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IP Multicast MIB
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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

   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.

   o This MIB module is independent of address type, whereas [RFC2932]
      only supported IPv4.

   o 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.

   o 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.

   o This MIB module includes a table of Source-Specific Multicast
      (SSM) address ranges to which SSM semantics [RFC3569] should be
      applied.

   o 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,

[RFC2578], STD 58, [RFC2579] and STD 58, [RFC2580].

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, Unsigned32, Counter32,
    Counter64, Gauge32, TimeTicks   FROM SNMPv2-SMI
    RowStatus, TEXTUAL-CONVENTION,
    TruthValue, StorageType,
    TimeStamp   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 "200603270000Z" -- 27 March 2006
     ORGANIZATION "IETF MBONED Working Group"
     CONTACT-INFO "David McWalter
                   Data Connection Limited
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     DESCRIPTION
             "The MIB module for management of IP Multicast function.

             This MIB module contains information about IP Multicast
             routing, data forwarding, and data reception.  This MIB
             module is independent of the multicast protocol(s) and
             address type(s) that are in use.

             Copyright (C) The Internet Society (2006).  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   "200603270000Z" -- 27 March 2006
     DESCRIPTION
            "Changes from RFC 2932:

             1) This MIB module is independent of address type, whereas
                RFC 2932 only supported IPv4.
             2) This MIB module allows several multicast protocols to
                perform routing on a single interface, whereas RFC 2932
                assumed each interface supported at most one multicast
                routing protocol. This MIB module retains but deprecates
                the object ipMcastInterfaceProtocol.
             3) 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.
             4) This MIB module includes a table of Source-Specific
                Multicast (SSM) address ranges to which RFC 3569 SSM
                semantics should be applied.
             5) This MIB module includes a table of local applications
                that are receiving multicast data.

                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

--
-- Textual conventions
--

LanguageTag ::= TEXTUAL-CONVENTION

    DISPLAY-HINT "99a"
    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..99))

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

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."
    INDEX      { ipMcastInterfaceIfIndex }
```

```
    ::= { ipMcastInterfaceTable 1 }

IpMcastInterfaceEntry ::= SEQUENCE {
    ipMcastInterfaceIfIndex          InterfaceIndex,
    ipMcastInterfaceTtl              Unsigned32,
    ipMcastInterfaceProtocol         IANAipMRouteProtocol,
    ipMcastInterfaceRateLimit        Unsigned32,
    ipMcastInterfaceInMcastOctets    Counter32,
    ipMcastInterfaceOutMcastOctets   Counter32,
    ipMcastInterfaceInMcastPkts      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     Unsigned32 (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      Unsigned32 (0..2147483647)
    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
    SYNTAX      Counter32
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The number of octets of multicast packets that have been
            sent on the interface."
    ::= { ipMcastInterfaceEntry 6 }


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."

     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 (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.

            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
          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."
    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,
    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 (SIZE (0|4|8|16|20))
    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
    STATUS     current
    DESCRIPTION
            "A value indicating the address family of the address
            contained in ipMcastRouteSource.  The value MUST be the same
            as the value of ipMcastRouteGroupType."
    ::= { ipMcastRouteEntry 4 }
```

ipMcastRouteSource OBJECT-TYPE
    SYNTAX   InetAddress (SIZE (0|4|8|16|20))
    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 }

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."
    ::= { 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.

            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 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.

            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 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.

            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 14 }

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 15 }

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. Inclusion of values for routing
            protocols is not intended to imply that those protocols need
            be supported."
    ::= { ipMcastRouteEntry 16 }

ipMcastRouteRtAddressType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "A value indicating the address family of the address
            contained in ipMcastRouteRtAddress. The value MUST be the
            same as the value of ipMcastRouteGroupType."
    ::= { ipMcastRouteEntry 17 }

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
            ipMcastRouteGroupPrefixLength bits. The remainder of the
            address bits are zero."
    ::= { ipMcastRouteEntry 18 }

ipMcastRouteRtPrefixLength OBJECT-TYPE
    SYNTAX   InetAddressPrefixLength (4..128)
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "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.

            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   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.

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

IpMcastRouteNextHopEntry ::= SEQUENCE {
     ipMcastRouteNextHopGroupAddressType     InetAddressType,
     ipMcastRouteNextHopGroup                InetAddress,
     ipMcastRouteNextHopSourceAddressType    InetAddressType,
     ipMcastRouteNextHopSource               InetAddress,
     ipMcastRouteNextHopSourcePrefixLength   InetAddressPrefixLength,
     ipMcastRouteNextHopIfIndex              InterfaceIndex,
     ipMcastRouteNextHopAddressType          InetAddressType,
     ipMcastRouteNextHopAddress              InetAddress,
     ipMcastRouteNextHopState                INTEGER,
     ipMcastRouteNextHopTimeStamp            TimeStamp,
     ipMcastRouteNextHopExpiryTime           TimeTicks,
     ipMcastRouteNextHopClosestMemberHops    Unsigned32,
     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 (SIZE (0|4|8|16|20))
     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 (SIZE (0|4|8|16|20))
     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 (SIZE (0|4|8|16|20))
    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 }

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."
```

