A YANG Data Model for Segment Routing in IPv6 (SRv6) support in Path Computation Element Communications Protocol (PCEP)  

draft-li-pce-pcep-srv6-yang-00

Abstract

This document augments a YANG data model for the management of Path Computation Element communications Protocol (PCEP) for communications between a Path Computation Client (PCC) and a Path Computation Element (PCE), or between two PCEs in support for Segment Routing in IPv6. The data model includes configuration data and state data (status information and counters for the collection of statistics).

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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.

PCEP is the communication protocol between a PCC and PCE and is defined in [RFC5440]. PCEP interactions include path computation requests and path computation replies as well as notifications of specific states related to the use of a PCE in the context of Multiprotocol Label Switching (MPLS) and Generalized MPLS (GMPLS) Traffic Engineering (TE). [RFC8231] specifies extensions to PCEP to enable stateful control of MPLS TE LSPs.


The PCEP operational state is included in the same tree as the PCEP configuration consistent with Network Management Datastore Architecture [RFC8342]. The origin of the data is indicated as per the origin metadata annotation.

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Terminology and Notation

This document also uses the following terms defined in [RFC7420]:

- PCEP entity: a local PCEP speaker.
- PCEP peer: to refer to a remote PCEP speaker.
- PCEP speaker: where it is not necessary to distinguish between local and remote.

Further, this document also uses the following terms defined in [RFC8231]:

- Stateful PCE, Passive Stateful PCE, Active Stateful PCE
- Delegation, Revocation, Redelegation
- LSP State Update, Path Computation Update message (PCUpd).

[RFC8281]:

- PCE-initiated LSP, Path Computation LSP Initiate Message (PCInitiate).

[RFC8408]:

- Path Setup Type (PST).

[I-D.ietf-pce-segment-routing]:

- Segment Routing (SR).
3.1. Tree Diagrams

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is defined in [RFC8340].

3.2. Prefixes in Data Node Names

In this document, names of data nodes and other data model objects are often used without a prefix, as long as it is clear from the context in which YANG module each name is defined. Otherwise, names are prefixed using the standard prefix associated with the corresponding YANG module, as shown in Table 1.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>YANG module</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>te-types</td>
<td>ietf-te-types</td>
<td>[I-D.ietf-teas-yang-te]</td>
</tr>
<tr>
<td>p</td>
<td>ietf-pcep</td>
<td>[I-D.ietf-pce-pcep-yang]</td>
</tr>
<tr>
<td>st</td>
<td>ietf-srv6-types</td>
<td>[I-D.raza-spring-srv6-yang]</td>
</tr>
</tbody>
</table>

Table 1: Prefixes and corresponding YANG modules

4. The Design of PCEP-SRv6 Data Model

4.1. The Overview of PCEP SRv6 Data Model

The PCEP-SRv6 YANG module defined in this document has all the common building blocks for the PCEP-SRv6 extension.
module: ietf-pcep-srv6
    augment /p:pcep/p:entity/p:capability:
        +++-rw srv6 {srv6}?
            +++-rw enabled?     boolean
            +++-rw msd-limit?    boolean
            +++-rw srv6-msd* [msd-type]
                +++-rw msd-type     uint8
                +++-rw msd-value?    uint8
    augment /p:pcep/p:entity/p:peers/p:peer/p:capability:
        +++-rw srv6 {srv6}?
            +++-rw enabled?     boolean
            +++-rw msd-limit?    boolean
            +++-rw srv6-msd* [msd-type]
                +++-rw msd-type     uint8
                +++-rw msd-value?    uint8
    augment /p:pcep/p:entity/p:lsp-db/p:lsp:
        +++-rw srv6 {srv6}?
            +++-ro segment-list
                +++-ro segment* [index]
                    +++-ro index        uint32
                    +++-ro sid-value?   st:srv6-sid

5. PCEP-SRv6 YANG Modules

5.1. ietf-pcep-srv6 module

RFC Ed.: In this section, replace all occurrences of ‘XXXX’ with the actual RFC number and all occurrences of the revision date below with the date of RFC publication (and remove this note).

