Internet
Internet-Draft
Intended status: Standards Track
Expires: 4 November 2026

Y. Qu
Futurewei Technologies
A. Lindem
Arrcus, Inc.

3 May 2026

YANG Data Model for OSPF Application-Specific Link Attributes and Flexible Algorithm
draft-ietf-lsr-ospf-flex-algo-yang-08

Abstract

This document defines a YANG data model to support OSPF Application-Specific Link Attributes and Flexible Algorithm. It also specifies the initial version of IANA-maintained YANG modules for IGP Algorithm Types, IGP Metric-Types, and IGP Link Attribute Applications.

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 4 November 2026.

Table of Contents

1. Overview

This document defines YANG [RFC7950] data modules augmenting the IETF OSPF YANG model [RFC9129], which itself augments the IETF Routing model [RFC8349], to provide support for both OSPF Flexible Algorithm as defined in [RFC9350] and OSPF Application-Specific Link Attributes as defined in [RFC9492].

Five YANG modules are defined in this document. The first is the initial version of the IANA-maintained YANG module for IGP Algorithm Types. The second module is the initial version of the IANA-maintained YANG module for IGP Metric-Type. The third module is the initial version of the IANA-maintained YANG module for IGP Link Attribute Application types. The fourth module is to support OSPF Application-Specific Link Attributes, and the fifth module augments the IETF OSPF YANG data model to support OSPF Flex Algorithm.

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. IANA IGP Algorithm Types Module

IANA has created a registry titled "IGP Algorithm Types" under the "Interior Gateway Protocol (IGP) Parameters" registry group to identify Algorithm Types. Module iana-igp-algo-types is an IANA-maintained module, which defines the identities for the Algorithm Types as in the IANA "IGP Algorithm Types" registry.

This module is maintained by IANA and will be updated if and when there is any change to the registry.

This document defines the initial version of the IANA-maintained YANG module for Algorithm Types that mirrors the IANA "IGP Algorithm Types" registry [IANA-IGP-ALGO-Types].

This YANG module references [RFC8665].

```
<CODE BEGINS> file "iana-igp-algo-types@2026-03-30.yang"
module iana-igp-algo-types {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:iana-igp-algo-types";
  prefix iana-algo-types;

  organization
    "Internet Assigned Numbers Authority (IANA)";
  contact
    "Internet Assigned Numbers Authority

     ICANN
     12025 Waterfront Drive, Suite 300
     Los Angeles, CA 90094-2536
     United States of America

     Tel:    +1 310 301 5800
      <mailto:iana@iana.org>";
  description
    "The YANG module defines the identities for Interior Gateway
     Protocol (IGP) Algorithm Types.

     This YANG module is maintained by IANA and reflects the 'IGP
     Algorithm Types' registry.

     Copyright (c) 2026 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 Revised 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).

        All revisions of IETF and IANA published modules can be found
        at the YANG Parameters registry group
        (https://www.iana.org/assignments/yang-parameters).

        This initial version of this YANG module is part of RFC XXXX
        (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
        for full legal notices.

        //RFC Ed.: replace XXXX with actual RFC number and remove
          this note

        The latest version of this YANG module is available at
        https://www.iana.org/assignments/yang-parameters.";

      revision 2026-03-30 {
        description
          "Initial Version";
        reference
          "RFC XXXX: YANG Data Model for OSPF Application-Specific
                     Link Attributes and Flexible Algorithm";
      }

      identity algo-type {
        description
          "Base identity for IGP Algorithm Type. The algorithm types
           are defined in IANA IGP Algorithm Types registry.";
      }

      identity algo-spf {
        base algo-type;
        description
          "Shortest Path First (SPF) algorithm based on link metric.";
        reference
          "RFC 8665: OSPF Extensions for Segment Routing";
      }

      identity algo-strict-spf {
        base algo-type;
        description
          "Strict Shortest Path First (SPF) algorithm based on link
           metric.";
        reference
          "RFC 8665: OSPF Extensions for Segment Routing";
      }
```

```
}
<CODE ENDS>
```

3. IANA IGP Metric Types Module

IANA has created a registry titled "IGP Metric-Type" under the "Interior Gateway Protocol (IGP) Parameters" registry group to identify Metric Types. Module iana-igp-metric-types is an IANA-maintained module, which defines the identities for the Metric Types as in the IANA "IGP Metric-Type" registry.

This module is maintained by IANA and will be updated if and when there is any change to the registry.

This document defines the initial version of the IANA-maintained YANG module for IGP metric types that mirrors the IANA "IGP Metric-Type" registry [IANA-IGP-Metric-Types].

