

Internet
Internet-Draft
Intended status: Standards Track
Expires: 13 July 2022

A. Lindem
Cisco Systems
Y. Qu
Futurewei
9 January 2022

OSPF YANG Model Augmentations for Additional Features - Version 1
draft-ietf-lsr-ospf-yang-augmentation-v1-07

Abstract

This document defines YANG data modules augmenting the IETF OSPF YANG model to provide support for Traffic Engineering Extensions to OSPF Version 3 as defined in RF 5329, OSPF Two-Part Metric as defined in [RFC 8042](#), OSPF Graceful Link Shutdown as defined in [RFC 8379](#), OSPF Link-Local Signaling (LLS) Extensions for Local Interface ID Advertisement as defined in [RFC 8510](#), OSPF Application-Specific Link Attributes as defined in [RFC 8920](#), and OSPF Flexible Algorithm.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 13 July 2022.

Copyright Notice

Copyright (c) 2022 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Revised BSD License.

Table of Contents

1.	Overview	2
1.1.	Requirements Language	3
2.	YANG Module for Traffic Engineering Extensions to OSPF Version 3	3
3.	YANG Module for OSPF Two-Part Metric	9
4.	YANG Module for OSPF Graceful Link Shutdown	13
5.	YANG Module for OSPF LLS Extension for Local Interface ID Advertisement	18
6.	YANG Module for OSPF Application-Specific Link Attributes . .	20
7.	YANG Module for OSPF Flexible Algorithm	26
8.	Security Considerations	46
9.	IANA Considerations	47
10.	Acknowledgements	48
11.	Normative References	48
	Authors' Addresses	50

[1.](#) Overview

YANG [[RFC6020](#)] [[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](#)]. YANG is proving relevant beyond its initial confines, as bindings to other interfaces (e.g., ReST) and encodings other than XML (e.g., JSON) are being defined. Furthermore, YANG data models can be used as the basis for implementation of other interfaces, such as CLI and programmatic APIs.

This document defines YANG data modules augmenting the IETF OSPF YANG model [[I-D.ietf-ospf-yang](#)], which itself augments [[RFC8349](#)], to provide support for configuration and operational state for the following OSPF features:

[RFC5329](#): Traffic Engineering Extensions to OSPF Version 3 [[RFC5329](#)].

[RFC8042](#): OSPF Two-Part Metric [[RFC8042](#)].

[RFC8379](#): OSPF Graceful Link Shutdown [[RFC8379](#)].

[RFC8510](#): OSPF Link-Local Signaling (LLS) Extensions for Local Interface ID Advertisement [[RFC8510](#)].

[RFC8920](#): OSPF Application-Specific Link Attributes [[RFC8920](#)].

RFCxxxx: IGP Flexible Algorithm [[I-D.ietf-lsr-flex-algo](#)].

The augmentations defined in this document requires support for the OSPF base model[I-D.ietf-ospf-yang] which defines basic OSPF configuration and state. The OSPF YANG model augments the ietf-routing YANG model defined in [[RFC8349](#)].

[1.1](#). 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 [[RFC2119](#)].

[2](#). YANG Module for Traffic Engineering Extesions to OSPF Version 3

This document defines a YANG module for Traffic Engineering Extensions to OSPF Version 3 as defined in [[RFC5329](#)]. It is an augmentation of the OSPF base model.

Internet-Draft

OSPF YANG Augments V1

January 2022

```
module: ietf-ospfv3-te
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:
+--ro ospfv3-intra-area-te
+--ro router-address-tlv
|   +--ro router-address?    inet:ipv6-address
+--ro link-tlv
|   +--ro link-type          ospf:router-link-type
+--ro local-if-ipv6-addrs
|   +--ro local-if-ipv6-addr*  inet:ipv6-address
+--ro remote-if-ipv6-addrs
|   +--ro remote-if-ipv6-addr*  inet:ipv6-address
+--ro te-metric?              uint32
+--ro max-bandwidth?
|   rt-types:bandwidth-ieee-float32
+--ro max-reservable-bandwidth?
|   rt-types:bandwidth-ieee-float32
+--ro unreserved-bandwidths
|   +--ro unreserved-bandwidth*
|       +--ro priority?          uint8
|       +--ro unreserved-bandwidth?
|           rt-types:bandwidth-ieee-float32
+--ro admin-group?           uint32
+--ro neighbor-id
|   +--ro nbr-interface-id      inet:ipv4-address
|   +--ro nbr-router-id        yang:dotted-quad
```

```

        +--ro unknown-tlvs
          +--ro unknown-tlv*
            +--ro type?      uint16
            +--ro length?    uint16
            +--ro value?     yang:hex-string

<CODE BEGINS> file "ietf-ospfv3-te@2021-07-11.yang"
module ietf-ospfv3-te {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospfv3-te";

  prefix ospfv3-te;

  import ietf-inet-types {
    prefix "inet";
    reference "RFC 6991: Common YANG Data Types";
  }

  import ietf-yang-types {

```

```

    prefix "yang";
    reference "RFC 6991: Common YANG Data Types";
  }

  import ietf-routing-types {
    prefix "rt-types";
    reference "RFC 8294: Common YANG Data Types for the
      Routing Area";
  }

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

  import ietf-ospf {
    prefix "ospf";
  }

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

```

contact

"WG Web: <<http://tools.ietf.org/wg/lsr>>
WG List: <<mailto:lsr@ietf.org>>

Author: Yingzhen Qu
<<mailto:yqu@futurewei.com>>
Author: Acee Lindem
<<mailto:acee@cisco.com>>";

description

"This YANG module defines the configuration and operational state for OSPFv3 extensions to support intra-area Traffic Engineering (TE) as defined in [RFC 5329](#).

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

Copyright (c) 2021 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions Relating to IETF Documents

Lindem & Qu

Expires 13 July 2022

[Page 5]

Internet-Draft

OSPF YANG Augments V1

January 2022

(<http://trustee.ietf.org/license-info>).

