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D. Dhody
U. Palle
Q. Zhao
Huawei Technology
D. King
Old Dog Consulting
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**Management Information Base (MIB) for the PCE Communications Protocol
(PCEP) for Path-Key based Confidentiality in Inter-Domain Path
Computation.**

[draft-dhody-pce-pcep-pathkey-mib-04](#)

Abstract

This memo defines an experimental portion of the Management Information Base for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling of the Path Computation Element communication Protocol (PCEP) for communications between a Path Computation Client (PCC) and a Path Computation Element (PCE), or between two PCEs when path-key-based confidentiality in inter-domain path computation is requested.

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Table of Contents

1.	Introduction	3
2.	Terminology	3
3.	The Internet-Standard Management Framework	4
4.	PCEP Pathkey MIB Module Architecture	4
5.	Example of the PCEP PathKey MIB module usage	4
6.	Object definitions	5
6.1.	PCE-PCEP-PATHKEY-DRAFT-MIB	5
6.2.	Objects for inclusion in module PCE-PCEP-DRAFT-MIB	19
7.	IANA Considerations	20
8.	Security Considerations	20
9.	References	21
9.1.	Normative References	21
9.2.	Informative References	22

1. Introduction

The Path Computation Element (PCE) defined in [[RFC4655](#)] is an entity that is capable of computing a network path or route based on a network graph, and applying computational constraints. A Path Computation Client (PCC) may make requests to a PCE for paths to be computed.

The PCE communication protocol (PCEP) is designed as a communication protocol between PCCs and PCEs for point-to-point (P2P) path computations and is defined in [[RFC5440](#)].

If confidentiality is required between domains, Path-Key-Based mechanism is described in [[RFC5520](#)]. For preserving the confidentiality of the "Confidential Path Segment (CPS)"; the PCE returns a path containing a loose hop in place of the segment that must be kept confidential.

[PCE-PCEP-DRAFT-MIB] defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community for P2P path computations.

This memo defines an experimental portion of the Management Information Base for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling of Path Computation Element communication Protocol (PCEP)[[RFC5440](#)] for communications between a Path Computation Client (PCC) and a Path Computation Element (PCE), or between two PCEs in path-key-based confidentiality in inter-domain path computations.

Some objects maybe moved to [[PCE-PCEP-DRAFT-MIB](#)] after consensus with the authors and working group, these are defined in [Section 6.2](#).

2. Terminology

The following terminology is used in this document.

CPS: Confidential Path Segment. A segment of a path that contains nodes and links that the AS policy requires to not be disclosed outside the AS.

Domain: Any collection of network elements within a common sphere of address management or path computational responsibility. Examples of domains include Interior Gateway Protocol (IGP) areas and Autonomous Systems (ASs).

IGP: Interior Gateway Protocol. Either of the two routing protocols, Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (IS-IS).

Path-Key: A Key used to replace or retrieve the Confidential Path Segment (CPS).

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.

P2P: Point-to-Point

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 \[RFC3410\]](#).

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 \[RFC2578\]](#) and STD 58, [RFC 2580 \[RFC2580\]](#).

4. PCEP Pathkey MIB Module Architecture

The PCEP Pathkey MIB will contain the following information:

- o PCEP Pathkey counters, timers and configurations
- o PCEP Pathkey table of CPS related information.

5. Example of the PCEP PathKey MIB module usage

In this section we provide an example (pcePcepPathKeyTable 1) of using the MIB objects described in [Section 6](#) to monitor. While this example is not meant to illustrate every permutation of the MIB, it is intended as an aid to understanding some of the key concepts. It is meant to be read after going through the MIB itself.

pcePcepPathKeyTable 1 of the PCE-PCEP-PATHKEY-DRAFT-MIB module :

```
{
    pcePcepPathKey                (4512),
    pcePcepPathKeyCPSIndex         (1),
    pcePcepPathKeyRequestSource    (x.x.x.x),
    pcePcepPathKeyRequestId        (10),
    pcePcepPathKeyRetrieved        (1),
    pcePcepPathKeyRetrieveSource    (y.y.y.y),
    pcePcepPathKeyDiscardTime      (10),
    pcePcepPathKeyReuseTime        (30)
}
```