This YANG module references [RFC3630], [RFC5305], [RFC7471], [RFC8570], [RFC9350], and [RFC9843].

```
<CODE BEGINS> file "iana-igp-metric-types@2026-03-30.yang"
module iana-igp-metric-types {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:iana-igp-metric-types";
  prefix iana-metric-types;

  organization
    "Internet Assigned Numbers Authority (IANA)";
  contact
    "Internet Assigned Numbers Authority

     ICANN
     12025 Waterfront Drive, Suite 300
     Los Angeles, CA 90094-2536
     United States of America

     Tel:    +1 310 301 5800
      <mailto:iana@iana.org>";
  description
    "The YANG module defines the identities for Interior Gateway
     Protocol (IGP) Metric-Types.

     This YANG module is maintained by IANA and reflects the 'IGP
     Metric-Type' registry.

     Copyright (c) 2026 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 Revised 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).

        All revisions of IETF and IANA published modules can be found
        at the YANG Parameters registry group
        (https://www.iana.org/assignments/yang-parameters).

        This initial version of this YANG module is part of RFC XXXX
        (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
        for full legal notices.

        //RFC Ed.: replace XXXX with actual RFC number and remove
          this note

        The latest version of this YANG module is available at
        https://www.iana.org/assignments/yang-parameters.";

      revision 2026-03-30 {
        description
          "Initial Version";
        reference
          "RFC XXXX: YANG Data Model for OSPF Application-Specific
                     Link Attributes and Flexible Algorithm";
      }

      identity metric-type {
        description
          "Base identity for IGP Metric-Type. The metric types
           are defined in IANA IGP Metric-Type registry.";
      }

      identity igp-metric {
        base metric-type;
        description
          "IGP Metric.";
        reference
          "RFC9350: IGP Flexible Algorithm";
      }

      identity min-unidirectional-link-delay {
        base metric-type;
        description
          "Min Unidirectional Link Delay as defined in RFC 8570
           and Section 4.2 and RFC 7471 Section 4.2.";
```

```
      reference
        "RFC 7471: OSPF Traffic Engineering (TE) Metric Extensions
         RFC 8570: IS-IS Traffic Engineering (TE) Metric Extensions
         RFC 9350: IGP Flexible Algorithm";
    }

    identity te-default-metric {
      base metric-type;
      description
        "Traffic Engineering Default Metric as defined in RFC 5305
         Section 3.7 and Traffic Engineering Metric as defined in
         RFC3630, Section 2.5.5.";
      reference
        "RFC 3630: OSPF Traffic Engineering
         RFC 5305: IS-IS Traffic Engineering
         RFC 9350: IGP Flexible Algorithm";
    }

    identity bandwidth-metric {
      base metric-type;
      description
        "Bandwidth metric.";
      reference
        "RFC 9843: IGP Flexible Algorithms: Bandwidth, Delay,
         Metrics, and Constraints, Sections 4 and 5";

    }
  }
  <CODE ENDS>
```

4. IANA IGP Link Attribute Applications Module

IANA has created a registry titled "Link Attribute Application Identifiers" under the "Interior Gateway Protocol (IGP) Parameters" registry group to identify IGP application types with application-specific link attributes. Module iana-igp-link-attr-apps is an IANA-maintained module, which defines the identities for the link attribute application IDs as in the IANA "Link Attribute Application Identifiers" registry.

This module is maintained by IANA and will be updated if and when there is any change to the registry.

This document defines the initial version of the IANA-maintained YANG module for IGP application types that mirrors the IANA "Link Attribute Application Identifiers" registry [IANA-Link-Attr-Apps].

This YANG module references [RFC9492].

```
<CODE BEGINS> file "iana-igp-link-attr-apps@2026-04-14.yang"
module iana-igp-link-attr-apps {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:iana-igp-link-attr-apps";
  prefix iana-link-attr-app;

  organization
    "Internet Assigned Numbers Authority (IANA)";
  contact
    "Internet Assigned Numbers Authority

     ICANN
     12025 Waterfront Drive, Suite 300
     Los Angeles, CA 90094-2536
     United States of America

     Tel:    +1 310 301 5800
      <mailto:iana@iana.org>";
  description
    "The YANG module defines the identities for Interior Gateway
     Protocol (IGP) Application IDs used for Link Attributes.

     This YANG module is maintained by IANA and reflects the 'Link
     Attribute Application Identifiers' registry.

     Copyright (c) 2026 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 Revised 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).

     All revisions of IETF and IANA published modules can be found
     at the YANG Parameters registry group
     (https://www.iana.org/assignments/yang-parameters).

     This initial version of this YANG module is part of RFC XXXX
     (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
     for full legal notices.

     //RFC Ed.: replace XXXX with actual RFC number and remove
       this note

     The latest version of this YANG module is available at
     https://www.iana.org/assignments/yang-parameters.";
```

```
    revision 2026-04-14 {
      description
        "Initial Version";
      reference
        "RFC XXXX: YANG Data Model for OSPF Application-Specific
                   Link Attributes and Flexible Algorithm";
    }

    identity igp-link-attr-app {
      description
        "Base identity for Standard Applications";
      reference
        "RFC 9492: OSPF Application-Specific Link Attributes";
    }

    identity rsvp-te-app {
      base igp-link-attr-app;
      description
        "RSVP Traffic Engineering (TE) Application - This
         corresponds to Bit 0 (R-BIT) in the Standard Application
         Bit Mask (SABM).";
      reference
        "RFC 3630: Traffic Engineering (TE) for OSPFv2
         RFC 5329: Traffic Engineering Extensions to OSPFv3";
    }

    identity sr-policy-app {
      base igp-link-attr-app;
      description
        "Segment Routing (SR) Policy Application - This
         corresponds to Bit 1 (S-BIT) in the Standard Application
         Bit Mask (SABM).";
      reference
        "RFC 8665: OSPF Extensions for Segment Routing
         RFC 8666: OSPFv3 Extensions for Segment Routing";
    }

    identity lfa-app {
      base igp-link-attr-app;
      description
        "Loop-Free Alternative (LFA) Application - This
         corresponds to Bit 2 (F-BIT) in the Standard Application
         Bit Mask (SABM).";
      reference
        "RFC 8102: Remote-LFA Node Protection and Manageability
         RFC 9855: Topology Independent Fast Reroute Using
                   Segment Routing";
    }
```

```
  identity flex-algo-app {
    base igp-link-attr-app;
    description
      "Flexible Algorithm Application - This
       corresponds to Bit 3 (X-BIT) in the Standard Application
       Bit Mask (SABM).";
    reference
      "RFC 9350: IGP Flexible Algorithm, Section 12.";
  }
}
<CODE ENDS>
```

5. YANG Module for OSPF Application-Specific Link Attributes

This document defined a YANG module for OSPF Application-Specific Link Attributes (ASLA) as defined in [RFC9492].

