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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 objects used for managing multicast function, independent of the specific multicast protocol(s) in use. This document obsoletes RFC 2932.
Table of Contents

1. Introduction ............................................ 3
2. History ................................................... 3
3. The Internet-Standard Management Framework ............... 3
4. Overview .................................................. 4
5. Definitions ............................................... 4
6. Security Considerations .................................. 36
7. IANA Considerations ....................................... 40
8. Acknowledgements ......................................... 40
9. References ................................................ 40
  9.1 Normative References .................................... 40
  9.2 Informative References .................................. 41
    Authors’ Addresses ....................................... 42
    Intellectual Property and Copyright Statements .......... 43
1. Introduction

This MIB describes objects used for managing IP multicast function, including IP multicast routing. These objects are independent of the specific multicast routing protocol in use. Managed objects specific to particular multicast protocols are defined elsewhere.

2. History

This document obsoletes [RFC2932]. The MIB module defined by this document is a re-working of the MIB module from [RFC2932], with changes that include the following.

- This MIB module is independent of address type, whereas [RFC2932] only supported IPv4.
- This MIB module allows several multicast protocols to perform routing on a single interface, where [RFC2932] assumed each interface supported at most one multicast routing protocol.
- This MIB module includes objects that are not specific to multicast routing. It allows management of multicast function on systems that do not perform routing, whereas RFC 2932 was restricted to multicast routing.
- This MIB module includes a table of Source-Specific Multicast (SSM) address ranges to which SSM semantics [RFC3569] should be applied.
- This MIB module includes a table of local applications that are receiving multicast data.

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 [RFC2119].

3. 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 [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,
4. Overview

This MIB module contains two scalars and seven tables. The tables are:

1. The IP Multicast Interface Table containing multicast information specific to interfaces.

2. The IP Multicast SSM Range Table, which contains one row per range of multicast group addresses to which Source-Specific Multicast semantics [RFC3569] should be applied.

3. The IP Multicast Route Table containing multicast routing information for IP datagrams sent by particular sources to the IP multicast groups known to a system.

4. The IP Multicast Routing Next Hop Table containing information on next-hops for the routing of 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.

5. The IP Multicast Scope Boundary Table containing the boundaries configured for multicast scopes [RFC2365].

6. The IP Multicast Scope Name Table containing human-readable names of multicast scope.

7. The IP Multicast Local Listener Table containing identifiers for local applications that are receiving multicast data.

This MIB module uses textual conventions defined in the IF-MIB [RFC2863], the INET-ADDRESS-MIB [RFC4001] and the IANA-RTPROTO-MIB.

5. Definitions

IPMCAST-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE, mib-2,
  Integer32, Counter32, Counter64, Gauge32,
  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,
IANAipMRouteProtocol FROM IANA-RTPROTO-MIB
InetAddress, InetAddressType,
InetAddressPrefixLength FROM INET-ADDRESS-MIB;

ipMcastMIB MODULE-IDENTITY
LAST-UPDATED "200512160000Z" -- 16 December 2005
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DESCRIPTION
"The MIB module for management of IP Multicast function.
Copyright (C) The Internet Society (2005). This version of
this MIB module is part of RFC yyyy; see the RFC itself for
full legal notices."
-- RFC Ed.: replace yyyy with actual RFC number & remove this note
REVISION "2005121600000Z" -- 16 December 2005
DESCRIPTION "Initial version, published as RFC yyyy."
-- RFC Ed.: replace yyyy with actual RFC number & remove this note
::= { mib-2 XXX }
-- RFC Ed.: replace XXX with IANA-assigned number & remove this note
LanguageTag ::= TEXTUAL-CONVENTION

DISPLAY-HINT "100a"
STATUS current
DESCRIPTION "A 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." 
REFERENCE "RFC 1766"
SYNTAX OCTET STRING (SIZE (1..100))

ipMcastMIBObjects OBJECT IDENTIFIER ::= { ipMcastMIB 1 }
ipMcast OBJECT IDENTIFIER ::= { ipMcastMIBObjects 1 }
ipMcastEnable OBJECT-TYPE
SYNTAX INTEGER { enabled(1), disabled(2) }
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The enabled status of IP Multicast function on this system."
::= { ipMcast 1 }
ipMcastRouteEntryCount OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of rows in the ipMcastRouteTable. This can be used to check for multicast routing activity, and to monitor the multicast routing table size."
::= { ipMcast 7 }
The Multicast Interface Table

ipMcastInterfaceTable OBJECT-TYPE
SYNTAX     SEQUENCE OF IpMcastInterfaceEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
   "The (conceptual) table used to manage the multicast protocol active on an interface."
::= { ipMcast 4 }

ipMcastInterfaceEntry OBJECT-TYPE
SYNTAX     IpMcastInterfaceEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
   "An entry (conceptual row) containing the multicast protocol information for a particular interface. This entry is preserved on agent restart."
INDEX      { ipMcastInterfaceIfIndex }
::= { ipMcastInterfaceTable 1 }

IpMcastInterfaceEntry ::= SEQUENCE {
ipMcastInterfaceIfIndex          InterfaceIndex,
ipMcastInterfaceTtl              Integer32,
ipMcastInterfaceProtocol         IANAipMRouteProtocol,
ipMcastInterfaceRateLimit        Integer32,
ipMcastInterfaceInMcastOctets    Counter32,
ipMcastInterfaceInMcastOctets    Counter32,
ipMcastInterfaceInMcastPkts      Counter32,
ipMcastInterfaceOutMcastOctets   Counter32,
ipMcastInterfaceOutMcastOctets   Counter32,
ipMcastInterfaceOutMcastPkts     Counter32,
ipMcastInterfaceHCInMcastOctets  Counter64,
ipMcastInterfaceHCOutMcastOctets Counter64,
ipMcastInterfaceHCInMcastPkts    Counter64,
ipMcastInterfaceHCOutMcastPkts   Counter64
}

