                  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.

Table of Contents

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"
        CONTACT-INFO
      "   Fred Baker
        Postal: Cisco Systems
                519 Lado Drive
                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

   This document was produced by the Integrated Services Working Group.

7. References

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