RIP Version 2 MIB Extension

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 RIP Version 2.

Acknowledgements

The authors would like to thank the IETF ripv2 Working Group for their help in improving the RIP-2 MIB extension.

Table of Contents

1. The Network Management Framework ...................... 2
2. Objects ............................................ 2
2.1 Format of Definitions ................................ 3
3. Overview ......................................... 3
3.1 Textual Conventions ................................ 3
3.2 Structure of MIB .................................. 3
3.3 Modifications from RFC 1389 .......................... 3
4. Definitions ........................................ 5
4.1 Global Counters ................................... 6
4.2 RIP Interface Tables ................................ 6
4.3 Peer Table .......................................... 12
5. References ......................................... 17
6. Security Considerations ............................... 18
7. Authors’ Addresses ................................. 18
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 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
   ORGANIZATION "IETF RIP-II Working Group"
   CONTACT-INFO
     "Fred Baker"
     Postal: Cisco Systems
     519 Lado Drive
     Santa Barbara, California 93111
     Tel: +1 805 681 0115
     E-Mail: fbaker@cisco.com
   "Gary Malkin"
     Xylogics, Inc.
     53 Third Avenue
     Burlington, MA 01803
     Phone: (617) 272-8140
     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 support
   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


6. Security Considerations

Security issues are not discussed in this memo.

7. Authors’ Addresses

Gary Malkin  
Xylogics, Inc.  
53 Third Avenue  
Burlington, MA  01803

Phone: (617) 272-8140  
EMail: gmalkin@Xylogics.COM

Fred Baker  
Cisco Systems  
519 Lado Drive  
Santa Barbara, California 93111

Phone: 805-681-0115  
EMail: fred@cisco.com