The module augments OSPF router configuration with support for the ASLA operation mode, enabling interoperability during the transition from legacy advertisements to ASLA. In addition, both OSPFv2 and OSPFv3 LSAs are augmented to include the TLVs defined in[RFC9492].

As far as whether or not an application-specific link atttribute is included, only legacy attributes that are defined in [RFC9129] are included. Additional atttributes will be included in these TLVs when the augmentations for the corresponding legacy attributes are added.

This YANG module references [RFC8349], [RFC9129], [RFC9350], [RFC9492], and [RFC9587] .

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:interfaces/ospf:interface:
    +--rw ospf-asla
       +--rw interface-asla* [link-attr-app]
          +--rw link-attr-app    identityref
```

```
          +--rw te-metric?       uint32
          +--rw admin-group?     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-link-opaque/ospf:extended-link-tlv:
       +--ro app-specific-link-attr-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 te-metric?      uint32
                +--ro admin-group?    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
               /ospfv3-e-lsa:e-router/ospfv3-e-lsa:e-router-tlvs
               /ospfv3-e-lsa:link-tlv:
       +--ro app-specific-link-attr-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 te-metric?      uint32
                +--ro admin-group?    uint32
                +--ro unknown-tlvs
                   +--ro unknown-tlv* []
                      +--ro type?     uint16
                      +--ro length?   uint16
                      +--ro value?    yang:hex-string
```

```
<CODE BEGINS> file "ietf-ospf-link-attr@2026-04-29.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;
    reference
      "RFC 9129: YANG Data Model for the OSPF Protocol";
  }
  import ietf-ospfv3-extended-lsa {
    prefix ospfv3-e-lsa;
    reference
      "RFC 9587: YANG Data Model for OSPFv3 Extended Link
                 State Advertisements (LSAs)";
  }
  import iana-igp-link-attr-apps {
    prefix iana-link-attr-apps;
    reference
      "RFC XXXX: YANG Data Model for OSPF Application-Specific
                 Link Attributes and Flexible Algorithm";
  }

  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.ietf@gmail.com>
     Author:   Acee Lindem
               <mailto:acee.ietf@gmail.com>
    ";
  description
    "This YANG module defines the configuration and operational
     state for OSPF application specific link attributes feature
     as defined in RFC 9492.

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

```
        Copyright (c) 2026 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 Revised 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.";

      revision 2026-04-29 {
        description
          "Initial version";
        reference
          "RFC XXXX: YANG Data Model for OSPF Application-Specific
                     Link Attributes and Flexible Algorithm";
      }

      grouping ospf-te-link-attrs {
        description
          "OSPF Application-Specific Link Attributes (ASLA)
           inherited from the base OSPF TE attributes";
        leaf te-metric {
          type uint32;
          description
            "TE metric.";
          reference
            "RFC 3630 - Traffic Engineering (TE) Extensions
             to OSPFv2";
        }
        leaf admin-group {
          type uint32;
          description
            "Administrative Group / Resource Class/Color.";
          reference
            "RFC 3630 - Traffic Engineering (TE) Extensions
             to OSPFv2";
        }
        reference
          "RFC 3630 - Traffic Engineering (TE) Extensions
           to OSPFv2";
      }

      grouping app-specific-link-attr-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 app-specific-link-attr-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 iana-link-attr-apps:igp-link-attr-app;
              }
              description
                "SABM bits list. This list will contain identities
                 for the applications which are set in the SABA bits.";
            }
            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-te-link-attrs;
            uses ospf:unknown-tlvs;
            description
              "Link Attributes sub-sub-TLVs.";
          }
          description
            "List of application-Specific Link Attributes sub-TLVs.";
        }
      }
      reference
```

```
        "RFC 9492: OSPF Application-Specific Link Attributes";
    }

    /* Configuration */

    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 {
          default 'legacy';
          leaf legacy {
            type empty;
            description
              "Only send legacy advertisements.";
          }
          leaf transition {
            type empty;
            description
              "Send both application-specific and legacy
               advertisements.";
          }
          leaf app-specific {
            type empty;
            description
              "Only send application-specific advertisements.";
          }
          description
            "Link attributes mode. Default to legacy mode for
             backward compatibility.";
        }
        description
          "Link attributes operation mode.";
      }
    }

    augment "/rt:routing/rt:control-plane-protocols/"
          + "rt:control-plane-protocol/ospf:ospf/"
          + "ospf:areas/ospf:area/ospf:interfaces/ospf:interface" {
      when "derived-from(/rt:routing/rt:control-plane-protocols/"
         + "rt:control-plane-protocol/rt:type, 'ospf:ospfv2') or "
```

```
          + "derived-from(/rt:routing/rt:control-plane-protocols/"
        + "rt:control-plane-protocol/rt:type, 'ospf:ospfv2')" {
        description
          "This augments the OSPF interfaces.";
      }
      description
        "This augments OSPF interface configuration
         with Application Specific Link Attributes (ASLA).";
      container ospf-asla {
        list interface-asla {
          key "link-attr-app";
          leaf link-attr-app {
            type identityref {
              base iana-link-attr-apps:igp-link-attr-app;
            }
            description
              "Application-specific attributes. Note that
               when encoded, applications with identical
               attributes may be included in the same sub-TLV.";
          }
          uses ospf-te-link-attrs;
          description
            "ASLA interface configuration.";
        }
        description
          "Application specific link attributes configuration.";
      }
    }

    /* 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 "derived-from(/rt:routing/rt:control-plane-protocols/"
         + "rt:control-plane-protocol/rt:type, 'ospf:ospfv2')" {
        description
          "This augmentation is only valid for OSPFv2.";
      }
      description
        "OSPF Application-Specific Link Attributes (ASLA) sub-TLV is
         a sub-TLV of OSPFv2 Extended Link TLV (RFC7684).";
      uses app-specific-link-attr-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:ospfv3/"
          + "ospf:ospfv3/ospf:body/ospfv3-e-lsa:e-router/"
          + "ospfv3-e-lsa:e-router-tlvs/ospfv3-e-lsa:link-tlv" {
      when "derived-from(/rt:routing/rt:control-plane-protocols/"
         + "rt:control-plane-protocol/rt:type, 'ospf:ospfv3')" {
        description
          "This augmentation is only valid for OSPFv3
           E-Router LSAs";
      }
      description
        "Augment OSPFv3 Area scope router-link TLV.";
      uses app-specific-link-attr-sub-tlvs;
    }
  }
  <CODE ENDS>
```

