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IP Forwarding Table MIB

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This document is a product of the IPv6 MIB Revision Design Team and it is a working item of the IPv6 Working Group. Comments should be addressed to the editors, or to the IPv6 Working Group mailing list at ipng@sunroof.eng.sun.com.

Abstract

This document defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects related to the forwarding of Internet Protocol (IP) packets in an IP version-independent manner. This document obsoletes [RFC 2096](#).

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Revision History

[Note to RFC Editor: Please remove prior to publication]

Changes from [draft-ietf-ipv6-rfc2096-update-04.txt](#):

28 Aug 2003 Corrected copyright statement in DESCRIPTION clause

Added inetCidrRouteNumber to
inetForwardCidrRouteGroup conformance statement

Removed SIZE constraints for inetCidrRouteDest and
inetCidrRouteNextHop

Added constraints statement to DESCRIPTION clause of
inetCidrRouteEntry

Added Intellectual Property section per requirements
of [RFC 2026](#)

Removed reference to [RFC 2026](#)

Removed ipForwardCompliance2

Changed definition of inetCidrRouteAge from Integer32
to Gauge32

Changes from [draft-ietf-ipv6-rfc2096-update-03.txt](#):

27 Jun 2003 Updated text to DESCRIPTION of inetCidrRouteDiscards

Re-instated inetCidrRouteNumber

Added references for IF-MIB, IP-MIB, and IANA-
RTPROTO-MIB

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Changed reference to [RFC 2096](#) from normative to
informative

Added RFC editor note to remove Revision History at
publication time

Updated REVISION clause

Added section describing changes from [RFC 2096](#)

Added REVISION clause for original publication as [RFC
1354](#)

Added MIB Copyright statement to DESCRIPTION

Changes from [draft-ietf-ipv6-rfc2096-update-02.txt](#):

16 Jan 2003 Changed lower-case 'h' to upper-case 'H' in hex
number.

Updated REVISION and LAST UPDATED dates.
13 Jun 2003 Changed inetCidrRouteDscp to inetCidrRoutePolicy.

Updated MIB Boilerplate.
17 Jun 2003 Added read-only compliance statement.

Added text to DESCRIPTION clause for
inetCidrRouteStatus to indicate a row cannot be
modified when it is active.

Removed numbered references from DESCRIPTION clauses.

Removed Unsigned32 from IMPORTS list.

Changed section numbers to conform with ID-nits.

Split references into normative/informative.

Updated security section.

Changes from [draft-ietf-ipv6-rfc2096-update-01.txt](#):

02 Nov 2002 Fixed bugs that caused the MIB not to compile.

Changed the type of inetCidrRouteDscp to Dscp.

Improved the revision information.

Removed inetCidrRouteNumber and inetCidrRouteWeight.

Other editorial changes.

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Changes from [draft-ietf-ipv6-rfc-2096-update-00.txt](#):

22 Aug 2002 Minor editorial changes and clean-up

Changes from [draft-ietf-ipngwg-rfc2096-update-00.txt](#):

27 Jun 2002 Added inetCidrRouteDscp index and inetCidrRouteWeight object to the inetCidrRouteTable.

Restored inetCidrRouteNextHopType variable (may be different from inetCidrRouteDestType, due to global vs. non-global distinction in new InetAddress TCs).

Removed inetCidrRouteInstance object. Use to identify a conceptual routing table is obviated by new InetAddress types and inclusion of DSCP index.

Changed editor, moved author information to end, several editorial changes.

13 Jul 2002 Changed name to [draft-ietf-ipv6-rfc-2096-update](#)-.txt
Removed inetCidrRouteNextHopType.

Changes from [draft-ops-rfc2096-update-00.txt](#):

12 Jul 2001 Renamed to IPNG working group draft
Added scopes to the uses of instance
Added inetCidrRouteDiscards to replace ipRoutingDiscards
Fixed some remaining ipCidr*/inetCidr* confusion in

DESCRIPTIONS

Changes from first draft posted to v6mib mailing list:

23 Feb 2001 Updated MODULE-IDENTITY

Deleted inetCidrRouteTos, add inetCidrRouteInstance in INDEX of inetCidrRouteTable.

Used InterfaceIndex, InetAddressPrefixLength and InetAutonomousSystemNumber TC's, and limited the SIZE of inetCidrRouteDest and inetCidrRouteNextHop

Updated conformance info. Added copyright and table of contents.

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1 Conventions Used In This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

2 The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

3 Overview

The MIB consists of one current table and two current global objects.

1. The object `inetCidrRouteNumber` indicates the number of current routes. This is primarily to avoid having to read the table in order to determine this number.
2. The object `inetCidrRouteDiscards` counts the number of valid routes that were discarded from `inetCidrRouteTable` for any reason. This object replaces the `ipRoutingDiscards` and `ipv6DiscardedRoutes` objects.
3. The `inetCidrRouteTable` provides the ability to display IP version-independent multipath CIDR routes.

In addition, there is one deprecated table and object, and one obsolete table and object, representing previous revisions of this MIB.

1. The obsolete object `ipForwardNumber` represents the number of entries in the obsolete `ipForwardTable`.
2. The obsolete `ipForwardTable` updates the [RFC 1213](#) `ipRouteTable` to display multipath IP Routes. This is in turn obsoleted by the `ipCidrRouteTable`.
3. The deprecated object `ipCidrRouteNumber` represents the number of entries in the deprecated `ipCidrRouteTable`.

