Definitions of Managed Objects for Path Computation Element Discovery
draft-ietf-pce-disc-mib-04

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects used for managing Path Computation Elements Discovery.

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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 objects used for managing Path Computation Elements Discovery.

For an introduction to the concepts of PCE, see [RFC4655].

2. The Internet-Standard Management Framework

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

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

3. Conventions used in this document

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 0.

4. Terminology

The terminology used in this document is built on notions introduced and discussed in PCE WG documents. The reader should be familiar with these documents.

Domain: any collection of network elements within a common sphere of address management or path computational responsibility.

IGP Area: OSPF Area or ISIS level.

PCC: Path Computation Client: any client application requesting a path computation to be performed by a Path Computation Element.

PCE: Path Computation Element: an entity (component, application, or network node) that is capable of computing a network path or route based on a network graph, and applying computational constraints.
5. Overview

[RFC4655] describes the architecture for a PCE-based path computation model for MPLS and GMPLS TE LSPs. The architecture allows the separation of PCE from PCC. It requires that a PCC be aware of the location of one or more PCEs. This relies on a communication protocol between PCC and PCE for automatic and dynamic PCE discovery.

[RFC4674] defines the PCE discovery mechanism and information elements which are derived as an extension for OSPF in [RFC5089] and as an extension for ISIS in [RFC5089].

The current MIB module defines the objects the section "6.10.2.1. PCC MIB module " of [RFC4674] identifies as to be disclosed on the management interface of the PCC.

6. Structure of the MIB Module

This MIB module is arranged into groups. Each group is organized as a set of related objects. The overall structure and assignment of objects to their groups, and the intended purpose of each group, is shown below.

6.1. The Discovery objects

Objects of pceDiscoveryObjects provide general information on the PCEs discovered and on their status.

This includes:
- A control to disable the automatic discovery mechanism;
- The number of known PCEs;
- The number of discovered PCEs;
- The pceDiscoveryTable which details information per PCE:
  - Addresses, discovery mechanism type;
  - Discovery time, last activity time;
  - Congestion and congestion duration.

6.2. PCEs capabilities objects

These objects report on computation capabilities per PCE as defined in PCE-PATHSCOPE, PCE-DOMAINS and PCE-NEIG-DOMAINS information elements.

Objects of pceDiscPathScopeTable collect the computation capabilities and preferences for the PCEs discovered.
Objects of pceDiscDomainTable list the domains for which the PCE discovered have topology visibility and path computation facilities.

Objects of pceDiscNeighborDomainTable define domains toward which a PCE can compute path.

6.3. PCEs options capabilities objects

Objects of pceDiscOptionalCapabilitiesTable provides computation options per PCE as defined in The PCE-CAP-FLAGS information elements.

6.4. PCEs Activity Objects

The objects of pceDiscActivityTable monitor the activity of the discovery mechanism of each PCE to enable effective analysis of the operation of the protocols.

pceDiscActivityTable reports on the activity of the discovery protocol per PCE:
- Modification of PCE discovery;
- The average and maximum rates of arrival, departure of PCE discovery information;
- The number of unacceptable and incomprehensible discovery information exchanges.

6.5. The Notification Group

This group defines notifications to inform of important events related to the monitoring of the PCE Discovery sessions such as the ending of all the sessions and abnormal rate of unacceptable messages.

7. Relationship to Other MIB Modules

7.1. Relationship to IGP MIB modules

PCE Discovery relies on existing protocols which have specialized MIB objects to monitor their own activities. Consequently this document considers that monitoring underlying protocols in out of the scope of the current MIB module.

7.2. MIB modules required for IMPORTS

The following MIB module IMPORTS objects from SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], and IF-MIB [RFC2863] and also REFERENCES document RFC0768 [RFC0768]
8. Definitions

PCE-DISC-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
   Counter32, Unsigned32, Integer32, IpAddress
   FROM SNMPv2-SMI
   TimeStamp,
   TruthValue
   FROM SNMPv2-TC
   Ipv6Address
   FROM IPV6-TC
   MODULE-COMPLIANCE, OBJECT-GROUP,
   NOTIFICATION-GROUP
   FROM SNMPv2-CONF
   AddressFamilyNumbers
   FROM IANA-ADDRESS-FAMILY-NUMBERS-MIB
   IANAipRouteProtocol
   FROM IANA-RTPROTO-MIB
pceStdMIB, PceRoutingDomainID
   FROM PCE-TC-STD-MIB; -- [xxxx]
   -- rfc editor replace xxxx with the rfc number

pceDiscDraftMIB MODULE-IDENTITY
   LAST-UPDATED "200810240000Z" -- October 24, 2008
   ORGANIZATION "Path Computation Element (PCE) Working Group"
   CONTACT-INFO "Stephan Emile
France Telecom
Email: emile.stephan@orange-ftgroup.com
Email comments directly to the PCE WG Mailing List at pce@ietf.org
WG-URL: http://www.ietf.org/html.charters/pce-charter.html"

