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X. Liu
Volta Networks
Z. Zhang, Ed.
ZTE Corporation
A. Peter
Individual contributor
M. Sivakumar
Juniper networks
F. Guo
Huawei Technologies
P. McAllister
Metaswitch Networks
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**A YANG Data Model for Multicast Source Discovery Protocol (MSDP)
draft-ietf-pim-msdp-yang-18**

Abstract

This document defines a YANG data model for the configuration and management of Multicast Source Discovery Protocol (MSDP) Protocol.

Status of This Memo

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[1.](#) Introduction

[RFC3618] introduces the protocol definition of MSDP. This document defines a YANG data model that can be used to configure and manage the MSDP protocol. The operational state data and statistics can also be retrieved by this model.

This model is designed to be used along with other multicast YANG models such as PIM [[I-D.ietf-pim-yang](#)], which are not covered in this document.

1.1. Terminology

The terminology for describing YANG data models is found in [[RFC6020](#)] and [[RFC7950](#)], including:

- o action
- o augment
- o container
- o choice
- o data model
- o data node
- o grouping
- o identity
- o leaf
- o list
- o module
- o uses

The following abbreviations are used in this document and the defined model:

MSDP: Multicast Source Discovery Protocol [[RFC3618](#)].

RP: Rendezvous Point [[RFC7761](#)]

RPF: Reverse Path Forwarding [[RFC7761](#)]

SA: Source-Active [[RFC3618](#)].

1.2. Conventions Used in This Document

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.

1.3. Tree Diagrams

Tree diagrams used in this document follow the notation defined in [\[RFC8340\]](#).

1.4. Prefixes in Data Node Names

In this document, names of data nodes, actions, and other data model objects are often used without a prefix, as long as it is clear from the context in which YANG module each name is defined. Otherwise, names are prefixed using the standard prefix associated with the corresponding YANG module, as shown in Table 1.

Prefix	YANG module	Reference
yang	ietf-yang-types	[RFC6991]
inet	ietf-inet-types	[RFC6991]
rt	ietf-routing	[RFC8349]
if	ietf-interfaces	[RFC8343]
ip	ietf-ip	[RFC8344]
key-chain	ietf-key-chain	[RFC8177]
rt-types	ietf-routing-types	[RFC8294]
acl	ietf-access-control-list	[RFC8519]

Table 1

2. Design of the Data Model

2.1. Scope of Model

The model covers MSDP [\[RFC3618\]](#).

This model can be used to configure and manage the MSDP protocol. The operational state data and statistics can be retrieved by this model. Even though no protocol-specific notifications are defined in this model, the subscription and push mechanism defined in [\[RFC8639\]](#) and [\[RFC8641\]](#) can be implemented by the user to subscribe to notifications on the data nodes in this model.

The model contains all the basic configuration parameters to operate the protocol. Depending on the implementation choices, some systems may not allow some of the advanced parameters to be configurable. The occasionally implemented parameters are modeled as optional features in this model. This model can be extended, and it has been structured in a way that such extensions can be conveniently made.

2.2. Specification

The configuration data nodes cover global configuration attributes and per peer configuration attributes. The state data nodes include global, per peer, and source-active information. The container "msdp" is the top level container in this data model. The presence of this container is expected to enable MSDP protocol functionality. No notification is defined in this model.

3. Module Structure

This model imports and augments the ietf-routing YANG model defined in [RFC8349]. Both configuration data nodes and state data nodes of [RFC8349] are augmented.

The YANG data model defined in this document conforms to the Network Management Datastore Architecture (NMDA) [RFC8342]. The operational state data is combined with the associated configuration data in the same hierarchy [RFC8407].

```

module: ietf-msdp
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol:
      +--rw msdp
        +--rw global
          | +--rw tcp-connection-source?  if:interface-ref
          | +--rw default-peer* [peer-addr prefix-policy]
          |                               {filter-policy}?
          | | +--rw peer-addr             -> ../../../../peers/peer/address
          | | +--rw prefix-policy         -> /acl:acls/acl/name
          | +--rw originating-rp
          | | +--rw interface?  if:interface-ref
          | +--rw sa-filter
          | | +--rw in?         -> /acl:acls/acl/name
          | | +--rw out?        -> /acl:acls/acl/name
          | +--rw sa-limit?          uint32
          | +--rw ttl-threshold?     uint8
        +--rw peers
          | +--rw peer* [address]
          |   +--rw address          inet:ipv4-address
          |   +---x clear-peer