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4. The deprecated `ipCidrRouteTable` updates the [RFC 1213](#) `ipRouteTable` to display multipath IP Routes having the same network number but differing network masks.

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[4](#) Definitions

IP-FORWARD-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE,
IpAddress, Integer32, Gauge32,
Counter32

FROM SNMPv2-SMI

```

RowStatus                                FROM SNMPv2-TC
MODULE-COMPLIANCE, OBJECT-GROUP          FROM SNMPv2-CONF
InterfaceIndex                           FROM IF-MIB
ip                                         FROM IP-MIB
IANAipRouteProtocol                      FROM IANA-RTPROTO-MIB
InetAddress, InetAddressType,
InetAddressPrefixLength,
InetAddressAutonomousSystemNumber        FROM INET-ADDRESS-MIB;

ipForward MODULE-IDENTITY
LAST-UPDATED "200308281500Z"
ORGANIZATION
    "IETF IPv6 Working Group
    http://www.ietf.org/html.charters/ipv6-charter.html"
CONTACT-INFO
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-- RFC Ed: please verify mailing list address at publication
-- and delete this note
DESCRIPTION
    "The MIB module for the management of CIDR multipath IP
    Routes.

    Copyright (C) The Internet Society (2003). This version
    of this MIB module is a part of RFC xxxx; see the RFC
    itself for full legal notices."
-- RFC Ed : replace xxxx with actual RFC number & remove note

REVISION      "200308281500Z"

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```

DESCRIPTION

"IPv4/v6 version-independent revision. Minimal changes

were made to the original [RFC 2096](#) MIB, to allow easy upgrade of existing IPv4 implementations to the version-independent MIB. These changes include:

Adding inetCidrRouteDiscards as a replacement for the deprecated ipRoutingDiscards and ipv6DiscardedRoutes objects.

Adding a new conformance statement to support the implementation of the IP Forwarding MIB in a read-only mode.

Published as RFC xxxx."

-- RFC Ed : replace xxxx with actual RFC number & remove note

REVISION "199609190000Z"

DESCRIPTION

"Revised to support CIDR routes.

Published as [RFC 2096](#)."

REVISION "199207022156Z"

DESCRIPTION

"Initial version, published as [RFC 1354](#)."

::= { ip 24 }

inetCidrRouteNumber OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of current inetCidrRouteTable entries that are not invalid."

::= { ipForward 6 }

inetCidrRouteDiscards OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of entries in the inetCidrRouteTable which were chosen to be discarded even though they are valid. One possible reason for discarding such an entry could be to free-up buffer space for other routing entries."

::= { ipForward 8 }

-- Inet CIDR Route Table

-- The Inet CIDR Route Table deprecates and replaces the
-- ipCidrRoute Table currently in the IP Forwarding Table MIB.
-- It adds IP protocol independence.

inetCidrRouteTable OBJECT-TYPE

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SYNTAX SEQUENCE OF InetCidrRouteEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This entity's IP Routing table."
REFERENCE
"[RFC 1213 Section 6.6](#), The IP Group"
 ::= { ipForward 7 }

inetCidrRouteEntry OBJECT-TYPE

SYNTAX InetCidrRouteEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A particular route to a particular destination, under a particular policy.

Dynamically created rows will survive an agent reboot.

Implementers need to be aware that if the total number of elements (octets or sub-identifiers) in inetCidrRouteDest, inetCidrRoutePolicy, and inetCidrRouteNextHop exceeds 111 then OIDs of column instances in this table will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."

INDEX {
inetCidrRouteDestType,
inetCidrRouteDest,
inetCidrRoutePfxLen,
inetCidrRoutePolicy,
inetCidrRouteNextHopType,
inetCidrRouteNextHop
}
 ::= { inetCidrRouteTable 1 }

InetCidrRouteEntry ::= SEQUENCE {
inetCidrRouteDestType InetAddressType,
inetCidrRouteDest InetAddress,
inetCidrRoutePfxLen InetAddressPrefixLength,
inetCidrRoutePolicy OBJECT IDENTIFIER,
inetCidrRouteNextHopType InetAddressType,
inetCidrRouteNextHop InetAddress,
inetCidrRouteIfIndex InterfaceIndex,
inetCidrRouteType INTEGER,
inetCidrRouteProto IANAipRouteProtocol,

| | |
|------------------------|-----------------------------|
| inetCidrRouteAge | Gauge32, |
| inetCidrRouteNextHopAS | InetAutonomousSystemNumber, |
| inetCidrRouteMetric1 | Integer32, |
| inetCidrRouteMetric2 | Integer32, |
| inetCidrRouteMetric3 | Integer32, |
| inetCidrRouteMetric4 | Integer32, |
| inetCidrRouteMetric5 | Integer32, |
| inetCidrRouteStatus | RowStatus |

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}

inetCidrRouteDestType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The type of the inetCidrRouteDest address, as defined
in the InetAddress MIB [[RFC3291](#)]."

::= { inetCidrRouteEntry 1 }

inetCidrRouteDest OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The destination IP address of this route.

Any assignment (implicit or otherwise) of an instance
of this object to a value x MUST be rejected if the
bitwise logical-AND of x with the value of the mask
formed from the corresponding instance of the
inetCidrRoutePfxLen object is not equal to x."

::= { inetCidrRouteEntry 2 }

inetCidrRoutePfxLen OBJECT-TYPE

SYNTAX InetAddressPrefixLength

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Indicates the number of leading one bits which form the
mask to be logical-ANDed with the destination address
before being compared to the value in the
inetCidrRouteDest field.

Any assignment (implicit or otherwise) of an instance
of this object to a value x MUST be rejected if the
bitwise logical-AND of the mask formed from x with the
value of the corresponding instance of the

