IP Multicast 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.

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.

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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.

1.1. Terminology

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].

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 includes support for IPv6 addressing and the IPv6 scoped address architecture. [RFC2932] supported only 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. Multicast routing protocols are now per-route, see ipMcastRouteProtocol.

- 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 [RFC2932] 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.

- This MIB module includes a table of multicast scope zones.

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, ([RFC2578], [RFC2579] and [RFC2580]).

4. Overview

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

1. The IP Multicast Interface Table, which contains 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, which contains 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, which contains information about 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, which contains the boundaries configured for multicast scopes [RFC2365].

6. The IP Multicast Scope Name Table, which contains human-readable names for multicast scopes.

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

8. The IP Multicast Zone Table, which contains an entry for each scope zone known to a system, and maps each zone to the multicast address range that is the corresponding scope.

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

The MIB modules defined in this document IMPORTs definitions normatively from the following MIB modules, beyond [RFC2578], [RFC2579], and [RFC2580]: HCNUM-TC [RFC2856], IF-MIB [RFC2863], IANA-RTPROTO-MIB, SNMP-FRAMEWORK-MIB [RFC3411], INET-ADDRESS-MIB [RFC4001], and LANGTAG-TC-MIB [RFC5131].

This MIB module also includes REFERENCE clauses that make normative references to Administratively Scoped IP Multicast [RFC2365], Unicast-Prefix-based IPv6 Multicast Addresses [RFC3306], IPv6 Scoped Address Architecture [RFC4007], and IPv6 Addressing Architecture [RFC4291].

Finally, this MIB module makes informative references to several RFCs in the text of DESCRIPTION clauses, including sysAppMIB [RFC2287], IP-MIB [RFC4293], Source-Specific Multicast [RFC3569], Protocol Independent Multicast-Sparse Mode version 2 (PIM-SMv2) Protocol Specification [RFC4601], Bidirectional Protocol Independent Multicast (BIDIR-PIM) [RFC5015], and Tags for Identifying Languages [RFC4646].

6. Definitions

IPMCAST-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE,
  mib-2, Unsigned32, Counter64,
  Gauge32, TimeTicks FROM SNMPv2-SMI -- [RFC2578]
  RowStatus, TruthValue,
  StorageType, TimeStamp FROM SNMPv2-TC -- [RFC2579]
  MODULE-COMPLIANCE, OBJECT-GROUP FROM SNMPv2-CONF -- [RFC2580]
  CounterBasedGauge64 FROM HCNUM-TC -- [RFC2856]
  InterfaceIndexOrZero,
  InterfaceIndex FROM IF-MIB -- [RFC2863]
  IANAipRouteProtocol,
  IANAipMRouteProtocol FROM IANA-RTPROTO-MIB
  SnmpAdminString FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
  InetAddress, InetAddressType,
  InetAddressPrefixLength,
  InetZoneIndex, InetVersion FROM INET-ADDRESS-MIB -- [RFC4001]
  LangTag FROM LANGTAG-TC-MIB; -- [RFC5131]

ipMcastMIB MODULE-IDENTITY
  LAST-UPDATED "200711090000Z" -- 9 November 2007
  ORGANIZATION "IETF MBONE Deployment (MBONED) Working Group"
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DESCRIPTION  
"The MIB module for management of IP Multicast, including  
multicast routing, data forwarding, and data reception.  

Copyright (C) The IETF Trust (2007). This version of this  
MIB module is part of RFC 5132; see the RFC itself for full  
legal notices."  

REVISION  "200711090000Z" -- 9 November 2007  
DESCRIPTION  "Initial version, published as RFC 5132.  

This MIB module obsoletes IPMROUTE-STD-MIB defined by  
[RFC2932]. Changes include the following:  

- This MIB module includes support for IPv6 addressing  
  and the IPv6 scoped address architecture. [RFC2932]  
  supported only 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. Multicast routing  
  protocols are now per-route, see  
  ipMcastRouteProtocol.
- 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 [RFC2932] 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.

- This MIB module includes a table of multicast scope zones.

::= { mib-2 168 }

--

-- Top-level structure of the MIB
--

ipMcast OBJECT IDENTIFIER ::= { ipMcastMIB 1 }

ipMcastEnabled OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The enabled status of IP Multicast function on this system. The storage type of this object is determined by ipMcastDeviceConfigStorageType."
::= { 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 2 }

ipMcastDeviceConfigStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-write
STATUS current

DESCRIPTION
"The storage type used for the global IP multicast configuration of this device, comprised of the objects listed below. If this storage type takes the value 'permanent', write-access to the listed objects need not be allowed.

The objects described by this storage type are:

ipMcastEnabled.

DEFVAL { nonVolatile }
::= { ipMcast 11 }

--
-- 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 3 }

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.

Per-interface multicast forwarding statistics are also available in ipIfStatsTable."
REFERENCE "RFC 4293 ipIfStatsTable"
INDEX { ipMcastInterfaceIPVersion, ipMcastInterfaceIfIndex }
::= { ipMcastInterfaceTable 1 }

IpMcastInterfaceEntry ::= SEQUENCE {
ipMcastInterfaceIPVersion InetVersion,
ipMcastInterfaceIfIndex InterfaceIndex,
ipMcastInterfaceTtl Unsigned32,
ipMcastInterfaceRateLimit Unsigned32,
ipMcastInterfaceStorageType StorageType}
ipMcastInterfaceIPVersion OBJECT-TYPE
  SYNTAX     InetVersion
  MAX-ACCESS not-accessible
  STATUS     current
  DESCRIPTION  
               "The IP version of this row."
  ::= { ipMcastInterfaceEntry 1 }

ipMcastInterfaceIfIndex OBJECT-TYPE
  SYNTAX     InterfaceIndex
  MAX-ACCESS not-accessible
  STATUS     current
  DESCRIPTION  
               "The index value that uniquely identifies the interface to
               which this entry is applicable.  The interface identified by
               a particular value of this index is the same interface as
               identified by the same value of the IF-MIB’s ifIndex."
  ::= { ipMcastInterfaceEntry 2 }

ipMcastInterfaceTtl OBJECT-TYPE
  SYNTAX     Unsigned32 (0..256)
  MAX-ACCESS read-write
  STATUS     current
  DESCRIPTION  
               "The datagram Time to Live (TTL) threshold for the
               interface.  Any IP multicast datagrams with a TTL (IPv4) or
               Hop Limit (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.  A
               value of 256 means that no multicast packets are forwarded
               out the interface."
  DEFVAL     { 0 }
  ::= { ipMcastInterfaceEntry 3 }

ipMcastInterfaceRateLimit OBJECT-TYPE
  SYNTAX     Unsigned32
  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 }

ipMcastInterfaceStorageType OBJECT-TYPE
  SYNTAX     StorageType
  MAX-ACCESS read-write
STATUS       current
DESCRIPTION   "The storage type for this row. Rows having the value
              'permanent' need not allow write-access to any columnar
              objects in the row."
              DEFVAL { nonVolatile }
 ::= { ipMcastInterfaceEntry 5 }

--
-- 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 4 }

ipMcastSsmRangeEntry OBJECT-TYPE
 SYNTAX        IpMcastSsmRangeEntry
 MAX-ACCESS   not-accessible
 STATUS       current
 DESCRIPTION  "An entry (conceptual row) containing a range of group
              addresses to which SSM semantics should be applied.

