RIP Version 2 MIB Extension

Status of this Memo

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 RIP Version 2.

Acknowledgements

Table of Contents

1. The Network Management Framework

   The Internet-standard Network Management Framework consists of three
   components. They are:

      STD 16/RFC 1155 which defines the SMI, the mechanisms used for
         describing and naming objects for the purpose of management.

      STD 16/RFC 1212 defines a more concise description mechanism,
         which is wholly consistent with the SMI.

      RFC 1156 which defines MIB-I, the core set of managed objects for
         the Internet suite of protocols. STD 17/RFC 1213 defines MIB-
         II, an evolution of MIB-I based on implementation experience
         and new operational requirements.

      STD 15/RFC 1157 which defines the SNMP, the protocol used for
         network access to managed objects.

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

2. Objects

   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) [7]
   defined in the SMI. In particular, each object has a name, a syntax,
   and an encoding. The name is an object identifier, an
   administratively assigned name, which specifies an object type. 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 OBJECT
   DESCRIPTOR, to also refer to the object type.

   The syntax of an object type defines the abstract data structure
   corresponding to that object type. The ASN.1 language is used for
   this purpose. However, the SMI [3] purposely restricts the ASN.1
   constructs which may be used. These restrictions are explicitly made
   for simplicity.

   The encoding of an object type is simply how that object type is
   represented using the object type's syntax. Implicitly tied to the
   notion of an object type's syntax and encoding is how the object type
   is represented when being transmitted on the network.

   The SMI specifies the use of the basic encoding rules of ASN.1 [8],
   subject to the additional requirements imposed by the SNMP.

2.1 Format of Definitions

   Section 4 contains the specification of all object types contained in
   this MIB module. The object types are defined using the conventions
   defined in the SMI, as amended by the extensions specified in [9].

3. Overview

3.1 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.

   The new data type is RouteTag. The RouteTag type represents the
   contents of the Route Domain field in the packet header or route
   entry.

3.2 Structure of MIB

   The RIP-2 MIB contains global counters, useful for detecting the
   deleterious effects of RIP incompatibilities; two "interfaces"
   tables, which contains interface-specific statistics and
   configuration information; and an optional "peer" table, containing
   information that may be helpful in debugging neighbor relationships.
   Like the protocol itself, this MIB takes great care to preserve
   compatibility with RIP-1 systems and controls for monitoring and
   controlling system interactions.

3.3 Modifications from RFC 1389

   The RIP-2 MIB was originally published in RFC 1389. It encoded the
   concept of a Routing Domain, and did not address unnumbered
   interfaces.

   In the current version of the protocol, Route Domains are deprecated;
   therefore, they are deprecated in the MIB as well. This means that
   the object rip2IfConfDomain is deprecated, and the object
   rip2PeerDomain (which cannot be deprecated, being an instance object)

must always be zero.

Unnumbered interfaces are supported in this version. Since the IP
Address that the neighbor uses may be unknown to the system, a
pseudo-address is used to identify these interfaces. The pseudo-
address is in the class A network 0.0.0.0, and the host number (the
least significant 24 bits of the address) are the ifIndex value of
the relevant IP Interface. This is an additional new meaning of the
objects rip2IfStatAddress and rip2IfConfAddress, backward compatible
with the RFC 1389 usage. The object rip2IfConfSrcAddress is added,
to permit the configuration of the source address on an unnumbered
interface, and the meaning of the object rip2PeerAddress is broadened
to remain relevant on unnumbered interfaces.

rip2IfConfSend is augmented with two values for the use of Demand RIP
under RIP-I and RIP-II rules. This avoids the necessity of a Demand
RIP MIB.

MD5 Authentication is supported.

