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YANG Data Model for BIER Protocol
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Abstract

This document defines a YANG data model for BIER configuration and operation.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on May 22, 2016.

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1. Introduction

This document defines a YANG data model for BIER configuration and operation.

2. Design of the Data Model

```
module: ietf-bier
augment /rt:routing:
   +--rw bier
      +--rw bier-global
         +--rw encapsulation-type?   identityref
         +--rw bitstringlength?      bsl
         +--rw bfr-id?               bfr-id
         +--rw af
         |  +--rw ipv4
         |  |  +--rw ipv4-bfr-prefix?   inet:ipv4-prefix
         |  +--rw ipv6
         |     +--rw ipv6-bfr-prefix?   inet:ipv6-prefix
         +--rw sub-domain* [sub-domain-id]
            +--rw sub-domain-id      sub-domain-id
            +--rw mt-id?             uint16
            +--rw bfr-id?            bfr-id
            +--rw frr?               boolean
            +--rw bitstringlength?   bsl
            +--rw af
               +--rw ipv4* [bitstringlength bier-mpls-label]
               |  +--rw bitstringlength               uint16
               |  +--rw bier-mpls-label               mpls:mpls-label
               |  +--rw bier-mpls-label-range-size?   uint8
```

```
                +--rw ipv6* [bitstringlength bier-mpls-label]
                   +--rw bitstringlength              uint16
                   +--rw bier-mpls-label              mpls:mpls-label
                   +--rw bier-mpls-label-range-size?  uint8

   augment /rt:routing/rt:routing-instance/rt:routing-protocols
   /rt:routing-protocol/isis:isis/isis:instance:
      +--rw mt
         +--rw mt-id          uint16
         +--rw bier-global
            +--rw enable?      boolean
            +--rw advertise?   boolean
            +--rw receive?     boolean

   augment /rt:routing/rt:routing-instance/rt:routing-protocols
   /rt:routing-protocol/ospf:ospf/ospf:instance:
      +--rw mt
         +--rw mt-id          uint16
         +--rw bier-global
            +--rw enable?      boolean
            +--rw advertise?   boolean
            +--rw receive?     boolean

   augment /rt:routing-state:
      +--ro bier-global
      |  +--ro bfr-id?            bfr-id
      |  +--ro ipv4-bfr-prefix?   inet:ipv4-prefix
      |  +--ro ipv6-bfr-prefix?   inet:ipv6-prefix
      |  +--ro sub-domain* [sub-domain-id]
      |     +--ro sub-domain-id      sub-domain-id
      |     +--ro mt-id?             uint16
      |     +--ro bfr-id?            bfr-id
      |     +--ro bitstringlength?   uint16
      |     +--ro ipv4* [bitstringlength label]
      |     |  +--ro bitstringlength     uint16
      |     |  +--ro label               mpls:mpls-label
      |     |  +--ro label-range-size?   uint8
      |     +--ro ipv6* [bitstringlength label]
      |        +--ro bitstringlength     uint16
      |        +--ro label               mpls:mpls-label
      |        +--ro label-range-size?   uint8
      +--ro birts
         +--ro birt-subdomain* [sub-domain-id]
         |  +--ro sub-domain-id           sub-domain-id
         |  +--ro birt-bitstringlength* [bitstringlength]
         |     +--ro bitstringlength    uint16
         |     +--ro birt-si* [si]
         |        +--ro si    si
```

```
        +--ro f-bm?                  uint16
        +--ro bier-mpls-in-label?    mpls:mpls-label
        +--ro bfr-nbr?               inet:ip-address
        +--ro bier-mpls-out-label?   mpls:mpls-label

   notifications:
      +---n bfr-id-collision
      |  +--ro bfr-id?   bfr-id
      +---n bfr-zero
      |  +--ro ipv4-bfr-prefix?   inet:ipv4-prefix
      |  +--ro ipv6-bfr-prefix?   inet:ipv6-prefix
      +---n sub-domain-id-collision
         +--ro sub-domain-id?   sub-domain-id
         +--ro mt-id?           uint16
```

3. Configuration

This Module augments the "/rt:routing:" with a BIER container. This Container defines all the configuration parameters related to BIER for this particular routing.

The BIER configuration contains global configuration.

The global configuration includes BIER transport type, imposition BitStringLengths, BFR-id, AF, and parameters associated with bier sub-domain.

