LSR Working Group
Internet-Draft
Intended status: Standards Track
Expires: 31 August 2025

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27 February 2025

A YANG Data Model for IS-IS Segment Routing for the MPLS Data Plane
draft-ietf-isis-sr-yang-25

Abstract

This document defines a YANG data module that can be used to ~~configure and~~ manage IS-IS Segment Routing for MPLS data plane.

Commenté [MB1]: This is covered by «manage».

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1. Overview

This document defines a YANG data model [RFC7950] that can be used to configure and manage IS-IS Segment Routing [RFC8667] for MPLS data plane and it is an augmentation to the IS-IS YANG data model [RFC9130].

The YANG module in this document conforms to the Network Management Datastore Architecture (NMDA) [RFC8342].

Commenté [MB2]: As you have some ro-only and reason in the structure with configuration/oper/etc.

8407bis says:

«If the document contains major Network Management Datastore Architecture (NMDA) exceptions or include a temporary non-NMDA module [RFC8342], then the Introduction section should mention this fact with the reasoning that motivated that design. Refer to Section 4.23 for more NMDA-related guidance. Specifically, Section 4.23.2 includes a recommendation for designers to describe and justify any NMDA exceptions in detail as part of the module itself. »

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.2. Tree Diagrams

This document uses the graphical representation of data models defined in [RFC8340].

2. Design of the IS-IS MPLS Segment Routing Module

This document defines a device YANG model for IS-IS Segment Routing for the
MPLS data plane. It is an augmentation of the IS-IS base model [RFC9130].

Commenté [MB3]: Add a reference.

The IS-IS SR MPLS YANG module requires support for the base segment routing module [RFC9020], which defines the global ~~segment routing~~SR ~~configuration~~ management structure independent of any specific routing protocol
~~configuration~~, and support of IS-IS base model [RFC9130] which defines basic IS-IS configuration and state.

2.1. Segment Routing Activation

Activation of IS-IS SR MPLS is done by setting the "enable" leaf to

Commenté [MB4]: Better to provide a path or at least indicate under which container.

true. This triggers advertisement of SR MPLS extensions based on the configuration parameters that have been set upsetup using the base segmentSR routing module.

2.2. Advertising Mapping Server Policy

The base segment routingSR module defines mapping server policies. By default, IS-IS will not advertise or process any mapping server entry. The IS-IS SR MPLS module allows the advertisement of one or multiple mapping server policies through the "bindings/advertise/policies" leaf-list. The "bindings/receive" leaf controls the reception and process of mapping server entries.

2.3. IP Fast Reroute

IS-IS SR MPLS model augments the fast-reroute container under interface. It brings the ability to activate TI-LFA (tTopology independent Independent Loop Free AAlternate (TI-LFA) and also enhances remote LFA (rLFA) to use segment-routingSR tunneling instead of LDP.

3. IS-IS MPLS Segment Routing Module Tree

The figure below describes the overall structure of the "isis-sr-mpls" YANG module:

```
module: ietf-isis-sr-mpls
  augment /rt:routing/rt:control-plane-protocols
          /rt:control-plane-protocol/isis:isis:
    +--rw segment-routing
    |  +--rw enabled?    boolean
    |  +--rw bindings {mapping-server}?
    |     +--rw advertise
    |     |  +--rw policies*   -> /rt:routing/sr:segment-routing
    |     |                       /sr-mpls:sr-mpls/bindings
    |     |                       /mapping-server/policy/name
    |     +--rw receive?     boolean
    +--rw protocol-srgb {sr-mpls:protocol-srgb}?
       +--rw srgb* [lower-bound upper-bound]
          +--rw lower-bound    uint32
          +--rw upper-bound    uint32
  augment /rt:routing/rt:control-plane-protocols
          /rt:control-plane-protocol/isis:isis
          /isis:interfaces/isis:interface:
    +--rw segment-routing
       +--rw adjacency-sid
          +--rw adj-sids* [value]
          |  +--rw value-type?           enumeration
          |  +--rw value                 uint32
          |  +--rw protected?            boolean
          |  +--rw weight?               uint8
          |  +--rw neighbor-system-id    isis:system-id
          +--rw advertise-adj-group-sid* [group-id]
          |  +--rw group-id    uint32
          +--rw advertise-protection?      enumeration
  augment /rt:routing/rt:control-plane-protocols
          /rt:control-plane-protocol/isis:isis/isis:interfaces
```

Commenté [MB5]: Add a reference

Commenté [MB6]: Indicate the path or add a reference to the parent container

Commenté [MB7]: Cite an authoritative reference.

