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IPv4 Multicast Routing MIB

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.

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Abstract

This memo 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 used for managing IP Multicast Routing for IPv4, independent of the specific multicast routing protocol in use.

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1. Introduction

This MIB describes objects used for managing IP Multicast Routing [16], independent of the specific multicast routing protocol [17-21] in use. Managed objects specific to particular multicast routing protocols are specified elsewhere. Similarly, this MIB does not support management of multicast routing for other address families, including IPv6. Such management may be supported by other MIBs.

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [1].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIV2, is described in STD 58, RFC 2578 [5], STD 58, RFC 2579 [6] and STD 58, RFC 2580 [7].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Overview

This MIB module contains one scalar and five tables. The tables are:

- (1) the IP Multicast Route Table containing multicast routing information for IP datagrams sent by particular sources to the IP multicast groups known to a router.
- (2) the IP Multicast Routing Next Hop Table containing information on the next-hops for the routing IP multicast datagrams. Each entry is one of a list of next-hops on outgoing interfaces for particular sources sending to a particular multicast group address.
- (3) the IP Multicast Routing Interface Table containing multicast routing information specific to interfaces.
- (4) the IP Multicast Scope Boundary Table containing the boundaries configured for multicast scopes [22].
- (5) the IP Multicast Scope Name Table containing human-readable names of multicast scope.

4. Definitions

```
IPMROUTE-STD-MIB DEFINITIONS ::= BEGIN
```

IMPORTS

```
MODULE-IDENTITY, OBJECT-TYPE, mib-2,
Integer32, Counter32, Counter64, Gauge32,
IpAddress, TimeTicks          FROM SNMPv2-SMI
RowStatus, TEXTUAL-CONVENTION,
TruthValue                    FROM SNMPv2-TC
MODULE-COMPLIANCE, OBJECT-GROUP FROM SNMPv2-CONF
SnmpAdminString              FROM SNMP-FRAMEWORK-MIB
InterfaceIndexOrZero,
InterfaceIndex                FROM IF-MIB
IANAipRouteProtocol,
IANAipMRRouteProtocol        FROM IANA-RTPROTO-MIB;
```

```
ipMRouteStdMIB MODULE-IDENTITY
```

```
LAST-UPDATED "200009220000Z" -- September 22, 2000
```

```
ORGANIZATION "IETF IDMR Working Group"
```

```
CONTACT-INFO
```

```
    " Dave Thaler
      Microsoft Corporation
      One Microsoft Way
      Redmond, WA 98052-6399
      US
```

```
    Phone: +1 425 703 8835
```

```
    EMail: dthaler@microsoft.com"
```

```
DESCRIPTION
```

```
    "The MIB module for management of IP Multicast routing, but
    independent of the specific multicast routing protocol in
    use."
```

```
REVISION "200009220000Z" -- September 22, 2000
```

```
DESCRIPTION
```

```
    "Initial version, published as RFC 2932."
```

```
::= { mib-2 83 }
```

```
-- Textual Conventions
```

```
LanguageTag ::= TEXTUAL-CONVENTION
```

```
DISPLAY-HINT "100a"
```

```
STATUS current
```

```
DESCRIPTION
```

```
    "An RFC 1766-style language tag, with all alphabetic
    characters converted to lowercase. This restriction is
    intended to make the lexical ordering imposed by SNMP useful
```

