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Advertisement of Stub Link Attributes
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Abstract

This document describes the mechanism that can be used to advertise the stub link attributes within the ISIS or OSPF domain.

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[1.](#) Introduction

Stub links are used commonly within enterprise or service provider networks. One common use case is the inter-AS routing scenario where there are no IGP adjacencies between the adjacent BGP domains. Using stub link on the inter-AS connections can ensure that prefixes contained within a domain are only reachable within the domain itself and are not advertised between domains which could result in undesirable consequences.

For operators that have multiple ASes interconnect with each other via the stub links, there is a requirement to obtain the inter-AS topology information as described in [\[I-D.ietf-idr-bgpls-inter-as-topology-ext\]](#). If the router that uses BGP-LS within one IGP domain can distinguish stub links from other normal interfaces, it is then easy for the router to report these stub links using BGP-LS to a centralized PCE controller. The controller can then pair the two endpoints of the stub link together via the prefixes information (for numbered stub link) or other

attributes (for unnumbered stub link) associated with the stub link.

Stub links are also normally the boundary of one IGP domain, knowing them can facilitate the operators to apply various policies on such

interfaces, for example, to secure their networks, or filtering the incoming traffic with scrutiny.

But OSPF and ISIS have no capability to identify such stub links and their associated attributes now.

This document defines the protocol extension for OSPFv2/v3 and ISIS to indicate the stub links and their associated attributes.

[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 [[RFC2119](#)].

[3.](#) Consideration for Identifying Stub Link

OSPF[[RFC5392](#)] defines the Inter-AS-TE-v2 LSA and Inter-AS-TE-v3 LSA to carry the TE information about inter-AS links. ISIS[[RFC5316](#)] defines the Inter-AS Reachability TLV to carry the TE information about inter-AS links. These LSAs and TLVs can be used to transfer the information about the stub link which are located at the boundary of one AS, but to accomplish the scenario that described in [[I-D.ietf-idr-bgpls-inter-as-topology-ext](#)], every inter-AS link should be configured with the Remote AS Number and IPv4/IPv6 Remote ASBR ID.

And, if the inter-AS stub link is LAN type, every inter-AS link must be configured with several Remote AS Numbers and IPv4/IPv6 Remote ASBR ID pairs to achieve the accurate description of the inter-AS connection. Although the peers on the LAN share the same prefixes, existing solutions doesn't utilize such information to form the connection topology.

To solve the problems that raised by the solutions based on [[RFC5392](#)] and [[RFC5316](#)], this document defines the Stub-Link TLV to identify

the stub link and transmit the associated attributes for OSPF and ISIS respectively.

4. Protocol Extension for Stub Link Attributes

The following sections define the protocol extension to indicate the stub link and its associated attributes in OSPFv2/v3 and ISIS.

4.1. OSPF Stub-Link TLV

This document defines the OSPF Stub-Link TLV to describe stub link of a single router. This Stub-Link TLV is only applicable to the Inter-AS-TE-v2 LSA and Inter-AS-TE-v3 LSA. Inclusion in other LSAs MUST be ignored.

The OSPF Stub-Link TLV which is under the IANA codepoint "Top Level Types in TE LSAs" has the following format:

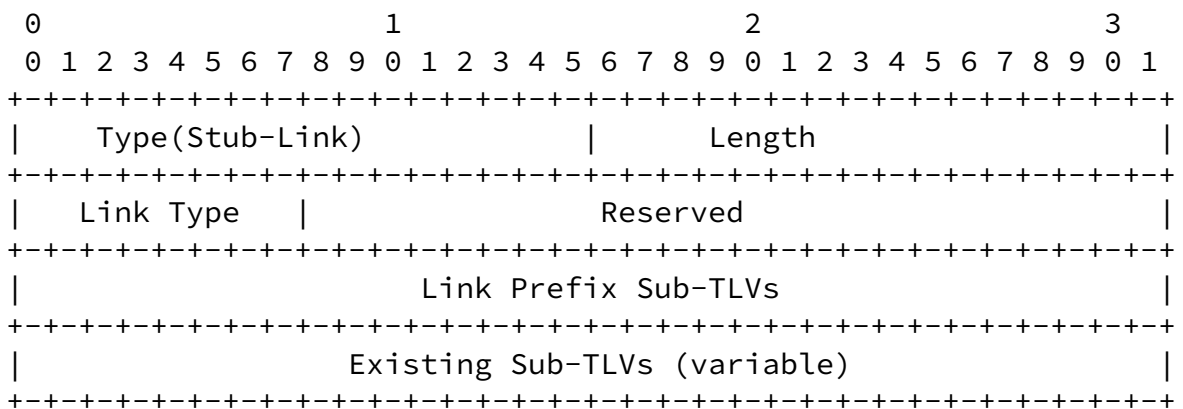


Figure 1: OSPF Stub-Link TLV

Type: The TLV type. The value is 7(TBD) for OSPF Stub-Link

Length: Variable, dependent on sub-TLVs

Link Type: Define the type of the stub-link:

- o 0: Reserved
- o 1: Numbered Stub Link
- o 2: Unnumbered Stub Link
- o 3-255: For future extension

Link Prefix Sub-TLV: The prefix of the stub-link. It's format is defined in [Section 4.3](#) and [Section 4.4](#).

Existing Sub-TLVs: Sub-TLV that defined within "Open Shortest Path First (OSPF) Traffic Engineering TLVs" for TE Link TLV(Value 2) can be included if necessary.

If the stub-link is "Unnumbered Stub Link" type, then the "Remote AS number" , "IPv4 Remote ASBR ID", "IPv6 Remote ASBR ID" sub-TLV MUST be included to facilitate the pairing of inter-AS link.

If this TLV is advertised multiple times in the same Inter-AS-TE-v2/v3 LSA, only the first instance of the TLV is used by receiving OSPFv2/v3 routers. This situation SHOULD be logged as an error.

If this TLV is advertised multiple times for the same link in different Inter-AS-TE-v2/v3 LSA originated by the same OSPFrouter, the OSPFStub-Link TLV in these LSAs with the smallest Opaque ID is used by receiving OSPFrouters. This situation may be logged as a warning.

It is RECOMMENDED that OSPF routers advertising OSPF Stub-Link TLVs in different OSPF Inter-AS-TE v2/v3 LSAs re-originate these LSAs in ascending order of Opaque ID to minimize the disruption.

This document creates a registry for Stub-Link attributes in [Section 7](#).

[4.2](#). ISIS Stub-link TLV

This document defines the ISIS Stub-Link TLV to describes stub link of a single router.

The ISIS Stub-Link TLV has the following format:

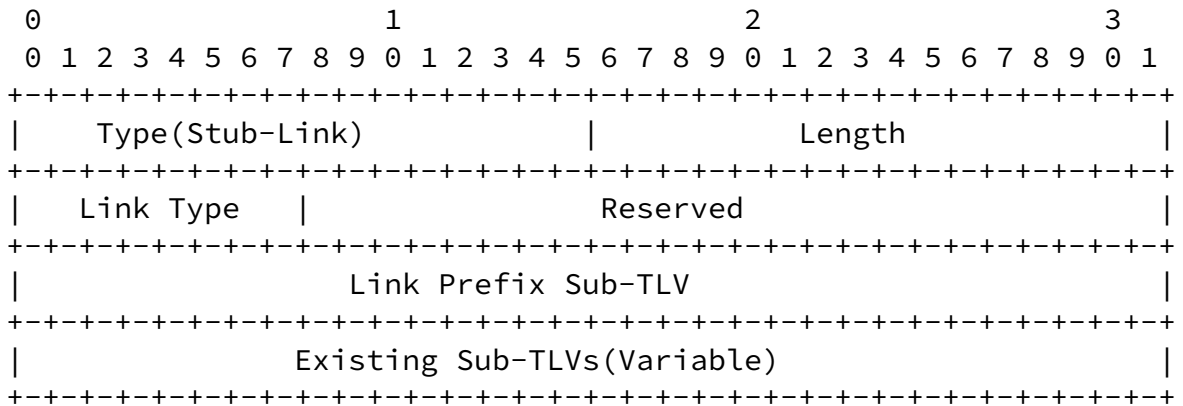


Figure 2: ISIS Stub-Link TLV

Type: ISIS TLV codepoint. Value is 151 (TBD) for stub-link TLV.