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

reference "RFC XXXX";

```
revision 2021-07-11 {  
  description  
    "Initial version";  
  reference  
    "RFC XXXX: A YANG Data Model for OSPFv3 TE.";  
}
```

```
identity ospfv3-intra-area-te-lsa {
```

```

base ospf:ospfv3-lsa-type;
description
  "OSPFv3 intra-area TE LSA.";
}

grouping ospfv3-intra-area-te {
  description "Grouping for OSPFv3 intra-area-te-lsa.";
  container ospfv3-intra-area-te {
    container router-address-tlv {
      description "The router IPv6 address tlv advertises a
        reachable IPv6 address.";
      leaf router-address {
        type inet:ipv6-address;
        description
          "Router IPv6 address.";
      }
    }
  }

  container link-tlv {
    description "Describes a single link, and it is constructed
      of a set of Sub-TLVs.";
    leaf link-type {
      type ospf:router-link-type;
      mandatory true;
      description "Link type.";
    }
  }

  container local-if-ipv6-addrs {
    description "All local interface IPv6 addresses.";
    leaf-list local-if-ipv6-addr {
      type inet:ipv6-address;
      description
        "List of local interface IPv6 addresses.";
    }
  }
}

```

```

    }
  }

  container remote-if-ipv6-addrs {
    description "All remote interface IPv6 addresses.";
    leaf-list remote-if-ipv6-addr {
      type inet:ipv6-address;
      description

```

```

        "List of remote interface IPv6 addresses.";
    }
}

leaf te-metric {
    type uint32;
    description "TE metric.";
}

leaf max-bandwidth {
    type rt-types:bandwidth-ieee-float32;
    description "Maximum bandwidth.";
}

leaf max-reservable-bandwidth {
    type rt-types:bandwidth-ieee-float32;
    description "Maximum reservable bandwidth.";
}

container unreserved-bandwidths {
    description "All unreserved bandwidths.";
    list unreserved-bandwidth {
        leaf priority {
            type uint8 {
                range "0 .. 7";
            }
            description "Priority from 0 to 7.";
        }
        leaf unreserved-bandwidth {
            type rt-types:bandwidth-ieee-float32;
            description "Unreserved bandwidth.";
        }
        description
            "List of unreserved bandwidths for different
            priorities.";
    }
}

leaf admin-group {
    type uint32;

```

description


```

        "Administrative group/Resource Class/Color.";
    }

    container neighbor-id {
        description "Neighbor link identification.";
        leaf nbr-interface-id {
            type inet:ipv4-address;
            mandatory true;
            description "The neighbor's interface ID.";
        }
        leaf nbr-router-id {
            type yang:dotted-quad;
            mandatory true;
            description "The neighbor's router ID.";
        }
    }

    uses ospf:unknown-tlvs;
}

description "OSPFv3 Intra-Area-TE-LSA.";
reference "RFC 5329: Traffic Engineering Extensions to OSPF
: Version 3.";
}
}

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" {
when "../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3.";
}
description
    "OSPFv3 Intra-Area-TE-LSA.";

    uses ospfv3-intra-area-te;
}
}
<CODE ENDS>

```

3. YANG Module for OSPF Two-Part Metric

This document defines a YANG module for OSPF Two-Part Metric feature as defined in [[RFC8042](#)]. It is an augmentation of the OSPF base model.

```
module: ietf-ospf-two-part-metric
augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
    /ospf:interfaces/ospf:interface:
    +--rw two-part-metric
        +--rw enable?          boolean
        +--rw int-input-cost?  ospf:ospf-link-metric
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-link-opaque
    /ospf:extended-link-tlv:
    +--ro network-to-router-metric-sub-tlvs
        +--ro net-to-rtr-sub-tlv*
            +--ro mt-id?      uint8
            +--ro mt-metric?  uint16
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:te-opaque/ospf:link-tlv:
    +--ro network-to-router-te-metric?  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-te:ospfv3-intra-area-te/ospfv3-te:link-tlv:
    +--ro network-to-router-te-metric?  uint32
```

<CODE BEGINS> file "ietf-ospf-two-part-metric@2021-07-11.yang"

```
module ietf-ospf-two-part-metric {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-two-part-metric";

  prefix ospf-two-metric;

  import ietf-routing {
    prefix "rt";
    reference "RFC 8349: A YANG Data Model for Routing
```

```
Management (NMDA Version)";  
}
```

Internet-Draft

OSPF YANG Augments V1

January 2022

```
import ietf-ospf {  
    prefix "ospf";  
}  
  
import ietf-ospfv3-te {  
    prefix "ospfv3-te";  
}  
  
organization  
    "IETF LSR - Link State Routing Working Group";  
  
contact  
    "WG Web:  <http://tools.ietf.org/wg/lsr>  
    WG List:  <mailto:lsr@ietf.org>  
  
    Author:   Yingzhen Qu  
              <mailto:yqu@futurewei.com>  
    Author:   Acee Lindem  
              <mailto:acee@cisco.com>;  
  
description  
    "This YANG module defines the configuration and operational  
    state for OSPF Two-Part Metric feature as defined in RFC 8042.  
  
    This YANG model conforms to the Network Management  
    Datastore Architecture (NMDA) as described in RFC 8342.  
  
    Copyright (c) 2021 IETF Trust and the persons identified as  
    authors of the code.  All rights reserved.  
  
    Redistribution and use in source and binary forms, with or  
    without modification, is permitted pursuant to, and subject  
    to the license terms contained in, the Simplified BSD License  
    set forth in Section 4.c of the IETF Trust's Legal Provisions  
    Relating to IETF Documents  
    (http://trustee.ietf.org/license-info).  
  
    This version of this YANG module is part of RFC XXXX;  
    see the RFC itself for full legal notices.";
```

```

reference "RFC XXXX";

revision 2021-07-11 {
  description
    "Initial version";
  reference
    "RFC XXXX: A YANG Data Model for OSPF.";
}

```

```

identity two-part-metric {
  base ospf:informational-capability;
  description
    "When set, the router is capable of supporting OSPF
    two-part metrics.";
  reference
    "RFC 8042: OSPF Two-Part Metric";
}

/* RFC 8042 */
augment "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/ospf:ospf/"
  + "ospf:areas/ospf:area/ospf:interfaces/ospf:interface" {
  when "../..../rt:type = 'ospf:ospfv2' or "
    + "../..../rt:type = 'ospf:ospfv3'" {
    description
      "This augments the OSPF interface configuration
      when used.";
  }
  description
    "This augments the OSPF protocol interface
    configuration with two-part metric.";

  container two-part-metric {
    when "enum-value(..ospf:interface-type) = 2" {
      description
        "Two-part metric when link type is multi-access.";
    }
    leaf enable {
      type boolean;
      default false;
      description

```

```

        "Enable two-part metric.";
    }
    leaf int-input-cost {
        type ospf:ospf-link-metric;
        description
            "Link state metric from the two-part-metric network
            to this router.";
    }
    description
        "Interface two part metric configuration.";
}

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-link-opaque/ospf:extended-link-tlv" {
when "../..../..../..../..../..../..../..../..../"
    + "rt:type = 'ospf:ospfv2'" {
    description
        "This augmentation is only valid for OSPFv2.";
}
description
    "Network-to-Router metric sub tlv for OSPFv2 extended link TLV
    in type 10 opaque LSA.";

    container network-to-router-metric-sub-tlvs {
        description "Network-to-Router metric sub TLV.";
        list net-to-rtr-sub-tlv {
            leaf mt-id {
                type uint8;
                description "Multi-Topology Identifier (MT-ID).";
            }
            leaf mt-metric {
                type uint16;
                description "Network-to-router metric.";
            }
        }
    }
}