when applied to language tags. Note that it is theoretically possible for a valid language tag to exceed the allowed length of this syntax, and thus be impossible to represent with this syntax. Sampling of language tags in current use on the Internet suggests that this limit does not pose a serious problem in practice."

```
SYNTAX      OCTET STRING (SIZE (1..100))
```

```
-- Top-level structure of the MIB
```

```
ipMRouteMIBObjects OBJECT IDENTIFIER ::= { ipMRouteStdMIB 1 }
```

```
ipMRoute      OBJECT IDENTIFIER ::= { ipMRouteMIBObjects 1 }
```

```
-- the IP Multicast Routing MIB-Group
```

```
--
```

```
-- a collection of objects providing information about
```

```
-- IP Multicast Groups
```

```
ipMRouteEnable OBJECT-TYPE
```

```
SYNTAX      INTEGER { enabled(1), disabled(2) }
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The enabled status of IP Multicast routing on this router."
```

```
::= { ipMRoute 1 }
```

```
ipMRouteEntryCount OBJECT-TYPE
```

```
SYNTAX      Gauge32
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The number of rows in the ipMRouteTable. This can be used  
    to monitor the multicast routing table size."
```

```
::= { ipMRoute 7 }
```

```
ipMRouteTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF IpMRouteEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The (conceptual) table containing multicast routing  
    information for IP datagrams sent by particular sources to  
    the IP multicast groups known to this router."
```

```
::= { ipMRoute 2 }
```

```

ipMRouteEntry OBJECT-TYPE
    SYNTAX      IpMRouteEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (conceptual row) containing the multicast routing
        information for IP datagrams from a particular source and
        addressed to a particular IP multicast group address.
        Discontinuities in counters in this entry can be detected by
        observing the value of ipMRouteUpTime."
    INDEX       { ipMRouteGroup,
                  ipMRouteSource,
                  ipMRouteSourceMask }
    ::= { ipMRouteTable 1 }

IpMRouteEntry ::= SEQUENCE {
    ipMRouteGroup          IpAddress,
    ipMRouteSource         IpAddress,
    ipMRouteSourceMask    IpAddress,
    ipMRouteUpstreamNeighbor IpAddress,
    ipMRouteInIfIndex     InterfaceIndexOrZero,
    ipMRouteUpTime        TimeTicks,
    ipMRouteExpiryTime    TimeTicks,
    ipMRoutePkts          Counter32,
    ipMRouteDifferentInIfPackets Counter32,
    ipMRouteOctets        Counter32,
    ipMRouteProtocol      IANAipMRouteProtocol,
    ipMRouteRtProto       IANAipRouteProtocol,
    ipMRouteRtAddress     IpAddress,
    ipMRouteRtMask        IpAddress,
    ipMRouteRtType        INTEGER,
    ipMRouteHCOctets      Counter64
}

ipMRouteGroup OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IP multicast group address for which this entry
        contains multicast routing information."
    ::= { ipMRouteEntry 1 }

ipMRouteSource OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION

```

"The network address which when combined with the corresponding value of ipMRouteSourceMask identifies the sources for which this entry contains multicast routing information."

::= { ipMRouteEntry 2 }

ipMRouteSourceMask OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The network mask which when combined with the corresponding value of ipMRouteSource identifies the sources for which this entry contains multicast routing information."

::= { ipMRouteEntry 3 }

ipMRouteUpstreamNeighbor OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address of the upstream neighbor (e.g., RPF neighbor) from which IP datagrams from these sources to this multicast address are received, or 0.0.0.0 if the upstream neighbor is unknown (e.g., in CBT)."

::= { ipMRouteEntry 4 }

ipMRouteInIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of ifIndex for the interface on which IP datagrams sent by these sources to this multicast address are received. A value of 0 indicates that datagrams are not subject to an incoming interface check, but may be accepted on multiple interfaces (e.g., in CBT)."

::= { ipMRouteEntry 5 }

ipMRouteUpTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time since the multicast routing information represented by this entry was learned by the router."

::= { ipMRouteEntry 6 }

ipMRouteExpiryTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum amount of time remaining before this entry will be aged out. The value 0 indicates that the entry is not subject to aging."

::= { ipMRouteEntry 7 }

ipMRoutePkts OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of packets which this router has received from these sources and addressed to this multicast group address."

::= { ipMRouteEntry 8 }

ipMRouteDifferentInIfPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of packets which this router has received from these sources and addressed to this multicast group address, which were dropped because they were not received on the interface indicated by ipMRouteInIfIndex. Packets which are not subject to an incoming interface check (e.g., using CBT) are not counted."

::= { ipMRouteEntry 9 }

ipMRouteOctets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of octets contained in IP datagrams which were received from these sources and addressed to this multicast group address, and which were forwarded by this router."

::= { ipMRouteEntry 10 }

ipMRouteProtocol OBJECT-TYPE

SYNTAX IANAipMRouteProtocol

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The multicast routing protocol via which this multicast forwarding entry was learned."