```



```

|   +--rw authentication {peer-authentication}?
|   |   +--rw (authentication-type)?
|   |   |   +--:(key-chain)
|   |   |   |   +--rw key-chain?          key-chain:key-chain-ref
|   |   |   +--:(password)
|   |   |   |   +--rw key?                  string
|   |   |   |   +--rw crypto-algorithm?    identityref
|   +--rw enabled?                          boolean
|   +--rw tcp-connection-source?             if:interface-ref
|   +--rw description?                       string
|   +--rw mesh-group?                        string
|   +--rw peer-as?                           inet:as-number
|                                           {peer-as-verification}?
|
|   +--rw sa-filter
|   |   +--rw in?      -> /acl:acls/acl/name
|   |   +--rw out?     -> /acl:acls/acl/name
|   +--rw sa-limit?          uint32
|   +--rw timer
|   |   +--rw connect-retry-interval?    uint16
|   |   +--rw holdtime-interval?         uint16
|   |   +--rw keepalive-interval?        uint16
|   +--rw ttl-threshold?          uint8
|   +--ro session-state?           enumeration
|   +--ro elapsed-time?            yang:gauge32
|   +--ro connect-retry-expire?    uint32
|   +--ro hold-expire?             uint16
|   +--ro is-default-peer?         boolean
|   +--ro keepalive-expire?        uint16
|   +--ro reset-count?             yang:zero-based-counter32
|   +--ro statistics
|   |   +--ro discontinuity-time?  yang:date-and-time
|   |   +--ro error
|   |   |   +--ro rpf-failure?    uint32
|   |   +--ro queue
|   |   |   +--ro size-in?        uint32
|   |   |   +--ro size-out?      uint32
|   |   +--ro received
|   |   |   +--ro keepalive?      yang:counter64
|   |   |   +--ro notification?   yang:counter64
|   |   |   +--ro sa-message?     yang:counter64
|   |   |   +--ro sa-response?    yang:counter64
|   |   |   +--ro sa-request?     yang:counter64
|   |   |   +--ro total?          yang:counter64
|   +--ro sent
|   |   +--ro keepalive?          yang:counter64
|   |   +--ro notification?       yang:counter64
|   |   +--ro sa-message?         yang:counter64
|   |   +--ro sa-response?        yang:counter64

```



```

|          +--ro sa-request?      yang:counter64
|          +--ro total?           yang:counter64
+---x clear-all-peers
+--ro sa-cache
  +--ro entry* [group source-addr]
    | +--ro group
    |   rt-types:ipv4-multicast-group-address
    | +--ro source-addr
    |   rt-types:ipv4-multicast-source-address
    | +--ro origin-rp* [rp-address]
    | | +--ro rp-address      inet:ipv4-address
    | | +--ro is-local-rp?    boolean
    | | +--ro sa-adv-expire?  uint32
    | +--ro state-attributes
    |   +--ro up-time?        yang:gauge32
    |   +--ro expire?         yang:gauge32
    |   +--ro holddown-interval? uint32
    |   +--ro peer-learned-from? inet:ipv4-address
    |   +--ro rpf-peer?       inet:ipv4-address
+---x clear
  +--w input
  +--w entry!
    | +--w group
    |   rt-types:ipv4-multicast-group-address
    | +--w source-addr?
    |   rt-types:ipv4-multicast-source-address
  +--w peer-address?  inet:ipv4-address
  +--w peer-as?       inet:as-number

```

3.1. MSDP Configuration

MSDP operation requires configuration information that is distributed amongst several peers. Several peers may be configured in a mesh-group. The Source-Active information may be filtered by peers.

The configuration modeling branch is composed of MSDP global and peer configurations. The two parts are the most important parts of MSDP.

Besides the fundamental features of MSDP protocol, several optional features are included in the model. These features help the control of MSDP protocol. The peer features and SA features make the deployment and control easier. The connection parameters can be used to control the TCP connection because MSDP protocol is based on TCP. The authentication features make the protocol more secure. The filter features selectively allow operators to prevent SA information from being forwarded to peers.

3.2. MSDP State

MSDP states are composed of MSDP global state, MSDP peer state, statistics information and SA cache information. The statistics information and SA cache information helps the operator to retrieve the protocol condition.

YANG actions are defined to clear the connection of one specific MSDP peer, clear the connections of all MSDP peers, or clear some or all the SA caches.