pcePcepPathKeyHopTable 1 of the PCE-PCEP-PATHKEY-DRAFT-MIB module :

```
{
    pcePcepPathKeyHopListIndex     1,
    pcePcepPathKeyHopIndex         1,
    pcePcepPathKeyHopAddrType      ipv4 (1),
    pcePcepPathKeyHopIpAddr        "192.168.100.1",
    pcePcepPathKeyHopIpPrefixLen   32,
    pcePcepPathKeyHopHopType       strict (2)
}
{
    pcePcepPathKeyHopListIndex     1,
    pcePcepPathKeyHopIndex         2,
    pcePcepPathKeyHopAddrType      ipv4 (1),
    pcePcepPathKeyHopIpAddr        "192.168.100.2",
    pcePcepPathKeyHopIpPrefixLen   32,
    pcePcepPathKeyHopHopType       strict (2)
}
```

6. Object definitions

6.1. PCE-PCEP-PATHKEY-DRAFT-MIB

This MIB module makes references to the following documents.

[[RFC2578](#)], [[RFC2580](#)], [[RFC3411](#)], [[RFC2863](#)], [[RFC3813](#)].

PCE-PCEP-PATHKEY-DRAFT-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
Unsigned32,
Counter32,
OCTET STRING,
experimental
FROM SNMPv2-SMI -- [\[RFC2578\]](#)

TimeStamp
FROM SNMPv2-TC -- [\[RFC2579\]](#)

PcePcepIdentifier,
FROM PCE-TC-STD-MIB

MplsLSPID, MplsPathIndex, TeHopAddressType,
TeHopAddress, TeHopAddressUnnum
FROM MPLS-TC-STD-MIB -- [\[RFC3811\]](#)

MODULE-COMPLIANCE,
OBJECT-GROUP,
NOTIFICATION-GROUP
FROM SNMPv2-CONF; -- [\[RFC2580\]](#)

pcePcepPathkeyDraftMIB MODULE-IDENTITY

LAST-UPDATED "201208171200Z" -- Aug 17, 2012
ORGANIZATION "Path Computation Element (PCE) Working Group"
CONTACT-INFO "

Dhruv Dhody
Udayasree Palle
Quintin Zhao
Huawei Technology
Daniel King
OldDog Consulting

EMail: dhruv.dhody@huawei.com

EMail: udayasree.palle@huawei.com

EMail: quintin.zhao@huawei.com

EMail: daniel@oldog.co.uk

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 PCE communication protocol(PCEP) for Path-Key-Based Inter-Domain Path Computation"

-- Revision history

REVISION

"201208171200Z" -- 17 Aug 2012 12:00:00 EST

DESCRIPTION

"

Main Changes from -03 draft :

1. Adding of DEFVAL for some objects.
2. Editorial Changes.

REVISION

"201202221200Z" -- 22 Feb 2012 12:00:00 EST

DESCRIPTION

"

Main Changes from -02 draft :

1. Editorial Changes.
2. Updated Contact Information.

REVISION

"201109051200Z" -- 05 Sept 2011 12:00:00 EST

DESCRIPTION

"

Main Changes from -01 draft :

1. Added pcePcepPathKeyCPSIndex.
2. Added pcePcepPathKeyHopListIndex.
3. Removed pcePcepPathKeyHopNum.
4. Updated Contact Information.

REVISION

"201103081200Z" -- 08 Mar 2011 12:00:00 EST

DESCRIPTION

"

Main Changes from -00 draft :

1. Added HopTable to store the CPS hops.
2. Added Path Key Creation Time.

REVISION

"201009171200Z" -- 17 Sep 2010 12:00:00 EST

DESCRIPTION

"[draft-00](#) version"

::= { experimental 9999 } --


```
-- Notifications --

pcePcepPathKeyNotifications OBJECT IDENTIFIER ::=
    { pcePcepPathKeyDraftMIB 0 }

pcePcepPathKeyMIBObjects OBJECT IDENTIFIER ::=
    { pcePcepPathKeyDraftMIB 1 }
pcePcepPathKeyConformance OBJECT IDENTIFIER ::=
    { pcePcepPathKeyDraftMIB 2 }

pcePcepPathKeyObjects OBJECT IDENTIFIER ::=
    { pcePcepPathKeyMIBObjects 1 }

--

-- PCE Pathkey Objects

--

pcePcepPathKeyDiscardTimer OBJECT-TYPE
    SYNTAX  Unsigned32
    UNITS   "minutes"
    MAX-ACCESS read-write
    STATUS  mandatory
    DESCRIPTION
        "The value which indicates a period of time after the
        expiration of which a PCE discard unwanted path-keys."
    DEFVAL {10}
    ::= { pcePcepPathKeyObjects 1 }

pcePcepPathKeyReUseTimer OBJECT-TYPE
    SYNTAX  Unsigned32
    UNITS   "minutes"
    MAX-ACCESS read-write
    STATUS  mandatory
    DESCRIPTION
        "The value which indicates a period of time which
        should expire before an old path-key could be
        reused for a new CPS."
    DEFVAL {30}
    ::= { pcePcepPathKeyObjects 2 }
```


