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Integrated Services Management Information Base Guaranteed Service Extensions using SMIv2

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.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing the the interface attributes defined in the Guaranteed Service of the Integrated Services Model. Comments should be made to the Integrated Services Working Group, intserv@isi.edu.

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1. The SNMPv2 Network Management Framework

The SNMPv2 Network Management Framework consists of four major components. They are:

- o RFC 1441 which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management.
- o STD 17, RFC 1213 defines MIB-II, the core set of managed objects for the Internet suite of protocols.
- o RFC 1445 which defines the administrative and other architectural aspects of the framework.
- o RFC 1448 which defines the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

1.1. Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) defined in the SMI. In particular, each object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to refer to the object type.

2. Overview

2.1. Textual Conventions

Several new data types are introduced as a textual convention in this MIB document. These textual conventions enhance the readability of the specification and can ease comparison with other specifications if appropriate. It should be noted that the introduction of the these textual conventions has no effect on either the syntax nor the semantics of any managed objects. The use of these is merely an artifact of the explanatory method used. Objects defined in terms of one of these methods are always encoded by means of the rules that define the primitive type. Hence, no changes to the SMI or the SNMP are necessary to accommodate these textual conventions which are adopted merely for the convenience of readers and writers in pursuit of the elusive goal of clear, concise, and unambiguous MIB documents.

