Network Working Group   B. Joshi
Request for Comments: 5240   Infosys Technologies Ltd.
Category: Standards Track   R. Bijlani
                                                            June 2008

         Protocol Independent Multicast (PIM) Bootstrap Router 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 document defines a portion of the Management Information Base
   (MIB) for use with network management protocols in the Internet
   community. In particular, it describes managed objects used for
   managing the Bootstrap Router (BSR) mechanism for PIM (Protocol
   Independent Multicast).

Table of Contents

1. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in the Internet community.
   In particular, it describes managed objects used for managing the
   Bootstrap Router (BSR) mechanism for PIM [RFC4601], [RFC5059].

   This document was created by moving some of the PIM BSR-specific MIB
   tables from one of the earlier versions of PIM MIB [RFC5060].

2. The Internet-Standard Management Framework

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

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB. MIB objects are generally
   accessed through the Simple Network Management Protocol (SNMP).
   Objects in the MIB are defined using the mechanisms defined in the
   Structure of Management Information (SMI). This memo specifies a MIB
   module that is compliant to the SMIv2, which is described in STD 58,
   RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580
   [RFC2580].

3. Conventions

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

4. Overview

   This MIB module contains four tables. The tables are:

   1. The Candidate-RP Table, which contains one row for each multicast
       group address prefix for which the local router is configured to
       advertise itself as a Candidate-RP (C-RP). This table exists on
       routers that are configured as Candidate-RP.

   2. The Elected BSR RP-Set Table, which contains one row for each
       Group-to-RP mapping that was received in C-RP advertisements.
       This table exists on a router that is an elected BSR (E-BSR).

   3. The Candidate-BSR Table, which contains one row for each
       Candidate-BSR configuration for the local router. This table
       exists on routers that are configured as Candidate-BSR.

   4. The Elected-BSR Table, which contains one row for each elected
       BSR. This table exists on a router that is an elected BSR.

   This MIB module uses textual conventions defined in the INET-ADDRESS-
   MIB [RFC4001].

5. Definitions

   PIM-BSR-MIB DEFINITIONS ::= BEGIN

   IMPORTS
       MODULE-IDENTITY, OBJECT-TYPE,
       NOTIFICATION-TYPE,
       mib-2, Unsigned32, TimeTicks   FROM SNMPv2-SMI
       RowStatus, TruthValue,
       StorageType   FROM SNMPv2-TC
       MODULE-COMPLIANCE, OBJECT-GROUP,
       NOTIFICATION-GROUP   FROM SNMPv2-CONF
       InetAddressType,
       InetAddressPrefixLength,
       InetAddress,
       InetZoneIndex   FROM INET-ADDRESS-MIB;

   pimBsrMIB MODULE-IDENTITY
       LAST-UPDATED "200805280000Z" -- 28 May 2008
       ORGANIZATION
               "IETF Protocol Independent Multicast (PIM) Working Group"
       CONTACT-INFO
               "Email: pim@ietf.org
                WG charter:
                http://www.ietf.org/html.charters/pim-charter.html"
       DESCRIPTION
               "The MIB module for management of the Bootstrap Router
               (BSR) mechanism for PIM routers.

               Copyright (C) The IETF Trust (2008). This version
               of this MIB module is part of RFC 5240; see the RFC
               itself for full legal notices."
       REVISION   "200805280000Z" -- 28 May 2008
       DESCRIPTION "Initial version, published as RFC 5240."
       ::= { mib-2 172 }