DESCRIPTION
   "This MIB module defines a collection of objects for managing Path
   Computation Elements (PCEs) Discovery."
::= { pceStdMIB 2 }

pceDiscNotifications OBJECT IDENTIFIER ::= { pceDiscDraftMIB 0 }
pceDiscMIBObjects OBJECT IDENTIFIER ::= { pceDiscDraftMIB 1 }
pceDiscoveryObjects OBJECT IDENTIFIER ::= { pceDiscMIBObjects 1 }
pceDiscoveryAdminStatus OBJECT-TYPE
SYNTAX INTEGER {
    enabled(1),
    disabled(2)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Setting this object to disabled(2) disables the discovery of PCEs. Once disabled, the discovery must be explicitly enabled to restore discovery of PCEs. Setting this object to enabled(1) enables the discovery of PCEs."
 ::= { pceDiscoveryObjects 1 }

pceDiscoveryKnownPCEs OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of PCEs the PCC is potentially in relation with. This includes PCE manually declared and active PCEs"
 ::= { pceDiscoveryObjects 2 }

pceDiscoveryActivePCEs OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of active PCEs. The detection of the activity of a PCE depends on the nature discovery mechanism.
PCE discovered using PCED information received:
The relation between the PCC and a PCE is active while the PCE discovery protocol maintains a communication between the PCC and this PCE.
PCE Manually declared:
The relation between the PCC and a PCE is active and the discovery mechanism is implementation specific;
"
 ::= { pceDiscoveryObjects 3 }

pceDiscoveryTable OBJECT-TYPE
SYNTAX SEQUENCE OF PceDiscoveryEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing the PCEs discovered."
 ::= { pceDiscoveryObjects 4 }
pceDiscoveryEntry OBJECT-TYPE
SYNTAX PceDiscoveryEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing general information of each PCE discovered."
INDEX { pceDiscoveryIndex }
 ::= { pceDiscoveryTable 1 }

PceDiscoveryEntry ::= SEQUENCE {
   pceDiscoveryIndex Integer32,
   pceDiscoveryMechanism IANAipRouteProtocol,
   pceDiscoveryIPv4Address IpAddress,
   pceDiscoveryIPv6Address Ipv6Address,
   pceDiscoveryTime TimeStamp,
   pceDiscoveryLastUpdated TimeStamp,
   pceDiscoveryCongestion TruthValue,
   pceDiscoveryCongestionDuration Unsigned32
}

pceDiscoveryIndex OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This object identifies locally the PCE for which this entry contains information."
 ::= { pceDiscoveryEntry 1 }

pceDiscoveryMechanism OBJECT-TYPE
SYNTAX IANAipRouteProtocol
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object identifies the type of discovery mechanism used to discover the PCE.
The discovery mechanisms covered by PCE WG at the time of the specification are:
   other (1), --not specified
   local (2), -- local interface
   isIs (9), -- Dual IS-IS
   ospf (13), -- Open Shortest Path First
   bgp (14), -- Border Gateway Protocol
It does not preclude the usage of another routing protocol numbered by this IANAipRouteProtocol"
 ::= { pceDiscoveryEntry 2 }
pceDiscoveryIPv4Address OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object is the IP address to be used to reach the PCE. It corresponds to the PCED PCE-ADDRESS. A value of 0.0.0.0 indicates the absence of this address."
 ::= { pceDiscoveryEntry 3 }

pceDiscoveryIPv6Address OBJECT-TYPE
SYNTAX Ipv6Address
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object is the IPv6 address to be used to reach the PCE. It corresponds to the PCED PCE-ADDRESS. A value of ::0 indicates the absence of this address."
 ::= { pceDiscoveryEntry 4 }

pceDiscoveryTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at the time this entry was created. local entry: the value of sysUpTime at the time the PCC restarted."
 ::= { pceDiscoveryEntry 5 }

pceDiscoveryLastUpdated OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at the time this entry was last updated. Static entry: if the entry values keep unchanged since the re-initialization of the PCC then this object contains a zero value."
 ::= { pceDiscoveryEntry 6 }