pcePcepPathKeyRetainStatus OBJECT-TYPE

```
SYNTAX      INTEGER {  
                enabled(1),  
                disabled(2)  
            }
```

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

```
STATUS      optional
```

DESCRIPTION

"The path-key retain status of this PCE to retain the path-key and CPS for debugging purposes."

```
DEFVAL {disabled(2)}
```

```
::= { pcePcepPathKeyObjects 3 }
```

pcePcepPathKeysGenerated OBJECT-TYPE

```
SYNTAX      Counter32
```

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

```
STATUS      mandatory
```

DESCRIPTION

"The number of path-keys generated by this PCE."

```
::= { pcePcepPathKeyObjects 4 }
```

pcePcepPathKeyExpandUnknown OBJECT-TYPE

```
SYNTAX      Counter32
```

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

```
STATUS      mandatory
```

DESCRIPTION

"The number of attempts to expand an unknown path-key."

```
::= { pcePcepPathKeyObjects 5 }
```

pcePcepPathKeyExpandExpired OBJECT-TYPE

```
SYNTAX      Counter32
```

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

```
STATUS      mandatory
```

DESCRIPTION

"The number of attempts to expand an expired path-key."

```
::= { pcePcepPathKeyObjects 6 }
```

pcePcepPathKeyExpandSame OBJECT-TYPE

```
SYNTAX      Counter32
```

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

```
STATUS      optional
```

DESCRIPTION

"The number of attempts to expand the same path-key."

```
::= { pcePcepPathKeyObjects 7 }
```


pcePcepPathKeyExpiredNoExpansion OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS optional

DESCRIPTION

"The number of path-keys expired without any attempt
to expand it."

::= { pcePcepPathKeyObjects 8 }

pcePcepPathKeyExpansionSuccess OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS optional

DESCRIPTION

"The number of path-key expansion requests (PCReq)
which had successful retrieval."

::= { pcePcepPathKeyObjects 9 }

pcePcepPathKeyExpansionFailures OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS optional

DESCRIPTION

"The number of path-key expansion requests (PCReq)
which had failed retrieval."

::= { pcePcepPathKeyObjects 10 }

pcePcepPathKeyConfig OBJECT-TYPE

SYNTAX INTEGER {
 enabled(1),
 disabled(2)
}

MAX-ACCESS read-write

STATUS mandatory

DESCRIPTION

"The path-key based inter domain computation
configuration."

DEFVAL {disabled(2)}

::= { pcePcepPathKeyObjects 11 }

pcePcepPathKeyTable OBJECT-TYPE

SYNTAX SEQUENCE OF pcePcepPathKeyEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains information about the
Pathkey CPS of PCE."

::= { pcePcepPathKeyObjects 12 }

pcePcepPathKeyEntry OBJECT-TYPE

SYNTAX pcePcepPathKeyEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table represents a path-key and CPS.
An entry is only created when a path-key generated by
PCE during inter-domain computation."

INDEX { pcePcepPathKey }

::= { pcePcepPathKeyTable 1 }

pcePcepPathKeyEntry ::= SEQUENCE {

pcePcepPathKey	Unsigned32,
pcePcepPathKeyCPSIndex	MplsPathIndex,
pcePcepPathKeyRequestSource	PcePcepIdentifier,
pcePcepPathKeyRequestId	Unsigned32,
pcePcepPathKeyRetrieved	INTEGER,
pcePcepPathKeyRetrieveSource	PcePcepIdentifier,
pcePcepPathKeyCreationTime	TimeStamp,
pcePcepPathKeyDiscardTime	Unsigned32,
pcePcepPathKeyReuseTime	Unsigned32,

}

pcePcepPathKey OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"The path-key value to identify a CPS."