   --
   -- Top-level structure
   --

   pimBsrNotifications   OBJECT IDENTIFIER ::= { pimBsrMIB 0 }
   pimBsrObjects   OBJECT IDENTIFIER ::= { pimBsrMIB 1 }

```
   --
   -- Conformance Information
   --

   pimBsrConformance OBJECT IDENTIFIER ::= { pimBsrMIB 2 }
   pimBsrCompliances OBJECT IDENTIFIER ::= { pimBsrConformance 1 }
   pimBsrGroups      OBJECT IDENTIFIER ::= { pimBsrConformance 2 }


   --
   -- The BSR Candidate-RP Table
   --

   pimBsrCandidateRPTable OBJECT-TYPE
       SYNTAX     SEQUENCE OF PimBsrCandidateRPEntry
       MAX-ACCESS not-accessible
       STATUS     current
       DESCRIPTION
               "The (conceptual) table listing the IP multicast group
                prefixes for which the local router is to advertise
                itself as a Candidate-RP."
       ::= { pimBsrObjects 1 }

   pimBsrCandidateRPEntry OBJECT-TYPE
       SYNTAX     PimBsrCandidateRPEntry
       MAX-ACCESS not-accessible
       STATUS     current
       DESCRIPTION
               "An entry (conceptual row) in the
                pimBsrCandidateRPTable."
       INDEX      { pimBsrCandidateRPAddressType,
                    pimBsrCandidateRPAddress,
                    pimBsrCandidateRPGroupAddress,
                    pimBsrCandidateRPGroupPrefixLength }
       ::= { pimBsrCandidateRPTable 1 }

   PimBsrCandidateRPEntry ::= SEQUENCE {
       pimBsrCandidateRPAddressType       InetAddressType,
       pimBsrCandidateRPAddress           InetAddress,
       pimBsrCandidateRPGroupAddress      InetAddress,
       pimBsrCandidateRPGroupPrefixLength InetAddressPrefixLength,
       pimBsrCandidateRPBidir             TruthValue,
       pimBsrCandidateRPAdvTimer          TimeTicks,
       pimBsrCandidateRPPriority          Unsigned32,
       pimBsrCandidateRPAdvInterval       Unsigned32,
       pimBsrCandidateRPHoldtime          Unsigned32,
       pimBsrCandidateRPStatus            RowStatus,
       pimBsrCandidateRPStorageType       StorageType
   }
```

```
pimBsrCandidateRPAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "The Inet address type of the Candidate-RP."
    ::= { pimBsrCandidateRPEntry 1 }

pimBsrCandidateRPAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "The (unicast) address that will be advertised as a
            Candidate-RP.  The InetAddressType is given by the
            pimBsrCandidateRPAddressType object."
    ::= { pimBsrCandidateRPEntry 2 }

pimBsrCandidateRPGroupAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "The IP multicast group address that, when combined with
            the corresponding value of
            pimBsrCandidateRPGroupPrefixLength, identifies a group
            prefix for which the local router will advertise itself
            as a Candidate-RP.  The InetAddressType is given by the
            pimBsrCandidateRPAddressType object.

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

pimBsrCandidateRPGroupPrefixLength OBJECT-TYPE
    SYNTAX      InetAddressPrefixLength (4..128)
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "The multicast group address mask that, when combined
            with the corresponding value of
            pimBsrCandidateRPGroupAddress, identifies a group prefix
            for which the local router will advertise itself as a
            Candidate-RP.  The InetAddressType is given by the
```

```
                 pimBsrCandidateRPAddressType object."
        ::= { pimBsrCandidateRPEntry 4 }

    pimBsrCandidateRPBidir OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
                "If this object is set to TRUE, this group range is
                advertised with this RP as a BIDIR-PIM group range.  If
                it is set to FALSE, it is advertised as a PIM-SM group
                range."
        DEFVAL { false }
        ::= { pimBsrCandidateRPEntry 5 }

    pimBsrCandidateRPAdvTimer OBJECT-TYPE
        SYNTAX     TimeTicks
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
                "The time remaining before the local router next sends
                a Candidate-RP-Advertisement to the elected BSR for
                this zone."
        ::= { pimBsrCandidateRPEntry 6 }

    pimBsrCandidateRPPriority OBJECT-TYPE
        SYNTAX     Unsigned32 (0..255)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
                "The priority for this Candidate-RP advertised in
                 Candidate-RP-Advertisements."
        REFERENCE "RFC 5059, section 3.2"
        DEFVAL { 192 }
        ::= { pimBsrCandidateRPEntry 7 }

    pimBsrCandidateRPAdvInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (1..26214)
        UNITS      "seconds"
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
                "A Candidate-RP generates Candidate-RP-Advertisements
                periodically.  This object represents the time interval
                in seconds between two consecutive advertisements."

        REFERENCE "RFC 5059, sections 3.2 and 5"
        DEFVAL { 60 }
```

        ::= { pimBsrCandidateRPEntry 8 }

    pimBsrCandidateRPHoldtime OBJECT-TYPE
        SYNTAX   Unsigned32 (0..65535)
        UNITS   "seconds"
        MAX-ACCESS read-create
        STATUS   current
        DESCRIPTION
                "Holdtime for this Candidate-RP. The amount of time (in
                seconds) this Candidate-RP entry is valid.