ipMcastInterfaceIfIndex OBJECT-TYPE
SYNTAX     InterfaceIndex
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
   "The ifIndex value of the interface for which this entry contains information."
::= { ipMcastInterfaceEntry 1 }
ipMcastInterfaceTtl 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 (IPv4) or Hop Count (IPv6)
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."
DEFVAL     { 0 }
::= { ipMcastInterfaceEntry 2 }

ipMcastInterfaceProtocol OBJECT-TYPE
SYNTAX     IANAipMRouteProtocol
MAX-ACCESS read-write
STATUS     deprecated
DESCRIPTION
"The multicast protocol running on this interface.
More than one multicast protocol can be used on an
interface, so this object is ambiguous. Use of this
object is deprecated."
::= { ipMcastInterfaceEntry 3 }

ipMcastInterfaceRateLimit 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 }
::= { ipMcastInterfaceEntry 4 }

ipMcastInterfaceInMcastOctets 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."
::= { ipMcastInterfaceEntry 5 }

ipMcastInterfaceOutMcastOctets OBJECT-TYPE
ipMcastInterfaceInMcastPkts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of multicast packets that have arrived on the
interface. In many cases, this object is identical to
ifInMulticastPkts in the Interfaces MIB.
However, some implementations use ifXTable for Layer 2
traffic statistics and ipMcastInterfaceTable at Layer 3. In
this case a difference between these objects probably
indicates that some Layer 3 multicast packets are being
transmitted as unicast at Layer 2."
REFERENCE "RFC 2863 ifInMulticastPkts"
::= { ipMcastInterfaceEntry 7 }

ipMcastInterfaceOutMcastPkts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of multicast packets that have been sent on the
interface. In many cases, this object is identical to
ifOutMulticastPkts in the Interfaces MIB.
However, some implementations use ifXTable for Layer 2
traffic statistics and ipMcastInterfaceTable at Layer 3. In
this case a difference between these objects probably
indicates that some Layer 3 multicast packets are being
transmitted as unicast at Layer 2."
REFERENCE "RFC 2863 ifOutMulticastPkts"
::= { ipMcastInterfaceEntry 8 }

ipMcastInterfaceHCInMcastOctets 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 ipMcastRouteInterfaceInMcastOctets. It is similar to ifHCInOctets in the Interfaces MIB, except that only multicast packets are counted.

::= { ipMcastInterfaceEntry 9 }

ipMcastInterfaceHCOutMcastOctets 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 ipMcastRouteInterfaceOutMcastOctets."
::= { ipMcastInterfaceEntry 10 }

ipMcastInterfaceHCInMcastPkts OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of multicast packets that have arrived on the interface. In many cases, this object is identical to ifHCInMulticastPkts in the Interfaces MIB. However, some implementations use ifXTable for Layer 2 traffic statistics and ipMcastInterfaceTable at Layer 3. In this case a difference between these objects probably indicates that some Layer 3 multicast packets are being transmitted as unicast at Layer 2."
REFERENCE "RFC 2863 ifHCInMulticastPkts"
::= { ipMcastInterfaceEntry 11 }

ipMcastInterfaceHCOutMcastPkts OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of multicast packets that have been sent on the interface. In many cases, this object is identical to ifHCOutMulticastPkts in the Interfaces MIB. However, some implementations use ifXTable for Layer 2 traffic statistics and ipMcastInterfaceTable at Layer 3. In this case a difference between these objects probably indicates that some Layer 3 multicast packets are being transmitted as unicast at Layer 2."
REFERENCE "RFC 2863 ifHCOutMulticastPkts"
::= {ipMcastInterfaceEntry 12 }

--
-- The SSM Range Table
--

ipMcastSsmRangeTable OBJECT-TYPE
SYNTAX SEQUENCE OF IpMcastSsmRangeEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "This table is used to create and manage the range(s) of
group addresses to which SSM semantics should be applied."
REFERENCE "RFC 3569"
::= {ipMcast 8 }

ipMcastSsmRangeEntry OBJECT-TYPE
SYNTAX IpMcastSsmRangeEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry (conceptual row) in the ssmRangeTable. This entry
is preserved on agent restart."
INDEX {ipMcastSsmRangeAddressType,
ipMcastSsmRangeAddress,
ipMcastSsmRangePrefixLength}
::= {ipMcastSsmRangeTable 1 }

IpMcastSsmRangeEntry ::= SEQUENCE {
ipMcastSsmRangeAddressType InetAddressType,
ipMcastSsmRangeAddress InetAddress,
ipMcastSsmRangePrefixLength InetAddressPrefixLength,
ipMcastSsmRangeRowStatus RowStatus
}

ipMcastSsmRangeAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The address type of the multicast group prefix."
::= {ipMcastSsmRangeEntry 1 }

ipMcastSsmRangeAddress OBJECT-TYPE
SYNTAX InetAddress (SIZE (4|8|16|20))
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The multicast group address which, when combined with
ipMcastSsmRangePrefixLength, gives the group prefix for this
SSM range. The InetAddressType is given by the
ipMcastSsmRangeAddressType object.

This address object is only significant up to
ipMcastSsmRangePrefixLength bits. The remainder of the
address bits are zero. This is especially important for
this index field, which is part of the index of this entry.
Any non-zero bits would signify an entirely different
entry.

For IPv6 SSM address ranges, only ranges within the space
FF3x::/32 are permitted (where 'x' is any valid scope).

To configure non-global scope SSM range entries within a
zone, consistent ipMcastBoundaryTable entries are required
on routers at the zone boundary."