```

```

        description
            "Network-to-Router metric sub-TLV.";
    }
}

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:te-opaque/"
+ "ospf:link-tlv" {
when "../.../.../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv2'" {
    description
        "This augmentation is only valid for OSPFv2.";
}
description
    "Traffic Engineering Network-to-Router Sub-TLV.";
    leaf network-to-router-te-metric {
        type uint32;
    }
}

```

```

        description "Network to Router TE metric.";
        reference
            "RFC 8042 - OSPF Two-Part Metric";
    }
}

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-te:ospfv3-intra-area-te/"
+ "ospfv3-te:link-tlv" {
when "../.../.../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3.";
}
}

```

```

    }
    description
      "Traffic Engineering Network-to-Router Sub-TLV.";
    leaf network-to-router-te-metric {
      type uint32;
      description "Network to Router TE metric.";
      reference
        "RFC 8042 - OSPF Two-Part Metric";
    }
  }
}
<CODE ENDS>

```

4. YANG Module for OSPF Graceful Link Shutdown

This document defines a YANG module for OSPF Graceful Link Shutdown feature as defined in [[RFC8379](#)]. It is an augmentation of the OSPF base model.

```

module: ietf-ospf-graceful-link-shutdown
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
  /ospf:interfaces/ospf:interface:
  +--rw graceful-link-shutdown
    +--rw enable?    boolean
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-link-opaque

```

```

        /ospf:extended-link-tlv:
+---ro graceful-link-shutdown-sub-tlv!
+---ro remote-address-sub-tlv
|   +---ro remote-address?   inet:ipv4-address
+---ro local-remote-int-id-sub-tlv
    +---ro local-int-id?     uint32
    +---ro remote-int-id?    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-router/ospfv3-e-lsa:e-router-tlvs
    /ospfv3-e-lsa:link-tlv:
+---ro graceful-link-shutdown-sub-tlv!

```

```

<CODE BEGINS> file "ietf-ospf-graceful-link-shutdown@2021-07-11.yang"
module ietf-ospf-graceful-link-shutdown {
  yang-version 1.1;
  namespace
    "urn:ietf:params:xml:ns:yang:ietf-ospf-graceful-link-shutdown";

  prefix ospf-grace-linkdown;

  import ietf-inet-types {
    prefix "inet";
    reference "RFC 6991: Common YANG Data Types";
  }

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

  import ietf-ospf {
    prefix "ospf";

```

```

}

import ietf-ospfv3-extended-lsa {
  prefix "ospfv3-e-lsa";

```



```

}

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

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

   Author:   Yingzhen Qu
             <mailto:yqu@futurewei.com>
   Author:   Acee Lindem
             <mailto:acee@cisco.com>";

description
  "This YANG module defines the configuration and operational
   state for OSPF Graceful Link Shutdown feature as defined
   in RFC 8379.

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

   Copyright (c) 2021 IETF Trust and the persons identified as
   authors of the code.  All rights reserved.

   Redistribution and use in source and binary forms, with or
   without modification, is permitted pursuant to, and subject
   to the license terms contained in, the Simplified BSD License
   set forth in Section 4.c of the IETF Trust's Legal Provisions
   Relating to IETF Documents
   (http://trustee.ietf.org/license-info).

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

reference "RFC XXXX";

revision 2021-07-11 {
  description
    "Initial version";
  reference
    "RFC XXXX: A YANG Data Model for OSPF Graceful Link Shutdown.";
}

```

```
/* RFC 8379 */
augment "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/ospf:ospf/"
  + "ospf:areas/ospf:area/ospf:interfaces/ospf:interface" {
  when "../.../rt:type = 'ospf:ospfv2' or "
    + "../.../rt:type = 'ospf:ospfv3'" {
    description
      "This augments the OSPF interface configuration
      when used.";
  }
  description
    "This augments the OSPF protocol interface
    configuration with segment routing.";

  container graceful-link-shutdown {
    leaf enable {
      type boolean;
      default false;
      description
        "Enable OSPF graceful link shutdown.";
    }
    description
      "OSPF Graceful Link Shutdown.";
  }
}
```

```
/* Database */
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-link-opaque/ospf:extended-link-tlv" {
  when "../.../rt:type = 'ospf:ospfv2'" {
    description
      "This augmentation is only valid for OSPFv2.";
  }
  description
    "OSPF graceful link shutdown for OSPFv2 extended link TLV
    in type 10 opaque LSA.";

  container graceful-link-shutdown-sub-tlv {
    presence "Enable graceful link shutdown";
```

```

    "Graceful-Link-Shutdown sub-TLV identifies the link as being
    gracefully shutdown.";
}

container remote-address-sub-tlv {
  leaf remote-address {
    type inet:ipv4-address;
    description
      "Remote IPv4 address used to identify a particular link
      on the remote side.";
  }
  description
    "This sub-TLV specifies the IPv4 address of the remote
    endpoint on the link.";
}

container local-remote-int-id-sub-tlv {
  leaf local-int-id {
    type uint32;
    description "Local interface ID.";
  }
  leaf remote-int-id {
    type uint32;
    description "Remote interface ID.";
  }
  description
    "This sub-TLV specifies Local and Remote Interface IDs.";
}
}

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-router"
+ "/ospfv3-e-lsa:e-router-tlvs/ospfv3-e-lsa:link-tlv" {
when "'ospf:../../../../../../../../../../'"
+ "rt:type" = 'ospf:ospfv3'" {
  description

```

```

        "This augmentation is only valid for OSPFv3
        E-Router LSAs";
    }
    container graceful-link-shutdown-sub-tlv {
        presence "Enable graceful link shutdown";
        description
            "Graceful-Link-Shutdown sub-TLV identifies the link as being
            gracefully shutdown.";
    }

```

```

    }
    description
        "Augment OSPFv3 Area scope router-link TLV.";
    }
}
<CODE ENDS>

```

5. YANG Module for OSPF LLS Extension for Local Interface ID Advertisement

This document defines a YANG module for OSPF Link-Local Signaling (LLS) Extensions for Local Interface ID Advertisement feature as defined in [\[RFC8510\]](#). It is an augmentation of the OSPF base model.

```

module: ietf-ospf-lls-local-id
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf:
    +--rw lls-int-id
    +--rw enable?    boolean

```

```

<CODE BEGINS> file "ietf-ospf-lls-local-id@2021-07-11.yang"
module ietf-ospf-lls-local-id {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-lls-local-id";

  prefix ospf-lls-localid;

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

```

```
import ietf-ospf {
    prefix "ospf";
}

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

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

    Author:     Yingzhen Qu
                <mailto:yqu@futurewei.com>
    Author:     Acee Lindem
```

Lindem & Qu

Expires 13 July 2022

[Page 18]

Internet-Draft

OSPF YANG Augments V1

January 2022

```
<mailto:acee@cisco.com>;
```

description

"This YANG module defines the configuration and operational state for OSPF Link-Local Signaling (LLS) Extensions for Local Interface ID Advertisement feature as defined in [RFC 8510](#).

