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Protocol Independent Multicast MIB

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing the Protocol Independent Multicast (PIM) protocols: PIM-SM (Sparse Mode), BIDIR-PIM (Bidirectional), and PIM-DM (Dense Mode). This document is part of work in progress to obsolete RFC 2934, and is to be preferred where the two documents overlap. This document does not obsolete RFC 2934.

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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) protocols (PIM-SM [RFC4601], BIDIR-PIM [RFC5015], and PIM-DM [RFC3973]).

This document is part of work in progress to obsolete RFC 2934 [RFC2934]. RFC 2934 defined an experimental MIB module for managing the PIM protocols. The MIB module defined by this document is a re-working of the MIB module from RFC 2934, with major changes that include the following.

- o This MIB module is independent of IP version, whereas RFC 2934 only supported IPv4.
- o This MIB module includes support for managing BIDIR-PIM.
- o This MIB module retains limited support for managing PIM-DM [RFC3973], but that is no longer its primary purpose.
- o This MIB module does not include support for managing PIM-SM v1.
- o This MIB module does not depend on the IPv4 Multicast Routing MIB defined in RFC 2932 [RFC2932].
- o This MIB module includes support for configuring static Rendezvous Points (RPs).
- o This MIB module includes support for configuring anycast RPs [RFC4610].

2. Terminology

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

3. The Internet-Standard Management Framework

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

4. Overview

This MIB module contains the following tables.

1. The PIM Interface Table, which contains one row per IP version for each interface of the router which is running PIM.
2. The PIM Neighbor Table, which contains one row for each of the router's PIM neighbors.
3. The PIM Neighbor Secondary Address Table, which contains one row for each secondary address advertised by each of the router's PIM neighbors.
4. The PIM (*,G) State Table, which contains one row for each group for which PIM has (*,G) state.
5. The PIM (*,G,I) State Table, which contains one row for each group and interface for which PIM has interface-specific (*,G) state.
6. The PIM (S,G) State Table, which contains one row for each source and group for which PIM has (S,G) state.
7. The PIM (S,G,I) State Table, which contains one row for each source, group, and interface for which PIM has interface-specific (S,G) state.
8. The PIM (S,G,rpt) State Table, which contains one row for each source and group for which PIM has (S,G,rpt) state.
9. The PIM (S,G,rpt,I) State Table, which contains one row for each source, group, and interface for which PIM has interface-specific (S,G,rpt) state.
10. The PIM Bidir DF-Election Table, which contains one row per interface for each Rendezvous Point (RP) for which Bidirectional-PIM Designated Forwarder (DF) election state is maintained.

11. The PIM Static RP Table, which contains one row per range of multicast group addresses for which a particular configured RP should be used.
12. The PIM Group Mapping Table, which contains one row for each mapping from a multicast group address prefix to the PIM mode and RP address to use for groups within that group prefix, regardless of the source of the group mapping information.
13. The PIM Anycast-RP Set Table, which contains one row for each RP within each Anycast-RP set of which the local router is a member.

This MIB module uses textual conventions defined in the IF-MIB [RFC2863], the INET-ADDRESS-MIB [RFC4001], and the IANA-RTPROTO-MIB [RTPROTO]. This MIB module REFERENCES [RFC3376], [RFC3569], [RFC3618], [RFC3810], [RFC3956], [RFC3973], [RFC4601], [RFC4610], [RFC5015], [RFC5059], and [IPMCAST-MIB].

5. Definitions

PIM-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

MODULE-IDENTITY, OBJECT-TYPE, mib-2,
NOTIFICATION-TYPE, Unsigned32,
Counter32, Counter64, Gauge32,
TimeTicks
    FROM SNMPv2-SMI
    -- [RFC2578]
TEXTUAL-CONVENTION,
RowStatus, TruthValue,
StorageType
    FROM SNMPv2-TC
    -- [RFC2579]
MODULE-COMPLIANCE, OBJECT-GROUP,
NOTIFICATION-GROUP
    FROM SNMPv2-CONF
    -- [RFC2580]
InterfaceIndexOrZero,
InterfaceIndex
    FROM IF-MIB
    -- [RFC2863]
InetAddressType,
InetAddressPrefixLength,
InetAddress, InetVersion
    FROM INET-ADDRESS-MIB
    -- [RFC4001]
IANAipRouteProtocol
    FROM IANA-RTPROTO-MIB;
    -- [RTPROTO]

```

pimStdMIB MODULE-IDENTITY

```

LAST-UPDATED "200711020000Z" -- 2 November 2007
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 PIM routers.

Copyright (C) The IETF Trust (2007). This version of this MIB module is part of RFC 5060; see the RFC itself for full legal notices."

REVISION "200711020000Z" -- 2 November 2007

DESCRIPTION "Initial version, published as RFC 5060."

::= { mib-2 157 }

--

-- Textual Conventions

--

PimMode ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The PIM mode in which a group is operating.

none(1) The group is not using PIM, which may be the case if, for example, it is a link-local or unroutable group address.

ssm(2) Source-Specific Multicast (SSM) with PIM Sparse Mode.

asm(3) Any Source Multicast (ASM) with PIM Sparse Mode.

bidir(4) Bidirectional PIM.

dm(5) PIM Dense Mode.

other(6) Any other PIM mode."

SYNTAX INTEGER {
 none(1),
 ssm(2),
 asm(3),
 bidir(4),
 dm(5),
 other(6)
 }

PimGroupMappingOriginType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The mechanism by which a PIM group mapping was learned.

fixed(1) Link-local or unroutable group mappings.

configRp(2) Local static RP configuration.

configSsm(3) Local SSM Group configuration.

bsr(4) The PIM Bootstrap Router (BSR) mechanism.

autoRP(5) Cisco's Auto-RP mechanism.

embedded(6) The Embedded-RP mechanism where the RP address is embedded in the multicast group address.

other(7) Any other mechanism."

REFERENCE "RFC 3569, RFC 3956, and RFC 5059"

```
SYNTAX      INTEGER {
                fixed(1),
                configRp(2),
                configSsm(3),
                bsr(4),
                autoRP(5),
                embedded(6),
                other(7)
            }
```

--

-- Top-level structure

--

```
pimNotifications OBJECT IDENTIFIER ::= { pimStdMIB 0 }
pim                OBJECT IDENTIFIER ::= { pimStdMIB 1 }
```

pimKeepalivePeriod OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The duration of the Keepalive Timer. This is the period during which the PIM router will maintain (S,G) state in the absence of explicit (S,G) local membership or (S,G) join messages received to maintain it. This timer period is called the Keepalive_Period in the PIM-SM specification. It is called the SourceLifetime in the PIM-DM specification.

The storage type of this object is determined by
pimDeviceConfigStorageType."

REFERENCE "RFC 4601 section 4.11"

DEFVAL { 210 }

::= { pim 14 }

pimRegisterSuppressionTime OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The duration of the Register Suppression Timer. This is the period during which a PIM Designated Router (DR) stops sending Register-encapsulated data to the Rendezvous Point (RP) after receiving a Register-Stop message. This object is used to run timers both at the DR and at the RP. This timer period is called the Register_Suppression_Time in the PIM-SM specification.

The storage type of this object is determined by
pimDeviceConfigStorageType."

REFERENCE "RFC 4601 section 4.11"

DEFVAL { 60 }

::= { pim 15 }

pimStarGEntries OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of entries in the pimStarGTable."

::= { pim 16 }

pimStarGIEntries OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of entries in the pimStarGITable."

::= { pim 17 }

pimSGEntries OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of entries in the pimSGTable."

```
::= { pim 18 }
```

```
pimSGIEntries OBJECT-TYPE
```

```
SYNTAX Gauge32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of entries in the pimSGITable."
```

```
::= { pim 19 }
```

```
pimSGRptEntries OBJECT-TYPE
```

```
SYNTAX Gauge32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of entries in the pimSGRptTable."
```

```
::= { pim 20 }
```

```
pimSGRptIEntries OBJECT-TYPE
```

```
SYNTAX Gauge32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of entries in the pimSGRptITable."
```

```
::= { pim 21 }
```

```
pimOutAsserts OBJECT-TYPE
```

```
SYNTAX Counter64
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of Asserts sent by this router.
```

```
Discontinuities in the value of this counter can occur at  
re-initialization of the management system, for example,  
when the device is rebooted."
```

```
REFERENCE "RFC 4601 section 4.6"
```

```
::= { pim 22 }
```

```
pimInAsserts OBJECT-TYPE
```

```
SYNTAX Counter64
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of Asserts received by this router. Asserts  
are multicast to all routers on a network. This counter is  
incremented by all routers that receive an assert, not only  
those routers that are contesting the assert."
```

Discontinuities in the value of this counter can occur at re-initialization of the management system, for example, when the device is rebooted."

REFERENCE "RFC 4601 section 4.6"

::= { pim 23 }

pimLastAssertInterface OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The interface on which this router most recently sent or received an assert, or zero if this router has not sent or received an assert."

REFERENCE "RFC 4601 section 4.6"

::= { pim 24 }

pimLastAssertGroupAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type of the multicast group address in the most recently sent or received assert. If this router has not sent or received an assert, then this object is set to unknown(0)."

::= { pim 25 }

pimLastAssertGroupAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The multicast group address in the most recently sent or received assert. The InetAddressType is given by the pimLastAssertGroupAddressType object."

::= { pim 26 }

pimLastAssertSourceAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type of the source address in the most recently sent or received assert. If the most recent assert was (*,G), or if this router has not sent or received an assert, then this object is set to unknown(0)."

::= { pim 27 }

```
pimLastAssertSourceAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (0|4|8|16|20))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The source address in the most recently sent or received
        assert.  The InetAddressType is given by the
        pimLastAssertSourceAddressType object."
    ::= { pim 28 }

pimNeighborLossNotificationPeriod OBJECT-TYPE
    SYNTAX      Unsigned32 (0..65535)
    UNITS       "seconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The minimum time that must elapse between pimNeighborLoss
        notifications originated by this router.  The maximum value
        65535 represents an 'infinite' time, in which case, no
        pimNeighborLoss notifications are ever sent.

        The storage type of this object is determined by
        pimDeviceConfigStorageType."
    DEFVAL     { 0 }
    ::= { pim 29 }

pimNeighborLossCount OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of neighbor loss events that have occurred.

        This counter is incremented when the neighbor timer expires,
        and the router has no other neighbors on the same interface
        with the same IP version and a lower IP address than itself.

        This counter is incremented whenever a pimNeighborLoss
        notification would be generated.

        Discontinuities in the value of this counter can occur at
        re-initialization of the management system, for example,
        when the device is rebooted."
    REFERENCE  "RFC 4601 section 4.3.2"
    ::= { pim 30 }

pimInvalidRegisterNotificationPeriod OBJECT-TYPE
    SYNTAX      Unsigned32 (10..65535)
```

UNITS "seconds"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The minimum time that must elapse between pimInvalidRegister notifications originated by this router. The default value of 65535 represents an 'infinite' time, in which case, no pimInvalidRegister notifications are ever sent.

The non-zero minimum allowed value provides resilience against propagation of denial-of-service attacks from the data and control planes to the network management plane.

The storage type of this object is determined by pimDeviceConfigStorageType."

DEFVAL { 65535 }
 ::= { pim 31 }

pimInvalidRegisterMsgsRcvd OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The number of invalid PIM Register messages that have been received by this device.

A PIM Register message is invalid if either

- o the destination address of the Register message does not match the Group to RP mapping on this device, or
- o this device believes the group address to be within an SSM address range, but this Register implies ASM usage.

These conditions can occur transiently while RP mapping changes propagate through the network. If this counter is incremented repeatedly over several minutes, then there is a persisting configuration error that requires correction.

The active Group to RP mapping on this device is specified by the object pimGroupMappingPimMode. If there is no such mapping, then the object pimGroupMappingPimMode is absent. The RP address contained in the invalid Register is pimInvalidRegisterRp.

Multicast data carried by invalid Register messages is discarded. The discarded data is from a source directly

connected to pimInvalidRegisterOrigin, and is addressed to pimInvalidRegisterGroup.

Discontinuities in the value of this counter can occur at re-initialization of the management system, for example, when the device is rebooted."

REFERENCE "RFC 4601 section 4.4.2, RFC 3569, and
'IP Multicast MIB' (August 2007) ipMcastSsmRangeTable"
 ::= { pim 32 }

pimInvalidRegisterAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type stored in pimInvalidRegisterOrigin, pimInvalidRegisterGroup, and pimInvalidRegisterRp.

If no invalid Register messages have been received, then this object is set to unknown(0)."

::= { pim 33 }

pimInvalidRegisterOrigin OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The source address of the last invalid Register message received by this device."

::= { pim 34 }

pimInvalidRegisterGroup OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The IP multicast group address to which the last invalid Register message received by this device was addressed."

::= { pim 35 }

pimInvalidRegisterRp OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The RP address to which the last invalid Register message received by this device was delivered."

::= { pim 36 }

pimInvalidJoinPruneNotificationPeriod OBJECT-TYPE

SYNTAX Unsigned32 (10..65535)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The minimum time that must elapse between pimInvalidJoinPrune notifications originated by this router. The default value of 65535 represents an 'infinite' time, in which case, no pimInvalidJoinPrune notifications are ever sent.

The non-zero minimum allowed value provides resilience against propagation of denial-of-service attacks from the control plane to the network management plane.

The storage type of this object is determined by pimDeviceConfigStorageType."

DEFVAL { 65535 }

::= { pim 37 }

pimInvalidJoinPruneMsgsRcvd OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of invalid PIM Join/Prune messages that have been received by this device.

A PIM Join/Prune message is invalid if either

- o the Group to RP mapping specified by this message does not match the Group to RP mapping on this device, or
- o this device believes the group address to be within an SSM address range, but this Join/Prune (*,G) or (S,G,rpt) implies ASM usage.

These conditions can occur transiently while RP mapping changes propagate through the network. If this counter is incremented repeatedly over several minutes, then there is a persisting configuration error that requires correction.

The active Group to RP mapping on this device is specified by the object pimGroupMappingPimMode. If there is no such mapping, then the object pimGroupMappingPimMode is absent. The RP address contained in the invalid Join/Prune is pimInvalidJoinPruneRp.

Invalid Join/Prune messages are discarded. This may result in loss of multicast data affecting listeners downstream of `pimInvalidJoinPruneOrigin`, for multicast data addressed to `pimInvalidJoinPruneGroup`.