Commenté [MB8]: I would split into small snippets and help readers go through to understand the rationale for each augment.

```
        /isis:interface/isis:fast-reroute/isis:lfa:
  +--rw ti-lfa {ti-lfa}?
     +--rw enabled?                  boolean
     +--rw selection-tie-breakers
        +--rw node-protection!
        |  +--rw priority?   uint8
        +--rw srlg-disjoint!
           +--rw priority?   uint8
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:interfaces
        /isis:interface/isis:fast-reroute/isis:lfa/isis:level-1:
  +--rw ti-lfa {ti-lfa}?
     +--rw enabled?   boolean
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:interfaces
        /isis:interface/isis:fast-reroute/isis:lfa/isis:level-2:
  +--rw ti-lfa {ti-lfa}?
     +--rw enabled?   boolean
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:interfaces
        /isis:interface/isis:fast-reroute/isis:lfa/isis:remote-lfa:
  +--rw use-segment-routing-path?   boolean {remote-lfa-sr}?
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:interfaces
        /isis:interface/isis:adjacencies/isis:adjacency:
  +--ro adjacency-sid* [value]
     +--ro value                   uint32
     +--ro address-family?         iana-rt-types:address-family
     +--ro weight?                 uint8
     +--ro protection-requested?   boolean
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:database
        /isis:levels/isis:lsp/isis:router-capabilities:
  +--ro sr-capability
  |  +--ro sr-capability
  |  |  +--ro sr-capability-flags*   identityref
  |  +--ro global-blocks
  |     +--ro global-block* []
  |        +--ro range-size?    uint32
  |        +--ro sid-sub-tlv
  |           +--ro length?   uint8
  |           +--ro sid?      uint32
  +--ro sr-algorithms
  |  +--ro sr-algorithm*   identityref
  +--ro local-blocks
  |  +--ro local-block* []
  |     +--ro range-size?    rt-types:uint24
  |     +--ro sid-sub-tlv
  |        +--ro length?   uint8
  |        +--ro sid?      uint32
  +--ro srms-preference
     +--ro preference?   uint8
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:
  +--ro sid-list* [sid]
     +--ro adj-sid-flags
```

```
     |  +--ro flags*   identityref
     +--ro weight?          uint8
     +--ro neighbor-id?     isis:system-id
     +--ro sid              uint32
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:
  +--ro sid-list* [sid]
     +--ro adj-sid-flags
     |  +--ro flags*   identityref
     +--ro weight?          uint8
     +--ro neighbor-id?     isis:system-id
     +--ro sid              uint32
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 prefix-sid-sub-tlvs
     +--ro prefix-sid-sub-tlv* [sid]
        +--ro prefix-sid-flags
        |  +--ro flags*   identityref
        +--ro algorithm?          identityref
        +--ro sid                 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 prefix-sid-sub-tlvs
     +--ro prefix-sid-sub-tlv* [sid]
        +--ro prefix-sid-flags
        |  +--ro flags*   identityref
        +--ro algorithm?          identityref
        +--ro sid                 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 prefix-sid-sub-tlvs
     +--ro prefix-sid-sub-tlv* [sid]
        +--ro prefix-sid-flags
        |  +--ro flags*   identityref
        +--ro algorithm?          identityref
        +--ro sid                 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 prefix-sid-sub-tlvs
     +--ro prefix-sid-sub-tlv* [sid]
        +--ro prefix-sid-flags
        |  +--ro flags*   identityref
        +--ro algorithm?          identityref
        +--ro sid                 uint32
augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:database
        /isis:levels/isis:lsp:
  +--ro sid-binding-tlvs
  |  +--ro sid-binding-tlv* [prefix]
  |     +--ro prefix                inet:ip-prefix
```

```
|     +--ro range?                uint16
|     +--ro sid-binding-flags
|     |  +--ro flags*   identityref
|     +--ro prefix-sid-sub-tlvs* []
|     |  +--ro prefix-sid-sub-tlvs
|     |     +--ro prefix-sid-sub-tlv* [sid]
|     |        +--ro prefix-sid-flags
|     |        |  +--ro flags*   identityref
|     |        +--ro algorithm?          identityref
|     |        +--ro sid                 uint32
|     +--ro sid-sub-tlvs* []
|     |  +--ro sid-sub-tlv
|     |     +--ro length?   uint8
|     |     +--ro sid?      uint32
|     +--ro unknown-tlvs
|        +--ro unknown-tlv* []
|           +--ro type?     uint16
|           +--ro length?   uint16
|           +--ro value?    yang:hex-string
+--ro mt-sid-binding-tlvs
   +--ro mt-sid-binding-tlv* [prefix mt-id]
      +--ro prefix                inet:ip-prefix
      +--ro range?                uint16
      +--ro sid-binding-flags
      |  +--ro flags*   identityref
      +--ro prefix-sid-sub-tlvs* []
      |  +--ro prefix-sid-sub-tlvs
      |     +--ro prefix-sid-sub-tlv* [sid]
      |        +--ro prefix-sid-flags
      |        |  +--ro flags*   identityref
      |        +--ro algorithm?          identityref
      |        +--ro sid                 uint32
      +--ro sid-sub-tlvs* []
      |  +--ro sid-sub-tlv
      |     +--ro length?   uint8
      |     +--ro sid?      uint32
      +--ro unknown-tlvs
      |  +--ro unknown-tlv* []
      |     +--ro type?     uint16
      |     +--ro length?   uint16
      |     +--ro value?    yang:hex-string
      +--ro mt-id                 uint16
```