REFERENCE "RFC 2373 section 2.7 and RFC 3306 section 6"
::= { ipMcastSsmRangeEntry 2 }

ipMcastSsmRangePrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The multicast group prefix length, which, when combined
with ipMcastSsmRangeAddress, gives the group prefix for this
SSM range. The InetAddressType is given by the
ipMcastSsmRangeAddressType object. If
'ipv4' or 'ipv4z', this object must be in the range 4..32.
If ipMcastSsmRangeAddressType is 'ipv6' or 'ipv6z', this
object must be in the range 8..128."
::= { ipMcastSsmRangeEntry 3 }

ipMcastSsmRangeRowStatus OBJECT-TYPE
SYNTAX     RowStatus
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"The status of this row, by which rows in this table can
be created and destroyed. There are no other writeable
columnar objects in this entry."
::= { ipMcastSsmRangeEntry 4 }

--

-- The IP Multicast Routing Table
--
ipMcastRouteTable OBJECT-TYPE
SYNTAX     SEQUENCE OF IpMcastRouteEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The (conceptual) table containing multicast routing
information for IP datagrams sent by particular sources to
to the IP multicast groups known to this router."
::= { ipMcast 2 }

ipMcastRouteEntry OBJECT-TYPE
SYNTAX     IpMcastRouteEntry
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 ipMcastRouteUpTime."
INDEX      { ipMcastRouteGroupAddressType,
ipMcastRouteGroup,
ipMcastRouteGroupPrefixLength,
ipMcastRouteSourceAddressType,
ipMcastRouteSource,
ipMcastRouteSourcePrefixLength }
::= { ipMcastRouteTable 1 }

IpMcastRouteEntry ::= SEQUENCE {
ipMcastRouteGroupAddressType      InetAddressType,
ipMcastRouteGroup                 InetAddress,
ipMcastRouteGroupPrefixLength     InetAddressPrefixLength,
ipMcastRouteSourceAddressType     InetAddressType,
ipMcastRouteSource                InetAddress,
ipMcastRouteSourcePrefixLength    InetAddressPrefixLength,
ipMcastRouteUpstreamNeighborType  InetAddressType,
ipMcastRouteUpstreamNeighbor      InetAddress,
ipMcastRouteInIfIndex             InterfaceIndexOrZero,
ipMcastRouteUpTime                TimeTicks,
ipMcastRouteExpiryTime            TimeTicks,
ipMcastRoutePkts                  Counter32,
ipMcastRouteDifferentInIfPackets  Counter32,
ipMcastRouteOctets                Counter32,
ipMcastRouteProtocol              IANAipMRouteProtocol,
ipMcastRouteRtProtocol            IANAipRouteProtocol,
ipMcastRouteRtAddressType         InetAddressType,
ipMcastRouteRtAddress             InetAddress,
ipMcastRouteRtPrefixLength        InetAddressPrefixLength,
ipMcastRouteRtType INTEGER,
ipMcastRouteHCOctets Counter64,
ipMcastRouteDifferentInIfOctets Counter32
}

ipMcastRouteGroupAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"A value indicating the address family of the address contained in ipMcastRouteGroup. Legal values correspond to the subset of address families for which multicast forwarding is supported."
::= { ipMcastRouteEntry 1 }

ipMcastRouteGroup OBJECT-TYPE
SYNTAX     InetAddress
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The IP multicast group address which when combined with the corresponding value specified in ipMcastRouteGroupPrefixLength identifies the groups for which this entry contains multicast routing information.

This address object is only significant up to ipMcastRouteGroupPrefixLength bits. The remainder of the address bits are zero. This is especially important for this index field, which is part of the index of this entry. Any non-zero bits would signify an entirely different entry."
::= { ipMcastRouteEntry 2 }

ipMcastRouteGroupPrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The length in bits of the mask which when combined with the corresponding value of ipMcastRouteGroup identifies the groups for which this entry contains multicast routing information."
::= { ipMcastRouteEntry 3 }

ipMcastRouteSourceAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
ipMcastRouteSource OBJECT-TYPE
SYNTAX     InetAddress
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The network address which when combined with the
corresponding value of ipMcastRouteSourcePrefixLength
identifies the sources for which this entry contains
multicast routing information.

This address object is only significant up to
ipMcastRouteGroupPrefixLength bits. The remainder of the
address bits are zero. This is especially important for
this index field, which is part of the index of this entry.
Any non-zero bits would signify an entirely different
entry."
::= { ipMcastRouteEntry 5 }

ipMcastRouteSourcePrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The length in bits of the mask which when combined with the
corresponding value of ipMcastRouteSource identifies the
sources for which this entry contains multicast routing
information."
::= { ipMcastRouteEntry 6 }

ipMcastRouteUpstreamNeighborType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"A value indicating the address family of the address
contained in ipMcastRouteUpstreamNeighbor. The value MUST
be the same as the value of ipMcastRouteGroupType."
::= { ipMcastRouteEntry 7 }

ipMcastRouteUpstreamNeighbor OBJECT-TYPE
SYNTAX     InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The address of the upstream neighbor (for example, RPF neighbor) from which IP datagrams from these sources to this multicast address are received. If the upstream neighbor is unknown, then ipMcastRouteUpstreamNeighbor will be 0.0.0.0 in the case of an IPv4 entry, and 0:0:0:0:0:0:0:0 in the case of an IPv6 entry (for example, in BIDIR-PIM)."
 ::= { ipMcastRouteEntry 8 }

ipMcastRouteInIfIndex 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 (for example, in BIDIR-PIM)."
 ::= { ipMcastRouteEntry 9 }

ipMcastRouteUpTime 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."
 ::= { ipMcastRouteEntry 10 }

ipMcastRouteExpiryTime 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. If ipMcastRouteNextHopState is pruned(1), this object represents the remaining time until the prune expires. If this timer expires, state reverts to forwarding(2). Otherwise, this object represents the time until this entry is removed from the table."
 ::= { ipMcastRouteEntry 11 }

ipMcastRoutePkts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of packets routed using this multicast route entry."
 ::= { ipMcastRouteEntry 12 }

ipMcastRouteDifferentInIfPackets 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 ipMcastRouteInIfIndex. Packets which are not subject to an incoming interface check (for example, using BIDIR-PIM) are not counted.

If this counter increases rapidly, this indicates a problem. A significant quantity of multicast data is arriving at this router on unexpected RPF paths (Reverse Path Forwarding paths; the unicast routes to the expected origin of multicast data flows), and is not being forwarded.

