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YANG Data Model for IS-IS Application-Specific Link Attributes and
Flexible Algorithm
draft-ietf-lsr-isis-flex-algo-yang-04

Abstract

This document defines a YANG data model to support IS-IS Application-Specific Link Attributes and Flexible Algorithm.

Status of This Memo

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1. Overview

This document defines two YANG [RFC7950] data modules. The first module is to provide support for configuration and operational state for IS-IS Application-Specific Link Attributes as defined in [RFC9479], and the second module is to support IS-IS Flexible Algorithm as defined in [RFC9350]. Both modules are augmenting the IETF IS-IS YANG model [RFC9130].

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2. YANG Module for IS-IS Application-Specific Link Attributes

This document defined a YANG module for IS-IS Application-Specific Link Attributes as defined in [RFC9479].

```

module: ietf-isis-link-attr
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis:
      +--rw isis-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/isis:isis/isis:interfaces
        /isis:interface:
+--rw isis-asla
  +--rw interface-asla* [app-id]
    +--rw app-id                uint16
    +--rw unidirectional-link-delay? uint32
    +--rw metric-type?          uint8
    +--rw metric?               uint32
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/isis:isis/isis:database
  /isis:levels/isis:lsp/isis:extended-is-neighbor
  /isis:neighbor/isis:instances/isis:instance:
+--ro asla-sub-tlvs
  +--ro asla-sub-tlv* []
    +--ro l-flag?          boolean
    +--ro sabm-length?      uint8
    +--ro r-flag?          boolean
    +--ro udabm-length?     uint8
    +--ro sabm
    | +--ro sabm-bits*      identityref
    +--ro udabm
  +--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/isis:isis/isis:database
  /isis:levels/isis:lsp/isis:mt-is-neighbor/isis:neighbor
  /isis:instances/isis:instance:
+--ro asla-sub-tlvs
  +--ro asla-sub-tlv* []
    +--ro l-flag?          boolean
    +--ro sabm-length?      uint8
    +--ro r-flag?          boolean
    +--ro udabm-length?     uint8
    +--ro sabm
    | +--ro sabm-bits*      identityref
    +--ro udabm
  +--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/isis:isis/isis:database
  /isis:levels/isis:lsp:
+--ro application-specific-srlg-tlv

```

```

+--ro as-srlg-tlv* []
  +--ro neighbor-system-id?  isis:system-id
  +--ro pseudo-node-id?      uint8
  +--ro l-flag?               boolean
  +--ro sabm-length?          uint8
  +--ro r-flag?               boolean
  +--ro udabm-length?         uint8
  +--ro sabm
  |   +--ro sabm-bits*  identityref
  +--ro udabm
  +--ro length-of-sub-tlvs?  uint8
  +--ro link-id-sub-tlvs
  |   +--ro link-local-remote-ids
  |   |   +--ro link-local-id?  union
  |   |   +--ro link-remote-id? union
  |   +--ro ipv4-interface-addr
  |   |   +--ro ipv4-int-addr?  inet:ipv4-address
  |   +--ro ipv4-neighbor-addr
  |   |   +--ro ipv4-neighbor-addr?  inet:ipv4-address
  |   +--ro ipv6-interface-addr
  |   |   +--ro ipv6-int-addr?  inet:ipv6-address
  |   +--ro ipv6-neighbor-addr
  |   |   +--ro ipv6-neighbor-addr?  inet:ipv6-address
  +--ro srlgs
  |   +--ro srlg*  uint32

```

```

<CODE BEGINS> file "ietf-isis-link-attr@2025-09-11.yang"
module ietf-isis-link-attr {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-isis-link-attr";
  prefix isis-link-attr;

  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-routing {
    prefix rt;
    reference
      "RFC 8349: A YANG Data Model for Routing
      Management (NMDA Version)";
  }
  import ietf-isis {
    prefix isis;
    reference
      "RFC 9130: YANG Data Model for the IS-IS Protocol";
  }
}

```

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

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Author: Madhavi Joshi

<madhavi@arrcus.com>

";

description

"This YANG module defines the configuration and operational state for IS-IS application specific link attributes feature as defined in RFC 9479.