Length: Variable, dependent on sub-TLVs

Link Type: Define the type of the stub-link:

- o 0: Reserved
- o 1: Numbered Stub Link
- o 2: Unnumbered Stub Link

- o 3-255: For future extension

Link Prefix Sub-TLV: The prefix of the stub-link. It's format is defined in [Section 4.3](#) and [Section 4.4](#).

Existing Sub-TLVs: Sub-TLVs that defined within "IS-IS Sub-TLVs for TLVs Advertising Neighbor Information " can be included if necessary.

If the stub-link is "Unnumbered Stub Link" type, then the "Remote AS number" , "IPv4 Remote ASBR ID", "IPv6 Remote ASBR ID" sub-TLV MUST be included to facilitate the pairing of inter-AS link.

[4.3](#). IPv4 Prefix Sub-TLV

The IPv4 Prefix Sub-TLV has the following format:

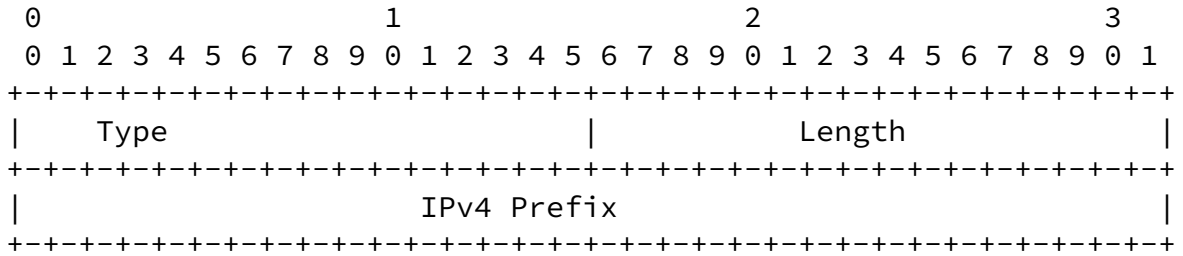


Figure 3: IPv4 Prefix Sub-TLV

Type: IPv4 Prefix Sub-TLV codepoint. Value is 25(TBD) for OSPFv2 (under "OSPFv2 Extended Link Sub-TLVs")

30(TBD) for OSPFv3(under OSPFv3 Extended-LSA Sub-TLVs)

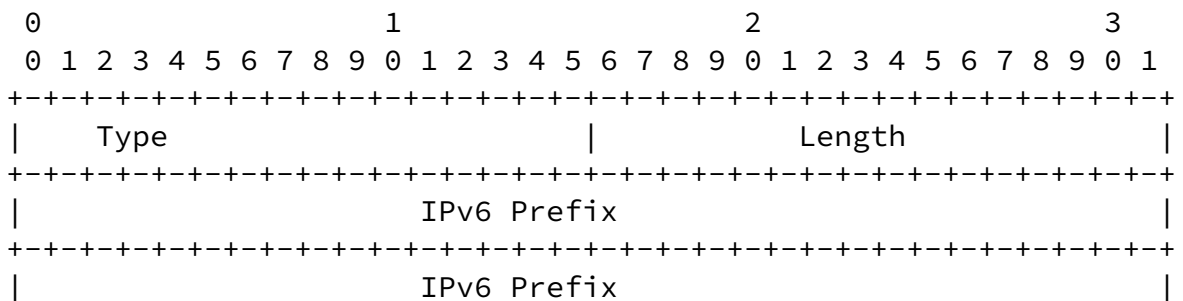
45(TBD) for IS-IS(under "IS-IS Sub-TLVs for TLVs Advertising Neighbor Information")

Length: Netmask length value of the IPv4 Prefix. Value should be in 2-32.

IPv4 Prefix: The value of 4-octet IPv4 Prefix address, the host part should be zero.