6. YANG Module for OSPF Flexible Algorithm

This document defines a YANG module for OSPF Flexible Algorithm as defined in [RFC9350]. It is an augmentation of the OSPF base model.

The module augments OSPF router configuration with support flexible algorithms. In addition, both the OSPFv2 and OSPFv3 link-state databases are augmented to include the TLVs defined in[RFC9350].

This YANG module references [RFC8349], [RFC9129], [RFC9350], [RFC9587], and [I-D.ietf-yang-te].

module: ietf-ospf-flex-algo

```
  augment /rt:routing/rt:control-plane-protocols
            /rt:control-plane-protocol/ospf:ospf:
    +--rw ospf-flex-algo
       +--rw flex-algo* [algo-number]
          +--rw algo-number             uint8
          +--rw advertise-definition?   boolean
          +--rw admin-groups
          |       {te-types:extended-admin-groups,
          |        te-types:named-extended-admin-groups}?
          |  +--rw exclude-admin-groups*       leafref
          |  +--rw include-any-admin-groups*   leafref
          |  +--rw include-all-admin-groups*   leafref
```

```
            +--rw exclude-srlgs*
            |       -> /te:te/globals/named-srlgs/named-srlg/name
            |       {te-types:named-srlg-groups}?
            +--rw calc-type?              identityref
            +--rw metric-type?            identityref
            +--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 algo-number?            uint8
            +--ro metric-type?            identityref
            +--ro calc-type?              identityref
            +--ro priority?               uint8
            +--ro fa-ex-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-any-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-all-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--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 algo-number?            uint8
            +--ro metric-type?            identityref
            +--ro calc-type?              identityref
            +--ro priority?               uint8
            +--ro fa-ex-ag-sub-tlv
```

```
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-any-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-all-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--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 algo-number?           uint8
            +--ro metric-type?           identityref
            +--ro calc-type?             identityref
            +--ro priority?              uint8
            +--ro fa-ex-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-any-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-all-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--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 algo-number?            uint8
           +--ro metric-type?            identityref
           +--ro calc-type?              identityref
           +--ro priority?               uint8
           +--ro fa-ex-ag-sub-tlv
           |  +--ro extended-admin-groups*   uint32
           +--ro fa-in-any-ag-sub-tlv
           |  +--ro extended-admin-groups*   uint32
           +--ro fa-in-all-ag-sub-tlv
           |  +--ro extended-admin-groups*   uint32
           +--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 algo-number?            uint8
            +--ro metric-type?            identityref
            +--ro calc-type?              identityref
            +--ro priority?               uint8
            +--ro fa-ex-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-any-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-all-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--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 algo-number?           uint8
            +--ro metric-type?           identityref
            +--ro calc-type?             identityref
            +--ro priority?              uint8
            +--ro fa-ex-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-any-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--ro fa-in-all-ag-sub-tlv
            |  +--ro extended-admin-groups*   uint32
            +--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 algo-number?   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 algo-number?   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 algo-number?   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 algo-number?   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: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 algo-number?   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 algo-number?   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 algo-number?   uint8
             +--ro metric?        uint32

     notifications:
       +---n flex-algo-not-supported
          +--ro routing-protocol-name?   leafref
          +--ro algo-number?             uint8
```

```
   <CODE BEGINS> file "ietf-ospf-flex-algo@2026-04-29.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;
      reference
        "RFC 9129: YANG Data Model for the OSPF
         Protocol";
    }
    import ietf-ospfv3-extended-lsa {
      prefix ospfv3-e-lsa;
      reference
        "RFC 9587: YANG Data Model for OSPFv3 Extended Link
         State Advertisements (LSAs)";
    }
    import ietf-te {
      prefix te;
      reference
        "RFC XXXX: A YANG Data Model for Traffic Engineering
                   Tunnels, Label Switched Paths, and Interfaces";
    }
    import iana-igp-algo-types {
      prefix iana-algo-types;
      reference
        "RFC XXXX: YANG Data Model for OSPF Application-Specific
                   Link Attributes and Flexible Algorithm";
    }
    import iana-igp-metric-types {
      prefix iana-metric-type;
      reference
        "RFC XXXX: YANG Data Model for OSPF Application-Specific
                   Link Attributes and Flexible Algorithm";
    }

    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.ietf@gmail.com>
       Author:    Acee Lindem
                  <mailto:acee.ietf@gmail.com>
      ";
    description
      "The YANG module defines the configuration and operational
```

```
        state for OSPF Flexible Algorithm as defined in RFC 9350.

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

        Copyright (c) 2026 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 Revised 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.";

      revision 2026-04-29 {
        description
          "Initial Version";
        reference
          "RFC XXXX: YANG Data Model for OSPF Application-Specific
                     Link Attributes and Flexible Algorithm";
      }

      /* Identities */

      identity fad-flags {
        description
          "Base identity for OSPF FAD flags.";
        reference
          "RFC 9350: IGP Flexible Algorithm";
      }

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