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 2025-09-11 {

description

"Initial version";

reference

"RFC XXXX: YANG Data Model for IS-IS Application-Specific Link Attributes and Flexible Algorithm";

```
}

identity sabm-bit {
  description
    "Base identity for sabm bits.";
  reference
    "RFC 8919: IS-IS Application-Specific Link Attributes";
}

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

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

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

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

grouping application-identifier-bit-mask {
  description
    "Identification of the set of applications associated with
    link attribute advertisements";
  leaf l-flag {
    type boolean;
    description
      "Legacy Flag. When set, all of the applications
      specified in the bit mask MUST use the legacy
      advertisements.";
  }
  leaf sabm-length {
    type uint8;
  }
}
```

```
    description
      "Standard Application Identifier Bit Mask Length in
      octets.";
  }
  leaf r-flag {
    type boolean;
    default "false";
    description
      "Reserved.";
  }
  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.";
}
}

grouping application-specific-link-attributes-sub-tlv {
  description
    "Grouping for specification of the applications and
    application-specific attribute values.";
  container asla-sub-tlvs {
    list asla-sub-tlv {
      uses application-identifier-bit-mask;
      uses isis:unknown-tlvs;
    }
    description
      "List of application specific link attributes sub-tlvs.";
  }
}
```

```
    description
      "Application specific link attributes sub-tlv.";
  }
}

grouping application-specific-srlg-tlv {
  description
    "Grouping of a TLV to advertise application-specific
     SRLGs for a given link.";
  container application-specific-srlg-tlv {
    list as-srlg-tlv {
      leaf neighbor-system-id {
        type isis:system-id;
        description
          "Neighbor System-ID.";
      }
      leaf pseudo-node-id {
        type uint8;
        description
          "Pseudo-node ID.";
      }
    }
    uses application-identifier-bit-mask;
    leaf length-of-sub-tlvs {
      type uint8;
      description
        "Length of sub-tlvs.";
    }
    container link-id-sub-tlvs {
      description
        "Link Identifier sub-TLVs.";
      container link-local-remote-ids {
        description
          "Link local/remote identifier sub-tlv.";
        leaf link-local-id {
          type union {
            type inet:ipv4-address;
            type uint32;
          }
          description
            "Local identifier of the link.
             It could be an IPv4 address or a local identifier.";
        }
        leaf link-remote-id {
          type union {
            type inet:ipv4-address;
            type uint32;
          }
          description
```



```
        "Remote identifier of the link.
        It could be an IPv4 address or a remotely learned
        identifier.";
    }
}
container ipv4-interface-addr {
  leaf ipv4-int-addr {
    type inet:ipv4-address;
    description
      "IPv4 address for the interface.";
  }
  description
    "IPv4 interface address sub-tlv.";
}
container ipv4-neighbor-addr {
  leaf ipv4-neighbor-addr {
    type inet:ipv4-address;
    description
      "IPv4 address for a neighboring router
      on this link.";
  }
  description
    "IPv4 neighbor address sub-tlv.";
}
container ipv6-interface-addr {
  leaf ipv6-int-addr {
    type inet:ipv6-address;
    description
      "IPv6 address for the interface.";
  }
  description
    "IPv6 interface address sub-tlv.";
}
container ipv6-neighbor-addr {
  leaf ipv6-neighbor-addr {
    type inet:ipv6-address;
    description
      "IPv6 address for a neighboring router
      on this link.";
  }
  description
    "IPv6 neighbor address sub-tlv.";
}
}
container srlgs {
  description
    "List of SRLGs.";
  leaf-list srlg {
```

```
        type uint32;
        description
            "SRLG value of the link.";
    }
}
description
    "List of application specific SRLG tlvs.";
}
description
    "Application specific SRLG tlv.";
}
}

/* Configuration */

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol"
+ "/isis:isis" {
when "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rt:type = 'isis:isis'" {
description
    "This augment ISIS routing protocol when used";
}
description
    "This augments ISIS protocol configuration
    with application specific link attributes.";
container isis-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.";
  }
}

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol"
  + "/isis:isis/isis:interfaces/isis:interface" {
  when "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/"
    + "rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used.";
  }
  description
    "This augments ISIS interface configuration
    with application specific link attributes.";
  container isis-asla {
    list interface-asla {
      key "app-id";
      leaf app-id {
        type uint16 {
          range "0 .. 1023";
        }
        description
          "Application ID.
          0 - RSVP TE. 1 - Segment Routing Policy.
          2 - Loop-Free Alternate.";
      }
      leaf unidirectional-link-delay {
        type uint32 {
          range "0 .. 16777215";
        }
        description
          "This 24-bit field carries the average link delay in
          microseconds.";
      }
      leaf metric-type {
        type uint8;
        description
          "IGP metric type.";
      }
      leaf metric {
        type uint32 {
          range "1 .. 16777215";
        }
        description
          "metric value.";
      }
    }
  }
}
```

```
    }
    description
      "ASLA interface configuration.";
  }
  description
    "Application specific link attributes configuration.";
}

/* TLV 22 */

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol"
+ "/isis:isis/isis:database/isis:levels/isis:lsp"
+ "/isis:extended-is-neighbor/isis:neighbor"
+ "/isis:instances/isis:instance" {
  when "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB TLV22.";
  uses application-specific-link-attributes-sub-tlv;
}

/* TLV 223 */

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol"
+ "/isis:isis/isis:database/isis:levels/isis:lsp"
+ "/isis:mt-is-neighbor/isis:neighbor"
+ "/isis:instances/isis:instance" {
  when "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB TLV223.";
  uses application-specific-link-attributes-sub-tlv;
}

/* application-specific SRLG TLV 238 */

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol"
+ "/isis:isis/isis:database/isis:levels/isis:lsp" {
```

```

when "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/rt:type = 'isis:isis'" {
  description
    "This augment ISIS routing protocol when used";
  }
description
  "This augments ISIS protocol LSDB.";
uses application-specific-srlg-tlv;
}
}
<CODE ENDS>