        ::= { 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   Unsigned32 (0..2147483647)
    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.

            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 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.

            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 }

--
-- 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."
    INDEX   { ipMcastBoundaryIfIndex,
                  ipMcastBoundaryAddressType,
                  ipMcastBoundaryAddress,

```
                    ipMcastBoundaryAddressPrefixLength }
        ::= { ipMcastBoundaryTable 1 }

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

ipMcastBoundaryAddress OBJECT-TYPE
    SYNTAX     InetAddress (SIZE (0|4|8|16|20))
    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.

                 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 5 }

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 6 }

--
-- 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."
    ::= { ipMcast 6 }

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

IpMcastScopeNameEntry ::= SEQUENCE {
    ipMcastScopeNameAddressType         InetAddressType,
    ipMcastScopeNameAddress             InetAddress,
    ipMcastScopeNameAddressPrefixLength InetAddressPrefixLength,
    ipMcastScopeNameLanguage            LanguageTag,
    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 (SIZE (0|4|8|16|20))
    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 }


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) 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            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 (SIZE (0|4|8|16|20))
     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 (SIZE (0|4|8|16|20))
    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      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 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
            "Implementations of all the mandatory MIB groups listed
            below can claim full compliance.

            This MIB contains several InetAddressType and InetAddress
            objects, but not all IP address types are supported by all
            protocol implementations.

            A MIB implementation can claim full compliance if all IP
            address types supported by the protocol implementation are
            supported by the MIB implementation."

    MODULE -- this module
    MANDATORY-GROUPS { ipMcastMIBBasicGroup}

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

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

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

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

        GROUP    ipMcastMIBHopCountGroup
        DESCRIPTION
           "This group is optional."

        GROUP    ipMcastMIBPktsOutGroup
        DESCRIPTION
           "This group is optional."

        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."

        GROUP    ipMcastMIBPktsGroup
        DESCRIPTION
           "This group is optional."

        GROUP    ipMcastMIBSsmGroup
        DESCRIPTION
           "This group is optional."

        GROUP    ipMcastMIBLocalListenerGroup
        DESCRIPTION
           "This group is optional."

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

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

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

        GROUP    ipMcastMIBIfPktsGroup
        DESCRIPTION
            "This group is optional."

        GROUP    ipMcastMIBRouteOctetsGroup
        DESCRIPTION
            "This group is optional."

    ::= { ipMcastMIBCompliances 1 }

ipMcastMIBMRouteCompliance MODULE-COMPLIANCE
    STATUS  deprecated
    DESCRIPTION
            "Implementations of this compliance statement are equivalent
            to compliance with the deprecated IPMROUTE-MIB module."

    MODULE  -- this module
    MANDATORY-GROUPS { ipMcastMIBMRouteBasicGroup }

    ::= { ipMcastMIBCompliances 2 }
--
```

```
-- Units of conformance
--
ipMcastMIBMRouteBasicGroup OBJECT-GROUP
    OBJECTS { ipMcastEnable, ipMcastRouteEntryCount,
              ipMcastRouteUpstreamNeighborType,
              ipMcastRouteUpstreamNeighbor, ipMcastRouteInIfIndex,
              ipMcastRouteTimeStamp, ipMcastRouteExpiryTime,
              ipMcastRouteNextHopState,
              ipMcastRouteNextHopTimeStamp,
              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 }

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 3 }

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 4 }

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 5 }

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 6 }

ipMcastMIBBasicGroup OBJECT-GROUP
        OBJECTS { ipMcastEnable, ipMcastRouteEntryCount
                }
        STATUS current
        DESCRIPTION
                "A collection of objects to support basic management of IP
                Multicast protocols."
        ::= { ipMcastMIBGroups 7 }

ipMcastMIBRouteGroup OBJECT-GROUP
        OBJECTS { ipMcastRouteUpstreamNeighborType,
                    ipMcastRouteUpstreamNeighbor, ipMcastRouteInIfIndex,
                    ipMcastRouteTimeStamp, ipMcastRouteExpiryTime,
                    ipMcastRouteNextHopState, ipMcastRouteNextHopTimeStamp,
                    ipMcastRouteNextHopExpiryTime,
                    ipMcastRouteNextHopProtocol,
                    ipMcastRouteNextHopPkts,
                    ipMcastInterfaceTtl,
                    ipMcastInterfaceRateLimit,
                    ipMcastInterfaceInMcastOctets,