```
        "RFC 9350: IGP Flexible Algorithm";
    }

    identity fapm-flags {
      description
        "Base identity for OSPF flex-algo prefix metric flags.";
      reference
        "RFC 9350: IGP Flexible Algorithm";
    }

    identity e-bit {
      base fapm-flags;
      description
        "External metric, if set, the metric specified is a
         type 2 external metric.";
      reference
        "RFC 9350: IGP Flexible Algorithm";
    }

    /* Groupings */

    grouping fad-tlvs {
      container fad-tlvs {
        list fad-tlv {
          leaf algo-number {
            type uint8;
            description
              "Flex-algo number - A value not in the inclusive range
               of 128-255 is an invalid FAD TLV specification.";
          }
          leaf metric-type {
            type identityref {
              base iana-metric-type:metric-type;
            }
            description
              "Type of metric to be used during the calculation.";
          }
          leaf calc-type {
            type identityref {
              base iana-algo-types:algo-type;
            }
            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.";
          }
          container fa-ex-ag-sub-tlv {
            leaf-list extended-admin-groups {
              type uint32;
              description
                "Extended administrative group as defined in
                 RFC 7308.";
            }
            description
              "The flex-algo exclude admin group sub-tlv.";
          }
          container fa-in-any-ag-sub-tlv {
            leaf-list extended-admin-groups {
              type uint32;
              description
                "Extended administrative group as defined in
                 RFC 7308.";
            }
            description
              "The flex-algo include-any admin group sub-tlv.";
          }
          container fa-in-all-ag-sub-tlv {
            leaf-list extended-admin-groups {
              type uint32;
              description
                "Extended administrative group as defined in
                 RFC 7308.";
            }
            description
              "The flex-algo include-all admin group 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.";
          }
          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.";
          }
          uses ospf:unknown-tlvs;
          description
            "List of flex-algo definition TLVs.";
        }
        description
          "OSPF Flexible Algorithm Definition TLV.";
      }
      description
        "OSPF Flexible Algorithm Definition (FAD) TLV.";
      reference
        "RFC 9350: IGP Flexible Algorithm";
    }

    grouping fapm-sub-tlvs {
      container fapm-sub-tlvs {
        list fapm-sub-tlv {
          leaf algo-number {
            type uint8;
            description
              "Flex-algo number - A value not in the inclusive range
               of 128-255 is an invalid FAD TLV specification.";
          }
          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.";
      reference
```

```
        "RFC 9350: IGP Flexible Algorithm";
    }

    grouping faam-sub-tlvs {
      container faam-sub-tlvs {
        list faam-sub-tlv {
          leaf algo-number {
            type uint8;
            description
              "Flex-algo number - A value not in the inclusive range
               of 128-255 is an invalid FAAM Sub-TLV specification.";
          }
          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.";
      reference
        "RFC 9350: IGP Flexible Algorithm";
    }

    /* 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 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 calc-type {
            type identityref {
              base iana-algo-types:algo-type;
            }
            default "iana-algo-types:algo-spf";
            description
              "Calcuation-type. Value from 0-127 inclusive from the
               IANA 'IGP Algorithm Types' registry defined under the
               'Interior Gateway Protocol (IGP) Parameters' registry.";
          }
          leaf metric-type {
            type identityref {
              base iana-metric-type:metric-type;
            }
            default "iana-metric-type:igp-metric";
            description
              "Type of metric to be used during the calculation.";
          }
          container prefix-metric {
            presence "Use flex-algo specific prefix metric.";
            description
              "Use flex-algo prefix metric.";
          }
          leaf priority {
            type uint8;
            description
              "Priority of the advertisement.";
          }
          description
            "List of flex-algo configurations.";
        }
        description
          "Flexible Algorithm configuration.";
      }
    }

    /* 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/ospf:ri-opaque" {
        when "../../../../../../../../../../../../../"
           + "rt:type = 'ospf:ospfv2'" {
          description
            "This augmentation is only valid for OSPFv2.";
        }
        description
          "Flex-algo definition TLVs for OSPFv2 type 9 opaque RI 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: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 (RI) 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 (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: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 "../../../../../../../../../../../../"
         + "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.";
      }