::= { ipMRouteEntry 11 }

ipMRouteRtProto OBJECT-TYPE

SYNTAX IANAipRouteProtocol

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The routing mechanism via which the route used to find the upstream or parent interface for this multicast forwarding entry was learned. Inclusion of values for routing protocols is not intended to imply that those protocols need be supported."

::= { ipMRouteEntry 12 }

ipMRouteRtAddress OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address portion of the route used to find the upstream or parent interface for this multicast forwarding entry."

::= { ipMRouteEntry 13 }

ipMRouteRtMask OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The mask associated with the route used to find the upstream or parent interface for this multicast forwarding entry."

::= { ipMRouteEntry 14 }

ipMRouteRtType OBJECT-TYPE

SYNTAX INTEGER {
 unicast (1), -- Unicast route used in multicast RIB
 multicast (2) -- Multicast route
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The reason the given route was placed in the (logical) multicast Routing Information Base (RIB). A value of unicast means that the route would normally be placed only in the unicast RIB, but was placed in the multicast RIB (instead or in addition) due to local configuration, such as when running PIM over RIP. A value of multicast means that

the route was explicitly added to the multicast RIB by the routing protocol, such as DVMRP or Multiprotocol BGP."

```
::= { ipMRouteEntry 15 }
```

```
ipMRouteHCOctets OBJECT-TYPE
```

```
SYNTAX Counter64
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

"The number of octets contained in IP datagrams which were received from these sources and addressed to this multicast group address, and which were forwarded by this router.

This object is a 64-bit version of ipMRouteOctets."

```
::= { ipMRouteEntry 16 }
```

```
--
```

```
-- The IP Multicast Routing Next Hop Table
```

```
--
```

```
ipMRouteNextHopTable OBJECT-TYPE
```

```
SYNTAX SEQUENCE OF IpMRouteNextHopEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

"The (conceptual) table containing information on the next-hops on outgoing interfaces for routing IP multicast datagrams. Each entry is one of a list of next-hops on outgoing interfaces for particular sources sending to a particular multicast group address."

```
::= { ipMRoute 3 }
```

```
ipMRouteNextHopEntry OBJECT-TYPE
```

```
SYNTAX IpMRouteNextHopEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

"An entry (conceptual row) in the list of next-hops on outgoing interfaces to which IP multicast datagrams from particular sources to a IP multicast group address are routed. Discontinuities in counters in this entry can be detected by observing the value of ipMRouteUpTime."

```
INDEX { ipMRouteNextHopGroup, ipMRouteNextHopSource,
        ipMRouteNextHopSourceMask, ipMRouteNextHopIfIndex,
        ipMRouteNextHopAddress }
```

```
::= { ipMRouteNextHopTable 1 }
```

```
IpMRouteNextHopEntry ::= SEQUENCE {
    ipMRouteNextHopGroup      IpAddress,
```

```

ipMRouteNextHopSource          IPAddress,
ipMRouteNextHopSourceMask     IPAddress,
ipMRouteNextHopIfIndex        InterfaceIndex,
ipMRouteNextHopAddress        IPAddress,
ipMRouteNextHopState          INTEGER,
ipMRouteNextHopUpTime         TimeTicks,
ipMRouteNextHopExpiryTime     TimeTicks,
ipMRouteNextHopClosestMemberHops Integer32,
ipMRouteNextHopProtocol       IANAipMRouteProtocol,
ipMRouteNextHopPkts           Counter32
}

ipMRouteNextHopGroup OBJECT-TYPE
    SYNTAX      IPAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IP multicast group for which this entry specifies a
         next-hop on an outgoing interface."
    ::= { ipMRouteNextHopEntry 1 }

ipMRouteNextHopSource OBJECT-TYPE
    SYNTAX      IPAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The network address which when combined with the
         corresponding value of ipMRouteNextHopSourceMask identifies
         the sources for which this entry specifies a next-hop on an
         outgoing interface."
    ::= { ipMRouteNextHopEntry 2 }

ipMRouteNextHopSourceMask OBJECT-TYPE
    SYNTAX      IPAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The network mask which when combined with the corresponding
         value of ipMRouteNextHopSource identifies the sources for
         which this entry specifies a next-hop on an outgoing
         interface."
    ::= { ipMRouteNextHopEntry 3 }

ipMRouteNextHopIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION

```

"The ifIndex value of the interface for the outgoing interface for this next-hop."

::= { ipMRouteNextHopEntry 4 }

ipMRouteNextHopAddress OBJECT-TYPE

SYNTAX IPAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The address of the next-hop specific to this entry. For most interfaces, this is identical to ipMRouteNextHopGroup. NBMA interfaces, however, may have multiple next-hop addresses out a single outgoing interface."

::= { ipMRouteNextHopEntry 5 }

ipMRouteNextHopState OBJECT-TYPE

SYNTAX INTEGER { pruned(1), forwarding(2) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An indication of whether the outgoing interface and next-hop represented by this entry is currently being used to forward IP datagrams. The value 'forwarding' indicates it is currently being used; the value 'pruned' indicates it is not."

::= { ipMRouteNextHopEntry 6 }

ipMRouteNextHopUpTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time since the multicast routing information represented by this entry was learned by the router."

::= { ipMRouteNextHopEntry 7 }

ipMRouteNextHopExpiryTime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum amount of time remaining before this entry will be aged out. If ipMRouteNextHopState is pruned(1), the remaining time until the prune expires and the state reverts to forwarding(2). Otherwise, the remaining time until this entry is removed from the table. The time remaining may be copied from ipMRouteExpiryTime if the protocol in use for this entry does not specify next-hop timers. The value 0

```
        indicates that the entry is not subject to aging."
 ::= { ipMRouteNextHopEntry 8 }

ipMRouteNextHopClosestMemberHops OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The minimum number of hops between this router and any
        member of this IP multicast group reached via this next-hop
        on this outgoing interface.  Any IP multicast datagrams for
        the group which have a TTL less than this number of hops
        will not be forwarded to this next-hop."
 ::= { ipMRouteNextHopEntry 9 }

ipMRouteNextHopProtocol OBJECT-TYPE
    SYNTAX      IANAipMRouteProtocol
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The routing mechanism via which this next-hop was learned."
 ::= { ipMRouteNextHopEntry 10 }

ipMRouteNextHopPkts OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of packets which have been forwarded using this
        route."
 ::= { ipMRouteNextHopEntry 11 }

--
-- The Multicast Routing Interface Table
--

ipMRouteInterfaceTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IpMRouteInterfaceEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table containing multicast routing
        information specific to interfaces."
 ::= { ipMRoute 4 }

ipMRouteInterfaceEntry OBJECT-TYPE
    SYNTAX      IpMRouteInterfaceEntry
    MAX-ACCESS  not-accessible
```

```

STATUS      current
DESCRIPTION
    "An entry (conceptual row) containing the multicast routing
    information for a particular interface."
INDEX       { ipMRouteInterfaceIfIndex }
 ::= { ipMRouteInterfaceTable 1 }

IpMRouteInterfaceEntry ::= SEQUENCE {
    ipMRouteInterfaceIfIndex      InterfaceIndex,
    ipMRouteInterfaceTtl          Integer32,
    ipMRouteInterfaceProtocol     IANAipMRouteProtocol,
    ipMRouteInterfaceRateLimit    Integer32,
    ipMRouteInterfaceInMcastOctets Counter32,
    ipMRouteInterfaceOutMcastOctets Counter32,
    ipMRouteInterfaceHCInMcastOctets Counter64,
    ipMRouteInterfaceHCOutMcastOctets Counter64
}

ipMRouteInterfaceIfIndex OBJECT-TYPE
SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The ifIndex value of the interface for which this entry
    contains information."
 ::= { ipMRouteInterfaceEntry 1 }

ipMRouteInterfaceTtl OBJECT-TYPE
SYNTAX      Integer32 (0..255)
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The datagram TTL threshold for the interface. Any IP
    multicast datagrams with a TTL less than this threshold will
    not be forwarded out the interface. The default value of 0
    means all multicast packets are forwarded out the
    interface."
 ::= { ipMRouteInterfaceEntry 2 }

ipMRouteInterfaceProtocol OBJECT-TYPE
SYNTAX      IANAipMRouteProtocol
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The routing protocol running on this interface."
 ::= { ipMRouteInterfaceEntry 3 }

ipMRouteInterfaceRateLimit OBJECT-TYPE

```

```
SYNTAX      Integer32
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The rate-limit, in kilobits per second, of forwarded
    multicast traffic on the interface. A rate-limit of 0
    indicates that no rate limiting is done."
DEFVAL      { 0 }
 ::= { ipMRouteInterfaceEntry 4 }
```

ipMRouteInterfaceInMcastOctets OBJECT-TYPE