<CODE BEGINS> file "ietf-pcep-srv6@2019-03-08.yang"
module ietf-pcep-srv6 {
    yang-version 1.1;

    prefix ps;

    import ietf-srv6-types {
        prefix "st";
        reference "RFC XXXX";
    }

    import ietf-te-types {
        prefix "te-types";
    }

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import ietf-pcep {
    prefix "p";
    reference "RFC XXXX";
}

organization
    "IETF PCE (Path Computation Element) Working Group";

contact
    "WG Web: <http://tools.ietf.org/wg/pce/>
    WG List: <mailto:pce@ietf.org>
    Editor: Cheng Li
    <mailto:chengli13@huawei.com>"

description
    "The YANG module augments the PCEP yang operational
    model with SRv6";

revision 2019-03-08 {
    description "Initial revision.";
    reference
        "RFC XXXX: A YANG Data Model for Path Computation
        Element Communications Protocol (PCEP) - Segment Routing in IPv6
        (SRv6)";
}

/* Identity */
identity path-setup-srv6 {
    base te-types:path-signaling-type;
    description
        "SRv6 path setup type";
}

/* Features */
feature srv6 {
    description
        "Support Segment Routing in IPv6 (SRv6) for PCE.";
}

/* Groupings */
grouping srv6-msd {
    description
        "SRv6 MSD";
leaf msd-type {
    type uint8;
    description "SRv6 Maximum Segment Depth (MSD) Type";
}
leaf msd-value {
    type uint8;
    description "SRv6 MSD value for the type";
}

grouping srv6 {
    description "SRv6";
    container srv6 {
        if-feature srv6;
        description "If SRv6 is supported";
        leaf enabled{
            type boolean;
            description "Enabled or Disabled";
        }
        leaf msd-limit {
            type boolean;
            default false;
            description "True indicates no limit on MSD, the list srv6-msd is ignored";
        }
        list srv6-msd {
            key "msd-type";
            description "list of SRv6 MSD";
            uses srv6-msd;
        }
    }
}

grouping segment-list {
    description "Segment list grouping";
    container segment-list {
        description "Segments for given segment list";
        list segment {
            key "index";
        }
    }
}
grouping segment-properties {
    description "Segment properties grouping";
    leaf index {
        type uint32;
        description "Segment index";
    }
    leaf sid-value {
        type st:srv6-sid;
        description "SRv6 SID value";
    }
}

/* Augment modules to add SRv6 */
augment "/p:pcep/p:entity/p:capability"{
    description "Augmenting SRv6";
    uses srv6;
}
    description "Augmenting SRv6";
    uses srv6;
}
augment "/p:pcep/p:entity/p:lsp-db/p:lsp"{
    description "Augmenting SRv6";
    container srv6 {
            description "For SRv6 path";
        }
        if-feature srv6;
        uses segment-list;
        description "SRv6";
    }
}

6. Security Considerations

The YANG module defined in this document is designed to be accessed via network management protocol such as NETCONF [RFC6241] or RESTCONF [RFC8040]. The lowest NETCONF layer is the secure transport layer and the mandatory-to-implement secure transport is SSH [RFC6242]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [RFC8446].

The NETCONF access control model [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a pre-configured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in the YANG module which are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., <edit-config>) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:


Unauthorized access to above list can adversely affect the PCEP session between the local entity and the peers. This may lead to inability to compute new paths, stateful operations on the delegated as well as PCE-initiated LSPs.

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. These are the subtrees and data nodes and their sensitivity/vulnerability:

- `/p:pcep/p:entity/p:lsp-db/p:lsp/ps:srv6` - The SRv6 SID in the network. Unauthorized access to this could provide the all path and network usage information.
7. IANA Considerations

This document registers a URI in the "IETF XML Registry" [RFC3688]. Following the format in RFC 3688, the following registration has been made.


Registrant Contact: The PCE WG of the IETF.

XML: N/A; the requested URI is an XML namespace.

This document registers a YANG module in the "YANG Module Names" registry [RFC6020].

- Name: ietf-pcep
- Prefix: ps
- Reference: This I-D

8. Acknowledgements

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9. References

9.1. Normative References


9.2. Informative References


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