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K. McCloghrie
cisco Systems
D. Farinacci
Procket Networks
D. Thaler
Microsoft
B. Fenner
AT&T Labs

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Protocol Independent Multicast MIB for IPv4

Status of this Memo

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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 managed objects used for managing the Protocol Independent Multicast (PIM) protocol for IPv4.

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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 Protocol Independent Multicast (PIM) protocol [16,17,18,19]. This MIB module is applicable to IPv4 multicast routers which implement PIM. This MIB does not support management of PIM for other address families, including IPv6. Such management may be supported by other MIBs.

2. The SNMP Network Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2271 [1].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], STD 58, RFC 2579 [6] and STD 58, RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Overview

This MIB module contains one scalar and eight tables. Some of the objects in these tables are deprecated. This MIB contains deprecated objects since they are necessary for managing PIMv1 routers, but PIMv1 itself is obsoleted by PIMv2 [18,19].

The tables contained in this MIB are:

(1) The PIM Interface Table contains one row for each of the router's PIM interfaces.

(2) The PIM Neighbor Table contains one row for each of the router's PIM neighbors.

(3) The PIM IP Multicast Route Table contains one row for each multicast routing entry whose incoming interface is running PIM.

(4) The PIM Next Hop Table which contains one row for each outgoing interface list entry in the multicast routing table whose interface is running PIM, and whose state is pruned.

(5) The (deprecated) PIM RP Table contains the PIM (version 1) information for IP multicast groups which is common to all RPs of a group.

(6) The PIM RP-Set Table contains the PIM (version 2) information for sets of candidate Rendezvous Points (RPs) for IP multicast group addresses with particular address prefixes.

(7) The PIM Candidate-RP Table contains the IP multicast groups for which the local router is to advertise itself as a Candidate-RP. If this table is empty, then the local router advertises itself as a Candidate-RP for all groups.

(8) The PIM Component Table contains one row for each of the PIM domains to which the router is connected.