```
        inetCidrRouteDest object is not equal to
        inetCidrRouteDest."
 ::= { inetCidrRouteEntry 3 }
```

inetCidrRoutePolicy OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Represents the general set of conditions that would cause the selection of one multipath route (set of next hops for a given destination) over another (referred to as policy). The value { 0 0 } shall be used for the default policy or if no particular policy applies."

```
 ::= { inetCidrRouteEntry 4 }
```

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inetCidrRouteNextHopType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The type of the inetCidrRouteNextHop address, as defined in the InetAddress MIB [[RFC3291](#)]."

Value should be set to unknown(0) for non-remote routes."

```
 ::= { inetCidrRouteEntry 5 }
```

inetCidrRouteNextHop OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"On remote routes, the address of the next system en route. For non-remote routes, a zero length string."

```
 ::= { inetCidrRouteEntry 6 }
```

inetCidrRouteIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The ifIndex value which identifies the local interface through which the next hop of this route should be reached."

```
 ::= { inetCidrRouteEntry 7 }
```

inetCidrRouteType OBJECT-TYPE

```
SYNTAX      INTEGER {
    other      (1), -- not specified by this MIB
    reject     (2), -- route which discards traffic and
                    -- returns ICMP notification
    local      (3), -- local interface
    remote     (4), -- remote destination
    blackhole  (5)  -- route which discards traffic
                    -- silently
}
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The type of route. Note that local(3) refers to a route for which the next hop is the final destination; remote(4) refers to a route for which the next hop is not the final destination.

Routes which do not result in traffic forwarding or rejection should not be displayed even if the implementation keeps them stored internally.

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reject(2) refers to a route which, if matched, discards the message as unreachable and returns a notification (e.g. ICMP error) to the message sender. This is used in some protocols as a means of correctly aggregating routes.

blackhole(5) refers to a route which, if matched, discards the message silently."

::= { inetCidrRouteEntry 8 }

inetCidrRouteProto OBJECT-TYPE

```
SYNTAX      IANAipRouteProtocol
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The routing mechanism via which this route was learned. Inclusion of values for gateway routing protocols is not intended to imply that hosts should support those protocols."

::= { inetCidrRouteEntry 9 }

inetCidrRouteAge OBJECT-TYPE

```
SYNTAX      Gauge32
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of seconds since this route was last updated or otherwise determined to be correct. Note that no semantics of 'too old' can be implied except through knowledge of the routing protocol by which the route was learned."

::= { inetCidrRouteEntry 10 }

inetCidrRouteNextHopAS OBJECT-TYPE

SYNTAX InetAutonomousSystemNumber

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The Autonomous System Number of the Next Hop. The semantics of this object are determined by the routing-protocol specified in the route's inetCidrRouteProto value. When this object is unknown or not relevant its value should be set to zero."

DEFVAL { 0 }

::= { inetCidrRouteEntry 11 }

inetCidrRouteMetric1 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The primary routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's inetCidrRouteProto

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value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { inetCidrRouteEntry 12 }

inetCidrRouteMetric2 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's inetCidrRouteProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { inetCidrRouteEntry 13 }

inetCidrRouteMetric3 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's inetCidrRouteProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { inetCidrRouteEntry 14 }

inetCidrRouteMetric4 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's inetCidrRouteProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { inetCidrRouteEntry 15 }

inetCidrRouteMetric5 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's inetCidrRouteProto value. If this metric is not used, its value should be set to -1."

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DEFVAL { -1 }

::= { inetCidrRouteEntry 16 }

inetCidrRouteStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The row status variable, used according to row installation and removal conventions."

```

        A row entry cannot be modified when the status is
        marked as active(1)."
    ::= { inetCidrRouteEntry 17 }

-- Conformance information

ipForwardConformance
    OBJECT IDENTIFIER ::= { ipForward 5 }

ipForwardGroups
    OBJECT IDENTIFIER ::= { ipForwardConformance 1 }

ipForwardCompliances
    OBJECT IDENTIFIER ::= { ipForwardConformance 2 }

-- Compliance statements

ipForwardFullCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "When this MIB is implemented for read-create, the
        implementation can claim full compliance."
    MODULE -- this module
    MANDATORY-GROUPS { inetForwardCidrRouteGroup }
    ::= { ipForwardCompliances 3 }

ipForwardReadOnlyCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "When this MIB is implemented without support for read-
        create (i.e. in read-only mode), the implementation can
        claim read-only compliance."
    MODULE -- this module
    MANDATORY-GROUPS { inetForwardCidrRouteGroup }

    OBJECT      inetCidrRouteIfIndex
    MIN-ACCESS   read-only
    DESCRIPTION
        "Write access is not required."

    OBJECT      inetCidrRouteType
    MIN-ACCESS   read-only
    DESCRIPTION

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```

"Write access is not required."