              Object Identifiers (OIDs) are limited to 128
              sub-identifiers, but this limit is not enforced by the
              syntax of this entry. In practice, this does not present
              a problem, because IP address types allowed by conformance
              statements do not exceed this limit."
 REFERENCE "RFC 3569"
 INDEX        { ipMcastSsmRangeAddressType,
             ipMcastSsmRangeAddress,
             ipMcastSsmRangePrefixLength }
 ::= { ipMcastSsmRangeTable 1 }

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

   This address object is only significant up to
   ipMcastSsmRangePrefixLength bits. The remaining address
   bits are set to 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 prefixed by
   FF3x::/16 are permitted, where 'x' is a valid IPv6 RFC 4291
   multicast address scope. The syntax of the address range is
   given by RFC 3306, Sections 4 and 7.

   For addresses of type ipv4z or ipv6z, the appended zone
   index is significant even though it lies beyond the prefix
   length. The use of these address types indicate that this
   SSM range entry applies only within the given zone. Zone
   index zero is not valid in this table.

   If non-global scope SSM range entries are present, then
   consistent ipMcastBoundaryTable entries are required on
   routers at the zone boundary."
   REFERENCE "RFC 2365, RFC 4291 Section 2.7, RFC 3306 Sections 4, 6,
   and 7"
   ::= { ipMcastSsmRangeEntry 2 }

ipMcastSsmRangePrefixLength OBJECT-TYPE
   SYNTAX     InetAddressPrefixLength
   MAX-ACCESS not-accessible
   STATUS     current
   DESCRIPTION
      "The length in bits of the mask which, when combined with
   
   McWalter, et al. Standards Track [Page 10]
ipMcastSsmRangeAddress, gives the group prefix for this SSM range.

The InetAddressType is given by ipMcastSsmRangeAddressType. For values ‘ipv4’ and ‘ipv4z’, this object must be in the range 4..32. For values ‘ipv6’ and ‘ipv6z’, this object must be in the range 8..128.”

REFERENCE "RFC 2365, RFC 4291 Section 2.7, RFC 3306 Sections 4, 6, and 7"
 ::= { 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.

This status object can be set to active(1) without setting any other columnar objects in this entry.

All writeable objects in this entry can be modified when the status of this entry is active(1)."
 ::= { ipMcastSsmRangeEntry 4 }

ipMcastSsmRangeStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The storage type for this row. Rows having the value 'permanent' need not allow write-access to any columnar objects in the row."
DEFVAL { nonVolatile }
 ::= { ipMcastSsmRangeEntry 5 }

--
-- 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 the IP multicast groups known to this router.

::= { ipMcast 5 }

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.

OIDs are limited to 128 sub-identifiers, but this limit
is not enforced by the syntax of this entry. In practice,
this does not present a problem, because IP address types
allowed by conformance statements do not exceed this limit."

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,
    ipMcastRouteTimeStamp             TimeStamp,
    ipMcastRouteExpiryTime            TimeTicks,
    ipMcastRouteProtocol              IANAipMRouteProtocol,
    ipMcastRouteRtProtocol            IANAipRouteProtocol,
    ipMcastRouteRtAddressType         InetAddressType,
    ipMcastRouteRtAddress             InetAddress,
    ipMcastRouteRtPrefixLength        InetAddressPrefixLength,
    ipMcastRouteRtType                INTEGER,
    ipMcastRouteOctets                Counter64,
    ipMcastRoutePkts                  Counter64,
    ipMcastRouteTtlDropOctets         Counter64,
    ipMcastRouteTtlDropPackets        Counter64,
    ipMcastRouteDifferentInIfOctets   Counter64,
    ipMcastRouteDifferentInIfPackets  Counter64,
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 remaining address
  bits are set to 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 addresses of type ipv4z or ipv6z, the appended zone
  index is significant even though it lies beyond the prefix
  length. The use of these address types indicate that this
  forwarding state applies only within the given zone. Zone
  index zero is not valid in this table."
::= { ipMcastRouteEntry 2 }

ipMcastRouteGroupPrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength
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.

  The InetAddressType is given by
ipMcastRouteGroupAddressType. For values 'ipv4' and 'ipv4z', this object must be in the range 4..32. For values 'ipv6' and 'ipv6z', this object must be in the range 8..128."
::= { ipMcastRouteEntry 3 }

ipMcastRouteSourceAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
   "A value indicating the address family of the address contained in ipMcastRouteSource. A value of unknown(0) indicates a non-source-specific entry, corresponding to all sources in the group. Otherwise, the value MUST be the same as the value of ipMcastRouteGroupType."
::= { ipMcastRouteEntry 4 }

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 ipMcastRouteSourcePrefixLength bits. The remaining address bits are set to 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 addresses of type ipv4z or ipv6z, the appended zone index is significant even though it lies beyond the prefix length. The use of these address types indicate that this source address applies only within the given zone. Zone index zero is not valid in this table."
::= { ipMcastRouteEntry 5 }

ipMcastRouteSourcePrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
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.

The InetAddressType is given by ipMcastRouteSourceAddressType. For the value 'unknown', this object must be zero. For values 'ipv4' and 'ipv4z', this object must be in the range 4..32. For values 'ipv6' and 'ipv6z', this object must be in the range 8..128."

 ::= { 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. An address type of unknown(0) indicates that the upstream neighbor is unknown, for example in BIDIR-PIM."
REFERENCE "RFC 5015"
 ::= { 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."
 ::= { 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)."
REFERENCE "RFC 5015"
 ::= { ipMcastRouteEntry 9 }
ipMcastRouteTimeStamp OBJECT-TYPE
SYNTAX     TimeStamp
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The value of sysUpTime at which the multicast routing
information represented by this entry was learned by the
router.