4. Definitions

   RIPv2-MIB DEFINITIONS ::= BEGIN

   IMPORTS
       MODULE-IDENTITY, OBJECT-TYPE, Counter32,
       TimeTicks, IpAddress   FROM SNMPv2-SMI
       TEXTUAL-CONVENTION, RowStatus   FROM SNMPv2-TC
       MODULE-COMPLIANCE, OBJECT-GROUP   FROM SNMPv2-CONF
       mib-2   FROM RFC1213-MIB;

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

   rip2 MODULE-IDENTITY
           LAST-UPDATED "9407272253Z"   -- Wed Jul 27 22:53:04 PDT 1994
           ORGANIZATION "IETF RIP-II Working Group"
           CONTACT-INFO
          "   Fred Baker
          Postal: Cisco Systems
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                  Santa Barbara, California 93111
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          EMail: gmalkin@Xylogics.COM"
        DESCRIPTION
           "The MIB module to describe the RIP2 Version 2 Protocol"
        ::= { mib-2 23 }

 -- RIP-2 Management Information Base

 -- the RouteTag type represents the contents of the
 -- Route Domain field in the packet header or route entry.
 -- The use of the Route Domain is deprecated.

 RouteTag ::= TEXTUAL-CONVENTION
     STATUS   current
     DESCRIPTION
        "the RouteTag type represents the contents of the Route Domain
        field in the packet header or route entry"
    SYNTAX   OCTET STRING (SIZE (2))

--4.1 Global Counters

--   The RIP-2 Globals Group.
--   Implementation of this group is mandatory for systems
--   which implement RIP-2.

-- These counters are intended to facilitate debugging quickly
-- changing routes or failing neighbors

rip2Globals OBJECT IDENTIFIER ::= { rip2 1 }

    rip2GlobalRouteChanges OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The number of route changes made to the IP Route
           Database by RIP. This does not include the refresh
           of a route's age."
        ::= { rip2Globals 1 }

    rip2GlobalQueries OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The number of responses sent to RIP queries
           from other systems."
        ::= { rip2Globals 2 }

--4.2 RIP Interface Tables

-- RIP Interfaces Groups
-- Implementation of these Groups is mandatory for systems
-- which implement RIP-2.

-- The RIP Interface Status Table.

    rip2IfStatTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF Rip2IfStatEntry
        MAX-ACCESS   not-accessible
        STATUS   current
        DESCRIPTION
           "A list of subnets which require separate
           status monitoring in RIP."
        ::= { rip2 2 }