4. Definitions

```
PIM-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, experimental,
    NOTIFICATION-TYPE,
    Integer32, IpAddress, TimeTicks  FROM SNMPv2-SMI
    RowStatus, TruthValue            FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP               FROM SNMPv2-CONF
    ipMRouteGroup, ipMRouteSource,
    ipMRouteSourceMask, ipMRouteNextHopGroup,
    ipMRouteNextHopSource, ipMRouteNextHopSourceMask,
    ipMRouteNextHopIfIndex,
    ipMRouteNextHopAddress           FROM IPMROUTE-STD-MIB
    InterfaceIndex                   FROM IF-MIB;

pimMIB MODULE-IDENTITY
    LAST-UPDATED "200009280000Z" -- September 28, 2000
    ORGANIZATION "IETF IDMR Working Group."
    CONTACT-INFO
            " Dave Thaler
              Microsoft Corporation
              One Microsoft Way
              Redmond, WA  98052-6399
              US

              Phone: +1 425 703 8835
              EMail: dthaler@microsoft.com"
    DESCRIPTION
            "The MIB module for management of PIM routers."
    REVISION     "200009280000Z" -- September 28, 2000
    DESCRIPTION
            "Initial version, published as RFC 2934."
    ::= { experimental 61 }

pimMIBObjects OBJECT IDENTIFIER ::= { pimMIB 1 }

pimTraps      OBJECT IDENTIFIER ::= { pimMIBObjects 0 }

pim           OBJECT IDENTIFIER ::= { pimMIBObjects 1 }

pimJoinPruneInterval OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "seconds"
    MAX-ACCESS read-write
    STATUS     current
```

```
    DESCRIPTION
            "The default interval at which periodic PIM-SM Join/Prune
            messages are to be sent."
    ::= { pim 1 }

-- The PIM Interface Table

pimInterfaceTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimInterfaceEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing the router's PIM interfaces.
            IGMP and PIM are enabled on all interfaces listed in this
            table."
    ::= { pim 2 }

pimInterfaceEntry OBJECT-TYPE
    SYNTAX     PimInterfaceEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimInterfaceTable."
    INDEX      { pimInterfaceIfIndex }
    ::= { pimInterfaceTable 1 }

PimInterfaceEntry ::= SEQUENCE {
    pimInterfaceIfIndex            InterfaceIndex,
    pimInterfaceAddress            IpAddress,
    pimInterfaceNetMask            IpAddress,
    pimInterfaceMode               INTEGER,
    pimInterfaceDR                 IpAddress,
    pimInterfaceHelloInterval      Integer32,
    pimInterfaceStatus             RowStatus,
    pimInterfaceJoinPruneInterval  Integer32,
    pimInterfaceCBSRPreference     Integer32
}

pimInterfaceIfIndex OBJECT-TYPE
    SYNTAX     InterfaceIndex
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The ifIndex value of this PIM interface."
    ::= { pimInterfaceEntry 1 }

pimInterfaceAddress OBJECT-TYPE
    SYNTAX     IpAddress
```

```
    MAX-ACCESS read-only
    STATUS     current

    DESCRIPTION
            "The IP address of the PIM interface."
    ::= { pimInterfaceEntry 2 }

pimInterfaceNetMask OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The network mask for the IP address of the PIM interface."
    ::= { pimInterfaceEntry 3 }

pimInterfaceMode OBJECT-TYPE
    SYNTAX     INTEGER { dense(1), sparse(2), sparseDense(3) }
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The configured mode of this PIM interface.  A value of
            sparseDense is only valid for PIMv1."
    DEFVAL     { dense }
    ::= { pimInterfaceEntry 4 }

pimInterfaceDR OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The Designated Router on this PIM interface.  For point-to-
            point interfaces, this object has the value 0.0.0.0."
    ::= { pimInterfaceEntry 5 }

pimInterfaceHelloInterval OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The frequency at which PIM Hello messages are transmitted
            on this interface."
    DEFVAL     { 30 }
    ::= { pimInterfaceEntry 6 }

pimInterfaceStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
```

```
    STATUS     current
    DESCRIPTION
            "The status of this entry.  Creating the entry enables PIM
            on the interface; destroying the entry disables PIM on the
            interface."
    ::= { pimInterfaceEntry 7 }

pimInterfaceJoinPruneInterval OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The frequency at which PIM Join/Prune messages are
            transmitted on this PIM interface.  The default value of
            this object is the pimJoinPruneInterval."
    ::= { pimInterfaceEntry 8 }

pimInterfaceCBSRPreference OBJECT-TYPE
    SYNTAX     Integer32 (-1..255)
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The preference value for the local interface as a candidate
            bootstrap router.  The value of -1 is used to indicate that
            the local interface is not a candidate BSR interface."
    DEFVAL     { 0 }
    ::= { pimInterfaceEntry 9 }


-- The PIM Neighbor Table

pimNeighborTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimNeighborEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing the router's PIM neighbors."
    ::= { pim 3 }

pimNeighborEntry OBJECT-TYPE
    SYNTAX     PimNeighborEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimNeighborTable."
    INDEX      { pimNeighborAddress }