If this information was present at the most recent re-
initialization of the local management subsystem, then this
object contains a zero value."
 ::= { ipMcastRouteEntry 10 }

ipMcastRouteExppiryTime 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 }

ipMcastRouteProtocol OBJECT-TYPE
SYNTAX     IANAipMRouteProtocol
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The multicast routing protocol via which this multicast
forwarding entry was learned."
 ::= { ipMcastRouteEntry 12 }

ipMcastRouteRtProtocol 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."
 ::= { ipMcastRouteEntry 13 }

ipMcastRouteRtAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
   "A value indicating the address family of the address
   contained in ipMcastRouteRtAddress."
 ::= { ipMcastRouteEntry 14 }

ipMcastRouteRtAddress OBJECT-TYPE
SYNTAX     InetAddress
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.

   This address object is only significant up to
   ipMcastRouteRtPrefixLength bits. The remaining address bits
   are set to zero.

   For addresses of type ipv4z or ipv6z, the appended zone
   index is significant even though it lies beyond the prefix
   length. The use of these address types indicate that this
   forwarding state applies only within the given zone. Zone
   index zero is not valid in this table."
 ::= { ipMcastRouteEntry 15 }

ipMcastRouteRtPrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
   "The length in bits of the mask associated with the route
   used to find the upstream or parent interface for this
   multicast forwarding entry.

   The InetAddressType is given by ipMcastRouteRtAddressType.
   For values ‘ipv4’ and ‘ipv4z’, this object must be in the
   range 4..32. For values ‘ipv6’ and ‘ipv6z’, this object
   must be in the range 8..128."
 ::= { ipMcastRouteEntry 16 }

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 due (instead or in addition) 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 the Distance Vector Multicast Routing Protocol (DVMRP) or Multiprotocol BGP."

::= { ipMcastRouteEntry 17 }

ipMcastRouteOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS  current
DESCRIPTION
"The number of octets contained in IP datagrams that were received from these sources and addressed to this multicast group address, and which were forwarded by this router.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp."

::= { ipMcastRouteEntry 18 }

ipMcastRoutePkts OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS  current
DESCRIPTION
"The number of packets routed using this multicast route entry.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp."

::= { ipMcastRouteEntry 19 }

ipMcastRouteTtlDropOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS  current
DESCRIPTION

"The number of octets contained in IP datagrams that this router has received from these sources and addressed to this multicast group address, which were dropped because the TTL (IPv4) or Hop Limit (IPv6) was decremented to zero, or to a value less than ipMcastInterfaceTtl for all next hops.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp."

::= {ipMcastRouteEntry 20}

ipMcastRouteTtlDropPackets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The number of packets that this router has received from these sources and addressed to this multicast group address, which were dropped because the TTL (IPv4) or Hop Limit (IPv6) was decremented to zero, or to a value less than ipMcastInterfaceTtl for all next hops.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp."

::= {ipMcastRouteEntry 21}

ipMcastRouteDifferentInIfOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The number of octets contained in IP datagrams that this router has received from these sources and addressed to this multicast group address, which were dropped because they were received on an unexpected interface.

For RPF checking protocols (such as PIM-SM), these packets arrived on interfaces other than ipMcastRouteInIfIndex, and were dropped because of this failed RPF check. (RPF paths are ‘Reverse Path Forwarding’ paths; the unicast routes to the expected origin of multicast data flows)."
Other protocols may drop packets on an incoming interface check for different reasons (for example, BIDIR-PIM performs a DF check on receipt of packets). All packets dropped as a result of an incoming interface check are counted here.

If this counter increases rapidly, this indicates a problem. A significant quantity of multicast data is arriving at this router on unexpected interfaces, 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.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp.

REFERENCE "RFC 4601 and RFC 5015"

::= { ipMcastRouteEntry 22 }

ipMcastRouteDifferentInIfPackets OBJECT-TYPE
SYNTAX Counter64
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 received on an unexpected interface.

For RPF checking protocols (such as PIM-SM), these packets arrived on interfaces other than ipMcastRouteInIfIndex, and were dropped because of this failed RPF check. (RPF paths are ‘Reverse Path Forwarding’ path; the unicast routes to the expected origin of multicast data flows).

Other protocols may drop packets on an incoming interface check for different reasons (for example, BIDIR-PIM performs a DF check on receipt of packets). All packets dropped as a result of an incoming interface check are counted here.

If this counter increases rapidly, this indicates a problem. A significant quantity of multicast data is arriving at this router on unexpected interfaces, 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.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of routes being removed and replaced, which can be detected by observing the value of ipMcastRouteTimeStamp.

REFERENCE "RFC 4601 and RFC 5015"

::= { ipMcastRouteEntry 23 }

ipMcastRouteBps OBJECT-TYPE
SYNTAX CounterBasedGauge64
UNITS "bits per second"
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Bits per second forwarded by this router using this multicast routing entry.

This value is a sample; it is the number of bits forwarded during the last whole 1 second sampling period. The value during the current 1 second sampling period is not made available until the period is completed.

The quantity being sampled is the same as that measured by ipMcastRouteOctets. The units and the sampling method are different."

::= { ipMcastRouteEntry 24 }

-- 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 6 }

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.

OIDs are limited to 128 sub-identifiers, but this limit is not enforced by the syntax of this entry. In practice, this does not present a problem, because IP address types allowed by conformance statements do not exceed this limit."

INDEX
{ ipMcastRouteNextHopGroupAddressType,  
ipMcastRouteNextHopGroup,  
ipMcastRouteNextHopGroupPrefixLength,  
ipMcastRouteNextHopSourceAddressType,  
ipMcastRouteNextHopSource,  
ipMcastRouteNextHopSourcePrefixLength,  
ipMcastRouteNextHopIfIndex,  
ipMcastRouteNextHopAddressType,  
ipMcastRouteNextHopAddress }  
::= { ipMcastRouteNextHopTable 1 }

IpMcastRouteNextHopEntry ::= SEQUENCE {  
ipMcastRouteNextHopGroupAddressType InetAddressType,  
ipMcastRouteNextHopGroup InetAddress,  
ipMcastRouteNextHopGroupPrefixLength InetAddressPrefixLength,  
ipMcastRouteNextHopSourceAddressType InetAddressType,  
ipMcastRouteNextHopSource InetAddress,  
ipMcastRouteNextHopSourcePrefixLength InetAddressPrefixLength,  
ipMcastRouteNextHopIfIndex InterfaceIndex,  
ipMcastRouteNextHopAddressType InetAddressType,  
ipMcastRouteNextHopAddress InetAddress,  
ipMcastRouteNextHopState INTEGER,  
ipMcastRouteNextHopTimeStamp TimeStamp,  
ipMcastRouteNextHopExpiryTime TimeTicks,  
ipMcastRouteNextHopClosestMemberHops Unsigned32,  
ipMcastRouteNextHopProtocol IANAipMRouteProtocol,  
ipMcastRouteNextHopOctets Counter64,  
ipMcastRouteNextHopPkts Counter64  
}

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 address which, when combined with the corresponding value specified in ipMcastRouteNextHopGroupPrefixLength, identifies the groups for which this entry contains multicast forwarding information.