Discontinuities in the value of this counter can occur at re-initialization of the management system, for example, when the device is rebooted."

REFERENCE "RFC 4601 section 4.5.2, RFC 3569, and
'IP Multicast MIB' (August 2007) ipMcastSsmRangeTable"
 ::= { pim 38 }

`pimInvalidJoinPruneAddressType` OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type stored in `pimInvalidJoinPruneOrigin`, `pimInvalidJoinPruneGroup`, and `pimInvalidJoinPruneRp`.

If no invalid Join/Prune messages have been received, this object is set to `unknown(0)`."

::= { pim 39 }

`pimInvalidJoinPruneOrigin` OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The source address of the last invalid Join/Prune message received by this device."

::= { pim 40 }

`pimInvalidJoinPruneGroup` OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The IP multicast group address carried in the last invalid Join/Prune message received by this device."

::= { pim 41 }

`pimInvalidJoinPruneRp` OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The RP address carried in the last invalid Join/Prune

message received by this device."
 ::= { pim 42 }

pimRPMappingNotificationPeriod OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The minimum time that must elapse between pimRPMappingChange notifications originated by this router. The default value of 65535 represents an 'infinite' time, in which case, no pimRPMappingChange notifications are ever sent.

The storage type of this object is determined by pimDeviceConfigStorageType."

DEFVAL { 65535 }

::= { pim 43 }

pimRPMappingChangeCount OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of changes to active RP mappings on this device.

Information about active RP mappings is available in pimGroupMappingTable. Only changes to active mappings cause this counter to be incremented. That is, changes that modify the pimGroupMappingEntry with the highest precedence for a group (lowest value of pimGroupMappingPrecedence).

Such changes may result from manual configuration of this device, or from automatic RP mapping discovery methods including the PIM Bootstrap Router (BSR) mechanism.

Discontinuities in the value of this counter can occur at re-initialization of the management system, for example, when the device is rebooted."

REFERENCE "RFC 5059"

::= { pim 44 }

pimInterfaceElectionNotificationPeriod OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The minimum time that must elapse between pimInterfaceElection notifications originated by this router. The default value of 65535 represents an 'infinite' time, in which case, no pimInterfaceElection notifications are ever sent.

The storage type of this object is determined by pimDeviceConfigStorageType."

DEFVAL { 65535 }
 ::= { pim 45 }

pimInterfaceElectionWinCount OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"The number of times this device has been elected DR or DF on any interface.

Elections occur frequently on newly-active interfaces, as triggered Hellos establish adjacencies. This counter is not incremented for elections on an interface until the first periodic Hello has been sent. If this router is the DR or DF at the time of sending the first periodic Hello after interface activation, then this counter is incremented (once) at that time.

Discontinuities in the value of this counter can occur at re-initialization of the management system, for example, when the device is rebooted."

REFERENCE "RFC 4601 section 4.3.2 and RFC 5015 section 3.5.2"
 ::= { pim 46 }

pimRefreshInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)
 UNITS "seconds"
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"The interval between successive State Refresh messages sent by an Originator. This timer period is called the RefreshInterval in the PIM-DM specification. This object is used only by PIM-DM.

The storage type of this object is determined by pimDeviceConfigStorageType."

REFERENCE "RFC 3973 section 4.8"

```
DEFVAL { 60 }
 ::= { pim 47 }
```

```
pimDeviceConfigStorageType OBJECT-TYPE
```

```
SYNTAX      StorageType
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

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

```
The objects described by this storage type are:
pimKeepalivePeriod, pimRegisterSuppressionTime,
pimNeighborLossNotificationPeriod,
pimInvalidRegisterNotificationPeriod,
pimInvalidJoinPruneNotificationPeriod,
pimRPMappingNotificationPeriod,
pimInterfaceElectionNotificationPeriod, and
pimRefreshInterval."
```

```
DEFVAL { nonVolatile }
```

```
 ::= { pim 48 }
```

```
--
```

```
-- 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.
PIM is enabled on all interfaces listed in this table."
```

```
 ::= { pim 1 }
```

```
pimInterfaceEntry OBJECT-TYPE
```

```
SYNTAX      PimInterfaceEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"An entry (conceptual row) in the pimInterfaceTable.  This
entry is preserved on agent restart."
```

```
INDEX      { pimInterfaceIfIndex,
             pimInterfaceIPVersion }
```

```
 ::= { pimInterfaceTable 1 }
```

```

PimInterfaceEntry ::= SEQUENCE {
    pimInterfaceIfIndex      InterfaceIndex,
    pimInterfaceIPVersion    InetVersion,
    pimInterfaceAddressType  InetAddressType,
    pimInterfaceAddress       InetAddress,
    pimInterfaceGenerationIDValue Unsigned32,
    pimInterfaceDR            InetAddress,
    pimInterfaceDRPriority    Unsigned32,
    pimInterfaceDRPriorityEnabled TruthValue,
    pimInterfaceHelloInterval Unsigned32,
    pimInterfaceTrigHelloInterval Unsigned32,
    pimInterfaceHelloHoldtime Unsigned32,
    pimInterfaceJoinPruneInterval Unsigned32,
    pimInterfaceJoinPruneHoldtime Unsigned32,
    pimInterfaceDFElectionRobustness Unsigned32,
    pimInterfaceLanDelayEnabled TruthValue,
    pimInterfacePropagationDelay Unsigned32,
    pimInterfaceOverrideInterval Unsigned32,
    pimInterfaceEffectPropagDelay Unsigned32,
    pimInterfaceEffectOverrideIvl Unsigned32,
    pimInterfaceSuppressionEnabled TruthValue,
    pimInterfaceBidirCapable TruthValue,
    pimInterfaceDomainBorder TruthValue,
    pimInterfaceStubInterface TruthValue,
    pimInterfacePruneLimitInterval Unsigned32,
    pimInterfaceGraftRetryInterval Unsigned32,
    pimInterfaceSRPriorityEnabled TruthValue,
    pimInterfaceStatus        RowStatus,
    pimInterfaceStorageType    StorageType
}

```

```

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

```

```

pimInterfaceIPVersion OBJECT-TYPE
    SYNTAX      InetVersion
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IP version of this PIM interface.  A physical interface
        may be configured in multiple modes concurrently, e.g., IPv4
        and IPv6; however, the traffic is considered to be logically
        separate."

```

```
::= { pimInterfaceEntry 2 }
```

```
pimInterfaceAddressType OBJECT-TYPE
```

```
SYNTAX      InetAddressType
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The address type of this PIM interface."
```

```
::= { pimInterfaceEntry 3 }
```

```
pimInterfaceAddress OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The primary IP address of this router on this PIM  
    interface. The InetAddressType is given by the  
    pimInterfaceAddressType object."
```

```
REFERENCE "RFC 4601 sections 4.1.6, 4.3.1-4.3.4, and 4.5.1"
```

```
::= { pimInterfaceEntry 4 }
```

```
pimInterfaceGenerationIDValue OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The value of the Generation ID this router inserted in the  
    last PIM Hello message it sent on this interface."
```

```
REFERENCE "RFC 4601 section 4.3.1"
```

```
::= { pimInterfaceEntry 5 }
```

```
pimInterfaceDR OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The primary IP address of the Designated Router on this PIM  
    interface. The InetAddressType is given by the  
    pimInterfaceAddressType object."
```

```
REFERENCE "RFC 4601 section 4.3"
```

```
::= { pimInterfaceEntry 6 }
```

```
pimInterfaceDRPriority OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The Designated Router Priority value inserted into the DR
```

Priority option in PIM Hello messages transmitted on this interface. Numerically higher values for this object indicate higher priorities."

REFERENCE "RFC 4601 section 4.3.2"

DEFVAL { 1 }

::= { pimInterfaceEntry 7 }

pimInterfaceDRPriorityEnabled OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Evaluates to TRUE if all routers on this interface are using the DR Priority option."

REFERENCE "RFC 4601 section 4.3.2"

::= { pimInterfaceEntry 8 }

pimInterfaceHelloInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..18000)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The frequency at which PIM Hello messages are transmitted on this interface. This object corresponds to the 'Hello_Period' timer value defined in the PIM-SM specification. A value of zero represents an 'infinite' interval, and indicates that periodic PIM Hello messages should not be sent on this interface."

REFERENCE "RFC 4601 section 9"

DEFVAL { 30 }

::= { pimInterfaceEntry 9 }

pimInterfaceTrigHelloInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..60)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum time before this router sends a triggered PIM Hello message on this interface. This object corresponds to the 'Trigered_Hello_Delay' timer value defined in the PIM-SM specification. A value of zero has no special meaning and indicates that triggered PIM Hello messages should always be sent immediately."

REFERENCE "RFC 4601 section 4.11"

DEFVAL { 5 }

::= { pimInterfaceEntry 10 }

pimInterfaceHelloHoldtime OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value set in the Holdtime field of PIM Hello messages transmitted on this interface. A value of 65535 represents an 'infinite' holdtime. Implementations are recommended to use a holdtime that is 3.5 times the value of pimInterfaceHelloInterval, or 65535 if pimInterfaceHelloInterval is set to zero."

REFERENCE "RFC 4601 sections 4.3.2 and 4.9.2"

DEFVAL { 105 }

::= { pimInterfaceEntry 11 }

pimInterfaceJoinPruneInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..18000)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The frequency at which this router sends PIM Join/Prune messages on this PIM interface. This object corresponds to the 't_periodic' timer value defined in the PIM-SM specification. A value of zero represents an 'infinite' interval, and indicates that periodic PIM Join/Prune messages should not be sent on this interface."

REFERENCE "RFC 4601 section 4.11"

DEFVAL { 60 }

::= { pimInterfaceEntry 12 }

pimInterfaceJoinPruneHoldtime OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value inserted into the Holdtime field of a PIM Join/Prune message sent on this interface. A value of 65535 represents an 'infinite' holdtime. Implementations are recommended to use a holdtime that is 3.5 times the value of pimInterfaceJoinPruneInterval, or 65535 if pimInterfaceJoinPruneInterval is set to zero. PIM-DM implementations are recommended to use the value of pimInterfacePruneLimitInterval."

REFERENCE "RFC 4601 sections 4.5.3 and 4.9.5"

DEFVAL { 210 }

```
::= { pimInterfaceEntry 13 }
```

```
pimInterfaceDFElectionRobustness OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The minimum number of PIM DF-Election messages that must be  
    lost in order for DF election on this interface to fail."
```

```
DEFVAL { 3 }
```

```
::= { pimInterfaceEntry 14 }
```

```
pimInterfaceLanDelayEnabled OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Evaluates to TRUE if all routers on this interface are  
    using the LAN Prune Delay option."
```

```
REFERENCE "RFC 4601 sections 4.3.3 and 4.9.2"
```

```
::= { pimInterfaceEntry 15 }
```

```
pimInterfacePropagationDelay OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (0..32767)
```

```
UNITS      "milliseconds"
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The expected propagation delay between PIM routers on this  
    network or link.
```

```
    This router inserts this value into the Propagation_Delay  
    field of the LAN Prune Delay option in the PIM Hello  
    messages sent on this interface. Implementations SHOULD  
    enforce a lower bound on the permitted values for this  
    object to allow for scheduling and processing delays within  
    the local router."
```

```
DEFVAL { 500 }
```

```
::= { pimInterfaceEntry 16 }
```

```
pimInterfaceOverrideInterval OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (0..65535)
```

```
UNITS      "milliseconds"
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The value this router inserts into the Override_Interval  
    field of the LAN Prune Delay option in the PIM Hello
```

messages it sends on this interface.

When overriding a prune, PIM routers pick a random timer duration up to the value of this object. The more PIM routers that are active on a network, the more likely it is that the prune will be overridden after a small proportion of this time has elapsed.

The more PIM routers are active on this network, the larger this object should be to obtain an optimal spread of prune override latencies."

REFERENCE "RFC 4601 section 4.3.3"

DEFVAL { 2500 }

::= { pimInterfaceEntry 17 }

pimInterfaceEffectPropagDelay OBJECT-TYPE

SYNTAX Unsigned32 (0..32767)

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Effective Propagation Delay on this interface. This object is always 500 if pimInterfaceLanDelayEnabled is FALSE."

REFERENCE "RFC 4601 section 4.3.3"

::= { pimInterfaceEntry 18 }

pimInterfaceEffectOverrideIvl OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Effective Override Interval on this interface. This object is always 2500 if pimInterfaceLanDelayEnabled is FALSE."

REFERENCE "RFC 4601 section 4.3.3"

::= { pimInterfaceEntry 19 }

pimInterfaceSuppressionEnabled OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Whether join suppression is enabled on this interface. This object is always TRUE if pimInterfaceLanDelayEnabled is FALSE."

REFERENCE "RFC 4601 section 4.3.3"

```
::= { pimInterfaceEntry 20 }
```

```
pimInterfaceBidirCapable OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Evaluates to TRUE if all routers on this interface are  
    using the Bidirectional-PIM Capable option."
```

```
REFERENCE "RFC 5015 section 3.2 and 3.7.4"
```

```
::= { pimInterfaceEntry 21 }
```

```
pimInterfaceDomainBorder OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Whether or not this interface is a PIM domain border. This  
    includes acting as a border for PIM Bootstrap Router (BSR)  
    messages, if the BSR mechanism is in use."
```

```
DEFVAL { false }
```

```
::= { pimInterfaceEntry 22 }
```

```
pimInterfaceStubInterface OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Whether this interface is a 'stub interface'. If this  
    object is set to TRUE, then no PIM packets are sent out this  
    interface, and any received PIM packets are ignored.
```

```
    Setting this object to TRUE is a security measure for  
    interfaces towards untrusted hosts. This allows an  
    interface to be configured for use with IGMP (Internet Group  
    Management Protocol) or MLD (Multicast Listener Discovery)  
    only, which protects the PIM router from forged PIM messages  
    on the interface.
```

```
    To communicate with other PIM routers using this interface,  
    this object must remain set to FALSE.
```

```
    Changing the value of this object while the interface is  
    operational causes PIM to be disabled and then re-enabled on  
    this interface."
```