      /* notification */

      notification flex-algo-not-supported {
        leaf routing-protocol-name {
          type leafref {
            path "/rt:routing/rt:control-plane-protocols/"
               + "rt:control-plane-protocol/rt:name";
          }
          description
            "Name of the OSPF instance.";
        }
        leaf algo-number {
          type uint8;
          description
            "Flex-algo identifier which is not supported by the OSPF
             instance. A value not in the inclusive range of 128-255
             is indicative of an invalid FAD algorithm specification.";
        }
        description
          "This notification is sent when an OSPF instance does not
           support this flex-algo.";
      }
    }
    <CODE ENDS>
```

7. Security Considerations

The YANG modules defined in this document are designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] and RESTCONF [RFC8040]. These protocols have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and have to use mutual authentication.

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

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., "config true", which is the default). All writable data nodes are likely to be reasonably sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) and delete operations to these data nodes without proper protection or authentication can have a negative effect on network operations. The following subtrees and data nodes have particular sensitivities/vulnerabilities:

/ospf:ospf/ospf-link-attr/link-attr-op-mode - Modification to the protocol operation mode may result in traffic disruption.

/ospf:ospf/flex-algo - Modification to flex-algo configuration could be used to mount a DoS attack. For example, changing of calc-type may result in routing loops.

Some of the readable data nodes in this YANG module 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. Specifically, the following subtrees and data nodes have particular sensitivities/ vulnerabilities:

Both module ietf-ospf-flex-algo and module ietf-ospf-link-attr augments base OSPF module Link State Database (LSDB) with various TLVs. Knowledge of these data nodes can be used to attack other routers in the OSPF domain. These attacks are documented in [RFC9129].

8. IANA Considerations

8.1. Registering YANG Modules

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

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

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

      URI: urn:ietf:params:xml:ns:yang:iana-igp-link-attr-apps
      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: iana-igp-algo-types
      Maintained by IANA?  Y
      namespace: urn:ietf:params:xml:ns:yang:iana-igp-algo-types
      prefix: iana-algo-types
      reference: RFC XXXX

      name: iana-igp-metric-types
      Maintained by IANA?  Y
      namespace: urn:ietf:params:xml:ns:yang:iana-igp-metric-types
      prefix: iana-metric-types
      reference: RFC XXXX

      name: iana-igp-link-attr-app
      Maintained by IANA?  Y
      namespace: urn:ietf:params:xml:ns:yang:iana-igp-link-attr-apps
      prefix: iana-link-attr-app
      reference: RFC XXXX

      name: ietf-ospf-link-attr
      Maintained by IANA?  N
      namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-link-attr
      prefix: ospf-link-attr
      reference: RFC XXXX

      name: ietf-ospf-flex-algo
      Maintained by IANA?  N
      namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-flex-algo
      prefix: ospf-flex-algo
      reference: RFC XXXX
```

8.2. IANA IGP Algorithm Types Module

This document defines the initial version of the IANA-maintained "iana-igp-algo-types" YANG module (Section 2). The most recent version of the YANG module is available from the "YANG Parameters" registry [IANA-YANG-Parameters].

IANA is requested to add this note to the registry:

> | New values must not be directly added to the "iana-algo-types" YANG module. They must instead be added to the "IGP Algorithm Types" registry in the "Interior Gateway Protocol (IGP) Parameters" registry group.

When a value is added to the "IGP Algorithm Types" registry, a new "identity" statement needs to be added to the "iana-igp-algo-types" YANG module. The name of the "identity" MUST be the name as provided in the registry. The "identity" statement should have the following sub-statements defined:

"base":	contains "algo-type".
"description":	Replicates the description from the registry.
"reference":	Replicates the reference(s) from the registry with the title of the document(s) added.

When the "iana-igp-algo-types" YANG module is updated, a new "revision" statement with a unique revision date must be added in front of the existing revision statements. The "revision" statement MUST contain both "description" and "reference" substatements as follows.

The "description" substatement captures what changed in the revised version. Typically, the description enumerates the changes such as updpates to existing entries (e.g., update a description or a reference) or notes which identities were added or had their status changed (e.g., deprecated, discouraged, or obsoleted).

The "reference" substatement points specifically to the published module (i.e., IANA_FOO_URL_With_REV). It may also point to an authoritative event triggering the update to the YANG module. In all cases, this event is cited from the underlying IANA registry. If the update is triggered by an RFC, that RFC must also be included in the "reference" substatement.

IANA is requested to add this note to [IANA-IGP-ALGO-Types]:

> | When this registry is modified, the YANG module "iana-igp-algo-types" Section 2 must be updated as defined in RFC XXXX.

8.3. IANA IGP Metric-Type Module

This document defines the initial version of the IANA-maintained "iana-igp-metric-types" YANG module (Section 3). The most recent version of the YANG module is available from the "YANG Parameters" registry [IANA-YANG-Parameters].

IANA is requested to add this note to the registry:

> New values must not be directly added to the "iana-igp-metric-types" YANG module. They must instead be added to the "IGP Metric-Type" registry in the "Interior Gateway Protocol (IGP) Parameters" registry group.

When a value is added to the "IGP Metric-Type" registry, a new "identity" statement needs to be added to the "iana-igp-metric-types" YANG module. The name of the "identity" MUST be the name as provided in the registry. The "identity" statement should have the following sub-statements defined:

"base":	contains "metric-type".
"description":	Replicates the description from the registry.
"reference":	Replicates the reference(s) from the registry with the title of the document(s) added.

When the "iana-igp-metric-types" YANG module is updated, a new "revision" statement with a unique revision date must be added in front of the existing revision statements. The "revision" statement MUST contain both "description" and "reference" substatements as follows.

The "description" substatement captures what changed in the revised version. Typically, the description enumerates the changes such as updpates to existing entries (e.g., update a description or a reference) or notes which identities were added or had their status changed (e.g., deprecated, discouraged, or obsoleted).