This address object is only significant up to ipMcastRouteNextHopGroupPrefixLength bits. The remaining address bits are set to 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 addresses of type ipv4z or ipv6z, the appended zone index is significant even though it lies beyond the prefix length. The use of these address types indicate that this forwarding state applies only within the given zone. Zone index zero is not valid in this table."

::= { ipMcastRouteNextHopEntry 2 }

ipMcastRouteNextHopGroupPrefixLength OBJECT-TYPE
SYNTAX     InetAddressPrefixLength
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.

The InetAddressType is given by ipMcastRouteNextHopGroupAddressType. For values ‘ipv4’ and ‘ipv4z’, this object must be in the range 4..32. For values ‘ipv6’ and ‘ipv6z’, this object must be in the range 8..128."

::= { ipMcastRouteNextHopEntry 3 }

ipMcastRouteNextHopSourceAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A value indicating the address family of the address contained in ipMcastRouteNextHopSource.
A value of unknown(0) indicates a non-source-specific entry, corresponding to all sources in the group. Otherwise, the value MUST be the same as the value of ipMcastRouteNextHopGroupType."
 ::= { ipMcastRouteNextHopEntry 4 }

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 remaining address bits are set to 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 addresses of type ipv4z or ipv6z, the appended zone index is significant even though it lies beyond the prefix length. The use of these address types indicate that this source address applies only within the given zone. Zone index zero is not valid in this table."
 ::= { ipMcastRouteNextHopEntry 5 }

ipMcastRouteNextHopSourcePrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
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."
The InetAddressType is given by
ipMcastRouteNextHopSourceAddressType. For the value
'unknown', this object must be zero. For values 'ipv4' and
'ipv4z', this object must be in the range 4..32. For values
'ipv6' and 'ipv6z', this object must be in the range
8..128." ::= { ipMcastRouteNextHopEntry 6 }

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 7 }

ipMcastRouteNextHopAddressType OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"A value indicating the address family of the address
contained in ipMcastRouteNextHopAddress."
::= { ipMcastRouteNextHopEntry 8 }

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. Non-Broadcast Multi-Access
(NBMA) interfaces, however, may
have multiple next-hop addresses out a single outgoing
interface."
::= { ipMcastRouteNextHopEntry 9 }

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
::= { ipMcastRouteNextHopEntry 10 }

ipMcastRouteNextHopTimeStamp OBJECT-TYPE
SYNTAX     TimeStamp
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The value of sysUpTime at which the multicast routing
information represented by this entry was learned by the
router.

If this information was present at the most recent re-
initialization of the local management subsystem, then this
object contains a zero value."
::= { ipMcastRouteNextHopEntry 11 }

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 12 }

ipMcastRouteNextHopClosestMemberHops OBJECT-TYPE
SYNTAX     Unsigned32 (0..256)
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 that have a TTL (IPv4) or Hop Count (IPv6) less
than this number of hops will not be forwarded to this
next-hop.

A value of 0 means all multicast datagrams are forwarded out
the interface. A value of 256 means that no multicast
datagrams are forwarded out the interface."
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 0.

::= { ipMcastRouteNextHopEntry 13 }

ipMcastRouteNextHopProtocol OBJECT-TYPE
SYNTAX     IANAipMRouteProtocol
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
  "The routing mechanism via which this next-hop was learned."
::= { ipMcastRouteNextHopEntry 14 }

ipMcastRouteNextHopOctets OBJECT-TYPE
SYNTAX     Counter64
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
  "The number of octets of multicast packets that have been
  forwarded using this route.

  Discontinuities in this monotonically increasing value
  occur at re-initialization of the management system.
  Discontinuities can also occur as a result of routes being
  removed and replaced, which can be detected by observing
  the value of ipMcastRouteNextHopTimeStamp."
::= { ipMcastRouteNextHopEntry 15 }

ipMcastRouteNextHopPkts OBJECT-TYPE
SYNTAX     Counter64
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
  "The number of packets which have been forwarded using this
  route.

  Discontinuities in this monotonically increasing value
  occur at re-initialization of the management system.
  Discontinuities can also occur as a result of routes being
  removed and replaced, which can be detected by observing
  the value of ipMcastRouteNextHopTimeStamp."
::= { ipMcastRouteNextHopEntry 16 }

--
--  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 multicast scope zone boundaries."
REFERENCE "RFC 4007 Section 5"
::= { ipMcast 7 }

ipMcastBoundaryEntry OBJECT-TYPE
SYNTAX IpMcastBoundaryEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry (conceptual row) describing one of this device’s multicast scope zone boundaries."

OIDs are limited to 128 sub-identifiers, but this limit is not enforced by the syntax of this entry. In practice, this does not present a problem, because IP address types allowed by conformance statements do not exceed this limit."
REFERENCE "RFC 2365 Section 5, RFC 4007 Section 5"
INDEX { ipMcastBoundaryIfIndex, ipMcastBoundaryAddressType, ipMcastBoundaryAddress, ipMcastBoundaryAddressPrefixLength } ::= { ipMcastBoundaryTable 1 }

IpMcastBoundaryEntry ::= SEQUENCE {
ipMcastBoundaryIfIndex              InterfaceIndex,
ipMcastBoundaryAddressType          InetAddressType,
ipMcastBoundaryAddress              InetAddress,
ipMcastBoundaryAddressPrefixLength  InetAddressPrefixLength,
ipMcastBoundaryTimeStamp            TimeStamp,
ipMcastBoundaryDroppedMcastOctets   Counter64,
ipMcastBoundaryDroppedMcastPkts     Counter64,
ipMcastBoundaryStatus               RowStatus,
ipMcastBoundaryStorageType          StorageType
}

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 over this interface.

For IPv4, zone boundaries cut through links. Therefore, this is an external interface. This may be either a physical or virtual interface (tunnel, encapsulation, and so forth.)

For IPv6, zone boundaries cut through nodes. Therefore, this is a virtual interface within the node. This is not an external interface, either real or virtual. Packets crossing this interface neither arrive at nor leave the node, but only move between zones within the node.

REFERENCE "RFC 2365 Section 5, RFC 4007 Section 5"
::= { 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 }

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 multicast address ranges must be prefixed by 239.0.0.0/8. Scoped IPv6 multicast address ranges are FF0x::/16, where x is a valid RFC 4291 multicast scope.

An IPv6 address prefixed by FF1x::/16 is a non-permanently-assigned address. An IPv6 address prefixed by FF3x::/16 is a unicast-prefix-based multicast addresses. A zone boundary for FF0x::/16 implies an identical boundary for these other prefixes. No separate FF1x::/16 or FF3x::/16 entries exist in this table.

This address object is only significant up to
ipMcastBoundaryAddressPrefixLength bits. The remaining address bits are set to 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.