4. MSDP YANG Model

This module references [\[RFC3618\]](#), [\[RFC4271\]](#), [\[RFC5925\]](#), [\[RFC6991\]](#), [\[RFC7761\]](#), [\[RFC8177\]](#), [\[RFC8294\]](#), [\[RFC8343\]](#), [\[RFC8344\]](#), [\[RFC8349\]](#), [\[RFC8519\]](#).

```
<CODE BEGINS> file "ietf-msdp@2020-04-15.yang"
module ietf-msdp {

  yang-version 1.1;

  namespace "urn:ietf:params:xml:ns:yang:ietf-msdp";
  prefix msdp;

  import ietf-yang-types {
    prefix "yang";
    reference "RFC 6991: Common YANG Data Types";
  }

  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-interfaces {
    prefix "if";
    reference "RFC 8343: A YANG Data Model for Interface Management";
  }

  import ietf-ip {
    prefix "ip";
```



```
reference "RFC 8344: A YANG Data Model for IP Management";
}

import ietf-key-chain {
  prefix "key-chain";
  reference "RFC 8177: YANG Data Model for Key Chains";
}

import ietf-routing-types {
  prefix "rt-types";
  reference "RFC 8294: Common YANG Data Types for the Routing
          Area";
}

import ietf-access-control-list {
  prefix acl;
  reference
    "RFC 8519: YANG Data Model for Network Access Control Lists
    (ACLs)";
}

organization
  "IETF PIM (Protocols for IP Multicast) Working Group";

contact
  "WG Web:  <http://tools.ietf.org/wg/pim/>
  WG List:  <mailto:pim@ietf.org>

  Editor:    Xufeng Liu
             <mailto:xufeng.liu.ietf@gmail.com>

  Editor:    Zheng Zhang
             <mailto:zzhang_ietf@hotmail.com>

  Editor:    Anish Peter
             <mailto:anish.ietf@gmail.com>

  Editor:    Mahesh Sivakumar
             <mailto:sivakumar.mahesh@gmail.com>

  Editor:    Feng Guo
             <mailto:guofeng@huawei.com>

  Editor:    Pete McAllister
             <mailto:pete.mcallister@metaswitch.com>";

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


description

"The module defines the YANG model definitions for Multicast Source Discovery Protocol (MSDP).

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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.

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revision 2020-04-15 {

 description

 "Initial revision.";

 reference

 "RFC XXXX: A YANG Data Model for MSDP.";

}

/*

 * Features

*/

feature filter-policy {

 description

 "Support policy configuration of peer/message filtering.";

 reference

 "[RFC 8519](#): YANG Data Model for Network Access Control Lists (ACLs)";

}

feature peer-as-verification {

 description

 "Support configuration of peer AS number.";

 reference


```
    "RFC 4271: A Border Gateway Protocol 4 (BGP-4)";
  }

  feature peer-authentication {
    description
      "Support configuration of peer authentication.";
    reference
      "RFC 8177: YANG Data Model for Key Chains.";
  }

  /*
   * Identities
   */

  identity msdp {
    base rt:control-plane-protocol;
    description "Identity for the Multicast Source Discovery
      Protocol (MSDP).";
    reference
      "RFC 3618: Multicast Source Discovery Protocol (MSDP)";
  }

  /*
   * Groupings
   */
  grouping authentication-container {
    description
      "Authentication attributes.";
    container authentication {
      if-feature peer-authentication;
      description
        "A container defining authentication attributes.";
      choice authentication-type {
        case key-chain {
          leaf key-chain {
            type key-chain:key-chain-ref;
            description
              "Reference to a key-chain.";
            reference
              "RFC 8177: YANG Data Model for Key Chains.";
          }
        }
        case password {
          leaf key {
            type string;
            description
              "This leaf specifies the authentication key.";
          }
        }
      }
    }
  }
}
```



```
leaf crypto-algorithm {
  type identityref {
    base key-chain:crypto-algorithm;
  }
  must "derived-from-or-self(., 'key-chain:md5')" {
    error-message
      "Only the md5 algorithm can be used for MSDP.";
    description "Check for crypto-algorithm.";
  }
  description
    "Cryptographic algorithm associated with key.
    Only the md5 algorithm can be used for MSDP.
    When 'md5' is specified, MSDP control messages
    are secured by TCP MD5 signatures as described
    in RFC 3618 and RFC 5925. Both peers of a
    connection SHOULD be configured to the same
    algorithm for the connection to be established.
    When this leaf is not configured, unauthenticated
    TCP is used.";
  reference
    "RFC 8177: YANG Data Model for Key Chains.
    RFC 5925: The TCP Authentication Option.";
}
}
description
  "Choice of authentication.";
}
} // authentication-container