```

3. YANG Module for IS-IS Flexible Algorithm

This section defines the YANG module for IS-IS Flexible Algorithm. The module uses the identities defined in the IANA-maintained YANG modules for IGP Algorithm Types [IANA-IGP-ALGO-Types] and IGP Metric Type [IANA-IGP-Metric-Types] in [I-D.ietf-lsr-ospf-flex-algo-yang].

```

module: ietf-isis-flex-algo
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis:
    +--rw isis-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 metric-type?          identityref
        +--rw calc-type?            identityref
        +--rw prefix-metric!
        +--rw priority?             uint8
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis
    /isis:database/isis:levels/isis:lsp
    /isis:router-capabilities:
    +--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*  uint64
    +--ro fa-in-any-ag-sub-tlv
    |   +--ro extended-admin-groups*  uint64
    +--ro fa-in-all-ag-sub-tlv
    |   +--ro extended-admin-groups*  uint64
    +--ro fad-flags-sub-tlv
    |   +--ro fad-flags*  identityref
    +--ro fa-ex-srlg-sub-tlv
    |   +--ro srlgs*  uint32
    +--ro unknown-tlvs
    |   +--ro unknown-tlv*  []
    |   |   +--ro type?  uint16
    |   |   +--ro length?  uint16
    |   |   +--ro value?  yang:hex-string
augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis
    /isis:database/isis:levels/isis:lsp
    /isis:extended-ipv4-reachability/isis:prefixes:
    +--ro fapm-sub-tlvs
    |   +--ro fapm-sub-tlv*  []
    |   |   +--ro algo-number?  uint8
    |   |   +--ro metric?  uint32
augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis
    /isis:database/isis:levels/isis:lsp
    /isis:mt-extended-ipv4-reachability/isis:prefixes:
    +--ro fapm-sub-tlvs
    |   +--ro fapm-sub-tlv*  []
    |   |   +--ro algo-number?  uint8
    |   |   +--ro metric?  uint32
augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis
    /isis:database/isis:levels/isis:lsp
    /isis:ipv6-reachability/isis:prefixes:
    +--ro fapm-sub-tlvs
    |   +--ro fapm-sub-tlv*  []
    |   |   +--ro algo-number?  uint8
    |   |   +--ro metric?  uint32
augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis
    /isis:database/isis:levels/isis:lsp
    /isis:mt-ipv6-reachability/isis:prefixes:
    +--ro fapm-sub-tlvs
    |   +--ro fapm-sub-tlv*  []
    |   |   +--ro algo-number?  uint8
    |   |   +--ro metric?  uint32