                This object's value can be zero only when this C-RP is
                shutting down."

        REFERENCE "RFC 5059, section 4.2"
        DEFVAL { 150 }

        ::= { pimBsrCandidateRPEntry 9 }

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

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

                All writable objects in this entry can be modified
                when the status of this entry is active(1)."

        ::= { pimBsrCandidateRPEntry 10 }

    pimBsrCandidateRPStorageType 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 }
        ::= { pimBsrCandidateRPEntry 11 }

    --

```
    -- The BSR Elected BSR RP-Set Table
    --

    pimBsrElectedBSRRPSetTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF PimBsrElectedBSRRPSetEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The (conceptual) table listing BSR-specific information
                about PIM group mappings learned via C-RP advertisements
                or created locally using configurations.  This table is
                maintained only on the Elected BSR.

                An Elected BSR uses this table to create Bootstrap
                messages after applying a local policy to include some
                or all of the group mappings in this table."

        ::= { pimBsrObjects 2 }

    pimBsrElectedBSRRPSetEntry OBJECT-TYPE
        SYNTAX      PimBsrElectedBSRRPSetEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "An entry (conceptual row) in the
                 pimBsrElectedBSRRPSetTable."
        INDEX       { pimBsrElectedBSRGrpMappingAddrType,
                      pimBsrElectedBSRGrpMappingGrpAddr,
                      pimBsrElectedBSRGrpMappingGrpPrefixLen,
                      pimBsrElectedBSRGrpMappingRPAddr }
        ::= { pimBsrElectedBSRRPSetTable 1 }

    PimBsrElectedBSRRPSetEntry ::= SEQUENCE {
        pimBsrElectedBSRGrpMappingAddrType    InetAddressType,
        pimBsrElectedBSRGrpMappingGrpAddr     InetAddress,
        pimBsrElectedBSRGrpMappingGrpPrefixLen InetAddressPrefixLength,
        pimBsrElectedBSRGrpMappingRPAddr      InetAddress,
        pimBsrElectedBSRRPSetPriority         Unsigned32,
        pimBsrElectedBSRRPSetHoldtime         Unsigned32,
        pimBsrElectedBSRRPSetExpiryTime       TimeTicks,
        pimBsrElectedBSRRPSetGrpBidir         TruthValue
    }

    pimBsrElectedBSRGrpMappingAddrType OBJECT-TYPE
        SYNTAX      InetAddressType
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
```

                    "The Inet address type of the IP multicast group
                    prefix."
            ::= { pimBsrElectedBSRRPSetEntry 2 }

    pimBsrElectedBSRGrpMappingGrpAddr OBJECT-TYPE
        SYNTAX   InetAddress (SIZE (4|8|16|20))
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                    "The IP multicast group address that, when combined
                    with pimBsrElectedBSRGrpMappingGrpPrefixLen, gives the
                    group prefix for this mapping. The InetAddressType is
                    given by the pimBsrElectedBSRGrpMappingAddrType object.

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

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

    pimBsrElectedBSRGrpMappingRPAddr OBJECT-TYPE
        SYNTAX   InetAddress (SIZE (4|8|16|20))
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                    "The IP address of the RP to be used for groups within
                    this group prefix. The InetAddressType is given by the
                    pimBsrElectedBSRGrpMappingAddrType object."
            ::= { pimBsrElectedBSRRPSetEntry 5 }

