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Extensions to OSPF for Advertising Prefix Administrative Tags

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:

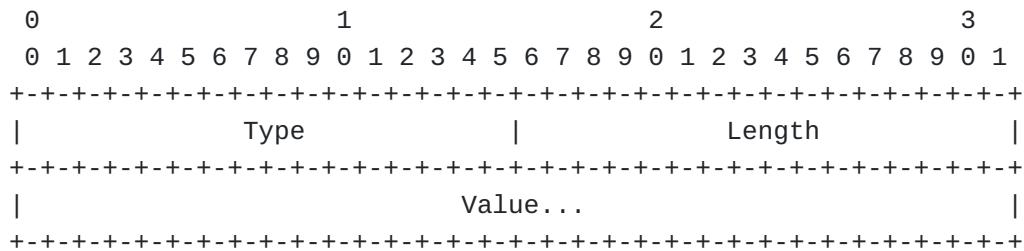


Figure 1: TLV Format

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:

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. YANG Data Model

YANG [[RFC7950](#)] is a data definition language used to define the contents of a conceptual data store that allows networked devices to be managed using NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)].

This section defines a YANG data model that can be used to configure and manage the prefix administrative tags defined in this document, which augments the OSPF YANG data model [[I-D.ietf-ospf-yang](#)] and the OSPFv3 Extended LSA YANG data model [[I-D.ietf-lsr-ospfv3-extended-lsa-yang](#)].

The following show the tree diagram of the module:

```

module: ietf-ospf-admin-tags

augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:ranges/ospf:range:
  +--rw admin-tags
    +--rw tags*   uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:interfaces/ospf:interface:
  +--rw admin-tags
    +--rw tags*   uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:interfaces/ospf:interface/ospf:database
  /ospf:link-scope-lsa-type/ospf:link-scope-lsas
  /ospf:link-scope-lsa/ospf:version/ospf:ospfv2/ospf:ospfv2
  /ospf:body/ospf:opaque/ospf:extended-prefix-opaque
  /ospf:extended-prefix-tlv:
  +--ro prefix-admin-tag-sub-tlvs
    +--ro admin-tag-sub-tlv* []
    +--ro admin-tags*   uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:database/ospf:area-scope-lsa-type/ospf:area-scope-lsas
  /ospf:area-scope-lsa/ospf:version/ospf:ospfv2/ospf:ospfv2
  /ospf:body/ospf:opaque/ospf:extended-prefix-opaque
  /ospf:extended-prefix-tlv:
  +--ro prefix-admin-tag-sub-tlvs
    +--ro admin-tag-sub-tlv* []
    +--ro admin-tags*   uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:database
  /ospf:as-scope-lsa-type/ospf:as-scope-lsas/ospf:as-scope-lsa
  /ospf:version/ospf:ospfv2/ospf:ospfv2/ospf:body/ospf:opaque
  /ospf:extended-prefix-opaque/ospf:extended-prefix-tlv:
  +--ro prefix-admin-tag-sub-tlvs
    +--ro admin-tag-sub-tlv* []
    +--ro admin-tags*   uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:database/ospf:area-scope-lsa-type/ospf:area-scope-lsas
  /ospf:area-scope-lsa/ospf:version/ospf:ospfv3/ospf:ospfv3
  /ospf:body/ospfv3-e-lsa:e-inter-area-prefix
  /ospfv3-e-lsa:e-inter-prefix-tlvs
  /ospfv3-e-lsa:inter-prefix-tlv:
  +--ro prefix-admin-tag-sub-tlvs
    +--ro admin-tag-sub-tlv* []
    +--ro admin-tags*   uint32