pceDiscoveryCongestion OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object indicates whether a PCE experiences a processing congestion state or not."
 ::= { pceDiscoveryEntry 7 }
pceDiscoveryCongestionDuration OBJECT-TYPE
   SYNTAX Unsigned32
   MAX-ACCESS read-only
   STATUS current
   DESCRIPTION
   "This object specifies, in seconds, the congestion duration.
   When the value of pceDiscoveryCongestion is ‘false’ then this
   object MUST be to ‘0’"
   ::= { pceDiscoveryEntry 8 }

pceDiscCapabilityObjects OBJECT IDENTIFIER ::= { pceDiscMIBObjects 2 }

--

-- PCE-PATHSCOPE informations elements

--

pceDiscPathScopeTable OBJECT-TYPE
   SYNTAX SEQUENCE OF PceDiscPathScopeEntry
   MAX-ACCESS not-accessible
   STATUS current
   DESCRIPTION
   "PCEs may be involved in various path computations such that
dedicated to one AS or one area, or specialized in inter AS,
inter area or inter layer. This table describe the path
computation capacities and preferences of the PCEs discovered."
   ::= { pceDiscCapabilityObjects 1 }

pceDiscPathScopeEntry OBJECT-TYPE
   SYNTAX PceDiscPathScopeEntry
   MAX-ACCESS not-accessible
   STATUS current
   DESCRIPTION
   "This object describes the path computation capacities and
preferences of the PCE identified with pceDiscoveryIndex."
   INDEX { pceDiscoveryIndex }
   ::= { pceDiscPathScopeTable 1 }
PceDiscPathScopeEntry ::= SEQUENCE {
  pceDiscPathScopeIntraArea TruthValue,
  pceDiscPathScopeInterArea TruthValue,
  pceDiscPathScopeDefInterArea TruthValue,
  pceDiscPathScopeInterAS TruthValue,
  pceDiscPathScopeDefInterAS TruthValue,
  pceDiscPathScopeInterLayer TruthValue,
  pceDiscPathScopePrefIntraArea Integer32,
  pceDiscPathScopePrefInterArea Integer32,
  pceDiscPathScopePrefInterAS Integer32,
  pceDiscPathScopePrefIntLayer Integer32
}

pceDiscPathScopeIntraArea OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Indicates whether the PCE supports the L option of the PATH-SCOPE sub TLV:
The value is ‘true’ if the PCE can compute intra-area path."
::= { pceDiscPathScopeEntry 1 }

pceDiscPathScopeInterArea OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Indicates whether the PCE supports the R option of the PATH-SCOPE sub TLV:
The value is ‘true’ if the PCE can act as PCE for inter-area TE LSPs computation."
::= { pceDiscPathScopeEntry 2 }

pceDiscPathScopeDefInterArea OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Indicates whether the PCE supports the Rd option of the PATH-SCOPE sub TLV:
The value is ‘true’ if the PCE can act as a default PCE for inter-area TE LSPs computation."
::= { pceDiscPathScopeEntry 3 }
pceDiscPathScopeInterAS OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates whether the PCE supports the S option of the PATH-
SCOPE sub TLV:
The value is 'true' if the PCE can act as PCE for inter-AS
TE LSPs computation."
::= { pceDiscPathScopeEntry 4 }

pceDiscPathScopeDefInterAS OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates whether the PCE supports the Sd option of the PATH-
SCOPE sub TLV:
The value is 'true' if the PCE can act as a default PCE for
inter-AS TE LSPs computation."
::= { pceDiscPathScopeEntry 5 }

pceDiscPathScopeInterLayer OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates whether the PCE supports the Y option of the PATH-
SCOPE sub TLV:
The value is 'true' if the PCE can compute or take part into
the computation of paths across layers."
::= { pceDiscPathScopeEntry 6 }

pceDiscPathScopePrefIntraArea OBJECT-TYPE
SYNTAX Integer32 (0..7)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates the level of preference of the option of computation
'L' compared to other computation options:
A value of 7 reflects the highest preference.
When the value of PceDiscPathScopeIntraArea is 'false' then
this objet MUST be to '0'."
::= { pceDiscPathScopeEntry 7 }
pceDiscPathScopePrefInterArea OBJECT-TYPE
SYNTAX Integer32 (0..7)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates the level of preference of the option of computation 'R' compared to other computation options:
A value of 7 reflects the highest preference.
When the value of PceDiscPathScopeInterArea is 'false' then this objet MUST be to '0'."
::= { pceDiscPathScopeEntry 8}

