

Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: 7 September 2022

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6 March 2022

Extensions to OSPF for Advertising Prefix Administrative Tags
draft-ietf-lsr-ospf-admin-tags-03

Abstract

It is useful for routers in an OSPFv2 or OSPFv3 routing domain to be able to associate tags with prefixes. Previously, OSPFv2 and OSPFv3 were relegated to a single tag for AS External and Not-So-Stubby-Area (NSSA) prefixes. With the flexible encodings provided by OSPFv2 Prefix/Link Attribute Advertisement and OSPFv3 Extended LSAs, multiple administrative tags may be advertised for all types of prefixes. These administrative tags can be used for many applications including route redistribution policy, selective prefix prioritization, selective IP Fast-ReRoute (IPFRR) prefix protection, and many others.

The ISIS protocol supports a similar mechanism that is described in [RFC 5130](#).

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[1.](#) Introduction

It is useful for routers in an OSPFv2 [[RFC2328](#)] or OSPFv3 [[RFC5340](#)] routing domain to be able to associate tags with prefixes. Previously, OSPFv2 and OSPFv3 were relegated to a single tag for AS External and Not-So-Stubby-Area (NSSA) prefixes. With the flexible encodings provided by OSPFv2 Prefix/Link Attribute Advertisement ([[RFC7684](#)]) and OSPFv3 Extended LSA ([[RFC8362](#)]), multiple administrative tags may be advertised for all types of prefixes. These administrative tags can be used many applications including (but not limited to):

1. Controlling which routes are redistributed into other protocols for readvertisement.
2. Prioritizing selected prefixes for faster convergence and

installation in the forwarding plane.

- 3. Identifying selected prefixes for Loop-Free Alternative (LFA) protection.

Throughout this document, OSPF is used when the text applies to both OSPFv2 and OSPFv3. OSPFv2 or OSPFv3 is used when the text is specific to one version of the OSPF protocol.

The ISIS protocol supports a similar mechanism that is described in [RFC 5130](#) [RFC5130].

1.1. Requirements Language

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.

2. 32-Bit Administrative Tag Sub-TLV

This document creates a new Administrative Tag Sub-TLV for OSPFv2 and OSPFv3. This Sub-TLV specifies one or more 32-bit unsigned integers that may be associated with an OSPF advertised prefix. The precise usage of these tags is beyond the scope of this document.

The format of this Sub-TLV is the same as the format used by the Traffic Engineering Extensions to OSPF [RFC3630]. The LSA payload consists of one or more nested Type/Length/Value (TLV) triplets. The format of each TLV is:

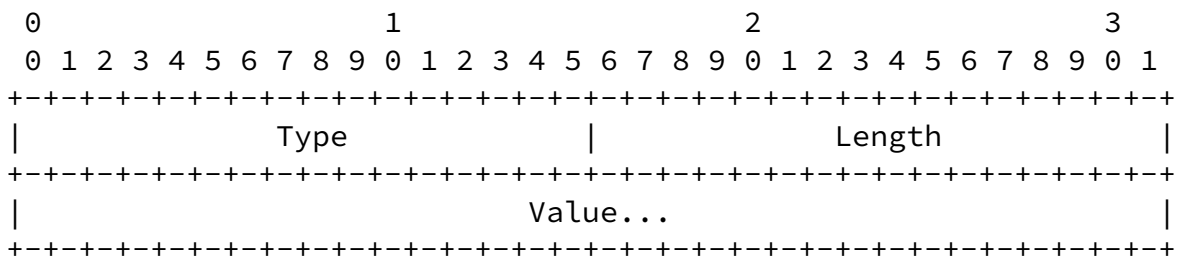
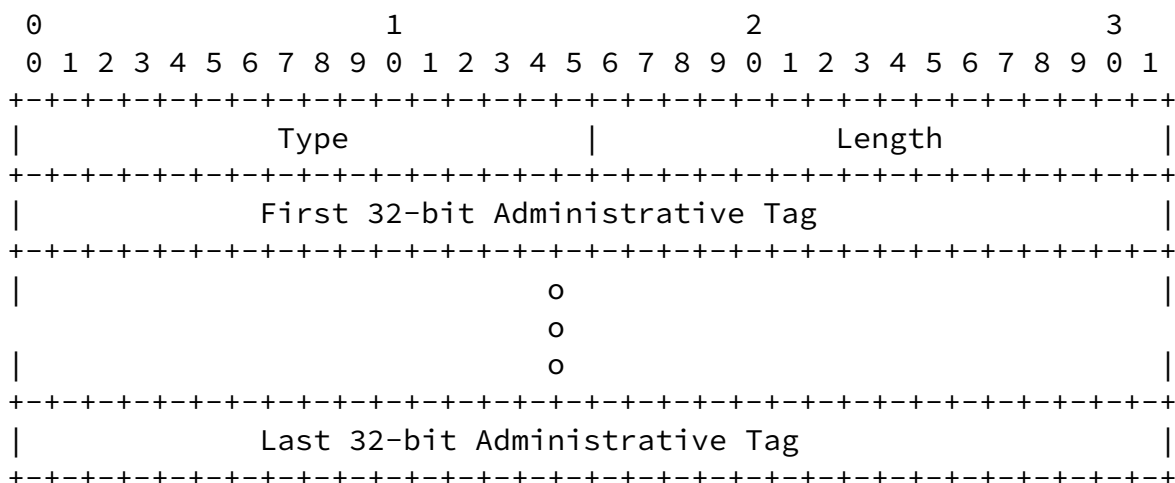


Figure 1: TLV Format

The Length field defines the length of the value portion in octets (thus a TLV with no value portion would have a length of 0). The TLV is padded to 4-octet alignment; padding is not included in the length field (so a 3-octet value would have a length of 3, but the total size of the TLV would be 8 octets).

The format of the 32-bit Administrative Tag TLV is as follows:



- Type A 16-bit field set to TBD. The value MAY be different depending upon the IANA registry from which it is allocated.
- Length A 16-bit field that indicates the length of the value portion in octets and will be a multiple of 4 octets dependent on the number of administrative tags advertised. If the sub-TLV is specified, at least one administrative tag must be advertised.
- Value A variable length list of one or more administrative tags.

Figure 2: 32-bit Administrative Tag Sub-TLV

This sub-TLV will carry one or more 32-bit unsigned integer values that will be used as administrative tags.

3. Administrative Tag Applicability

The administrative tag TLV specified herein will be valid as a sub-TLV of the following TLVs specified in [[RFC7684](#)]:

1. Extended Prefix TLV advertised in the OSPFv2 Extended Prefix LSA

The administrative tag TLV specified herein will be valid as a sub-TLV of the following TLVs specified in [[RFC8362](#)]:

1. Inter-Area-Prefix TLV advertised in the E-Inter-Area-Prefix-LSA
2. Intra-Area-Prefix TLV advertised in the E-Link-LSA and the E-Intra-Area-Prefix-LSA

3. External-Prefix TLV advertised in the E-AS-External-LSA and the E-NSSA-LSA

4. Protocol Operation

An OSPF router supporting this specification MUST propagate administrative tags when acting as an Area Border Router and originating summary advertisements into other areas. Similarly, an OSPF router supporting this specification and acting as an ABR for a Not-So-Stubby Area (NSSA) MUST propagate tags when translating NSSA routes to AS External advertisements [[RFC3101](#)]. The number of tags supported MAY limit the number of tags that are propagated. When propagating multiple tags, the order of the the tags must be preserved.

For configured area ranges, NSSA ranges, and configured summarization of redistributed routes, tags from component routes SHOULD NOT be propagated to the summary. Implementations SHOULD provide a mechanism to configure tags for area ranges, NSSA ranges, and redistributed route summaries.