For guidance, if the rate of increase of this counter exceeds 1% of the rate of increase of ipMcastRoutePkts, then there are multicast routing problems that require investigation."
 ::= { ipMcastRouteEntry 13 }

ipMcastRouteOctets 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."
 ::= { ipMcastRouteEntry 14 }

ipMcastRouteProtocol OBJECT-TYPE
SYNTAX IANAipIM ROUTeProtocol
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The multicast routing protocol via which this multicast
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.

::= { ipMcastRouteEntry 16 }

The address family of the address contained in ipMcastRouteRtAddress. The value MUST be the same as the value of ipMcastRouteGroupType.

::= { ipMcastRouteEntry 17 }

The address portion of the route used to find the upstream or parent interface for this multicast forwarding entry. This address object is only significant up to ipMcastRouteGroupPrefixLength bits. The remainder of the address bits are zero.

::= { ipMcastRouteEntry 18 }

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

::= { ipMcastRouteEntry 19 }
ipMcastRouteRtType 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."
::= { ipMcastRouteEntry 20 }

ipMcastRouteHCOctets 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 ipMcastRouteOctets."
::= { ipMcastRouteEntry 21 }

ipMcastRouteDifferentInIfOctets OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of octets contained in IP datagrams 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 ipMcastRouteInIfIndex. Octets in IP datagrams which are not subject to an incoming interface check (for example, using BIDIR-PIM) are not counted.

If this counter increases rapidly, this indicates a problem. A significant quantity of multicast data is arriving at this router on unexpected RPF paths (Reverse Path Forwarding paths; the unicast routes to the expected origin of multicast data flows), and is not being forwarded."
For guidance, if the rate of increase of this counter exceeds 1% of the rate of increase of ipMcastRouteOctets, then there are multicast routing problems that require investigation.

 ::= { ipMcastRouteEntry 22 }

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

ipMcastRouteNextHopTable OBJECT-TYPE
SYNTAX     SEQUENCE OF IpMcastRouteNextHopEntry
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."
 ::= { ipMcast 3 }

ipMcastRouteNextHopEntry OBJECT-TYPE
SYNTAX     IpMcastRouteNextHopEntry
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 an IP multicast group address are routed. Discontinuities in counters in this entry can be detected by observing the value of ipMcastRouteNextHopUpTime."
INDEX      { ipMcastRouteNextHopGroupAddressType,
     ipMcastRouteNextHopGroup,
     ipMcastRouteNextHopSourceAddressType,
     ipMcastRouteNextHopSource,
     ipMcastRouteNextHopSourcePrefixLength,
     ipMcastRouteNextHopIfIndex,
     ipMcastRouteNextHopAddressType,
     ipMcastRouteNextHopAddress }
 ::= { ipMcastRouteNextHopTable 1 }

IpMcastRouteNextHopEntry ::= SEQUENCE {
     ipMcastRouteNextHopGroupAddressType  InetAddressType,
     ipMcastRouteNextHopGroup             InetAddress,
     ipMcastRouteNextHopSourceAddressType InetAddressType,
     ipMcastRouteNextHopSource            InetAddress,
     ipMcastRouteNextHopSourcePrefixLength INTEGER,  
     ipMcastRouteNextHopIfIndex           INTEGER,  
     ipMcastRouteNextHopAddressType       InetAddressType,
     ipMcastRouteNextHopAddress           InetAddress,
     ipMcastRouteNextHopUpTime            INTEGER,  
     ipMcastRouteNextHopReason            OBJECT-TYPE { 1.3.6.1.2.1.71.1.2.1.2 }  
     ..."
ipMcastRouteNextHopSourcePrefixLength InetAddressPrefixLength,
ipMcastRouteNextHopIfIndex InterfaceIndex,
ipMcastRouteNextHopAddressType InetAddressType,
ipMcastRouteNextHopAddress InetAddress,
ipMcastRouteNextHopState INTEGER,
ipMcastRouteNextHopUpTime TimeTicks,
ipMcastRouteNextHopExpiryTime TimeTicks,
ipMcastRouteNextHopClosestMemberHops Integer32,
ipMcastRouteNextHopProtocol IANAipMRouteProtocol,
ipMcastRouteNextHopPkts Counter32,
ipMcastRouteNextHopOctets Counter32

\}

ipMcastRouteNextHopGroupAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A value indicating the address family of the address contained in ipMcastRouteNextHopGroup. Legal values correspond to the subset of address families for which multicast forwarding is supported."
::= { ipMcastRouteNextHopEntry 1 }

ipMcastRouteNextHopGroup OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The IP multicast group for which this entry specifies a next-hop on an outgoing interface."
::= { ipMcastRouteNextHopEntry 2 }

ipMcastRouteNextHopSourceAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A value indicating the address family of the address contained in ipMcastRouteNextHopSource. The value MUST be the same as the value of ipMcastRouteNextHopGroupType."
::= { ipMcastRouteNextHopEntry 3 }

ipMcastRouteNextHopSource OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The network address which when combined with the corresponding value of the mask specified in ipMcastRouteNextHopSourcePrefixLength identifies the sources for which this entry specifies a next-hop on an outgoing interface.

This address object is only significant up to ipMcastRouteNextHopSourcePrefixLength bits. The remainder of the address bits are zero. This is especially important for this index field, which is part of the index of this entry. Any non-zero bits would signify an entirely different entry."

::= { ipMcastRouteNextHopEntry 4 }

ipMcastRouteNextHopSourcePrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The length in bits of the mask which when combined with the corresponding value specified in ipMcastRouteNextHopSource identifies the sources for which this entry specifies a next-hop on an outgoing interface."

::= { ipMcastRouteNextHopEntry 5 }

ipMcastRouteNextHopIfIndex 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."

::= { ipMcastRouteNextHopEntry 6 }

ipMcastRouteNextHopAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A value indicating the address family of the address contained in ipMcastRouteNextHopAddress. The value MUST be the same as the value of ipMcastRouteNextHopGroupType."