    pimBsrElectedBSRRPSetPriority OBJECT-TYPE

```
     SYNTAX      Unsigned32 (0..255)
     MAX-ACCESS read-only
     STATUS      current
     DESCRIPTION
             "The priority for RP.  Numerically higher values for
             this object indicate lower priorities, with the value
             zero denoting the highest priority."
     REFERENCE "RFC 5059, section 4.1"
     ::= { pimBsrElectedBSRRPSetEntry 6 }

 pimBsrElectedBSRRPSetHoldtime OBJECT-TYPE
     SYNTAX      Unsigned32 (0..65535)
     UNITS       "seconds"
     MAX-ACCESS read-only
     STATUS      current
     DESCRIPTION
             "The holdtime for RP"
     REFERENCE "RFC 5059, section 4.1"
     ::= { pimBsrElectedBSRRPSetEntry 7 }

 pimBsrElectedBSRRPSetExpiryTime OBJECT-TYPE
     SYNTAX      TimeTicks
     MAX-ACCESS read-only
     STATUS      current
     DESCRIPTION
             "The minimum time remaining before this entry will be
             aged out.  The value zero indicates that this entry will
             never be aged out."
     ::= { pimBsrElectedBSRRPSetEntry 8 }

 pimBsrElectedBSRRPSetGrpBidir OBJECT-TYPE
     SYNTAX      TruthValue
     MAX-ACCESS read-only
     STATUS      current
     DESCRIPTION
             "If this object is TRUE, this group range with this
             RP is a BIDIR-PIM group range.  If it is set to FALSE,
             it is a PIM-SM group range."
     ::= { pimBsrElectedBSRRPSetEntry 9 }

 --
 -- The BSR Candidate-BSR Table
 --

 pimBsrCandidateBSRTable OBJECT-TYPE
     SYNTAX      SEQUENCE OF PimBsrCandidateBSREntry
     MAX-ACCESS not-accessible
     STATUS      current
```

```
        DESCRIPTION
                "The (conceptual) table containing Candidate-BSR
                configuration for the local router.  The table contains
                one row for each zone for which the local router is
                to advertise itself as a Candidate-BSR."
        ::= { pimBsrObjects 3 }

    pimBsrCandidateBSREntry OBJECT-TYPE
        SYNTAX      PimBsrCandidateBSREntry
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
                "An entry (conceptual row) in the
                pimBsrCandidateBSRTable."
        INDEX       { pimBsrCandidateBSRZoneIndex }
        ::= { pimBsrCandidateBSRTable 1 }

    PimBsrCandidateBSREntry ::= SEQUENCE {
        pimBsrCandidateBSRZoneIndex        InetZoneIndex,
        pimBsrCandidateBSRAddressType      InetAddressType,
        pimBsrCandidateBSRAddress          InetAddress,
        pimBsrCandidateBSRPriority         Unsigned32,
        pimBsrCandidateBSRHashMaskLength   Unsigned32,
        pimBsrCandidateBSRElectedBSR       TruthValue,
        pimBsrCandidateBSRBootstrapTimer   TimeTicks,
        pimBsrCandidateBSRStatus           RowStatus,
        pimBsrCandidateBSRStorageType      StorageType
    }

    pimBsrCandidateBSRZoneIndex OBJECT-TYPE
        SYNTAX      InetZoneIndex (1..4294967295)
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
                "The zone index uniquely identifies the zone on a
                device to which this Candidate-BSR is attached.  There is
                one entry for each zone in ipMcastZoneTable.  Scope-level
                information for this zone can be extracted from
                ipMcastZoneTable in IP Multicast MIB [RFC5132].

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

        ::= { pimBsrCandidateBSREntry 1 }

    pimBsrCandidateBSRAddressType OBJECT-TYPE
        SYNTAX      InetAddressType
```

```
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The address type of the Candidate-BSR."
    ::= { pimBsrCandidateBSREntry 2 }

pimBsrCandidateBSRAddress OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The (unicast) address that the local router will
            use to advertise itself as a Candidate-BSR.  The
            InetAddressType is given by the
            pimBsrCandidateBSRAddressType object."
    ::= { pimBsrCandidateBSREntry 3 }

pimBsrCandidateBSRPriority OBJECT-TYPE
    SYNTAX      Unsigned32 (0..255)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The priority value for the local router as a
            Candidate-BSR for this zone.  Numerically higher