::= { ipMcastBoundaryEntry 3 }

ipMcastBoundaryAddressPrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
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.

The InetAddressType is given by ipMcastBoundaryAddressType. For values 'ipv4' and 'ipv4z', this object must be in the range 4..32. For values 'ipv6' and 'ipv6z', this object must be set to 16."

::= { ipMcastBoundaryEntry 4 }

ipMcastBoundaryTimeStamp OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at which the multicast boundary information represented by this entry was learned by the router.

If this information was present at the most recent re-initialization of the local management subsystem, then this object contains a zero value."

::= { ipMcastBoundaryEntry 5 }

ipMcastBoundaryDroppedMcastOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of octets of multicast packets that have been dropped as a result of this zone boundary configuration.

Discontinuities in this monotonically increasing value occur at re-initialization of the management system. Discontinuities can also occur as a result of boundary
configuration being removed and replaced, which can be
detected by observing the value of
ipMcastBoundaryTimeStamp."
 ::= { ipMcastBoundaryEntry 6 }

ipMcastBoundaryDroppedMcastPkts OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of multicast packets that have been dropped as a
result of this zone boundary configuration.
Discontinuities in this monotonically increasing value
occur at re-initialization of the management system.
Discontinuities can also occur as a result of boundary
configuration being removed and replaced, which can be
detected by observing the value of
ipMcastBoundaryTimeStamp."
 ::= { ipMcastBoundaryEntry 7 }

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.
This status object can be set to active(1) without setting
any other columnar objects in this entry.
All writeable objects in this entry can be modified when the
status of this entry is active(1)."
 ::= { ipMcastBoundaryEntry 8 }

ipMcastBoundaryStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The storage type for this row. Rows having the value
'permanent' need not allow write-access to any columnar
objects in the row."
DEFVAL { nonVolatile }
 ::= { ipMcastBoundaryEntry 9 }

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

ipMcastScopeNameTable OBJECT-TYPE
SYNTAX      SEQUENCE OF IpMcastScopeNameEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  
"The (conceptual) table listing multicast scope names."
REFERENCE "RFC 4007 Section 4"
::= { ipMcast 8 }

ipMcastScopeNameEntry OBJECT-TYPE
SYNTAX      IpMcastScopeNameEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  
"An entry (conceptual row) that names a multicast address scope.

OIDs are limited to 128 sub-identifiers, but this limit is not enforced by the syntax of this entry. In practice, this does not present a problem, because IP address types allowed by conformance statements do not exceed this limit."
REFERENCE "RFC 4007 Section 4"
INDEX      { ipMcastScopeNameAddressType,
                          ipMcastScopeNameAddress,
                          ipMcastScopeNameAddressPrefixLength,
                          ipMcastScopeNameLanguage } 
::= { ipMcastScopeNameTable 1 }

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

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 multicast address ranges must be prefixed by 239.0.0.0/8. Scoped IPv6 multicast address ranges are FF0x::/16, where x is a valid RFC 4291 multicast scope.

An IPv6 address prefixed by FF1x::/16 is a non-permanently-assigned address. An IPv6 address prefixed by FF3x::/16 is a unicast-prefix-based multicast addresses. A scope FF0x::/16 implies an identical scope name for these other prefixes. No separate FF1x::/16 or FF3x::/16 entries exist in this table.

This address object is only significant up to ipMcastScopeNameAddressPrefixLength bits. The remaining address bits are set to 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."

::= { ipMcastScopeNameEntry 2 }

ipMcastScopeNameAddressPrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
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.

The InetAddressType is given by ipMcastScopeNameAddressType. For values ‘ipv4’ and ‘ipv4z’, this object must be in the range 4..32. For values ‘ipv6’ and ‘ipv6z’, this object must be set to 16."

::= { ipMcastScopeNameEntry 3 }
ipMcastScopeNameLanguage OBJECT-TYPE  
SYNTAX     LangTag  
MAX-ACCESS not-accessible  
STATUS     current  
DESCRIPTION  
"Language tag associated with the scope name."  
REFERENCE "RFC 4646"  
::= { 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 with decimal values to describe the address and mask length associated with the scope.

When no name is specified, the default value of this object for IPv6 should be the string FF0x::/16, with x replaced by the hexadecimal value for the RFC 4291 multicast scope.

An IPv6 address prefixed by FF1x::/16 is a non-permanently-assigned address. An IPv6 address prefixed by FF3x::/16 is a unicast-prefix-based multicast addresses. A scope FF0x::/16 implies an identical scope name for these other prefixes. No separate FF1x::/16 or FF3x::/16 entries exist in this table."  
REFERENCE "RFC 2365, RFC 3306 Section 4, RFC 4291 Section 2.7"  
::= { 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 }

ipMcastScopeNameStorageType OBJECT-TYPE
SYNTAX       StorageType
MAX-ACCESS  read-create
STATUS       current
DESCRIPTION
 "The storage type for this row. Rows having the value
'permanent' need not allow write-access to any columnar
objects in the row."
DEFVAL { nonVolatile }
 ::= { ipMcastScopeNameEntry 8 }

--
-- 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) identifying a local application
or service that has joined a multicast group as a listener."
OIDs are limited to 128 sub-identifiers, but this limit is not enforced by the syntax of this entry. In practice, this does not present a problem, because IP address types allowed by conformance statements do not exceed this limit.

INDEX { ipMcastLocalListenerGroupAddressType,
ipMcastLocalListenerGroupAddress,
ipMcastLocalListenerSourceAddressType,
ipMcastLocalListenerSourceAddress,
ipMcastLocalListenerSourcePrefixLength,
ipMcastLocalListenerIfIndex,
ipMcastLocalListenerRunIndex }
::= { ipMcastLocalListenerTable 1 }

IpMcastLocalListenerEntry ::= SEQUENCE {
  ipMcastLocalListenerGroupAddressType    InetAddressType,
ipMcastLocalListenerGroupAddress        InetAddress,
ipMcastLocalListenerSourceAddressType   InetAddressType,
ipMcastLocalListenerSourceAddress       InetAddress,
ipMcastLocalListenerSourcePrefixLength  InetAddressPrefixLength,
ipMcastLocalListenerIfIndex             InterfaceIndex,
ipMcastLocalListenerRunIndex            Unsigned32
}

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.

A value of unknown(0) indicates a non-source-specific entry, corresponding to all sources in the group. Otherwise, the value MUST be the same as the value of ipMcastLocalListenerGroupAddressType."

::= { 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 remaining address bits are set to 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 addresses of type ipv4z or ipv6z, the appended zone index is significant even though it lies beyond the prefix length. The use of these address types indicate that this listener address applies only within the given zone. Zone index zero is not valid in this table."