    ::= { pimNeighborTable 1 }
```

```
PimNeighborEntry ::= SEQUENCE {
    pimNeighborAddress      IpAddress,
    pimNeighborIfIndex      InterfaceIndex,
    pimNeighborUpTime       TimeTicks,
    pimNeighborExpiryTime   TimeTicks,
    pimNeighborMode         INTEGER
}

pimNeighborAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The IP address of the PIM neighbor for which this entry
            contains information."
    ::= { pimNeighborEntry 1 }

pimNeighborIfIndex OBJECT-TYPE
    SYNTAX     InterfaceIndex
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The value of ifIndex for the interface used to reach this
            PIM neighbor."
    ::= { pimNeighborEntry 2 }

pimNeighborUpTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time since this PIM neighbor (last) became a neighbor
            of the local router."
    ::= { pimNeighborEntry 3 }

pimNeighborExpiryTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The minimum time remaining before this PIM neighbor will be
            aged out."
    ::= { pimNeighborEntry 4 }

pimNeighborMode OBJECT-TYPE
    SYNTAX     INTEGER { dense(1), sparse(2) }
    MAX-ACCESS read-only
    STATUS     deprecated
```

```
    DESCRIPTION
            "The active PIM mode of this neighbor.  This object is
            deprecated for PIMv2 routers since all neighbors on the
            interface must be either dense or sparse as determined by
            the protocol running on the interface."
    ::= { pimNeighborEntry 5 }

--
-- The PIM IP Multicast Route Table
--

pimIpMRouteTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimIpMRouteEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing PIM-specific information on
            a subset of the rows of the ipMRouteTable defined in the IP
            Multicast MIB."
    ::= { pim 4 }

pimIpMRouteEntry OBJECT-TYPE
    SYNTAX     PimIpMRouteEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimIpMRouteTable.  There
            is one entry per entry in the ipMRouteTable whose incoming
            interface is running PIM."
    INDEX      { ipMRouteGroup, ipMRouteSource, ipMRouteSourceMask }
    ::= { pimIpMRouteTable 1 }

PimIpMRouteEntry ::= SEQUENCE {
    pimIpMRouteUpstreamAssertTimer   TimeTicks,
    pimIpMRouteAssertMetric          Integer32,
    pimIpMRouteAssertMetricPref      Integer32,
    pimIpMRouteAssertRPTBit          TruthValue,
    pimIpMRouteFlags                 BITS
}

pimIpMRouteUpstreamAssertTimer OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time remaining before the router changes its upstream
            neighbor back to its RPF neighbor.  This timer is called the
            Assert timer in the PIM Sparse and Dense mode specification.
```

```
            A value of 0 indicates that no Assert has changed the
            upstream neighbor away from the RPF neighbor."
    ::= { pimIpMRouteEntry 1 }

pimIpMRouteAssertMetric OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The metric advertised by the assert winner on the upstream
            interface, or 0 if no such assert is in received."
    ::= { pimIpMRouteEntry 2 }

pimIpMRouteAssertMetricPref OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The preference advertised by the assert winner on the
            upstream interface, or 0 if no such assert is in effect."
    ::= { pimIpMRouteEntry 3 }

pimIpMRouteAssertRPTBit OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The value of the RPT-bit advertised by the assert winner on
            the upstream interface, or false if no such assert is in
            effect."
    ::= { pimIpMRouteEntry 4 }

pimIpMRouteFlags OBJECT-TYPE
    SYNTAX     BITS {
                  rpt(0),
                  spt(1)
               }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "This object describes PIM-specific flags related to a
            multicast state entry.  See the PIM Sparse Mode
            specification for the meaning of the RPT and SPT bits."
    ::= { pimIpMRouteEntry 5 }

--
-- The PIM Next Hop Table
--
```

```
pimIpMRouteNextHopTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimIpMRouteNextHopEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing PIM-specific information on
            a subset of the rows of the ipMRouteNextHopTable defined in
            the IP Multicast MIB."
    ::= { pim 7 }

pimIpMRouteNextHopEntry OBJECT-TYPE
    SYNTAX     PimIpMRouteNextHopEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimIpMRouteNextHopTable.
            There is one entry per entry in the ipMRouteNextHopTable
            whose interface is running PIM and whose
            ipMRouteNextHopState is pruned(1)."
    INDEX      { ipMRouteNextHopGroup, ipMRouteNextHopSource,
                 ipMRouteNextHopSourceMask, ipMRouteNextHopIfIndex,
                 ipMRouteNextHopAddress }
    ::= { pimIpMRouteNextHopTable 1 }

PimIpMRouteNextHopEntry ::= SEQUENCE {
    pimIpMRouteNextHopPruneReason       INTEGER
}

pimIpMRouteNextHopPruneReason OBJECT-TYPE
    SYNTAX     INTEGER {
                  other (1),
                  prune (2),
                  assert (3)
               }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "This object indicates why the downstream interface was