In this document, we contains two types of BitStringLengths: Imposition and Disposition BitStringLengths, as defined in ([I-D.ietf-bier-architecture]).The imposition BitStringLengths is defined under bier-global container, and the disposition BitStringLengths is defined under the sub-domain.

4. Control plane configuration

This Module augments routing-protocol configuration with BIER.

This Module supports ISIS ([I-D.ietf-bier-isis-extensions])and OSPF ([I-D.ietf-bier-ospf-bier-extensions]) as control plane for BIER.

5. States

The operational states contains basic parameters associated with bier, such as BFR-id, BFR-prefixes and parameters associated with bier sub-domain.

It also includes the Bit Index Routing Table(BIRT).

6. Notification

This Module includes bfr-id-collision, bfr-zero, and sub-domain-id-collision.

7. BIER YANG Data Model

```
module ietf-bier {

    namespace "urn:ietf:params:xml:ns:yang:ietf-bier";

    prefix "bier";

    import ietf-routing {
      prefix "rt";
    }

    import ietf-inet-types {
      prefix "inet";
    }

        import ietf-mpls {
           prefix "mpls";
         }

    organization
      "IETF BIER(Bit Indexed Explicit Replication ) Working Group";

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       "WG List:  <mailto:bier@ietf.org>

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        ";
     description
     "The YANG module defines a generic configuration
       model for BIER.";

          revision 2015-11-19 {
       description
         "02 revision, typedef the parameters related with bier, change the
type of label to mpls-label";
       reference
         "draft-chh-bier-bier-yang-01";
     }

     revision 2015-10-16 {
       description
         "01 revision.";
       reference
         "draft-chh-bier-bier-yang-01";
     }

     revision 2015-06-22 {
       description
         "Initial revision.";
       reference
          "draft-chh-bier-bier-yang-00";
     }

     /* Identities */
     identity bier-encapsulation{
       description
         "Base identity for BIER encapsulation.";
     }
     identity bier-encapsulation-mpls {
       base bier-encapsulation;
       description
         "This identity represents MPLS encapsulation for bier.";
     }

        /* Type definitions */

        typedef sub-domain-id {
```

```
          type uint16;
```

```
        description
         "The type for sub-domain-id";
        }

    typedef si {
        type uint16;
        description
         "The type for set identifier";
        }

        typedef bfr-id {
        type uint16;
        description
         "The type for bfr identifier";
        }


  typedef bsl {
        type enumeration{
          enum 64-bit{
                   description "bitstringlength is 64";
              }
      enum 128-bit{
                       description "bitstringlength is 128";
                       }
                                    enum 256-bit{
                                    description "bitstringlength is 256";
                                    }
                                    enum 512-bit{
                                    description "bitstringlength is 512";
                                    }
                                    enum 1024-bit{
                                    description "bitstringlength is 1024";
                                    }
                                    enum 2048-bit{
                                    description "bitstringlength is 2048";
                                    }
                                    enum 4096-bit{
                                    description "bitstringlength is 4096";
                                    }
                               }
              description
                       "The bitstringlength type for imposition mode";
    }

     /* Configuration Data */
    augment "/rt:routing" {
              description
```

```
                    "This augments routing-instance configuration with
bier.";
        container bier{
                description "BIER config.";
                container bier-global {
                        description
                                "BIER global config.";
                        leaf encapsulation-type {
                                type identityref {
                                        base bier-encapsulation;
                                }
                                default "bier-encapsulation-mpls";
                                description
                                        "Dataplane to be used.";
                        }
                        leaf bitstringlength{
                                type bsl;
                                description
                                        "imposition";
                        }
                        leaf bfr-id {
                                type bfr-id;
                                        description
                                        "BIER bfr identifier.";
                        }
                        container af {
                                container ipv4 {
                                        leaf ipv4-bfr-prefix {
                                                type inet:ipv4-prefix;
                                                description
                                                        "BIER IPv4 prefix.";
                                        }
                                        description
                                                "IPv4 prefix.";
                                }
                                container ipv6 {
                                        leaf ipv6-bfr-prefix {
                                                type  inet:ipv6-prefix;
                                                description
                                                        "BIER IPv6 prefix.";
                                        }
                                        description
                                                "IPv6 prefix.";
                                }
                        description
                                                "BIER IPV4&IPV6 prefix";
                        }
                        list sub-domain {
```

```
                key "sub-domain-id";
```

```
                              leaf sub-domain-id{
                                      type sub-domain-id;
                                      description
                                "sub-domain ID.";
                              }
                              leaf mt-id {
                                      type uint16;
                              description
                                "multi-topology ID.";
                              }
                              leaf bfr-id{
                                      type bfr-id;
                                       description
                                 "BIER bfr identifier.";
                              }
                              leaf frr{
                                      type boolean;
                                      description
                                "Enables BIER FRR.";
                              }
                              leaf bitstringlength{
                                  type bsl;
                        description
                           "imposition";
                                      }
                                      container af {
                                              list ipv4 {