grouping tcp-connect-source {
  description
    "Attribute to configure peer TCP connection source.";
  leaf tcp-connection-source {
    type if:interface-ref;
    must "/if:interfaces/if:interface[if:name = current()]/"
      + "ip:ipv4/ip:enabled != 'false'" {
      error-message "The interface must have IPv4 enabled.";
      description
        "The interface must have IPv4 enabled.";
      reference
        "RFC 8343: A YANG Data Model for Interface Management";
    }
    description
      "The interface is to be the source for the TCP
      connection. It is a reference to an entry in the global
      interface list.";
  }
}
```



```
} // tcp-connect-source

grouping global-config-attributes {
  description "Global MSDP configuration.";

  uses tcp-connect-source;

  list default-peer {
    if-feature filter-policy;
    key "peer-addr prefix-policy";

    description
      "The default peer accepts all MSDP SA messages.
      A default peer is needed in topologies where MSDP peers
      do not coexist with BGP peers. The reverse path
      forwarding (RPF) check on SA messages will fail, and no
      SA messages will be accepted. In these cases, you can
      configure the peer as a default peer and bypass RPF checks.";

    leaf peer-addr {
      type leafref {
        path "../../peers/peer/address";
      }
      mandatory true;
      description
        "Reference to a peer that is in the peer list.";
    }
    leaf prefix-policy {
      type leafref {
        path "/acl:acls/acl:acl/acl:name";
      }
      description
        "If specified, only those SA entries whose RP is
        permitted in the prefix list are allowed;
        if not specified, all SA messages from the default
        peer are accepted.";
      reference
        "RFC 8519: YANG Data Model for Network Access Control
        Lists (ACLs)";
    }
  } // default-peer

  container originating-rp {
    description
      "The container of Originating RP.";
    leaf interface {
      type if:interface-ref;
      must "/if:interfaces/if:interface[if:name = current()]/"
```



```
        + "ip:ipv4/ip:enabled != 'false'" {
          error-message "The interface must have IPv4 enabled.";
          description
            "The interface must have IPv4 enabled.";
          reference
            "RFC 8343: A YANG Data Model for Interface Management";
        }
      description
        "Reference to an entry in the global interface
         list.
         IP address of the interface used in the RP field of
         an SA message entry. When Anycast RPs are used, all
         RPs use the same IP address. This parameter can be
         used to define a unique IP address for the RP of each
         MSDP peer.
         By default, the software uses the RP address of the
         local system.";
    }
  } // originating-rp

  uses sa-filter-container;

  leaf sa-limit {
    type uint32;
    description
      "A limit on the number of SA entries accepted.
       By default, there is no limit.";
  }
  uses ttl-threshold;
} // global-config-attributes

grouping peer-config-attributes {
  description "Per peer configuration for MSDP.";

  uses authentication-container;
  leaf enabled {
    type boolean;
    description
      "'true' if peer is enabled;
       'false' if peer is disabled.";
  }
  uses tcp-connect-source;

  leaf description {
    type string;
    description
      "The peer description.";
  }
}
```



```
leaf mesh-group {
  type string;
  description
    "The name of mesh-group which this peer belongs to.";
  reference
    "RFC 3618: Multicast Source Discovery Protocol (MSDP),
    section 10.2.";
}
leaf peer-as {
  if-feature peer-as-verification;
  type inet:as-number;
  description
    "Peer's autonomous system number (ASN). Using peer-as to
    do verification can provide more controlled ability.
    The value can be compared with the BGP peer AS. If they
    are different, the SA comes from this peer may be rejected.
    If the AS number is the same as the local AS, then the
    peer is within the same domain; otherwise, this peer is
    external to the domain. Like the definition and usage
    in BGP.";
  reference
    "RFC 4271: A Border Gateway Protocol 4 (BGP-4)";
}
uses sa-filter-container;
leaf sa-limit {
  type uint32;
  description
    "A limit on the number of SA entries accepted from this
    peer. By default, there is no limit.";
}
container timer {
  description "Timer attributes.";
  reference
    "RFC 3618: Multicast Source Discovery Protocol (MSDP),
    section 5.";
  leaf connect-retry-interval {
    type uint16;
    units seconds;
    default 30;
    description "Peer timer for connect-retry.
      By default, MSDP peers wait 30 seconds after
      session is reset.";
  }
  leaf holdtime-interval {
    type uint16 {
      range "3..65535";
    }
    units seconds;
  }
}
```