```

OBJECT      inetCidrRouteNextHopAS
MIN-ACCESS   read-only

```



```

DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteMetric1
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteMetric2
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteMetric3
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteMetric4
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteMetric5
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      inetCidrRouteStatus
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

::= { ipForwardCompliances 4 }

-- units of conformance

inetForwardCidrRouteGroup OBJECT-GROUP
    OBJECTS { inetCidrRouteDiscards,
                inetCidrRouteIfIndex, inetCidrRouteType,
                inetCidrRouteProto,  inetCidrRouteAge,
                inetCidrRouteNextHopAS, inetCidrRouteMetric1,
                inetCidrRouteMetric2, inetCidrRouteMetric3,
                inetCidrRouteMetric4, inetCidrRouteMetric5,
                inetCidrRouteStatus, inetCidrRouteNumber
            }
    STATUS      current
    DESCRIPTION
        "The IP version-independent CIDR Route Table."
    ::= { ipForwardGroups 4 }

```

-- Deprecated Objects

ipCidrRouteNumber OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"The number of current ipCidrRouteTable entries that are not invalid. This object is deprecated in favor of inetCidrRouteNumber and the inetCidrRouteTable."

::= { ipForward 3 }

-- IP CIDR Route Table

-- The IP CIDR Route Table obsoletes and replaces the ipRoute
-- Table current in MIB-I and MIB-II and the IP Forwarding Table.
-- It adds knowledge of the autonomous system of the next hop,
-- multiple next hops, and policy routing, and Classless
-- Inter-Domain Routing.

ipCidrRouteTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpCidrRouteEntry

MAX-ACCESS not-accessible

STATUS deprecated

DESCRIPTION

"This entity's IP Routing table. This table has been deprecated in favor of the IP version neutral inetCidrRouteTable."

REFERENCE

"[RFC 1213 Section 6.6](#), The IP Group"

::= { ipForward 4 }

ipCidrRouteEntry OBJECT-TYPE

SYNTAX IpCidrRouteEntry

MAX-ACCESS not-accessible

STATUS deprecated

DESCRIPTION

"A particular route to a particular destination, under a particular policy."

INDEX {

ipCidrRouteDest,

ipCidrRouteMask,

ipCidrRouteTos,

ipCidrRouteNextHop

}

::= { ipCidrRouteTable 1 }

```

IpCidrRouteEntry ::= SEQUENCE {
    ipCidrRouteDest      IpAddress,
    ipCidrRouteMask      IpAddress,
    ipCidrRouteTos       Integer32,
    ipCidrRouteNextHop   IpAddress,
    ipCidrRouteIfIndex   Integer32,

```

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```

    ipCidrRouteType      INTEGER,
    ipCidrRouteProto     INTEGER,
    ipCidrRouteAge       Integer32,
    ipCidrRouteInfo      OBJECT IDENTIFIER,
    ipCidrRouteNextHopAS Integer32,
    ipCidrRouteMetric1   Integer32,
    ipCidrRouteMetric2   Integer32,
    ipCidrRouteMetric3   Integer32,
    ipCidrRouteMetric4   Integer32,
    ipCidrRouteMetric5   Integer32,
    ipCidrRouteStatus    RowStatus
}

```

ipCidrRouteDest OBJECT-TYPE

```

SYNTAX      IpAddress
MAX-ACCESS  read-only
STATUS      deprecated
DESCRIPTION

```

"The destination IP address of this route.

This object may not take a Multicast (Class D) address value.

Any assignment (implicit or otherwise) of an instance of this object to a value x must be rejected if the bitwise logical-AND of x with the value of the corresponding instance of the ipCidrRouteMask object is not equal to x."

```

::= { ipCidrRouteEntry 1 }

```

ipCidrRouteMask OBJECT-TYPE

```

SYNTAX      IpAddress
MAX-ACCESS  read-only
STATUS      deprecated
DESCRIPTION

```

"Indicate the mask to be logical-ANDed with the destination address before being compared to the value in the ipCidrRouteDest field. For those systems that do not support arbitrary subnet masks, an agent constructs the value of the ipCidrRouteMask by reference to the IP Address Class.

Any assignment (implicit or otherwise) of an instance of this object to a value x must be rejected if the bitwise logical-AND of x with the value of the corresponding instance of the ipCidrRouteDest object is not equal to ipCidrRouteDest."