```
REFERENCE "RFC 3376, RFC 3810"
```

```
DEFVAL { false }
```

```
::= { pimInterfaceEntry 23 }
```

pimInterfacePruneLimitInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The minimum interval that must transpire between two successive Prunes sent by a router. This object corresponds to the 't_limit' timer value defined in the PIM-DM specification. This object is used only by PIM-DM."

REFERENCE "RFC 3973 section 4.8"

DEFVAL { 60 }

::= { pimInterfaceEntry 24 }

pimInterfaceGraftRetryInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..65535)

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The minimum interval that must transpire between two successive Grafts sent by a router. This object corresponds to the 'Graft_Retry_Period' timer value defined in the PIM-DM specification. This object is used only by PIM-DM."

REFERENCE "RFC 3973 section 4.8"

DEFVAL { 3 }

::= { pimInterfaceEntry 25 }

pimInterfaceSRPriorityEnabled OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Evaluates to TRUE if all routers on this interface are using the State Refresh option. This object is used only by PIM-DM."

::= { pimInterfaceEntry 26 }

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.

This status object can be set to active(1) without setting

any other columnar objects in this entry.

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

```
::= { pimInterfaceEntry 27 }
```

```
pimInterfaceStorageType 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 }
```

```
::= { pimInterfaceEntry 28 }
```

```
--
```

```
-- 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 2 }
```

```
pimNeighborEntry OBJECT-TYPE
```

```
SYNTAX      PimNeighborEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"An entry (conceptual row) in the pimNeighborTable."
```

```
INDEX      { pimNeighborIfIndex,
             pimNeighborAddressType,
             pimNeighborAddress }
```

```
::= { pimNeighborTable 1 }
```

```
PimNeighborEntry ::= SEQUENCE {
```

```
  pimNeighborIfIndex      InterfaceIndex,
  pimNeighborAddressType  InetAddressType,
  pimNeighborAddress      InetAddress,
  pimNeighborGenerationIDPresent TruthValue,
  pimNeighborGenerationIDValue  Unsigned32,
  pimNeighborUpTime       TimeTicks,
  pimNeighborExpiryTime   TimeTicks,
```

```

    pimNeighborDRPriorityPresent      TruthValue,
    pimNeighborDRPriority             Unsigned32,
    pimNeighborLanPruneDelayPresent  TruthValue,
    pimNeighborTBit                   TruthValue,
    pimNeighborPropagationDelay       Unsigned32,
    pimNeighborOverrideInterval       Unsigned32,
    pimNeighborBidirCapable           TruthValue,
    pimNeighborSRCapable              TruthValue
}

pimNeighborIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The value of ifIndex for the interface used to reach this
        PIM neighbor."
    ::= { pimNeighborEntry 1 }

pimNeighborAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of this PIM neighbor."
    ::= { pimNeighborEntry 2 }

pimNeighborAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The primary IP address of this PIM neighbor. The
        InetAddressType is given by the pimNeighborAddressType
        object."
    ::= { pimNeighborEntry 3 }

pimNeighborGenerationIDPresent OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Evaluates to TRUE if this neighbor is using the Generation
        ID option."
    REFERENCE  "RFC 4601 section 4.3.1"
    ::= { pimNeighborEntry 4 }

pimNeighborGenerationIDValue OBJECT-TYPE

```

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The value of the Generation ID from the last PIM Hello
 message received from this neighbor. This object is always
 zero if pimNeighborGenerationIDPresent is FALSE."
REFERENCE "RFC 4601 section 4.3.1"
 ::= { pimNeighborEntry 5 }

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 6 }

pimNeighborExpiryTime OBJECT-TYPE

SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The minimum time remaining before this PIM neighbor will
 time out. The value zero indicates that this PIM neighbor
 will never time out."
 ::= { pimNeighborEntry 7 }

pimNeighborDRPriorityPresent OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "Evaluates to TRUE if this neighbor is using the DR Priority
 option."
REFERENCE "RFC 4601 section 4.3.2"
 ::= { pimNeighborEntry 8 }

pimNeighborDRPriority OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The value of the Designated Router Priority from the last
 PIM Hello message received from this neighbor. This object
 is always zero if pimNeighborDRPriorityPresent is FALSE."
REFERENCE "RFC 4601 section 4.3.2"

```
::= { pimNeighborEntry 9 }
```

```
pimNeighborLanPruneDelayPresent OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Evaluates to TRUE if this neighbor is using the LAN Prune  
    Delay option."
```

```
REFERENCE "RFC 4601 section 4.3.3"
```

```
::= { pimNeighborEntry 10 }
```

```
pimNeighborTBit OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Whether the T bit was set in the LAN Prune Delay option  
    received from this neighbor. The T bit specifies the  
    ability of the neighbor to disable join suppression. This  
    object is always TRUE if pimNeighborLanPruneDelayPresent is  
    FALSE."
```

```
REFERENCE "RFC 4601 section 4.3.3"
```

```
::= { pimNeighborEntry 11 }
```

```
pimNeighborPropagationDelay OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (0..32767)
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The value of the Propagation_Delay field of the LAN Prune  
    Delay option received from this neighbor. This object is  
    always zero if pimNeighborLanPruneDelayPresent is FALSE."
```

```
REFERENCE "RFC 4601 section 4.3.3"
```

```
::= { pimNeighborEntry 12 }
```

```
pimNeighborOverrideInterval OBJECT-TYPE
```

```
SYNTAX      Unsigned32 (0..65535)
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The value of the Override_Interval field of the LAN Prune  
    Delay option received from this neighbor. This object is  
    always zero if pimNeighborLanPruneDelayPresent is FALSE."
```

```
REFERENCE "RFC 4601 section 4.3.3"
```

```
::= { pimNeighborEntry 13 }
```

```
pimNeighborBidirCapable OBJECT-TYPE
```

```

SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Evaluates to TRUE if this neighbor is using the
    Bidirectional-PIM Capable option."
REFERENCE   "RFC 5015 section 3.2 and 3.7.4"
 ::= { pimNeighborEntry 14 }

```

```
pimNeighborSRCapable OBJECT-TYPE
```

```

SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Evaluates to TRUE if this neighbor is using the State
    Refresh Capable option. This object is used only by
    PIM-DM."
REFERENCE   "RFC 3973 section 4.3.4"
 ::= { pimNeighborEntry 15 }

```

```

--
-- The PIM Neighbor Secondary Address Table
--

```

```
pimNbrSecAddressTable OBJECT-TYPE
```

```

SYNTAX      SEQUENCE OF PimNbrSecAddressEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The (conceptual) table listing the secondary addresses
    advertised by each PIM neighbor (on a subset of the rows of
    the pimNeighborTable defined above)."
REFERENCE   "RFC 4601 section 4.3.4"
 ::= { pim 3 }

```

```
pimNbrSecAddressEntry OBJECT-TYPE
```

```

SYNTAX      PimNbrSecAddressEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) in the pimNbrSecAddressTable."
INDEX       { pimNbrSecAddressIfIndex,
             pimNbrSecAddressType,
             pimNbrSecAddressPrimary,
             pimNbrSecAddress }
 ::= { pimNbrSecAddressTable 1 }

```

```
PimNbrSecAddressEntry ::= SEQUENCE {
```

```

    pimNbrSecAddressIfIndex InterfaceIndex,
    pimNbrSecAddressType   InetAddressType,
    pimNbrSecAddressPrimary InetAddress,
    pimNbrSecAddress       InetAddress
}

pimNbrSecAddressIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The value of ifIndex for the interface used to reach this
        PIM neighbor."
    ::= { pimNbrSecAddressEntry 1 }

pimNbrSecAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of this PIM neighbor."
    ::= { pimNbrSecAddressEntry 2 }

pimNbrSecAddressPrimary OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The primary IP address of this PIM neighbor. The
        InetAddressType is given by the pimNbrSecAddressType
        object."
    ::= { pimNbrSecAddressEntry 3 }

pimNbrSecAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The secondary IP address of this PIM neighbor. The
        InetAddressType is given by the pimNbrSecAddressType
        object."
    ::= { pimNbrSecAddressEntry 4 }

--
-- The PIM (*,G) State Table
--

pimStarGTable OBJECT-TYPE

```

```

SYNTAX      SEQUENCE OF PimStarEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The (conceptual) table listing the non-interface specific
    (*,G) state that PIM has."
REFERENCE   "RFC 4601 section 4.1.3"
 ::= { pim 4 }

```

```

pimStarEntry OBJECT-TYPE
SYNTAX      PimStarEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) in the pimStarGTable."
INDEX       { pimStarGAddressType,
              pimStarGGrpAddress }
 ::= { pimStarGTable 1 }

```

```

PimStarEntry ::= SEQUENCE {
    pimStarGAddressType      InetAddressType,
    pimStarGGrpAddress       InetAddress,
    pimStarGUpTime           TimeTicks,
    pimStarGPimMode          PimMode,
    pimStarGRPAddressType    InetAddressType,
    pimStarGRPAddress        InetAddress,
    pimStarGPimModeOrigin    PimGroupMappingOriginType,
    pimStarGRPIsLocal        TruthValue,
    pimStarGUpstreamJoinState INTEGER,
    pimStarGUpstreamJoinTimer TimeTicks,
    pimStarGUpstreamNeighborType InetAddressType,
    pimStarGUpstreamNeighbor InetAddress,
    pimStarGRPFIIndex        InterfaceIndexOrZero,
    pimStarGRPFPNextHopType  InetAddressType,
    pimStarGRPFPNextHop      InetAddress,
    pimStarGRPFPRouteProtocol IANAipRouteProtocol,
    pimStarGRPFPRouteAddress  InetAddress,
    pimStarGRPFPRoutePrefixLength InetAddressPrefixLength,
    pimStarGRPFPRouteMetricPref Unsigned32,
    pimStarGRPFPRouteMetric  Unsigned32
}

```

```

pimStarGAddressType OBJECT-TYPE
SYNTAX      InetAddressType
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The address type of this multicast group."

```

```
::= { pimStarGEntry 1 }
```

```
pimStarGGrpAddress OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE (4|8|16|20))
```

```
MAX-ACCESS not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The multicast group address. The InetAddressType is given
    by the pimStarGAddressType object."
```

```
::= { pimStarGEntry 2 }
```

```
pimStarGUpTime OBJECT-TYPE
```

```
SYNTAX      TimeTicks
```

```
MAX-ACCESS read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The time since this entry was created by the local router."
```

```
::= { pimStarGEntry 3 }
```

```
pimStarGPimMode OBJECT-TYPE
```

```
SYNTAX      PimMode { asm(3), bidir(4) }
```

```
MAX-ACCESS read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Whether this entry represents an ASM (Any Source Multicast,
    used with PIM-SM) or BIDIR-PIM group."
```

```
::= { pimStarGEntry 4 }
```

```
pimStarGRPAddressType OBJECT-TYPE
```

```
SYNTAX      InetAddressType
```

```
MAX-ACCESS read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The address type of the Rendezvous Point (RP), or
    unknown(0) if the RP address is unknown."
```

```
::= { pimStarGEntry 5 }
```

```
pimStarGRPAddress OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
```

```
MAX-ACCESS read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "The address of the Rendezvous Point (RP) for the group.
```

```
    The InetAddressType is given by the pimStarGRPAddressType."
```

```
::= { pimStarGEntry 6 }
```

```
pimStarGPimModeOrigin OBJECT-TYPE
```

```
SYNTAX      PimGroupMappingOriginType
```

```
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The mechanism by which the PIM mode and RP for the group
    were learned."
 ::= { pimStarGEntry 7 }
```

pimStarGRPIsLocal OBJECT-TYPE

```
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "Whether the local router is the RP for the group."
 ::= { pimStarGEntry 8 }
```

pimStarGUpstreamJoinState OBJECT-TYPE

```
SYNTAX INTEGER {
    notJoined (1),
    joined (2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "Whether the local router should join the RP tree for the
    group. This corresponds to the state of the upstream (*,G)
    state machine in the PIM-SM specification."
REFERENCE "RFC 4601 section 4.5.6"
 ::= { pimStarGEntry 9 }
```

pimStarGUpstreamJoinTimer OBJECT-TYPE

```
SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The time remaining before the local router next sends a
    periodic (*,G) Join message on pimStarGRPFIfIndex. This
    timer is called the (*,G) Upstream Join Timer in the PIM-SM
    specification. This object is zero if the timer is not
    running."
REFERENCE "RFC 4601 section 4.10"
 ::= { pimStarGEntry 10 }
```

pimStarGUpstreamNeighborType OBJECT-TYPE

```
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The primary address type of the upstream neighbor, or
```

unknown(0) if the upstream neighbor address is unknown or is not a PIM neighbor."
 ::= { pimStarGEntry 11 }

pimStarGUpstreamNeighbor OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The primary address of the neighbor on pimStarGRPFIfIndex that the local router is sending periodic (*,G) Join messages to. The InetAddressType is given by the pimStarGUpstreamNeighborType object. This address is called RPF'(*,G) in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.1.6"

::= { pimStarGEntry 12 }

pimStarGRPFIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of ifIndex for the Reverse Path Forwarding (RPF) interface towards the RP, or zero if the RPF interface is unknown."

::= { pimStarGEntry 13 }

pimStarGRPFNextHopType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type of the RPF next hop towards the RP, or unknown(0) if the RPF next hop is unknown."

::= { pimStarGEntry 14 }

pimStarGRPFNextHop OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address of the RPF next hop towards the RP. The InetAddressType is given by the pimStarGRPFNextHopType object. This address is called MRIB.next_hop(RP(G)) in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.5.5"

::= { pimStarGEntry 15 }

```
pimStarGRPFRouteProtocol OBJECT-TYPE
    SYNTAX      IANAipRouteProtocol
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The routing mechanism via which the route used to find the
        RPF interface towards the RP was learned."
    ::= { pimStarEntry 16 }

pimStarGRPFRouteAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (0|4|8|16|20))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The IP address that, when combined with the corresponding
        value of pimStarGRPFRoutePrefixLength, identifies the route
        used to find the RPF interface towards the RP. The
        InetAddressType is given by the pimStarGRPFRNextHopType
        object.