```
        default 75;
        description "The SA hold down period of this MSDP peer.";
    }
    leaf keepalive-interval {
        type uint16 {
            range "1..65535";
        }
        units seconds;
        must '. < ../holdtime-interval' {
            error-message
                "The keepalive interval must be smaller than the
                hold time interval";
        }
        default 60;
        description "The keepalive timer of this MSDP peer.";
    }
} // timer
uses ttl-threshold;
} // peer-config-attributes

grouping peer-state-attributes {
    description "Per peer state attributes for MSDP.";

    leaf session-state {
        type enumeration {
            enum disabled {
                description "Disabled.";
            }
            enum inactive {
                description "Inactive.";
            }
            enum listen {
                description "Listen.";
            }
            enum connecting {
                description "Connecting.";
            }
            enum established {
                description "Established.";
            }
        }
        config false;
        description
            "Peer session state.";
        reference
            "RFC 3618: Multicast Source Discovery Protocol (MSDP),
            section 11.";
    }
}
```



```
leaf elapsed-time {
    type yang:gauge32;
    units seconds;
    config false;
    description "Elapsed time for being in a state.";
}
leaf connect-retry-expire {
    type uint32;
    units seconds;
    config false;
    description "Connect retry expire time of peer connection.";
}
leaf hold-expire {
    type uint16;
    units seconds;
    config false;
    description "Hold expire time of peer connection.";
}
leaf is-default-peer {
    type boolean;
    config false;
    description "'true' if this peer is one of the default peer.";
}
leaf keepalive-expire {
    type uint16;
    units seconds;
    config false;
    description "Keepalive expire time of this peer.";
}
leaf reset-count {
    type yang:zero-based-counter32;
    config false;
    description "The reset count of this peer.";
}

container statistics {
    config false;
    description
        "A container defining statistics attributes.";

    leaf discontinuity-time {
        type yang:date-and-time;
        description
            "The time on the most recent occasion at which any one
            or more of the statistic counters suffered a
            discontinuity. If no such discontinuities have occurred
            since the last re-initialization of the local
            management subsystem, then this node contains the time
```



```
        the local management subsystem re-initialized itself.";
    }

    container error {
        description
            "A grouping defining error statistics attributes.";
        leaf rpf-failure {
            type uint32;
            description "Number of RPF failures.";
        }
    }

    container queue {
        description
            "A container includes queue statistics attributes.";
        leaf size-in {
            type uint32;
            description
                "The number of messages received from the peer
                currently queued.";
        }
        leaf size-out {
            type uint32;
            description
                "The number of messages queued to be sent to the peer.";
        }
    }

    container received {
        description "Received message counters.";
        uses statistics-sent-received;
    }
    container sent {
        description "Sent message counters.";
        uses statistics-sent-received;
    }
} // statistics
} // peer-state-attributes

grouping sa-filter-container {
    description "A container defining SA filters.";
    container sa-filter {
        description
            "Specifies an access control list (ACL) to filter source
            active (SA) messages coming in to or going out of the
            peer.";
        leaf in {
            type leafref {
```



```
    path "/acl:acls/acl:acl/acl:name";
  }
  description
    "Filters incoming SA messages only.
    The value is the name to uniquely identify a
    policy that contains one or more rules used to
    accept or reject MSDP SA messages.
    If the policy is not specified, all MSDP SA messages are
    accepted.";
  reference
    "RFC 8519: YANG Data Model for Network Access Control
    Lists (ACLs)";
}
leaf out {
  type leafref {
    path "/acl:acls/acl:acl/acl:name";
  }
  description
    "Filters outgoing SA messages only.
    The value is the name to uniquely identify a
    policy that contains one or more rules used to
    accept or reject MSDP SA messages.
    If the policy is not specified, all MSDP SA messages are
    sent.";
  reference
    "RFC 8519: YANG Data Model for Network Access Control
    Lists (ACLs)";
}
} // sa-filter
} // sa-filter-container

grouping ttl-threshold {
  description "Attribute to configure TTL threshold.";
  leaf ttl-threshold {
    type uint8 {
      range 1..255;
    }
    description "Maximum number of hops data packets can
      traverse before being dropped.";
  }
}
} // ttl-threshold

grouping statistics-sent-received {
  description
    "A grouping defining sent and received statistics attributes.";
  leaf keepalive {
    type yang:counter64;
    description
```