                                                      key "bitstringlength bier-mpls-
label";
                                                      leaf bitstringlength {
                                                              type uint16;
                                                          description
                                                       "BIER bitstringlength.";
                                                      }
                                                      leaf bier-mpls-label{
                                                              type mpls:mpls-label;
                                                          description
                                                     "BIER label.";
                                                      }
                                                      leaf bier-mpls-label-range-
size{
                                                              type uint8;
                                                          description
                                                     "BIER label range.";
                                                      }
                                                      description
                                                              "IPv4 mapping
entries.";
```

```
                                        }
                                        list ipv6 {
                                                key "bitstringlength bier-mpls-
label";
```

```
                                        leaf bitstringlength {
                                                type uint16;
                                            description
                                     "BIER bitstringlength.";
                                                }
                                                leaf bier-mpls-label{
                                                        type mpls:mpls-label;
                                                    description
                                                "BIER label.";
                                                  }
                                                  leaf bier-mpls-label-range-
size{
                                                        type uint8;
                                                    description
                                                "BIER label range.";
                                                  }
                                                  description
                                                        "IPv6 mapping
entries.";
                                        }
                                description
                                  "Bier mapping entries.";
                                }
                        description
                          "Parameters associated with bier sub-domain.";
                        }
                }
        }
        }
     augment "/rt:routing/rt:routing-instance/rt:routing-protocols/"
           + "rt:routing-protocol" {
                description
                        "This augments ospf protocol configuration with bier.";

                container mt-ospf{
            description
                        "Control of bier advertisement and reception.";

                        leaf mt-id{
                                type uint16;
                                description
                                        "Multi-topology associated with bier
sub-domain.";
                        }
                        container bier-global {
                                description
                                        "BIER global config.";
                                leaf enable {
```

```
                    type boolean;
                    default false;
                    description
```

```
                                        "Enables bier protocol
extensions.";
                                }
                                leaf advertise {
                                        type boolean;
                                        default true;
                                        description
                                                "Enable to advertise the
parameters associated with
                                                bier.";
                                }
                                leaf receive {
                                        type boolean;
                                        default true;
                                        description
                                                "Enable to receive the
parameters associated with
                                                bier.";
                                }
                        }
                }
    }

        augment "/rt:routing/rt:routing-instance/rt:routing-protocols/"
           + "rt:routing-protocol" {
                description
                        "This augments ISIS protocol configuration with bier.";
                container mt-isis{
                        description
                                "Control of bier advertisement and reception.";
                        leaf mt-id{
                                type uint16;
                                description
                                        "Multi-topology associated with bier
sub-domain.";
                        }
                        container bier-global {
                                description
                                        "BIER global config.";
                                leaf enable {
                                        type boolean;
                                        default false;
                                        description
                                                "Enables bier protocol
extensions.";
                                }
                                leaf advertise {
                                        type boolean;
```

```
                                        default true;
                                        description
                                                "Enable to advertise the
parameters associated with
                                                bier.";
                                }
```

```
                                leaf receive {
                                        type boolean;
                                        default true;
                                        description
                                                "Enable to receive the
parameters associated with
                                                bier.";
                                }
                        }
                }
    }

         /* Operational  data */
    augment "/rt:routing-state" {
        description
                        "This augments the operational states with bier.";
                container bier-global{
                        leaf bfr-id{
                type bfr-id;
                                description
                                        "BIER BFR ID.";
            }
                        leaf ipv4-bfr-prefix{
                type inet:ipv4-prefix;
                description
                                    "BIER ipv4 prefix.";
            }
                        leaf ipv6-bfr-prefix{
                type inet:ipv6-prefix;
                description
                                    "BIER ipv6 prefix.";
            }
                        list sub-domain {
                                key "sub-domain-id";
                                leaf sub-domain-id {
