RFC 9194
A YANG Module for IS-IS Reverse Metric

Abstract
This document defines a YANG module for managing the reverse metric extension to the Intermediate System to Intermediate System (IS-IS) intra-domain routing information exchange protocol.

Status of This Memo
This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc9194.

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1. Introduction

This document defines a YANG module for managing the reverse metric extension to IS-IS [RFC8500] [ISO-10589]. Please refer to [RFC8500] for the description and definition of the functionality managed by this module.

The YANG data model described in this document conforms to the Network Management Datastore Architecture defined in [RFC8342].

2. YANG Management

2.1. YANG Tree

The following is the YANG tree diagram [RFC8340] for the IS-IS reverse metric extension additions.
module: ietf-isis-reverse-metric
   augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis:
     +++-rw reverse-metric
     +++-rw enable-receive?   boolean
   augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis/interfaces
     /isis:interface:
      +++-rw reverse-metric
      +++-rw metric?              isis:wide-metric
      +++-rw flags
       |  +++-rw whole-lan?   boolean
       |  +++-rw allow-unreachable?   boolean
      +++-rw exclude-te-metric?   boolean
      +++-rw level-1
       |  +++-rw metric?              isis:wide-metric
       |  +++-rw flags
       |  |  +++-rw whole-lan?   boolean
       |  |  +++-rw allow-unreachable?   boolean
       |  +++-rw exclude-te-metric?   boolean
      +++-rw level-2
       |  +++-rw metric?              isis:wide-metric
       |  +++-rw flags
       |  |  +++-rw whole-lan?   boolean
       |  |  +++-rw allow-unreachable?   boolean
       |  +++-rw exclude-te-metric?   boolean
   augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis/interfaces
     /isis:interface/isis:adjacencies/isis:adjacency:
      +++-ro reverse-metric
      +++-ro metric?      isis:wide-metric
      +++-ro flags
       |  +++-ro whole-lan?   boolean
       |  +++-ro allow-unreachable?   boolean
      +++-ro te-metric?   uint32

2.2. YANG Module

The following is the YANG module for managing the IS-IS reverse metric functionality defined in [RFC8500]. It imports modules from [RFC8349] and [RFC9130].

This YANG module uses the same per-level hierarchical configuration structure as that defined in the augmented base module.

<CODE BEGINS> file "ietf-isis-reverse-metric@2022-10-19.yang"

module ietf-isis-reverse-metric {
   yang-version 1.1;
   prefix isis-rmetric;

   import ietf-routing {
      prefix rt;
      reference
import ietf-isis {
  prefix isis;
  reference
    "RFC 9130: YANG Data Model for the IS-IS Protocol";
}

organization
  "IETF LSR Working Group (LSR)";

contact
  "WG Web:  <https://datatracker.ietf.org/wg/lsr/>
  WG List: <mailto:lsr@ietf.org>
  Author:  Christian Hopps
           <mailto:chopps@chopps.org>";

description
  "This module defines the configuration and operational state
   for managing the IS-IS reverse metric functionality
   (RFC 8500).

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   authors of the code.  All rights reserved.

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   forth in Section 4.c of the IETF Trust's Legal Provisions
   Relating to IETF Documents

   This version of this YANG module is part of RFC 9194; see the
   RFC itself for full legal notices.";

revision 2022-10-19 {
  description
    "Initial revision.";
  reference
    "RFC 9194: A YANG Module for IS-IS Reverse Metric";
}

grouping reverse-metric-data {
  description
    "IS-IS reverse metric data.";
  leaf metric {
    type isis:wide-metric;
    description
      "The reverse metric value.";
    reference
      "RFC 8500: IS-IS Routing with Reverse Metric, Section 2";
  }
  container flags {
    description