```
        "The number of keepalive messages.";
    }
    leaf notification {
        type yang:counter64;
        description
            "The number of notification messages.";
    }
    leaf sa-message {
        type yang:counter64;
        description
            "The number of SA messages.";
    }
    leaf sa-response {
        type yang:counter64;
        description
            "The number of SA response messages.";
    }
    leaf sa-request {
        type yang:counter64;
        description
            "The number of SA request messages.";
    }
    leaf total {
        type yang:counter64;
        description
            "The number of total messages.";
    }
} // statistics-sent-received

/*
 * Data nodes
 */
augment "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol" {
    when "derived-from-or-self(rt:type, 'msdp:msdp')" {
        description
            "This augmentation is only valid for a routing protocol
            instance of MSDP.";
    }
    description
        "MSDP augmentation to routing control-plane protocol
        configuration and state.";
    container msdp {
        description
            "MSDP configuration and operational state data.";

        container global {
            description
```



```
    "Global attributes.";
    uses global-config-attributes;
}

container peers {
    description
        "Containing a list of peers.";
    list peer {
        key "address";
        description
            "List of MSDP peers.";
        leaf address {
            type inet:ipv4-address;
            description
                "The address of the peer";
        }
        action clear-peer {
            description
                "Clears the TCP connection to the peer.";
        }
        uses peer-config-attributes;
        uses peer-state-attributes;
    }
}

action clear-all-peers {
    description
        "'All peers' TCP connection are cleared.";
}

container sa-cache {
    config false;
    description
        "The SA cache information.";
    list entry {
        key "group source-addr";
        description "A list of SA cache entries.";
        leaf group {
            type rt-types:ipv4-multicast-group-address;
            description "The group address of this SA cache.";
        }
        leaf source-addr {
            type rt-types:ipv4-multicast-source-address;
            description "Source IPv4 address.";
        }
        list origin-rp {
            key "rp-address";
            description "Origin RP information.";
        }
    }
}
```



```
    leaf rp-address {
      type inet:ipv4-address;
      description
        "The RP address. IP address used in the RP field
        of an SA message entry.";
    }
    leaf is-local-rp {
      type boolean;
      description
        "'true' if the RP is local;
        'false' if The RP is not local.";
    }
    leaf sa-adv-expire {
      type uint32;
      units seconds;
      description
        "The remaining time duration before expiration
        of the periodic SA advertisement timer on a
        local RP.";
    }
  }
}

container state-attributes {
  description "SA cache state attributes for MSDP.";

  leaf up-time {
    type yang:gauge32;
    units seconds;
    description
      "Indicates the duration time when this SA entry is
      created in the cache. MSDP is a periodic protocol,
      the value can be used to check the state of
      SA cache.";
  }
  leaf expire {
    type yang:gauge32;
    units seconds;
    description
      "Indicates the duration time when this SA entry in
      the cache times out. MSDP is a periodic protocol,
      the value can be used to check the state of
      SA cache.";
  }
  leaf holddown-interval {
    type uint32;
    units seconds;
    description
      "Hold-down timer value for SA forwarding.";
  }
}
```



```
    reference
      "RFC 3618: Multicast Source Discovery Protocol
      (MSDP), section 5.3.";
  }
  leaf peer-learned-from {
    type inet:ipv4-address;
    description
      "The address of the peer that we learned this
      SA from.";
  }
  leaf rpf-peer {
    type inet:ipv4-address;
    description
      "The address is the SA's originating RP.";
  }
} // state-attributes
} // entry

action clear {
  description
    "Clears MSDP source active (SA) cache entries.";
  input {
    container entry {
      presence "If a particular entry is cleared.";
      description
        "The SA cache (S,G) or (*,G) entry to be cleared. If
        this is not provided, all entries are cleared.";
      leaf group {
        type rt-types:ipv4-multicast-group-address;
        mandatory true;
        description "The group address";
      }
      leaf source-addr {
        type rt-types:ipv4-multicast-source-address;
        description
          "Address of multicast source to be cleared. If this
          is not provided then all entries related to the
          given group are cleared.";
      }
    }
  }
  leaf peer-address {
    type inet:ipv4-address;
    description
      "Peer IP address from which MSDP SA cache entries have
      been learned. If this is not provided, entries learned
      from all peers are cleared.";
  }
  leaf peer-as {
```