4. IS-IS MPLS Segment Routing YANG Module

[RFC6991], [RFC8102], [RFC8294], [RFC8349], [RFC8667], [RFC9020], [RFC9130], and [I-D.ietf-rtgwg-segment-routing-ti-lfa] are referenced in the YANG model.

```
<CODE BEGINS> file "ietf-isis-sr-mpls@2025-01-29.yang"
module ietf-isis-sr-mpls {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-isis-sr-mpls";
  prefix isis-sr-mpls;

  import ietf-routing {
    prefix rt;
```

Commenté [MB9]: See the proposed changes at dummy-misc/yang/ietf-isis-sr-mpls.yang at main · boucadair/dummy-misc

Main DISCUSS point:

Use of explicit type than inferring the type from the length

```
  reference
    "RFC 8349 - A YANG Data Model for Routing
               Management (NMDA Version)";
}
import ietf-inet-types {
  prefix inet;
  reference
    "RFC 6991 - Common YANG Data Types";
}
import ietf-segment-routing-common {
  prefix sr-cmn;
  reference
    "RFC 9020 - YANG Data Model for Segment Routing";
}
import ietf-segment-routing-mpls {
  prefix sr-mpls;
  reference
    "RFC 9020 - YANG Data Model for Segment Routing";
}
import ietf-isis {
  prefix isis;
  reference
    "RFC 9130 - YANG Data Model for IS-IS Protocol";
}
import iana-routing-types {
  prefix iana-rt-types;
  reference
    "RFC 8294 - Common YANG Data Types for the Routing Area";
}
import ietf-routing-types {
  prefix rt-types;
  reference
    "RFC 8294 - Common YANG Data Types for the Routing Area";
}

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

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   Author:    Ing-Wher Chen
              <mailto:ingwherchen@mitre.org>
   Author:    Jeff Tantsura
              <mailto:jefftant.ietf@gmail.com>
  ";
description
  "The YANG module defines the generic configuration and
   operational state for Segment Routing ISIS extensions for the
   MPLS data plane, which is common across all of the vendor
```

```
   implementations.

   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
   (https://www.rfc-editor.org/info/rfcXXXX); 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.

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

revision 2025-01-29 {
  description
    "Initial revision.";
  reference
    "RFC XXXX: A YANG Data Model for IS-IS Segment Routing for the
               MPLS Data Plane";
}

/* Identities */

identity sr-capability {
  description
    "Base identity for ISIS SR-Capabilities sub-TLV flags";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing";
}

identity mpls-ipv4 {
  base sr-capability;
  description
    "If set, then the router is capable of
     processing SR MPLS encapsulated IPv4 packets
     on all interfaces.";
}

identity mpls-ipv6 {
  base sr-capability;
  description
```

```
    "If set, then the router is capable of
     processing SR MPLS encapsulated IPv6 packets
     on all interfaces.";
}

identity prefix-sid-flag {
  description
    "Base identity for prefix SID sub-TLV flags.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 2.1";
}

identity r-flag {
  base prefix-sid-flag;
  description
    "Re-advertisement Flag.";
}

identity n-flag {
  base prefix-sid-flag;
  description
    "Node-SID Flag.";
}

identity p-flag {
  base prefix-sid-flag;
  description
    "No-PHP (No Penultimate Hop-Popping) Flag.";
}

identity e-flag {
  base prefix-sid-flag;
  description
    "Explicit NULL Flag.";
}

identity v-flag {
  base prefix-sid-flag;
  description
    "Value Flag.";
}

identity l-flag {
  base prefix-sid-flag;
  description
    "Local Flag.";
}

identity adj-sid-flag {
  description
    "Base identity for Adj-SID sub-TLV flags.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 2.2";
}

identity f-flag {
  base adj-sid-flag;
  description
```

```
    "Address-Family flag.";
}

identity b-flag {
  base adj-sid-flag;
  description
    "Backup flag.";
}

identity vi-flag {
  base adj-sid-flag;
  description
    "Value/Index flag.";
}

identity lo-flag {
  base adj-sid-flag;
  description
