

Network Working Group
Request for Comments: 1724
Obsoletes: 1389
Category: Standards Track

G. Malkin
Xylogics, Inc.
F. Baker
Cisco Systems
November 1994

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
    LAST-UPDATED "9407272253Z"           -- Wed Jul 27 22:53:04 PDT 1994
    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

        Postal: 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

- [1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, IAB, April 1988.
- [2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, IAB, August 1989.
- [3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", STD 16, RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [4] McCloghrie K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1156, Hughes LAN Systems, Performance Systems International, May 1990.
- [5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [6] Rose, M., Editor, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", RFC 1158, Performance Systems International, May 1990.
- [7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.
- [8] 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.
- [9] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", STD 16, RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [10] Malkin, G., "RIP Version 2 - Carrying Additional Information", RFC 1723, Xylogics, Inc., November 1994.

- [11] Malkin, G., "RIP Version 2 Protocol Analysis", RFC 1721, Xylogics, Inc., November 1994.
- [12] Malkin, G., "RIP Version 2 Protocol Applicability Statement", RFC 1722, Xylogics, Inc., November 1994.

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