                                        type sub-domain-id;
                                        description
                                                "sub-domain ID.";
                                }
                                leaf mt-id {
                                        type uint16;
                                        description
                                         "Multi-topology ID";
                                }
                                leaf bfr-id {
                                        type bfr-id;
                                        description
                                                "BIER bfr identifier.";
```

```
}
```

```
                        leaf bitstringlength{
                                type uint16;
                                description
                          "BIER bitstringlength.";
                        }
                        list ipv4 {
                                key "bitstringlength label";
                                leaf bitstringlength {
                                        type uint16;
                                        description
                              "BIER bitstringlength.";
                                }
                                leaf label{
                                        type mpls:mpls-label;
                                        description
                                  "BIER label.";
                                }
                                leaf label-range-size{
                                        type uint8;
                                        description
                                  "BIER label range.";
                                }
                                description
                                        "IPv4 mapping entries.";
                        }
                        list ipv6 {
                                key "bitstringlength label";
                                leaf bitstringlength {
                                        type uint16;
                                        description
                              "BIER bitstringlength.";
                                }
                                leaf label{
                                        type mpls:mpls-label;
                                        description
                                  "BIER label.";
                                }
                                leaf label-range-size{
                                        type uint8;
                                        description
                                  "BIER label range.";
                                }
                                description
                                        "IPv6 mapping entries.";
                        }

                description
                           "Parameters associated with bier sub-
```

```
domain.";
```

```
                }
              description
                 "Parameters associated with bier.";
              }
              container birts{
                      list birt-subdomain{
                              key "sub-domain-id";
                              leaf sub-domain-id{
                                      type sub-domain-id;
                                      description
                                              "BIER sub domain ID";
                              }
                           list birt-bitstringlength {
                key "bitstringlength";
                               leaf bitstringlength{
                                      type uint16;
                                      description
                              "BIER bitstringlength.";
                              }
                              list birt-si {
                                key "si";
                                    leaf si{
                                      type si;
                                      description
                                "BIER set identifier.";
                                }
                                    description
                                      "Query the BIRT based on the key set
identifier & bitstringlength & sub-domain-id.";
                               }
                               description
                                 "Query the BIRT based on the key
bitstringlengt & sub-domain-id.";
                             }
                             description
                               "Query the BIRT based on the key sub-
domain.";
              }

                              leaf f-bm{
                                      type uint16;
                                      description
                                  "BIER Forwarding Bit Mask.";
                              }
                              leaf bier-mpls-in-label{
                                      type mpls:mpls-label;
                   description
                                      "BIER in-label.";
```

```
                }
                leaf bfr-nbr{
                        type inet:ip-address;
```

```
                                    description
                                  "BIER BFR Neighbors.";
                                }
                                leaf bier-mpls-out-label{
                                    type mpls:mpls-label;
                        description
                                       "BIER out-label.";
                                }
                             description
                                "Shows Bit Index Routing Table.";
                             }
                    }


          /* Notifications */
        notification bfr-id-collision{
                    leaf bfr-id{
                            type bfr-id;
                            description
                                    "BIER BFR ID.";
            }
                    description
                            "BFR ID received in the controlplane that caused BFR ID
                            collision.";
        }

        notification bfr-zero{
                    leaf ipv4-bfr-prefix{
                            type inet:ipv4-prefix;
                            description
                                    "BIER ipv4 bfr prefix";
            }
                    leaf ipv6-bfr-prefix{
                            type inet:ipv6-prefix;
                            description
                                    "BIER ipv6 bfr prefix";
            }
                    description
                            "Invalid value associated with prefix";
        }

        notification sub-domain-id-collision{
                    leaf sub-domain-id{
                            type sub-domain-id;
                            description
                                    "BIER sub domain ID";
            }
                    leaf mt-id{
```

```
                        type uint16;
                        description
                                "Multi-topology ID";
        }
                description
                        "Sub domain ID received in the controlplane that
                        caused Sub domain ID collision";
    }

 }
```

8. Security Considerations

TBD.

9. Acknowledgements

We would like to thank IJsbrand Wijnands, and Reshad Rahman for their comments and support of this work.

10. IANA Considerations

This document requires no IANA Actions. Please remove this section before RFC publication.

11. Normative references

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