        This address object is only significant up to
        pimStarGRPFRoutePrefixLength bits. The remainder of the
        address bits are zero."
    ::= { pimStarEntry 17 }

pimStarGRPFRoutePrefixLength OBJECT-TYPE
    SYNTAX      InetAddressPrefixLength
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The prefix length that, when combined with the
        corresponding value of pimStarGRPFRouteAddress, identifies
        the route used to find the RPF interface towards the RP.
        The InetAddressType is given by the pimStarGRPFRNextHopType
        object."
    ::= { pimStarEntry 18 }

pimStarGRPFRouteMetricPref OBJECT-TYPE
    SYNTAX      Unsigned32 (0..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The metric preference of the route used to find the RPF
        interface towards the RP."
    ::= { pimStarEntry 19 }

pimStarGRPFRouteMetric OBJECT-TYPE
    SYNTAX      Unsigned32
```

```

MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The routing metric of the route used to find the RPF
    interface towards the RP."
 ::= { pimStarGEntry 20 }

--
-- The PIM (*,G,I) State Table
--

pimStarGITable OBJECT-TYPE
    SYNTAX SEQUENCE OF PimStarGIEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "The (conceptual) table listing the interface-specific (*,G)
        state that PIM has."
    REFERENCE "RFC 4601 section 4.1.3"
    ::= { pim 5 }

pimStarGIEntry OBJECT-TYPE
    SYNTAX PimStarGIEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry (conceptual row) in the pimStarGITable."
    INDEX { pimStarGAddressType,
           pimStarGGrpAddress,
           pimStarGIIfIndex }
    ::= { pimStarGITable 1 }

PimStarGIEntry ::= SEQUENCE {
    pimStarGIIfIndex InterfaceIndex,
    pimStarGIUpTime TimeTicks,
    pimStarGILocalMembership TruthValue,
    pimStarGIJoinPruneState INTEGER,
    pimStarGIPrunePendingTimer TimeTicks,
    pimStarGIJoinExpiryTimer TimeTicks,
    pimStarGIAssertState INTEGER,
    pimStarGIAssertTimer TimeTicks,
    pimStarGIAssertWinnerAddressType InetAddressType,
    pimStarGIAssertWinnerAddress InetAddress,
    pimStarGIAssertWinnerMetricPref Unsigned32,
    pimStarGIAssertWinnerMetric Unsigned32
}

pimStarGIIfIndex OBJECT-TYPE

```

```

SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The ifIndex of the interface that this entry corresponds
    to."
 ::= { pimStarGIEEntry 1 }

```

```

pimStarGIUpTime OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The time since this entry was created by the local router."
 ::= { pimStarGIEEntry 2 }

```

```

pimStarGILocalMembership OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Whether the local router has (*,G) local membership on this
    interface (resulting from a mechanism such as IGMP or MLD).
    This corresponds to local_receiver_include(*,G,I) in the
    PIM-SM specification."
REFERENCE  "RFC 3376, RFC 3810, and RFC 4601 section 4.1.6"
 ::= { pimStarGIEEntry 3 }

```

```

pimStarGIJoinPruneState OBJECT-TYPE
SYNTAX      INTEGER {
                noInfo (1),
                join (2),
                prunePending (3)
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The state resulting from (*,G) Join/Prune messages
    received on this interface. This corresponds to the state
    of the downstream per-interface (*,G) state machine in the
    PIM-SM specification."
REFERENCE  "RFC 4601 section 4.5.2"
 ::= { pimStarGIEEntry 4 }

```

```

pimStarGIPrunePendingTimer OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current

```

DESCRIPTION

"The time remaining before the local router acts on a (*,G) Prune message received on this interface, during which the router is waiting to see whether another downstream router will override the Prune message. This timer is called the (*,G) Prune-Pending Timer in the PIM-SM specification. This object is zero if the timer is not running."

REFERENCE "RFC 4601 section 4.5.1"

::= { pimStarGIEEntry 5 }

pimStarGIJoinExpiryTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time remaining before (*,G) Join state for this interface expires. This timer is called the (*,G) Join Expiry Timer in the PIM-SM specification. This object is zero if the timer is not running. A value of 'FFFFFFFF'h indicates an infinite expiry time."

REFERENCE "RFC 4601 section 4.10"

::= { pimStarGIEEntry 6 }

pimStarGIAssertState OBJECT-TYPE

SYNTAX INTEGER {
 noInfo (1),
 iAmAssertWinner (2),
 iAmAssertLoser (3)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The (*,G) Assert state for this interface. This corresponds to the state of the per-interface (*,G) Assert state machine in the PIM-SM specification. If pimStarGPimMode is 'bidir', this object must be 'noInfo'."

REFERENCE "RFC 4601 section 4.6.2"

::= { pimStarGIEEntry 7 }

pimStarGIAssertTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimStarGIAssertState is 'iAmAssertWinner', this is the time remaining before the local router next sends a (*,G) Assert message on this interface. If pimStarGIAssertState is 'iAmAssertLoser', this is the time remaining before the

(* ,G) Assert state expires. If pimStarGIAssertState is 'noInfo', this is zero. This timer is called the (* ,G) Assert Timer in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.6.2"

::= { pimStarGIEntry 8 }

pimStarGIAssertWinnerAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimStarGIAssertState is 'iAmAssertLoser', this is the address type of the assert winner; otherwise, this object is unknown(0)."

::= { pimStarGIEntry 9 }

pimStarGIAssertWinnerAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimStarGIAssertState is 'iAmAssertLoser', this is the address of the assert winner. The InetAddressType is given by the pimStarGIAssertWinnerAddressType object."

::= { pimStarGIEntry 10 }

pimStarGIAssertWinnerMetricPref OBJECT-TYPE

SYNTAX Unsigned32 (0..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimStarGIAssertState is 'iAmAssertLoser', this is the metric preference of the route to the RP advertised by the assert winner; otherwise, this object is zero."

::= { pimStarGIEntry 11 }

pimStarGIAssertWinnerMetric OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimStarGIAssertState is 'iAmAssertLoser', this is the routing metric of the route to the RP advertised by the assert winner; otherwise, this object is zero."

::= { pimStarGIEntry 12 }

--

-- The PIM (S,G) State Table

--

```
pimSGTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PimSGEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table listing the non-interface specific
        (S,G) state that PIM has."
    REFERENCE  "RFC 4601 section 4.1.4"
    ::= { pim 6 }
```

```
pimSGEntry OBJECT-TYPE
    SYNTAX      PimSGEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (conceptual row) in the pimSGTable."
    INDEX       { pimSGAddressType,
                pimSGGrpAddress,
                pimSGSrcAddress }
    ::= { pimSGTable 1 }
```

```
PimSGEntry ::= SEQUENCE {
    pimSGAddressType      InetAddressType,
    pimSGGrpAddress       InetAddress,
    pimSGSrcAddress       InetAddress,
    pimSGUpTime           TimeTicks,
    pimSGPimMode          PimMode,
    pimSGUpstreamJoinState INTEGER,
    pimSGUpstreamJoinTimer TimeTicks,
    pimSGUpstreamNeighbor InetAddress,
    pimSGRPFFifIndex     InterfaceIndexOrZero,
    pimSGRPFFNextHopType InetAddressType,
    pimSGRPFFNextHop     InetAddress,
    pimSGRPFFRouteProtocol IANAipRouteProtocol,
    pimSGRPFFRouteAddress InetAddress,
    pimSGRPFFRoutePrefixLength InetAddressPrefixLength,
    pimSGRPFFRouteMetricPref Unsigned32,
    pimSGRPFFRouteMetric Unsigned32,
    pimSGSPTBit           TruthValue,
    pimSGKeepaliveTimer   TimeTicks,
    pimSGDRRegisterState  INTEGER,
    pimSGDRRegisterStopTimer TimeTicks,
    pimSGRPRegisterPMBRAAddressType InetAddressType,
    pimSGRPRegisterPMBRAAddress  InetAddress,
    pimSGUpstreamPruneState  INTEGER,
    pimSGUpstreamPruneLimitTimer TimeTicks,
```

```

    pimSGOriginatorState          INTEGER,
    pimSGSourceActiveTimer       TimeTicks,
    pimSGStateRefreshTimer       TimeTicks
}

pimSGAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of the source and multicast group for this
        entry."
    ::= { pimSGEntry 1 }

pimSGGrpAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The multicast group address for this entry.  The
        InetAddressType is given by the pimSGAddressType object."
    ::= { pimSGEntry 2 }

pimSGSrcAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The source address for this entry.  The InetAddressType is
        given by the pimSGAddressType object."
    ::= { pimSGEntry 3 }

pimSGUpTime OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The time since this entry was created by the local router."
    ::= { pimSGEntry 4 }

pimSGPimMode OBJECT-TYPE
    SYNTAX      PimMode { ssm(2), asm(3) }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Whether pimSGGrpAddress is an SSM (Source Specific
        Multicast, used with PIM-SM) or ASM (Any Source Multicast,
        used with PIM-SM) group."

```

REFERENCE "RFC 4601 section 4.5.2, RFC 3569, and
 'IP Multicast MIB' (August 2007) ipMcastSsmRangeTable"
 ::= { pimSGEntry 5 }

pimSGUpstreamJoinState OBJECT-TYPE

SYNTAX INTEGER {
 notJoined (1),
 joined (2)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Whether the local router should join the shortest-path tree for the source and group represented by this entry. This corresponds to the state of the upstream (S,G) state machine in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.5.7"

::= { pimSGEntry 6 }

pimSGUpstreamJoinTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time remaining before the local router next sends a periodic (S,G) Join message on pimSGRPFIfIndex. This timer is called the (S,G) Upstream Join Timer in the PIM-SM specification. This object is zero if the timer is not running."

REFERENCE "RFC 4601 sections 4.10 and 4.11"

::= { pimSGEntry 7 }

pimSGUpstreamNeighbor OBJECT-TYPE

SYNTAX InetAddress (SIZE (4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The primary address of the neighbor on pimSGRPFIfIndex that the local router is sending periodic (S,G) Join messages to. This is zero if the RPF next hop is unknown or is not a PIM neighbor. The InetAddressType is given by the pimSGAddressType object. This address is called RPF'(S,G) in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.1.6"

::= { pimSGEntry 8 }

pimSGRPFIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

```

MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The value of ifIndex for the RPF interface towards the
    source, or zero if the RPF interface is unknown."
 ::= { pimSGEntry 9 }

```

```

pimSGRPFNextHopType OBJECT-TYPE
SYNTAX      InetAddressType
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The address type of the RPF next hop towards the source, or
    unknown(0) if the RPF next hop is unknown."
 ::= { pimSGEntry 10 }

```

```

pimSGRPFNextHop OBJECT-TYPE
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The address of the RPF next hop towards the source.  The
    InetAddressType is given by the pimSGRPFNextHopType.  This
    address is called MRIB.next_hop(S) in the PIM-SM
    specification."
REFERENCE "RFC 4601 section 4.5.5"
 ::= { pimSGEntry 11 }

```

```

pimSGRPFRouteProtocol OBJECT-TYPE
SYNTAX      IANAipRouteProtocol
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The routing mechanism via which the route used to find the
    RPF interface towards the source was learned."
 ::= { pimSGEntry 12 }

```

```

pimSGRPFRouteAddress OBJECT-TYPE
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The IP address that, when combined with the corresponding
    value of pimSGRPFRoutePrefixLength, identifies the route
    used to find the RPF interface towards the source.  The
    InetAddressType is given by the pimSGRPFNextHopType object.

    This address object is only significant up to

```

```
        pimSGRPFRoutePrefixLength bits.  The remainder of the
        address bits are zero."
 ::= { pimSGEntry 13 }
```

```
pimSGRPFRoutePrefixLength OBJECT-TYPE
    SYNTAX      InetAddressPrefixLength
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The prefix length that, when combined with the
        corresponding value of pimSGRPFRouteAddress, identifies the
        route used to find the RPF interface towards the source.
        The InetAddressType is given by the pimSGRPFNextHopType
        object."
 ::= { pimSGEntry 14 }
```

```
pimSGRPFRouteMetricPref OBJECT-TYPE
    SYNTAX      Unsigned32 (0..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The metric preference of the route used to find the RPF
        interface towards the source."
 ::= { pimSGEntry 15 }
```

```
pimSGRPFRouteMetric OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The routing metric of the route used to find the RPF
        interface towards the source."
 ::= { pimSGEntry 16 }
```

```
pimSGSPTBit OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Whether the SPT bit is set; and therefore whether
        forwarding is taking place on the shortest-path tree."
 ::= { pimSGEntry 17 }
```

```
pimSGKeepaliveTimer OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

"The time remaining before this (S,G) state expires, in the absence of explicit (S,G) local membership or (S,G) Join messages received to maintain it. This timer is called the (S,G) Keepalive Timer in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.1.4"

::= { pimSGEntry 18 }

pimSGDRRegisterState OBJECT-TYPE

SYNTAX INTEGER {
noInfo (1),
join (2),
joinPending (3),
prune (4)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Whether the local router should encapsulate (S,G) data packets in Register messages and send them to the RP. This corresponds to the state of the per-(S,G) Register state machine in the PIM-SM specification. This object is always 'noInfo' unless pimSGPimMode is 'asm'."

REFERENCE "RFC 4601 section 4.4.1"

::= { pimSGEntry 19 }

pimSGDRRegisterStopTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimSGDRRegisterState is 'prune', this is the time remaining before the local router sends a Null-Register message to the RP. If pimSGDRRegisterState is 'joinPending', this is the time remaining before the local router resumes encapsulating data packets and sending them to the RP. Otherwise, this is zero. This timer is called the Register-Stop Timer in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.4"

::= { pimSGEntry 20 }

pimSGRPRegisterPMBRAAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address type of the first PIM Multicast Border Router to send a Register message with the Border bit set. This

object is unknown(0) if the local router is not the RP for the group."
 ::= { pimSGEntry 21 }

pimSGRPRegisterPMBRAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|8|16|20))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The IP address of the first PIM Multicast Border Router to send a Register message with the Border bit set. The InetAddressType is given by the pimSGRPRegisterPMBRAddressType object."

::= { pimSGEntry 22 }

pimSGUpstreamPruneState OBJECT-TYPE

SYNTAX INTEGER {
 forwarding (1),
 ackpending (2),
 pruned (3)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Whether the local router has pruned itself from the tree. This corresponds to the state of the upstream prune (S,G) state machine in the PIM-DM specification. This object is used only by PIM-DM."

REFERENCE "RFC 3973 section 4.4.1"

::= { pimSGEntry 23 }

pimSGUpstreamPruneLimitTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time remaining before the local router may send a (S,G) Prune message on pimSGRPFIIndex. This timer is called the (S,G) Prune Limit Timer in the PIM-DM specification. This object is zero if the timer is not running. This object is used only by PIM-DM."