The "reference" substatement points specifically to the published module (i.e., IANA_FOO_URL_With_REV). It may also point to an authoritative event triggering the update to the YANG module. In all cases, this event is cited from the underlying IANA registry. If the update is triggered by an RFC, that RFC must also be included in the "reference" substatement.

IANA is requested to add this note to [IANA-IGP-Metric-Types]:

> When this registry is modified, the YANG module "iana-metric-types" Section 3 must be updated as defined in RFC XXXX.

8.4. IANA IGP Link Attribute Applications Module

This document defines the initial version of the IANA-maintained "iana-igp-link-attr-apps" YANG module (Section 4). The most recent version of the YANG module is available from the "YANG Parameters" registry [IANA-YANG-Parameters].

IANA is requested to add this note to the registry:

> | New values must not be directly added to the "iana-igp-link-attr-apps" YANG module. They must instead be added to the "Link Attribute Application IDs" registry in the "Interior Gateway Protocol (IGP) Parameters" registry group.

When a value is added to the "Link Attribute Application IDs" registry, a new "identity" statement needs to be added to the "iana-igp-link-attr-apps" YANG module. The name of the "identity" MUST be the name as provided in the registry. The "identity" statement should have the following sub-statements defined:

"base":	contains "igp-link-attr-app".
"description":	Replicates the description from the registry.
"reference":	Replicates the reference(s) from the registry with the title of the document(s) added.

When the "iana-igp-link-attr-apps" YANG module is updated, a new "revision" statement with a unique revision date must be added in front of the existing revision statements. The "revision" statement MUST contain both "description" and "reference" substatements as follows.

The "description" substatement captures what changed in the revised version. Typically, the description enumerates the changes such as updpates to existing entries (e.g., update a description or a reference) or notes which identities were added or had their status changed (e.g., deprecated, discouraged, or obsoleted).

The "reference" substatement points specifically to the published module (i.e., IANA_FOO_URL_With_REV). It may also point to an authoritative event triggering the update to the YANG module. In all cases, this event is cited from the underlying IANA registry. If the update is triggered by an RFC, that RFC must also be included in the "reference" substatement.

IANA is requested to add this note to [IANA-Link-Attr-Apps]:

> | When this registry is modified, the YANG module "iana-igp-link-attr-apps" must be updated as defined in RFC XXXX Section 4 .

9. Acknowledgements

Thanks to Dhruv Dhody for his detailed YANG doctors review.

Thanks to Adrian Farrel for his OPS directorate review.

Thanks to Renato Westphal for his review and comments.

10. References

10.1. Normative References

[I-D.ietf-yang-te]
IETF, "YANG Data Model for Traffic Engineering", Work in Progress, Internet-Draft, draft-ietf-yang-te, <https://datatracker.ietf.org/doc/html/draft-ietf-yang-te>.

[IANA-IGP-ALGO-Types]
IANA, "IGP Algorithm Types", <https://www.iana.org/assignments/igp-parameters>.

[IANA-IGP-Metric-Types]
IANA, "IGP Metric-Type", <https://www.iana.org/assignments/igp-parameters>.

[IANA-Link-Attr-Apps]
IANA, "Link Attribute Application Identifiers", <https://www.iana.org/assignments/igp-parameters>.

[IANA-YANG-Parameters]
IANA, "YANG Module Names", <https://www.iana.org/assignments/yang-parameters>.

[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>.

[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>.

[RFC4252] Ylonen, T. and C. Lonvick, Ed., "The Secure Shell (SSH) Authentication Protocol", RFC 4252, DOI 10.17487/RFC4252, January 2006, <https://www.rfc-editor.org/info/rfc4252>.

[RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic Engineering", RFC 5305, DOI 10.17487/RFC5305, October 2008, <https://www.rfc-editor.org/info/rfc5305>.

[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>.

[RFC7471] Giacalone, S., Ward, D., Drake, J., Atlas, A., and S. Previdi, "OSPF Traffic Engineering (TE) Metric Extensions", RFC 7471, DOI 10.17487/RFC7471, March 2015, <https://www.rfc-editor.org/info/rfc7471>.

[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>.

[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>.

[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>.

[RFC8570] Ginsberg, L., Ed., Previdi, S., Ed., Giacalone, S., Ward, D., Drake, J., and Q. Wu, "IS-IS Traffic Engineering (TE) Metric Extensions", RFC 8570, DOI 10.17487/RFC8570, March 2019, <https://www.rfc-editor.org/info/rfc8570>.

[RFC8665] Psenak, P., Ed., Previdi, S., Ed., Filsfils, C., Gredler, H., Shakir, R., Henderickx, W., and J. Tantsura, "OSPF Extensions for Segment Routing", RFC 8665, DOI 10.17487/RFC8665, December 2019, <https://www.rfc-editor.org/info/rfc8665>.

[RFC9000] Iyengar, J., Ed. and M. Thomson, Ed., "QUIC: A UDP-Based Multiplexed and Secure Transport", RFC 9000, DOI 10.17487/RFC9000, May 2021, <https://www.rfc-editor.org/info/rfc9000>.

[RFC9129] Yeung, D., Qu, Y., Zhang, Z., Chen, I., and A. Lindem, "YANG Data Model for the OSPF Protocol", RFC 9129, DOI 10.17487/RFC9129, October 2022, <https://www.rfc-editor.org/info/rfc9129>.