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

Copyright (c) 2021 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>).

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

```
reference "RFC XXXX";
```

```
revision 2021-07-11 {
```

```

description
  "Initial version";
reference
  "RFC XXXX: A YANG Data Model for OSPF.";
}

augment "/rt:routing/rt:control-plane-protocols"
  + "/rt:control-plane-protocol/ospf:ospf" {
  when "../rt:type = 'ospf:ospfv2' or "
    + "../rt:type = 'ospf:ospfv3'" {
    description
      "This augments the OSPF routing protocol when used.";
  }
  description
    "This augments the OSPF protocol configuration
    to support LLS extensions for local interface ID
    advertisement.";
  container lls-int-id {
    leaf enable {
      type boolean;
      default false;
      description

```

```

      "Enable LLS to advertise local interface ID.";
    }
    description
      "OSPF LLS Extensions for interface ID.";
    reference "RFC 8510 - OSPF Link-Local Signaling (LLS)
      Extensions for Local Interface ID Advertisement";
  }
}
}
}
<CODE ENDS>

```

6. YANG Module for OSPF Application-Specific Link Attributes

This document defines a YANG module for OSPF Application-Specific Link Attributes feature as defined in [RFC8920]. It is an augmentation of the OSPF base model.

```

module: ietf-ospf-link-attr
augment /rt:routing/rt:control-plane-protocols

```

```

        /rt:control-plane-protocol/ospf:ospf:
+---rw ospf-link-attr
  +---rw (link-attr-op-mode)
    +---:(legacy)
      | +---rw legacy?          empty
    +---:(transition)
      | +---rw transition?      empty
    +---:(app-specific)
      +---rw app-specific?      empty
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-link-opaque
  /ospf:extended-link-tlv:
+---ro application-specific-link-attributes-sub-tlvs
  +---ro asla-sub-tlvs* []
    +---ro sabm-length?          uint8
    +---ro udabm-length?         uint8
    +---ro sabm
    | +---ro sabm-bits*          identityref
    +---ro udabm
    +---ro link-attributes-sub-sub-tlvs
      +---ro unknown-tlvs
        +---ro unknown-tlv* []
          +---ro type?           uint16
          +---ro length?         uint16
          +---ro value?          yang:hex-string
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-router/ospfv3-e-lsa:e-router-tlvs
        /ospfv3-e-lsa:link-tlv:
+---ro application-specific-link-attributes-sub-tlvs
  +---ro asla-sub-tlvs* []
    +---ro sabm-length?          uint8
    +---ro udabm-length?         uint8
    +---ro sabm
    | +---ro sabm-bits*          identityref
    +---ro udabm

```

```

        +--ro link-attributes-sub-sub-tlvs
          +--ro unknown-tlvs
            +--ro unknown-tlv* []
              +--ro type?      uint16
              +--ro length?    uint16
              +--ro value?     yang:hex-string

<CODE BEGINS> file "ietf-ospf-link-attr@2020-10-31.yang"
module ietf-ospf-link-attr {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-link-attr";

  prefix ospf-link-attr;

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

  import ietf-ospf {
    prefix "ospf";
  }

  import ietf-ospfv3-extended-lsa {
    prefix "ospfv3-e-lsa";
  }

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

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

    Author:   Yingzhen Qu

```

```

Author: <mailto:yqu@futurewei.com>
Author: Acee Lindem
       <mailto:acee@cisco.com>
Author: Stephane Litkowski
       <mailto:slitkows.ietf@gmail.com>;

```


description

"This YANG module defines the configuration and operational state for OSPF application specific link attributes feature as defined in RFC xxxx.

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

Copyright (c) 2020 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>).

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 2020-10-31 {  
  description  
    "Initial version";  
  reference  
    "RFC XXXX: A YANG Data Model for OSPF application specific  
    link attributes."  
}
```

```
identity sabm-bit {  
  description  
    "Base identity for sabm bits."  
}
```

```

identity rsvp-te-bit {
    base sabm-bit;
    description
        "R bit, RSVP-TE.";
}

identity sr-policy-bit {
    base sabm-bit;
    description
        "S bit, Segment Routing Policy.";
}

identity lfa-bit {
    base sabm-bit;
    description
        "F bit, Loop Free Alternate (LFA). Includes all LFA types.";
}

grouping application-specific-link-attributes-sub-tlvs {
    description
        "OSPF Application-Specific Link Attributes (ASLA) sub-TLV.
        The ASLA sub-TLV is a sub-TLV of the OSPFv2 Extended Link
        TLV [RFC7684] and OSPFv3 Router-Link TLV [RFC8362].";

    container application-specific-link-attributes-sub-tlvs {
        description "Application-Specific Link Attributes sub-TLV.";
        list asla-sub-tlvs {
            leaf sabm-length {
                type uint8;
                description
                    "Standard Application Identifier Bit Mask Length in
                    octets.";
            }
            leaf udabm-length {
                type uint8;
                description
                    "User Defined Application Identifier Bit Mask Length
                    in octets.";
            }
        }
        container sabm {
            leaf-list sabm-bits {
                type identityref {
                    base sabm-bit;
                }
            }
            description
                "SABM bits list. This list will contain
                identities for the bits which are set in the
                SABA bits.";
        }
    }
}

```

Internet-Draft

OSPF YANG Augments V1

January 2022

```
    }
    description
      "Standard Application Identifier Bit Mask.";
  }
  container udabm {
    description
      "User Defined Application Identifier Bit Mask.
      This container is to be augmented by user defined
      applications.";
  }
  container link-attributes-sub-sub-tlvs {
    uses ospf:unknown-tlvs;
    description
      "Link Attributes sub-sub-TLVs.";
  }
  description
    "List of application-Specific Link Attributes sub-TLVs.";
}
}

augment "/rt:routing/rt:control-plane-protocols"
+ "/rt:control-plane-protocol/ospf:ospf" {
  when "../rt:type = 'ospf:ospfv2' or "
+ "../rt:type = 'ospf:ospfv3'" {
    description
      "This augments the OSPF routing protocol when used.";
  }
  description
    "This augments OSPF protocol configuration
    with application-specific link attributes.";

  container ospf-link-attr {
    choice link-attr-op-mode {
      mandatory "true";
      leaf legacy {
        type empty;
        description
          "Only send legacy advertisements.";
      }
      leaf transition {
        type empty;
      }
    }
  }
}
```



