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IGP extension for PCEP security capability support in the PCE discovery
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Abstract

When a Path Computation Element (PCE) is a Label Switching Router (LSR) participating in the Interior Gateway Protocol (IGP), or even a server participating in IGP, its presence and path computation capabilities can be advertised using IGP flooding. The IGP extensions for PCE discovery ([RFC 5088](#) and [RFC 5089](#)) define a method to advertise path computation capabilities using IGP flooding for OSPF and IS-IS respectively. However these specifications lack a method to advertise PCEP security (e.g., Transport Layer Security(TLS), TCP Authentication Option (TCP-AO)) support capability.

This document proposes new capability flag bits for PCE-CAP-FLAGS sub-TLV that can be announced as attribute in the IGP advertisement to distribute PCEP security support information. In addition, this document updates [RFC 5088](#) and [RFC 5089](#) to allow advertisement of Key ID or Key Chain Name Sub-TLV to support TCP A0 security capability.

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Internet-Draft

IGP discovery for PCEP Security

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1. Introduction

As described in [[RFC5440](#)], PCEP communication privacy is one importance issue, as an attacker that intercepts a Path Computation Element (PCE) message could obtain sensitive information related to computed paths and resources.

Among the possible solutions mentioned in these documents, Transport Layer Security (TLS) [[RFC8446](#)] provides support for peer authentication, and message encryption and integrity while TCP Authentication Option (TCP-AO) [[RFC5925](#)] and Cryptographic Algorithms for TCP-AO [[RFC5926](#)] offer significantly improved security for applications using TCP. As specified in [section 4 of \[RFC8253\]](#), in order for a Path Computation Client (PCC) to begin a connection with a PCE server using TLS or TCP-AO, PCC needs to know whether PCE server supports TLS or TCP-AO as a secure transport.

[[RFC5088](#)] and [[RFC5089](#)] define a method to advertise path computation capabilities using IGP flooding for OSPF and IS-IS respectively. However these specifications lack a method to advertise PCEP security (e.g., TLS) support capability.

This document proposes new capability flag bits for PCE-CAP-FLAGS sub-TLV that can be announced as attributes in the IGP advertisement to distribute PCEP security support information. In addition, this document updates [RFC5088](#) and [RFC5089](#) to allow advertisement of Key ID

or Key Chain Name Sub-TLV to support TCP A0 security capability.

Note that the PCEP Open message exchange is another way to discover PCE capabilities information, but in this instance, the TCP security related key parameters need to be known before the PCEP session is

established and the PCEP Open messages are exchanged, thus the use of the PCE discovery and capabilities advertisement in the IGP needs to be used.

2. Conventions used in this document

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. IGP extension for PCEP security capability support

[[RFC5088](#)] defines a PCE Discovery (PCED) TLV carried in an OSPF Router Information Link State Advertisement (LSA) as defined in [[RFC7770](#)] to facilitate PCE discovery using OSPF. This document defines two new capability flag bits in the OSPF PCE Capability Flags to indicate TCP Authentication Option (TCP-AO) support [[RFC5925](#)][[RFC5926](#)], PCEP over TLS support [[RFC8253](#)] respectively.

Similarly, [[RFC5089](#)] defines the PCED sub-TLV for use in PCE discovery using IS-IS. This document will use the same flag for the OSPF PCE Capability Flags sub-TLV to allow IS-IS to indicate TCP Authentication Option (TCP-AO) support, PCEP over TLS support respectively.

The IANA assignments for shared OSPF and IS-IS Security Capability Flags are documented in [Section 8.1](#) ("OSPF PCE Capability Flag") of this document.

3.1. Use of PCEP security capability support for PCE discovery

TCP-AO, PCEP over TLS support flag bits are advertised using IGP flooding.

Type: 6

Length: 4

KeyID: The one octed Key ID as per [RFC5925] to uniquely identify the Master Key Tuple (MKT).

Reserved: MUST be set to zero while sending and ignored on receipt.

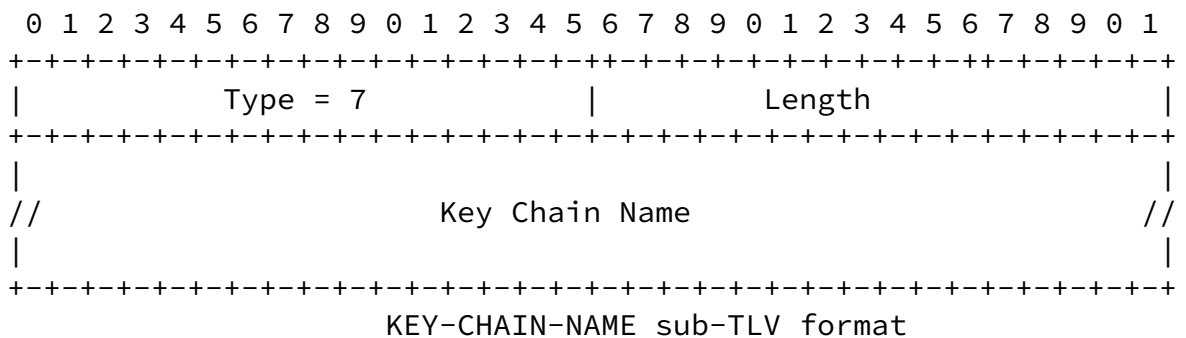
3.3. KEY-CHAIN-NAME Sub-TLV

The KEY-CHAIN-NAME sub-TLV specifies a keychain name that can be used by the PCC to identify the keychain [RFC8177].