REFERENCE "RFC 2973 section 4.8"

::= { pimSGEntry 24 }

pimSGOriginatorState OBJECT-TYPE

SYNTAX INTEGER {
 notOriginator (1),
 originator (2)
 }

```

    }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "Whether the router is an originator for an (S,G) message
    flow. This corresponds to the state of the per-(S,G)
    Originator state machine in the PIM-DM specification. This
    object is used only by PIM-DM."
REFERENCE "RFC 3973 section 4.5.2"
 ::= { pimSGEntry 25 }

```

pimSGSourceActiveTimer OBJECT-TYPE

```

SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "If pimSGOriginatorState is 'originator', this is the time
    remaining before the local router reverts to a notOriginator
    state. Otherwise, this is zero. This timer is called the
    Source Active Timer in the PIM-DM specification. This
    object is used only by PIM-DM."
REFERENCE "RFC 3973 section 4.8"
 ::= { pimSGEntry 26 }

```

pimSGStateRefreshTimer OBJECT-TYPE

```

SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "If pimSGOriginatorState is 'originator', this is the time
    remaining before the local router sends a State Refresh
    message. Otherwise, this is zero. This timer is called the
    State Refresh Timer in the PIM-DM specification. This
    object is used only by PIM-DM."
REFERENCE "RFC 3973 section 4.8"
 ::= { pimSGEntry 27 }

```

```

--
-- The PIM (S,G,I) State Table
--

```

pimSGITable OBJECT-TYPE

```

SYNTAX SEQUENCE OF PimSGIEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
    "The (conceptual) table listing the interface-specific (S,G)
    state that PIM has."

```

REFERENCE "RFC 4601 section 4.1.4"
 ::= { pim 7 }

pimSGIEntry OBJECT-TYPE

SYNTAX PimSGIEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry (conceptual row) in the pimSGITable."

INDEX { pimSGAddressType,
 pimSGGrpAddress,
 pimSGSrcAddress,
 pimSGIIfIndex }

::= { pimSGITable 1 }

PimSGIEntry ::= SEQUENCE {

pimSGIIfIndex	InterfaceIndex,
pimSGIUpTime	TimeTicks,
pimSGILocalMembership	TruthValue,
pimSGIJoinPruneState	INTEGER,
pimSGIPrunePendingTimer	TimeTicks,
pimSGIJoinExpiryTimer	TimeTicks,
pimSGIAssertState	INTEGER,
pimSGIAssertTimer	TimeTicks,
pimSGIAssertWinnerAddressType	InetAddressType,
pimSGIAssertWinnerAddress	InetAddress,
pimSGIAssertWinnerMetricPref	Unsigned32,
pimSGIAssertWinnerMetric	Unsigned32

}

pimSGIIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"The ifIndex of the interface that this entry corresponds to."

::= { pimSGIEntry 1 }

pimSGIUpTime OBJECT-TYPE

SYNTAX TimeTicks
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The time since this entry was created by the local router."

::= { pimSGIEntry 2 }

pimSGILocalMembership OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Whether the local router has (S,G) local membership on this interface (resulting from a mechanism such as IGMP or MLD).

This corresponds to local_receiver_include(S,G,I) in the PIM-SM specification."

REFERENCE "RFC 3376, RFC 3810, RFC 4601 sections 4.1.6, 4.6.1, and 4.6.2"

::= { pimSGIEntry 3 }

pimSGIJoinPruneState OBJECT-TYPE

SYNTAX INTEGER {
 noInfo (1),
 join (2),
 prunePending (3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The state resulting from (S,G) Join/Prune messages received on this interface. This corresponds to the state of the downstream per-interface (S,G) state machine in the PIM-SM and PIM-DM specification."

REFERENCE "RFC 4601 section 4.5.3 and RFC 3973 section 4.4.2"

::= { pimSGIEntry 4 }

pimSGIPrunePendingTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time remaining before the local router acts on an (S,G) Prune message received on this interface, during which the router is waiting to see whether another downstream router will override the Prune message. This timer is called the (S,G) Prune-Pending Timer in the PIM-SM specification. This object is zero if the timer is not running."

REFERENCE "RFC 4601 sections 4.5.3 and 4.5.4"

::= { pimSGIEntry 5 }

pimSGIJoinExpiryTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time remaining before (S,G) Join state for this

interface expires. This timer is called the (S,G) Join Expiry Timer in the PIM-SM specification. This object is zero if the timer is not running. A value of 'FFFFFFFF'h indicates an infinite expiry time. This timer is called the (S,G) Prune Timer in the PIM-DM specification."

REFERENCE "RFC 4601 section 4.10 and RFC 3973 section 4.8"

::= { pimSGIEntry 6 }

pimSGIAssertState OBJECT-TYPE

SYNTAX INTEGER {
noInfo (1),
iAmAssertWinner (2),
iAmAssertLoser (3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The (S,G) Assert state for this interface. This corresponds to the state of the per-interface (S,G) Assert state machine in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.6.1"

::= { pimSGIEntry 7 }

pimSGIAssertTimer OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimSGIAssertState is 'iAmAssertWinner', this is the time remaining before the local router next sends a (S,G) Assert message on this interface. If pimSGIAssertState is 'iAmAssertLoser', this is the time remaining before the (S,G) Assert state expires. If pimSGIAssertState is 'noInfo', this is zero. This timer is called the (S,G) Assert Timer in the PIM-SM specification."

REFERENCE "RFC 4601 section 4.6.1"

::= { pimSGIEntry 8 }

pimSGIAssertWinnerAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pimSGIAssertState is 'iAmAssertLoser', this is the address type of the assert winner; otherwise, this object is unknown(0)."

::= { pimSGIEntry 9 }

```
pimSGIAssertWinnerAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (0|4|8|16|20))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If pimSGIAssertState is 'iAmAssertLoser', this is the
         address of the assert winner. The InetAddressType is given
         by the pimSGIAssertWinnerAddressType object."
    ::= { pimSGIEntry 10 }
```

```
pimSGIAssertWinnerMetricPref OBJECT-TYPE
    SYNTAX      Unsigned32 (0..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If pimSGIAssertState is 'iAmAssertLoser', this is the
         metric preference of the route to the source advertised by
         the assert winner; otherwise, this object is zero."
    ::= { pimSGIEntry 11 }
```

```
pimSGIAssertWinnerMetric OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If pimSGIAssertState is 'iAmAssertLoser', this is the
         routing metric of the route to the source advertised by the
         assert winner; otherwise, this object is zero."
    ::= { pimSGIEntry 12 }
```

```
--
-- The PIM (S,G,rpt) State Table
--
```

```
pimSGRptTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PimSGRptEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table listing the non-interface specific
         (S,G,rpt) state that PIM has."
    REFERENCE  "RFC 4601 section 4.1.5"
    ::= { pim 8 }
```

```
pimSGRptEntry OBJECT-TYPE
    SYNTAX      PimSGRptEntry
    MAX-ACCESS  not-accessible
    STATUS      current
```

DESCRIPTION

"An entry (conceptual row) in the pimSGRptTable."

```
INDEX      { pimStarGAddressType,
             pimStarGGrpAddress,
             pimSGRptSrcAddress }
 ::= { pimSGRptTable 1 }
```

```
PimSGRptEntry ::= SEQUENCE {
    pimSGRptSrcAddress      InetAddress,
    pimSGRptUpTime         TimeTicks,
    pimSGRptUpstreamPruneState  INTEGER,
    pimSGRptUpstreamOverrideTimer  TimeTicks
}
```

pimSGRptSrcAddress OBJECT-TYPE

```
SYNTAX      InetAddress (SIZE (4|8|16|20))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

"The source address for this entry. The InetAddressType is given by the pimStarGAddressType object."

```
 ::= { pimSGRptEntry 1 }
```

pimSGRptUpTime OBJECT-TYPE

```
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

"The time since this entry was created by the local router."

```
 ::= { pimSGRptEntry 2 }
```

pimSGRptUpstreamPruneState OBJECT-TYPE

```
SYNTAX      INTEGER {
             rptNotJoined (1),
             pruned (2),
             notPruned (3)
             }
```

```
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

"Whether the local router should prune the source off the RP tree. This corresponds to the state of the upstream (S,G,rpt) state machine for triggered messages in the PIM-SM specification."

```
REFERENCE "RFC 4601 section 4.5.9"
 ::= { pimSGRptEntry 3 }
```

pimSGRptUpstreamOverrideTimer OBJECT-TYPE

```

SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The time remaining before the local router sends a
    triggered (S,G,rpt) Join message on pimStarGRPFIfIndex.
    This timer is called the (S,G,rpt) Upstream Override Timer
    in the PIM-SM specification.  This object is zero if the
    timer is not running."
REFERENCE "RFC 4601 section 4.5.9"
 ::= { pimSGRptEntry 4 }

```

```

--
-- The PIM (S,G,rpt,I) State Table
--

```

```

pimSGRptITable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PimSGRptIEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table listing the interface-specific
        (S,G,rpt) state that PIM has."
    REFERENCE "RFC 4601 section 4.1.5"
    ::= { pim 9 }

```

```

pimSGRptIEntry OBJECT-TYPE
    SYNTAX      PimSGRptIEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry (conceptual row) in the pimSGRptITable."
    INDEX       { pimStarGAddressType,
                 pimStarGGrpAddress,
                 pimSGRptSrcAddress,
                 pimSGRptIIfIndex }
    ::= { pimSGRptITable 1 }

```

```

PimSGRptIEntry ::= SEQUENCE {
    pimSGRptIIfIndex      InterfaceIndex,
    pimSGRptIUpTime       TimeTicks,
    pimSGRptILocalMembership TruthValue,
    pimSGRptIJoinPruneState INTEGER,
    pimSGRptIPrunePendingTimer TimeTicks,
    pimSGRptIPruneExpiryTimer TimeTicks
}

```

```

pimSGRptIIfIndex OBJECT-TYPE

```

```

SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The ifIndex of the interface that this entry corresponds
    to."
 ::= { pimSGRptIEntry 1 }

```

```

pimSGRptIUpTime OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The time since this entry was created by the local router."
 ::= { pimSGRptIEntry 2 }

```

```

pimSGRptILocalMembership OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Whether the local router has both (*,G) include local
    membership and (S,G) exclude local membership on this
    interface (resulting from a mechanism such as IGMP or MLD).
    This corresponds to local_receiver_exclude(S,G,I) in the
    PIM-SM specification."
REFERENCE  "RFC 3376, RFC 3810, RFC 4601 section 4.1.6"
 ::= { pimSGRptIEntry 3 }

```

```

pimSGRptIJoinPruneState OBJECT-TYPE
SYNTAX      INTEGER {
                noInfo (1),
                prune (2),
                prunePending (3)
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The state resulting from (S,G,rpt) Join/Prune messages
    received on this interface. This corresponds to the state
    of the downstream per-interface (S,G,rpt) state machine in
    the PIM-SM specification."
REFERENCE  "RFC 4601 section 4.5.4"
 ::= { pimSGRptIEntry 4 }

```

```

pimSGRptIPrunePendingTimer OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only

```

```

STATUS      current
DESCRIPTION
    "The time remaining before the local router starts pruning
    this source off the RP tree.  This timer is called the
    (S,G,rpt) Prune-Pending Timer in the PIM-SM specification.
    This object is zero if the timer is not running."
REFERENCE "RFC 4601 section 4.5.4"
 ::= { pimSGRptIEntry 5 }

```

```

pimSGRptIPruneExpiryTimer OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The time remaining before (S,G,rpt) Prune state for this
    interface expires.  This timer is called the (S,G,rpt)
    Prune Expiry Timer in the PIM-SM specification.  This object
    is zero if the timer is not running.  A value of 'FFFFFFFF'h
    indicates an infinite expiry time."
REFERENCE "RFC 4601 section 4.5.4"
 ::= { pimSGRptIEntry 6 }

```

```

--
-- The PIM Bidir DF-Election Table
--

```

```

pimBidirDFElectionTable OBJECT-TYPE
SYNTAX      SEQUENCE OF PimBidirDFElectionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The (conceptual) table listing the per-RP Designated
    Forwarder (DF) Election state for each interface for all the
    RPs in BIDIR mode."
REFERENCE "RFC 5015 section 3.5"
 ::= { pim 10 }

```

```

pimBidirDFElectionEntry OBJECT-TYPE
SYNTAX      PimBidirDFElectionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) in the pimBidirDFElectionTable."
INDEX       { pimBidirDFElectionAddressType,
             pimBidirDFElectionRPAddress,
             pimBidirDFElectionIfIndex }
 ::= { pimBidirDFElectionTable 1 }

```

```

PimBidirDFElectionEntry ::= SEQUENCE {
    pimBidirDFElectionAddressType      InetAddressType,
    pimBidirDFElectionRPAddress        InetAddress,
    pimBidirDFElectionIfIndex          InterfaceIndex,
    pimBidirDFElectionWinnerAddressType InetAddressType,
    pimBidirDFElectionWinnerAddress    InetAddress,
    pimBidirDFElectionWinnerUpTime     TimeTicks,
    pimBidirDFElectionWinnerMetricPref Unsigned32,
    pimBidirDFElectionWinnerMetric     Unsigned32,
    pimBidirDFElectionState            INTEGER,
    pimBidirDFElectionStateTimer       TimeTicks
}

pimBidirDFElectionAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of the RP for which the DF state is being
        maintained."
    ::= { pimBidirDFElectionEntry 1 }

pimBidirDFElectionRPAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IP address of the RP for which the DF state is being
        maintained. The InetAddressType is given by the
        pimBidirDFElectionAddressType object."
    ::= { pimBidirDFElectionEntry 2 }

pimBidirDFElectionIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The value of ifIndex for the interface for which the DF
        state is being maintained."
    ::= { pimBidirDFElectionEntry 3 }

pimBidirDFElectionWinnerAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The primary address type of the winner of the DF Election
        process. A value of unknown(0) indicates there is currently

```

```

        no DF."
 ::= { pimBidirDFElectionEntry 4 }

pimBidirDFElectionWinnerAddress OBJECT-TYPE
SYNTAX      InetAddress (SIZE (0|4|8|16|20))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The primary IP address of the winner of the DF Election
    process. The InetAddressType is given by the
    pimBidirDFElectionWinnerAddressType object."
 ::= { pimBidirDFElectionEntry 5 }

pimBidirDFElectionWinnerUpTime OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The time since the current winner (last) became elected as
    the DF for this RP."
 ::= { pimBidirDFElectionEntry 6 }

pimBidirDFElectionWinnerMetricPref OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The metric preference advertised by the DF Winner, or zero
    if there is currently no DF."
 ::= { pimBidirDFElectionEntry 7 }

pimBidirDFElectionWinnerMetric OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The metric advertised by the DF Winner, or zero if there is
    currently no DF."
 ::= { pimBidirDFElectionEntry 8 }

pimBidirDFElectionState OBJECT-TYPE
SYNTAX      INTEGER {
                dfOffer(1),
                dfLose(2),
                dfWinner(3),
                dfBackoff(4)
            }
MAX-ACCESS  read-only

```

```

STATUS      current
DESCRIPTION
    "The state of this interface with respect to DF-Election for
    this RP. The states correspond to the ones defined in the
    BIDIR-PIM specification."
REFERENCE "RFC 5015 section 3.5.3.1"
 ::= { pimBidirDFElectionEntry 9 }

```

```

pimBidirDFElectionStateTimer OBJECT-TYPE
SYNTAX      TimeTicks
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The minimum time remaining after which the local router
    will expire the current DF state represented by
    pimBidirDFElectionState."
 ::= { pimBidirDFElectionEntry 10 }

```

```

--
-- The PIM Static RP Table
--

```

```

pimStaticRPTable OBJECT-TYPE
SYNTAX      SEQUENCE OF PimStaticRPEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "This table is used to manage static configuration of RPs.