            values for this object indicate higher priorities."
    DEFVAL { 0 }
    ::= { pimBsrCandidateBSREntry 4 }

pimBsrCandidateBSRHashMaskLength OBJECT-TYPE
    SYNTAX      Unsigned32 (0..128)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The hash mask length (used in the RP hash function)
            that the local router will advertise in its Bootstrap
            messages for this zone.  This object defaults
            to 30 if pimBsrCandidateBSRAddressType is 'ipv4' or
            'ipv4z' , and defaults to 126 if
            pimBsrCandidateBSRAddressType is 'ipv6' or 'ipv6z'."
    ::= { pimBsrCandidateBSREntry 5 }

pimBsrCandidateBSRElectedBSR OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "Whether the local router is the elected BSR for this
            zone."
```

```
       ::= { pimBsrCandidateBSREntry 6 }

   pimBsrCandidateBSRBootstrapTimer OBJECT-TYPE
       SYNTAX     TimeTicks
       MAX-ACCESS read-only
       STATUS     current
       DESCRIPTION
               "The time remaining before the local router next
               originates a Bootstrap message for this zone.
               Value of this object is zero if
               pimBsrCandidateBSRElectedBSR is 'FALSE'."
       ::= { pimBsrCandidateBSREntry 7 }

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

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

               All writable objects in this entry can be modified
               when the status of this entry is active(1)."
       ::= { pimBsrCandidateBSREntry 8 }

   pimBsrCandidateBSRStorageType 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 }
      ::= { pimBsrCandidateBSREntry 9 }

   --
   -- The BSR Elected-BSR Table
   --

   pimBsrElectedBSRTable OBJECT-TYPE
       SYNTAX     SEQUENCE OF PimBsrElectedBSREntry
       MAX-ACCESS not-accessible
       STATUS     current
       DESCRIPTION
```

```
            "The (conceptual) table containing information about
             elected BSRs.  The table contains one row for each
             zone for which there is an elected BSR."
        ::= { pimBsrObjects 4 }

    pimBsrElectedBSREntry OBJECT-TYPE
        SYNTAX      PimBsrElectedBSREntry
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
                "An entry (conceptual row) in the
                 pimBsrElectedBSRTable."
        INDEX      { pimBsrElectedBSRZoneIndex }
        ::= { pimBsrElectedBSRTable 1 }

    PimBsrElectedBSREntry ::= SEQUENCE {
        pimBsrElectedBSRZoneIndex       InetZoneIndex,
        pimBsrElectedBSRAddressType     InetAddressType,
        pimBsrElectedBSRAddress         InetAddress,
        pimBsrElectedBSRPriority        Unsigned32,
        pimBsrElectedBSRHashMaskLength  Unsigned32,
        pimBsrElectedBSRExpiryTime      TimeTicks
    }

    pimBsrElectedBSRZoneIndex OBJECT-TYPE
        SYNTAX      InetZoneIndex (1..4294967295)
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
                "The zone index uniquely identifies the zone on a
                device to which this Elected BSR is attached.  There
                is one entry for each zone in ipMcastZoneTable.
                Scope-level information for this zone can be extracted
                from ipMcastZoneTable in IP Multicast MIB [RFC5132].

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

        ::= { pimBsrElectedBSREntry 1 }

    pimBsrElectedBSRAddressType OBJECT-TYPE
        SYNTAX      InetAddressType
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The address type of the elected BSR."
        ::= { pimBsrElectedBSREntry 2 }
```

```
    pimBsrElectedBSRAddress OBJECT-TYPE
        SYNTAX      InetAddress (SIZE (4|8|16|20))
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The (unicast) address of the elected BSR.  The
                InetAddressType is given by the
                pimBsrElectedBSRAddressType object."
        ::= { pimBsrElectedBSREntry 3 }

    pimBsrElectedBSRPriority OBJECT-TYPE
        SYNTAX      Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The priority value for the elected BSR for this address