            pruned, whether in response to a PIM prune message or due to
            PIM Assert processing."
    ::= { pimIpMRouteNextHopEntry 2 }

-- The PIM RP Table

pimRPTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimRPEntry
    MAX-ACCESS not-accessible
    STATUS     deprecated
```

```
    DESCRIPTION
            "The (conceptual) table listing PIM version 1 information
            for the Rendezvous Points (RPs) for IP multicast groups.
            This table is deprecated since its function is replaced by
            the pimRPSetTable for PIM version 2."
    ::= { pim 5 }

pimRPEntry OBJECT-TYPE
    SYNTAX     PimRPEntry
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
            "An entry (conceptual row) in the pimRPTable.  There is one
            entry per RP address for each IP multicast group."
    INDEX      { pimRPGroupAddress, pimRPAddress }
    ::= { pimRPTable 1 }

PimRPEntry ::= SEQUENCE {
    pimRPGroupAddress    IpAddress,
    pimRPAddress         IpAddress,
    pimRPState           INTEGER,
    pimRPStateTimer      TimeTicks,
    pimRPLastChange      TimeTicks,
    pimRPRowStatus       RowStatus
}

pimRPGroupAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
            "The IP multicast group address for which this entry
            contains information about an RP."
    ::= { pimRPEntry 1 }

pimRPAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
            "The unicast address of the RP."
    ::= { pimRPEntry 2 }

pimRPState OBJECT-TYPE
    SYNTAX     INTEGER { up(1), down(2) }
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
```

```
            "The state of the RP."
    ::= { pimRPEntry 3 }

pimRPStateTimer OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
            "The minimum time remaining before the next state change.
            When pimRPState is up, this is the minimum time which must
            expire until it can be declared down.  When pimRPState is
            down, this is the time until it will be declared up (in
            order to retry)."
    ::= { pimRPEntry 4 }

pimRPLastChange OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
            "The value of sysUpTime at the time when the corresponding
            instance of pimRPState last changed its value."
    ::= { pimRPEntry 5 }

pimRPRowStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     deprecated
    DESCRIPTION
            "The status of this row, by which new entries may be
            created, or old entries deleted from this table."
    ::= { pimRPEntry 6 }

-- The PIM RP-Set Table

pimRPSetTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimRPSetEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing PIM information for
            candidate Rendezvous Points (RPs) for IP multicast groups.
            When the local router is the BSR, this information is
            obtained from received Candidate-RP-Advertisements.  When
            the local router is not the BSR, this information is
            obtained from received RP-Set messages."
    ::= { pim 6 }
```

```
pimRPSetEntry OBJECT-TYPE
    SYNTAX     PimRPSetEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimRPSetTable."
    INDEX      { pimRPSetComponent, pimRPSetGroupAddress,
                 pimRPSetGroupMask, pimRPSetAddress }
    ::= { pimRPSetTable 1 }

PimRPSetEntry ::= SEQUENCE {

    pimRPSetGroupAddress    IpAddress,
    pimRPSetGroupMask       IpAddress,
    pimRPSetAddress         IpAddress,
    pimRPSetHoldTime        Integer32,
    pimRPSetExpiryTime      TimeTicks,
    pimRPSetComponent       Integer32
}

pimRPSetGroupAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The IP multicast group address which, when combined with
            pimRPSetGroupMask, gives the group prefix for which this
            entry contains information about the Candidate-RP."
    ::= { pimRPSetEntry 1 }

pimRPSetGroupMask OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The multicast group address mask which, when combined with
            pimRPSetGroupAddress, gives the group prefix for which this
            entry contains information about the Candidate-RP."
    ::= { pimRPSetEntry 2 }

pimRPSetAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The IP address of the Candidate-RP."
    ::= { pimRPSetEntry 3 }
```

```
pimRPSetHoldTime OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    UNITS      "seconds"
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The holdtime of a Candidate-RP.  If the local router is not
            the BSR, this value is 0."
    ::= { pimRPSetEntry 4 }

pimRPSetExpiryTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The minimum time remaining before the Candidate-RP will be
            declared down.  If the local router is not the BSR, this
            value is 0."
    ::= { pimRPSetEntry 5 }

pimRPSetComponent OBJECT-TYPE
    SYNTAX     Integer32 (1..255)
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            " A number uniquely identifying the component.  Each
            protocol instance connected to a separate domain should have
            a different index value."
    ::= { pimRPSetEntry 6 }

--
-- Note: { pim 8 } through { pim 10 } were used in older versions