```

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

<CODE BEGINS> file "ietf-isis-flex-algo@2025-10-06.yang"
module ietf-isis-flex-algo {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-isis-flex-algo";
  prefix isis-flex-algo;

  import ietf-routing {
    prefix rt;
    reference
      "RFC 8349: A YANG Data Model for Routing
        Management (NMDA Version)";
  }
  import ietf-te-types {
    prefix te-types;
    reference
      "RFC8776: Common YANG Data Types for Traffic Engineering.";
  }
  import ietf-isis {
    prefix isis;
    reference
      "RFC 9130: YANG Data Model for the IS-IS Protocol";
  }
  import ietf-te {
    prefix te;
  }
  import iana-igp-algo-types {
    prefix iana-algo-types;
  }
  import iana-igp-metric-types {
    prefix iana-metric-type;
  }

  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>
  Author:   Stephane Litkowski
            <mailto:slitkows.ietf@gmail.com>
  Author:   Madhavi Joshi
            <madhavi@arrcus.com>
";
description
  "The YANG module defines the configuration and operational
  state for ISIS 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 IS-IS Application-Specific
    Link Attributes and Flexible Algorithm";
}

/* Identities */

identity fad-flags {
  description
    "Base identity for ISIS FAD flags.";
}

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.";
}

/* Groupings */

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

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

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

```
    "The flex-algo include-all admin group sub-tlv.";
  }

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

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

  grouping fad-tlvs {
    container fad-tlvs {
      list fad-tlv {
        leaf 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.";
    }
    uses fa-ex-ag-sub-tlv;
    uses fa-in-any-ag-sub-tlv;
    uses fa-in-all-ag-sub-tlv;
    uses fad-flags-sub-tlv;
    uses fa-ex-srlg-sub-tlv;
    uses isis:unknown-tlvs;
    description
      "List of flex-algo definition TLVs.";
  }
  description
    "ISIS Flexible Algorithm Definition TLV.";
}
description
  "ISIS Flexible Algorithm Definition (FAD) TLV.";
}

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 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.";
}

/* Configurations */

augment "/rt:routing/"
    + "rt:control-plane-protocols/rt:control-plane-protocol"
    + "/isis:isis" {
    when "/rt:routing/rt:control-plane-protocols/"
        + "rt:control-plane-protocol/rt:type = 'isis:isis'" {
        description
            "This augment ISIS routing protocol when used";
    }
    description
        "This augments ISIS protocol configuration
        with flexible algorithm.";
    container isis-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 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;
  }
  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.";
}
```

```
    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"
  + "/isis:isis/isis:database/isis:levels/isis:lsp"
  + "/isis:router-capabilities" {
when "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/"
  + "rt:type = 'isis:isis'" {
  description
    "This augment ISIS routing protocol when used";
}
description
  "This augments ISIS protocol LSDB router capability.";
uses fad-tlvs;
}

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol"
  + "/isis:isis/isis:database/isis:levels/isis:lsp"
  + "/isis:extended-ipv4-reachability/"
  + "isis:prefixes" {
when "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/"
  + "rt:type = 'isis:isis'" {
  description
    "This augment ISIS routing protocol when used";
}
description
  "This augments ISIS protocol LSDB prefix.";
```

```
    uses fapm-sub-tlvs;
  }

  augment "/rt:routing/"
    + "rt:control-plane-protocols/rt:control-plane-protocol"
    + "/isis:isis/isis:database/isis:levels/isis:lsp"
    + "/isis:mt-extended-ipv4-reachability/isis:prefixes" {
  when "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/"
    + "rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses fapm-sub-tlvs;
}

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol"
  + "/isis:isis/isis:database/isis:levels/isis:lsp"
  + "/isis:ipv6-reachability/isis:prefixes" {
  when "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/"
    + "rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses fapm-sub-tlvs;
}

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol"
  + "/isis:isis/isis:database/isis:levels/isis:lsp"
  + "/isis:mt-ipv6-reachability/isis:prefixes" {
  when "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/"
    + "rt:type = 'isis:isis'" {
    description
      "This augment ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses fapm-sub-tlvs;
}
```

```
/* notification */

notification flex-algo-not-supported {
  uses isis:notification-instance-hdr;
  leaf algo-number {
    type uint8 {
      range "128..255";
    }
    description
      "Flex-algo identifier which is not supported by the IS-IS
       instance.";
  }
  description
    "This notification is sent when an IS-IS instance does not
     support this flex-algo.";
}
}
<CODE ENDS>
```