    "Local flag.";
}

identity s-flag {
  base adj-sid-flag;
  description
    "Group flag.";
}

identity pe-flag {
  base adj-sid-flag;
  description
    "Persistent flag.";
}

identity sid-binding-flag {
  description
    "Base identity for sid binding tlv flags.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 2.4";
}

identity af-flag {
  base sid-binding-flag;
  description
    "Address-Family flag.";
}

identity m-flag {
  base sid-binding-flag;
  description
    "Mirror Context flag.";
}

identity sf-flag {
  base sid-binding-flag;
  description
    "S flag. If set, the binding label TLV should be flooded
     across the entire routing domain.";
}
```

```
identity d-flag {
  base sid-binding-flag;
  description
    "Leaking flag.";
}

identity a-flag {
  base sid-binding-flag;
  description
    "Attached flag.";
}

/* Features */

feature remote-lfa-sr {
  description
    "Enhance rLFA to use SR path.";
  reference
    "RFC 8102: Remote-LFA Node Protection and Manageability";
}

feature ti-lfa {
  description
    "Topology-Independent Loop-Free Alternate (TI-LFA)
     computation using segment routing.";
  reference
    "draft-ietf-rtgwg-segment-routing-ti-lfa -
     Topology-Independent Fast Reroute using Segment Routing";
}

/* Groupings */

grouping sid-sub-tlv {
  description
    "SID/Label sub-TLV grouping.";
  container sid-sub-tlv {
    description
      "Used to advertise the SID/Label associated with a
       prefix or adjacency.";
    leaf length {
      type uint8;
      description
        "Length of the SID value. YANG model specification
         is necessary since it dictates the semantics of the
         SID.";
    }
    leaf sid {
      type uint32;
      description
        "Segment Identifier (SID) - A 20 bit label or 32 bit SID.
         If the length is set to 3, then the 20 rightmost bits
         represent an MPLS label. If the length is set to 4, then
         the value is a 32-bit index.";
    }
  }
}
```

```
grouping sr-capability {
  description
    "SR capability grouping.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 3";
  container sr-capability {
    description
      "Segment Routing capability.";
    container sr-capability {
      leaf-list sr-capability-flags {
        type identityref {
          base sr-capability;
        }
        description
          "SR Capability sub-TLV flags.";
      }
      description
        "SR Capability Flags.";
    }
    container global-blocks {
      description
        "Segment Routing Global Blocks.";
      list global-block {
        description
          "Segment Routing Global Block.";
        leaf range-size {
          type uint32;
          description
            "The SID range.";
        }
        uses sid-sub-tlv;
      }
    }
  }
}

grouping sr-algorithm {
  description
    "SR algorithm grouping.";

  container sr-algorithms {
    description
      "All SR algorithms.";
    leaf-list sr-algorithm {
      type identityref {
        base sr-cmn:prefix-sid-algorithm;
      }
      description
        "The Segment Routing (SR) algorithms that the router is
         currently using.";
    }
  }
}

grouping srlb {
  description
    "SR Local Block grouping.";
  reference
```

```
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 3.3";
  container local-blocks {
    description
      "List of SRLBs.";
    list local-block {
      description
        "Segment Routing Local Block.";
      leaf range-size {
        type rt-types:uint24;
        description
          "The SID range.";
      }
      uses sid-sub-tlv;
    }
  }
}

grouping srms-preference {
  description
    "The SRMS preference TLV is used to advertise
     a preference associated with the node that acts
     as an SR Mapping Server.";
  container srms-preference {
    description
      "SRMS Preference TLV.";
    leaf preference {
      type uint8;
      description
        "SRMS preference TLV, value from 0 to 255 with