4.4. IPv6 Prefix Sub-TLV

The IPv6 Prefix Sub-TLV has the following format:



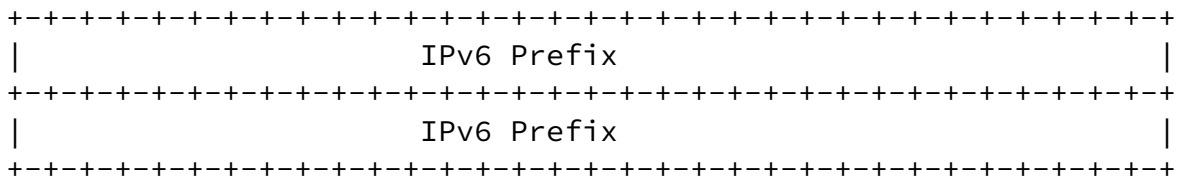


Figure 4: IPv6 Prefix Sub-TLV

Type: IPv6 Prefix Sub-TLV codepoint. Value is 31(TBD) for OSPFv3.(under OSPFv3 Extended-LSA Sub-TLVs)

46(TBD) for IS-IS(under "IS-IS Sub-TLVs for TLVs Advertising Neighbor Information")

Length: Netmask length value of the IPv6 Prefix. Value should be in 2-128.

IPv6 Prefix: The value of 16-octet IPv6 Prefix address, the host part should be zero.

5. Application of the Stub Link attributes

For scenario that described in [\[I-D.ietf-idr-bgpls-inter-as-topology-ext\]](#), the prefixes information associated with the stub link can be used to pair the two endpoints of the stub link by the controller. Such solution can apply in P2P, Broadcast, P2MP, NBMA numbered stub link type. For unnumbered Stub link, the controller can use the associated Remote-AS, IPv4/IPv6 Remote Router ID to pair the two endpoints of the stub link.

6. Security Considerations

Security concerns for ISIS are addressed in [\[RFC5304\]](#) and [\[RFC5310\]](#)

Security concern for OSPFv3 is addressed in [\[RFC4552\]](#)

Advertisement of the additional information defined in this document introduces no new security concerns.

7. IANA Considerations

IANA is requested to the allocation in following registries:

Registry	Type	Meaning
Top Level Types in TE LSAs	7	OSPF Stub-Link TLV
ISIS Top-Level TLV	151	IS-IS Stub-Link TLV
OSPFv2 Extended Link TLV	25	IPv4 Prefix Sub-TLV
OSPFv3 Extended-LSA Sub-TLVs	30	IPv4 Prefix Sub-TLV
OSPFv3 Extended-LSA Sub-TLVs	31	IPv6 Prefix Sub-TLV
IS-IS Sub-TLVs for TLVs Advertising Neighbor Information	45	IPv4 Prefix Sub-TLV
IS-IS Sub-TLVs for TLVs Advertising Neighbor Information	46	IPv6 Prefix Sub-TLV

Figure 5: IANA Allocation for newly defined TLVs and Sub-TLVs

8. Acknowledgement

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9. References

9.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC4552] Gupta, M. and N. Melam, "Authentication/Confidentiality for OSPFv3", [RFC 4552](#), DOI 10.17487/RFC4552, June 2006, <<https://www.rfc-editor.org/info/rfc4552>>.
- [RFC5304] Li, T. and R. Atkinson, "IS-IS Cryptographic Authentication", [RFC 5304](#), DOI 10.17487/RFC5304, October 2008, <<https://www.rfc-editor.org/info/rfc5304>>.

- [RFC5310] Bhatia, M., Manral, V., Li, T., Atkinson, R., White, R., and M. Fanto, "IS-IS Generic Cryptographic Authentication", [RFC 5310](#), DOI 10.17487/RFC5310, February 2009, <<https://www.rfc-editor.org/info/rfc5310>>.
- [RFC5316] Chen, M., Zhang, R., and X. Duan, "ISIS Extensions in Support of Inter-Autonomous System (AS) MPLS and GMPLS Traffic Engineering", [RFC 5316](#), DOI 10.17487/RFC5316, December 2008, <<https://www.rfc-editor.org/info/rfc5316>>.
- [RFC5392] Chen, M., Zhang, R., and X. Duan, "OSPF Extensions in Support of Inter-Autonomous System (AS) MPLS and GMPLS Traffic Engineering", [RFC 5392](#), DOI 10.17487/RFC5392, January 2009, <<https://www.rfc-editor.org/info/rfc5392>>.

[9.2.](#) Informative References

- [I-D.ietf-idr-bgpls-inter-as-topology-ext]
Wang, A., Chen, H., Talaulikar, K., and S. Zhuang, "BGP-LS Extension for Inter-AS Topology Retrieval", [draft-ietf-idr-bgpls-inter-as-topology-ext-11](#) (work in progress), May 2022.

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