```
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of octets of multicast packets that have arrived
    on the interface, including framing characters. This object
    is similar to ifInOctets in the Interfaces MIB, except that
    only multicast packets are counted."
 ::= { ipMRouteInterfaceEntry 5 }
```

ipMRouteInterfaceOutMcastOctets OBJECT-TYPE

```
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of octets of multicast packets that have been
    sent on the interface."
 ::= { ipMRouteInterfaceEntry 6 }
```

ipMRouteInterfaceHCInMcastOctets OBJECT-TYPE

```
SYNTAX      Counter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of octets of multicast packets that have arrived
    on the interface, including framing characters. This object
    is a 64-bit version of ipMRouteInterfaceInMcastOctets. It
    is similar to ifHCInOctets in the Interfaces MIB, except
    that only multicast packets are counted."
 ::= { ipMRouteInterfaceEntry 7 }
```

ipMRouteInterfaceHCOutMcastOctets OBJECT-TYPE

```
SYNTAX      Counter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of octets of multicast packets that have been
```

```

        sent on the interface.  This object is a 64-bit version of
        ipMRouteInterfaceOutMcastOctets."
 ::= { ipMRouteInterfaceEntry 8 }

--
-- The IP Multicast Scope Boundary Table
--

ipMRouteBoundaryTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IpMRouteBoundaryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table listing the router's scoped
        multicast address boundaries."
 ::= { ipMRoute 5 }

ipMRouteBoundaryEntry OBJECT-TYPE
    SYNTAX      IpMRouteBoundaryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (conceptual row) in the ipMRouteBoundaryTable
        representing a scoped boundary."
    INDEX       { ipMRouteBoundaryIfIndex, ipMRouteBoundaryAddress,
                 ipMRouteBoundaryAddressMask }
 ::= { ipMRouteBoundaryTable 1 }

IpMRouteBoundaryEntry ::= SEQUENCE {
    ipMRouteBoundaryIfIndex      InterfaceIndex,
    ipMRouteBoundaryAddress      IpAddress,
    ipMRouteBoundaryAddressMask  IpAddress,
    ipMRouteBoundaryStatus       RowStatus
}

ipMRouteBoundaryIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IfIndex value for the interface to which this boundary
        applies.  Packets with a destination address in the
        associated address/mask range will not be forwarded out this
        interface."
 ::= { ipMRouteBoundaryEntry 1 }

ipMRouteBoundaryAddress OBJECT-TYPE
    SYNTAX      IpAddress

```

```

MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
    "The group address which when combined with the
    corresponding value of ipMRouteBoundaryAddressMask
    identifies the group range for which the scoped boundary
    exists. Scoped addresses must come from the range 239.x.x.x
    as specified in RFC 2365."
 ::= { ipMRouteBoundaryEntry 2 }

```

```

ipMRouteBoundaryAddressMask OBJECT-TYPE
SYNTAX      IPAddress
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
    "The group address mask which when combined with the
    corresponding value of ipMRouteBoundaryAddress identifies
    the group range for which the scoped boundary exists."
 ::= { ipMRouteBoundaryEntry 3 }

```

```

ipMRouteBoundaryStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS read-create
STATUS      current
DESCRIPTION
    "The status of this row, by which new entries may be
    created, or old entries deleted from this table."
 ::= { ipMRouteBoundaryEntry 4 }

```

```

--
-- The IP Multicast Scope Name Table
--

```

```

ipMRouteScopeNameTable OBJECT-TYPE
SYNTAX      SEQUENCE OF IpMRouteScopeNameEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
    "The (conceptual) table listing the multicast scope names."
 ::= { ipMRoute 6 }

```

```

ipMRouteScopeNameEntry OBJECT-TYPE
SYNTAX      IpMRouteScopeNameEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) in the ipMRouteScopeNameTable
    representing a multicast scope name."

```