::= { ipMcastLocalListenerEntry 4 }

ipMcastLocalListenerSourcePrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
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 local listener.

The InetAddressType is given by
ipMcastLocalListenerSourceAddressType. For the value 'unknown', this object must be zero. For values 'ipv4' and 'ipv4z', this object must be in the range 4..32. For values 'ipv6' and 'ipv6z', this object must be in the range
8..128.
::= { ipMcastLocalListenerEntry 5 }

ipMcastLocalListenerIfIndex  OBJECT-TYPE
SYNTAX  InterfaceIndex
MAX-ACCESS not-accessible
STATUS   current
DESCRIPTION
   "The IfIndex value of the interface for which this entry
   specifies a local listener."
::= { ipMcastLocalListenerEntry 6 }

ipMcastLocalListenerRunIndex  OBJECT-TYPE
SYNTAX  Unsigned32 (0..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.

   A value of zero indicates that the application instance(s)
   cannot be identified. A value of zero indicates that one or
   more unidentified applications have joined the specified
   multicast groups (for the specified sources) as listeners."
REFERENCE "RFC 2287 sysApplRunIndex"
::= { ipMcastLocalListenerEntry 7 }

--
--  The Multicast Zone Table
--

ipMcastZoneTable  OBJECT-TYPE
SYNTAX  SEQUENCE OF IpMcastZoneEntry
MAX-ACCESS not-accessible
STATUS   current
DESCRIPTION
   "The (conceptual) table listing scope zones on this device."
REFERENCE "RFC 4007 Section 5"
::= { ipMcast 10 }

ipMcastZoneEntry  OBJECT-TYPE
SYNTAX  IpMcastZoneEntry
MAX-ACCESS not-accessible
STATUS   current
DESCRIPTION
"An entry (conceptual row) describing a scope zone on this
device."
REFERENCE "RFC 4007 Section 5"
INDEX { ipMcastZoneIndex }
::= { ipMcastZoneTable 1 }

IpMcastZoneEntry ::= SEQUENCE {
ipMcastZoneIndex                        InetZoneIndex,
ipMcastZoneScopeDefaultZoneIndex        InetZoneIndex,
ipMcastZoneScopeAddressType             InetAddressType,
ipMcastZoneScopeAddress                 InetAddress,
ipMcastZoneScopeAddressPrefixLength     InetAddressPrefixLength
}

ipMcastZoneIndex OBJECT-TYPE
SYNTAX InetZoneIndex (1..4294967295)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This zone index uniquely identifies a zone on a device.

Each zone is for a given scope. Scope-level information in
this table is for the unique scope that corresponds to this
zone.

Zero is a special value used to request the default zone for
a given scope. Zero is not a valid value for this object.

To test whether ipMcastZoneIndex is the default zone for
this scope, test whether ipMcastZoneIndex is equal to
ipMcastZoneScopeDefaultZoneIndex."
::= { ipMcastZoneEntry 1 }

ipMcastZoneScopeDefaultZoneIndex OBJECT-TYPE
SYNTAX InetZoneIndex (1..4294967295)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The default zone index for this scope. This is the zone
that this device will use if the default (zero) zone is
requested for this scope.

Zero is not a valid value for this object."
::= { ipMcastZoneEntry 2 }

ipMcastZoneScopeAddressType OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The IP address type for which this scope zone exists."
::= { ipMcastZoneEntry 3 }

ipMcastZoneScopeAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The multicast group address which, when combined with
ipMcastZoneScopeAddressPrefixLength, gives the multicast
address range for this scope. The InetAddressType is given
by ipMcastZoneScopeAddressType.

Scoped IPv4 multicast address ranges are prefixed by
239.0.0.0/8. Scoped IPv6 multicast address ranges are
FF0x::/16, where x is a valid RFC 4291 multicast scope.

An IPv6 address prefixed by FF1x::/16 is a non-permanently-
assigned address. An IPv6 address prefixed by FF3x::/16 is
a unicast-prefix-based multicast addresses. A scope
FF0x::/16 implies an identical scope for these other
prefixes. No separate FF1x::/16 or FF3x::/16 entries exist
in this table.

This address object is only significant up to
ipMcastZoneScopeAddressPrefixLength bits. The remaining
address bits are set to zero."
REFERENCE "RFC 2365, RFC 3306 Section 4, RFC 4291 Section 2.7"
::= { ipMcastZoneEntry 4 }

ipMcastZoneScopeAddressPrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The length in bits of the mask which, when combined
with ipMcastZoneScopeAddress, gives the multicast address
prefix for this scope.

The InetAddressType is given by ipMcastZoneScopeAddressType.
For values ‘ipv4’ and ‘ipv4z’, this object must be in the
range 4..32. For values ‘ipv6’ and ‘ipv6z’, this object
must be set to 16."
::= { ipMcastZoneEntry 5 }
Conformance information

ipMcastMIBConformance

OBJECT IDENTIFIER ::= { ipMcastMIB 2 }

ipMcastMIBCompliances

OBJECT IDENTIFIER ::= { ipMcastMIBConformance 1 }

ipMcastMIBGroups

OBJECT IDENTIFIER ::= { ipMcastMIBConformance 2 }

Compliance statements

ipMcastMIBComplianceHost

MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for hosts supporting IPMCAST-MIB.

Support for either InetAddressType ipv4 or ipv6 is mandatory; support for both InetAddressTypes ipv4 and ipv6 is optional. Support for types ipv4z and ipv6z is optional.

-- OBJECT     ipMcastLocalListenerGroupAddressType
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                           ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastLocalListenerGroupAddress
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastLocalListenerSourceAddressType
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                            ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastLocalListenerSourceAddress
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6."

MODULE -- this module

MANDATORY-GROUPS { ipMcastMIBLocalListenerGroup,
ipMcastMIBBasicGroup }

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

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

GROUP ipMcastMIBSsmGroup
DESCRIPTION
"This group is optional."

GROUP ipMcastMIBRouteGroup
DESCRIPTION
"This group is optional."

GROUP ipMcastMIBRouteDiagnosticsGroup
DESCRIPTION
"This group is optional."

GROUP ipMcastMIBBoundaryIfGroup
DESCRIPTION
"This group is optional."

GROUP ipMcastMIBScopeNameGroup
DESCRIPTION
"This group is optional."

::= { ipMcastMIBCompliances 1 }

ipMcastMIBComplianceRouter MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The compliance statement for routers supporting
IPMCAST-MIB.

Support for either InetAddressType ipv4 or ipv6 is
mandatory; support for both InetAddressTypes ipv4 and ipv6
is optional. Support for types ipv4z and ipv6z is
optional.

