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Yang Data Model for SRv6 based Services
draft-raza-bess-srv6-services-yang-01

Abstract

This document defines a YANG data model that can be used to configure and manage SRv6 based services in BGP.

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

Status of This Memo

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[1.](#) Introduction

YANG [[RFC6020](#)] [[RFC7950](#)] is a data definition language that was introduced to define the contents of a conceptual data store that allows network devices to be managed using NETCONF [[RFC6241](#)].

Segment Routing (SR), as defined in [[RFC8402](#)], is source routing paradigm where a node steers a packet through an ordered list of instructions, called segments. A segment is identified using its SID (Segment Identifier) and may represent a topological path, a service

endpoint, a virtual network function, etc. The IPv6 dataplane instantiation of SR is called SRv6 as specified in [\[I-D.ietf-spring-srv6-network-programming\]](#)

BGP overlay service endpoints can be identified using SRv6 service SIDs. These services include L3VPN, EVPN, and Internet services. The procedures and messages for BGP overlay services using SRv6 SID are specified in [\[I-D.dawra-bess-srv6-services\]](#)

This document defines the YANG model for managing these SRv6 based services in BGP.

[2.](#) Specification of Requirements

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.

[3.](#) Model Overview

The modeling in this document complies with the Network Management Datastore Architecture (NMDA) [\[RFC8342\]](#). The operational state data is combined with the associated configuration data in the same hierarchy [\[RFC8407\]](#). When protocol states are retrieved from the NMDA operational state datastore, the returned states cover all "config true" (rw) and "config false" (ro) nodes defined in the schema.

The scope of data modeling is for the following management constructs:

- o Configuration
- o Operational State
- o Notifications
- o Executables (Actions)

The Yang extensions proposed in this model augment the base BGP model

defined in [[I-D.ietf-idr-bgp-model](#)]. The common data types for SRv6 are imported from [[I-D.raza-spring-srv6-yang](#)].

TBD: The base BGP model [[I-D.ietf-idr-bgp-model](#)] in its current form is not scoped within the context of a Network Instance. Therefore, the context of a VRF is not fully realized. The extensions done in this model should fall within the scope of a VRF, once the top BGP container is linked under Network Instance.

[4.](#) Configuration and State

Current revision of this document defines the following areas:

- o Configuration: Enable Segment-routing SRv6 based service
- o Configuration: Designate SRv6 locator for SID allocation
- o Configuration: Specify SID allocation mode (per-vrf, per-ce)

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- o State: Info related to Remote SRv6 SID learnt in a service route

The BGP service here refers to overlay for global (Internet) as well L3VPN service for IPv4 and IPv6.

[Ed Note: TODO EVPN]

[4.1.](#) Tree

```
module: ietf-bgp-srv6-services
  augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
    +--rw segment-routing
      +--rw srv6
        +--rw locator?    -> /rt:routing/srv6:srv6/locators/locator/name

  augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
    +--rw segment-routing
      +--rw srv6
        +--rw locator?      -> /rt:routing/srv6:srv6/locators/locator/name
        +--rw sid-alloc-mode? enumeration

  augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
```

```

    +--rw segment-routing
      +--rw srv6
        +--rw locator?          -> /rt:routing/srv6:srv6/locators/locator/name
        +--rw sid-alloc-mode?   enumeration

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
  +--rw segment-routing
    +--rw srv6
      +--rw locator?          -> /rt:routing/srv6:srv6/locators/locator/name
      +--rw sid-alloc-mode?   enumeration

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
  +--rw segment-routing
    +--rw srv6
      +--rw locator?          -> /rt:routing/srv6:srv6/locators/locator/name
      +--rw sid-alloc-mode?   enumeration

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
  +--ro routes
    +--ro route* [prefix neighbor add-path-id]
      +--ro prefix          union
      +--ro neighbor        inet:ip-address
      +--ro add-path-id     uint32
      +--ro srv6
        +--ro received-sids* [received-sid]