```

```

augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:database/ospf:area-scope-lsa-type/ospf:area-scope-lsas
  /ospf:area-scope-lsa/ospf:version/ospf:ospfv3/ospf:ospfv3
  /ospf:body/ospfv3-e-lsa:e-intra-area-prefix
  /ospfv3-e-lsa:e-intra-prefix-tlvs
  /ospfv3-e-lsa:intra-prefix-tlv:
+--ro prefix-admin-tag-sub-tlvs
  +--ro admin-tag-sub-tlv* []
  +--ro admin-tags*      uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:interfaces/ospf:interface/ospf:database
  /ospf:link-scope-lsa-type/ospf:link-scope-lsas
  /ospf:link-scope-lsa/ospf:version/ospf:ospfv3/ospf:ospfv3
  /ospf:body/ospfv3-e-lsa:e-link/ospfv3-e-lsa:e-link-tlvs
  /ospfv3-e-lsa:intra-prefix-tlv:
+--ro prefix-admin-tag-sub-tlvs
  +--ro admin-tag-sub-tlv* []
  +--ro admin-tags*      uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:database
  /ospf:as-scope-lsa-type/ospf:as-scope-lsas/ospf:as-scope-lsa
  /ospf:version/ospf:ospfv3/ospf:ospfv3/ospf:body
  /ospfv3-e-lsa:e-as-external/ospfv3-e-lsa:e-external-tlvs
  /ospfv3-e-lsa:external-prefix-tlv:
+--ro prefix-admin-tag-sub-tlvs
  +--ro admin-tag-sub-tlv* []
  +--ro admin-tags*      uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:database
  /ospf:as-scope-lsa-type/ospf:as-scope-lsas/ospf:as-scope-lsa
  /ospf:version/ospf:ospfv3/ospf:ospfv3/ospf:body
  /ospfv3-e-lsa:e-nssa/ospfv3-e-lsa:e-external-tlvs
  /ospfv3-e-lsa:external-prefix-tlv:
+--ro prefix-admin-tag-sub-tlvs
  +--ro admin-tag-sub-tlv* []
  +--ro admin-tags*      uint32

```

The following is the YANG module:

<CODE BEGINS> file "ietf-ospf-admin-tags@2022-10-11.yang"

```
module ietf-ospf-admin-tags {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-admin-tags";
  prefix ospf-admin-tags;

  import ietf-routing {
    prefix "rt";
    reference "RFC 8349: A YANG Data Model for Routing
              Management (NMDA Version)";
  }

  import ietf-ospf {
    prefix ospf;
    reference "RFC xxxx: YANG Data Model for OSPF Protocol.";
  }

  import ietf-ospfv3-extended-lsa {
    prefix "ospfv3-e-lsa";
    reference "RFC xxxx: YANG Model for OSPFv3 Extended LSAs.";
  }

  organization
    "IETF LSR - Link State Routing Working Group";

  contact
    "WG Web:  <https://datatracker.ietf.org/wg/lsr/>
     WG List: <mailto:lsr@ietf.org>

     Author:  Yingzhen Qu
              <mailto:yingzhen.qu@futurewei.com>
     Author:  Acee Lindem
              <mailto:acee@cisco.com>
     Author:  Peter Psenak
              <mailto:ppsenak@cisco.com>";

  description
    "This YANG module defines the configuration
     and operational state for OSPF administrative tags.

     This YANG model conforms to the Network Management
     Datastore Architecture (NMDA) as described in RFC 8342.

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     without modification, is permitted pursuant to, and subject to
```

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.

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 (RFC 2119) (RFC 8174) when, and only when, they appear in all capitals, as shown here.";

reference "RFC XXXX";

```
revision 2022-10-11 {
  description
    "Initial revision.";
  reference
    "RFC XXXX: A YANG Data Model for OSPFv2 Administrative Tags.";
}
```

```
grouping prefix-admin-tag-sub-tlvs {
  description "Prefix Administrative Tag sub-TLVs.";
```

```
  container prefix-admin-tag-sub-tlvs {
    description "Prefix admin tag sub-TLV.";
    list admin-tag-sub-tlv {
      description "Prefix admin tag sub-TLV.";
      leaf-list admin-tags {
        type uint32;
        description "32-bit administrative tag.";
      }
    }
  }
}
```

```
/* Configuration */
augment "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/ospf:ospf/"
  + "ospf:areas/ospf:area/ospf:ranges/ospf:range" {
  when "derived-from-or-self(..../..../..../"
    + "rt:type, 'ospf:ospf')"
```

```
  {
    description
      "This augments the OSPF routing protocol area range
        configuration.";
```

```
  }
  description
```

```

    "This augments the OSPF protocol area range configuration
    with Administrative Tags. The configured tags will be
    advertised with summary prefix when it is active.";

    container admin-tags {
        when "../ospf:advertise = 'true'";
        leaf-list tags {
            type uint32;
            description
                "32-bit administrative tags.";
        }
        description
            "OSPF prefix administrative tags.";
    }
}

augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/ospf:ospf/"
+ "ospf:areas/ospf:area/ospf:interfaces/ospf:interface" {
    when "derived-from-or-self(..../..../..../..../"
        + "rt:type, 'ospf:ospf')";
    description
        "This augments the OSPF routing protocol interface
        configuration.";
}
description
    "This augments the OSPF protocol interface configuration
    with Administrative Tags. The configured tags will be
    advertised with local prefixes configured for the interface.";

    container admin-tags {
        leaf-list tags {
            type uint32;
            description
                "32-bit administrative tags.";
        }
        description
            "OSPF prefix administrative tags.";
    }
}

/* Database */
augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol/"
+ "ospf:ospf/ospf:areas/ospf:area/"
+ "ospf:interfaces/ospf:interface/ospf:database/"
+ "ospf:link-scope-lsa-type/ospf:link-scope-lsas/"
+ "ospf:link-scope-lsa/ospf:version/ospf:ospfv2/"
+ "ospf:ospfv2/ospf:body/ospf:opaque/"