::= { pcePcepPathKeyEntry 1 }

pcePcepPathKeyCPSIndex OBJECT-TYPE

SYNTAX MplsPathIndex

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"The HopList index of the CPS. This index
is used to expand Hops in
pcePcepPathKeyHopTable."

::= { pcePcepPathKeyEntry 2 }


```
pcePcepPathKeyRequestSource OBJECT-TYPE
    SYNTAX  PcePcepIdentifier
    MAX-ACCESS read-only
    STATUS  mandatory
    DESCRIPTION
        "Source that issued the original request that led
         to the creation of the path-key."
    ::= { pcePcepPathKeyEntry 3 }

pcePcepPathKeyRequestId OBJECT-TYPE
    SYNTAX  Unsigned32
    MAX-ACCESS read-only
    STATUS  mandatory
    DESCRIPTION
        "The request ID of the original PCReq that led
         to the creation of the path-key."
    ::= { pcePcepPathKeyEntry 4 }

pcePcepPathKeyRetrieved OBJECT-TYPE
    SYNTAX  INTEGER {
        TRUE(1),
        FALSE(2)
    }
    MAX-ACCESS read-only
    STATUS  mandatory
    DESCRIPTION
        "It specifies whether the path-key is retrieved
         or not."
    ::= { pcePcepPathKeyEntry 5 }

pcePcepPathKeyRetrieveSource OBJECT-TYPE
    SYNTAX  PcePcepIdentifier
    MAX-ACCESS read-only
    STATUS  mandatory
    DESCRIPTION
        "If the path-key is retrieved then by which
         PCC."
    ::= { pcePcepPathKeyEntry 6 }

pcePcepPathKeyCreationTime OBJECT-TYPE
    SYNTAX  TimeStamp
    MAX-ACCESS read-only
    STATUS  mandatory
    DESCRIPTION
        "The value of sysUpTime at which Path Key
         was generated by PCE."
    ::= { pcePcepPathKeyEntry 7 }
```


pcePcepPathKeyDiscardTime OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"The time after which the path segment associated
with the path-key will be discarded."

::= { pcePcepPathKeyEntry 8 }

pcePcepPathKeyReuseTime OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"The time after which the path-key will be available
for re-use."

::= { pcePcepPathKeyEntry 9 }

pcePcepPathKeyHopTable OBJECT-TYPE

SYNTAX SEQUENCE OF pcePcepPathKeyHopEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains information about the
Pathkey Hop in the CPS of PCE."

::= { pcePcepPathKeyObjects 13 }

pcePcepPathKeyHopEntry OBJECT-TYPE

SYNTAX pcePcepPathKeyHopEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table represents a Hop in the CPS.
An entry is only created when a path-key generated by
PCE during inter-domain computation."

INDEX { pcePcepPathKeyHopListIndex,
pcePcepPathKeyHopIndex }

::= { pcePcepPathKeyHopTable 1 }


```
pcePcepPathKeyHopEntry ::= SEQUENCE {  
    pcePcepPathKeyHopListIndex      MplsPathIndex,  
    pcePcepPathKeyHopIndex          MplsPathIndex,  
    pcePcepPathKeyHopAddrType       TeHopAddressType,  
    pcePcepPathKeyHopIpAddress      TeHopAddress,  
    pcePcepPathKeyHopIpPrefixLen    InetAddressPrefixLength,  
    pcePcepPathKeyHopAddrUnnum      TeHopAddressUnnum,  
    pcePcepPathKeyHopLspId          MplsLSPID,  
    pcePcepPathKeyHopType           INTEGER,  
}
```

```
pcePcepPathKeyHopListIndex OBJECT-TYPE  
    SYNTAX      MplsPathIndex  
    MAX-ACCESS  read-only  
    STATUS      mandatory  
    DESCRIPTION  
        "The primary index into this table identifying a  
        particular CPS. All hops in the CPS will have the  
        same ListIndex. This corresponds to  
        pcePcepPathKeyCPSIndex in pcePcepPathKeyEntry."  
  
    ::= { pcePcepPathKeyHopEntry 1 }
```

```
pcePcepPathKeyHopIndex OBJECT-TYPE  
    SYNTAX      MplsPathIndex  
    MAX-ACCESS  read-only  
    STATUS      mandatory  
    DESCRIPTION  
        "The secondry index into this table identifying a  
        particular Hop."  
  
    ::= { pcePcepPathKeyHopEntry 2 }
```

```
pcePcepPathKeyHopAddrType OBJECT-TYPE  
    SYNTAX      TeHopAddressType  
    MAX-ACCESS  read-only  
    STATUS      mandatory  
    DESCRIPTION  
        "The Hop Address Type of this CPS hop.  
        Note that lspid(5) is a valid option only  
        for tunnels signaled via CRLDP."  
    DEFVAL { ipv4 }  
    ::= { pcePcepPathKeyHopEntry 2 }
```


pcePcepPathKeyHopIpAddr OBJECT-TYPE

SYNTAX TeHopAddress

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"The Hop Address for this CPS hop.