         255 being the most preferred.";
    }
  }
}

grouping adjacency-state {
  description
    "This grouping extends adjacency state.";
  list adjacency-sid {
    key "value";
    config false;
    leaf value {
      type uint32;
      description
        "Value of the Adj-SID.";
    }
    leaf address-family {
      type iana-rt-types:address-family;
      description
        "Address-family associated with the
         segment ID";
    }
    leaf weight {
      type uint8;
      description
        "Weight associated with
         the adjacency SID.";
    }
    leaf protection-requested {
```

```
      type boolean;
      description
        "Describe if the adjacency SID
         must be protected.";
    }
    description
      "List of adjacency Segment IDs.";
  }
}

grouping prefix-sid-sub-tlv {
  description
    "This grouping defines segment routing prefix segment
     identifier (prefix-sid) sub-tlv.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing, Section 2.1";
  container prefix-sid-sub-tlvs {
    description
      "PrefixSID sub-tlvs.";
    list prefix-sid-sub-tlv {
      key "sid";
      container prefix-sid-flags {
        leaf-list flags {
          type identityref {
            base prefix-sid-flag;
          }
          description
            "Prefix SID sub-TLV flags.";
        }
        description
          "Describes flags associated with the
           segment ID.";
      }
      leaf algorithm {
        type identityref {
          base sr-cmn:prefix-sid-algorithm;
        }
        description
          "Algorithm to be used for path computation.";
      }
      leaf sid {
        type uint32;
        description
          "Value of the prefix-SID.";
      }
      description
        "List of prefix-sid sub-tlvs.";
    }
  }
}

grouping adjacency-segment-id {
  description
    "This grouping defines segment routing extensions
     for adjacencies.";
  list sid-list {
    key "sid";
    container adj-sid-flags {
```

```
      leaf-list flags {
        type identityref {
          base adj-sid-flag;
        }
        description
          "Adj-SID sub-TLV flags list.";
      }
      description
        "Adj-SID sub-TLV flags.";
    }
    leaf weight {
      type uint8;
      description
        "The value represents the weight of the Adj-SID
         for the purpose of load balancing.";
    }
    leaf neighbor-id {
      type isis:system-id;
      description
        "Describes the system ID of the neighbor
         associated with the SID value. This is only
         used on LAN adjacencies.";
    }
    leaf sid {
      type uint32;
      description
        "Value of the Adj-SID.";
    }
    description
      "List of segments.";
  }
}

grouping sid-binding-tlv {
  leaf prefix {
    type inet:ip-prefix;
    description
      "The prefix represents the Forwarding Equivalence
       Class at the tail end of the advertised path.";
  }
  leaf range {
    type uint16;
    description
      "Provides the ability to specify a range of addresses
       and their associated prefix-sids.";
  }
  container sid-binding-flags {
    leaf-list flags {
      type identityref {
        base sid-binding-flag;
      }
      description
        "SID Binding TLV flags.";
    }
    description
      "Binding TLV flags.";
  }
  list prefix-sid-sub-tlvs {
```

```
    uses prefix-sid-sub-tlv;
    description
      "List of prefix-sid sub-tlvs.";
    reference
      "RFC 8667 - IS-IS Extensions for Segment Routing,
       Section 2.4.4";
  }
  list sid-sub-tlvs {
    uses sid-sub-tlv;
    description
      "List of prefix-sid sub-tlvs.";
    reference
      "RFC 8667 - IS-IS Extensions for Segment Routing,
       Section 2.4.5";
  }
  uses isis:unknown-tlvs;
  description
    "SID/Label binding TLV, type 149.";
  reference
    "RFC 8667 - IS-IS Extensions for Segment Routing,
     Section 2.4";
}

/* Configuration */

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis" {