```



```

when "derived-from-or-self(..../rt:type, 'ospf:ospfv3')" {
  + "../..../rt:type, 'ospf:ospfv3'" {
    description
      "This augmentation is only valid for OSPFv3.";
  }
  description
    "Augment OSPFv3 Intra-Area-Prefix TLV in the E-Link-LSA.";

  uses prefix-admin-tag-sub-tlvs;
}

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol/"
+ "ospf:ospf/ospf:database/"
+ "ospf:as-scope-lsa-type/ospf:as-scope-lsas/"
+ "ospf:as-scope-lsa/ospf:version/ospf:ospfv3/"
+ "ospf:ospfv3/ospf:body/ospfv3-e-lsa:e-as-external/"
+ "ospfv3-e-lsa:e-external-tlvs/"
+ "ospfv3-e-lsa:external-prefix-tlv" {
  when "derived-from-or-self(..../rt:type, 'ospf:ospfv3')" {
    + "../..../rt:type, 'ospf:ospfv3'" {
      description
        "This augmentation is only valid for OSPFv3.";
    }
  }
  description
    "Augment OSPFv3 External-Prefix TLV in the E-AS-External-LSA.";

  uses prefix-admin-tag-sub-tlvs;
}

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol/"
+ "ospf:ospf/ospf:database/"
+ "ospf:as-scope-lsa-type/ospf:as-scope-lsas/"
+ "ospf:as-scope-lsa/ospf:version/ospf:ospfv3/"
+ "ospf:ospfv3/ospf:body/ospfv3-e-lsa:e-nssa/"
+ "ospfv3-e-lsa:e-external-tlvs/"
+ "ospfv3-e-lsa:external-prefix-tlv" {
  when "derived-from-or-self(..../rt:type, 'ospf:ospfv3')" {
    + "../..../rt:type, 'ospf:ospfv3'" {
      description
        "This augmentation is only valid for OSPFv3.";
    }
  }
  description
    "Augment OSPFv3 External-Prefix TLV in the E-NSSA-LSA.";

  uses prefix-admin-tag-sub-tlvs;
}

```

<CODE ENDS>

6. 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](#)].

The YANG modules specified in this document define a schema for data that is designed to be accessed via network management protocols such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [[RFC6242](#)]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [[RFC8446](#)].

The NETCONF Access Control Model (NACM) [[RFC8341](#)] provides the means to restrict access for particular NETCONF or RESTCONF users to a pre-configured subset of all available NETCONF or RESTCONF protocol operations and content.

The following data nodes defined in the YANG module that are writable/creatable/deletable (i.e., config true, which is the default). The modifications to these data nodes without proper protection can have a negative effect on network operations.

```
/ospf:ospf/ospf:areas/ospf:area/ospf:interfaces/ospf:interface/  
admin-tags
```

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. Exposure of the OSPF link state database may be useful in mounting a Denial-of-Service (DoS) attacks. These are the readable data nodes:

```
/ospf:ospf/ospf:areas/ospf:area/ospf:interfaces/ospf:interface/  
admin-tags
```

/prefix-admin-tag-sub-tlvs

7. 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

The IANA is requested to assign one new URI from the IETF XML registry ([[RFC3688](#)]). Authors are suggesting the following URI:

URI: urn:ietf:params:xml:ns:yang:ietf-ospf-admin-tags
Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace

This document also requests one new YANG module name in the YANG Module Names registry ([[RFC6020](#)]) with the following suggestion :

name: ietf-ospf-admin-tags
namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-admin-tags
prefix: ospf-admin-tags
reference: RFC XXXX

8. 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.