::= { ipCidrRouteEntry 2 }

-- The following convention is included for specification
 -- of TOS Field contents. At this time, the Host Requirements
 -- and the Router Requirements documents disagree on the width
 -- of the TOS field. This mapping describes the Router
 -- Requirements mapping, and leaves room to widen the TOS field

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-- without impact to fielded systems.

ipCidrRouteTos OBJECT-TYPE

SYNTAX Integer32 (0..2147483647)

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"The policy specifier is the IP TOS Field. The encoding of IP TOS is as specified by the following convention. Zero indicates the default path if no more specific policy applies.

| | | |
|------------|-----------------|---|
| PRECEDENCE | TYPE OF SERVICE | 0 |
|------------|-----------------|---|

| Field | IP TOS Policy | Field | IP TOS Policy |
|----------|---------------|----------|---------------|
| Contents | Code | Contents | Code |
| 0 0 0 0 | ==> 0 | 0 0 0 1 | ==> 2 |
| 0 0 1 0 | ==> 4 | 0 0 1 1 | ==> 6 |
| 0 1 0 0 | ==> 8 | 0 1 0 1 | ==> 10 |
| 0 1 1 0 | ==> 12 | 0 1 1 1 | ==> 14 |
| 1 0 0 0 | ==> 16 | 1 0 0 1 | ==> 18 |
| 1 0 1 0 | ==> 20 | 1 0 1 1 | ==> 22 |
| 1 1 0 0 | ==> 24 | 1 1 0 1 | ==> 26 |
| 1 1 1 0 | ==> 28 | 1 1 1 1 | ==> 30" |

::= { ipCidrRouteEntry 3 }

ipCidrRouteNextHop OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"On remote routes, the address of the next system en
route; Otherwise, 0.0.0.0."

::= { ipCidrRouteEntry 4 }

ipCidrRouteIfIndex OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS deprecated

DESCRIPTION

"The ifIndex value which identifies the local interface
through which the next hop of this route should be
reached."

DEFVAL { 0 }

::= { ipCidrRouteEntry 5 }

ipCidrRouteType OBJECT-TYPE

SYNTAX INTEGER {

other (1), -- not specified by this MIB

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reject (2), -- route which discards traffic

local (3), -- local interface

remote (4) -- remote destination

}

MAX-ACCESS read-create

STATUS deprecated

DESCRIPTION

"The type of route. Note that local(3) refers to a
route for which the next hop is the final destination;
remote(4) refers to a route for which the next hop is
not the final destination.

Routes which do not result in traffic forwarding or
rejection should not be displayed even if the
implementation keeps them stored internally.

reject (2) refers to a route which, if matched,
discards the message as unreachable. This is used in
some protocols as a means of correctly aggregating
routes."

::= { ipCidrRouteEntry 6 }

ipCidrRouteProto OBJECT-TYPE

SYNTAX INTEGER {

other (1), -- not specified

local (2), -- local interface

netmgmt (3), -- static route

```

        icmp      (4), -- result of ICMP Redirect

        -- the following are all dynamic
        -- routing protocols
        egp        (5), -- Exterior Gateway Protocol
        ggp        (6), -- Gateway-Gateway Protocol
        hello      (7), -- FuzzBall HelloSpeak
        rip        (8), -- Berkeley RIP or RIP-II
        isIs       (9), -- Dual IS-IS
        esIs       (10), -- ISO 9542
        ciscoIgrp  (11), -- Cisco IGRP
        bbnSpfIgp  (12), -- BBN SPF IGP
        ospf       (13), -- Open Shortest Path First
        bgp        (14), -- Border Gateway Protocol
        idpr       (15), -- InterDomain Policy Routing
        ciscoEigrp (16) -- Cisco EIGRP
    }
MAX-ACCESS read-only
STATUS deprecated
DESCRIPTION
    "The routing mechanism via which this route was learned.
    Inclusion of values for gateway routing protocols is
    not intended to imply that hosts should support those
    protocols."
::= { ipCidrRouteEntry 7 }

```

ipCidrRouteAge OBJECT-TYPE

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```

SYNTAX      Integer32
MAX-ACCESS read-only
STATUS deprecated
DESCRIPTION
    "The number of seconds since this route was last updated
    or otherwise determined to be correct. Note that no
    semantics of 'too old' can be implied except through
    knowledge of the routing protocol by which the route
    was learned."
DEFVAL { 0 }
::= { ipCidrRouteEntry 8 }

```

ipCidrRouteInfo OBJECT-TYPE

```

SYNTAX      OBJECT IDENTIFIER
MAX-ACCESS read-create
STATUS deprecated
DESCRIPTION
    "A reference to MIB definitions specific to the
    particular routing protocol which is responsible for
    this route, as determined by the value specified in the

```

route's ipCidrRouteProto value. If this information is not present, its value should be set to the OBJECT IDENTIFIER { 0 0 }, which is a syntactically valid object identifier, and any implementation conforming to ASN.1 and the Basic Encoding Rules must be able to generate and recognize this value."

::= { ipCidrRouteEntry 9 }

ipCidrRouteNextHopAS OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-create
STATUS deprecated
DESCRIPTION

"The Autonomous System Number of the Next Hop. The semantics of this object are determined by the routing-protocol specified in the route's ipCidrRouteProto value. When this object is unknown or not relevant its value should be set to zero."

DEFVAL { 0 }
::= { ipCidrRouteEntry 10 }

ipCidrRouteMetric1 OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-create
STATUS deprecated
DESCRIPTION

"The primary routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipCidrRouteProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }
::= { ipCidrRouteEntry 11 }

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ipCidrRouteMetric2 OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-create
STATUS deprecated
DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipCidrRouteProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }
::= { ipCidrRouteEntry 12 }

```

ipCidrRouteMetric3 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      deprecated
    DESCRIPTION
        "An alternate routing metric for this route.  The
         semantics of this metric are determined by the routing-
         protocol specified in the route's ipCidrRouteProto
         value.  If this metric is not used, its value should be
         set to -1."
    DEFVAL { -1 }
    ::= { ipCidrRouteEntry 13 }

```