pceDiscPathScopePrefInterAS OBJECT-TYPE
SYNTAX Integer32 (0..7)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates the level of preference of the option of computation 'S' compared to other computation options:
A value of 7 reflects the highest preference.
When the value of PceDiscPathScopeInterAS is 'false' then this objet MUST be to '0'."
::= { pceDiscPathScopeEntry 9}

pceDiscPathScopePrefIntLayer OBJECT-TYPE
SYNTAX Integer32 (0..7)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates the level of preference of the option of computation 'Y' compared to other computation options:
A value of 7 reflects the highest preference.
When the value of PceDiscPathScopeInterLayer is 'false' then this objet MUST be to '0'."
::= { pceDiscPathScopeEntry 10}

--

-- PCE-DOMAINS information elements

--

pceDiscDomainTable OBJECT-TYPE
SYNTAX SEQUENCE OF PceDiscDomainEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing the set of domains where the PCE has topology visibility and can compute paths."
::= { pceDiscCapabilityObjects 2}
pceDiscDomainEntry OBJECT-TYPE
SYNTAX  PceDiscDomainEntry
MAX-ACCESS  not-accessible
STATUS  current
DESCRIPTION
"This information describes a domain where the PCE identified
with pceDiscoveryIndex has topology visibility and can compute
paths."
INDEX { pceDiscoveryIndex, pceDiscDomainIndex }
::= { pceDiscDomainTable 1 }

PceDiscDomainEntry ::= SEQUENCE {
pceDiscDomainIndex Integer32,
pceDiscDomainIDType AddressFamilyNumbers,
pceDiscDomainID PceRoutingDomainID
}

pceDiscDomainIndex OBJECT-TYPE
SYNTAX  Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS  current
DESCRIPTION
"This object identifies locally a domain for which the PCE
identified by pceDiscoveryIndex has topology visibility and can
compute paths."
::= { pceDiscDomainEntry 1 }

pceDiscDomainIDType OBJECT-TYPE
SYNTAX  AddressFamilyNumbers
MAX-ACCESS  read-only
STATUS  current
DESCRIPTION
"This object identifies the type of the domainID of a PCE-
DOMAIN SUB TLV.
Acceptable types are :
   ipV4(1) and ipV6(2) for an OSPF area ID;
   nsap(3) for and ISIS area ID;
   asNumber(18) for an BGP AS number"
::= { pceDiscDomainEntry 2 }

pceDiscDomainID OBJECT-TYPE
SYNTAX  PceRoutingDomainID
MAX-ACCESS  read-only
STATUS  current
DESCRIPTION
"The ID (area,AS) of the routing domain for which this entry
contains information."
::= { pceDiscDomainEntry 3 }
-- NEIG-PCE-DOMAINS information elements

pceDiscNeighborDomainTable OBJECT-TYPE
SYNTAX SEQUENCE OF PceDiscNeighborDomainEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing the set of destination domains toward
which a PCE can compute paths."
::= { pceDiscCapabilityObjects 3 }

pceDiscNeighborDomainEntry OBJECT-TYPE
SYNTAX PceDiscNeighborDomainEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing the destination domains of each PCE."
INDEX { pceDiscoveryIndex, pceDiscNeighborDomainIndex }
::= { pceDiscNeighborDomainTable 1 }

PceDiscNeighborDomainEntry ::= SEQUENCE {
  pceDiscNeighborDomainIndex Integer32,
  pceDiscNeighborDomainIDType AddressFamilyNumbers,
  pceDiscNeighborDomainID PceRoutingDomainID
}

pceDiscNeighborDomainIndex OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This object identifies locally a destination domain toward
which a PCE identified by pceDiscoveryIndex can compute path."
::= { pceDiscNeighborDomainEntry 1 }

pceDiscNeighborDomainIDType OBJECT-TYPE
SYNTAX AddressFamilyNumbers
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object identifies the type of the routing domain.
Acceptable types are:
ipV4(1) and ipV6(2) for an OSPF area ID;
nsap(3) for an ISIS area ID;
asNumber(18) for an BGP AS number"
::= { pceDiscNeighborDomainEntry 2 }

pceDiscNeighborDomainID OBJECT-TYPE
SYNTAX PceRoutingDomainID
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The ID (area,AS) of the routing domain for which this entry
contains information."
 ::= { pceDiscNeighborDomainEntry 3 }

pceDiscOptionalCapabilitiesObjects OBJECT IDENTIFIER ::= {
 pceDiscMIBObjects 3 }