::= { ipMcastRouteNextHopEntry 7 }

ipMcastRouteNextHopAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The address of the next-hop specific to this entry. For most interfaces, this is identical to ipMcastRouteNextHopGroup. NBMA interfaces, however, may have multiple next-hop addresses out a single outgoing interface."
::= { ipMcastRouteNextHopEntry 8 }

ipMcastRouteNextHopState 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."
::= { ipMcastRouteNextHopEntry 9 }

ipMcastRouteNextHopUpTime 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."
::= { ipMcastRouteNextHopEntry 10 }

ipMcastRouteNextHopExpiryTime 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 ipMcastRouteNextHopState 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 ipMcastRouteExpiryTime 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."
::= { ipMcastRouteNextHopEntry 11 }

ipMcastRouteNextHopClosestMemberHops 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 (IPv4) or Hop Count (IPv6) less than this number of hops will not be forwarded to this next-hop.

This is an optimization applied by multicast routing protocols that explicitly track hop counts to downstream listeners. Multicast protocols that are not aware of hop counts to downstream listeners set this object to zero."

::= { ipMcastRouteNextHopEntry 12 }

ipMcastRouteNextHopProtocol OBJECT-TYPE
SYNTAX       IANAipMRouteProtocol
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION   "The routing mechanism via which this next-hop was learned."
::= { ipMcastRouteNextHopEntry 13 }

ipMcastRouteNextHopPktS OBJECT-TYPE
SYNTAX       Counter32
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION   "The number of packets which have been forwarded using this route."
::= { ipMcastRouteNextHopEntry 14 }

ipMcastRouteNextHopOctets OBJECT-TYPE
SYNTAX       Counter32
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION   "The number of octets of multicast packets that have been forwarded using this route."
::= { ipMcastRouteNextHopEntry 15 }

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

ipMcastBoundaryTable OBJECT-TYPE
SYNTAX       SEQUENCE OF IpMcastBoundaryEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
"The (conceptual) table listing the system’s scoped multicast address boundaries."
::= { ipMcast 5 }

ipMcastBoundaryEntry OBJECT-TYPE
SYNTAX IpMcastBoundaryEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry (conceptual row) in the ipMcastBoundaryTable representing a scoped boundary. This entry is preserved on agent restart."
INDEX { ipMcastBoundaryIfIndex,
   ipMcastBoundaryAddressType,
   ipMcastBoundaryAddress,
   ipMcastBoundaryAddressPrefixLength }
::= { ipMcastBoundaryTable 1 }

IpMcastBoundaryEntry ::= SEQUENCE {
  ipMcastBoundaryIfIndex              InterfaceIndex,
  ipMcastBoundaryAddressType          InetAddressType,
  ipMcastBoundaryAddress              InetAddress,
  ipMcastBoundaryAddressPrefixLength  InetAddressPrefixLength,
  ipMcastBoundaryStatus               RowStatus
}

ipMcastBoundaryIfIndex 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."
::= { ipMcastBoundaryEntry 1 }

ipMcastBoundaryAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A value indicating the address family of the address contained in ipMcastBoundaryAddress. Legal values correspond to the subset of address families for which multicast forwarding is supported."
::= { ipMcastBoundaryEntry 2 }
Internet-Draft                IP MCAST MIB                 December 2005

ipMcastBoundaryAddress OBJECT-TYPE
SYNTAX     InetAddress
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
 "The group address which when combined with the
corresponding value of ipMcastBoundaryAddressPrefixLength
identifies the group range for which the scoped boundary
exists. Scoped IPv4 addresses must come from the range
239.x.x.x. Scoped IPv6 addresses must come from range
ff.nn.nn.nn.nn.nn.nn.nn, where nn encodes the scope type and
group identifier.

This address object is only significant up to
ipMcastBoundaryAddressPrefixLength bits. The remainder of
the address bits are zero. This is especially important for
this index field, which is part of the index of this entry.
Any non-zero bits would signify an entirely different
entry."
REFERENCE "RFC 2365, RFC 2373"
::= { ipMcastBoundaryEntry 3 }

ipMcastBoundaryAddressPrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
 "The length in bits of the mask which when combined with the
corresponding value of ipMcastBoundaryAddress identifies the
group range for which the scoped boundary exists."
::= { ipMcastBoundaryEntry 4 }

ipMcastBoundaryStatus OBJECT-TYPE
SYNTAX     RowStatus
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
 "The status of this row, by which rows in this table can
be created and destroyed. There are no other other
writeable columnar objects in this entry."
::= { ipMcastBoundaryEntry 5 }

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

ipMcastScopeNameTable OBJECT-TYPE
SYNTAX     SEQUENCE OF IpMcastScopeNameEntry

ipMcastScopeNameEntry OBJECT-TYPE
SYNTAX IpMcastScopeNameEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry (conceptual row) in the ipMcastScopeNameTable representing a multicast scope name. This entry is preserved on agent restart."
INDEX { ipMcastScopeNameAddressType, ipMcastScopeNameAddress, ipMcastScopeNameAddressPrefixLength, IMPLIED ipMcastScopeNameLanguage }
 ::= { ipMcastScopeNameTable 1 }

IpMcastScopeNameEntry ::= SEQUENCE {
ipMcastScopeNameAddressType InetAddressType,
ipMcastScopeNameAddress InetAddress,
ipMcastScopeNameAddressPrefixLength InetAddressPrefixLength,
ipMcastScopeNameLanguage LanguageTag,
ipMcastScopeNameString SnmpAdminString,
ipMcastScopeNameDefault TruthValue,
ipMcastScopeNameStatus RowStatus }

ipMcastScopeNameAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A value indicating the address family of the address contained in ipMcastScopeNameAddress. Legal values correspond to the subset of address families for which multicast forwarding is supported."
 ::= { ipMcastScopeNameEntry 1 }

ipMcastScopeNameAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The group address which when combined with the corresponding value of ipMcastScopeNameAddressPrefixLength
identifies the group range associated with the multicast scope. Scoped IPv4 addresses must come from the range 239.x.x.x. Scoped IPv6 addresses must come from the range ff.nn.nn.nn.nn.nn.nn.nn, where nn encodes the scope type and group identifier.