```
        type inet:as-number;
        description
            "ASN from which MSDP SA cache entries have been learned.
            If this is not provided, entries learned from all AS's
            are cleared.";
    }
}
} // clear
} // sa-cache
} // msdp
} // augment
}
```

<CODE ENDS>

5. 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 NETCONF access control model [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). 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:

Under /rt:routing/rt:control-plane-protocols/msdp,

msdp:global

This subtree specifies the configuration for the MSDP attributes at the global level. Modifying the configuration can cause MSDP default peers to be deleted or the connection to be rebuilt, and unexpected filtering of the SA.

msdp:peers

This subtree specifies the configuration for the MSDP attributes at the peer level. Modifying the configuration will allow unexpected MSDP peer establishment and unexpected SA information learning and advertisement.

The key field writability should be controlled strictly. The key misoperation will break the existing MSDP connection, and the associated SA caches will also be deleted.

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 is msdp subtree and key data node and their sensitivity/vulnerability:

```
/rt:routing/rt:control-plane-protocols/msdp,
```

Unauthorized access to any data node of the above subtree can disclose the operational state information of MSDP on this device. For example, the peer information disclosure may lead to a forged connection attack, the ACL nodes' uncorrected modification may lead to the filter errors.

The "key" field is also a sensitive readable configuration. Unauthorized reading may lead to the password leaking. Modification will allow the unexpected rebuilding of connected peers.

Authentication configuration is supported via the specification of key-chains [[RFC8177](#)] or the direct specification of key and authentication algorithm. Hence, authentication configuration in the "authentication" container inherits the security considerations of [[RFC8177](#)]. This includes the considerations with respect to the local storage and handling of authentication keys.

Some of the RPC operations in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control access to these operations. These are the operations and their sensitivity/vulnerability:

```
/rt:routing/rt:control-plane-protocols/msdp:clear-peer,
```

```
/rt:routing/rt:control-plane-protocols/msdp:clear-sa-cache,
```

Unauthorized access to any of the above action operations can lead to the MSDP peers connection rebuilding or delete SA records on this device.

6. IANA Considerations

RFC Ed.: Please replace all occurrences of 'XXXX' with the actual RFC number (and remove this note).

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

URI: urn:ietf:params:xml:ns:yang:ietf-msdp

Registrant Contact: The IESG

XML: N/A, the requested URI is an XML namespace

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

name: ietf-msdp

namespace: urn:ietf:params:xml:ns:yang:ietf-msdp

prefix: msdp

reference: RFC XXXX

7. Contributors

The authors would like to thank Yisong Liu (liuyisong@huawei.com), Benchong Xu (xu.benchong@zte.com.cn), Tanmoy Kundu (tanmoy.kundu@alcatel-lucent.com) for their valuable contributions.

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Appendix A. Data Tree Example

This section contains an example of an instance data tree in JSON encoding [[RFC7951](#)], containing configuration data.

A.1. The global and peer configuration example

```
{
  "ietf-interfaces:interfaces": {
    "interface": [
      {
        "name": "eth1",
        "description": "An interface with MSDP enabled.",
        "type": "iana-if-type:ethernetCsmacd",
        "ietf-ip:ipv4": {
          "forwarding": true,
```



```
        "address": [
          {
            "ip": "192.0.2.1",
            "prefix-length": 24
          }
        ]
      }
    ]
  },
  "ietf-access-control-list:acls": {
    "acl": [
      {
        "name": "msdp-default-peer-policy",
        "type": "ietf-access-control-list:ipv4-acl-type",
        "aces": {
          "ace": [
            {
              "name": "accept",
              "actions": {
                "forwarding": "ietf-access-control-list:accept"
              }
            }
          ]
        }
      }
    ]
  },
  "ietf-routing:routing": {
    "router-id": "203.0.113.1",
    "control-plane-protocols": {
      "control-plane-protocol": [
        {
          "type": "ietf-msdp:msdp",
          "name": "msdp-1",
          "ietf-msdp:msdp": {
            "global": {
              "tcp-connection-source": "eth1",
              "default-peer": [
                {
                  "peer-addr": "198.51.100.8",
                  "prefix-policy": "msdp-default-peer-policy"
                }
              ]
            },
            "originating-rp": {
              "interface": "eth1"
            }
          },
          "sa-limit": 0,
```