4. 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:

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

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

5. IANA Considerations

This document registers a URI in the IETF XML registry [RFC3688]. Following the format in [RFC3688], the following registrations are requested:

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

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

This document registers the YANG module in the YANG Module Names registry [RFC7950].

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

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

6. Acknowledgements

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7. References

7.1. Normative References

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

Qu, Y. and A. Lindem, "YANG Data Model for OSPF Application-Specific Link Attributes and Flexible Algorithm", Work in Progress, Internet-Draft, draft-ietf-lsr-ospf-flex-algo-yang-02, 12 September 2025, <<https://datatracker.ietf.org/doc/html/draft-ietf-lsr-ospf-flex-algo-yang-02>>.

[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>>.

[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>>.

[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>>.

[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>>.

[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>>.

[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>>.

- [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>>.
- [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>>.
- [RFC9130] Litkowski, S., Ed., Yeung, D., Lindem, A., Zhang, J., and L. Lhotka, "YANG Data Model for the IS-IS Protocol", RFC 9130, DOI 10.17487/RFC9130, October 2022, <<https://www.rfc-editor.org/info/rfc9130>>.
- [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>>.
- [RFC9479] Ginsberg, L., Psenak, P., Previdi, S., Henderickx, W., and J. Drake, "IS-IS Application-Specific Link Attributes", RFC 9479, DOI 10.17487/RFC9479, October 2023, <<https://www.rfc-editor.org/info/rfc9479>>.

7.2. 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 IS-IS Flex-Algo Configuration

The following is an example configuration for IS-IS 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:isis="urn:ietf:params:xml:ns:yang:ietf-isis">\
          isis:isis</type>
        <name>isis</name>
        <isis xmlns="urn:ietf:params:xml:ns:yang:ietf-isis">
          <system-id>1111.2222.3333</system-id>
          <area-address>49.0001.0000.0000.0001</area-address>
          <isis-flex-algo xmlns="urn:ietf:params:xml:ns:yang:\
            ietf-isis-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>
          </isis-flex-algo>
        </isis>
      </control-plane-protocol>
    </control-plane-protocols>
  </routing>
```

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

The following is an example configuration for IS-IS Flexible Algorithm in JSON format using the YANG model defined in this document.

```
{
  "te": {
    "enable": true,
    "globals": {
      "named-admin-groups": {
        "named-admin-group": {
          "name": "blue"
        }
      }
    }
  }
}
{
  "routing": {
    "router-id": "1.1.1.1",
    "control-plane-protocols": {
      "control-plane-protocol": {
        "type": "isis:isis",
        "name": "isis",
        "isis": {
          "system-id": "1111.2222.3333",
          "area-address": "49.0001.0000.0000.0001",
          "isis-flex-algo": {
            "flex-algo": {
              "algo-number": 200,
              "admin-groups": {
                "exclude-admin-groups": "blue"
              },
              "metric-type": "iana-metric-types:igp-metric",
              "calc-type": "iana-algo-types:algo-spf",
              "prefix-metric": "",
              "priority": 100
            }
          }
        }
      }
    }
  }
}
```

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