This address object is only significant up to ipMcastScopeNameAddressPrefixLength bits. The remainder of the address bits are zero. This is especially important for this index field, which is part of the index of this entry. Any non-zero bits would signify an entirely different entry.

REFERENCE "RFC 2365, RFC 2373"
::= { ipMcastScopeNameEntry 2 }

ipMcastScopeNameAddressPrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The length in bits of the mask which when combined with the corresponding value of ipMcastScopeNameAddress identifies the group range associated with the multicast scope."
::= { ipMcastScopeNameEntry 3 }

ipMcastScopeNameLanguage OBJECT-TYPE
SYNTAX LanguageTag
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Language tag associated with the scope name."
REFERENCE "RFC 1766"
::= { ipMcastScopeNameEntry 4 }

ipMcastScopeNameString 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 for IPv4 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. Scoped IPv6 addresses must come from range ff.nn.nn.nn.nn.nn.nn.nn, where nn encodes the scope type and group identifier."
::= { ipMcastScopeNameEntry 5 }

ipMcastScopeNameDefault 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 }
 ::= { ipMcastScopeNameEntry 6 }

ipMcastScopeNameStatus OBJECT-TYPE
SYNTAX     RowStatus
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"The status of this row, by which rows in this table can be created and destroyed. Before the row can be activated, the object ipMcastScopeNameString must be set to a valid value. All writeable objects in this entry can be modified when the status is active(1)."
 ::= { ipMcastScopeNameEntry 7 }

--
-- The Multicast Listeners Table
--

ipMcastLocalListenerTable OBJECT-TYPE
SYNTAX     SEQUENCE OF IpMcastLocalListenerEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The (conceptual) table listing local applications or services that have joined multicast groups as listeners. Entries exist for all addresses in the multicast range for all applications and services as they are classified on this device."
 ::= { ipMcast 9 }

ipMcastLocalListenerEntry OBJECT-TYPE
SYNTAX     IpMcastLocalListenerEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"An entry (conceptual row) in the LocalListenerTable."
INDEX  { ipMcastLocalListenerGroupAddressType,
    ipMcastLocalListenerGroupAddress,
    ipMcastLocalListenerSourceAddressType,
    ipMcastLocalListenerSourceAddress,
    ipMcastLocalListenerSourcePrefixLength,
    ipMcastLocalListenerRunIndex }
::= { ipMcastLocalListenerTable 1 }

IpMcastLocalListenerEntry ::= SEQUENCE {
    ipMcastLocalListenerGroupAddressType    InetAddressType,
    ipMcastLocalListenerGroupAddress        InetAddress,
    ipMcastLocalListenerSourceAddressType   InetAddressType,
    ipMcastLocalListenerSourceAddress       InetAddress,
    ipMcastLocalListenerSourcePrefixLength  InetAddressPrefixLength,
    ipMcastLocalListenerRunIndex            Integer32
}

ipMcastLocalListenerGroupAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
    "A value indicating the address family of the address
    contained in ipMcastLocalListenerGroupAddress. Legal values
    correspond to the subset of address families for which
    multicast is supported."
::= { ipMcastLocalListenerEntry 1 }

ipMcastLocalListenerGroupAddress OBJECT-TYPE
SYNTAX     InetAddress
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
    "The IP multicast group for which this entry specifies
    locally joined applications or services."
::= { ipMcastLocalListenerEntry 2 }

ipMcastLocalListenerSourceAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
    "A value indicating the address family of the address
    contained in ipMcastLocalListenerSource. The value MUST be
    the same as the value of ipMcastLocalListenerAddressType."
::= { ipMcastLocalListenerEntry 3 }

ipMcastLocalListenerSourceAddress OBJECT-TYPE
SYNTAX    InetAddress
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"The network address which when combined with the corresponding value of the mask specified in ipMcastLocalListenerSourcePrefixLength identifies the sources for which this entry specifies a local listener.

This address object is only significant up to ipMcastLocalListenerSourcePrefixLength bits. The remainder of the address bits are zero. This is especially important for this index field, which is part of the index of this entry. Any non-zero bits would signify an entirely different entry."
::= { ipMcastLocalListenerEntry 4 }

ipMcastLocalListenerSourcePrefixLength OBJECT-TYPE
SYNTAX    InetAddressPrefixLength (4..128)
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"The length in bits of the mask which when combined with the corresponding value specified in ipMcastLocalListenerSource identifies the sources for which this entry specifies a locally listener. A mask length of zero corresponds to all sources within the group."
::= { ipMcastLocalListenerEntry 5 }

ipMcastLocalListenerRunIndex OBJECT-TYPE
SYNTAX    Integer32 (1..2147483647)
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"A unique value corresponding to a piece of software running on this router or host system. Where possible, this should be the system’s native, unique identification number.

This identifier is platform-specific. It may correspond to a process ID or application instance number."
REFERENCE "RFC 2287 sysApplRunIndex"
::= { ipMcastLocalListenerEntry 6 }

--
-- Conformance information
--

ipMcastMIBConformance
OBJECT IDENTIFIER ::= { ipMcastMIB 2 }

ipMcastMIBCompliances
OBJECT IDENTIFIER ::= { ipMcastMIBConformance 1 }

ipMcastMIBGroups OBJECT IDENTIFIER ::= { ipMcastMIBConformance 2 }

--
-- Compliance statements
--

ipMcastMIBCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION "The compliance statement for the IP Multicast MIB."
MODULE -- this module
MANDATORY-GROUPS { ipMcastMIBBasicGroup }

GROUP ipMcastMIBRouteGroup
DESCRIPTION "This group is mandatory if the system is a router."

GROUP ipMcastMIBSsmGroup
DESCRIPTION "This group is mandatory if the system is a router that supports Source-Specific Multicast. Write access is not mandatory. IPv6 support is not mandatory."