    If the group prefixes configured for two or more rows in
    this table overlap, the row with the greatest value of
    pimStaticRPGrpPrefixLength is used for the overlapping
    range."
REFERENCE "RFC 4601 section 3.7"
 ::= { pim 11 }

```

```

pimStaticRPEntry OBJECT-TYPE
SYNTAX      PimStaticRPEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) in the pimStaticRPTable. This
    entry is preserved on agent restart."
INDEX       { pimStaticRPAddressType,
             pimStaticRPGrpAddress,
             pimStaticRPGrpPrefixLength }
 ::= { pimStaticRPTable 1 }

```

```

PimStaticRPEntry ::= SEQUENCE {
    pimStaticRPAddressType      InetAddressType,
    pimStaticRPGrpAddress       InetAddress,
    pimStaticRPGrpPrefixLength  InetAddressPrefixLength,
    pimStaticRPPAddress         InetAddress,
    pimStaticRPPimMode          PimMode,
    pimStaticRPOverrideDynamic  TruthValue,
    pimStaticRPPrecedence       Unsigned32,
    pimStaticRPRowStatus        RowStatus,
    pimStaticRPStorageType      StorageType
}

```

```

pimStaticRPAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of this entry."
    ::= { pimStaticRPEntry 1 }

```

```

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

        This address object is only significant up to
        pimStaticRPGrpPrefixLength bits. The remainder of the
        address bits are zero. This is especially important for
        this index field, which is part of the index of this entry.
        Any non-zero bits would signify an entirely different
        entry."
    ::= { pimStaticRPEntry 2 }

```

```

pimStaticRPGrpPrefixLength OBJECT-TYPE
    SYNTAX      InetAddressPrefixLength (4..128)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The multicast group prefix length that, when combined
        with pimStaticRPGrpAddress, gives the group prefix for this
        entry. The InetAddressType is given by the
        pimStaticRPAddressType object. If pimStaticRPAddressType is
        'ipv4' or 'ipv4z', this object must be in the range 4..32.

```

If pimStaticRPGrpAddressType is 'ipv6' or 'ipv6z', this object must be in the range 8..128."

```
::= { pimStaticRPEntry 3 }
```

pimStaticRPRPAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE (4|8|16|20))

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The IP address of the RP to be used for groups within this group prefix. The InetAddressType is given by the pimStaticRPAddressType object."

```
::= { pimStaticRPEntry 4 }
```

pimStaticRPPimMode OBJECT-TYPE

SYNTAX PimMode { ssm(2), asm(3), bidir(4) }

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The PIM mode to be used for groups in this group prefix.

If this object is set to ssm(2), then pimStaticRPRPAddress must be set to zero. No RP operations are ever possible for PIM Mode SSM."

REFERENCE "RFC 4601 section 3.7, RFC 3569, and 'IP Multicast MIB' (August 2007) ipMcastSsmRangeTable"

DEFVAL { asm }

```
::= { pimStaticRPEntry 5 }
```

pimStaticRPOVERRIDEDynamic OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Whether this static RP configuration will override other group mappings in this group prefix. If this object is TRUE, then it will override:

- RP information learned dynamically for groups in this group prefix.

- RP information configured in pimStaticRPTable with pimStaticRPOVERRIDEDynamic set to FALSE.

See pimGroupMappingTable for details."

DEFVAL { false }

```
::= { pimStaticRPEntry 6 }
```

pimStaticRPPrecedence OBJECT-TYPE

SYNTAX Unsigned32
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"The value for pimGroupMappingPrecedence to be used for this static RP configuration. This allows fine control over which configuration is overridden by this static configuration.

If pimStaticRPOverrideDynamic is set to TRUE, all dynamic RP configuration is overridden by this static configuration, whatever the value of this object.

The absolute values of this object have a significance only on the local router and do not need to be coordinated with other routers. A setting of this object may have different effects when applied to other routers.

Do not use this object unless fine control of static RP behavior on the local router is required."

::= { pimStaticRPEntry 7 }

pimStaticRPRowStatus OBJECT-TYPE

SYNTAX RowStatus
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"The status of this row, by which rows in this table can be created and destroyed.

This status object cannot be set to active(1) before a valid value has been written to pimStaticRPRPAddress.

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

::= { pimStaticRPEntry 8 }

pimStaticRPStorageType 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 }

::= { pimStaticRPEntry 9 }

```
--
-- The PIM Anycast-RP Set Table
--
```

```
pimAnycastRPSetTable OBJECT-TYPE
```

```
SYNTAX SEQUENCE OF PimAnycastRPSetEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

"This table is used to manage Anycast-RP via PIM Register messages, as opposed to via other protocols such as MSDP (Multicast Source Discovery Protocol).

Entries must be configured in this table if and only if the local router is a member of one or more Anycast-RP sets, that is, one or more Anycast-RP addresses are assigned to the local router. Note that if using static RP configuration, this is in addition to, not instead of, the pimStaticRPTable entries that must be configured for the Anycast-RPs.

The set of rows with the same values of both pimAnycastRPSetAddressType and pimAnycastRPSetAnycastAddress corresponds to the Anycast-RP set for that Anycast-RP address.

When an Anycast-RP set configuration is active, one entry per pimAnycastRPSetAnycastAddress corresponds to the local router. The local router is identified by the pimAnycastRpSetLocalRouter object. That entry determines the source address used by the local router when forwarding PIM Register messages within the Anycast-RP set."

```
REFERENCE "RFC 4610, RFC 3618"
```

```
::= { pim 12 }
```

```
pimAnycastRPSetEntry OBJECT-TYPE
```

```
SYNTAX PimAnycastRPSetEntry
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

"An entry corresponds to a single router within a particular Anycast-RP set. This entry is preserved on agent restart."

```
INDEX { pimAnycastRPSetAddressType,
        pimAnycastRPSetAnycastAddress,
        pimAnycastRPSetRouterAddress }
```

```
::= { pimAnycastRPSetTable 1 }
```

```
PimAnycastRPSetEntry ::= SEQUENCE {
```

```

    pimAnycastRPSetAddressType      InetAddressType,
    pimAnycastRPSetAnycastAddress   InetAddress,
    pimAnycastRPSetRouterAddress    InetAddress,
    pimAnycastRPSetLocalRouter      TruthValue,
    pimAnycastRPSetRowStatus        RowStatus,
    pimAnycastRPSetStorageType      StorageType
}

pimAnycastRPSetAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of the Anycast-RP address and router
        address."
    ::= { pimAnycastRPSetEntry 1 }

pimAnycastRPSetAnycastAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The Anycast-RP address.  The InetAddressType is given by
        the pimAnycastRPSetAddressType object."
    ::= { pimAnycastRPSetEntry 2 }

pimAnycastRPSetRouterAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (4|8|16|20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address of a router that is a member of the Anycast-RP
        set.  The InetAddressType is given by the
        pimAnycastRPSetAddressType object.

        This address differs from pimAnycastRPSetAnycastAddress.
        Equal values for these two addresses in a single entry are
        not permitted.  That would cause a Register loop."
    ::= { pimAnycastRPSetEntry 3 }

pimAnycastRPSetLocalRouter OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Whether this entry corresponds to the local router."
    ::= { pimAnycastRPSetEntry 4 }

```

pimAnycastRPSetRowStatus OBJECT-TYPE

SYNTAX RowStatus
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION

"The status of this row, by which rows in this table can be created and destroyed.

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

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

::= { pimAnycastRPSetEntry 5 }

pimAnycastRPSetStorageType 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 }

::= { pimAnycastRPSetEntry 6 }

--

-- The PIM Group Mapping Table

--

pimGroupMappingTable OBJECT-TYPE

SYNTAX SEQUENCE OF PimGroupMappingEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"The (conceptual) table listing mappings from multicast group prefixes to the PIM mode and RP address to use for groups within that group prefix.

Rows in this table are created for a variety of reasons, indicated by the value of the pimGroupMappingOrigin object.

- Rows with a pimGroupMappingOrigin value of 'fixed' are created automatically by the router at startup, to correspond to the well-defined prefixes of link-local and unroutable group addresses. These rows are never destroyed.

- Rows with a pimGroupMappingOrigin value of 'embedded' are created by the router to correspond to group prefixes that are to be treated as being in Embedded-RP format.
- Rows with a pimGroupMappingOrigin value of 'configRp' are created and destroyed as a result of rows in the pimStaticRPTable being created and destroyed.
- Rows with a pimGroupMappingOrigin value of 'configSsm' are created and destroyed as a result of configuration of SSM address ranges to the local router.
- Rows with a pimGroupMappingOrigin value of 'bsr' are created as a result of running the PIM Bootstrap Router (BSR) mechanism. If the local router is not the elected BSR, these rows are created to correspond to group prefixes in the PIM Bootstrap messages received from the elected BSR. If the local router is the elected BSR, these rows are created to correspond to group prefixes in the PIM Bootstrap messages that the local router sends. In either case, these rows are destroyed when the group prefixes are timed out by the BSR mechanism.
- Rows with a pimGroupMappingOrigin value of 'other' are created and destroyed according to some other mechanism not specified here.

Given the collection of rows in this table at any point in time, the PIM mode and RP address to use for a particular group is determined using the following algorithm.

1. From the set of all rows, the subset whose group prefix contains the group in question are selected.
2. If there are no such rows, then the group mapping is undefined.
3. If there are multiple selected rows, and a subset is defined by pimStaticRPTable (pimGroupMappingOrigin value of 'configRp') with pimStaticRPOverrideDynamic set to TRUE, then this subset is selected.
4. From the selected subset of rows, the subset that have the greatest value of pimGroupMappingGrpPrefixLength are selected.
5. If there are still multiple selected rows, the subset that has the highest precedence (the lowest numerical

value for pimGroupMappingPrecedence) is selected.

6. If there are still multiple selected rows, the row selected is implementation dependent; the implementation might or might not apply the PIM hash function to select the row.
7. The group mode to use is given by the value of pimGroupMappingPimMode from the single selected row; the RP to use is given by the value of pimGroupMappingRPAddress, unless pimGroupMappingOrigin is 'embedded', in which case, the RP is extracted from the group address in question."

REFERENCE "RFC 4601 section 3.7, RFC 3956, and RFC 4610"

::= { pim 13 }

pimGroupMappingEntry OBJECT-TYPE

SYNTAX PimGroupMappingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) in the pimGroupMappingTable."

INDEX { pimGroupMappingOrigin,
pimGroupMappingAddressType,
pimGroupMappingGrpAddress,
pimGroupMappingGrpPrefixLength,
pimGroupMappingRPAddressType,
pimGroupMappingRPAddress }

::= { pimGroupMappingTable 1 }

PimGroupMappingEntry ::= SEQUENCE {

pimGroupMappingOrigin PimGroupMappingOriginType,

pimGroupMappingAddressType InetAddressType,

pimGroupMappingGrpAddress InetAddress,

pimGroupMappingGrpPrefixLength InetAddressPrefixLength,

pimGroupMappingRPAddressType InetAddressType,

pimGroupMappingRPAddress InetAddress,

pimGroupMappingPimMode PimMode,

pimGroupMappingPrecedence Unsigned32

}

pimGroupMappingOrigin OBJECT-TYPE

SYNTAX PimGroupMappingOriginType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The mechanism by which this group mapping was learned."

::= { pimGroupMappingEntry 1 }

pimGroupMappingAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The address type of the IP multicast group prefix."

::= { pimGroupMappingEntry 2 }

pimGroupMappingGrpAddress 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 pimGroupMappingGrpPrefixLength, gives the group prefix for this mapping. The InetAddressType is given by the pimGroupMappingAddressType object.

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

::= { pimGroupMappingEntry 3 }

pimGroupMappingGrpPrefixLength OBJECT-TYPE

SYNTAX InetAddressPrefixLength (4..128)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The multicast group prefix length that, when combined with pimGroupMappingGrpAddress, gives the group prefix for this mapping. The InetAddressType is given by the pimGroupMappingAddressType object. If pimGroupMappingAddressType is 'ipv4' or 'ipv4z', this object must be in the range 4..32. If pimGroupMappingAddressType is 'ipv6' or 'ipv6z', this object must be in the range 8..128."

::= { pimGroupMappingEntry 4 }

pimGroupMappingRPAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The address type of the RP to be used for groups within this group prefix, or unknown(0) if no RP is to be used or

if the RP address is unknown. This object must be unknown(0) if pimGroupMappingPimMode is ssm(2), or if pimGroupMappingOrigin is embedded(6)."

```
::= { pimGroupMappingEntry 5 }
```

```
pimGroupMappingRPAddress OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE (0|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 pimGroupMappingRPAddressType object."

```
::= { pimGroupMappingEntry 6 }
```

```
pimGroupMappingPimMode OBJECT-TYPE
```

```
SYNTAX      PimMode
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

"The PIM mode to be used for groups in this group prefix."