```

        "ttl-threshold": 1
    },
    "peers": {
        "peer": [
            {
                "address": "198.51.100.8",
                "enabled": true,
                "tcp-connection-source": "eth1",
                "description": "x",
                "mesh-group": "x",
                "peer-as": 100,
                "sa-limit": 0,
                "timer": {
                    "connect-retry-interval": 0,
                    "holdtime-interval": 3,
                    "keepalive-interval": 1
                },
                "ttl-threshold": 1
            }
        ]
    }
}

```

[A.2.](#) The state example

```

{
  "ietf-interfaces:interfaces": {
    "interface": [
      {
        "name": "eth1",
        "description": "An interface with MSDP enabled.",
        "type": "iana-if-type:ethernetCsmacd",
        "phys-address": "00:00:5e:00:53:01",
        "oper-status": "up",
        "statistics": {
          "discontinuity-time": "2020-02-22T11:22:33+02:00"
        },
        "ietf-ip:ipv4": {
          "forwarding": true,
          "mtu": 1500,
          "address": [
            {
              "ip": "192.0.2.1",

```



```
        "prefix-length": 24,
        "origin": "static"
      }
    ]
  }
}
],
"ietf-access-control-list:acls": {
  "acl": [
    {
      "name": "msdp-default-peer-policy",
      "type": "ietf-access-control-list:ipv4-acl-type",
      "aces": {
        "ace": [
          {
            "name": "accept",
            "actions": {
              "forwarding": "ietf-access-control-list:accept"
            }
          }
        ]
      }
    }
  ]
}
],
"ietf-routing:routing": {
  "router-id": "203.0.113.1",
  "control-plane-protocols": {
    "control-plane-protocol": [
      {
        "type": "ietf-msdp:msdp",
        "name": "msdp-1",
        "ietf-msdp:msdp": {
          "global": {
            "tcp-connection-source": "eth1",
            "default-peer": [
              {
                "peer-addr": "198.51.100.8",
                "prefix-policy": "msdp-default-peer-policy"
              }
            ],
            "originating-rp": {
              "interface": "eth1"
            },
            "sa-limit": 0,
            "ttl-threshold": 1
          }
        }
      }
    ]
  }
}
```



```
"peers":{
  "peer":[
    {
      "address": "198.51.100.8",
      "enabled": true,
      "tcp-connection-source": "eth1",
      "description": "x",
      "mesh-group": "x",
      "peer-as": 100,
      "sa-limit": 0,
      "timer":{
        "connect-retry-interval": 0,
        "holdtime-interval": 3,
        "keepalive-interval": 1
      },
      "ttl-threshold": 1,
      "session-state": "established",
      "elapsed-time": 5,
      "is-default-peer": true,
      "keepalive-expire": 1,
      "reset-count": 1,
      "statistics": {
        "discontinuity-time": "2020-02-22T12:22:33+02:00"
      }
    }
  ]
},
"sa-cache": {
  "entry": [
    {
      "group": "233.252.0.23",
      "source-addr": "198.51.100.8",
      "origin-rp": [
        {
          "rp-address": "203.0.113.10",
          "is-local-rp": false,
          "sa-adv-expire": 150
        }
      ],
      "state-attributes": {
        "up-time": 20,
        "expire": 120,
        "holddown-interval": 150,
        "peer-learned-from": "203.0.113.10",
        "rpf-peer": "203.0.113.10"
      }
    }
  ]
}
```



```
    }  
  }  
]  
}  
}
```

A.3. The actions example

This example shows the input data (in JSON) for executing an "sa-cache clear" action to clear the cache of all entries which match the group address of 233.252.0.23.

```
{  
  "ietf-msdp:sa-cache":{  
    "input":{  
      "entry":{  
        "group":"233.252.0.23"  
      }  
    }  
  }  
}
```

Authors' Addresses

Xufeng Liu
Volta Networks

Email: xufeng.liu.ietf@gmail.com

Zheng Zhang (editor)
ZTE Corporation
No. 50 Software Ave, Yuhuatai District
Nanjing
China

Email: zzhang_ietf@hotmail.com

Anish Peter
Individual contributor

Email: anish.ietf@gmail.com

Mahesh Sivakumar
Juniper networks
1133 Innovation Way
Sunnyvale, CALIFORNIA 94089
USA

Email: sivakumar.mahesh@gmail.com

Feng Guo
Huawei Technologies
Huawei Bld., No.156 Beiqing Rd.
Beijing 100095
China

Email: guofeng@huawei.com

Pete McAllister
Metaswitch Networks
100 Church Street
Enfield EN2 6BQ
UK

Email: pete.mcallister@metaswitch.com