3. Definitions

```
INTEGRATED-SERVICES-GUARANTEED-MIB DEFINITIONS ::= BEGIN

    IMPORTS
            MODULE-IDENTITY, OBJECT-TYPE             FROM SNMPv2-SMI
            RowStatus                                FROM SNMPv2-TC
            MODULE-COMPLIANCE, OBJECT-GROUP          FROM SNMPv2-CONF
            intSrv                        FROM INTEGRATED-SERVICES-MIB
            ifIndex                                  FROM IF-MIB;

--  This MIB module uses the extended OBJECT-TYPE macro as
--  defined in [9].

intSrvGuaranteed MODULE-IDENTITY
        LAST-UPDATED "9511030500Z" -- Thu Aug 28 09:04:22 PDT 1997
        ORGANIZATION "IETF Integrated Services Working Group"
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               Santa Barbara, California 93111
       Tel:    +1 805 681 0115
       E-Mail: fred@cisco.com"
    DESCRIPTION
       "The MIB module to describe the Guaranteed Service of
       the Integrated Services Protocol"
    ::= { intSrv 5 }

intSrvGuaranteedObjects          OBJECT IDENTIFIER
                                 ::= { intSrvGuaranteed 1 }
intSrvGuaranteedNotifications    OBJECT IDENTIFIER
                                 ::= { intSrvGuaranteed 2 }
intSrvGuaranteedConformance      OBJECT IDENTIFIER
                                 ::= { intSrvGuaranteed 3 }


--      The Integrated Services Interface Attributes Database
--      contains information that is shared with other reservation
--      procedures such as ST-II.


    intSrvGuaranteedIfTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF IntSrvGuaranteedIfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
           "The attributes of the system's interfaces  ex-
           ported by the Guaranteed Service."
       ::= { intSrvGuaranteedObjects 1 }


    intSrvGuaranteedIfEntry OBJECT-TYPE
        SYNTAX      IntSrvGuaranteedIfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
           "The reservable attributes of  a  given  inter-
           face."
       INDEX { ifIndex }
       ::= { intSrvGuaranteedIfTable 1 }

IntSrvGuaranteedIfEntry ::=
    SEQUENCE {
        intSrvGuaranteedIfBacklog INTEGER,
        intSrvGuaranteedIfDelay   INTEGER,
        intSrvGuaranteedIfSlack   INTEGER,
        intSrvGuaranteedIfStatus  RowStatus
    }

    intSrvGuaranteedIfBacklog OBJECT-TYPE
        SYNTAX      INTEGER (0..'0FFFFFFF'h)
        UNITS       "bytes"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "The Backlog  parameter  is  the  data  backlog
           resulting  from  the vagaries of how a specific
           implementation deviates from a  strict  bit-by-
           bit  service.  So, for instance, for packetized
           weighted fair queueing, Backlog is set  to  the
           Maximum Packet Size.

           The Backlog term is measured in units of bytes.
           An  individual  element can advertise a Backlog
           value between 1 and 2**28 (a  little  over  250
           megabytes)  and  the  total added over all ele-
           ments can range as high as  (2**32)-1.   Should
           the  sum of the different elements delay exceed
           (2**32)-1, the end-to-end error term should  be
           (2**32)-1."
       ::= { intSrvGuaranteedIfEntry 1 }

    intSrvGuaranteedIfDelay OBJECT-TYPE
```

```
        SYNTAX      INTEGER (0..'0FFFFFFF'h)
        UNITS       "microseconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "The Delay parameter at  each  service  element
           should  be  set  to the maximum packet transfer
           delay (independent of bucket size) through  the
           service  element.   For  instance,  in a simple
           router, one might compute the worst case amount
           of  time  it  make  take  for a datagram to get
           through the input interface to  the  processor,
           and how long it would take to get from the pro-
           cessor to the outbound interface (assuming  the
           queueing  schemes work correctly).  For an Eth-
           ernet, it might represent the worst case  delay
           if  the maximum number of collisions is experi-
           enced.

           The Delay term is measured in units of one  mi-
           crosecond.  An individual element can advertise
           a delay value between  1  and  2**28  (somewhat
           over two minutes) and the total delay added all
           elements  can  range  as  high  as   (2**32)-1.
           Should  the sum of the different elements delay
           exceed (2**32)-1, the end-to-end  delay  should
           be (2**32)-1."
       ::= { intSrvGuaranteedIfEntry 2 }

    intSrvGuaranteedIfSlack OBJECT-TYPE
        SYNTAX      INTEGER (0..'0FFFFFFF'h)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "If a network element uses a certain amount  of
           slack,  Si,  to  reduce the amount of resources
           that it has reserved for a particular flow,  i,
           the  value  Si  should be stored at the network
           element.   Subsequently,  if  reservation   re-
           freshes  are  received  for flow i, the network
           element must use the same slack Si without  any
           further computation. This guarantees consisten-
           cy in the reservation process.

           As an example for the use of  the  slack  term,
           consider the case where the required end-to-end
           delay, Dreq, is larger than the  maximum  delay
           of the fluid flow system.  In this, Ctot is the
```

```
           sum of the Backlog terms end to end,  and  Dtot
           is the sum of the delay terms end to end.  Dreq
           is obtained by setting R=r in the  fluid  delay
           formula, and is given by

                        b/r + Ctot/r + Dtot.

           In this case the slack term is

                  S = Dreq - (b/r + Ctot/r + Dtot).

           The slack term may be used by the network  ele-
           ments  to  adjust  their local reservations, so
           that they can admit flows that would  otherwise
           have been rejected. A service element at an in-
           termediate network element that can  internally
           differentiate between delay and rate guarantees
           can now take advantage of this  information  to
           lower the amount of resources allocated to this
           flow. For example, by taking an amount of slack
           s  <= S, an RCSD scheduler [5] can increase the
           local delay bound, d, assigned to the flow,  to
           d+s. Given an RSpec, (Rin, Sin), it would do so
           by setting Rout = Rin and Sout = Sin - s.

           Similarly,  a  network  element  using  a   WFQ
           scheduler  can  decrease  its local reservation
           from Rin to Rout by using some of the slack  in
           the  RSpec.  This  can be accomplished by using
           the transformation rules given in the  previous
           section,  that ensure that the reduced reserva-
           tion level will not increase the  overall  end-
           to-end delay."
       ::= { intSrvGuaranteedIfEntry 3 }


    intSrvGuaranteedIfStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "'valid' on interfaces that are configured  for
           the Guaranteed Service."
       ::= { intSrvGuaranteedIfEntry 4 }

--      No notifications are currently defined

-- conformance information
```

```
intSrvGuaranteedGroups       OBJECT IDENTIFIER
                             ::= { intSrvGuaranteedConformance 1 }
intSrvGuaranteedCompliances OBJECT IDENTIFIER
                             ::= { intSrvGuaranteedConformance 2 }

-- compliance statements

    intSrvGuaranteedCompliance MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
           "The compliance statement "
       MODULE  -- this module
       MANDATORY-GROUPS {
           intSrvGuaranteedIfAttribGroup
           }
       ::= { intSrvGuaranteedCompliances 1 }


    intSrvGuaranteedIfAttribGroup OBJECT-GROUP
         OBJECTS {
            intSrvGuaranteedIfBacklog,
            intSrvGuaranteedIfDelay,
            intSrvGuaranteedIfSlack,
            intSrvGuaranteedIfStatus
        }
        STATUS  current
        DESCRIPTION
           "These objects are required  for  Systems  sup-
           porting the Guaranteed Service of the Integrat-
           ed Services Architecture."
       ::= { intSrvGuaranteedGroups 2 }

END
```

4. Security Considerations

The use of an SNMP SET results in an RSVP or Integrated Services reservation under rules that are different compared to if the reservation was negotiated using RSVP. However, no other security considerations exist other than those imposed by SNMP itself.

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6. Acknowledgements

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7. References

[1] Rose, M., Editor, "Management Information Base for Network Management of TCP/IP-based internets", STD 17, RFC 1213, May 1990.

[2] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization. International Standard 8824, (December, 1987).

[3] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization. International Standard 8825, (December, 1987).