```

INDEX      { ipMRouteScopeNameAddress,
              ipMRouteScopeNameAddressMask,
              IMPLIED ipMRouteScopeNameLanguage }
 ::= { ipMRouteScopeNameTable 1 }

IpMRouteScopeNameEntry ::= SEQUENCE {
    ipMRouteScopeNameAddress      IpAddress,
    ipMRouteScopeNameAddressMask  IpAddress,
    ipMRouteScopeNameLanguage     LanguageTag,
    ipMRouteScopeNameString       SnmpAdminString,
    ipMRouteScopeNameDefault      TruthValue,
    ipMRouteScopeNameStatus       RowStatus
}

ipMRouteScopeNameAddress OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The group address which when combined with the
        corresponding value of ipMRouteScopeNameAddressMask
        identifies the group range associated with the multicast
        scope. Scoped addresses must come from the range
        239.x.x.x."
    ::= { ipMRouteScopeNameEntry 1 }

ipMRouteScopeNameAddressMask OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The group address mask which when combined with the
        corresponding value of ipMRouteScopeNameAddress identifies
        the group range associated with the multicast scope."
    ::= { ipMRouteScopeNameEntry 2 }

ipMRouteScopeNameLanguage OBJECT-TYPE
    SYNTAX      LanguageTag
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The RFC 1766-style language tag associated with the scope
        name."
    ::= { ipMRouteScopeNameEntry 3 }

ipMRouteScopeNameString OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-create

```

```

STATUS      current
DESCRIPTION
    "The textual name associated with the multicast scope.  The
    value of this object should be suitable for displaying to
    end-users, such as when allocating a multicast address in
    this scope.  When no name is specified, the default value of
    this object should be the string 239.x.x.x/y with x and y
    replaced appropriately to describe the address and mask
    length associated with the scope."
 ::= { ipMRouteScopeNameEntry 4 }

ipMRouteScopeNameDefault OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "If true, indicates a preference that the name in the
    following language should be used by applications if no name
    is available in a desired language."
DEFVAL { false }
 ::= { ipMRouteScopeNameEntry 5 }

ipMRouteScopeNameStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The status of this row, by which new entries may be
    created, or old entries deleted from this table."
 ::= { ipMRouteScopeNameEntry 6 }

-- conformance information

ipMRouteMIBConformance
    OBJECT IDENTIFIER ::= { ipMRouteStdMIB 2 }
ipMRouteMIBCompliances
    OBJECT IDENTIFIER ::= { ipMRouteMIBConformance 1 }
ipMRouteMIBGroups  OBJECT IDENTIFIER ::= { ipMRouteMIBConformance 2 }

-- compliance statements

ipMRouteMIBCompliance MODULE-COMPLIANCE
STATUS      current
DESCRIPTION
    "The compliance statement for the IP Multicast MIB."
MODULE     -- this module
MANDATORY-GROUPS { ipMRouteMIBBasicGroup,

```

```
ipMRouteMIBRouteGroup}
```

```
GROUP ipMRouteMIBBoundaryGroup
```

```
DESCRIPTION
```

```
"This group is mandatory if the router supports
administratively-scoped multicast address boundaries."
```

```
OBJECT ipMRouteBoundaryStatus
```

```
MIN-ACCESS read-only
```

```
DESCRIPTION
```

```
"Write access is not required."
```

```
OBJECT ipMRouteScopeNameStatus
```

```
MIN-ACCESS read-only
```

```
DESCRIPTION
```

```
"Write access is not required."
```

```
GROUP ipMRouteMIBHCInterfaceGroup
```

```
DESCRIPTION
```

```
"This group is mandatory only for those network interfaces
for which the value of the corresponding instance of ifSpeed
is greater than 20,000,000 bits/second."
```

```
::= { ipMRouteMIBCompliances 1 }
```

```
-- units of conformance
```

```
ipMRouteMIBBasicGroup OBJECT-GROUP
```

```
OBJECTS { ipMRouteEnable, ipMRouteEntryCount,
ipMRouteUpstreamNeighbor, ipMRouteInIfIndex,
ipMRouteUpTime, ipMRouteExpiryTime,
ipMRouteNextHopState,
ipMRouteNextHopUpTime,
ipMRouteNextHopExpiryTime,
ipMRouteNextHopProtocol,
ipMRouteNextHopPkts,
ipMRouteInterfaceTtl,
ipMRouteInterfaceProtocol, ipMRouteInterfaceRateLimit,
ipMRouteInterfaceInMcastOctets,
ipMRouteInterfaceOutMcastOctets,
ipMRouteProtocol
}
```