-- PCE-CAP-FLAGS

pceDiscOptionalCapabilitiesTable OBJECT-TYPE
SYNTAX SEQUENCE OF PceDiscOptionalCapabilitiesEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table describes various capabilities supported by the
PCEs discovered, such as path computation options, requests
processing options or new options added in the future in IANA
registry named ‘PCE Capability Flags’.“
 ::= { pceDiscOptionalCapabilitiesObjects 1 }

pceDiscOptionalCapabilitiesEntry OBJECT-TYPE
SYNTAX PceDiscOptionalCapabilitiesEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This objet describes an atomic capability the PCE identified
by pceDiscoveryIndex supports. "
INDEX { pceDiscoveryIndex }
 ::= { pceDiscOptionalCapabilitiesTable 1 }

PceDiscOptionalCapabilitiesEntry ::= SEQUENCE {
  pceDiscOptionalCapability Integer32
}
pceDiscOptionalCapability OBJECT-TYPE
SYNTAX Integer32 (0..31)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This objet describes an atomic option the PCE identified by pceDiscoveryIndex supports. The IANA registry ‘PCE Capability Flags’ handles current capabilities and the definition of new options in the future. At the time being the value is restricted to one of the following:
0 Path computation with GMPLS link constraints;
1 Bidirectional path computation;
2 Diverse path computation;
3 Load-balanced path computation;
4 Synchronized path computation;
5 Support for multiple objective functions;
6 Support for additive path constraints (max hop count, etc.);
7 Support for request prioritization;
8 Support for multiple requests per message.

NOTE: This object type is not enumerated because new options, like p2mp capabilities, may be defined in the future."
 ::= { pceDiscOptionalCapabilitiesEntry 1 }

-- Activity objects

pceDiscActivityObjects OBJECT IDENTIFIER ::= { pceDiscMIBObjects 4 }
pceDiscActivityTable OBJECT-TYPE
SYNTAX SEQUENCE OF PceDiscActivityEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information describing the discovery mechanisms activities."
 ::= { pceDiscActivityObjects 1 }
pceDiscActivityEntry OBJECT-TYPE
SYNTAX PceDiscActivityEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This object describes the discovery activity of the PCE identified by pceDiscoveryIndex."
INDEX { pceDiscoveryIndex }
 ::= { pceDiscActivityTable 1 }
PceDiscActivityEntry ::= SEQUENCE {
pceDiscActivityTlvReceived Integer32,
pceDiscActivityErroredTlvReceived Integer32,
pceDiscActivityErroredTlvLastMinutePercentage Integer32,
pceDiscActivityErroredTlvRisingThreshold Integer32
}
pceDiscActivityTlvReceived OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object counts the number of information elements received since the discovery of the PCE."
 ::= { pceDiscActivityEntry 1 }

pceDiscActivityErroredTlvReceived OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object counts the number of Errored information elements received since the discovery of the PCE."
 ::= { pceDiscActivityEntry 2 }

pceDiscActivityErroredTlvLastMinutePercentage OBJECT-TYPE
SYNTAX Integer32 (0..100)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object reports the percentage of the errored information elements received over a one-minute average."
 ::= { pceDiscActivityEntry 3 }

pceDiscActivityErroredTlvRisingThreshold OBJECT-TYPE
SYNTAX Integer32 (0..100)
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This object specifies the percentage of information elements errors limit to be reach before triggering the sending of the notification ‘pceDiscAbnormalErroredTlvPercentage’."n ::= { pceDiscActivityEntry 4 }
pceDiscNotAnyPceIdentified  NOTIFICATION-TYPE

OBJECTS {
  pceDiscoveryKnownPCEs
}

STATUS current

DESCRIPTION
  "This notification is sent when the value of 'pceDiscoveryKnownPCEs' decreases to zero.
  This occurs typically when, after modification of configuration, there is no more PCE manually declared and when there is no more PCE discovery sessions configured."

::= { pceDiscNotifications 1 }

pceDiscAllPcesInactive  NOTIFICATION-TYPE

OBJECTS {
  pceDiscoveryKnownPCEs,
  pceDiscoveryActivePCEs
}

STATUS current

DESCRIPTION
  "This notification is sent when the value of 'pceDiscoveryActivePCEs' decreases to zero.
  This occurs when all the PCE discovery sessions come inactive."

