopNControlStatus object is equal to active(1).

::= { interfaceTopNControlEntry 4 }

interfaceTopNNormalizationFactor
OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The value used for normalization if interfaceTopNNormalizationReq has the value 'true'.

Example:
The following set of values is applied to a device with multiple Ethernet interfaces running at 10 Mbps, 100 Mbps, and 1 Gbps. interfaceTopNObjectVariable = 'ifInOctets'
interfaceTopNObjectSampleType = 'deltaValue'
interfaceTopNNormalizationReq = 'true'
interfaceTopNNormalizationFactor = 1000000000
Applying this set of values will result in the sampled delta values to be multiplied by 100 for the 10 Mbps interfaces, and by 10 for the 100 Mbps interfaces, while the sample values for the 1 Gbps interface are left unchanged. The effective speed of the interface is taken from the value of ifSpeed for each interface, if ifSpeed is less than 4,294,967,295, or from ifHighSpeed multiplied by 1,000,000 otherwise.

At row creation the agent SHOULD set the value of this object to
the effective speed of the interface."
::= { interfaceTopNControlEntry 5 }

interfaceTopNTimeRemaining OBJECT-TYPE
SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The number of seconds left in the report
currently being collected. When this object
is modified by the management station, a new
collection is started, possibly aborting a
currently running report. The new value is
used as the requested duration of this report,
which is loaded into the associated
interfaceTopNDuration object.

When this object is set to a non-zero value,
any associated interfaceTopNEntries shall be
made inaccessible by the agent. While the value
of this object is non-zero, it decrements by one
per second until it reaches zero. During this
time, all associated interfaceTopNEntries shall
remain inaccessible. At the time that this object
decrements to zero, the report is made accessible
in the interfaceTopNTable. Thus, the interfaceTopN
Table needs to be created only at the end of the
collection interval.

If the value of this object is set to zero
while the associated report is running, the
running report is aborted and no associated
interfaceTopNEntries are created."
DEFVAL { 0 }
::= { interfaceTopNControlEntry 6 }

interfaceTopNDuration OBJECT-TYPE
SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of seconds that this report has
collected during the last sampling interval,
or if this report is currently being collected,
the number of seconds that this report is being
collected during this sampling interval.

When the associated interfaceTopNTimeRemaining
object is set, this object shall be set by the
agent to the same value and shall not be modified
until the next time the interfaceTopNTimeRemaining
is set.

This value shall be zero if no reports have been
requested for this interfaceTopNControlEntry.

::= { interfaceTopNControlEntry 7 }

interfaceTopNRequestedSize OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The maximum number of interfaces requested
for the Top N Table.

When this object is created or modified, the
agent should set interfaceTopNGrantedSize as close
to this object as is possible for the particular
implementation and available resources."
DEFVAL { 10 }
::= { interfaceTopNControlEntry 8 }

interfaceTopNGrantedSize OBJECT-TYPE
SYNTAX      Integer32 (0.. 2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The maximum number of interfaces in the
top N table.

When the associated interfaceTopNRequestedSize object is
created or modified, the agent should set this object as
closely to the requested value as is possible for the particular
implementation and available resources. The
agent must not lower this value except as a result of a
set to the associated interfaceTopNRequestedSize object."
::= { interfaceTopNControlEntry 9 }

interfaceTopNStartTime OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of sysUpTime when this top N report was
last started. In other words, this is the time that
the associated interfaceTopNTimeRemaining object was
modified to start the requested report.

If the report has not yet been started, the value of this object is zero.

 ::= { interfaceTopNControlEntry 10 }

interfaceTopNOwner OBJECT-TYPE
SYNTAX        OwnerString
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION   "The entity that configured this entry and is using the resources assigned to it."
 ::= { interfaceTopNControlEntry 11 }

interfaceTopNLastCompletionTime OBJECT-TYPE
SYNTAX        TimeStamp
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "The value of sysUpTime when this top N report was last completed. If no report was yet completed, the value of this object is zero."
 ::= { interfaceTopNControlEntry 12 }

interfaceTopNRowStatus OBJECT-TYPE
SYNTAX        RowStatus
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION   "The status of this row.

If the value of this object is not equal to active(1), all associated entries in the interfaceTopNTable shall be deleted by the agent."
 ::= { interfaceTopNControlEntry 13 }

-- Interface Top "N" reports

interfaceTopNTable OBJECT-TYPE
SYNTAX        SEQUENCE OF InterfaceTopNEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION   "A table of reports for the top 'N' ports based on
setting of associated control table entries. The maximum number of entries depends on the number of entries in table interfaceTopNControlTable and the value of object interfaceTopNGrantedSize for each entry.

For each entry in the interfaceTopNControlTable, interfaces with the highest value of interfaceTopNValue shall be placed in this table in decreasing order of that rate until there is no more room or until there are no more ports."

::= { interfaceTopNObjects 3 }

interfaceTopNEntry OBJECT-TYPE
SYNTAX InterfaceTopNEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A set of statistics for an interface that is part of a top N report."
INDEX { interfaceTopNControlIndex,
interfaceTopNIndex } ::= { interfaceTopNTable 1 }

InterfaceTopNEntry ::= SEQUENCE {
interfaceTopNIndex
Integer32,
interfaceTopNDataSourceIndex
Integer32,
interfaceTopNValue
Gauge32,
interfaceTopNValue64
CounterBasedGauge64
}

interfaceTopNIndex OBJECT-TYPE
SYNTAX Integer32 (1..65535)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An index that uniquely identifies an entry in the interfaceTopN table among those in the same report. This index is between 1 and N, where N is the number of entries in this report. Increasing values of interfaceTopNIndex shall be assigned to entries with decreasing values of interfaceTopNValue or interfaceTopNValue64, whichever applies, until index N is assigned to the entry with the
lowest value of interfaceTopNValue / interfaceTopNValue64 or there are no more interfaceTopNEntries.