An OSPF router supporting this specification MUST be able to

advertise and interpret one 32-bit tag for prefixes. An OSPF router supporting this specification MAY be able to advertise and propagate multiple 32-bit tags. The maximum tags that an implementation supports is a local matter depending upon supported applications using the prefix or link tags.

When a single tag is advertised for AS External or NSSA LSA prefix, the existing tag in OSPFv2 and OSPFv3 AS-External-LSA and NSSA-LSA encodings SHOULD be utilized. This will facilitate backward compatibility with implementations that do not support this specification.

[4.1.](#) Equal-Cost Multipath Applicability

When multiple LSAs contribute to an OSPF route, it is possible that these LSAs will all have different tags. In this situation, the OSPF router MUST associate the tags from one of the LSAs contributing a path and, if the implementation supports multiple tags, MAY associate tags for multiple contributing LSAs up to the maximum number of tags supported.

[5.](#) Security Considerations

This document describes a generic mechanism for advertising administrative tags for OSPF prefixes. The administrative tags are generally less critical than the topology information currently advertised by the base OSPF protocol. The security considerations for the generic mechanism are dependent on their application. One such application is to control leaking of OSPF routes to other protocols (e.g., BGP [[RFC4271](#)]). If an attacker were able to modify the admin tags associated with OSPF routes and they were be used for this application, such routes could be prevented from being advertised in routing domains where they are required (subtle denial or service) or they could be advertised into routing domains where they shouldn't be advertised (routing vulnerability). Security considerations for the base OSPF protocol are covered in [[RFC2328](#)]

and [[RFC5340](#)].

6. IANA Considerations

The following values should be allocated from the OSPF Extended Prefix TLV Sub-TLV Registry [[RFC7684](#)]:

* TBD - 32-bit Administrative Tag TLV

The following values should be allocated from the OSPFv3 Extended-LSA Sub-TLV Registry [[RFC8362](#)]:

* TBD - 32-bit Administrative Tag TLV

7. Acknowledgments

The authors of [RFC 5130](#) are acknowledged since this document draws upon both the ISIS specification and deployment experience.

Thanks to Donnie Savage for his comments and questions.

The RFC text was produced using Marshall Rose's xml2rfc tool.

8. References

8.1. 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>>.

[RFC2328] Moy, J., "OSPF Version 2", STD 54, [RFC 2328](#), DOI 10.17487/RFC2328, April 1998, <<https://www.rfc-editor.org/info/rfc2328>>.

[RFC3630] Katz, D., Kompella, K., and D. Yeung, "Traffic Engineering (TE) Extensions to OSPF Version 2", [RFC 3630](#), DOI 10.17487/RFC3630, September 2003, <<https://www.rfc-editor.org/info/rfc3630>>.

- [RFC5340] Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", [RFC 5340](#), DOI 10.17487/RFC5340, July 2008, <<https://www.rfc-editor.org/info/rfc5340>>.
- [RFC7684] Psenak, P., Gredler, H., Shakir, R., Henderickx, W., Tantsura, J., and A. Lindem, "OSPFv2 Prefix/Link Attribute Advertisement", [RFC 7684](#), DOI 10.17487/RFC7684, November 2015, <<https://www.rfc-editor.org/info/rfc7684>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC8362] Lindem, A., Roy, A., Goethals, D., Reddy Vallem, V., and F. Baker, "OSPFv3 Link State Advertisement (LSA) Extensibility", [RFC 8362](#), DOI 10.17487/RFC8362, April 2018, <<https://www.rfc-editor.org/info/rfc8362>>.