::= { pceDiscNotifications 2 }

pceDiscAbnormalErroredTlvPercentage  NOTIFICATION-TYPE

OBJECTS {
  pceDiscActivityErroredTlvLastMinutePercentage,
  pceDiscActivityErroredTlvRisingThreshold
}

STATUS current

DESCRIPTION
  "This notification is sent when the value of 'pceDiscActivityErroredTlvLastMinutePercentage' rises over the value of pceDiscActivityErroredTlvRisingThreshold."

::= { pceDiscNotifications 3 }
-- PCE DISC agents conformance statement

pceDiscConformance OBJECT IDENTIFIER ::= { pceDiscDraftMIB 2 }
pceDiscCompliances OBJECT IDENTIFIER ::= { pceDiscConformance 1 }
pceDiscGroups OBJECT IDENTIFIER ::= { pceDiscConformance 2 }

-- PCE DISC agent compliance statements

pceDiscGeneralPceInformation MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
  "The compliance statement for SNMP entities that implement only
general monitoring information as proposed in the 2nd S. of the
section 6.1 of [RFC4674]."
  MODULE
  MANDATORY-GROUPS {
    pceDiscDiscoveryGroup,
    pceDiscActivityGroup,
    pceDiscPathScopeGroup,
    pceDiscDomainsGroup,
    pceDiscOptionsGroup,
    pceDiscNotificationGroup
  }
  ::= { pceDiscCompliances 1 }

pceDiscDiscoveryGroup OBJECT-GROUP
  OBJECTS {
    pceDiscoveryAdminStatus,
    pceDiscoveryKnownPCEs,
    pceDiscoveryActivePCEs,
    pceDiscoveryMechanism,
    pceDiscoveryIPv4Address,
    pceDiscoveryIPv6Address,
    pceDiscoveryTime,
    pceDiscoveryLastUpdated,
    pceDiscoveryCongestion,
    pceDiscoveryCongestionDuration
  }
  STATUS current
  DESCRIPTION
  "Hight level objects for monitoring the PCEs sessions."
  ::= { pceDiscGroups 1 }
pceDiscActivityGroup OBJECT-GROUP
OBJECTS {
   pceDiscActivityTlvReceived,
   pceDiscActivityErroredTlvReceived,
   pceDiscActivityErroredTlvLastMinutePercentage,
   pceDiscActivityErroredTlvRisingThreshold
}
STATUS current
DESCRIPTION
   "Objects for monitoring PCEs sessions activity."
 ::= { pceDiscGroups 2 }

pceDiscPathScopeGroup OBJECT-GROUP
OBJECTS {
   pceDiscPathScopeIntraArea,
   pceDiscPathScopeInterArea,
   pceDiscPathScopeDefInterArea,
   pceDiscPathScopeInterAS,
   pceDiscPathScopeDefInterAS,
   pceDiscPathScopeInterLayer,
   pceDiscPathScopePrefIntraArea,
   pceDiscPathScopePrefInterArea,
   pceDiscPathScopePrefInterAS,
   pceDiscPathScopePrefIntLayer
}
STATUS current
DESCRIPTION
   "Objects describing the path computation capabilities."
 ::= { pceDiscGroups 3 }

pceDiscDomainsGroup OBJECT-GROUP
OBJECTS {
   pceDiscDomainIDType,
   pceDiscDomainID,
   pceDiscNeighborDomainIDType,
   pceDiscNeighborDomainID
}
STATUS current
DESCRIPTION
   "Objects describing the domains the PCEs compute paths on and
   are in relation with."
 ::= { pceDiscGroups 4 }

pceDiscOptionsGroup OBJECT-GROUP
OBJECTS {
   pceDiscOptionalCapability
}
STATUS current
DESCRIPTION
   "Objects describing PCEs options capabilities."
 ::= { pceDiscGroups 5 }
pceDiscNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        pceDiscNotAnyPceIdentified,
        pceDiscAllPcesInactive,
        pceDiscAbnormalErroredTlvPercentage
    }
    STATUS current
    DESCRIPTION
        "Set of notifications implemented in this module."
    ::= { pceDiscGroups 6 }

END

9. 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:

- on/off of discovery: Unauthorized changes to pceDiscoveryAdminStatus could result in a temporary interruption of the discovery;

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:

- IP addresses of PCE.

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.

10. IANA Considerations

11. References

11.1. Normative References


11.2. Informative References


Appendix A. Open Issues

This list of open issues should be cleared and removed before this document hits the IESG.

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