```

                                /named-admin-group/name
+--rw exclude-srlgs*          -> /te:te/globals/named-srlgs
                                /named-srlg/name
                                {te-types:named-srlg-groups}?
+--rw fast-reroute?            boolean
+--rw metric-type?             identityref
+--rw microloop-avoidance?     boolean
+--rw prefix-metric!
+--rw priority?                uint8
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:ri-opaque:
+--ro fad-tlvs
+--ro fad-tlv* []
+--ro flex-algo?               uint8
+--ro metric-type?            identityref
+--ro calc-type?              uint8

```

```

+--ro priority?                uint8
+--ro fa-ex-ag-sub-tlv
| +--ro extended-admin-groups* uint64
+--ro fa-in-any-ag-sub-tlv
| +--ro extended-admin-groups* uint64
+--ro fa-in-all-ag-sub-tlv
| +--ro extended-admin-groups* uint64
+--ro fad-flags-sub-tlv
| +--ro fad-flags* identityref
+--ro fa-ex-srlg-sub-tlv
| +--ro srlgs* uint32
+--ro unknown-tlvs
+--ro unknown-tlv* []
+--ro type?                    uint16
+--ro length?                  uint16
+--ro value?                   yang:hex-string
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:ri-opaque:

```

```

+---ro fad-tlvs
  +---ro fad-tlv* []
    +---ro flex-algo?          uint8
    +---ro metric-type?        identityref
    +---ro calc-type?          uint8
    +---ro priority?           uint8
    +---ro fa-ex-ag-sub-tlv
      | +---ro extended-admin-groups*  uint64
    +---ro fa-in-any-ag-sub-tlv
      | +---ro extended-admin-groups*  uint64
    +---ro fa-in-all-ag-sub-tlv
      | +---ro extended-admin-groups*  uint64
    +---ro fad-flags-sub-tlv
      | +---ro fad-flags*  identityref
    +---ro fa-ex-srlg-sub-tlv
      | +---ro srlgs*  uint32
    +---ro unknown-tlvs
      +---ro unknown-tlv* []
        +---ro type?      uint16
        +---ro length?    uint16
        +---ro value?     yang:hex-string
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:ri-opaque:
+---ro fad-tlvs

```

```

+---ro fad-tlv* []
  +---ro flex-algo?          uint8
  +---ro metric-type?        identityref
  +---ro calc-type?          uint8
  +---ro priority?           uint8
  +---ro fa-ex-ag-sub-tlv
    | +---ro extended-admin-groups*  uint64
  +---ro fa-in-any-ag-sub-tlv
    | +---ro extended-admin-groups*  uint64
  +---ro fa-in-all-ag-sub-tlv
    | +---ro extended-admin-groups*  uint64
  +---ro fad-flags-sub-tlv
    | +---ro fad-flags*  identityref
  +---ro fa-ex-srlg-sub-tlv

```

```

    | +--ro srlgs*    uint32
+--ro unknown-tlvs
    +--ro unknown-tlv* []
        +--ro type?    uint16
        +--ro length?  uint16
        +--ro value?   yang:hex-string
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/ospf:router-information:
+--ro fad-tlvs
    +--ro fad-tlv* []
        +--ro flex-algo?                uint8
        +--ro metric-type?              identityref
        +--ro calc-type?                uint8
        +--ro priority?                 uint8
        +--ro fa-ex-ag-sub-tlv
            | +--ro extended-admin-groups*  uint64
        +--ro fa-in-any-ag-sub-tlv
            | +--ro extended-admin-groups*  uint64
        +--ro fa-in-all-ag-sub-tlv
            | +--ro extended-admin-groups*  uint64
        +--ro fad-flags-sub-tlv
            | +--ro fad-flags*  identityref
        +--ro fa-ex-srlg-sub-tlv
            | +--ro srlgs*    uint32
        +--ro unknown-tlvs
            +--ro unknown-tlv* []
                +--ro type?    uint16
                +--ro length?  uint16
                +--ro value?   yang:hex-string
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/ospf:router-information:
+--ro fad-tlvs
    +--ro fad-tlv* []
        +--ro flex-algo?                uint8

```



```

    +--ro metric-type?          identityref
    +--ro calc-type?            uint8
    +--ro priority?             uint8
    +--ro fa-ex-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fa-in-any-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fa-in-all-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fad-flags-sub-tlv
    | +--ro fad-flags*  identityref
    +--ro fa-ex-srlg-sub-tlv
    | +--ro srlgs*  uint32
    +--ro unknown-tlvs
        +--ro unknown-tlv* []
            +--ro type?  uint16
            +--ro length?  uint16
            +--ro value?  yang:hex-string
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
/ospf:router-information:
+--ro fad-tlvs
+--ro fad-tlv* []
    +--ro flex-algo?          uint8
    +--ro metric-type?        identityref
    +--ro calc-type?          uint8
    +--ro priority?           uint8
    +--ro fa-ex-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fa-in-any-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fa-in-all-ag-sub-tlv
    | +--ro extended-admin-groups*  uint64
    +--ro fad-flags-sub-tlv
    | +--ro fad-flags*  identityref
    +--ro fa-ex-srlg-sub-tlv
    | +--ro srlgs*  uint32
    +--ro unknown-tlvs
        +--ro unknown-tlv* []

```

```

        +--ro type?      uint16
        +--ro length?    uint16
        +--ro value?     yang:hex-string
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 fapm-sub-tlvs
  +--ro fapm-sub-tlv* []
    +--ro flex-algo?    uint8
    +--ro fapm-flags*   identityref
    +--ro metric?       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 fapm-sub-tlvs
  +--ro fapm-sub-tlv* []
    +--ro flex-algo?    uint8
    +--ro fapm-flags*   identityref
    +--ro metric?       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 fapm-sub-tlvs
  +--ro fapm-sub-tlv* []
    +--ro flex-algo?    uint8
    +--ro fapm-flags*   identityref
    +--ro metric?       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 fapm-sub-tlvs
  +--ro fapm-sub-tlv* []
    +--ro flex-algo?    uint8
    +--ro fapm-flags*   identityref
    +--ro metric?       uint32

```

Internet-Draft

OSPF YANG Augments V1

January 2022