-- of this MIB.  Since some earlier versions of this MIB have been
-- widely-deployed, these values must not be used in the future,
-- as long the MIB is rooted under { experimental 61 }.
--

-- The PIM Candidate-RP Table

pimCandidateRPTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimCandidateRPEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing the IP multicast groups for
            which the local router is to advertise itself as a
            Candidate-RP when the value of pimComponentCRPHoldTime is
            non-zero.  If this table is empty, then the local router
```

```
            will advertise itself as a Candidate-RP for all groups
            (providing the value of pimComponentCRPHoldTime is non-
            zero)."
    ::= { pim 11 }

pimCandidateRPEntry OBJECT-TYPE
    SYNTAX     PimCandidateRPEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimCandidateRPTable."
    INDEX      { pimCandidateRPGroupAddress,
                 pimCandidateRPGroupMask }
    ::= { pimCandidateRPTable 1 }

PimCandidateRPEntry ::= SEQUENCE {
    pimCandidateRPGroupAddress    IpAddress,
    pimCandidateRPGroupMask       IpAddress,
    pimCandidateRPAddress         IpAddress,
    pimCandidateRPRowStatus       RowStatus
}

pimCandidateRPGroupAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The IP multicast group address which, when combined with
            pimCandidateRPGroupMask, identifies a group prefix for which
            the local router will advertise itself as a Candidate-RP."
    ::= { pimCandidateRPEntry 1 }

pimCandidateRPGroupMask OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The multicast group address mask which, when combined with
            pimCandidateRPGroupMask, identifies a group prefix for which
            the local router will advertise itself as a Candidate-RP."
    ::= { pimCandidateRPEntry 2 }

pimCandidateRPAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The (unicast) address of the interface which will be
```

```
            advertised as a Candidate-RP."
    ::= { pimCandidateRPEntry 3 }

pimCandidateRPRowStatus 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."
    ::= { pimCandidateRPEntry 4 }

-- The PIM Component Table

pimComponentTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF PimComponentEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table containing objects specific to a PIM
            domain.  One row exists for each domain to which the router
            is connected.  A PIM-SM domain is defined as an area of the
            network over which Bootstrap messages are forwarded.
            Typically, a PIM-SM router will be a member of exactly one
            domain.  This table also supports, however, routers which
            may form a border between two PIM-SM domains and do not
            forward Bootstrap messages between them."
    ::= { pim 12 }

pimComponentEntry OBJECT-TYPE
    SYNTAX     PimComponentEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the pimComponentTable."
    INDEX      { pimComponentIndex }
    ::= { pimComponentTable 1 }

PimComponentEntry ::= SEQUENCE {
    pimComponentIndex              Integer32,
    pimComponentBSRAddress         IpAddress,
    pimComponentBSRExpiryTime      TimeTicks,
    pimComponentCRPHoldTime        Integer32,
    pimComponentStatus             RowStatus
}

pimComponentIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..255)
```

```
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "A number uniquely identifying the component.  Each protocol
            instance connected to a separate domain should have a
            different index value.  Routers that only support membership
            in a single PIM-SM domain should use a pimComponentIndex
            value of 1."
    ::= { pimComponentEntry 1 }

pimComponentBSRAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The IP address of the bootstrap router (BSR) for the local
            PIM region."
    ::= { pimComponentEntry 2 }

pimComponentBSRExpiryTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The minimum time remaining before the bootstrap router in
            the local domain will be declared down.  For candidate BSRs,
            this is the time until the component sends an RP-Set
            message.  For other routers, this is the time until it may
            accept an RP-Set message from a lower candidate BSR."
    ::= { pimComponentEntry 3 }

pimComponentCRPHoldTime OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The holdtime of the component when it is a candidate RP in
            the local domain.  The value of 0 is used to indicate that
            the local system is not a Candidate-RP."
    DEFVAL     { 0 }
    ::= { pimComponentEntry 4 }

pimComponentStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
```

```
            "The status of this entry.  Creating the entry creates
            another protocol instance; destroying the entry disables a
            protocol instance."
    ::= { pimComponentEntry 5 }

-- PIM Traps

pimNeighborLoss NOTIFICATION-TYPE
    OBJECTS {
       pimNeighborIfIndex
    }
    STATUS             current
    DESCRIPTION
            "A pimNeighborLoss trap signifies the loss of an adjacency