9. 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>>.

[RFC3688]

Mealling, M., "The IETF XML Registry", BCP 81, RFC 3688, DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/info/rfc3688>>.

[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>>.

[RFC6020]

Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.

[RFC6241]

Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <<https://www.rfc-editor.org/info/rfc6241>>.

[RFC6242]

Wasserman, M., "Using the NETCONF Protocol over Secure Shell (SSH)", RFC 6242, DOI 10.17487/RFC6242, June 2011, <<https://www.rfc-editor.org/info/rfc6242>>.

[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>>.

[RFC7950]

Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <<https://www.rfc-editor.org/info/rfc7950>>.

[RFC8040]

Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", RFC 8040, DOI 10.17487/RFC8040, January 2017, <<https://www.rfc-editor.org/info/rfc8040>>.

[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>>.

[RFC8341]

Bierman, A. and M. Bjorklund, "Network Configuration Access Control Model", STD 91, RFC 8341, DOI 10.17487/RFC8341, March 2018, <<https://www.rfc-editor.org/info/rfc8341>>.

[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>>.

[RFC8446]

Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", RFC 8446, DOI 10.17487/RFC8446, August 2018, <<https://www.rfc-editor.org/info/rfc8446>>.

[I-D.ietf-ospf-yang]

Yeung, D., Qu, Y., Zhang, J., Chen, I., and A. Lindem, "YANG Data Model for OSPF Protocol", Work in Progress, Internet-Draft, draft-ietf-ospf-yang-29, 17 October 2019, <<https://www.ietf.org/archive/id/draft-ietf-ospf-yang-29.txt>>.

[I-D.ietf-lsr-ospfv3-extended-lsa-yang]

Lindem, A., Palani, S., and Y. Qu, "YANG Model for OSPFv3 Extended LSAs", Work in Progress, Internet-Draft, draft-ietf-lsr-ospfv3-extended-lsa-yang-12, 30 August 2022, <<https://www.ietf.org/archive/id/draft-ietf-lsr-ospfv3-extended-lsa-yang-12.txt>>.

10. 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]

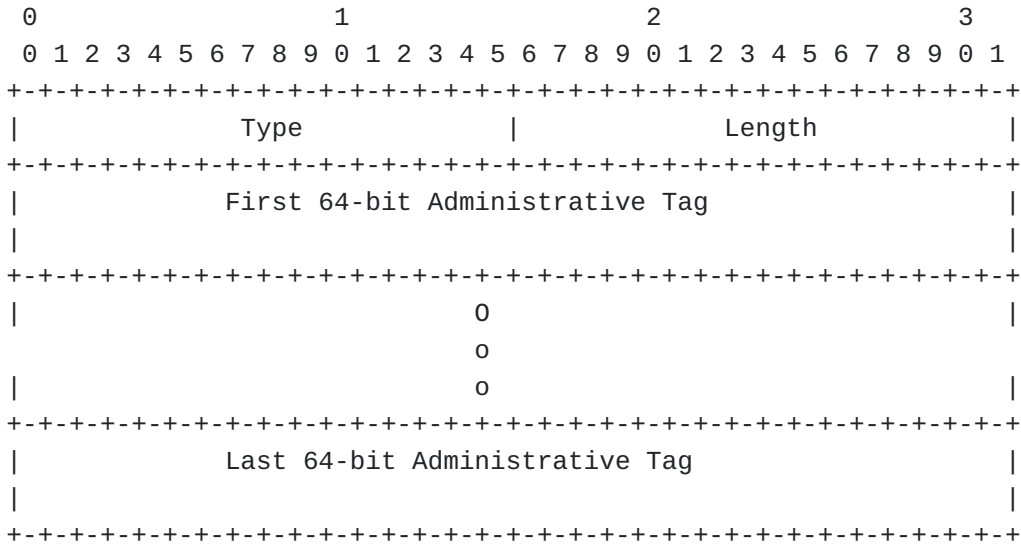
Psenak, P., Ed., Ginsberg, L., Henderickx, W., Tantsura, J., and J. Drake, "OSPF Application-Specific Link Attributes", RFC 8920, DOI 10.17487/RFC8920, October 2020, <<https://www.rfc-editor.org/info/rfc8920>>.

Appendix A. 64-Bit Administrative Tag Sub-TLV

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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