```
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 fapm-sub-tlvs
+--ro fapm-sub-tlv* []
  +--ro flex-algo?      uint8
  +--ro fapm-flags*     identityref
  +--ro metric?         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:
+--ro eia-asbr-opaque
+--ro eia-asbr-tlv
  | +--ro asbr-rtr-id?      rt-types:router-id
  | +--ro faam-sub-tlvs
  | | +--ro faam-sub-tlv* []
  | |   +--ro flex-algo?    uint8
  | |   +--ro metric?       uint32
  | +--ro unknown-tlvs
  |   +--ro unknown-tlv* []
  |     +--ro type?         uint16
  |     +--ro length?       uint16
  |     +--ro value?        yang:hex-string
+--ro unknown-tlvs
  +--ro unknown-tlv* []
    +--ro type?             uint16
    +--ro length?           uint16
    +--ro value?            yang:hex-string
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-router
  /ospfv3-e-lsa:e-inter-router-tlvs
  /ospfv3-e-lsa:inter-router-tlv:
+--ro faam-sub-tlvs
+--ro faam-sub-tlv* []
  +--ro flex-algo?      uint8
```

+-ro metric? uint32

```
<CODE BEGINS> file "ietf-ospf-flex-algo@2021-06-18.yang"
module ietf-ospf-flex-algo {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-flex-algo";
  prefix ospf-flex-algo;

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

  import ietf-routing-types {
    prefix "rt-types";
    reference "RFC 8294: Common YANG Data Types for the
              Routing Area";
  }

  import ietf-te-types {
    prefix te-types;
    reference
      "RFC8776: Common YANG Data Types for Traffic Engineering.";
  }

  import ietf-ospf {
    prefix "ospf";
  }

  import ietf-ospfv3-extended-lsa {
    prefix "ospfv3-e-lsa";
  }

  import ietf-te {
    prefix "te";
  }
}
```

organization
"IETF LSR - Link State Routing Working Group";
contact
"WG Web: <<https://tools.ietf.org/wg/spring/>>
WG List: <<mailto:spring@ietf.org>>

Author: Yingzhen Qu
<<mailto:yingzhen.qu@futurewei.com>>
Author: Acee Lindem
<<mailto:acee@cisco.com>>
Author: Stephane Litkowski

Lindem & Qu

Expires 13 July 2022

[Page 32]

Internet-Draft

OSPF YANG Augments V1

January 2022

<<mailto:slitkows.ietf@gmail.com>>
";

description

"The YANG module defines the configuration and operational state for OSPF Flexible Algorithm as defined in RFC xxxx.

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

Copyright (c) 2021 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>).

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: YANG Data Model for OSPF Flexible Algorithm.";

revision 2021-06-18 {
  description
    "Initial Version";
  reference "RFC XXXX: YANG Data Model for OSPF Flexible Algorithm.";
}

/* Identities */

identity metric-type {
  description
    "Base identity for route metric types.";
}

identity igp-metric {
  base metric-type;
  description

```

```

    "Identity for the IGP metric type.";
}

identity min-uni-delay {
  base metric-type;
  description
    "Min unidirectional link delay metric type.";
  reference
    "RFC 7471 - OSPF Traffic Engineering (TE) Metric Extensions";
}

identity te-metric {
  base metric-type;
  description
    "Traffic engineering metric type.";
  reference
    "RFC 3630 - Traffic Engineering (TE) Extensions to OSPF
      Version 2";
}

identity fad-flags {
  description

```

```

        "Base identity for OSPF FAD flags.";
    }

    identity m-bit {
        base fad-flags;
        description
            "M bit, when set, the fex-algo specific prefix and ASBR
            metric MUST be used for inter-area and external prefix
            calculation.";
    }

    identity fapm-flags {
        description
            "Base identity for OSPF flex-algo prefix metric flags.";
    }

    identity e-bit {
        base fapm-flags;
        description
            "External metric, if set, the metric specified is a
            type 2 external metric.";
    }

    /* Groupings */
    grouping fa-ex-ag-sub-tlv {
        container fa-ex-ag-sub-tlv {

```

```

        leaf-list extended-admin-groups {
            type uint64;
            description
                "Extended administrative group as defined in RFC 7308.";
        }
        description
            "The flex-algo exclude admin group sub-tlv.";
    }
    description
        "The flex-algo exclude admin group sub-tlv.";
}

grouping fa-in-any-ag-sub-tlv {
    container fa-in-any-ag-sub-tlv {
        leaf-list extended-admin-groups {

```

```

        type uint64;
        description
            "Extended administrative group as defined in RFC 7308";
    }
    description
        "The flex-algo include-any admin group sub-tlv.";
    }
    description
        "The flex-algo include-any admin group sub-tlv.";
    }

    grouping fa-in-all-ag-sub-tlv {
        container fa-in-all-ag-sub-tlv {
            leaf-list extended-admin-groups {
                type uint64;
                description
                    "Extended administrative group as defined in RFC 7308";
            }
            description
                "The flex-algo include-all admin group sub-tlv.";
        }
        description
            "The flex-algo include-all admin group sub-tlv.";
    }

    grouping fad-flags-sub-tlv {
        container fad-flags-sub-tlv {
            leaf-list fad-flags {
                type identityref {
                    base fad-flags;
                }
                description
                    "Flex-algo definition flags list.";
            }
        }
    }

```

```

    }
    description
        "OSPF flex-algo definition flags.";
    }
    description
        "The flex-algo definition flags sub-tlv.";
    }

```



```

grouping fa-ex-srlg-sub-tlv {
  container fa-ex-srlg-sub-tlv {
    leaf-list srlgs {
      type uint32;
      description
        "SRLG value as defined in RFC 4203.";
    }
    description
      "The flex-algo exclude SRLG sub-tlv.";
  }
  description
    "The flex-algo exclude SRLG sub-tlv.";
}

grouping fad-tlvs {
  container fad-tlvs {
    list fad-tlv {
      leaf flex-algo {
        type uint8;
        description
          "Flex-algo number, value between 128 and 255 inclusive.";
      }
      leaf metric-type {
        type identityref {
          base metric-type;
        }
        description
          "Type of metric to be used during the calculation.";
      }
      leaf calc-type {
        type uint8 {
          range "0..127";
        }
        description
          "IGP algorithm types, value from 0 to 127 as
          defined under 'Interior Gateway Protocol (IGP)
          Parameter' by IANA.";
      }
      leaf priority {
        type uint8;

```

description

```

        "Priority of the advertisement.";
    }

    uses fa-ex-ag-sub-tlv;
    uses fa-in-any-ag-sub-tlv;
    uses fa-in-all-ag-sub-tlv;
    uses fad-flags-sub-tlv;
    uses fa-ex-srlg-sub-tlv;
    uses ospf:unknown-tlvs;

    description
        "List of flex-algo definition TLVs.";
    }
    description
        "OSPF Flexible Algorithm Definition TLV.";
    }
    description
        "OSPF Flexible Algorithm Definition (FAD) TLV.";
    }

    grouping fapm-sub-tlvs {
        container fapm-sub-tlvs {
            list fapm-sub-tlv {
                leaf flex-algo {
                    type uint8;
                    description
                        "Flex-algo number, value between 128 and 255
                        inclusive.";
                }
                leaf-list fapm-flags {
                    type identityref {
                        base fapm-flags;
                    }
                    description
                        "Flex-algo prefix metric flags list.";
                }
                leaf metric {
                    type uint32;
                    description
                        "Prefix metric.";
                }
                description
                    "List of flex-algo prefix sub-tlvs.";
            }
            description
                "Flex-algo prefix metric sub-tlvs.";
        }
    }