```

ipCidrRouteMetric4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      deprecated
    DESCRIPTION
        "An alternate routing metric for this route.  The
         semantics of this metric are determined by the routing-
         protocol specified in the route's ipCidrRouteProto
         value.  If this metric is not used, its value should be
         set to -1."
    DEFVAL { -1 }
    ::= { ipCidrRouteEntry 14 }

```

```

ipCidrRouteMetric5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      deprecated
    DESCRIPTION
        "An alternate routing metric for this route.  The
         semantics of this metric are determined by the routing-
         protocol specified in the route's ipCidrRouteProto
         value.  If this metric is not used, its value should be
         set to -1."
    DEFVAL { -1 }
    ::= { ipCidrRouteEntry 15 }

```

```

ipCidrRouteStatus OBJECT-TYPE
    SYNTAX      RowStatus

```

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```

    MAX-ACCESS  read-create
    STATUS      deprecated
    DESCRIPTION
        "The row status variable, used according to row
         installation and removal conventions."
    ::= { ipCidrRouteEntry 16 }

```



```

-- compliance statements

ipForwardCompliance MODULE-COMPLIANCE
    STATUS      deprecated
    DESCRIPTION
        "The compliance statement for SNMPv2 entities which
        implement the ipForward MIB."

    MODULE -- this module
    MANDATORY-GROUPS { ipForwardCidrRouteGroup }

    ::= { ipForwardCompliances 1 }

-- units of conformance

ipForwardCidrRouteGroup OBJECT-GROUP
    OBJECTS { ipCidrRouteNumber,
              ipCidrRouteDest, ipCidrRouteMask, ipCidrRouteTos,
              ipCidrRouteNextHop, ipCidrRouteIfIndex,
              ipCidrRouteType, ipCidrRouteProto, ipCidrRouteAge,
              ipCidrRouteInfo, ipCidrRouteNextHopAS,
              ipCidrRouteMetric1, ipCidrRouteMetric2,
              ipCidrRouteMetric3, ipCidrRouteMetric4,
              ipCidrRouteMetric5, ipCidrRouteStatus
            }
    STATUS      deprecated
    DESCRIPTION
        "The CIDR Route Table."
    ::= { ipForwardGroups 3 }

-- Obsoleted Definitions - Objects

ipForwardNumber OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The number of current ipForwardTable entries that are
        not invalid."
    ::= { ipForward 1 }

-- IP Forwarding Table

-- The IP Forwarding Table obsoletes and replaces the ipRoute
-- Table current in MIB-I and MIB-II. It adds knowledge of

```

```
-- the autonomous system of the next hop, multiple next hop
-- support, and policy routing support.
```

```
ipForwardTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IpForwardEntry
    MAX-ACCESS  not-accessible
    STATUS      obsolete
    DESCRIPTION
        "This entity's IP Routing table."
    REFERENCE
        "RFC 1213 Section 6.6, The IP Group"
    ::= { ipForward 2 }
```

```
ipForwardEntry OBJECT-TYPE
    SYNTAX      IpForwardEntry
    MAX-ACCESS  not-accessible
    STATUS      obsolete
    DESCRIPTION
        "A particular route to a particular destination, under a
        particular policy."
    INDEX {
        ipForwardDest,
        ipForwardProto,
        ipForwardPolicy,
        ipForwardNextHop
    }
    ::= { ipForwardTable 1 }
```

```
IpForwardEntry ::= SEQUENCE {
    ipForwardDest      IpAddress,
    ipForwardMask      IpAddress,
    ipForwardPolicy    Integer32,
    ipForwardNextHop   IpAddress,
    ipForwardIfIndex   Integer32,
    ipForwardType      INTEGER,
    ipForwardProto     INTEGER,
    ipForwardAge        Integer32,
    ipForwardInfo      OBJECT IDENTIFIER,
    ipForwardNextHopAS Integer32,
    ipForwardMetric1   Integer32,
    ipForwardMetric2   Integer32,
    ipForwardMetric3   Integer32,
    ipForwardMetric4   Integer32,
    ipForwardMetric5   Integer32
}
```

```
ipForwardDest OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      obsolete
```

DESCRIPTION

"The destination IP address of this route. An entry with a value of 0.0.0.0 is considered a default route.

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This object may not take a Multicast (Class D) address value.

Any assignment (implicit or otherwise) of an instance of this object to a value x must be rejected if the bitwise logical-AND of x with the value of the corresponding instance of the ipForwardMask object is not equal to x."

::= { ipForwardEntry 1 }

ipForwardMask OBJECT-TYPE

SYNTAX IpAddress
MAX-ACCESS read-create
STATUS obsolete

DESCRIPTION

"Indicate the mask to be logical-ANDed with the destination address before being compared to the value in the ipForwardDest field. For those systems that do not support arbitrary subnet masks, an agent constructs the value of the ipForwardMask by reference to the IP Address Class.

Any assignment (implicit or otherwise) of an instance of this object to a value x must be rejected if the bitwise logical-AND of x with the value of the corresponding instance of the ipForwardDest object is not equal to ipForwardDest."

