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Distribution of MPLS Traffic Engineering (TE) LSP State using BGP
draft-dong-idr-te-lsp-distribution-00

Abstract

This document describes a mechanism to collect the Traffic Engineering (TE) LSP information using BGP. Such information can be used by external components for path reoptimization, service placement and network visualization.

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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This Internet-Draft will expire on April 18, 2013.

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1. Introduction

In some network environments, the states of established Multi-Protocol Label Switching (MPLS) Traffic Engineering (TE) Label Switched Paths (LSPs) in the network are required by some components external to the network domain. Usually this information is directly maintained by the ingress Label Edge Routers (LERs) of the MPLS TE LSPs.

One example of using the LSP information is stateful Path Computation Element (PCE) [I-D.ietf-pce-stateful-pce], which could provide benefits in path reoptimization . While some extensions are proposed in Path Computation Element Communication Protocol (PCEP) for the Path Computation Clients (PCCs) to report the LSP states to the PCE, this mechanism may not be applicable in a management-based PCE architecture as specified in section 5.5 of [RFC4655]. As illustrated in the figure below, the PCC is not an LSR in the routing domain, thus the head-end nodes of the TE-LSP may not implement the PCEP protocol. In this case some general mechanism to collect the TE-LSP states from the ingress LERs is needed. This document proposes an LSP state collection mechanism complementary to the mechanism defined in [I-D.ietf-pce-stateful-pce].

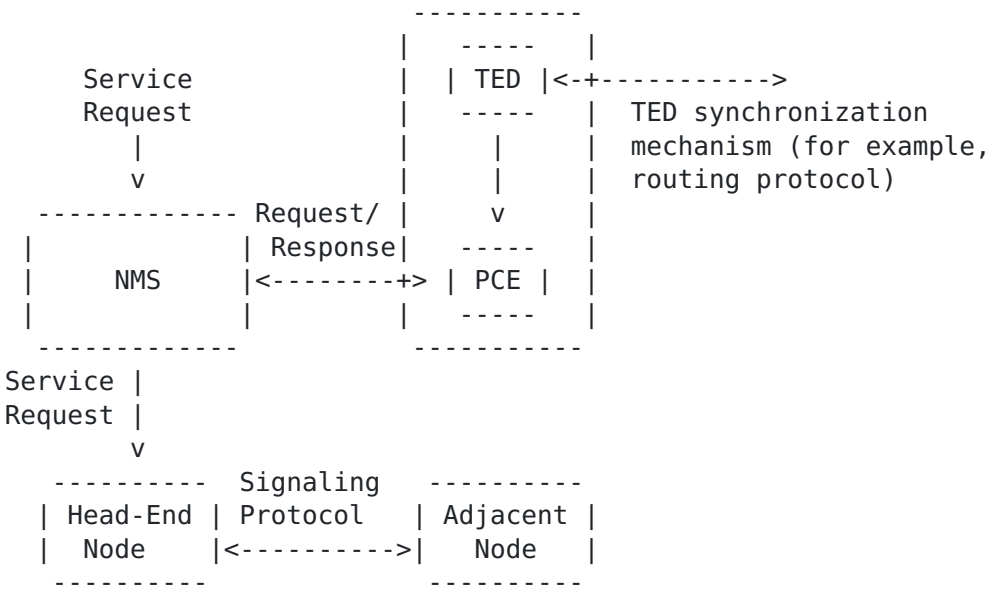

Figure 1. Management-Based PCE Usage

In networks with composite PCE nodes as specified in section 5.1 of [RFC4655], the PCE is implemented on some routers in the network, and the PCCs in the network can use the mechanism described in [I-D.ietf-pce-stateful-pce] to report the LSP information to the PCE

nodes. An external component may further need to collect the LSP information from all the PCEs in the network to get a global view of the LSP states in the network.

In some networks, a centralized controller is used for service placement. Obtaining the TE LSP state information is quite important for making appropriate service placement decisions with the purpose of both meeting the application's requirements and utilizing the network resource efficiently.

The Network Management System (NMS) may need to provide global visibility of the TE LSPs in the network as part of the network visualization.

BGP has been extended to distribute link-state and traffic engineering information and share with some external components [I-D.ietf-idr-ls-distribution]. Using the same protocol to collect other network layer information would be desired by the external components, which avoids introducing multiple protocols for network information collection. This document describes a mechanism to distribute the TE LSP information to external components using BGP.