```

```
    description
      "Flexible Algorithm Prefix Metric (FAPM) sub TLVs.";
  }

  grouping faam-sub-tlvs {
    container faam-sub-tlvs {
      list faam-sub-tlv {
        leaf flex-algo {
          type uint8;
          description
            "Flex-algo number, value between 128 and 255
            inclusive.";
        }
        leaf metric {
          type uint32;
          description
            "Prefix metric.";
        }
        description
          "List of faam sub-tlvs.";
      }
      description
        "Flexible Algorithm ASBR Metric (FAAM) Sub-TLVs.";
    }
    description
      "Flexible Algorithm ASBR Metric (FAAM) Sub-TLVs.";
  }

  /* Configurations */

  augment "/rt:routing/rt:control-plane-protocols"
    + "/rt:control-plane-protocol/ospf:ospf" {
    when "../rt:type = 'ospf:ospfv2' or "
      + "../rt:type = 'ospf:ospfv3'" {
      description
        "This augments the OSPF routing protocol when used.";
    }
    description
      "This augments OSPF protocol with Flexible
      Algorithm.";

    container ospf-flex-algo {
      list flex-algo {
        key "algo-number";
```

```
leaf algo-number {
  type uint8 {
```

```
    range "128..255";
  }
  description
    "An identifier in the range 128-255 that's associated
    with the Flexible Algorithm Definition.";
}
```

```
leaf advertise-definition {
  type boolean;
  default true;
  description
    "Enable to advertise the flex-algo definition.";
}
```

```
container admin-groups {
  if-feature "te-types:extended-admin-groups";
  if-feature "te-types:named-extended-admin-groups";
  leaf-list exclude-admin-groups {
    type leafref {
      path "/te:te/te:globals/te:named-admin-groups/"
        + "te:named-admin-group/te:name";
    }
    description
      "Exclude rule used during the flex-algo
      path computation.";
  }
  leaf-list include-any-admin-groups {
    type leafref {
      path "/te:te/te:globals/te:named-admin-groups/"
        + "te:named-admin-group/te:name";
    }
    description
      "Include-any rule used during the flex-algo
      path computation.";
  }
  leaf-list include-all-admin-groups {
    type leafref {
      path "/te:te/te:globals/te:named-admin-groups/"
        + "te:named-admin-group/te:name";
    }
  }
}
```

```

    }
    description
      "Include-all rule used during the flex-algo
      path computation.";
  }
  description
    "Specify links for the flex-algo path computation.";
}

```

```

leaf-list exclude-srlgs {
  if-feature "te-types:named-srlg-groups";
  type leafref {
    path "/te:te/te:globals/te:named-srlgs/te:named-srlg/"
      + "te:name";
  }
  description
    "Shared Risk Link Groups (SRLGs) to be excluded during
    the flex-algo path computation.";
}

leaf fast-reroute {
  type boolean;
  default true;
  description
    "Enable fast reroute.";
}

leaf metric-type {
  type identityref {
    base metric-type;
  }
  description
    "Type of metric to be used during the calculation.";
}

leaf microloop-avoidance {
  type boolean;
  default true;
  description
    "Enable microloop avoidance.";
}

```

[Page 40]

January 2022

```

}

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:ri-opaque" {
when "../../../../../../../../../../../../../../../"
+ "rt:type = 'ospf:ospfv2'" {
description
"This augmentation is only valid for OSPFv2.";
}

description
"Flex-algo definition TLVs for OSPFv2 type 10 opaque RI LSA.";

uses fad-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:ospfv2/"
+ "ospf:ospfv2/ospf:body/ospf:opaque/ospf:ri-opaque" {
when "../../../../../../../../../../../"
+ "rt:type = 'ospf:ospfv2'" {
description
"This augmentation is only valid for OSPFv2.";
}
description
"Flex-algo definition TLVs for OSPFv2 type 11 opaque RI LSA.";

uses fad-tlvs;
}

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/ospf:router-information" {
when "../..../..../..../..../..../..../..../..../"
    + "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3.";
    }
}

description
    "Flex-algo definition TLVs for OSPFv3 Router Information LSA.";

uses fad-tlvs;
}

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/ospf:router-information" {
when "../..../..../..../..../..../..../..../..../"
    + "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3.";
    }
}

description

```

```

    "Flex-algo definition TLVs for OSPFv3 Router Information LSA.";

uses fad-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/ospf:router-information" {

```



```

when "../.../.../.../.../.../.../.../..."
  + "rt:type = 'ospf:ospfv3'" {
    description
      "This augmentation is only valid for OSPFv3.";
  }
description
  "Flex-algo definition TLVs for OSPFv3 Router Information LSA.";

uses fad-tlvs;
}

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" {
when "../.../.../.../.../.../.../.../.../.../.../.../..."
  + "rt:type = 'ospf:ospfv2'" {
    description
      "This augmentation is only valid for OSPFv2.";
  }
description
  "Flex-algo prefix metric sub TLVs for OSPFv2 extended prefix TLV
    in type 9 opaque LSA.";
  uses fapm-sub-tlvs;
}

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" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "rt:type = 'ospf:ospfv2'" {
    description

```

```

        "This augmentation is only valid for OSPFv2.";
    }
    description
        "Flex-algo prefix metric sub TLVs for OSPFv2 extended prefix TLV
        in type 10 opaque LSA.";
    uses fapm-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:ospfv2/"
    + "ospf:ospfv2/ospf:body/ospf:opaque/"
    + "ospf:extended-prefix-opaque/ospf:extended-prefix-tlv" {
when "../..../..../..../..../..../..../..../..../"
    + "rt:type = 'ospf:ospfv2'" {
    description
        "This augmentation is only valid for OSPFv2.";
    }
    description
        "Flex-algo prefix metric sub TLVs for OSPFv2 extended prefix TLV
        in type 11 opaque LSA.";
    uses fapm-sub-tlvs;
}

/* Flex-algo prefix metric Sub-TLV in OSPFv3 Inter-Area Prefix TLV */
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" {
when "../..../..../..../..../..../..../..../..../"
    + "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3
        E-Router LSAs";
    }
    uses fapm-sub-tlvs;
    description
        "OSPFv3 Area-Scoped Inter-Area Prefix TLV.";
}