The KEY-CHAIN-NAME sub-TLV MAY be present in the PCED sub-TLV carried within the IS-IS Router Information Capability TLV when the capability flag bit of PCE-CAP-FLAGS sub-TLV in IS-IS is set to indicate TCP Authentication Option (TCP-AO) support. Similarly, this sub-TLV MAY be present in the PCED TLV carried within OSPF Router

Information LSA when the capability flag bit of PCE-CAP-FLAGS sub-TLV in OSPF is set to indicate TCP-AO support.

The format of the KEY-CHAIN-NAME sub-TLV is as follows:



Type: 7

Length: Variable

Key Name: The Key Chain Name contains a string to be used to identify the key chain. It SHOULD be a string of printable ASCII characters, without a NULL terminator. The TLV MUST be zero-padded so that the

TLV is 4-octet aligned.

4. Update to [RFC5088](#) and [RFC5089](#)

[Section 4 of \[RFC5088\]](#) states that no new sub-TLVs will be added to the PCED TLV, and no new PCE information will be carried in the Router Information LSA. This document updates [\[RFC5088\]](#) by allowing the two new sub-TLVs defined in this document to be carried in the PCED TLV of the for use in the Router Information LSA.

[Section 4 of \[RFC5089\]](#) states that no new sub-TLVs will be added to the PCED TLV, and no new PCE information will be carried in the Router CAPABILITY TLV. This document updates [\[RFC5089\]](#) by allowing the two new sub-TLVs defined in this document to be carried in the PCED TLV of the for use in the Router CAPABILITY TLV.

The introduction of the additional sub-TLVs should be viewed as an exception to the [\[RFC5088\]](#)[\[RFC5089\]](#) policy justified by the need to know the new information prior to establishing a PCEP session. The restrictions defined in [\[RFC5089\]](#)[\[RFC5089\]](#) should still be considered to be in place.

5. Backward Compatibility Consideration

An LSR that does not support the new IGP PCE capability bits specified in this document silently ignores those bits.

An LSR that does not support the new KEYNAME sub-TLV specified in this document silently ignores the sub-TLV.

IGP extensions defined in this document do not introduce any new interoperability issues.

6. Management Considerations

A configuration option may be provided for advertising and withdrawing PCE security capability via IGP.

7. Security Considerations

Security considerations as specified by [RFC5088] and [RFC5089] are applicable to this document.

The information related to PCEP security is sensitive and due care needs to be taken by the operator. This document defines new capability bits that are susceptible to downgrade attack by toggling them. The content of Key ID or Key Chain Name Sub-TLV can be tweaked to enable a man-in-the-middle attack. Thus before advertisement of the PCE security parameters, it MUST be insured that the IGP is protected for authentication and integrity of the PCED TLV if the mechanism described in this document is used. As stated in [RFC5088] and [RFC5089], the IGP do not provide encryption mechanism to protect the privacy of the PCED TLV, if this information can make the PCEP session less secure then the operator should take that into consideration.

8. IANA Considerations

8.1. OSPF PCE Capability Flag

IANA is requested to allocate new bits assignments for the OSPF Parameters "Path Computation Element (PCE) Capability Flags" registry.

Bit	Meaning	Reference
xx	TCP-AO Support	[This.I.D]
xx	PCEP over TLS support	[This.I.D]

The registry is located at: <https://www.iana.org/assignments/ospfv2-parameters/ospfv2-parameters.xml#ospfv2-parameters-14.xml>

8.2. PCED sub-TLV Type Indicators

The PCED sub-TLVs were defined in [RFC5088] and [RFC5089], but they did not create a registry for it. This document requests IANA to create a new top-level OSPF registry, the "PCED sub-TLV type indicators" registry. This registry should be populated with -

Value	Description	Reference
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0	Reserved	[This.I.D] [RFC5088]
1	PCE-ADDRESS	[This.I.D] [RFC5088]
2	PATH-SCOPE	[This.I.D] [RFC5088]
3	PCE-DOMAIN	[This.I.D] [RFC5088]
4	NEIG-PCE-DOMAIN	[This.I.D] [RFC5088]
6	KEY-ID	[This.I.D]
7	KEY-CHAIN-NAME	[This.I.D]

This registry is also used by IS-IS PCED sub-TLV.

9. Acknowledgments

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10.2. Informative References

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Appendix A. No MD5 Capability Support

To be compliant with [Section 10.2 of RFC5440](#), this document doesn't consider to add capability for TCP-MD5. Therefore by default, PCEP Speaker in communication supports capability for TCP-MD5 (See [section 10.2](#), [[RFC5440](#)]). A method to advertise TCP-MD5 Capability support using IGP flooding is not required. If the client is looking for

connecting with PCE server with other Security capability support (e.g., TLS support) than TCP-MD5, the client MUST check if flag bit in the PCE- CAP-FLAGS sub-TLV for specific capability is set (See [section 3.1](#)).

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