2. Carrying LSP State Information in BGP

2.1. LSP Information NLRI

A new NLRI "LSP Information NLRI" is advertised in BGP UPDATE messages using the MP_REACH_NLRI and MP_UNREACH_NLRI attributes [RFC4760]. The AFI value is TBD, the SAFI value can be 1 for LSPs in the public network. BGP speakers that wish to exchange LSP Information NLRI MUST use the BGP Multiprotocol Extensions Capability Code (1) to advertise the corresponding (AFI, SAFI) pair, as specified in [RFC4760].

The format of the LSP Information NLRI is as follows:

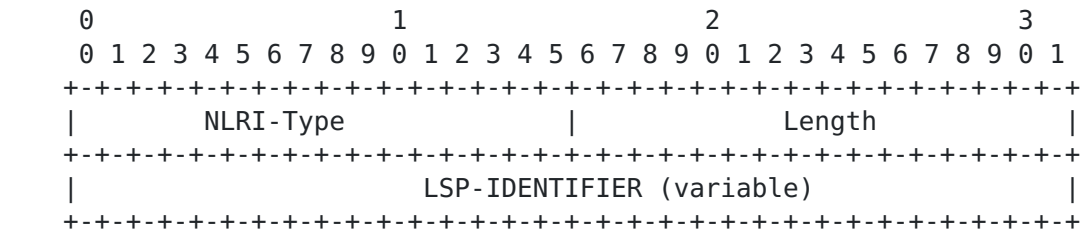

Figure 2. LSP Information NLRI

The NLRI-Type field can be one of the following values:

o NLRI-Type = 1: IPv4 LSP NLRI

o NLRI-Type = 2: IPv6 LSP NLRI

If the NLRI-Type value is set to 1, the LSP-IDENTIFIER is the IPv4-LSP-IDENTIFER structured as below:

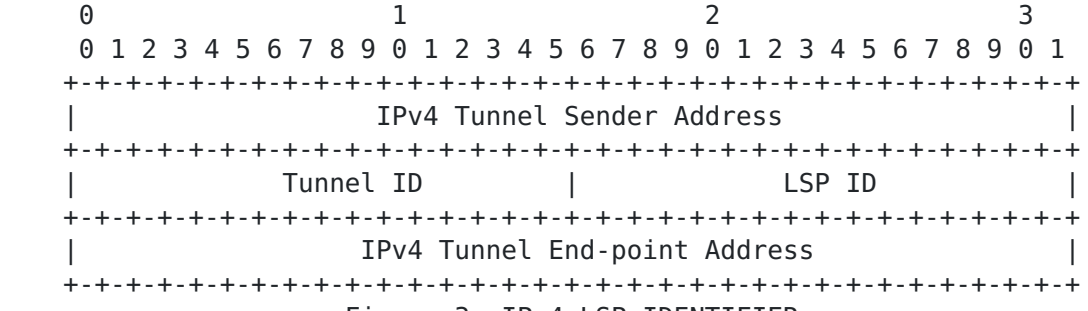

Figure 3. IPv4-LSP-IDENTIFIER

If the NLRI-Type value is set to 2, the LSP-IDENTIFIER is the IPv6-LSP-IDENTIFIER structured as below:

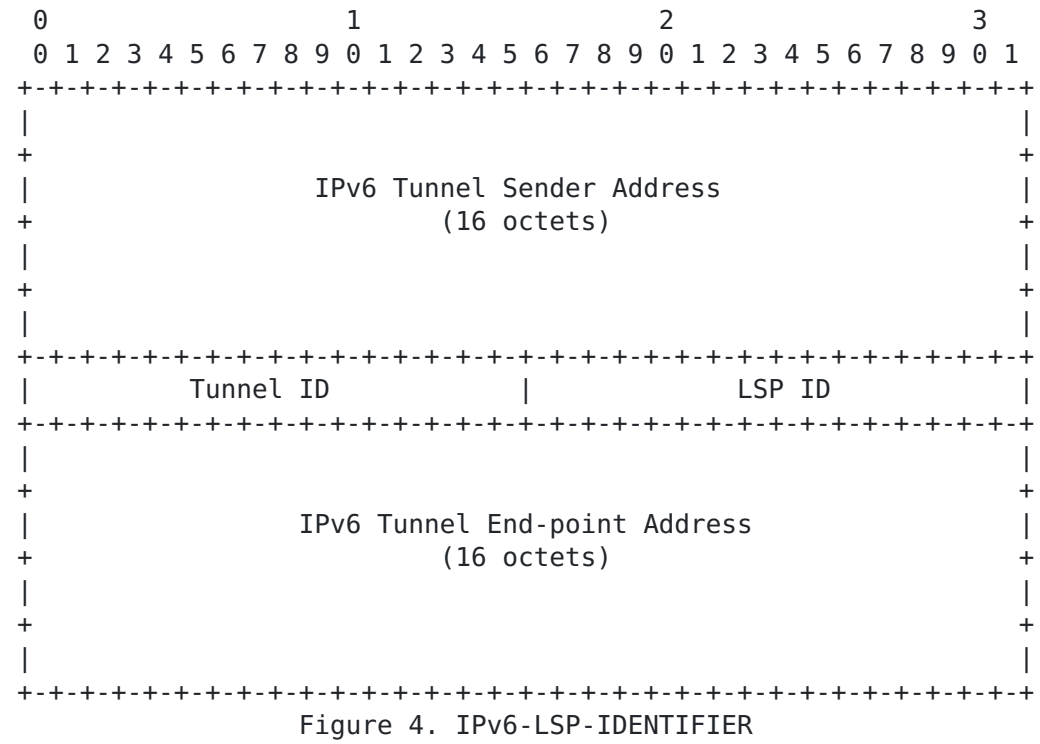

Figure 4. IPv6-LSP-IDENTIFIER

The fields in the IPv4-LSP-IDENTIFIER and IPv6-LSP-IDENTIFIER are the same as specified in [RFC3209].

2.2. LSP State Attribute

The LSP State Attribute is an optional non-transitive BGP attribute which is used to describe the characteristics of the LSPs. The LSP State Attribute consists of a set of objects defined in [RFC3209], [RFC3473] and [RFC5440] . This Attribute SHOULD only be used with the LSP Information NLRI.

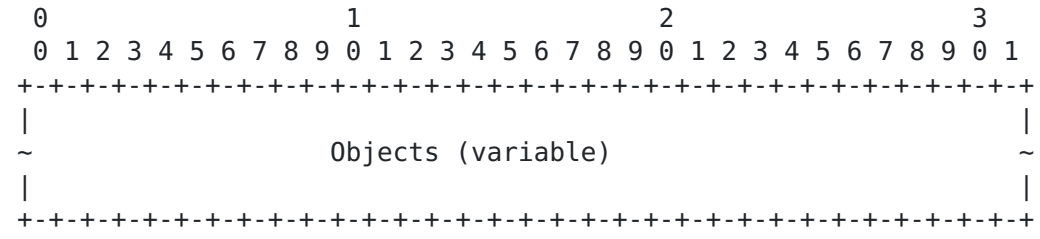

Figure 5. LSP State Attribute

Currently the Objects that can be carried in the LSP State Attribute include:

- LSP Attributes (LSPA) Object
- Explicit Route Object (ERO)
- Record Route Object (RRO)
- BANDWIDTH Object
- METRIC Object
- Protection Object
- Admin Status Object

Other Objects may also be carried in the LSP State Attribute, which would be specified in a future version.

3. IANA Considerations

IANA needs to assign a new AFI value for the LSP Information NLRI. This code point will come from the "Address Family Numbers" registry.

IANA needs to assign an new code point for the LSP State Attribute from the "BGP Path Attributes" registry.

4. Security Considerations

TBD

5. Acknowledgements

6. References

6.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3209] Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", RFC 3209, December 2001.

[RFC3473] Berger, L., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic

Engineering (RSVP-TE) Extensions", RFC 3473, January 2003.

[RFC4760] Bates, T., Chandra, R., Katz, D., and Y. Rekhter, "Multiprotocol Extensions for BGP-4", RFC 4760, January 2007.

[RFC5440] Vasseur, JP. and JL. Le Roux, "Path Computation Element (PCE) Communication Protocol (PCEP)", RFC 5440, March 2009.

6.2. Informative References

[I-D.ietf-idr-ls-distribution]
Gredler, H., Medved, J., Previdi, S., and A. Farrel, "North-Bound Distribution of Link-State and TE Information using BGP", draft-ietf-idr-ls-distribution-00 (work in progress), September 2012.

[I-D.ietf-pce-stateful-pce]
Crabbe, E., Medved, J., Varga, R., and I. Minei, "PCEP Extensions for Stateful PCE", draft-ietf-pce-stateful-pce-01 (work in progress), July 2012.

[RFC4655] Farrel, A., Vasseur, J., and J. Ash, "A Path Computation Element (PCE)-Based Architecture", RFC 4655, August 2006.

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