TEAS Working Group
Internet Draft

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**BGP-LS extend for inter-AS topology retrieval**
**draft-wang-idr-bgpls-inter-as-topology-ext-00.txt**

## Status of this Memo



## Copyright Notice



## Abstract

This document describes new TLVs extended for BGP-LS to transfer the originator of redistributed routes and other inter-AS TE related TLVs to let the SDN controller to retrieve the network topology automatically under the multi-domain environments.

This extension can expand the usage of BGP-LS protocol to multi-domain; enable the network operator to collect the connection relationship between different domains and then calculate the overall network topology automatically based on the information provided by BGP-LS protocol.

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## 1. Introduction

BGP-LS [RFC 7752] describes the methodology that using BGP protocol to transfer the Link-State information. Such method can enable SDN controller to collect the underlay network topology automatically, but normally it can only get the information within one IGP domain. If the operator has more than one IGP domain, and these domains interconnect each other, there is no general TLV within current BGP-LS to transfer the interconnect information.

Draft[I-D.ietf-idr-bgpls-segment-routing-epe]defines some extensions for exporting BGP peering node topology information (including its peers, interfaces and peering ASs) in a way that is exploitable in order to compute efficient BGP Peering Engineering policies and strategies. Such information can also be used to calculate the interconnection topology among different IGP domains, but it requires the border routers to run BGP-LS protocol to collect this information and report them to the PCE/SDN controller, which restricts the deployment flexibility of BGP-LS protocol.

Draft[I-D.ietf-idr-bgpls-segment-routing-ext]defines some extensions for exporting segment routing related information. It proposes one "Source Router Identifier" TLV which is defined in [RFC7794] to transfer the originator information of redistributed prefixes. But

the definition of such TLV focuses mainly on the IS-IS domain, and it will only be reported when the network deploys segment routing technology.

But beyond the segment routing scenario, draft [I-D.ietf-teas-native-ip-scenarios] defines other non segment routing scenarios that the PCE/SDN controller needs to get the topology information among different domains automatically, and the IGP protocol in these domains is not limited to IS-IS. Then we need to broader and reshape the definition of "Source Router Identifier" TLV to include and cover more general situations.

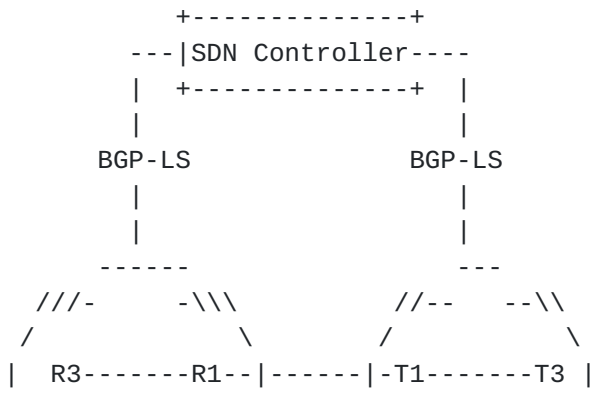
This draft analysis the situations that the PCE/SDN controller needs to get the originator information of the prefixes between different domains, define new TLVs to extend the BGP-LS protocol to transfer the key information related to the interconnect topology. After that, the SDN controller can then deduce the multi-domain topology automatically based on the information from BGP-LS protocol.

## 2. Conventions used in this document

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].

## 3. Multi-Domain Scenarios.

Fig.1 illustrates the multi-domain scenarios that this draft discussed. Normally, SDN Controller can get the topology of IGP A and IGP B individually via the BGP-LS protocol, but it can't get the topology connection information between these two IGP domains because there is normally no IGP protocol run on the connected links.



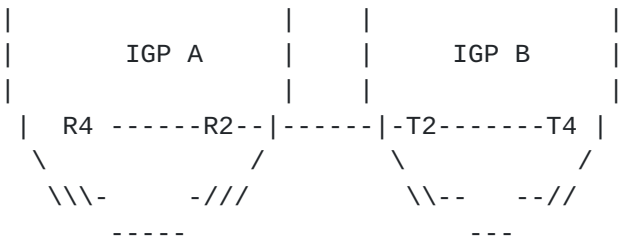



Fig.1 Multi-Domain Scenarios

### 3.1. IS-IS/OSPF Native IP Scenario

When the IGP A or IGP B runs IS-IS/OSPF protocol, normally the operator will redistribute the prefixes of interconnect links into IS-IS/OSPF protocol to ensure the inter-domain connectivity.

[RFC7794] defines the "IPv4/IPv6 Source Router ID" to indicate this information and it will flood within the IGP domain. If BGP-LS protocol that runs on one of the interior router can carry such information, the PCE/SDN controller will know the anchor router of the inter-domain links. Such information is needed within not only for segment routing scenario as described in [I-D.ietf-idr-bgpls-segment-routing-ext], but also in non segment routing scenario as described in [I-D.ietf-teas-native-ip-scenarios].

[RFC2328] defines the type 5 external LSA to transfer the external routes; [draft-ietf-ospf-ospfv3-lsa-extend] defines the "External-Prefix TLV" to transfer the external routes; these LSAs have also the advertising router information that initiates the redistribute activity. If such information can be reported also via the "IPv4/IPv6 Source Router ID", then the PCE/SDN controller can construct the underlay inter-domain topology according to procedure described in section 3.5.