OBJECT ipMcastSsmRangeAddressType
SYNTAX InetAddressType {ipv4(1), ipv6(2), ipv4z(3),
ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT    ipMcastSsmRangeAddress
-- SYNTAX    InetAddress {SIZE (4|8|16|20)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteGroupAddressType
-- SYNTAX    InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                        ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteGroup
-- SYNTAX    InetAddress {SIZE (0|4|8|16|20)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteSourceAddressType
-- SYNTAX    InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                        ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteSource
-- SYNTAX    InetAddress {SIZE (0|4|8|16|20)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteNextHopGroupAddressType
-- SYNTAX    InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                        ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT    ipMcastRouteNextHopGroup
-- SYNTAX    InetAddress {SIZE (0|4|8|16|20)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                             ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT     ipMcastRouteNextHopSource
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT     ipMcastRouteNextHopAddressType
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                             ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.
--
-- OBJECT     ipMcastRouteNextHopAddress
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 or ipv6.

MODULE -- this module
MANDATORY-GROUPS { ipMcastMIBRouteProtoGroup,
                   ipMcastMIBBasicGroup,
                   ipMcastMIBSsmGroup,
                   ipMcastMIBRouteGroup }

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

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

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

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

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

OBJECT  ipMcastRouteUpstreamNeighborType
SYNTAX  InetAddressType { unknown(0), ipv4(1), ipv6(2),
                      ipv4z(3), ipv6z(4) }
DESCRIPTION
   "This compliance requires support for unknown and either ipv4
   or ipv6."

OBJECT  ipMcastRouteUpstreamNeighbor
SYNTAX  InetAddress (SIZE (0|4|8|16|20))
DESCRIPTION
   "This compliance requires support for unknown and either ipv4
   or ipv6."

OBJECT  ipMcastRouteRtAddressType
SYNTAX  InetAddressType { unknown(0), ipv4(1), ipv6(2),
                      ipv4z(3), ipv6z(4) }
DESCRIPTION
   "This compliance requires support for unknown and either ipv4
   or ipv6."

OBJECT  ipMcastRouteRtAddress
SYNTAX  InetAddress (SIZE (0|4|8|16|20))
DESCRIPTION
   "This compliance requires support for unknown and either ipv4
   or ipv6."

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

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

GROUP     ipMcastMIBRouteDiagnosticsGroup
DESCRIPTION
   "This group is not mandatory, but SHOULD be supported where
   hardware permits."
GROUP ipMcastMIBPktsOutGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBHopCountGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBRouteOctetsGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBRouteBpsGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBLocalListenerGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBBoundaryIfGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBScopeNameGroup
DESCRIPTION "This group is optional."

::= { ipMcastMIBCompliances 2 }

ipMcastMIBComplianceBorderRouter MODULE-COMPLIANCE
STATUS current
DESCRIPTION "The compliance statement for routers on scope boundaries supporting IPMCAST-MIB.

Support for either InetAddressType ipv4z or ipv6z is mandatory; support for both InetAddressTypes ipv4z and ipv6z is optional.

-- OBJECT ipMcastSsmRangeAddressType
-- SYNTAX InetAddressType {ipv4(1), ipv6(2), ipv4z(3), ipv6z(4)}
-- DESCRIPTION
-- This compliance requires support for ipv4 or ipv6.
--
-- OBJECT ipMcastSsmRangeAddress
-- SYNTAX InetAddress (SIZE (4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
-- either ipv4 or ipv6.

-- OBJECT     ipMcastRouteSource
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
-- either ipv4 and ipv4z or ipv6 and ipv6z.

-- OBJECT     ipMcastRouteNextHopSource
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
-- ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
-- either ipv4 and ipv4z or ipv6 and ipv6z.
-- OBJECT     ipMcastRouteNextHopSource
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 and ipv4z or ipv6 and ipv6z.
--
-- OBJECT     ipMcastRouteNextHopAddressType
-- SYNTAX     InetAddressType {unknown(0), ipv4(1), ipv6(2),
--                             ipv4z(3), ipv6z(4)}
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 and ipv4z or ipv6 and ipv6z.
--
-- OBJECT     ipMcastRouteNextHopAddress
-- SYNTAX     InetAddress (SIZE (0|4|8|16|20))
-- DESCRIPTION
--     This compliance requires support for unknown and
--     either ipv4 and ipv4z or ipv6 and ipv6z.
--
-- OBJECT     ipMcastBoundaryAddressType
-- SYNTAX     InetAddressType {ipv4(1), ipv6(2)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastBoundaryAddress
-- SYNTAX     InetAddress (SIZE (4|16))
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastScopeNameAddressType
-- SYNTAX     InetAddressType {ipv4(1), ipv6(2)}
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.
--
-- OBJECT     ipMcastScopeNameAddress
-- SYNTAX     InetAddress (SIZE (4|16))
-- DESCRIPTION
--     This compliance requires support for ipv4 or ipv6.

MODULE -- this module
MANDATORY-GROUPS { ipMcastMIBRouteProtoGroup,
                   ipMcastMIBBasicGroup,
                   ipMcastMIBSsmGroup,
                   ipMcastMIBRouteGroup,
                   ipMcastMIBBoundaryIfGroup,
                   ipMcastMIBScopeNameGroup }
OBJECT  ipMcastEnabled
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

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

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

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

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

OBJECT  ipMcastRouteUpstreamNeighborType
SYNTAX  InetAddressType { unknown(0), ipv4(1), ipv6(2),
ipv4z(3), ipv6z(4) }
DESCRIPTION
"This compliance requires support for unknown and either ipv4
and ipv4z, or ipv6 and ipv6z."

OBJECT  ipMcastRouteUpstreamNeighbor
SYNTAX  InetAddress (SIZE (0|4|8|16|20))
DESCRIPTION
"This compliance requires support for unknown and either ipv4
and ipv4z, or ipv6 and ipv6z."

OBJECT  ipMcastRouteRtAddressType
SYNTAX  InetAddressType { unknown(0), ipv4(1), ipv6(2),
ipv4z(3), ipv6z(4) }
DESCRIPTION
"This compliance requires support for unknown and either ipv4
and ipv4z, or ipv6 and ipv6z."

OBJECT  ipMcastRouteRtAddress
SYNTAX  InetAddress (SIZE (0|4|8|16|20))
DESCRIPTION
"This compliance requires support for unknown and either ipv4 and ipv4z, or ipv6 and ipv6z."

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

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

GROUP ipMcastMIBRouteDiagnosticsGroup
DESCRIPTION "This group is not mandatory, but SHOULD be supported where hardware permits."

GROUP ipMcastMIBPktsOutGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBHopCountGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBRouteOctetsGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBRouteBpsGroup
DESCRIPTION "This group is optional."

GROUP ipMcastMIBLocalListenerGroup
DESCRIPTION "This group is optional."