```
::= { pimGroupMappingEntry 7 }
```

```
pimGroupMappingPrecedence OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

"The precedence of this row, used in the algorithm that determines which row applies to a given group address (described above). Numerically higher values for this object indicate lower precedences, with the value zero denoting the highest precedence.

The absolute values of this object have a significance only on the local router and do not need to be coordinated with other routers."

```
::= { pimGroupMappingEntry 8 }
```

```
--
```

```
-- PIM Notifications
```

```
--
```

```
pimNeighborLoss NOTIFICATION-TYPE
```

```
OBJECTS { pimNeighborUpTime }
```

```
STATUS      current
```

```
DESCRIPTION
```

"A pimNeighborLoss notification signifies the loss of an

adjacency with a neighbor. This notification should be generated when the neighbor timer expires, and the router has no other neighbors on the same interface with the same IP version and a lower IP address than itself.

This notification is generated whenever the counter `pimNeighborLossCount` is incremented, subject to the rate limit specified by `pimNeighborLossNotificationPeriod`."

REFERENCE "RFC 4601 section 4.3.2"

::= { pimNotifications 1 }

`pimInvalidRegister` NOTIFICATION-TYPE

OBJECTS { `pimGroupMappingPimMode`,
`pimInvalidRegisterAddressType`,
`pimInvalidRegisterOrigin`,
`pimInvalidRegisterGroup`,
`pimInvalidRegisterRp`
}

STATUS current

DESCRIPTION

"A `pimInvalidRegister` notification signifies that an invalid PIM Register message was received by this device.

This notification is generated whenever the counter `pimInvalidRegisterMsgsRcvd` is incremented, subject to the rate limit specified by `pimInvalidRegisterNotificationPeriod`."

REFERENCE "RFC 4601 section 4.4.2"

::= { pimNotifications 2 }

`pimInvalidJoinPrune` NOTIFICATION-TYPE

OBJECTS { `pimGroupMappingPimMode`,
`pimInvalidJoinPruneAddressType`,
`pimInvalidJoinPruneOrigin`,
`pimInvalidJoinPruneGroup`,
`pimInvalidJoinPruneRp`,
`pimNeighborUpTime`
}

STATUS current

DESCRIPTION

"A `pimInvalidJoinPrune` notification signifies that an invalid PIM Join/Prune message was received by this device.

This notification is generated whenever the counter `pimInvalidJoinPruneMsgsRcvd` is incremented, subject to the rate limit specified by `pimInvalidJoinPruneNotificationPeriod`."

REFERENCE "RFC 4601 section 4.5.2"
 ::= { pimNotifications 3 }

pimRPMappingChange NOTIFICATION-TYPE
 OBJECTS { pimGroupMappingPimMode,
 pimGroupMappingPrecedence
 }

STATUS current

DESCRIPTION

"A pimRPMappingChange notification signifies a change to the active RP mapping on this device.

This notification is generated whenever the counter pimRPMappingChangeCount is incremented, subject to the rate limit specified by pimRPMappingChangeNotificationPeriod."

::= { pimNotifications 4 }

pimInterfaceElection NOTIFICATION-TYPE

OBJECTS { pimInterfaceAddressType,
 pimInterfaceAddress }

STATUS current

DESCRIPTION

"A pimInterfaceElection notification signifies that a new DR or DF has been elected on a network.

This notification is generated whenever the counter pimInterfaceElectionWinCount is incremented, subject to the rate limit specified by pimInterfaceElectionNotificationPeriod."

REFERENCE "RFC 4601 section 4.3.2 and RFC 5015 section 3.5.2"

::= { pimNotifications 5 }

--

-- Conformance Information

--

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

--

-- Compliance Statements

--

pimMIBComplianceAsm MODULE-COMPLIANCE

STATUS current

DESCRIPTION

```
        "The compliance statement for routers which are running
        PIM-SM (Sparse Mode)."
```

```
MODULE -- this module
MANDATORY-GROUPS { pimTopologyGroup,
                    pimSsmGroup,
                    pimRPConfigGroup,
                    pimSmGroup }
```

```
GROUP pimNotificationGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimTuningParametersGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimRouterStatisticsGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimAnycastRpGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimStaticRPPrecedenceGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimNetMgmtNotificationObjects
DESCRIPTION
    "This group is optional."
```

```
GROUP pimNetMgmtNotificationGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimDiagnosticsGroup
DESCRIPTION
    "This group is optional."
```

```
GROUP pimDeviceStorageGroup
DESCRIPTION
    "This group is optional."
```

```
::= { pimMIBCompliances 1 }
```

```
pimMIBComplianceBidir MODULE-COMPLIANCE
STATUS current
```

DESCRIPTION

"The compliance statement for routers which are running Bidir-PIM."

MODULE -- this module

MANDATORY-GROUPS { pimTopologyGroup,
pimRPConfigGroup,
pimSmGroup,
pimBidirGroup }

GROUP pimNotificationGroup

DESCRIPTION

"This group is optional."

GROUP pimTuningParametersGroup

DESCRIPTION

"This group is optional."

GROUP pimRouterStatisticsGroup

DESCRIPTION

"This group is optional."

GROUP pimAnycastRpGroup

DESCRIPTION

"This group is optional."

GROUP pimStaticRPPrecedenceGroup

DESCRIPTION

"This group is optional."

GROUP pimNetMgmtNotificationObjects

DESCRIPTION

"This group is optional."

GROUP pimNetMgmtNotificationGroup

DESCRIPTION

"This group is optional."

GROUP pimDiagnosticsGroup

DESCRIPTION

"This group is optional."

GROUP pimDeviceStorageGroup

DESCRIPTION

"This group is optional."

::= { pimMIBCompliances 2 }

pimMIBComplianceSsm MODULE-COMPLIANCE

```

STATUS    current
DESCRIPTION
    "The compliance statement for routers which are running
    PIM SSM (Source Specific Multicast)."
```

```

MODULE    -- this module
MANDATORY-GROUPS { pimTopologyGroup,
                    pimSsmGroup }
```

```

GROUP    pimNotificationGroup
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimTuningParametersGroup
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimRouterStatisticsGroup
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimNetMgmtNotificationObjects
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimNetMgmtNotificationGroup
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimDiagnosticsGroup
DESCRIPTION
    "This group is optional."
```

```

GROUP    pimDeviceStorageGroup
DESCRIPTION
    "This group is optional."
```

```
 ::= { pimMIBCompliances 3 }
```

```

pimMIBComplianceDm MODULE-COMPLIANCE
STATUS    current
DESCRIPTION
    "The compliance statement for routers which are running
    PIM-DM (Dense Mode)."
```

```

MODULE    -- this module
MANDATORY-GROUPS { pimTopologyGroup,
                    pimSsmGroup,
                    pimRPConfigGroup,
                    pimSmGroup,
```

```

        pimDmGroup }

GROUP    pimNotificationGroup
DESCRIPTION
    "This group is optional."

GROUP    pimTuningParametersGroup
DESCRIPTION
    "This group is optional."

GROUP    pimRouterStatisticsGroup
DESCRIPTION
    "This group is optional."

GROUP    pimAnycastRpGroup
DESCRIPTION
    "This group is optional."

GROUP    pimStaticRPPrecedenceGroup
DESCRIPTION
    "This group is optional."

GROUP    pimNetMgmtNotificationObjects
DESCRIPTION
    "This group is optional."

GROUP    pimNetMgmtNotificationGroup
DESCRIPTION
    "This group is optional."

GROUP    pimDiagnosticsGroup
DESCRIPTION
    "This group is optional."

GROUP    pimDeviceStorageGroup
DESCRIPTION
    "This group is optional."

 ::= { pimMIBCompliances 4 }

--
-- Units of Conformance
--

pimTopologyGroup OBJECT-GROUP
    OBJECTS { pimInterfaceAddressType,
              pimInterfaceAddress,
              pimInterfaceGenerationIDValue,

```

```

        pimInterfaceDR,
        pimInterfaceDRPriorityEnabled,
        pimInterfaceHelloHoldtime,
        pimInterfaceJoinPruneHoldtime,
        pimInterfaceLanDelayEnabled,
        pimInterfaceEffectPropagDelay,
        pimInterfaceEffectOverrideIvl,
        pimInterfaceSuppressionEnabled,
        pimInterfaceBidirCapable,
        pimNeighborGenerationIDPresent,
        pimNeighborGenerationIDValue,
        pimNeighborUpTime,
        pimNeighborExpiryTime,
        pimNeighborDRPriorityPresent,
        pimNeighborDRPriority,
        pimNeighborLanPruneDelayPresent,
        pimNeighborTBit,
        pimNeighborPropagationDelay,
        pimNeighborOverrideInterval,
        pimNeighborBidirCapable,
        pimNbrSecAddress
    }
    STATUS current
    DESCRIPTION
        "A collection of read-only objects used to report local PIM
        topology."
    ::= { pimMIBGroups 1 }

pimNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { pimNeighborLoss }
    STATUS current
    DESCRIPTION
        "A collection of notifications for signaling important PIM
        events."
    ::= { pimMIBGroups 2 }

pimTuningParametersGroup OBJECT-GROUP
    OBJECTS { pimKeepalivePeriod,
        pimRegisterSuppressionTime,
        pimInterfaceDRPriority,
        pimInterfaceHelloInterval,
        pimInterfaceTrigHelloInterval,
        pimInterfaceJoinPruneInterval,
        pimInterfacePropagationDelay,
        pimInterfaceOverrideInterval,
        pimInterfaceDomainBorder,
        pimInterfaceStubInterface,
        pimInterfaceStatus,
    }

```

```

        pimInterfaceStorageType
    }
STATUS current
DESCRIPTION
    "A collection of writeable objects used to configure PIM
    behavior and to tune performance."
 ::= { pimMIBGroups 3 }

pimRouterStatisticsGroup OBJECT-GROUP
OBJECTS { pimStarGEntries,
          pimStarGIEntries,
          pimSGEntries,
          pimSGIEntries,
          pimSGRptEntries,
          pimSGRptIEntries
        }
STATUS current
DESCRIPTION
    "A collection of statistics global to the PIM router."
 ::= { pimMIBGroups 4 }

pimSsmGroup OBJECT-GROUP
OBJECTS { pimSGUpTime,
          pimSGPimMode,
          pimSGUpstreamJoinState,
          pimSGUpstreamJoinTimer,
          pimSGUpstreamNeighbor,
          pimSGRPFFifIndex,
          pimSGRPFFNextHopType,
          pimSGRPFFNextHop,
          pimSGRPFFRouteProtocol,
          pimSGRPFFRouteAddress,
          pimSGRPFFRoutePrefixLength,
          pimSGRPFFRouteMetricPref,
          pimSGRPFFRouteMetric,
          pimSGSPTBit,
          pimSGKeepaliveTimer,
          pimSGDRRegisterState,
          pimSGDRRegisterStopTimer,
          pimSGRPRegisterPMBRAAddressType,
          pimSGRPRegisterPMBRAAddress,
          pimSGIUpTime,
          pimSGILocalMembership,
          pimSGIJoinPruneState,
          pimSGIPrunePendingTimer,
          pimSGIJoinExpiryTimer,
          pimSGIAssertState,
          pimSGIAssertTimer,
        }

```

```

        pimSGIAssertWinnerAddressType,
        pimSGIAssertWinnerAddress,
        pimSGIAssertWinnerMetricPref,
        pimSGIAssertWinnerMetric
    }
STATUS    current
DESCRIPTION
    "A collection of objects to support management of PIM
    routers running the PIM SSM (Source Specific Multicast)
    protocol, in PIM mode SM (Sparse Mode)."
```

::= { pimMIBGroups 5 }

```

pimRPConfigGroup OBJECT-GROUP
OBJECTS { pimStaticRPRPAddress,
          pimStaticRPPimMode,
          pimStaticRPOVERRIDEdynamic,
          pimStaticRPRowStatus,
          pimStaticRPStorageType,
          pimGroupMappingPimMode,
          pimGroupMappingPrecedence
        }
STATUS    current
DESCRIPTION
    "A collection of objects to support configuration of RPs
    (Rendezvous Points) and Group Mappings."
```

::= { pimMIBGroups 6 }

```

pimSmGroup OBJECT-GROUP
OBJECTS { pimStarGUpTime,
          pimStarGPimMode,
          pimStarGRPAddressType,
          pimStarGRPAddress,
          pimStarGPimModeOrigin,
          pimStarGRPIsLocal,
          pimStarGUpstreamJoinState,
          pimStarGUpstreamJoinTimer,
          pimStarGUpstreamNeighborType,
          pimStarGUpstreamNeighbor,
          pimStarGRPFIIndex,
          pimStarGRPFINextHopType,
          pimStarGRPFINextHop,
          pimStarGRPFIRouteProtocol,
          pimStarGRPFIRouteAddress,
          pimStarGRPFIRoutePrefixLength,
          pimStarGRPFIRouteMetricPref,
          pimStarGRPFIRouteMetric,
          pimStarGIUpTime,
          pimStarGILocalMembership,
```

```

        pimStarGIJoinPruneState,
        pimStarGIPrunePendingTimer,
        pimStarGIJoinExpiryTimer,
        pimStarGIAssertState,
        pimStarGIAssertTimer,
        pimStarGIAssertWinnerAddressType,
        pimStarGIAssertWinnerAddress,
        pimStarGIAssertWinnerMetricPref,
        pimStarGIAssertWinnerMetric,
        pimSGRptUpTime,
        pimSGRptUpstreamPruneState,
        pimSGRptUpstreamOverrideTimer,
        pimSGRptIUptime,
        pimSGRptILocalMembership,
        pimSGRptIJoinPruneState,
        pimSGRptIPrunePendingTimer,
        pimSGRptIPruneExpiryTimer
    }
    STATUS current
    DESCRIPTION
        "A collection of objects to support management of PIM
        routers running PIM-SM (Sparse Mode). The groups
        pimSsmGroup and pimRPConfigGroup are also required."
    ::= { pimMIBGroups 7 }

pimBidirGroup OBJECT-GROUP
    OBJECTS { pimInterfaceDFElectionRobustness,
        pimBidirDFElectionWinnerAddressType,
        pimBidirDFElectionWinnerAddress,
        pimBidirDFElectionWinnerUpTime,
        pimBidirDFElectionWinnerMetricPref,
        pimBidirDFElectionWinnerMetric,
        pimBidirDFElectionState,
        pimBidirDFElectionStateTimer
    }
    STATUS current
    DESCRIPTION
        "A collection of objects to support management of PIM
        routers running BIDIR mode. The groups pimSsmGroup,
        pimSmGroup and pimRPConfigGroup are also required."
    ::= { pimMIBGroups 8 }

pimAnycastRpGroup OBJECT-GROUP
    OBJECTS { pimAnycastRPSetLocalRouter,
        pimAnycastRPSetRowStatus,
        pimAnycastRPSetStorageType
    }
    STATUS current

```

DESCRIPTION

"A collection of objects to support management of the PIM Anycast-RP mechanism."

