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RIP Version 2 MIB Extension

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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

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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
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       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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6. Security Considerations

Security issues are not discussed in this memo.

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