    rip2IfStatEntry OBJECT-TYPE

```
        SYNTAX    Rip2IfStatEntry
        MAX-ACCESS    not-accessible
        STATUS    current
        DESCRIPTION
            "A Single Routing Domain in a single Subnet."
        INDEX { rip2IfStatAddress }
        ::= { rip2IfStatTable 1 }

    Rip2IfStatEntry ::=
        SEQUENCE {
            rip2IfStatAddress
                IpAddress,
            rip2IfStatRcvBadPackets
                Counter32,
            rip2IfStatRcvBadRoutes
                Counter32,
            rip2IfStatSentUpdates
                Counter32,
            rip2IfStatStatus
                RowStatus
    }

    rip2IfStatAddress OBJECT-TYPE
        SYNTAX    IpAddress
        MAX-ACCESS    read-only
        STATUS    current
        DESCRIPTION
            "The IP Address of this system on the indicated
            subnet. For unnumbered interfaces, the value 0.0.0.N,
            where the least significant 24 bits (N) is the ifIndex
            for the IP Interface in network byte order."
        ::= { rip2IfStatEntry 1 }

    rip2IfStatRcvBadPackets OBJECT-TYPE
        SYNTAX    Counter32
        MAX-ACCESS    read-only
        STATUS    current
        DESCRIPTION
            "The number of RIP response packets received by
            the RIP process which were subsequently discarded
            for any reason (e.g. a version 0 packet, or an
            unknown command type)."
        ::= { rip2IfStatEntry 2 }

    rip2IfStatRcvBadRoutes OBJECT-TYPE
        SYNTAX    Counter32
        MAX-ACCESS    read-only
        STATUS    current
```

```
         DESCRIPTION
            "The number of routes, in valid RIP packets,
            which were ignored for any reason (e.g. unknown
            address family, or invalid metric)."
         ::= { rip2IfStatEntry 3 }

   rip2IfStatSentUpdates OBJECT-TYPE
         SYNTAX   Counter32
         MAX-ACCESS   read-only
         STATUS   current
         DESCRIPTION
            "The number of triggered RIP updates actually
            sent on this interface.  This explicitly does
            NOT include full updates sent containing new
            information."
         ::= { rip2IfStatEntry 4 }

   rip2IfStatStatus OBJECT-TYPE
         SYNTAX   RowStatus
         MAX-ACCESS   read-create
         STATUS   current
         DESCRIPTION
            "Writing invalid has the effect of deleting
            this interface."
         ::= { rip2IfStatEntry 5 }

-- The RIP Interface Configuration Table.

   rip2IfConfTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF Rip2IfConfEntry
         MAX-ACCESS   not-accessible
         STATUS   current
         DESCRIPTION
            "A list of subnets which require separate
            configuration in RIP."
         ::= { rip2 3 }

   rip2IfConfEntry OBJECT-TYPE
         SYNTAX   Rip2IfConfEntry
         MAX-ACCESS   not-accessible
         STATUS   current
         DESCRIPTION
            "A Single Routing Domain in a single Subnet."
         INDEX { rip2IfConfAddress }
         ::= { rip2IfConfTable 1 }

   Rip2IfConfEntry ::=
         SEQUENCE {
```

```
        rip2IfConfAddress
            IpAddress,
        rip2IfConfDomain
            RouteTag,
        rip2IfConfAuthType
            INTEGER,
        rip2IfConfAuthKey
            OCTET STRING (SIZE(0..16)),
        rip2IfConfSend
            INTEGER,
        rip2IfConfReceive
            INTEGER,
        rip2IfConfDefaultMetric
            INTEGER,
        rip2IfConfStatus
            RowStatus,
        rip2IfConfSrcAddress
            IpAddress
    }

rip2IfConfAddress OBJECT-TYPE
    SYNTAX   IpAddress
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The IP Address of this system on the indicated
        subnet.  For unnumbered interfaces, the value 0.0.0.N,
        where the least significant 24 bits (N) is the ifIndex
        for the IP Interface in network byte order."
    ::= { rip2IfConfEntry 1 }

rip2IfConfDomain OBJECT-TYPE
    SYNTAX   RouteTag
    MAX-ACCESS   read-create
    STATUS   obsolete
    DESCRIPTION
        "Value inserted into the Routing Domain field
        of all RIP packets sent on this interface."
    DEFVAL { '0000'h }
    ::= { rip2IfConfEntry 2 }

rip2IfConfAuthType OBJECT-TYPE
    SYNTAX   INTEGER {
                noAuthentication (1),
                simplePassword (2),
                md5 (3)
             }
    MAX-ACCESS   read-create
```

```
      STATUS    current
      DESCRIPTION
         "The type of Authentication used on this
         interface."
    DEFVAL { noAuthentication }
    ::= { rip2IfConfEntry 3 }

rip2IfConfAuthKey OBJECT-TYPE
    SYNTAX    OCTET STRING (SIZE(0..16))
    MAX-ACCESS    read-create
    STATUS    current
    DESCRIPTION
       "The value to be used as the Authentication Key
       whenever the corresponding instance of
       rip2IfConfAuthType has a value other than
       noAuthentication.  A modification of the corresponding
       instance of rip2IfConfAuthType does not modify
       the rip2IfConfAuthKey value.  If a string shorter
       than 16 octets is supplied, it will be left-
       justified and padded to 16 octets, on the right,
       with nulls (0x00).

       Reading this object always results in an  OCTET
       STRING of length zero; authentication may not
       be bypassed by reading the MIB object."
    DEFVAL { ''h }
    ::= { rip2IfConfEntry 4 }

rip2IfConfSend OBJECT-TYPE
    SYNTAX    INTEGER {
                doNotSend (1),
                ripVersion1 (2),
                rip1Compatible (3),
                ripVersion2 (4),
                ripV1Demand (5),
                ripV2Demand (6)
           }
    MAX-ACCESS    read-create
    STATUS    current
    DESCRIPTION
       "What the router sends on this interface.
       ripVersion1 implies sending RIP updates compliant