OBJECT ipMcastZoneScopeAddressType
SYNTAX InetAddressType { ipv4(1), ipv6(2) }
DESCRIPTION "This compliance requires support for ipv4 or ipv6."

OBJECT ipMcastZoneScopeAddress
SYNTAX InetAddress (SIZE (4|16))
DESCRIPTION "This compliance requires support for ipv4 or ipv6."
::= { ipMcastMIBCompliances 3 }

-- Units of conformance

ipMcastMIBBasicGroup OBJECT-GROUP
  OBJECTS { ipMcastEnabled,
            ipMcastRouteEntryCount,
            ipMcastDeviceConfigStorageType }
  STATUS  current
  DESCRIPTION "A collection of objects to support basic management of IP
                Multicast protocols."
  ::= { ipMcastMIBGroups 1 }

ipMcastMIBSsmGroup OBJECT-GROUP
  OBJECTS { ipMcastSsmRangeRowStatus,
            ipMcastSsmRangeStorageType }
  STATUS  current
  DESCRIPTION "A collection of objects to support management of Source-
                Specific Multicast routing."
  ::= { ipMcastMIBGroups 2 }

ipMcastMIBRouteGroup OBJECT-GROUP
  OBJECTS { ipMcastInterfaceTtl,
            ipMcastInterfaceRateLimit,
            ipMcastInterfaceStorageType,
            ipMcastRouteUpstreamNeighborType,
            ipMcastRouteUpstreamNeighbor,
            ipMcastRouteInIfIndex,
            ipMcastRouteTimeStamp,
            ipMcastRouteExpiryTime,
            ipMcastRouteNextHopState,
            ipMcastRouteNextHopTimeStamp,
            ipMcastRouteNextHopExpiryTime }
  STATUS  current
  DESCRIPTION "A collection of objects to support basic management of IP
                Multicast routing."
  ::= { ipMcastMIBGroups 3 }

ipMcastMIBRouteDiagnosticsGroup OBJECT-GROUP
  OBJECTS { ipMcastRoutePkts,
            ipMcastRouteTtlDropPackets,
            ipMcastRouteDifferentInIfPackets

McWalter, et al. Standards Track [Page 51]
STATUS current
DESCRIPTION "A collection of routing diagnostic packet counters."
::= { ipMcastMIBGroups 4 }

ipMcastMIBPktOutGroup OBJECT-GROUP
OBJECTS { ipMcastRouteNextHopTimeStmp,     
ipMcastRouteNextHopPkts }
STATUS current
DESCRIPTION "A collection of objects to support management of packet
    counters for each outgoing interface entry of a route."
::= { ipMcastMIBGroups 5 }

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 6 }

ipMcastMIBRouteOctetsGroup OBJECT-GROUP
OBJECTS { ipMcastRouteTimeStmp, ipMcastRouteOctets,     
ipMcastRouteTtlDropOctets, ipMcastRouteDifferentIfOctets,     
ipMcastRouteNextHopTimeStmp, ipMcastRouteNextHopOctets }
STATUS current
DESCRIPTION "A collection of objects to support management of octet
    counters for each forwarding entry."
::= { ipMcastMIBGroups 7 }

ipMcastMIBRouteBpsGroup OBJECT-GROUP
OBJECTS { ipMcastRouteBps }
STATUS current
DESCRIPTION "A collection of objects to support sampling of data rate
    in bits per second for each forwarding entry."
::= { ipMcastMIBGroups 8 }

ipMcastMIBRouteProtoGroup OBJECT-GROUP
OBJECTS { ipMcastRouteProtocol, ipMcastRouteRtProtocol,     
ipMcastRouteRtAddressType, ipMcastRouteRtAddress,     
ipMcastRouteRtPrefixLength, ipMcastRouteRtType,     
...
ipMcastRouteNextHopProtocol }

STATUS current

DESCRIPTION
"A collection of objects providing information on the relationship between multicast routing information and the IP Forwarding Table."

::= { ipMcastMIBGroups 9 }

ipMcastMIBLocalListenerGroup OBJECT-GROUP

OBJECTS { ipMcastLocalListenerRunIndex }

STATUS current

DESCRIPTION
"A collection of objects to support management of local listeners on hosts or routers."

::= { ipMcastMIBGroups 10 }

ipMcastMIBBoundaryIfGroup OBJECT-GROUP

OBJECTS { ipMcastBoundaryTimeStamp,
  ipMcastBoundaryDroppedMcastOctets,
  ipMcastBoundaryDroppedMcastPkts,
  ipMcastBoundaryStatus,
  ipMcastBoundaryStorageType,
  ipMcastZoneScopeDefaultZoneIndex,
  ipMcastZoneScopeAddressType,
  ipMcastZoneScopeAddress,
  ipMcastZoneScopeAddressPrefixLength
}

STATUS current

DESCRIPTION
"A collection of objects to support management of multicast scope zone boundaries."

::= { ipMcastMIBGroups 11 }

ipMcastMIBScopeNameGroup OBJECT-GROUP

OBJECTS { ipMcastScopeNameString, ipMcastScopeNameDefault,
  ipMcastScopeNameStatus, ipMcastScopeNameStorageType }

STATUS current

DESCRIPTION
"A collection of objects to support management of multicast address scope names."

::= { ipMcastMIBGroups 12 }

END
7. Security Considerations

7.1. SNMPv3

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

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

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

7.2. Writeable Objects

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. This section discusses and lists these elements.

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.

In this MIB module, possible effects that can be induced by SET operations on writeable objects include:

- Modifications to multicast routing behavior that prevent or disrupt services provided by the network, including (but not limited to) multicast data traffic delivery.

- Modifications to multicast routing behavior that allow interception or subversion of 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.
The following are the read-write and read-create objects defined in this MIB module.

ipMcastEnabled ipMcastDeviceConfigStorageType ipMcastInterfaceTtl
ipMcastInterfaceRateLimit ipMcastInterfaceStorageType
ipMcastSsmRangeRowStatus ipMcastSsmRangeStorageType
ipMcastBoundaryStatus ipMcastBoundaryStorageType
ipMcastScopeNameString ipMcastScopeNameDefault ipMcastScopeNameStatus
ipMcastScopeNameStorageType

7.3. Readable Objects

As well as the writeable objects discussed above, there are a number of readable objects (i.e., objects with a MAX-ACCESS other than not-accessible) that 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.

In this MIB module, possible effects that can be induced by GET and/or NOTIFY operations include:

- Determination of 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.

- Determination of whether multicast data is flowing in the network, or has flowed recently, as well as the locations 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.

8. IANA Considerations

IPMCAST-MIB is rooted under the mib-2 subtree. IANA has assigned { mib-2 168 } to the IPMCAST-MIB module specified in this document.

9. Acknowledgements

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10. References

10.1. Normative References


10.2. Informative References


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