  when "derived-from-or-self(../rt:type, 'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol configuration
     with segment routing for the MPLS data plane.";
  uses sr-mpls:sr-control-plane;
  container protocol-srgb {
    if-feature "sr-mpls:protocol-srgb";
    uses sr-cmn:srgb;
    description
      "Per-protocol Segment Routing Global Block (SRGB).";
    reference
      "RFC 8402 - Segment Routing Architecture, Section 2";
  }
}

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:interfaces/isis:interface" {
  when "derived-from-or-self(../../../rt:type, 'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol configuration
     with segment routing.";
  uses sr-mpls:igp-interface {
    augment "segment-routing/adjacency-sid/adj-sids" {
```

```
      when "../../../isis:interface-type = 'broadcast'" {
        description
          "This augments broadcast interface.";
      }
      description
        "This augments LAN interface adj-sid with system-id.";
      leaf neighbor-system-id {
        type isis:system-id;
        mandatory true;
        description
          "Neighbor system ID.";
      }
    }
  }
}

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:interfaces/isis:interface"
      + "/isis:fast-reroute/isis:lfa" {
  when "derived-from-or-self(../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS interface IP FRR with TILFA.";
  container ti-lfa {
    if-feature "ti-lfa";
    leaf enabled {
      type boolean;
      default "false";
      description
        "Enables TI-LFA computation.";
    }
    container selection-tie-breakers {
      container node-protection {
        presence "Presence of container enables the node
                  protection tie-breaker";
        leaf priority {
          type uint8;
          default "128";
          description
            "Priority for node protection tie-breaker with
             a lower priority being more preferred.";
        }
        description
          "Enable node protection as a TI-LFA path
           selection tie-breaker. A path providing node
           protection will be selected over one that
           doesn't provide node protection.";
      }
      container srlg-disjoint {
        presence "Presence of container enables the SRLG
                  disjoint tie-breaker";
        leaf priority {
          type uint8;
          default "128";
```

```
          description
            "Priority for SRLG disjoint tie-breaker with
             a lower priority being more preferred.";
          }
          description
            "Enable SRLG (Shared Resource Link Group)
             disjoint  as a TI-LFA path selection tie-breaker.
             A path providing node a disjoint path for SRLG
             links from the primary path will be selected over
             one that doesn't provide an SRLG disjoint path.";
        }
        description
          "Configure path selection tie-breakers and their
           respective priorities for the TI-LFA computation.";
      }
      description
        "Topology Independent Loop Free Alternate
         (TI-LFA) support.";
    }
  }

  augment "/rt:routing/"
        + "rt:control-plane-protocols/rt:control-plane-protocol"
        + "/isis:isis/isis:interfaces/isis:interface"
        + "/isis:fast-reroute/isis:lfa/isis:level-1" {
    when "derived-from-or-self(../../../../../../rt:type,"
       + "'isis:isis')" {
      description
        "This augments ISIS routing protocol when used";
    }
    description
      "This augments ISIS interface level-1 IP FRR with TILFA.";
    container ti-lfa {
      if-feature "ti-lfa";
      leaf enabled {
        type boolean;
        default "false";
        description
          "Enables TI-LFA computation.";
      }
      description
        "TI-LFA configuration.";
    }
  }

  augment "/rt:routing/"
        + "rt:control-plane-protocols/rt:control-plane-protocol"
        + "/isis:isis/isis:interfaces/isis:interface"