leaf whole-lan {
  type boolean;
  description
  "The 'Whole LAN' bit (W bit) (RFC 8500). If true, then
  a Designated Intermediate System (DIS) processing this
  reverse metric will add the metric value to all the
  nodes it advertises in the pseudonode Link State
  Protocol Data Unit (LSP) for this interface.
  Otherwise, it will only increment the metric for the
  advertising node in the pseudonode LSP for this
  interface.";
  reference
  "RFC 8500: IS-IS Routing with Reverse Metric,
   Section 2";
}

leaf allow-unreachable {
  type boolean;
  description
  "The 'Unreachable' bit (U bit) (RFC 8500). If true, it
  allows the neighbor to increment the overall metric up
  to 2^24-1 rather than the lesser maximum of 2^24-2.
  If the metric is then set by the neighbor to 2^24-1,
  it will cause traffic to stop using, rather than avoid
  using, the interface.";
  reference
  "RFC 8500: IS-IS Routing with Reverse Metric,
   Section 2";
}

grouping reverse-metric-if-config-data {
  description
  "IS-IS reverse metric config data.";
  uses reverse-metric-data;
  leaf exclude-te-metric {
    type boolean;
    default "false";
    description
    "If true and there is a TE metric defined for this
    interface, then do not send the Traffic Engineering
    Metric sub-TLV in the Reverse Metric TLV.";
    reference
    "RFC 8500: IS-IS Routing with Reverse Metric, Section 2";
  }
}

grouping tlv16-reverse-metric {
  description
  "IS-IS Reverse Metric TLV data.";
  uses reverse-metric-data;
  leaf te-metric {
    type uint32;
    description
    "The TE metric value from the sub-TLV, if present.";
    reference
  }
}
The reverse metric configuration for an IS-IS instance.

container reverse-metric {
  description "Global reverse metric configuration.";
  leaf enable-receive {
    type boolean;
    default "false";
    description "Enables handling of reverse metric announcements from
    neighbors. By default, reverse metric handling is disabled and must be explicitly enabled through this
    configuration.";
  }
}

The reverse metric configuration for an interface.

container reverse-metric {
  description "Announces a reverse metric to neighbors. The
  configuration is hierarchical and follows the same
  behavior as that defined for per-level values in the
  augmented base module.

  Reverse metric operation is enabled by the configuration
  of a 'reverse-metric' metric value either at the top
  level or under a level-specific container node. If a
  'reverse-metric' metric value is only specified under a
  level-specific container node, then operation is only
  enabled at the specified level.

  As the reverse metric is advertised in IS-IS Hello
Protocol Data Units (IIH PDUs), level-specific configuration is only available for broadcast interface types.
uses reverse-metric-if-config-data {
refine "flags/whole-lan" {
  default "false";
}
refine "flags/allow-unreachable" {
  default "false";
}
}
container level-1 {
  when '../../isis:interface-type = "broadcast"';
description
  "Announces a reverse metric to level-1 neighbors.";
  uses reverse-metric-if-config-data;
}
container level-2 {
  when '../../isis:interface-type = "broadcast"';
description
  "Announces a reverse metric to level-2 neighbors.";
  uses reverse-metric-if-config-data;
}
}
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 augment is only valid when the routing protocol instance type is 'isis'.";
}

description
  "The reverse metric state advertised by an adjacency.";
container reverse-metric {
  description
    "IS-IS Reverse Metric TLV data.";
  uses tlv16-reverse-metric;
}

3. IANA Considerations

3.1. Updates to the IETF XML Registry

This document registers a URI in the "IETF XML Registry" [RFC3688]. Following the format in [RFC3688], the following registration has been made:
3.2. Updates to the YANG Module Names Registry

This document registers one YANG module in the "YANG Module Names" registry [RFC6020]. Following the format in [RFC6020], the following registration has been made:

Name: ietf-isis-reverse-metric
Maintained by IANA? N
Prefix: isis-rmetric
Reference: RFC 9194

4. Security Considerations

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 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.

The YANG module defined in this document can enable, disable, and modify the behavior of metrics used by routing. For the security implications regarding these types of changes, consult [RFC8500] -- which defines the functionality -- as well as [RFC9130].