                type.  Numerically higher values for this object indicate
                higher priorities."
        ::= { pimBsrElectedBSREntry 4 }

    pimBsrElectedBSRHashMaskLength OBJECT-TYPE
        SYNTAX      Unsigned32 (0..128)
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The hash mask length (used in the RP hash function)
                advertised by the elected BSR for this zone."
        ::= { pimBsrElectedBSREntry 5 }

    pimBsrElectedBSRExpiryTime OBJECT-TYPE
        SYNTAX      TimeTicks
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "The minimum time remaining before the elected BSR for
                this zone will be declared down."
        ::= { pimBsrElectedBSREntry 6 }

    --
    -- PIM BSR Notifications
    --

    pimBsrElectedBSRLostElection   NOTIFICATION-TYPE
        OBJECTS { pimBsrElectedBSRAddressType,
                  pimBsrElectedBSRAddress,
                  pimBsrElectedBSRPriority }
        STATUS      current
        DESCRIPTION
```

```
            "A pimBsrElectedBSRLostElection notification should be
            generated when current E-BSR lost election to a new
            Candidate-BSR.  Only an E-BSR should generate this
            notification.

            This notification is generated when
            pimBsrCandidateBSRElectedBSR becomes FALSE."

    REFERENCE "RFC 5059, section 3.1"
    ::= { pimBsrNotifications 1 }

pimBsrCandidateBSRWinElection   NOTIFICATION-TYPE
    OBJECTS { pimBsrCandidateBSRElectedBSR }
    STATUS      current
    DESCRIPTION
            "A pimBsrCandidateBSRWinElection notification should be
            generated when a C-BSR wins BSR Election.  Only an
            E-BSR should generate this notification.

            This notification is generated when
            pimBsrCandidateBSRElectedBSR becomes TRUE."

    REFERENCE "RFC 5059, section 3.1"
    ::= { pimBsrNotifications 2 }

--
-- Compliance Statements
--

pimBsrCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for PIM routers that implement
            the Bootstrap Router (BSR) mechanism."
    MODULE  -- this module
    MANDATORY-GROUPS { pimBsrObjectGroup }

      GROUP    pimBsrDiagnosticsGroup
      DESCRIPTION
          "This group is optional."

    ::= { pimBsrCompliances 1 }

--
-- Units of Conformance
--

pimBsrObjectGroup OBJECT-GROUP
```

```
        OBJECTS { pimBsrCandidateRPBidir,
                  pimBsrCandidateRPAdvTimer,
                  pimBsrCandidateRPPriority,
                  pimBsrCandidateRPAdvInterval,
                  pimBsrCandidateRPHoldtime,
                  pimBsrCandidateRPStatus,
                  pimBsrCandidateRPStorageType,
                  pimBsrElectedBSRRPSetPriority,
                  pimBsrElectedBSRRPSetHoldtime,
                  pimBsrElectedBSRRPSetExpiryTime,
                  pimBsrElectedBSRRPSetGrpBidir,
                  pimBsrCandidateBSRAddress,
                  pimBsrCandidateBSRAddressType,
                  pimBsrCandidateBSRPriority,
                  pimBsrCandidateBSRHashMaskLength,
                  pimBsrCandidateBSRElectedBSR,
                  pimBsrCandidateBSRBootstrapTimer,
                  pimBsrCandidateBSRStatus,
                  pimBsrCandidateBSRStorageType,
                  pimBsrElectedBSRAddress,
                  pimBsrElectedBSRAddressType,
                  pimBsrElectedBSRPriority,
                  pimBsrElectedBSRHashMaskLength,
                  pimBsrElectedBSRExpiryTime }
     STATUS  current
     DESCRIPTION
             "A collection of objects for managing the Bootstrap
             Router (BSR) mechanism for PIM routers."
     ::= { pimBsrGroups 1 }

   pimBsrDiagnosticsGroup NOTIFICATION-GROUP
       NOTIFICATIONS  { pimBsrElectedBSRLostElection,
                        pimBsrCandidateBSRWinElection }
       STATUS  current
       DESCRIPTION
               "Objects providing additional diagnostics related to
               the Bootstrap Router (BSR) mechanism for PIM routers."
       ::= { pimBsrGroups 2 }

     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:

o A new Candidate-BSR with high priority or modification of priority