DEFVAL { '00000000'H } -- 0.0.0.0

::= { ipForwardEntry 2 }

-- The following convention is included for specification
-- of TOS Field contents. At this time, the Host Requirements
-- and the Router Requirements documents disagree on the width
-- of the TOS field. This mapping describes the Router
-- Requirements mapping, and leaves room to widen the TOS field
-- without impact to fielded systems.

ipForwardPolicy OBJECT-TYPE

SYNTAX Integer32 (0..2147483647)
MAX-ACCESS read-only
STATUS obsolete

DESCRIPTION

"The general set of conditions that would cause

the selection of one multipath route (set of next hops for a given destination) is referred to as 'policy'.

Unless the mechanism indicated by ipForwardProto specifies otherwise, the policy specifier is the IP TOS Field. The encoding of IP TOS is as specified by the following convention. Zero indicates the default path if no more specific policy applies.

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| | | |
|------------|-----------------|---|
| PRECEDENCE | TYPE OF SERVICE | 0 |
|------------|-----------------|---|

| Field | IP TOS | Field | IP TOS |
|----------|-------------|----------|-------------|
| Contents | Policy Code | Contents | Policy Code |
| 0 0 0 0 | ==> 0 | 0 0 0 1 | ==> 2 |
| 0 0 1 0 | ==> 4 | 0 0 1 1 | ==> 6 |
| 0 1 0 0 | ==> 8 | 0 1 0 1 | ==> 10 |
| 0 1 1 0 | ==> 12 | 0 1 1 1 | ==> 14 |
| 1 0 0 0 | ==> 16 | 1 0 0 1 | ==> 18 |
| 1 0 1 0 | ==> 20 | 1 0 1 1 | ==> 22 |
| 1 1 0 0 | ==> 24 | 1 1 0 1 | ==> 26 |
| 1 1 1 0 | ==> 28 | 1 1 1 1 | ==> 30 |

Protocols defining 'policy' otherwise must either define a set of values which are valid for this object or must implement an integer-instanced policy table for which this object's value acts as an index."

::= { ipForwardEntry 3 }

ipForwardNextHop OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS obsolete

DESCRIPTION

"On remote routes, the address of the next system en route; Otherwise, 0.0.0.0."

::= { ipForwardEntry 4 }

ipForwardIfIndex OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS obsolete

DESCRIPTION

"The ifIndex value which identifies the local interface through which the next hop of this route should be reached."

DEFVAL { 0 }

::= { ipForwardEntry 5 }

ipForwardType OBJECT-TYPE

SYNTAX INTEGER {

other (1), -- not specified by this MIB

invalid (2), -- logically deleted

local (3), -- local interface

remote (4) -- remote destination

}

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MAX-ACCESS read-create

STATUS obsolete

DESCRIPTION

"The type of route. Note that local(3) refers to a route for which the next hop is the final destination; remote(4) refers to a route for which the next hop is not the final destination.

Setting this object to the value invalid(2) has the effect of invalidating the corresponding entry in the ipForwardTable object. That is, it effectively disassociates the destination identified with said entry from the route identified with said entry. It is an implementation-specific matter as to whether the agent removes an invalidated entry from the table. Accordingly, management stations must be prepared to receive tabular information from agents that corresponds to entries not currently in use. Proper interpretation of such entries requires examination of the relevant ipForwardType object."

DEFVAL { invalid }

::= { ipForwardEntry 6 }

ipForwardProto OBJECT-TYPE

SYNTAX INTEGER {

other (1), -- not specified

local (2), -- local interface

netmgmt (3), -- static route

icmp (4), -- result of ICMP Redirect

```

-- the following are all dynamic
-- routing protocols
    egp      (5),  -- Exterior Gateway Protocol
    ggp      (6),  -- Gateway-Gateway Protocol
    hello    (7),  -- FuzzBall HelloSpeak
    rip      (8),  -- Berkeley RIP or RIP-II
    is-is    (9),  -- Dual IS-IS
    es-is    (10), -- ISO 9542
    ciscoIgrp(11), -- Cisco IGRP
    bbnSpfIgp(12), -- BBN SPF IGP
    ospf     (13), -- Open Shortest Path First
    bgp      (14), -- Border Gateway Protocol
    idpr     (15)  -- InterDomain Policy Routing
}
MAX-ACCESS read-only
STATUS      obsolete
DESCRIPTION
    "The routing mechanism via which this route was learned.
    Inclusion of values for gateway routing protocols is
    not intended to imply that hosts should support those
    protocols."
::= { ipForwardEntry 7 }

```

ipForwardAge OBJECT-TYPE

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```

SYNTAX      Integer32
MAX-ACCESS read-only
STATUS      obsolete
DESCRIPTION
    "The number of seconds since this route was last updated
    or otherwise determined to be correct. Note that no
    semantics of 'too old' can be implied except through
    knowledge of the routing protocol by which the route
    was learned."
DEFVAL { 0 }
::= { ipForwardEntry 8 }

```

ipForwardInfo OBJECT-TYPE