```

```
/* Flex-algo prefix metric Sub-TLV in OSPFv3 External Prefix TLV */
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 "'ospf:../../../../../../../../../../../../'"
+ "rt:type" = 'ospf:ospfv3' {
description
  "This augmentation is only valid for OSPFv3.";
}
uses fapm-sub-tlvs;
description
  "OSPFv3 AS-Scoped External Prefix TLV.";
}

/* OSPFv2 Extended Inter-Area ASBR LSA */
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" {
when "../../../../../../../../../../../../"
+ "rt:type" = 'ospf:ospfv2' {
description
  "This augmentation is only valid for OSPFv2.";
}
description
  "OSPFv2 Extended Inter-Area ASBR LSA in type 10
  opaque LSA.";

container eia-asbr-opaque {
  container eia-asbr-tlv {
    leaf asbr-rtr-id {
      type rt-types:router-id;
      description
        "The OSPF Router ID of the ASBR.";
    }
  }
  uses faam-sub-tlvs;
  uses ospf:unknown-tlvs;
  description
    "EIA-ASBR TLV, used to advertise additional attributes
    associated with the reachability of an ASBR.";
```

```
}
```

```
    uses ospf:unknown-tlvs;

    description
      "OSPFv2 Extended Inter-Area (EIA-ASBR) opaque LSA.";
  }
}

/* FAAM Sub-TLV in OSPFv3 Inter-Area-Router TLV */
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-router/"
+ "ospfv3-e-lsa:e-inter-router-tlvs/"
+ "ospfv3-e-lsa:inter-router-tlv" {
when "../.../.../.../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv3'" {
  description
    "This augmentation is only valid for OSPFv3
    Inter-Area-Router TLV.";
}
uses faam-sub-tlvs;
description
  "OSPFv3 Area-Scoped Inter-Area-Router TLV.";
}
}
<CODE ENDS>
```

8. Security Considerations

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 [RFC5246].

The NETCONF access control model [RFC6536] 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.

There are a number of data nodes defined in the modules that are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations.

Some of the readable data nodes in the modules may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. The exposure of the Link State Database (LSDB) will expose the detailed topology of the network. This may be undesirable since both due to the fact that exposure may facilitate other attacks. Additionally, network operators may consider their topologies to be sensitive confidential data.

9. IANA Considerations

This document registers URIs in the IETF XML registry [[RFC3688](#)]. Following the format in [[RFC3688](#)], the following registrations is requested to be made:

URI: urn:ietf:params:xml:ns:yang:ietf-ospfv3-te
Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace.

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

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

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

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

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

This document registers the YANG modules in the YANG Module Names registry [[RFC6020](#)].

name: ietf-ospfv3-te
namespace: urn:ietf:params:xml:ns:yang:ietf-ospfv3-te
prefix: ospfv3-te
reference: RFC XXXX

name: ietf-ospf-two-metric
namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-two-metric
prefix: ospf-two-metric
reference: RFC XXXX

name: ietf-ospf-grace-linkdown
namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-grace-linkdown
prefix: ospf-grace-linkdown
reference: RFC XXXX

name: ietf-ospf-lls-localid
namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-lls-localid
prefix: ospf-lls-localid
reference: RFC XXXX

name: ietf-ospf-link-attr
namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-link-attr
prefix: ospf-link-attr
reference: RFC XXXX

name: ietf-ospf-flex-algo

namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-flex-algo
prefix: ospf-flex-algo
reference: RFC XXXX

10. Acknowledgements

This document was produced using Marshall Rose's xml2rfc tool.

The YANG model was developed using the suite of YANG tools written and maintained by numerous authors.

11. Normative References

[I-D.ietf-lsr-flex-algo]

Psenak, P., Hegde, S., Filsfils, C., Talaulikar, K., and A. Gulko, "IGP Flexible Algorithm", Work in Progress, Internet-Draft, [draft-ietf-lsr-flex-algo-18](https://www.ietf.org/archive/id/draft-ietf-lsr-flex-algo-18), 25 October 2021, <<https://www.ietf.org/archive/id/draft-ietf-lsr-flex-algo-18.txt>>.

Lindem & Qu

Expires 13 July 2022

[Page 48]

Internet-Draft

OSPF YANG Augments V1

January 2022

[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](https://www.ietf.org/archive/id/draft-ietf-ospf-yang-29), 17 October 2019, <<https://www.ietf.org/archive/id/draft-ietf-ospf-yang-29.txt>>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](https://www.rfc-editor.org/info/rfc2119), [RFC 2119](https://www.rfc-editor.org/info/rfc2119), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

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

[RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", [RFC 5246](https://www.rfc-editor.org/info/rfc5246), DOI 10.17487/RFC5246, August 2008,

<<https://www.rfc-editor.org/info/rfc5246>>.

- [RFC5329] Ishiguro, K., Manral, V., Davey, A., and A. Lindem, Ed., "Traffic Engineering Extensions to OSPF Version 3", [RFC 5329](#), DOI 10.17487/RFC5329, September 2008, <<https://www.rfc-editor.org/info/rfc5329>>.
- [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>>.
- [RFC6536] Bierman, A. and M. Bjorklund, "Network Configuration Protocol (NETCONF) Access Control Model", [RFC 6536](#), DOI 10.17487/RFC6536, March 2012, <<https://www.rfc-editor.org/info/rfc6536>>.
- [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>>.
- [RFC8042] Zhang, Z., Wang, L., and A. Lindem, "OSPF Two-Part Metric", [RFC 8042](#), DOI 10.17487/RFC8042, December 2016, <<https://www.rfc-editor.org/info/rfc8042>>.
- [RFC8349] Lhotka, L., Lindem, A., and Y. Qu, "A YANG Data Model for Routing Management (NMDA Version)", [RFC 8349](#), DOI 10.17487/RFC8349, March 2018, <<https://www.rfc-editor.org/info/rfc8349>>.

- [RFC8379] Hegde, S., Sarkar, P., Gredler, H., Nanduri, M., and L. Jalil, "OSPF Graceful Link Shutdown", [RFC 8379](#), DOI 10.17487/RFC8379, May 2018, <<https://www.rfc-editor.org/info/rfc8379>>.
- [RFC8510] Psenak, P., Ed., Talaulikar, K., Henderickx, W., and P. Pillay-Esnault, "OSPF Link-Local Signaling (LLS) Extensions for Local Interface ID Advertisement", [RFC 8510](#), DOI 10.17487/RFC8510, January 2019, <<https://www.rfc-editor.org/info/rfc8510>>.
- [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>>.

Authors' Addresses

Acee Lindem
Cisco Systems
301 Midenhall Way
Cary, NC 27513

Email: acee@cisco.com

Yingzhen Qu
Futurewei
2330 Central Expressway
Santa Clara, CA 95050
United States of America

Email: yingzhen.qu@futurewei.com