```

```

    | +--ro received-sid      srv6-types:srv6-sid
  +--ro local-sids* [local-sid]
    +--ro local-sid          srv6-types:srv6-sid
    +--ro locator?          -> /rt:routing/srv6:srv6/locators/locator/name

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
  +--ro routes
    +--ro route* [prefix neighbor add-path-id]
      +--ro prefix          union
      +--ro neighbor        inet:ip-address
      +--ro add-path-id     uint32
      +--ro srv6
        +--ro received-sids* [received-sid]
        | +--ro received-sid      srv6-types:srv6-sid
      +--ro local-sids* [local-sid]
        +--ro local-sid          srv6-types:srv6-sid

```

```

        +--ro locator?      -> /rt:routing/srv6:srv6/locators/locator/na

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
+--ro routes
  +--ro route* [rd prefix neighbor add-path-id]
    +--ro rd          rt-types:route-distinguisher
    +--ro prefix       union
    +--ro neighbor     inet:ip-address
    +--ro add-path-id  uint32
    +--ro srv6
      +--ro received-sids* [received-sid]
        | +--ro received-sid  srv6-types:srv6-sid
      +--ro local-sids* [local-sid]
        +--ro local-sid      srv6-types:srv6-sid
        +--ro locator?      -> /rt:routing/srv6:srv6/locators/locator/na

augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/bgp:
+--ro routes
  +--ro route* [rd prefix neighbor add-path-id]
    +--ro rd          rt-types:route-distinguisher
    +--ro prefix       union
    +--ro neighbor     inet:ip-address
    +--ro add-path-id  uint32
    +--ro srv6
      +--ro received-sids* [received-sid]
        | +--ro received-sid  srv6-types:srv6-sid
      +--ro local-sids* [local-sid]
        +--ro local-sid      srv6-types:srv6-sid
        +--ro locator?      -> /rt:routing/srv6:srv6/locators/locator/na

```

[5.](#) Notifications

TBD

[6.](#) Executables (Actions)

TBD

[7.](#) Yang Module

<CODE BEGINS> file "ietf-bgp-srv6-services@2019-07-08.yang"

```
module ietf-bgp-srv6-services {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-bgp-srv6-services";
  // replace with IANA namespace when assigned
  prefix bgp-srv6-svc ;

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

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

  import ietf-routing {
    prefix "rt";
    reference
      "RFC 8349: A YANG Data Model for Routing Management (NMDA
      version)";
  }

  import ietf-srv6-types {
    prefix srv6-types;
    reference "RFC XXXX: YANG Data Model for SRv6";
    // RFC Editor: replace XXXX with actual RFC number and remove
    // this note
  }

  import ietf-srv6-base {
    prefix srv6;
  }
}
```

}

```

import ietf-bgp {
    prefix bgp;
}

organization
    "IETF BESS Working Group";

contact
    "BESS working group - bess@ietf.org";

description
    "This YANG module defines a data model to configure and
    manage SRv6 extensions in BGP."

    Terms and Acronyms

    AF : Address Family

    BGP (bgp) : Border Gateway Protocol

    EVPN: Ethernet VPN

    SR : Segment Routing

    SID : Segment Identifier

    SRv6 : Segment Routing with IPv6 Data plane

    VPN : Virtual Private Network

    VRF : Virtual Routing and Forwarding

    ";

revision 2019-07-08 {
    description
        "Initial revision" ;
    reference "";
}

// Sid type union
typedef sid-type {
    type union {
        type rt-types:mpls-label;
        type srv6-types:srv6-sid;
    }
}