### 3.2. IS-IS/OSPF inter-AS TE Scenario

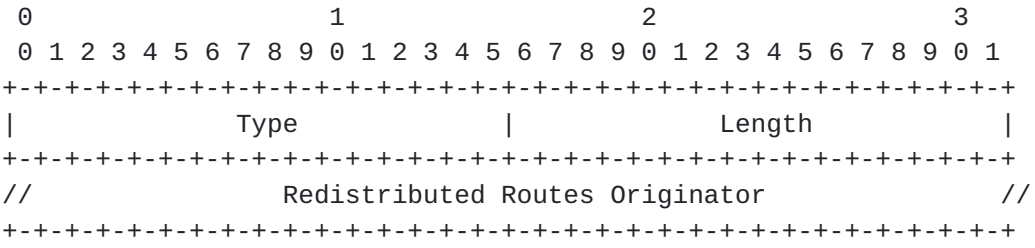
[RFC5316] and [RFC5392] define the IS-IS and OSPF extensions respectively to deal with the requirements for inter-AS traffic engineering. They define some new sub-TLVs(Remote AS Number IPv4 Remote ASBR ID IPv6 Remote ASBR ID) which are associated with the inter-AS TE link TLVs to report the TE topology between different domains. These TLVs are also flooding within the IGP domain. If the

PCE/SDN controller can know these information via one of the interior router that runs BGP-LS protocol, the PCE/SDN controller can rebuild the inter-AS TE topology correctly.

## 3.3. Proposed Solution

### 3.3.1. Redistributed Routes Originator TLV

This draft proposes to define one new TLV to transfer such key information; we call it "Redistributed Routes Originator" TLV. The format of this TLV is illustrated below:




Type: should be allocated by IANA.

Length: 4 or 16 Bytes.

Redistributed Routes Originator: Router ID of the redistributed routes.

For IGP that runs IS-IS protocol, the "Redistributed Routes Originator" should contain the IPv4/IPv6 address of the redistributed router which is defined in [RFC7794];

For IGP that runs OSPF v2/v3 protocol, the "Redistributed Routes Originator" should contain the IPv4/IPv6 address of the redistributed router which is included in the External LSA that defined in [RFC2328] or "External-Prefix TLV" that defined in [draft-ietf-ospf-ospfv3-lsa-extend];

This TLV should be coincided with the IGP Route Tag TLV or OSPF Route Type TLV, because these two TLVs indicate the associated prefixes redistributed via other protocols. They are all under the associated Prefix NLRI.

### 3.3.2. Inter-AS TE related TLVs

This draft proposes to add three new TLVs that is associated with the inter-AS TE link NLRI to transfer the information via BGP-LS, which are required to build the inter-AS related topology by the PCE/SDN controller.

The following Link Attribute TLVs are added in the BGP-LS attribute

with a Link NLRI:

| TLV Code Point | Description | IS-IS/OSPF TLV /Sub-TLV | Reference (RFC/Section) |
|---|---|---|---|
| TBD | Remote AS Number | 24/21 | [RFC5316]/3.3.1 |
| | | | [RFC5392]/3.3.1 |
| TBD | IPv4 Remote ASBR ID | 25/22 | [RFC5316]/3.3.2 |
| | | | [RFC5392]/3.3.2 |
| TBD | IPv6 Remote ASBR ID | 26/24 | [RFC5316]/3.3.3 |
| | | | [RFC5392]/3.3.3 |

### 3.3.3. Topology Reconstruction.

When SDN Controller gets such information from BGP-LS protocol, it should compares the proximity of the redistributed prefixes. If they are under the same scope, then it should find the corresponding associated "redistributed route originator" TLV, build the link between these two originators.

After iterating the above procedures for all of the redistributed prefixes, the SDN controller can then draw the connection topology between different domains automatically.

## 4. Security Considerations

TBD

## 5. IANA Considerations

TBD

## 6. Conclusions

TBD

## 7. References

### 7.1. Normative References

[RFC2328] J. Moy, "OSPF Version 2",RFC2328, April 1998 http://www.rfc-editor.org/info/rfc2328

[RFC 5316] M. Chen, R. Zhang, X. Duan, "ISIS Extensions in Support of Inter-Autonomous System (AS) MPLS and GMPLS Traffic Engineering", RFC5316, December 2008, http://www.rfc-editor.org/info/rfc5316

[RFC5392] M. Chen, R. Zhang, X. Duan, "OSPF Extensions in Support of Inter-Autonomous System (AS) MPLS and GMPLS Traffic Engineering", RFC5392, January 2009, http://www.rfc-editor.org/info/rfc5392

[RFC7752] H. Gredler, Ed., J. Medved, S. Previdi, A. Farrel, S. Ray, "North-Bound Distribution of Link-State and Traffic Engineering (TE) Information Using BGP ", RFC7752, March 2016, https://tools.ietf.org/html/rfc7752

[RFC7794] L. Ginsberg, Ed., B. Decraene, S. Previdi, X. Xu, U. Chunduri, "IS-IS Prefix Attributes for Extended IPv4 and IPv6 Reachability", RFC7794, March 2016

### 7.2. Informative References

[I-D.ietf-idr-bgpls-segment-routing-epe]

S. Previdi, C. Filsfils, K. Patel, S. Ray, J. Dong, "BGP-LS extensions for Segment Routing BGP Egress Peer Engineering",

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[draft-ietf-ospf-ospfv3-lsa-extend]

A.Lindem, A.Roy, D.Goethals, V.Reddy Vallem, "OSPFv3 LSA Extendibility", https://datatracker.ietf.org/doc/draft-ietf-ospf-ospfv3-lsa-extend/ (work in progess), January 2018

## 8. Acknowledgments

TBD.

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