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 YANG nodes correspond directly to the functionality provided in RFC 8500, and the security considerations of the functionality are described in RFC 8500. These are the subtrees and data nodes:

Under "/rt:routing/rt:control-plane-protocols/" +
  "rt:control-plane-protocol/isis:isis"
- /isis-rmetric:reverse-metric/ISIS-rmetric:enable-receive
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. These YANG nodes correspond directly to the functionality provided in RFC 8500, and the security considerations of the functionality are described in RFC 8500. These are the subtrees and data nodes:

Under "/rt:routing/rt:control-plane-protocols/" + 
"rt:control-plane-protocol/isis:isis/" + 
"isis:interfaces/isis:interface/" + 
"isis-rmetric:reverse-metric" 
- /isis-rmetric:metric 
- /isis-rmetric:flags/isis-rmetric:whole-lan 
- /isis-rmetric:flags/isis-rmetric:allow-unreachable 
- /isis-rmetric:exclude-te-metric 

Under "/rt:routing/rt:control-plane-protocols/" + 
"rt:control-plane-protocol/isis:isis/" + 
"isis:interfaces/isis:interface/" + 
"isis-rmetric:reverse-metric/" + 
"isis-rmetric:level-1/" 
- /isis-rmetric:metric 
- /isis-rmetric:flags/isis-rmetric:whole-lan 
- /isis-rmetric:flags/isis-rmetric:allow-unreachable 
- /isis-rmetric:exclude-te-metric 

Under "/rt:routing/rt:control-plane-protocols/" + 
"rt:control-plane-protocol/isis:isis/" + 
"isis:interfaces/isis:interface/" + 
"isis-rmetric:reverse-metric/" + 
"isis-rmetric:level-2/" 
- /isis-rmetric:metric 
- /isis-rmetric:flags/isis-rmetric:whole-lan 
- /isis-rmetric:flags/isis-rmetric:allow-unreachable 
- /isis-rmetric:exclude-te-metric 

Under "/rt:routing/rt:control-plane-protocols/" + 
"rt:control-plane-protocol/isis:isis/" + 
"isis:interfaces/isis:interface/" + 
"isis-adjacencies/isis:adjacency/" + 
"isis-rmetric:reverse-metric" 
- /isis-rmetric:metric 
- /isis-rmetric:flags/isis-rmetric:whole-lan 
- /isis-rmetric:flags/isis-rmetric:allow-unreachable 
- /isis-rmetric:te-metric
5. Normative References


6. Informative References


Appendix A. Examples

A.1. Enablement Example Using XML YANG Instance Data

Below is an example of XML [W3C.REC-xml-20081126] YANG instance data [RFC8342] to enable reverse metric processing.

```xml
<rt:routing
    xmlns:isis="urn:ietf:params:xml:ns:yang:ietf-isis"
    <rt:control-plane-protocols>
        <rt:control-plane-protocol>
            <rt:type>isis:isis</rt:type>
            <rt:name>default</rt:name>
            <isis:isis>
                <isis:area-address>00</isis:area-address>
                <isis-rmetric:reverse-metric>
                    <isis-rmetric:enable-receive>true</isis-rmetric:enable-receive>
                </isis-rmetric:reverse-metric>
            </isis:isis>
        </rt:control-plane-protocol>
    </rt:control-plane-protocols>
</rt:routing>
```

Figure 1: Example XML Data to Enable Reverse Metric Processing

A.2. Usage Example Using XML YANG Instance Data

Below is an example of XML YANG instance data [RFC8342] for the "ietf-isis-reverse-metric" module.
Figure 2: Example XML Data for the "ietf-isis-reverse-metric" Module

A.3. Usage Example Using JSON YANG Instance Data

Below is an example of JSON YANG instance data [RFC7951] for the "ietf-isis-reverse-metric" module.
Figure 3: Example JSON Data for the Level-1-Only Reverse Metric

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