```



```
        description "Type definition for Segment Identifier. This is
                    a union type which can be either a SR MPLS SID in the
                    form of a label, or a SRv6 SID in the form of
                    an IPv6 address.";
        reference "TBD";
    }

    grouping route-key-leafs {
        description "Grouping for key leafs identifying a route";
        leaf prefix {
            type union {
                type inet:ip-prefix;
                type string;
            }
            description "BGP Prefix. This is a temp definition to
                        cover ip-prefix and other NLRI formats.
                        Import the type once defined in base
                        BGP RIB model";
        }
        leaf neighbor {
            type inet:ip-address;
            description "BGP Neighbor";
        }
        leaf add-path-id {
            type uint32;
            description "Add-path ID";
        }
    }

    grouping common-bgp-route-grouping {
        description "BGP route list" ;
        container routes {
            config false;
            description "BGP Route in local RIB";
            list route {
                key "prefix neighbor add-path-id";
                description "BGP route list";
                uses route-key-leafs;
            }
        }
    }

    grouping common-bgp-vpn-route-grouping {
        description "BGP route list" ;
        container routes {
            config false;
            description "BGP VPN Route in local RIB";
```

```
list route {
```

```
    key "rd prefix neighbor add-path-id";
    description "Route List";

    leaf rd {
        type rt-types:route-distinguisher;
        description "Route Distinguisher";
    }
    uses route-key-leafs;
}
}

//
// SRv6 extensions related Groupings
//

grouping srv6-grouping {
    description "SRv6 container";

    container segment-routing {
        description "Segment-routing parameters";

        container srv6 {
            description "Segment-routing with IPv6 dataplane (SRv6) parameters";
        }
    }
}

grouping srv6-locator-grouping {
    description "SRv6 locator ref";
    leaf locator {
        type leafref {
            path "/rt:routing/srv6:srv6/srv6:locators/srv6:locator/srv6:name";
        }
        description "Reference to an SRv6 Locator";
    }
}

grouping segment-routing-srv6-locator-grouping {
```

```

description
  "An absolute reference to an SRv6 locator";

container segment-routing {
  description "Segment-routing parameters";

  container srv6 {
    description "Segment-routing with IPv6 dataplane (SRv6) parameters";
  }
}

```

```

    uses srv6-locator-grouping;
  }
}

// SRv6 VPN Sid allocation mode
grouping srv6-sid-mode {
  description "SRv6 VPN SID allocation mode";
  leaf sid-alloc-mode {
    type enumeration {
      enum per-ce {
        description "Allocate SRv6 SID per CE";
      }
      enum per-route {
        description "Allocate SRv6 SID per prefix";
      }
      enum per-vpn {
        description "Allocate SRv6 SID per VPN";
      }
    }
    description "BGP SRv6 SID allocation model";
  }
}

grouping srv6-attr-sid-info {
  description "SRv6 SID info per route";
  container srv6 {
    description "Per Route SRv6 parameters";
    list received-sids {
      key "received-sid";
      description "List of received SRv6 SIDs";
      leaf received-sid {
        type srv6-types:srv6-sid;
      }
    }
  }
}

```

```

        description "Received SID";
    }
}
list local-sids {
    key "local-sid";
    description "List of local SRv6 SIDs";
    leaf local-sid {
        type srv6-types:srv6-sid;
        description "Local SID";
    }

    uses srv6-locator-grouping;
}
}
}

```

```

//
// BGP Specific Paramters
//

// SRv6 Loc designation
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgpglobal" {
    description
        "Augment BGP global";
    uses segment-routing-srv6-locator-grouping;
}

// Augment AF with route list
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgpglobal/bgpafris/bgpafris/bgpiipv4-unicast" {
    description
        "Augment BGP SAFI route";
    uses common-bgp-route-grouping;
}
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgpglobal/bgpafris/bgpafris/bgpiipv6-unicast" {
    description
        "Augment BGP SAFI route";
    uses common-bgp-route-grouping;
}
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +

```

```

        "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv4-unicast" {
        description
        "Augment BGP SAFI route";
        uses common-bgp-vpn-route-grouping;
    }
    augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
        "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv6-unicast" {
        description
        "Augment BGP SAFI route";
        uses common-bgp-vpn-route-grouping;
    }
    /* TODO
    augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
        "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l2vpn-evpn" {
        description
        "Augment BGP SAFI route";
        uses common-bgp-vpn-route-grouping;
    }
    */

    // SRv6 VPN SID allocation mode configuration.
    augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +

```

```

        "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:ipv4-unicast" {
        description
        "Augment BGP global IPv4 unicast AF mode
        to add SR specific parameters";
        container segment-routing {
        description "Segment Routing specific parameters";
        container srv6 {
        description "SRv6 specific parameters";
        uses srv6-locator-grouping;
        uses srv6-sid-mode;
        }
        }
    }

    augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
        "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:ipv6-unicast" {
        description
        "Augment BGP global IPv6 unicast AF mode
        to add SR specific parameters";
    }