   (bsrCandidateBSRPriority) of an existing Candidate-BSR can take
   over the functionality of an Elected BSR, which can prevent and
   disrupt the services.

o A new Candidate-RP with lower priority or modification of priority
   (bsrCandidateRPPriority) of an existing Candidate-RP can force
   other routers to select itself for a particular group prefix.
   This can prevent and disrupt the services provided through this
   group prefix.

The following are the read-write and read-create objects defined in
this MIB module:

bsrCandidateRPBidir
bsrCandidateRPPriority
bsrCandidateRPAdvInterval
bsrCandidateRPHoldtime
bsrCandidateBSRAddressType
bsrCandidateBSRAddress
bsrCandidateBSRPriority
bsrCandidateBSRHashMaskLength

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:

pimBsrCandidateRPAdvTimer
pimBsrElectedBSRRPSetPriority
pimBsrElectedBSRRPSetHoldtime
pimBsrElectedBSRRPSetExpiryTime
pimBsrElectedBSRRPSetGrpBidir
pimBsrCandidateBSRElectedBSR
pimBsrCandidateBSRBootstrapTimer
pimBsrElectedBSRAddressType
pimBsrElectedBSRAddress
pimBsrElectedBSRPriority
pimBsrElectedBSRHashMaskLength
pimBsrElectedBSRExpiryTime

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

o Determination of Elected BSR, Candidate-BSRs, and Candidate-RPs in
   the Multicast Network topology. This information may be sensitive
   and may be used in preparation for Denial-of-Service (DoS) attacks
   including any of the attacks described above.

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

The MIB module in this document uses the following IANA-assigned
OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor   OBJECT IDENTIFIER value
----------   ----------------------
pimBsrMIB   { mib-2 172 }

8. Acknowledgments

This MIB module is based on the original work in [RFC5060] by R.
Sivaramu, J. Lingard, and B. Joshi.

Many thanks to Bill Fenner, Stig Venaas, Nidhi Bhaskar, David
Mcwalter, David Harrington, and J. W. Atwood for their feedback on
this MIB module.

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

9. References

9.1. Normative References

   [RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
               Requirement Levels", BCP 14, RFC 2119, March 1997.

   [RFC2578]   McCloghrie, K., Ed., Perkins, D., Ed., and J.
               Schoenwaelder, Ed., "Structure of Management Information
               Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

   [RFC2579]   McCloghrie, K., Ed., Perkins, D., Ed., and J.
               Schoenwaelder, Ed., "Textual Conventions for SMIv2",
               STD 58, RFC 2579, April 1999.

   [RFC2580]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
               "Conformance Statements for SMIv2", STD 58, RFC 2580,
               April 1999.

   [RFC4001]   Daniele, M., Haberman, B., Routhier, S., and J.
               Schoenwaelder, "Textual Conventions for Internet Network
               Addresses", RFC 4001, February 2005.

   [RFC4601]   Fenner, B., Handley, M., Holbrook, H., and I. Kouvelas,
               "Protocol Independent Multicast - Sparse Mode (PIM-SM):
               Protocol Specification (Revised)", RFC 4601, August 2006.

   [RFC5060]   Sivaramu, R., Lingard, J., McWalter, D., Joshi, B., and A.
               Kessler, "Protocol Independent Multicast MIB", RFC 5060,
               January 2008.

   [RFC5059]   Bhaskar, N., Gall, A., Lingard, J., and S. Venaas,
               "Bootstrap Router (BSR) Mechanism for Protocol Independent
               Multicast (PIM)", RFC 5059, January 2008.

   [RFC5132]   McWalter, D., Thaler, D., and A. Kessler, "IP Multicast
               MIB", RFC 5132, December 2007.

9.2. Informative References

   [RFC3410]   Case, J., Mundy, R., Partain, D., and B. Stewart,
               "Introduction and Applicability Statements for Internet-
               Standard Management Framework", RFC 3410, December 2002.

Authors' Addresses

    Bharat Joshi
    Infosys Technologies Ltd.
    44 Electronics City, Hosur Road
    Bangalore 560 100
    India

    EMail: bharat_joshi@infosys.com
    URI: http://www.infosys.com/

    Raina Bijlani

    EMail: rainab@gmail.com

Full Copyright Statement

Intellectual Property