```
STATUS current
```

```
DESCRIPTION
```

```
"A collection of objects to support basic management of IP
Multicast routing."
```

```
::= { ipMRouteMIBGroups 1 }
```

```
ipMRouteMIBHopCountGroup OBJECT-GROUP
  OBJECTS { ipMRouteNextHopClosestMemberHops }
  STATUS current
  DESCRIPTION
    "A collection of objects to support management of the use of
    hop counts in IP Multicast routing."
  ::= { ipMRouteMIBGroups 2 }

ipMRouteMIBBoundaryGroup OBJECT-GROUP
  OBJECTS { ipMRouteBoundaryStatus, ipMRouteScopeNameString,
            ipMRouteScopeNameDefault, ipMRouteScopeNameStatus }
  STATUS current
  DESCRIPTION
    "A collection of objects to support management of scoped
    multicast address boundaries."
  ::= { ipMRouteMIBGroups 3 }

ipMRouteMIBPktsOutGroup OBJECT-GROUP
  OBJECTS { ipMRouteNextHopPkts }
  STATUS current
  DESCRIPTION
    "A collection of objects to support management of packet
    counters for each outgoing interface entry of a route."
  ::= { ipMRouteMIBGroups 4 }

ipMRouteMIBHCInterfaceGroup OBJECT-GROUP
  OBJECTS { ipMRouteInterfaceHCInMcastOctets,
            ipMRouteInterfaceHCOutMcastOctets,
            ipMRouteHCOctets }
  STATUS current
  DESCRIPTION
    "A collection of objects providing information specific to
    high speed (greater than 20,000,000 bits/second) network
    interfaces."
  ::= { ipMRouteMIBGroups 5 }

ipMRouteMIBRouteGroup OBJECT-GROUP
  OBJECTS { ipMRouteRtProto, ipMRouteRtAddress,
            ipMRouteRtMask, ipMRouteRtType }
  STATUS current
  DESCRIPTION
    "A collection of objects providing information on the
    relationship between multicast routing information, and the
    IP Forwarding Table."
  ::= { ipMRouteMIBGroups 6 }

ipMRouteMIBPktsGroup OBJECT-GROUP
  OBJECTS { ipMRoutePkts, ipMRouteDifferentInIfPackets,
```

```
        ipMRouteOctets }
STATUS   current
DESCRIPTION
        "A collection of objects to support management of packet
        counters for each forwarding entry."
 ::= { ipMRouteMIBGroups 7 }
```

END

5. IANA Considerations

The ipMRouteRtProto, ipMRouteNextHopProtocol, ipMRouteInterfaceProtocol, and ipMRouteProtocol use textual conventions imported from the IANA-RTPROTO-MIB. The purpose of defining these textual conventions in a separate MIB module is to allow additional values to be defined without having to issue a new version of this document. The Internet Assigned Numbers Authority (IANA) is responsible for the assignment of all Internet numbers, including various SNMP-related numbers; it will administer the values associated with these textual conventions.

The rules for additions or changes to the IANA-RTPROTO-MIB are outlined in the DESCRIPTION clause associated with its MODULE-IDENTITY statement.

The current versions of the IANA-RTPROTO-MIB can be accessed from the IANA home page at: "<http://www.iana.org/>".

6. Security Considerations

This MIB contains readable objects whose values provide information related to multicast routing, including information on what machines are sending to which groups. There are also a number of objects that have a MAX-ACCESS clause of read-write and/or read-create, such as those which allow an administrator to configure multicast boundaries.

While unauthorized access to the readable objects is relatively innocuous, unauthorized access to the write-able objects could cause a denial of service, or could cause wider distribution of packets intended only for local distribution. Hence, the support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is such an insecure environment. 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 SET (change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [12] and the View-based Access Control Model RFC 2575 [15] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

7. Intellectual Property Notice

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8. Acknowledgements

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