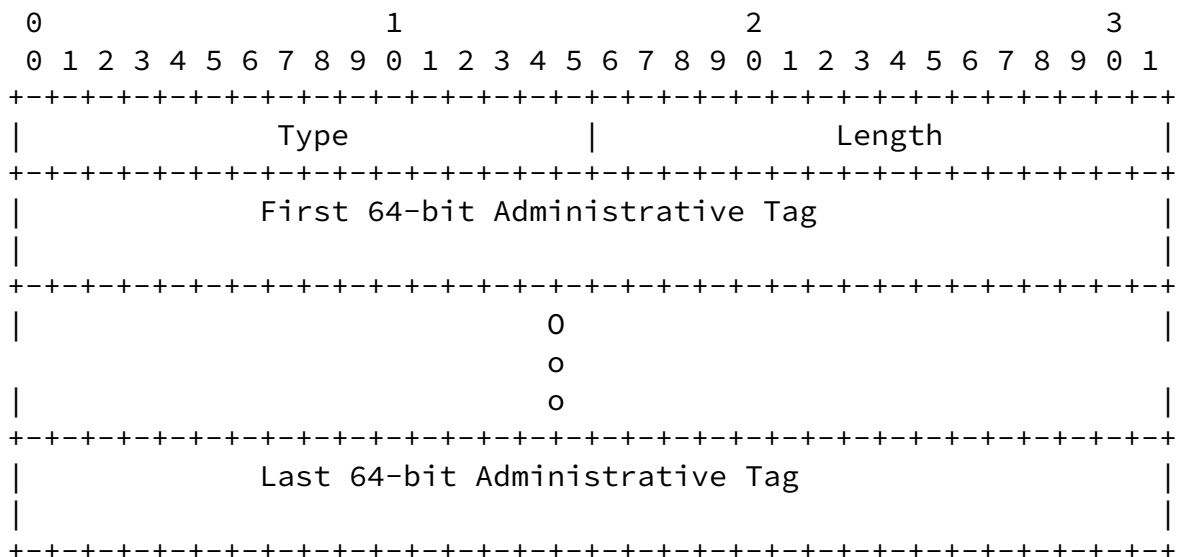
8.2. Informative References

- [RFC3101] Murphy, P., "The OSPF Not-So-Stubby Area (NSSA) Option", [RFC 3101](#), DOI 10.17487/RFC3101, January 2003, <<https://www.rfc-editor.org/info/rfc3101>>.
- [RFC4271] Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A Border Gateway Protocol 4 (BGP-4)", [RFC 4271](#), DOI 10.17487/RFC4271, January 2006, <<https://www.rfc-editor.org/info/rfc4271>>.
- [RFC5130] Previdi, S., Shand, M., Ed., and C. Martin, "A Policy Control Mechanism in IS-IS Using Administrative Tags", [RFC 5130](#), DOI 10.17487/RFC5130, February 2008, <<https://www.rfc-editor.org/info/rfc5130>>.
- [RFC8920] Psenak, P., Ed., Ginsberg, L., Henderickx, W., Tantsura, J., and J. Drake, "OSPF Application-Specific Link Attributes", [RFC 8920](#), DOI 10.17487/RFC8920, October 2020, <<https://www.rfc-editor.org/info/rfc8920>>.

The definition of the 64-bit tag was considered but discarded given that there is no strong requirement or use case. The specification is included here for information.

This sub-TLV will carry one or more 64-bit unsigned integer values that will be used as administrative tags.

The format of the 64-bit Administrative Tag TLV is as follows:



- Type A 16-bit field set to TBD. The value MAY be different depending upon the registry from which it is allocated.

- Length A 16-bit field that indicates the length of the value portion in octets and will be a multiple of 8 octets dependent on the number of administrative tags advertised. If the sub-TLV is specified, at least one administrative tag must be advertised.

- Value A variable length list of one or more 64-bit administrative tags.

Figure 3: 64-bit Administrative Tag TLV

[Appendix B](#). Link Administrative Tags

The advertisement of administrative tags corresponding to links has been removed from the document. The specification of advertising link administrative groups as specified in [RFC8920] advertising administrative tags for links.

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