::= { pimMIBGroups 9 }

pimStaticRPPrecedenceGroup OBJECT-GROUP

OBJECTS { pimStaticRPPrecedence }

STATUS current

DESCRIPTION

"A collection of objects to allow fine control of interactions between static RP configuration and dynamically acquired group to RP mappings."

::= { pimMIBGroups 10 }

pimNetMgmtNotificationObjects OBJECT-GROUP

OBJECTS { pimInvalidRegisterNotificationPeriod,
pimInvalidRegisterMsgsRcvd,
pimInvalidRegisterAddressType,
pimInvalidRegisterOrigin,
pimInvalidRegisterGroup,
pimInvalidRegisterRp,
pimInvalidJoinPruneNotificationPeriod,
pimInvalidJoinPruneMsgsRcvd,
pimInvalidJoinPruneAddressType,
pimInvalidJoinPruneOrigin,
pimInvalidJoinPruneGroup,
pimInvalidJoinPruneRp,
pimRPMappingNotificationPeriod,
pimRPMappingChangeCount,
pimInterfaceElectionNotificationPeriod,
pimInterfaceElectionWinCount
}

STATUS current

DESCRIPTION

"A collection of objects to support notification of PIM network management events."

::= { pimMIBGroups 11 }

pimNetMgmtNotificationGroup NOTIFICATION-GROUP

NOTIFICATIONS { pimInvalidRegister,
pimInvalidJoinPrune,
pimRPMappingChange,
pimInterfaceElection
}

STATUS current

DESCRIPTION

"A collection of notifications for signaling PIM network management events."

```
::= { pimMIBGroups 12 }
```

```
pimDiagnosticsGroup OBJECT-GROUP
```

```
OBJECTS { pimInAsserts,  
           pimOutAsserts,  
           pimLastAssertInterface,  
           pimLastAssertGroupAddressType,  
           pimLastAssertGroupAddress,  
           pimLastAssertSourceAddressType,  
           pimLastAssertSourceAddress,  
           pimNeighborLossNotificationPeriod,  
           pimNeighborLossCount  
        }
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Objects providing additional diagnostics related to a PIM  
router."
```

```
::= { pimMIBGroups 13 }
```

```
pimDmGroup OBJECT-GROUP
```

```
OBJECTS {  
           pimRefreshInterval,  
           pimInterfacePruneLimitInterval,  
           pimInterfaceGraftRetryInterval,  
           pimInterfaceSRPriorityEnabled,  
           pimNeighborSRCapable,  
           pimSGUpstreamPruneState,  
           pimSGUpstreamPruneLimitTimer,  
           pimSGOriginatorState,  
           pimSGSourceActiveTimer,  
           pimSGStateRefreshTimer  
        }
```

```
STATUS current
```

```
DESCRIPTION
```

```
"A collection of objects required for management of PIM  
Dense Mode (PIM-DM) function. The groups pimSsmGroup and  
pimSmGroup are also required."
```

```
REFERENCE "RFC 3973"
```

```
::= { pimMIBGroups 14 }
```

```
pimDeviceStorageGroup OBJECT-GROUP
  OBJECTS { pimDeviceConfigStorageType
  }
  STATUS current
  DESCRIPTION
    "An object that specifies the volatility of global PIM
    configuration settings on this device."
  ::= { pimMIBGroups 15 }
```

END

6. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

The following tables and objects could be employed to modify multicast routing behavior in a way that prevents, disrupts, or subverts services provided by the network, including (but not limited to) multicast data traffic delivery. For example, attacks can be envisaged that would pass nominated multicast data streams through a nominated location, without the sources or listeners becoming aware of this subversion.

```
pimKeepalivePeriod pimRegisterSuppressionTime
pimNeighborLossNotificationPeriod
pimInvalidRegisterNotificationPeriod
pimInvalidJoinPruneNotificationPeriod pimRPMMappingNotificationPeriod
pimInterfaceElectionNotificationPeriod pimRefreshInterval
pimInterfaceTable pimInterfaceEntry pimInterfaceIfIndex
pimInterfaceIPVersion pimInterfaceHelloInterval
pimInterfaceTrigHelloInterval pimInterfaceJoinPruneInterval
pimInterfaceDFElectionRobustness pimInterfaceHelloHoldtime
pimInterfaceJoinPruneHoldtime pimInterfacePropagationDelay
pimInterfaceOverrideInterval pimInterfaceDRPriority
pimInterfaceDomainBorder pimInterfaceStatus pimInterfaceStubInterface
pimInterfacePruneLimitInterval pimStaticRPTable pimStaticRPEntry
pimStaticRPAddressType pimStaticRPGrpAddress
pimStaticRPGrpPrefixLength pimStaticRPRPAddress pimStaticRPPimMode
pimStaticRPOverrideDynamic pimStaticRPRowStatus pimStaticRPPrecedence
pimAnycastRPSetTable pimAnycastRPSetEntry pimAnycastRPSetAddressType
pimAnycastRPSetAnycastAddress pimAnycastRPSetRouterAddress
```

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

The following tables and objects could be employed to determine the topology, disposition, and composition of the network. This information may be commercially sensitive, and may also be used in preparation for attacks, including any of the attacks described above.

The following tables and objects may also be used to determine whether multicast data is flowing in the network, or has flowed recently. They may also be used to determine the network location of senders and recipients. An attacker can apply 'traffic analysis' to this data. In some cases, the information revealed by traffic analyses can be as damaging as full knowledge of the data being transported.

pimKeepalivePeriod pimRegisterSuppressionTime pimStarGEntries
pimStarGIEEntries pimSGEntries pimSGIEEntries pimSGRptEntries
pimSGRptIEEntries pimOutAsserts pimInAsserts pimLastAssertInterface
pimLastAssertGroupAddressType pimLastAssertGroupAddress
pimLastAssertSourceAddressType pimLastAssertSourceAddress
pimNeighborLossNotificationPeriod pimNeighborLossCount
pimInvalidRegisterNotificationPeriod pimInvalidRegisterMsgsRcvd
pimInvalidRegisterAddressType pimInvalidRegisterOrigin
pimInvalidRegisterGroup pimInvalidRegisterRp
pimInvalidJoinPruneNotificationPeriod pimInvalidJoinPruneMsgsRcvd
pimInvalidJoinPruneAddressType pimInvalidJoinPruneOrigin
pimInvalidJoinPruneGroup pimInvalidJoinPruneRp
pimRPMMappingNotificationPeriod pimRPMMappingChangeCount
pimInterfaceElectionNotificationPeriod pimInterfaceElectionWinCount
pimRefreshInterval pimInterfaceTable pimInterfaceEntry
pimInterfaceIfIndex pimInterfaceIPVersion pimInterfaceAddressType
pimInterfaceAddress pimInterfaceDR pimInterfaceHelloInterval
pimInterfaceTrigHelloInterval pimInterfaceJoinPruneInterval
pimInterfaceDFElectionRobustness pimInterfaceHelloHoldtime
pimInterfaceJoinPruneHoldtime pimInterfacePropagationDelay
pimInterfaceOverrideInterval pimInterfaceGenerationIDValue
pimInterfaceDRPriority pimInterfaceLanDelayEnabled
pimInterfaceEffectPropagDelay pimInterfaceEffectOverrideIvl
pimInterfaceSuppressionEnabled pimInterfaceBidirCapable
pimInterfaceDRPriorityEnabled pimInterfaceDomainBorder
pimInterfaceStatus pimInterfaceStubInterface

pimInterfacePruneLimitInterval pimInterfaceSRPriorityEnabled
 pimNeighborTable pimNeighborEntry pimNeighborIfIndex
 pimNeighborAddressType pimNeighborAddress pimNeighborUpTime
 pimNeighborExpiryTime pimNeighborLanPruneDelayPresent
 pimNeighborPropagationDelay pimNeighborOverrideInterval
 pimNeighborTBit pimNeighborGenerationIDPresent
 pimNeighborGenerationIDValue pimNeighborBidirCapable
 pimNeighborDRPriorityPresent pimNeighborDRPriority
 pimNeighborSRCapable pimNbrSecAddressTable pimNbrSecAddressEntry
 pimNbrSecAddressIfIndex pimNbrSecAddressType pimNbrSecAddressPrimary
 pimNbrSecAddress pimStarGTable pimStarGEntry pimStarGAddressType
 pimStarGGrpAddress pimStarGUpTime pimStarGPimMode
 pimStarGRPAddressType pimStarGRPAddress pimStarGPimModeOrigin
 pimStarGRPIsLocal pimStarGUpstreamJoinState pimStarGUpstreamJoinTimer
 pimStarGUpstreamNeighborType pimStarGUpstreamNeighbor
 pimStarGRPFIfIndex pimStarGRPFNextHopType pimStarGRPFNextHop
 pimStarGRPFRouteProtocol pimStarGRPFRouteAddress
 pimStarGRPFRoutePrefixLength pimStarGRPFRouteMetricPref
 pimStarGRPFRouteMetric pimStarGITable pimStarGIEntry pimStarGIIfIndex
 pimStarGIUpTime pimStarGILocalMembership pimStarGIJoinPruneState
 pimStarGIPrunePendingTimer pimStarGIJoinExpiryTimer
 pimStarGIAssertState pimStarGIAssertTimer
 pimStarGIAssertWinnerAddressType pimStarGIAssertWinnerAddress
 pimStarGIAssertWinnerMetricPref pimStarGIAssertWinnerMetric
 pimSGTable pimSGEntry pimSGAddressType pimSGGrpAddress
 pimSGSrcAddress pimSGUpTime pimSGPimMode pimSGUpstreamJoinState
 pimSGUpstreamJoinTimer pimSGUpstreamNeighbor pimSGRPFIfIndex
 pimSGRPFNextHopType pimSGRPFNextHop pimSGRPFRouteProtocol
 pimSGRPFRouteAddress pimSGRPFRoutePrefixLength
 pimSGRPFRouteMetricPref pimSGRPFRouteMetric pimSGSPTBit
 pimSGKeepaliveTimer pimSGDRRegisterState pimSGDRRegisterStopTimer
 pimSGRPRegisterPMBRAAddressType pimSGRPRegisterPMBRAAddress
 pimSGUpstreamPruneState pimSGUpstreamPruneLimitTimer
 pimSGOriginatorState pimSGSourceActiveTimer pimSGStateRefreshTimer
 pimSGITable pimSGIEntry pimSGIIfIndex pimSGIUpTime
 pimSGILocalMembership pimSGIJoinPruneState pimSGIPrunePendingTimer
 pimSGIJoinExpiryTimer pimSGIAssertState pimSGIAssertTimer
 pimSGIAssertWinnerAddressType pimSGIAssertWinnerAddress
 pimSGIAssertWinnerMetricPref pimSGIAssertWinnerMetric pimSGRptTable
 pimSGRptEntry pimSGRptSrcAddress pimSGRptUpTime
 pimSGRptUpstreamPruneState pimSGRptUpstreamOverrideTimer
 pimSGRptITable pimSGRptIEntry pimSGRptIIfIndex pimSGRptIUpTime
 pimSGRptILocalMembership pimSGRptIJoinPruneState
 pimSGRptIPrunePendingTimer pimSGRptIPruneExpiryTimer
 pimBidirDFElectionTable pimBidirDFElectionEntry
 pimBidirDFElectionAddressType pimBidirDFElectionRPAddress
 pimBidirDFElectionIfIndex pimBidirDFElectionWinnerAddressType
 pimBidirDFElectionWinnerAddress pimBidirDFElectionWinnerUpTime

pimBidirDFElectionWinnerMetricPref pimBidirDFElectionWinnerMetric
pimBidirDFElectionState pimBidirDFElectionStateTimer pimStaticRPTable
pimStaticRPEntry pimStaticRPAddressType pimStaticRPGrpAddress
pimStaticRPGrpPrefixLength pimStaticRPPAddress pimStaticRPPimMode
pimStaticRPOverrideDynamic pimStaticRPPRowStatus pimStaticRPPrecedence
pimAnycastRPSetTable pimAnycastRPSetEntry pimAnycastRPSetAddressType
pimAnycastRPSetAnycastAddress pimAnycastRPSetRouterAddress
pimAnycastRPSetRowStatus pimAnycastRPSetLocalRouter
pimGroupMappingTable pimGroupMappingEntry pimGroupMappingOrigin
pimGroupMappingAddressType pimGroupMappingGrpAddress
pimGroupMappingGrpPrefixLength pimGroupMappingRPAddress
pimGroupMappingPimMode pimGroupMappingPrecedence

There is also a specific danger arising from the notification `pimInvalidRegister`. This is originated by devices that receive an incorrect unicast-encapsulated multicast data packet, which poses a clear danger of propagating a DoS (Denial of Service) attack from the data or control plane to the network management plane. The following steps are taken to guard against this.

1. The notification is disabled by default. The writeable field `pimInvalidRegisterNotificationPeriod` must be set in order to enable it.
2. The syntax of `pimInvalidRegisterNotificationPeriod` prevents any given device from originating the notification more frequently than once every 10 seconds.
3. The counter `pimInvalidRegisterMsgsRcvd` provides equivalent function to the notification. Management applications are encouraged to monitor this counter in preference to enabling the notification.

The same measures are taken in respect of `pimInvalidJoinPrune`, though as this notification can only arise as a result of unroutable control packets, the risk is not so acute.

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

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

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

7. IANA Considerations

PIM-STD-MIB is rooted under the mib-2 subtree. IANA has assigned { mib-2 157 } to the PIM-STD-MIB module specified in this document.

8. Acknowledgements

This MIB module is based on the original work in RFC 2934 [RFC2934] by K. McCloghrie, D. Farinacci, D. Thaler, and W. Fenner and has been updated based on feedback from the IETF's Protocol Independent Multicast (PIM) Working Group.

Jonathan Nicholas was the editor of early versions of this document, and contributed the objects for management of PIM-DM.

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