[RFC9350] Psenak, P., Ed., Hegde, S., Filsfils, C., Talaulikar, K., and A. Gulko, "IGP Flexible Algorithm", RFC 9350, DOI 10.17487/RFC9350, February 2023, <https://www.rfc-editor.org/info/rfc9350>.

[RFC9492] Psenak, P., Ed., Ginsberg, L., Henderickx, W., Tantsura, J., and J. Drake, "OSPF Application-Specific Link Attributes", RFC 9492, DOI 10.17487/RFC9492, October 2023, <https://www.rfc-editor.org/info/rfc9492>.

[RFC9587] Lindem, A., Palani, S., and Y. Qu, "YANG Data Model for OSPFv3 Extended Link State Advertisements (LSAs)", RFC 9587, DOI 10.17487/RFC9587, June 2024, <https://www.rfc-editor.org/info/rfc9587>.

[RFC9843] Hegde, S., Britto, W., Shetty, R., Decraene, B., Psenak, P., and T. Li, "IGP Flexible Algorithms: Bandwidth, Delay, Metrics, and Constraints", RFC 9843, DOI 10.17487/RFC9843, September 2025, <https://www.rfc-editor.org/info/rfc9843>.

10.2. Informative References

[RFC8792] Watsen, K., Auerswald, E., Farrel, A., and Q. Wu, "Handling Long Lines in Content of Internet-Drafts and RFCs", RFC 8792, DOI 10.17487/RFC8792, June 2020, <https://www.rfc-editor.org/info/rfc8792>.

Appendix A. Example OSPF Flex-Algo Configuration (XML)

The following is an example configuration for OSPF Flexible Algorithm using the YANG model defined in this document.

Note: '\' line wrapping per [RFC8792].

```
<?xml version='1.0' encoding='UTF-8'?>
  <te xmlns="urn:ietf:params:xml:ns:yang:ietf-te">
    <enable>true</enable>
    <globals>
      <named-admin-groups>
        <named-admin-group>
          <name>blue</name>
        </named-admin-group>
      </named-admin-groups>
    </globals>
  </te>
  <routing xmlns="urn:ietf:params:xml:ns:yang:ietf-routing">
    <router-id>1.1.1.1</router-id>
    <control-plane-protocols>
      <control-plane-protocol>
        <type xmlns:ospf="urn:ietf:params:xml:ns:yang:ietf-ospf">\
          ospf:ospfv2</type>
        <name>OSPFv2</name>
           <ospf xmlns="urn:ietf:params:xml:ns:yang:ietf-ospf">
            <areas>
              <area>
                <area-id>0.0.0.0</area-id>
              </area>
            </areas>
          <ospf-flex-algo xmlns="urn:ietf:params:xml:ns:yang:\
            ietf-ospf-flex-algo">
            <flex-algo>
              <algo-number>200</algo-number>
              <admin-groups>
                <exclude-admin-groups>blue</exclude-admin-groups>
              </admin-groups>
              <metric-type xmlns:iana-metric-types=\
                "urn:ietf:params:xml:ns:yang:iana-igp-metric-types">\
                iana-metric-types:igp-metric</metric-type>
              <calc-type xmlns:iana-algo-types=\
                "urn:ietf:params:xml:ns:yang:iana-igp-algo-types">\
                iana-algo-types:algo-spf</calc-type>
              <prefix-metric/>
              <priority>100</priority>
            </flex-algo>
          </ospf-flex-algo>
        </ospf>
      </control-plane-protocol>
    </control-plane-protocols>
  </routing>
```

Appendix B. Example OSPF Flex-Algo Configuration (JSON)

The following is the same example configuration for OSPF Flexible Algorithm as in the previous section in JSON format using the YANG model defined in this document.

```
{
  "te": {
    "enable": "true",
    "globals": {
      "named-admin-groups": {
        "named-admin-group": {
          "name": "blue"
        }
      }
    },
    "_xmlns": "urn:ietf:params:xml:ns:yang:ietf-te"
  }
}
{
  "routing": {
    "router-id": "1.1.1.1",
    "control-plane-protocols": {
      "control-plane-protocol": {
        "type": {
          "_xmlns:ospf": "urn:ietf:params:xml:ns:yang:ietf-ospf",
          "__text": "ospf:ospfv2"
        },
        "name": "OSPFv2",
        "ospf": {
          "areas": {
            "area": {
              "area-id": "0.0.0.0"
            }
          },
          "ospf-flex-algo": {
            "flex-algo": {
              "algo-number": "200",
              "admin-groups": {
                "exclude-admin-groups": "blue"
              },
              "metric-type": {
                "_xmlns:iana-metric-types": "urn:ietf:params:xml:ns:\
                yang:iana-igp-metric-types",
                "__text": "iana-metric-types:igp-metric"
              },
              "calc-type": {
                "_xmlns:iana-algo-types": "urn:ietf:params:xml:ns:\
```

```
                    yang:iana-igp-algo-types",
                    "__text": "iana-algo-types:algo-spf"
                  },
                  "prefix-metric": "",
                  "priority": "100"
                },
                "_xmlns": "urn:ietf:params:xml:ns:yang:\
                ietf-ospf-flex-algo"
              },
              "_xmlns": "urn:ietf:params:xml:ns:yang:ietf-ospf"
            }
          }
        },
        "_xmlns": "urn:ietf:params:xml:ns:yang:ietf-routing"
      }
    }
```


Authors' Addresses

Yingzhen Qu
Futurewei Technologies
United States of America
Email: yingzhen.ietf@gmail.com

Acee Lindem
Arrcus, Inc.
United States of America
Email: acee.ietf@gmail.com