        + "/isis:fast-reroute/isis:lfa/isis:level-2" {
    when "derived-from-or-self(../../../../../../rt:type,"
       + "'isis:isis')" {
      description
        "This augments ISIS routing protocol when used";
    }
    description
      "This augments ISIS IP interface level-2 FRR with TILFA.";
    container ti-lfa {
      if-feature "ti-lfa";
```

```
    leaf enabled {
      type boolean;
      default "false";
      description
        "Enables TI-LFA computation.";
    }
    description
      "TI-LFA configuration.";
  }
}

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:interfaces/isis:interface"
      + "/isis:fast-reroute/isis:lfa/isis:remote-lfa" {
  when "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS remoteLFA config with
     use of segment-routing path.";
  leaf use-segment-routing-path {
    if-feature "remote-lfa-sr";
    type boolean;
    default "false";
    description
      "Force remote LFA to use segment routing path instead of LDP
       path. The value of this leaf is in effect only when
       remote-lfa is enabled.";
  }
}

/* Operational states */

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:interfaces/isis:interface"
      + "/isis:adjacencies/isis:adjacency" {
  when "derived-from-or-self(../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol configuration
     with segment routing.";
  uses adjacency-state;
}

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:database/isis:levels/isis:lsp"
      + "/isis:router-capabilities" {
  when "derived-from-or-self(../../../../../rt:type,"
     + "'isis:isis')" {
    description
```

```
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB router capability.";
  uses sr-capability;
  uses sr-algorithm;
  uses srlb;
  uses srms-preference;
}

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" {
  when "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB neighbor.";
  uses adjacency-segment-id;
}

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" {
  when "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB neighbor.";
  uses adjacency-segment-id;
}

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 "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses prefix-sid-sub-tlv;
}

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 "derived-from-or-self(../../../../../../rt:type,"
```

```
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses prefix-sid-sub-tlv;
}

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 "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses prefix-sid-sub-tlv;
}

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 "derived-from-or-self(../../../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB prefix.";
  uses prefix-sid-sub-tlv;
}

augment "/rt:routing/"
      + "rt:control-plane-protocols/rt:control-plane-protocol"
      + "/isis:isis/isis:database/isis:levels/isis:lsp" {
  when "derived-from-or-self(../../../../rt:type,"
     + "'isis:isis')" {
    description
      "This augments ISIS routing protocol when used";
  }
  description
    "This augments ISIS protocol LSDB.";

  container sid-binding-tlvs {
    list sid-binding-tlv {
      key "prefix";
      uses sid-binding-tlv;
      description
        "Sid/label binding TLV, type 149.";
    }
    description
      "List of sid/label binding TLVs.";
  }
```

```
      container mt-sid-binding-tlvs {
        list mt-sid-binding-tlv {
          key "prefix mt-id";
          uses sid-binding-tlv;
          leaf mt-id {
            type uint16;
            description
              "A 12-bit field containing the non-zero ID
               of the topology.";
          }
          description
            "Multi-Topology SID/Label binding TLV, type 150.";
          reference
            "RFC 8667 - IS-IS Extensions for Segment Routing,
             Section 2.5";
        }
        description
          "List of multi-topology sid/label binding TLVs.";
      }
    }
  }
  <CODE ENDS>
```

