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BGP Extensions for Path Computation Element (PCE) Discovery draft-dong-pce-discovery-proto-bgp-00

Abstract

In network scenarios where Path Computation Element (PCE) is used for centralized path computation, it is desirable for Path Computation Clients (PCCs) to automatically discover the set of PCEs. As BGP has been extended for north-bound distribution of routing and LSP path information to PCE, the PCEs may not participate in Interior Gateway Protocol (IGP) for collecting the routing information, thus the IGP based PCE discovery cannot be used directly in these scenarios. This document specifies the BGP extensions for PCE discovery.

Requirements Language

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].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

In network scenarios where Path Computation Element (PCE) is used for centralized path computation, it is desirable for Path Computation Clients (PCCs) to automatically discover the set of PCEs. As BGP will be used for north-bound distribution of routing and Label Switched Path (LSP) information to PCE[I-D.ietf-idr-ls-distribution] [I-D.ietf-idr-te-lsp-distribution] [I-D.ietf-idr-te-pm-bgp], the PCEs may not participate in Interior Gateway Protocol (IGP) for collecting the routing information, thus the IGP based PCE discovery mechanisms defined in [RFC5088] [RFC5089] cannot be used directly.

This document proposes to extend BGP for PCE discovery in such scenarios. While in each IGP domain, the IGP based PCE discovery mechanism may be used in conjunction with the BGP based PCE discovery. Thus the BGP based PCE discovery is complemental to the existing IGP based mechanisms.

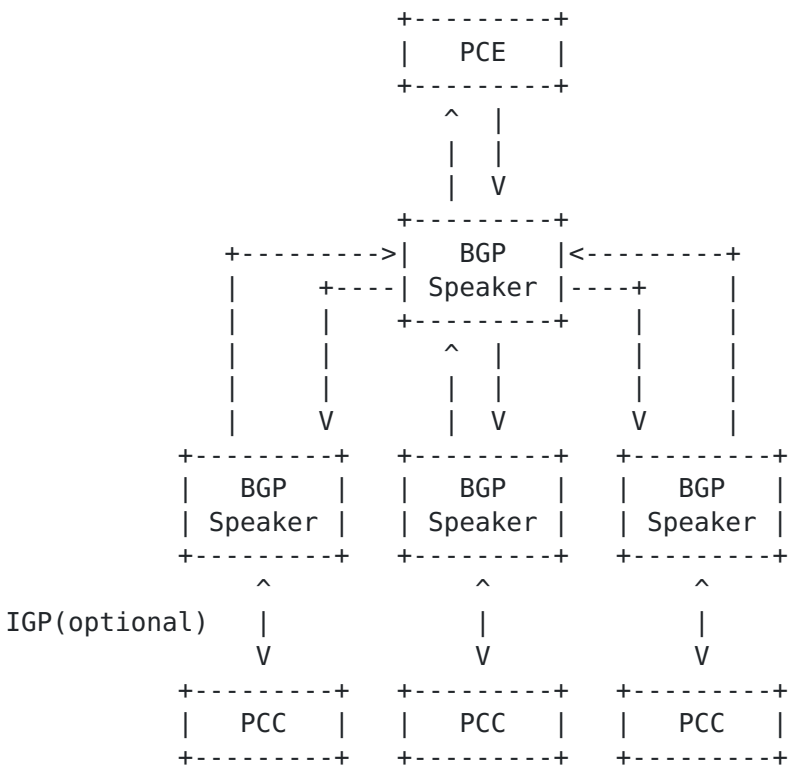

Figure 1. BGP for routing collection and PCE discovery

As shown in the network architecture in Figure 1, BGP is used for both routing information distribution and PCE information discovery. The routing information is distributed from the network elements up to PCE, while the PCE discovery information is advertised from PCE down to PCCs. IGP based PCE discovery mechanism may be used for the distribution of PCE discovery information in each IGP domain.

2. Carrying PCE Discovery Information in BGP

2.1. PCE Address Information

The PCE discovery information is advertised in BGP UPDATE messages using the MP_REACH_NLRI and MP_UNREACH_NLRI attributes [RFC4760]. A new NLRI called PCE_ADDR NLRI is defined for carrying the PCE address information which can be used to reach the PCE. The AFI/SAFI value for the PCE_ADDR NLRI is TBD. In order for two BGP speakers to exchange PCE_ADDR NLRI, they MUST use BGP Capabilities Advertisement [RFC4760] to ensure that both are capable of properly processing such NLRI. This is done by using Capability Code 1 (which indicates Multiprotocol Extensions capabilities), with the AFI/SAFI pair for the PCE_ADDR NLRI.