            with a neighbor.  This trap should be generated when the
            neighbor timer expires, and the router has no other
            neighbors on the same interface with a lower IP address than
            itself."
    ::= { pimTraps 1 }

-- conformance information

pimMIBConformance OBJECT IDENTIFIER ::= { pimMIB 2 }
pimMIBCompliances OBJECT IDENTIFIER ::= { pimMIBConformance 1 }
pimMIBGroups      OBJECT IDENTIFIER ::= { pimMIBConformance 2 }


-- compliance statements

pimV1MIBCompliance MODULE-COMPLIANCE
    STATUS  deprecated
    DESCRIPTION
            "The compliance statement for routers running PIMv1 and
            implementing the PIM MIB."
    MODULE  -- this module
        MANDATORY-GROUPS { pimV1MIBGroup }

    ::= { pimMIBCompliances 1 }

pimSparseV2MIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for routers running PIM Sparse
            Mode and implementing the PIM MIB."
    MODULE  -- this module
    MANDATORY-GROUPS { pimV2MIBGroup }

    GROUP      pimV2CandidateRPMIBGroup
```

```
    DESCRIPTION
            "This group is mandatory if the router is capable of being a
            Candidate RP."

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

    ::= { pimMIBCompliances 2 }

pimDenseV2MIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for routers running PIM Dense Mode
            and implementing the PIM MIB."
    MODULE  -- this module

        MANDATORY-GROUPS { pimDenseV2MIBGroup }

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

    ::= { pimMIBCompliances 3 }

-- units of conformance

pimNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { pimNeighborLoss }
    STATUS  current
    DESCRIPTION
            "A collection of notifications for signaling important PIM
            events."
    ::= { pimMIBGroups 1 }

pimV2MIBGroup OBJECT-GROUP
    OBJECTS { pimJoinPruneInterval, pimNeighborIfIndex,
              pimNeighborUpTime, pimNeighborExpiryTime,
              pimInterfaceAddress, pimInterfaceNetMask,
              pimInterfaceDR, pimInterfaceHelloInterval,
              pimInterfaceStatus, pimInterfaceJoinPruneInterval,
              pimInterfaceCBSRPreference, pimInterfaceMode,
              pimRPSetHoldTime, pimRPSetExpiryTime,
              pimComponentBSRAddress, pimComponentBSRExpiryTime,
              pimComponentCRPHoldTime, pimComponentStatus,
              pimIpMRouteFlags, pimIpMRouteUpstreamAssertTimer
```

```
            }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support management of PIM Sparse
            Mode (version 2) routers."
    ::= { pimMIBGroups 2 }

pimDenseV2MIBGroup OBJECT-GROUP
    OBJECTS { pimNeighborIfIndex,
              pimNeighborUpTime, pimNeighborExpiryTime,
              pimInterfaceAddress, pimInterfaceNetMask,
              pimInterfaceDR, pimInterfaceHelloInterval,
              pimInterfaceStatus, pimInterfaceMode
            }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support management of PIM Dense
            Mode (version 2) routers."
    ::= { pimMIBGroups 5 }

pimV2CandidateRPMIBGroup OBJECT-GROUP
    OBJECTS { pimCandidateRPAddress,
              pimCandidateRPRowStatus
            }
    STATUS  current
    DESCRIPTION
            "A collection of objects to support configuration of which
            groups a router is to advertise itself as a Candidate-RP."
    ::= { pimMIBGroups 3 }

pimV1MIBGroup OBJECT-GROUP
    OBJECTS { pimJoinPruneInterval, pimNeighborIfIndex,
              pimNeighborUpTime, pimNeighborExpiryTime,
              pimNeighborMode,
              pimInterfaceAddress, pimInterfaceNetMask,
              pimInterfaceJoinPruneInterval, pimInterfaceStatus,
              pimInterfaceMode, pimInterfaceDR,
              pimInterfaceHelloInterval,
              pimRPState, pimRPStateTimer,
              pimRPLastChange, pimRPRowStatus
            }
    STATUS  deprecated
    DESCRIPTION
            "A collection of objects to support management of PIM
            (version 1) routers."
    ::= { pimMIBGroups 4 }

pimNextHopGroup OBJECT-GROUP
```

```
    OBJECTS { pimIpMRouteNextHopPruneReason }
    STATUS  current
    DESCRIPTION
            "A collection of optional objects to provide per-next hop
            information for diagnostic purposes.  Supporting this group
            may add a large number of instances to a tree walk, but the
            information in this group can be extremely useful in
            tracking down multicast connectivity problems."
    ::= { pimMIBGroups 6 }

pimAssertGroup OBJECT-GROUP
    OBJECTS { pimIpMRouteAssertMetric, pimIpMRouteAssertMetricPref,
              pimIpMRouteAssertRPTBit }
    STATUS  current
    DESCRIPTION
            "A collection of optional objects to provide extra
            information about the assert election process.  There is no
            protocol reason to keep such information, but some
            implementations may already keep this information and make
            it available.  These objects can also be very useful in
            debugging connectivity or duplicate packet problems,
            especially if the assert winner does not support the PIM and
            IP Multicast MIBs."
    ::= { pimMIBGroups 7 }

END
```