5. Security Considerations

Commenté [MB10]: Please use the latest template in 8407bis

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

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

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). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

/isis:isis/segment-routing

/isis:isis/protocol-srgb

/isis:isis/isis:interfaces/isis:interface/segment-routing

/isis:isis/isis:interfaces/isis:interface/isis:fast-reroute/ti-lfa

The ability to disable or enable IS-IS ~~Segment Routing~~SR support and/or change ~~Segment Routing~~SR configurations can result in a ~~Denail~~Denial-of-

Service (DoS) attack, as this may cause traffic to be dropped or misrouted. Please refer to Section 5 of [RFC8667] for more information on Segment Routing extensions.

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.

/isis:router-capabilities/sr-capability

/isis:router-capabilities/sr-algorithms

/isis:router-capabilities/local-blocks

/isis:router-capabilities/srms-preference

/isis:router-capabilities/node-msd-tlv

And the augmentations to the ISIS link state database.

Unauthorized access to any data node of these subtrees can disclose the operational state information of IS-IS protocol on ~~this~~ a device.

6. Acknowledgements

Authors would like to thank Derek Yeung, Acee Lindem, Yi Yang for their major contributions to the draft. Also, thanks to Reshad Rahman,
and Tom Petch for their thorough reviews and helpful comments.

MITRE has approved this document for Public Release, Distribution Unlimited, with Public Release Case Number 19-3033.

7. IANA Considerations

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

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

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

name: ietf-isis-sr-mpls
namespace: urn:ietf:params:xml:ns:yang:ietf-isis-sr-mpls
prefix: isis-sr-mpls
maintained by IANA? N
reference: RFC XXXX

8. References

8.1. Normative References

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Commenté [MB11]: Should be informative

Commenté [MB12]: Should be informative

Commenté [MB13]: Should be informative

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Appendix A. A Configuration Example

The following is an XML example using the IS-IS SR MPLS YANG module defined in this document.

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

```
<?xml version='1.0' encoding='UTF-8'?>
  <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">\
```

Commenté [MB14]: Should be informative

Commenté [MB15]: Should be informative

```
          isis:isis</type>
        <name>isis</name>
        <isis xmlns="urn:ietf:params:xml:ns:yang:ietf-isis">
          <system-id>1111.2222.3333</system-id>
          <interfaces>
            <interface>
              <name/>
              <segment-routing xmlns="urn:ietf:params:xml:ns:yang:\
                ietf-isis-sr-mpls">
                <adjacency-sid>
                  <adj-sids>
                    <value>38888</value>
                  </adj-sids>
                </adjacency-sid>
              </segment-routing>
            </interface>
          </interfaces>
          <segment-routing xmlns="urn:ietf:params:xml:ns:yang:\
            ietf-isis-sr-mpls">
            <enabled>true</enabled>
          </segment-routing>
          <protocol-srgb xmlns="urn:ietf:params:xml:ns:yang:\
            ietf-isis-sr-mpls">
            <srgb>
              <lower-bound>4000</lower-bound>
              <upper-bound>5000</upper-bound>
            </srgb>
          </protocol-srgb>
        </isis>
      </control-plane-protocol>
    </control-plane-protocols>
  </routing>
```

The following is the same example using JSON format.

```
{
  "ietf-routing:routing": {
    "router-id": "1.1.1.1",
    "control-plane-protocols": {
      "control-plane-protocol": {
        "type": "ietf-isis:isis",
        "name": "isis",
        "ietf-isis": {
          "system-id": "1111.2222.3333",
          "interfaces": {
            "interface": {
              "name": "",
              "ietf-isis-sr-mpls:segment-routing": {
                "adjacency-sid": {
                  "adj-sids": {
                    "value": 38888
                  }
                }
              }
            }
          },
          "ietf-isis-sr-mpls:segment-routing": {
            "enabled": true
```

Commenté [MB16]: Please add the prefix.

```
              },
              "ietf-isis-sr-mpls:protocol-srgb": {
                "srgb": {
                  "lower-bound": 4000,
                  "upper-bound": 5000
                }
              }
            }
          }
        }
      }
    }
```

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