GROUP ipMcastMIBBoundaryIfGroup
DESCRIPTION "This group is mandatory if the system is a router that supports administratively-scoped multicast address boundaries."

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

GROUP ipMcastMIBScopeNameGroup
DESCRIPTION "This group is mandatory if the system is a router that supports multicast scope names."

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

GROUP ipMcastMIBHCInterfaceGroup
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."

GROUP ipMcastMIBRouteProtoGroup
DESCRIPTION
"This group is mandatory if the system is a router."

::= { ipMcastMIBCompliances 1 }

--
-- Units of conformance
--

ipMcastMIBMRouteBasicGroup OBJECT-GROUP
OBJECTS { ipMcastEnable, ipMcastRouteEntryCount,
ipMcastRouteUpstreamNeighborType,
ipMcastRouteUpstreamNeighbor, ipMcastRouteInIfIndex,
ipMcastRouteUpTime, ipMcastRouteExpiryTime,
ipMcastRouteNextHopState,
ipMcastRouteNextHopUpTime,
ipMcastRouteNextHopExpiryTime,
ipMcastRouteNextHopProtocol,
ipMcastRouteNextHopPkts,
ipMcastInterfaceTtl,
ipMcastInterfaceProtocol,
ipMcastInterfaceRateLimit,
ipMcastInterfaceInMcastOctets,
ipMcastInterfaceOutMcastOctets
}
STATUS deprecated
DESCRIPTION
"A collection of objects to support basic management of IP
Multicast routing.

This conformance group is deprecated. It is replaced by
ipMcastMIBBasicGroup and ipMcastMIBRouteGroup"
::= { ipMcastMIBGroups 1 }

ipMcastMIBHopCountGroup OBJECT-GROUP
OBJECTS { ipMcastRouteNextHopClosestMemberHops }
STATUS current
DESCRIPTION
"A collection of objects to support management of the use of
hop counts in IP Multicast routing."
::= { ipMcastMIBGroups 2 }
ipMcastMIBBoundaryGroup OBJECT-GROUP
   OBJECTS { ipMcastBoundaryStatus, ipMcastScopeNameString,
              ipMcastScopeNameDefault, ipMcastScopeNameStatus }
   STATUS  deprecated
   DESCRIPTION
   "A collection of objects to support management of scoped
    multicast address boundaries.

   This conformance group is deprecated. It is replaced by
   the two conformance groups ipMcastMIBBoundaryIfGroup and
   ipMcastMIBScopeNameGroup."
   ::= { ipMcastMIBGroups 3 }

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

ipMcastMIBHCInterfaceGroup OBJECT-GROUP
   OBJECTS { ipMcastInterfaceHCInMcastOctets,
              ipMcastInterfaceHCOutMcastOctets,
              ipMcastInterfaceHCInMcastPkts,
              ipMcastInterfaceHCOutMcastPkts,
              ipMcastRouteHCOctets }
   STATUS  current
   DESCRIPTION
   "A collection of objects providing information specific to
    high speed (greater than 20,000,000 bits/second) network
    interfaces."
   ::= { ipMcastMIBGroups 5 }

ipMcastMIBRouteProtoGroup OBJECT-GROUP
   OBJECTS { ipMcastRouteProtocol, ipMcastRouteRtProtocol,
              ipMcastRouteRtAddressType, ipMcastRouteRtAddress,
              ipMcastRouteRtPrefixLength, ipMcastRouteRtType }
   STATUS  current
   DESCRIPTION
   "A collection of objects providing information on the
    relationship between multicast routing information, and the
    IP Forwarding Table."
   ::= { ipMcastMIBGroups 6 }

ipMcastMIBPktsGroup OBJECT-GROUP
   OBJECTS { ipMcastRoutePkts, ipMcastRouteDifferentInIfPackets,
              ipMcastRouteOctets }
STATUS current
DESCRIPTION "A collection of objects to support management of packet
   counters for each forwarding entry."
::= { ipMcastMIBGroups 7 }

ipMcastMIBBasicGroup OBJECT-GROUP
   OBJECTS { ipMcastEnable, ipMcastRouteEntryCount
   }
   STATUS current
   DESCRIPTION "A collection of objects to support basic management of IP
   Multicast protocols."
   ::= { ipMcastMIBGroups 8 }

ipMcastMIBRouteGroup OBJECT-GROUP
   OBJECTS { ipMcastRouteUpstreamNeighborType,
      ipMcastRouteUpstreamNeighbor, ipMcastRouteInIfIndex,
      ipMcastRouteUpTime, ipMcastRouteExpireTime,
      ipMcastRouteNextHopState,
      ipMcastRouteNextHopUpTime,
      ipMcastRouteNextHopExpireTime,
      ipMcastRouteNextHopPkts,
      ipMcastInterfaceTtl,
      ipMcastInterfaceRateLimit,
      ipMcastInterfaceInMcastOctets,
      ipMcastInterfaceOutMcastOctets
   }
   STATUS current
   DESCRIPTION "A collection of objects to support basic management of IP
   Multicast routing."
   ::= { ipMcastMIBGroups 9 }

ipMcastMIBSsmGroup OBJECT-GROUP
   OBJECTS { ipMcastSsmRangeRowStatus }
   STATUS current
   DESCRIPTION "A collection of objects to support management of the use of
   Source-Specific Multicast routing."
   ::= { ipMcastMIBGroups 10 }

ipMcastMIBLocalListenerGroup OBJECT-GROUP
   OBJECTS { ipMcastLocalListenerRunIndex }
   STATUS current
   DESCRIPTION "A collection of objects to support management of local
listeners on hosts or routers.