       with  RFC  1058.   rip1Compatible implies
       broadcasting RIP-2 updates using RFC 1058 route
       subsumption rules.  ripVersion2 implies
       multicasting RIP-2 updates.  ripV1Demand indicates
       the use of Demand RIP on a WAN interface under RIP
       Version 1 rules.  ripV2Demand indicates the use of
```

```
        Demand RIP on a WAN interface under Version 2 rules."
    DEFVAL { rip1Compatible }
    ::= { rip2IfConfEntry 5 }

rip2IfConfReceive OBJECT-TYPE
    SYNTAX   INTEGER {
                rip1 (1),
                rip2 (2),
                rip1OrRip2 (3),
                doNotRecieve (4)
            }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This indicates which version of RIP updates
        are to be accepted.  Note that rip2 and
        rip1OrRip2 implies reception of multicast
        packets."
    DEFVAL { rip1OrRip2 }
    ::= { rip2IfConfEntry 6 }

rip2IfConfDefaultMetric OBJECT-TYPE
    SYNTAX   INTEGER ( 0..15 )
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This variable indicates the metric that is to
        be used for the default route entry in RIP updates
        originated on this interface.  A value of zero
        indicates that no default route should be
        originated; in this case, a default route via
        another router may be propagated."
    ::= { rip2IfConfEntry 7 }

rip2IfConfStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "Writing invalid has  the  effect  of  deleting
        this interface."
    ::= { rip2IfConfEntry 8 }

rip2IfConfSrcAddress OBJECT-TYPE
    SYNTAX   IpAddress
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
```

```
             "The IP Address this system will use as a source
              address on this interface.  If it is a numbered
              interface, this MUST be the same value as
              rip2IfConfAddress.  On unnumbered interfaces,
              it must be the value of rip2IfConfAddress for
              some interface on the system."
         ::= { rip2IfConfEntry 9 }

--4.3 Peer Table

--   Peer Table

--       The RIP Peer Group
--       Implementation of this Group is Optional

--       This group provides information about active peer
--       relationships intended to assist in debugging.  An
--       active peer is a router from which a valid RIP
--       updated has been heard in the last 180 seconds.

     rip2PeerTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF Rip2PeerEntry
         MAX-ACCESS   not-accessible
         STATUS   current
         DESCRIPTION
            "A list of RIP Peers."
         ::= { rip2 4 }

    rip2PeerEntry OBJECT-TYPE
         SYNTAX   Rip2PeerEntry
         MAX-ACCESS   not-accessible
         STATUS   current
         DESCRIPTION
            "Information regarding a single routing peer."
         INDEX { rip2PeerAddress, rip2PeerDomain }
         ::= { rip2PeerTable 1 }

     Rip2PeerEntry ::=
         SEQUENCE {
            rip2PeerAddress
                IpAddress,
            rip2PeerDomain
                RouteTag,
            rip2PeerLastUpdate
                TimeTicks,
            rip2PeerVersion
                INTEGER,
            rip2PeerRcvBadPackets
```

```
            Counter32,
         rip2PeerRcvBadRoutes
            Counter32
        }

rip2PeerAddress OBJECT-TYPE
    SYNTAX   IpAddress
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The IP Address that the peer is using as its source
        address.  Note that on an unnumbered link, this may
        not be a member of any subnet on the system."
    ::= { rip2PeerEntry 1 }

rip2PeerDomain OBJECT-TYPE
    SYNTAX   RouteTag
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The value in the Routing Domain field  in  RIP
        packets received from the peer.  As domain suuport
        is deprecated, this must be zero."
    ::= { rip2PeerEntry 2 }

rip2PeerLastUpdate OBJECT-TYPE
    SYNTAX   TimeTicks
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The value of sysUpTime when the most recent
        RIP update was received from this system."
    ::= { rip2PeerEntry 3 }

rip2PeerVersion OBJECT-TYPE
    SYNTAX   INTEGER ( 0..255 )
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The RIP version number in the header of the
        last RIP packet received."
    ::= { rip2PeerEntry 4 }

rip2PeerRcvBadPackets OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
```

```
        "The number of RIP response packets from this
        peer discarded as invalid."
   ::= { rip2PeerEntry 5 }


rip2PeerRcvBadRoutes OBJECT-TYPE
    SYNTAX    Counter32
    MAX-ACCESS    read-only
    STATUS    current
    DESCRIPTION
       "The number of routes from this peer that were
       ignored because the entry format was invalid."
   ::= { rip2PeerEntry 6 }
```

```
-- conformance information

rip2Conformance OBJECT IDENTIFIER ::= { rip2 5 }

rip2Groups      OBJECT IDENTIFIER ::= { rip2Conformance 1 }
rip2Compliances OBJECT IDENTIFIER ::= { rip2Conformance 2 }

-- compliance statements
rip2Compliance MODULE-COMPLIANCE
    STATUS   current
    DESCRIPTION
       "The compliance statement "
    MODULE  -- this module
    MANDATORY-GROUPS {
                rip2GlobalGroup,
                rip2IfStatGroup,
                rip2IfConfGroup,
                rip2PeerGroup
        }
    GROUP       rip2GlobalGroup
    DESCRIPTION
       "This group defines global controls for RIP-II systems."
    GROUP       rip2IfStatGroup
    DESCRIPTION
       "This group defines interface statistics for RIP-II systems."
    GROUP       rip2IfConfGroup
    DESCRIPTION
       "This group defines interface configuration for RIP-II systems."
    GROUP       rip2PeerGroup
    DESCRIPTION
       "This group defines peer information for RIP-II systems."
    ::= { rip2Compliances 1 }
```