The format of PCE_ADDR NLRI is shown as below:

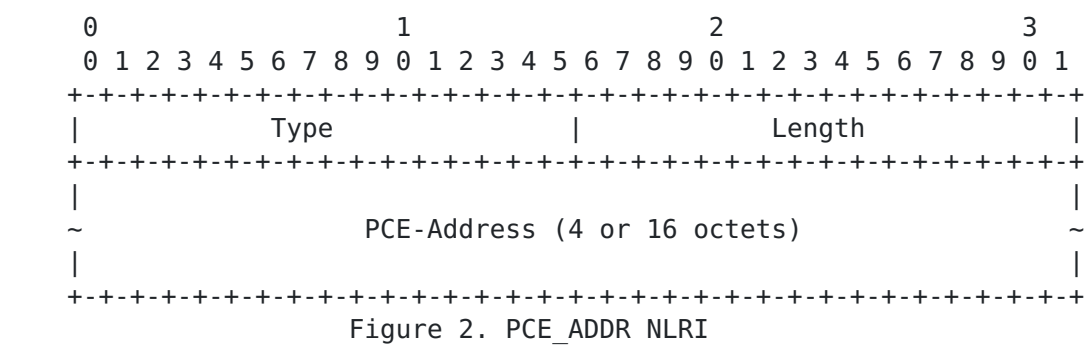

Figure 2. PCE_ADDR NLRI

For PCEs identified by IPv4 address, the Type field SHOULD be set to 1, and the Length field SHOULD be set to 4.

For PCEs identified by IPv6 address, the Type field SHOULD be set to 2, and the Length field SHOULD be set to 16.

2.2. PCE Discovery Attribute

The detailed PCE discovery information is carried in a new optional non-transitive BGP attribute called PCE_DISC Attribute, which consists of a series of PCE Discovery TLVs for specific PCE information. The PCE_DISC attribute SHOULD only be used with PCE_ADDR NLRI.

The format of the PCE Discovery TLV is shown as below:

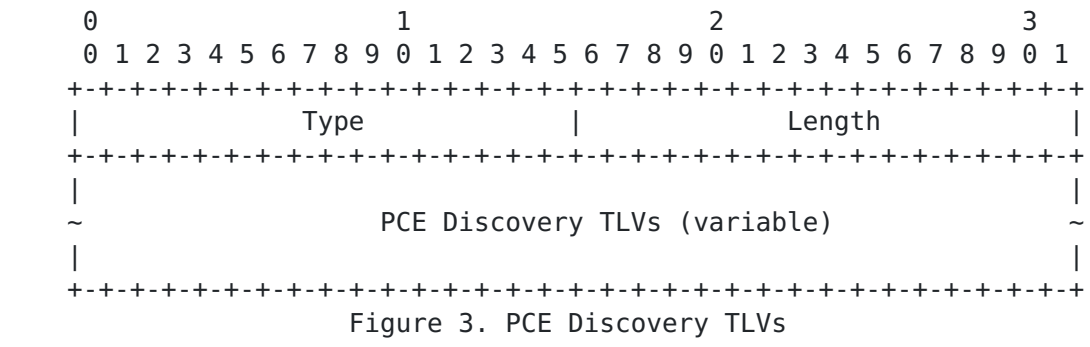

Figure 3. PCE Discovery TLVs

The Type code and format of the PCE Discovery TLVs are consistent with the IGP PCED Sub-TLVs defined in [RFC5088] [RFC5089]. Type 1 is reserved, which is used in IGP based PCE discovery mechanisms to carry PCE Address .

TLV-Type	Length	Name
2	3	PATH-SCOPE TLV
3	variable	PCE-DOMAIN TLV
4	variable	NEIG-PCE-DOMAIN TLV
5	variable	PCE-CAP-FLAGS TLV

The PATH-SCOPE TLV MUST always be carried in the PCE_DISC Attribute. Other TLVs are optional and may facilitate the PCE selection.

More PCE Discovery TLVs may be defined in future.

3. Operational Considerations

Existing BGP operational procedures apply to the advertisement of PCE discovery information. Such information is treated as pure application level data which has no immediate impact on forwarding states.

PCE discovery information is considered relatively stable and does not change frequently, thus this information will not bring significant impact on the amount of BGP updates in the network.

4. IANA Considerations

IANA needs to assign new AFI and SAFI codes for PCE_ADDR NLRI from "Address Family Numbers" and "Subsequent Address Family Identifiers" registry.

IANA needs to assign a new type code for "PCE_DISC" attribute from "BGP Path Attributes" registry.

5. Security Considerations

Procedures and protocol extensions defined in this document do not affect the BGP security model. See [RFC6952] for details.

6. Acknowledgements

The authors would like to thank Zhenbin Li for the discussion and comments.

7. References

7.1. Normative References

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7.2. Informative References

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