::= { ipMcastMIBGroups 11 }

ipMcastMIBBoundaryIfGroup OBJECT-GROUP
OBJECTS { ipMcastBoundaryStatus }
STATUS current
DESCRIPTION
"A collection of objects to support management of scoped multicast address boundaries."
::= { ipMcastMIBGroups 12 }

ipMcastMIBScopeNameGroup OBJECT-GROUP
OBJECTS { ipMcastScopeNameString, ipMcastScopeNameDefault, ipMcastScopeNameStatus }
STATUS current
DESCRIPTION
"A collection of objects to support management of multicast address scope names."
::= { ipMcastMIBGroups 13 }

ipMcastMIBIfPktsGroup OBJECT-GROUP
OBJECTS { ipMcastInterfaceInMcastPkts, ipMcastInterfaceOutMcastPkts }
STATUS current
DESCRIPTION
"A collection of objects to support management of packet counters for each interface entry."
::= { ipMcastMIBGroups 14 }

ipMcastMIBRouteOctetsGroup OBJECT-GROUP
OBJECTS { ipMcastRouteOctets, ipMcastRouteNextHopOctets, ipMcastRouteDifferentInIfOctets }
STATUS current
DESCRIPTION
"A collection of objects to support management of octet counters for each forwarding entry."
::= { ipMcastMIBGroups 15 }

END

6. 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:

The following tables and objects could be employed to modify
multicast routing behavior in a way that prevents or disrupts
services provided by the network, including (but not limited to)
multicast data traffic delivery.

The following tables and objects may also be used to modify multicast
routing behavior in order to intercept or subvert any information
that is carried by the network. For example, attacks can be
envisaged that would pass nominated multicast data streams through a
nominated location, without the sources or listeners becoming aware
of this subversion.

ipMcastEnable
ipMcastInterfaceTable
ipMcastInterfaceEntry
ipMcastInterfaceIfIndex
ipMcastInterfaceTtl
ipMcastInterfaceProtocol
ipMcastInterfaceRateLimit
ipMcastSsmRangeTable
ipMcastSsmRangeEntry
ipMcastSsmRangeAddressType
ipMcastSsmRangeAddress
ipMcastSsmRangePrefixLength
ipMcastSsmRangeRowStatus
ipMcastBoundaryTable
ipMcastBoundaryEntry
ipMcastBoundaryIfIndex
ipMcastBoundaryAddressType
ipMcastBoundaryAddress
ipMcastBoundaryAddressPrefixLength
ipMcastBoundaryStatus
ipMcastScopeNameTable
ipMcastScopeNameEntry
ipMcastScopeNameAddressType
ipMcastScopeNameAddress
ipMcastScopeNameAddressPrefixLength
ipMcastScopeNameLanguage
ipMcastScopeNameString
ipMcastScopeNameDefault
ipMcastScopeNameStatus

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:

The following tables and objects could be employed to determine the topology, disposition, and composition of the network. This information may be commercially sensitive, and may also be used in preparation for attacks, including any of the attacks described above.

The following tables and objects may also be used to determine whether multicast data is flowing in the network, or has flowed recently. They may also be used to determine the network location of senders and recipients. An attacker can apply ‘traffic analysis’ to this data. In some cases, the information revealed by traffic analyses can be as damaging as full knowledge of the data being transported.

ipMcastRouteEntryCount
ipMcastInterfaceInMcastOctets
ipMcastInterfaceOutMcastOctets
ipMcastInterfaceInMcastPkts
ipMcastInterfaceOutMcastPkts
ipMcastInterfaceHCInMcastOctets
ipMcastInterfaceHCOutMcastOctets
ipMcastInterfaceHCInMcastPkts
ipMcastInterfaceHCOutMcastPkts
ipMcastRouteTable
ipMcastRouteEntry
ipMcastRouteGroupAddressType
ipMcastRouteGroup
ipMcastRouteGroupPrefixLength
ipMcastRouteSourceAddressType
ipMcastRouteSource
ipMcastRouteSourcePrefixLength
ipMcastRouteUpstreamNeighborType
ipMcastRouteUpstreamNeighbor
ipMcastRouteInIfIndex
ipMcastRouteUpTime
ipMcastRouteExpiryTime
ipMcastRoutePkts
ipMcastRouteDifferentInIfPackets
ipMcastRouteOctets
ipMcastRouteProtocol
ipMcastRouteRtProtocol
ipMcastRouteRtAddressType
ipMcastRouteRtAddress
ipMcastRouteRtPrefixLength
ipMcastRouteRtType
ipMcastRouteHCOctets
ipMcastRouteDifferentInIfOctets
ipMcastRouteNextHopTable
ipMcastRouteNextHopEntry
ipMcastRouteNextHopGroupAddressType
ipMcastRouteNextHopGroup
ipMcastRouteNextHopSourceAddressType
ipMcastRouteNextHopSource
ipMcastRouteNextHopSourcePrefixLength
ipMcastRouteNextHopIfIndex
ipMcastRouteNextHopAddressType
ipMcastRouteNextHopAddress
ipMcastRouteNextHopState
ipMcastRouteNextHopUpTime
ipMcastRouteNextHop_expiryTime
ipMcastRouteNextHopClosestMemberHops
ipMcastRouteNextHopProtocol
ipMcastRouteNextHopPkts
ipMcastRouteNextHopOctets
ipMcastLocalListenerTable
ipMcastLocalListenerEntry
ipMcastLocalListenerGroupAddressType
ipMcastLocalListenerGroupAddress
ipMcastLocalListenerSourceAddressType
ipMcastLocalListenerSourceAddress
ipMcastLocalListenerSourcePrefixLength
ipMcastLocalListenerRunIndex

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), there is still no control over whom on the secure network is allowed to access (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 access (read/change/create/delete) them.
7. IANA Considerations

IP-MCAST-MIB should be rooted under the mib-2 subtree. IANA is requested to assign { mib-2 XXX } to the IP-MCAST-MIB module specified in this document.

8. Acknowledgements

This MIB module is based on the original work in [RFC2932] by K. McCloghrie, D. Farinacci and D. Thaler.

Suggested IPv6 multicast MIBs by R. Sivaramu and R. Raghunarayan have been used for comparison while editing this MIB module.

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9. References

9.1 Normative References


9.2 Informative References


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