```

SYNTAX      OBJECT IDENTIFIER
MAX-ACCESS read-create
STATUS      obsolete
DESCRIPTION
    "A reference to MIB definitions specific to the
    particular routing protocol which is responsible for
    this route, as determined by the value specified in the
    route's ipForwardProto value. If this information is
    not present, its value should be set to the OBJECT

```

IDENTIFIER { 0 0 }, which is a syntactically valid object identifier, and any implementation conforming to ASN.1 and the Basic Encoding Rules must be able to generate and recognize this value."

::= { ipForwardEntry 9 }

ipForwardNextHopAS OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS obsolete

DESCRIPTION

"The Autonomous System Number of the Next Hop. When this is unknown or not relevant to the protocol indicated by ipForwardProto, zero."

DEFVAL { 0 }

::= { ipForwardEntry 10 }

ipForwardMetric1 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS obsolete

DESCRIPTION

"The primary routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipForwardProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { ipForwardEntry 11 }

ipForwardMetric2 OBJECT-TYPE

SYNTAX Integer32

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MAX-ACCESS read-create

STATUS obsolete

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipForwardProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { ipForwardEntry 12 }

ipForwardMetric3 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS obsolete

```

DESCRIPTION
    "An alternate routing metric for this route.  The
    semantics of this metric are determined by the routing-
    protocol specified in the route's ipForwardProto value.
    If this metric is not used, its value should be set to
    -1."
DEFVAL { -1 }
::= { ipForwardEntry 13 }

ipForwardMetric4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      obsolete
    DESCRIPTION
        "An alternate routing metric for this route.  The
        semantics of this metric are determined by the routing-
        protocol specified in the route's ipForwardProto value.
        If this metric is not used, its value should be set to
        -1."
    DEFVAL { -1 }
    ::= { ipForwardEntry 14 }

ipForwardMetric5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      obsolete
    DESCRIPTION
        "An alternate routing metric for this route.  The
        semantics of this metric are determined by the routing-
        protocol specified in the route's ipForwardProto value.
        If this metric is not used, its value should be set to
        -1."
    DEFVAL { -1 }
    ::= { ipForwardEntry 15 }

-- Obsoleted Definitions - Groups
-- compliance statements

ipForwardOldCompliance MODULE-COMPLIANCE

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STATUS      obsolete
DESCRIPTION
    "The compliance statement for SNMP entities which
    implement the ipForward MIB."

MODULE -- this module
MANDATORY-GROUPS { ipForwardMultiPathGroup }

```



```

::= { ipForwardCompliances 2 }

ipForwardMultiPathGroup OBJECT-GROUP
    OBJECTS { ipForwardNumber,
               ipForwardDest, ipForwardMask, ipForwardPolicy,
               ipForwardNextHop, ipForwardIfIndex, ipForwardType,
               ipForwardProto, ipForwardAge, ipForwardInfo,
               ipForwardNextHopAS,
               ipForwardMetric1, ipForwardMetric2, ipForwardMetric3,
               ipForwardMetric4, ipForwardMetric5
            }
    STATUS      obsolete
    DESCRIPTION
        "IP Multipath Route Table."
    ::= { ipForwardGroups 2 }

END

```

5 Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

1. The inetCidrRouteTable contains routing and forwarding information that is critical to the operation of the network node (especially routers). Allowing unauthenticated write access to this table can compromise the validity of the forwarding information.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

1. The inetCidrRouteTable contains routing and forwarding information that can be used to compromise a network. Specifically, this table can be used to construct a map of the network in preparation for a denial-of-service attack on the network infrastructure.
2. The inetCidrRouteProto object identifies the routing protocols in use within a network. This information can be used to determine how a denial-of-service attack should be launched.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [\[RFC3410\]](#), [section 8](#)), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

[6](#) Intellectual Property

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[7](#) Changes from [RFC 2096](#)

This document updates [RFC 2096](#) in the following ways:

1. Utilized the InetAddress TC to support IP version-independent implementations of the forwarding MIB. This gives common forwarding MIB support for IPv4 and IPv6.
2. Created a read-only conformance statement to support implementations that only wish to retrieve data.
3. Created the inetCidrRouteDiscards object to replace the deprecated ipRoutingDiscards and ipv6DiscardedRoutes objects.

8 Normative References

- [RFC2119] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels", [RFC 2119](#), [BCP14](#), March 1999.
- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC3291] Daniele, M., Haberman, B., Routhier, S., Schoenwaelder, J., "Textual Conventions for Internet Network Addresses", [RFC 3291](#), May 2002.
- RFC Ed : An update to [RFC 3291](#) is in the works, in the case that
-- [draft-ietf-ops-rfc3291bis](#) is published before or at the same
-- time as this document, please update this reference and the two
-- citations in the document. Afterwards, please remove this note.
- [RFC2863] McCloghrie, K., and Kastenholz, F., "The Interfaces Group MIB", [RFC 2863](#), June 2000.
- [2011upd] Routhier, S., "Management Information Base for the Internet Protocol (IP),
[draft-ietf-ipv6-rfc2011-update-02.txt](#), February 2003.
- [RTPROTO] IANA, "IP Route Protocol MIB",
<http://www.iana.org/assignments/ianaiprouteprotocol-mib>,
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9 Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart,
"Introduction and Applicability Statements for Internet-
Standard Management Framework", [RFC 3410](#), December 2002.
- [RFC2096] Baker, F., "IP Forwarding Table MIB", [RFC 2096](#), January
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10 Authors and Acknowledgements

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