

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	2
2. The Internet-Standard Management Framework	2
3. Conventions	2
4. Overview	2
5. Definitions	3
6. Security Considerations	17
7. IANA Considerations	19
8. Acknowledgments	19
9. References	20
9.1. Normative References	20
9.2. Informative References	20

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
}

```

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

pimBsrCandidateRPAAddress 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
        pimBsrCandidateRPAAddressType 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
        pimBsrCandidateRPAAddressType 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

Copyright (C) The IETF Trust (2008).

This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