```
                ipMcastInterfaceOutMcastOctets
            }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support basic management of IP
            Multicast routing."
    ::= { ipMcastMIBGroups 8 }


ipMcastMIBSsmGroup OBJECT-GROUP
    OBJECTS { ipMcastSsmRangeRowStatus, ipMcastSsmRangeStorageType }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support management of the use of
            Source-Specific Multicast routing."
    ::= { 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 { ipMcastBoundaryStatus, ipMcastBoundaryStorageType }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support management of scoped
            multicast address 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 }


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

```
   ::= { ipMcastMIBGroups 13 }

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 14 }

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
        ipMcastSsmRangeStorageType
        ipMcastBoundaryTable
        ipMcastBoundaryEntry
        ipMcastBoundaryIfIndex
        ipMcastBoundaryAddressType
        ipMcastBoundaryAddress
        ipMcastBoundaryAddressPrefixLength
        ipMcastBoundaryStatus
        ipMcastBoundaryStorageType
        ipMcastScopeNameTable
        ipMcastScopeNameEntry
        ipMcastScopeNameAddressType
        ipMcastScopeNameAddress
        ipMcastScopeNameAddressPrefixLength
        ipMcastScopeNameLanguage
        ipMcastScopeNameString
        ipMcastScopeNameDefault
        ipMcastScopeNameStatus
        ipMcastScopeNameStorageType

     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
ipMcastRouteTimeStamp
ipMcastRouteExpiryTime
ipMcastRoutePkts
ipMcastRouteDifferentInIfPackets
ipMcastRouteOctets
ipMcastRouteProtocol
ipMcastRouteRtProtocol
ipMcastRouteRtAddressType
ipMcastRouteRtAddress
ipMcastRouteRtPrefixLength
ipMcastRouteRtType
ipMcastRouteHCOctets
ipMcastRouteDifferentInIfOctets
ipMcastRouteNextHopTable
ipMcastRouteNextHopEntry
ipMcastRouteNextHopGroupAddressType
ipMcastRouteNextHopGroup
ipMcastRouteNextHopSourceAddressType
ipMcastRouteNextHopSource
ipMcastRouteNextHopSourcePrefixLength
ipMcastRouteNextHopIfIndex
ipMcastRouteNextHopAddressType
ipMcastRouteNextHopAddress
ipMcastRouteNextHopState
ipMcastRouteNextHopTimeStamp
ipMcastRouteNextHopExpiryTime
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.
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Suggested IPv6 multicast MIBs by R. Sivaramu and R. Raghunarayan have
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