-- units of conformance

```
rip2GlobalGroup    OBJECT-GROUP
    OBJECTS {
                rip2GlobalRouteChanges,
                rip2GlobalQueries
    }
    STATUS  current
    DESCRIPTION
       "This group defines global controls for RIP-II systems."
    ::= { rip2Groups 1 }
rip2IfStatGroup    OBJECT-GROUP
    OBJECTS {
            rip2IfStatAddress,
            rip2IfStatRcvBadPackets,
            rip2IfStatRcvBadRoutes,
            rip2IfStatSentUpdates,
            rip2IfStatStatus
    }
    STATUS  current
    DESCRIPTION
       "This group defines interface statistics for RIP-II systems."
    ::= { rip2Groups 2 }
rip2IfConfGroup    OBJECT-GROUP
    OBJECTS {
            rip2IfConfAddress,
            rip2IfConfAuthType,
            rip2IfConfAuthKey,
            rip2IfConfSend,
            rip2IfConfReceive,
            rip2IfConfDefaultMetric,
            rip2IfConfStatus,
            rip2IfConfSrcAddress
    }
    STATUS  current
    DESCRIPTION
       "This group defines interface configuration for RIP-II systems."
    ::= { rip2Groups 3 }
rip2PeerGroup    OBJECT-GROUP
    OBJECTS {
            rip2PeerAddress,
            rip2PeerDomain,
            rip2PeerLastUpdate,
            rip2PeerVersion,
            rip2PeerRcvBadPackets,
            rip2PeerRcvBadRoutes
    }
    STATUS  current
```

```
   DESCRIPTION
       "This group defines peer information for RIP-II systems."
    ::= { rip2Groups 4 }
END
```

5. References

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       Network Management Standards", RFC 1052, IAB, April 1988.

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        Xylogics, Inc., November 1994.

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6. Security Considerations

   Security issues are not discussed in this memo.

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