5. Security Considerations

This MIB contains readable objects whose values provide information related to multicast routing, including information on the network topology. There are also a number of objects that have a MAX-ACCESS clause of read-write and/or read-create, which allow an administrator to configure PIM in the router.

While unauthorized access to the readable objects is relatively innocuous, unauthorized access to the write-able objects could cause a denial of service. Hence, the support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is such an insecure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and SET (change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2274 [12] and the View-based Access Control Model RFC 2275 [15] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

6. Intellectual Property Notice

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7. Acknowledgements

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8. Authors' Addresses

Keith McCloghrie
cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706

Phone: +1 408 526 5260
EMail: kzm@cisco.com

Dino Farinacci
Procket Networks
3850 North First Street
San Jose, CA 95134

Phone: +1 408-954-7909
Email: dino@procket.com

Dave Thaler
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

Phone: +1 425 703 8835
EMail: dthaler@microsoft.com

Bill Fenner
AT&T Labs - Research
75 Willow Rd.
Menlo Park, CA 94025

Phone: +1 650 330 7893
EMail: fenner@research.att.com

9. References

[1] Wijnen, B., Harrington, D. and R. Presuhn, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.

[2] Rose, M. and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.

[3] Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.

[4] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

[5] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[6] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[7] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[8] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

[9] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.

[10] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.

[11] Case, J., Harrington D., Presuhn R. and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.

[12] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

[13] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.

[14] Levi, D., Meyer, P. and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.

[15] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.

[16] Deering, S., Estrin, D., Farinacci, D., Jacobson, V., Liu, G. and L. Wei, "Protocol Independent Multicast (PIM): Motivation and Architecture", Work in Progress.

[17] Deering, S., Estrin, D., Farinacci, D., Jacobson, V., Liu, G. and L. Wei, "Protocol Independent Multicast (PIM): Protocol Specification", Work in Progress.

[18] Estrin, D., Farinacci, D., Helmy, A., Thaler, D., Deering, S., Handley, M., Jacobson, V., Liu, C., Sharma, P. and L. Wei, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification", RFC 2362, June 1998.

[19] Deering, S., Estrin, D., Farinacci, D., Jacobson, V., Helmy, A. and L. Wei, "Protocol Independent Multicast Version 2, Dense Mode Specification", Work in Progress.

[20] McCloghrie, K., Farinacci, D. and D. Thaler, "IPv4 Multicast Routing MIB", RFC 2932, October 2000.

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