The type of this address is determined by the
value of the corresponding pcePcepPathKeyHopAddrType."

DEFVAL { '00000000'h } -- IPv4 address 0.0.0.0

::= { pcePcepPathKeyHopEntry 4 }

pcePcepPathKeyHopIpPrefixLen OBJECT-TYPE

SYNTAX InetAddressPrefixLength

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pcePcepPathKeyHopAddrType is set to ipv4(1) or
ipv6(2), then this value will contain an
appropriate prefix length for the IP address in
object pcePcepPathKeyHopIpAddr. Otherwise this value
is irrelevant and should be ignored."

DEFVAL { 32 }

::= { pcePcepPathKeyHopEntry 5 }

pcePcepPathKeyHopAddrUnnum OBJECT-TYPE

SYNTAX TeHopAddressUnnum

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pcePcepPathKeyHopAddrType is set to unnum(4),
then this value will contain the interface
identifier of the unnumbered interface for this
hop. This object should be used in conjunction
with pcePcepPathKeyHopIpAddr which would contain
the LSR Router ID in this case."

::= { pcePcepPathKeyHopEntry 6 }

pcePcepPathKeyHopLspId OBJECT-TYPE

SYNTAX MplsLSPID

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If pcePcepPathKeyHopAddrType is set to lspid(5), then this value will contain the LSPID of a tunnel of this hop. The present tunnel being configured is tunneled through this hop (using label stacking). This object is otherwise insignificant and should contain a value of 0 to indicate this fact."

::= { pcePcepPathKeyHopEntry 7 }

pcePcepPathKeyHopType OBJECT-TYPE

SYNTAX INTEGER {\n
strict(1),
loose(2)
}

MAX-ACCESS read-only

STATUS mandatory

DESCRIPTION

"Denotes whether this hop is routed in a strict or loose fashion. "

DEFVAL { strict }

::= { pcePcepPathKeyHopEntry 8 }

--- Notifications

pcePcepPathKeyExpandUnknownNtf NOTIFICATION-TYPE

OBJECTS {
pcePcepPathKeyExpandUnknown
}

STATUS mandatory

DESCRIPTION

"This notification is sent when an attempt to expand an unknown path-key is made. The value of the counter pcePcepPathKeyExpandUnknown is also increased at this time."

::= { pcePcepPathKeyNotifications 1 }

pcePcepPathKeyExpandExpiredNtf NOTIFICATION-TYPE

```

OBJECTS      {
                pcePcepPathKeyExpandExpired
            }

```

```

STATUS      mandatory

```

DESCRIPTION

"This notification is sent when an attempt to expand an expired path-key is made. The value of the counter pcePcepPathKeyExpandExpired is also increased at this time."

```

::= { pcePcepPathKeyNotifications 2 }

```

pcePcepPathKeyExpandSameNtf NOTIFICATION-TYPE

```

OBJECTS      {
                pcePcepPathKeyExpandSame
            }

```

```

STATUS      optional

```

DESCRIPTION

"This notification is sent when a duplicate attempt to expand the same path-key is made. The value of the counter pcePcepPathKeyExpandSame is also increased at this time."

```

::= { pcePcepPathKeyNotifications 3 }

```

pcePcepPathKeyExpiredNoExpansionNtf NOTIFICATION-TYPE

```

OBJECTS      {
                pcePcepPathKeyExpiredNoExpansion
            }

```

```

STATUS      optional

```

DESCRIPTION

"This notification is sent when path-key expires without any attempt to expand it. The value of the counter pcePcepPathKeyExpiredNoExpansion is also increased at this time."

```

::= { pcePcepPathKeyNotifications 4 }

```

```

_ _ *****
-- Module Conformance Statement
_ _ *****

```

pcePcepPathKeyGroups

```

OBJECT IDENTIFIER ::= { pcePcepPathKeyConformance 1 }

```

pcePcepPathKeyCompliances

```

OBJECT IDENTIFIER ::= { pcePcepPathKeyConformance 2 }

