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Y. Qu
Futurewei Technologies
A. Lindem
Arrcus, Inc.
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YANG Data Model for OSPF Application-Specific Link Attributes and
Flexible Algorithm
draft-ietf-lsr-ospf-flex-algo-yang-03

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 and IGP Metric-Type.

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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].

Four YANG modules 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 augments the IETF OSPF YANG data model to support OSPF Flexible Algorithm, and the fourth module is to support OSPF Application-Specific Link Attributes.

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. 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`].

```
<CODE BEGINS> file "iana-igp-algo-types@2025-09-05.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.

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    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 2025-09-05 {
  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 Algorithm Types that mirrors the IANA "IGP Metric-Type" registry [IANA-IGP-Metric-Types].

```
<CODE BEGINS> file "iana-igp-metric-types@2025-09-05.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.
```

```

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```

```

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```

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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 2025-09-05 {
  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 RFC8570
      Section 4.2 and RFC7471 Section 4.2.";
  reference
    "RFC9350: IGP Flexible Algorithm";
}

identity te-default-metric {
```

```

    base metric-type;
    description
      "Traffic Engineering Default Metric as defined in RFC5305
       Section 3.7 and Traffic Engineering Metric as defined in
       RFC3630, Section 2.5.5.";
    reference
      "RFC9350: IGP Flexible Algorithm";
  }

  identity bandwidth-metric {
    base metric-type;
    description
      "Bandwidth metric.";
    reference
      "draft-ietf-lsr-flex-algo-bw-con";
  }
}
<CODE ENDS>

```

4. 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 the OSPFv2 and OSPFv3 link-state databases are augmented to include the TLVs defined in [RFC9492].

```

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

```

```

<CODE BEGINS> file "ietf-ospf-link-attr@2025-09-05.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)";
}

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.

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

revision 2025-09-05 {
  description
    "Initial version";
  reference
    "RFC XXXX: YANG Data Model for OSPF Application-Specific
      Link Attributes and Flexible Algorithm";
```

```
}

identity sabm-bit {
  description
    "Base identity for SABM bits.";
  reference
    "RFC 9492: OSPF Application-Specific Link Attributes";
}

identity rsvp-te-bit {
  base sabm-bit;
  description
    "R bit, RSVP-TE.";
  reference
    "RFC 9492: OSPF Application-Specific Link Attributes";
}

identity sr-policy-bit {
  base sabm-bit;
  description
    "S bit, Segment Routing Policy.";
  reference
    "RFC 9492: OSPF Application-Specific Link Attributes";
}

identity lfa-bit {
  base sabm-bit;
  description
    "F bit, Loop Free Alternate (LFA). Includes all LFA types.";
  reference
    "RFC 9492: OSPF Application-Specific Link Attributes";
}

identity flex-algo-bit {
  base sabm-bit;
  description
    "X bit, flexible algorithm.";
  reference
    "RFC 9350: IGP Flexible Algorithm, Section 12.";
}

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 sabm-bit;
      }
      description
        "SABM bits list. This list will contain
        identities for the bits 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: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 {
        mandatory true;
        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";
    }
    description
      "Link attributes operation mode.";
  }
}

```

```

/* 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>

```

5. 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].

```

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
    /ospfv3/ospfv3:ospfv3/ospfv3: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@2025-10-06.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
    "draft-ietf-teas-yang-te";
}
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.

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

The key words 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL', 'SHALL NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED', 'NOT RECOMMENDED', 'MAY', and 'OPTIONAL' in this document are to be interpreted as described in BCP 14 (RFC 2119) (RFC 8174) when, and only when, they appear in all capitals, as shown here.";

```
revision 2025-10-06 {
  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, value between 128 and 255 inclusive.";
        }
        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, 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
    "List of flex-algo prefix sub-tlvs.";
```



```
        "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, 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.";
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
    "Calculation-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 "'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.";
}

/* 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.";
    }
    description
        "This notification is sent when an OSPF instance does not
        support this flex-algo.";
}
}
<CODE ENDS>
```

6. 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].

7. IANA Considerations

7.1. 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: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: 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

7.2. IANA IGP Algorithm Types Module

This document defines the initial version of the IANA-maintained "iana-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-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-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 updates 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-algo-types"  
| Section 2 must be updated as defined in RFC XXXX.
```

7.3. IANA IGP Metric-Type Module

This document defines the initial version of the IANA-maintained "iana-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-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-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-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 updates 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 2 must be updated as defined in RFC XXXX.
```

8. Acknowledgements

Thanks to Dhruv Dhody for his detailed YANG doctors review.

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

9. References

9.1. Normative References

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<<https://www.iana.org/assignments/igp-parameters>>.
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9.2. 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