```

```

    container segment-routing {
      description "Segment Routing specific parameters";
      container srv6 {
        description "SRv6 specific parameters";
        uses srv6-locator-grouping;
        uses srv6-sid-mode;
      }
    }
  }
}

augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
  "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv4-unicast"
description
  "Augment BGP L3VPN IPv4 unicast AF mode
  to add SR specific parameters";
container segment-routing {
  description "Segment Routing specific parameters";
  container srv6 {
    description "SRv6 specific parameters";
    uses srv6-locator-grouping;
    uses srv6-sid-mode;
  }
}

augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
  "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv6-unicast"
description
  "Augment BGP L3VPN IPv6 unicast AF mode

```

```

    to add SR specific parameters";
  container segment-routing {
    description "Segment Routing specific parameters";
    container srv6 {
      description "SRv6 specific parameters";
      uses srv6-locator-grouping;
      uses srv6-sid-mode;
    }
  }
}

// SRv6 local and remote sids per route.

```

```

augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:ipv4-unicast/" +
    "bgp-srv6-svc:routes/bgp-srv6-svc:route" {
    description
        "Augment AF route with SRv6 SID info";
    uses srv6-attr-sid-info;
}
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:ipv6-unicast/" +
    "bgp-srv6-svc:routes/bgp-srv6-svc:route" {
    description
        "Augment AF route with SRv6 SID info";
    uses srv6-attr-sid-info;
}

augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv4-unicast/" +
    "bgp-srv6-svc:routes/bgp-srv6-svc:route" {
    description
        "Augment AF route with SRv6 SID info";
    uses srv6-attr-sid-info;
}

augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l3vpn-ipv6-unicast/" +
    "bgp-srv6-svc:routes/bgp-srv6-svc:route" {
    description
        "Augment AF route with SRv6 SID info";
    uses srv6-attr-sid-info;
}

/* TODO
augment "/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/" +
    "bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi/bgp:l2vpn-evpn/" +
    "bgp-srv6-svc:routes/bgp-srv6-svc:route" {
    description

```

```

        "Augment AF route with SRv6 SID info";
    uses srv6-attr-sid-info;
}
*/

```

}

<CODE ENDS>

8. IANA Considerations

This document requests the registration of the following URI in the IETF "XML registry" [[RFC3688](#)]:

URI	Registrant	XML
urn:ietf:params:xml:ns:yang:ietf-bgp-srv6-services	The IESG	N/A

This document requests the registration of the following YANG module in the "YANG Module Names" registry [[RFC6020](#)]:

Name	Namespace	Prefix	Reference
ietf-bgp-srv6-services	urn:ietf:params:xml:ns:yang:ietf-bgp-srv6-services	bgp-srv6-services	This document

-- RFC Editor: Replace "This document" with the document RFC number at time of publication, and remove this note.

9. Security Considerations

The transport protocol used for sending the BGP Segment Routing data MUST support authentication and SHOULD support encryption. The data-model by itself does not create any security implications.

This draft does not change any underlying security issues inherent in [[I-D.ietf-idr-bgp-model](#)].

[10.](#) Acknowledgements

TBD.

[11.](#) Contributors

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[12.](#) References

[12.1.](#) Normative References

- [I-D.dawra-bess-srv6-services]
Dawra, G., Filsfils, C., Brissette, P., Agrawal, S., Leddy, J., daniel.voyer@bell.ca, d., daniel.bernier@bell.ca, d., Steinberg, D., Raszuk, R., Decraene, B., Matsushima, S., Zhuang, S., and J. Rabadan, "SRv6 BGP based Overlay services", [draft-dawra-bess-srv6-services-02](#) (work in progress), July 2019.
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Jethanandani, M., Patel, K., Hares, S., and J. Haas, "BGP YANG Model for Service Provider Networks", [draft-ietf-idr-bgp-model-09](#) (work in progress), June 2020.
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