```



```
--
-- Full Compliance
--

pcePcepPathKeyModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The Module is implemented with support
        for read-create and read-write. In other
        words, both monitoring and configuration
        are available when using this MODULE-COMPLIANCE."

    MODULE -- this module
        MANDATORY-GROUPS { pcePcepPathKeyGeneralGroup,
                           pcePcepPathKeyNotificationsGroup
                           }

    ::= { pcePcepPathKeyCompliances 1 }

--
-- Read-Only Compliance
--

pcePcepPathKeyModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The Module is implemented with support
        for read-only. In other words, only monitoring
        is available by implementing this MODULE-COMPLIANCE."

    MODULE -- this module
        MANDATORY-GROUPS { pcePcepPathKeyGeneralGroup,
                           pcePcepPathKeyNotificationsGroup
                           }

    ::= { pcePcepPathKeyCompliances 2 }

-- units of conformance
```



```
pcePcepPathKeyGeneralGroup OBJECT-GROUP
    OBJECTS {
        pcePcepPathKeyDiscardTimer,
        pcePcepPathKeyReUseTimer,
        pcePcepPathKeysGenerated,
        pcePcepPathKeyExpandUnknown,
        pcePcepPathKeyExpandExpired,
        pcePcepPathKeyConfig,
        pcePcepPathKey,
        pcePcepPathKeyCPSIndex,
        pcePcepPathKeyRequestSource,
        pcePcepPathKeyRequestId,
        pcePcepPathKeyRetrieved,
        pcePcepPathKeyRetrieveSource,
        pcePcepPathKeyCreationTime,
        pcePcepPathKeyDiscardTime,
        pcePcepPathKeyReuseTime,
        pcePcepPathKeyHopListIndex,
        pcePcepPathKeyHopIndex,
        pcePcepPathKeyHopAddrType,
        pcePcepPathKeyHopIpAddress,
        pcePcepPathKeyHopIpPrefixLen,
        pcePcepPathKeyHopType
    }
    STATUS      current
    DESCRIPTION
        "Objects that apply to all PCEP Pathkey MIB
        implementations."

    ::= { pcePcepPathKeyGroups 1 }

pcePcepPathKeyNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS { pcePcepPathKeyExpandUnknownNtf,
                    pcePcepPathKeyExpandExpiredNtf
                    }

    STATUS      current

    DESCRIPTION
        "The notifications for a PCEP Pathkey MIB implementation."
    ::= { pcePcepPathKeyGroups 2 }

END
```

6.2. Objects for inclusion in module PCE-PCEP-DRAFT-MIB

Following object maybe moved to [[PCE-PCEP-DRAFT-MIB](#)] after consensus with the authors and working group.

pcePcepPathKeyConfig

7. IANA Considerations

TBD

8. Security Considerations

This MIB module can be used for configuration of certain objects, and anything that can be configured can be incorrectly configured, with potentially disastrous results.

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

- o pcePcepPathKeyDiscardTimer: Setting this value incorrectly may cause the expiration of Pathkey before attempt to retrieve the CPS.
- o pcePcepPathKeyReUseTimer: Setting this value incorrectly may cause the re-use of pathkey which may not guarantee the uniqueness of path-key values.

The user of the PCE-PCEP-PATHKEY-DRAFT-MIB module must therefore be aware that support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The readable objects in the PCE-PCEP-PATHKEY-DRAFT-MIB module (i.e., those with MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide information about the amount and frequency of path computation requests and responses within the network and can reveal some aspects of their configuration.

In such environments it is important to control also GET and NOTIFY access to these objects and possibly even to encrypt their values when sending them over the network via SNMP.

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.

9. References

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Authors' Addresses

Dhruv Dhody
Huawei Technology
Leela Palace
Bangalore, Karnataka 560008
INDIA

EMail: dhruv.dhody@huawei.com

Udayasree Palle
Huawei Technology
Leela Palace
Bangalore, Karnataka 560008
INDIA

EMail: udayasree.palle@huawei.com

Quintin Zhao
Huawei Technology
125 Nagog Technology Park
Acton, MA 01719
US

EMail: quintin.zhao@huawei.com

Daniel King
Old Dog Consulting
UK

EMail: daniel@olddog.co.uk