No ports are included in a report where their value of interfaceTopNValue would be zero."

::= { interfaceTopNEntry 1 }

interfaceTopNDataSourceIndex OBJECT-TYPE
SYNTAX      Integer32  (1..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object identifies the index corresponding to the dataSource for this entry.

For sorted values of variables belonging to the IF-MIB, EtherLike-MIB or TOKENRING-MIB, this value equals the ifIndex of the interface.

For sorted values of variables belonging to the RMON-MIB, this value equals the interface corresponding to the data source, pointed to by the value of etherStatsDataSource.

For sorted values of variables belonging to the BRIDGE-MIB, this value equals the interface corresponding to the bridge port, pointed to by the value of dot1dBasePortIfIndex."

::= { interfaceTopNEntry 2 }

interfaceTopNValue OBJECT-TYPE
SYNTAX      Gauge32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The value at the end of the sampling interval, or the amount of change in the selected variable during this sampling interval for the identified interface. The selected variable is that interfaces’s instance of the object selected by interfaceTopNObjectVariable. This value may be normalized if interfaceTopNNormalization required equals ‘true’. This value of this object will be computed for all cases when interfaceTopNObjectVariable points to a 32-bit counter or Gauge or when interfaceTopNObjectSampleType equals bandwidthPercentage(3), and will be zero for all other cases."
::= { interfaceTopNEntry 3 }

interfaceTopNValue64 OBJECT-TYPE
SYNTAX CounterBasedGauge64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value at the end of the sampling interval, or
the amount of change in the selected variable
during this sampling interval for the identified
interface. The selected variable is that interfaces’s
instance of the object selected by
interfaceTopNObjectVariable. This value may be normalized
if interfaceTopNNormalization required equals ‘true’.
This value of this object will be computed for all
cases when interfaceTopNObjectVariable points to
a 64-bit counter, and will be zero for all other cases."
::= { interfaceTopNEntry 4 }

-- -- Notifications Section
-- {none defined}
--
-- -- Conformance Section
--

.interfaceTopNCompliances OBJECT IDENTIFIER ::= {interfaceTopNConformance 1 }
.interfaceTopNGroups OBJECT IDENTIFIER ::= {interfaceTopNConformance 2 }

.interfaceTopNCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"Describes the requirements for conformance to the
InterfaceTopN MIB."
MODULE -- this module
MANDATORY-GROUPS { interfaceTopNGroup }
::= { interfaceTopNCompliances 1 }

.interfaceTopNGroup OBJECT-GROUP
OBJECTS {
.interfaceTopNCaps,
.interfaceTopNObjectVariable,
.interfaceTopNObjectSampleType,
interfaceTopNNormalizationReq,
interfaceTopNNormalizationFactor,
interfaceTopNTimeRemaining,
interfaceTopNDuration,
interfaceTopNRequestedSize,
interfaceTopNGrantedSize,
interfaceTopNStartTime,
interfaceTopNOwner,
interfaceTopNLastCompletionTime,
interfaceTopNRowStatus,
interfaceTopNDataSourceIndex,
interfaceTopNValue,
interfaceTopNValue64
}

STATUS current

DESCRIPTION
"A collection of objects providing interfaceTopN data for
a multiple interfaces device."

::= { interfaceTopNGroups 1 }

END

7. References

for Describing SNMP Management Frameworks", RFC 2571, April
1999.

of Management Information for TCP/IP-based Internets", STD


[RFC1215] M. Rose, "A Convention for Defining Traps for use with the

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J.,
Rose, M., and S. Waldbusser, "Structure of Management
Information Version 2 (SMIv2)", STD 58, RFC 2578, April
1999.

[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J.,
Rose, M., and S. Waldbusser, "Textual Conventions for
SMIv2", STD 58, RFC 2579, April 1999.
[RFC2580]   McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J.,
              Rose, M., and S. Waldbusser, "Conformance Statements for
              SMIv2", STD 58, RFC 2580, April 1999.


[RFC1901]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser,
              "Introduction to Community-based SNMPv2", RFC 1901, January
              1996.

[RFC1906]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser,
              "Transport Mappings for Version 2 of the Simple Network

              Processing and Dispatching for the Simple Network Management
              Protocol (SNMP)", RFC 2572, April 1999.

              (USM) for version 3 of the Simple Network Management
              Protocol (SNMPv3)", RFC 2574, April 1999.

[RFC1905]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser,
              "Protocol Operations for Version 2 of the Simple Network

              RFC 2573, April 1999.

              Access Control Model (VACM) for the Simple Network

[RFC2570]   Case, J., Mundy, R., Partain, D., and B. Stewart,
              "Introduction to Version 3 of the Internet-standard Network

[RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate


              "Remote Network Monitoring MIB Extensions for Switched
8. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF’s procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.
9. Security Considerations

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.

There are a number of managed objects in this MIB that may contain sensitive information. These are:

- interfaceTopNDDataSourceIndex
- interfaceTopNValue

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is not a secure environment. 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.

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 [RFC2274] and the View-based Access Control Model [RFC2275] 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.

10. Author’s Address

Dan Romascanu
Avaya Inc.
Atidim Technology Park, Bldg. #3
Tel Aviv, 61131
Israel

Phone: +972-3-645-8414
EMail: dromasca@avaya.com
11. Full Copyright Statement

Copyright (C) The Internet Society (2001). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.