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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.

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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 ipv4-bfr-prefix?   inet:ipv4-prefix
   |     +--rw ipv6-bfr-prefix?   inet:ipv6-prefix
   |     +--rw sub-domain* [sub-domain-id]
   |        +--rw sub-domain-id      sub-domain-id
   |        +--rw igp-type?          igp-type
   |        +--rw mt-id?             mt-id
   |        +--rw bfr-id?            bfr-id
   |        +--rw bitstringlength?   bsl
   |        +--rw af
   |           +--rw ipv4* [bitstringlength bier-mpls-label-base]
   |           |  +--rw bitstringlength               uint16
   |           |  +--rw bier-mpls-label-base          rt-types:mpls-label
   |           |  +--rw bier-mpls-label-range-size?   bier-mpls-label-range-
size
   |           +--rw ipv6* [bitstringlength bier-mpls-label-base]
   |              +--rw bitstrin+--glength               uint16
```

```
   |              +--rw bier-mpls-label-base          rt-types:mpls-label
```

```
   |              +--rw bier-mpls-label-range-size?   bier-mpls-label-range-
size
   +--ro bier-state
      +---bier-global-state
      |    +--ro encapsulation-type?   identityref
      |    +--ro bitstringlength?      bsl
      |    +--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 igp-type         igp-type
      |    +--ro mt-id?           mt-id
      |    +--ro bfr-id?          bfr-id
      |    +--rw bitstringlength?   bsl
      |    +--ro ipv4* [bitstringlength bier-mpls-label-base]
      |    |  +--ro bitstringlength               uint16
      |    |  +--ro bier-mpls-label-base          rt-types:mpls-label
      |    |  +--ro bier-mpls-label-range-size?   bier-mpls-label-range-size
      |    +--ro ipv6* [bitstringlength bier-mpls-label-base]
      |       +--ro bitstringlength               uint16
      |       +--ro bier-mpls-label-base          rt-types:mpls-label
      |       +--ro bier-mpls-label-range-size?   bier-mpls-label-range-size
      +--ro birts-state
         +--ro birt* [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?    rt-types:mpls-label
                  +--ro bfr-nbr?               inet:ip-address
                  +--ro bier-mpls-out-label?   rt-types:mpls-label

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

  augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
isis:isis:
   +--rw bier-isis-cfg
      +--rw mt-id          mt-id
```

```
+--rw bier-global
   +--rw enable?      boolean
   +--rw advertise?   boolean
```

```
         +--rw receive?     boolean


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 encapsulation type, imposition BitStringLengths, BFR-id, BFR-prefixes, 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 the "/rt:routing/rt:routing-protocols/ rt:routing-protocol/ospf:ospf/ospf:instance:" and "/rt:routing/ rt:routing-protocols/rt:routing-protocol/isis:isis:"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 BIER encapsulation type, BitStringLengths, 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

```
<CODE BEGINS> file "ietf-bier@2018-02-07.yang"
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-routing-types {
      prefix "rt-types";
     }

    import ietf-isis{
      prefix "isis";
     }

    import ietf-ospf  {
      prefix "ospf";
     }

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

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

      WG Chair: Tony Przygienda
                <mailto:tonysietf@gmail.com>

      WG Chair: Greg Shepherd
                <mailto:gjshep@gmail.com>
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        ";
        description
          "The YANG module defines a generic configuration
           model for BIER.";

        revision 2018-02-07{
          description
            "latest revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2017-08-10{
          description
            "02 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";

        }


        revision 2017-01-20{
          description
            "01 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2016-07-23{
          description
            "00 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2016-05-12{
          description
            "04 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2016-03-16 {
```

```
          description
            "03 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2015-12-03 {
          description
            "02 revision";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2015-10-16 {
          description
            "01 revision.";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

        revision 2015-06-22 {
          description
            "Initial revision.";
          reference "RFC XXXX: YANG Data Model for BIER Protocol.";
        }

     /* 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.";
     }

        /*Typedefs*/

        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 mt-id {
  type uint16;
  description
    "The type for multi-topology identifier";
}

typedef bier-mpls-label-range-size{
  type uint8;
  description
        "The type for BIER label range size.";
       }

typedef bsl {
  type enumeration{
        enum 64-bit{
          value 1;
          description
            "bitstringlength is 64";
               }
        enum 128-bit{
          value 2;
          description
                "bitstringlength is 128";
               }
        enum 256-bit{
          value 3;
          description
            "bitstringlength is 256";
               }
        enum 512-bit{
          value 4;
                description
                  "bitstringlength is 512";
               }
        enum 1024-bit{
          value 5;
          description
            "bitstringlength is 1024";
               }
        enum 2048-bit{
          value 6;
          description
```

```
                    "bitstringlength is 2048";
                       }
                 enum 4096-bit{
                   value 7;
                   description
                     "bitstringlength is 4096";
                       }
                }
                 description
                   "The bitstringlength type for imposition mode";
       }

         typedef igp-type {
           type enumeration{
                 enum ISIS{
                   value 1;
                   description
                     "isis protocol";
                       }
                 enum OSPF{
                   value 2;
                   description
                     "ospf protocol";
                       }
                  }
         description
                   "The IGP type";
                 }

        /*grouping*/
          grouping bier-protocol-extensions{
                leaf mt-id{
                  type mt-id;
                  description
                        "Multi-topology associated with bier sub-domain.";
                 }
            container bier-global {
                  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.";
                        }
                  description
                        "BIER global config.";
                }
            description
                  "Defines protocol extensions.";
            }

          grouping bier-parameters{
                leaf encapsulation-type {
                  type identityref {
                    base bier-encapsulation;
                        }
                  default "bier-encapsulation-mpls";
                  description
                        "Dataplane to be used.";
                }
                leaf bitstringlength{
                  type bsl;
                  description
                    "imposition bitstringlength.";
                }
                leaf bfr-id {
                  type bfr-id;
                  description
                        "BIER bfr identifier.";
                }
                leaf ipv4-bfr-prefix {
                  type inet:ipv4-prefix;
                  description
                        "BIER IPv4 prefix.";
                }
                leaf ipv6-bfr-prefix {
                  type  inet:ipv6-prefix;
                  description
                        "BIER IPv6 prefix.";
                }
          description
            " BIER parameters.";
          }
```

```
          grouping bier-mpls-cfg{
```

```
                leaf bitstringlength {
                  type uint16;
                  description
                        "BIER bitstringlength.";
                }
                leaf bier-mpls-label-base{
                  type rt-types:mpls-label;
                  description
                        "BIER label base.";
                }
                leaf bier-mpls-label-range-size{
                  type bier-mpls-label-range-size;
                  description
                        "BIER label range.";
                }
            description
                  "Defines the necessary label ranges per bitstring length.";
            }

      augment "/rt:routing" {
            description
                  "This augments routing-instance configuration with bier.";
            container bier{
                  container bier-global {
                    uses bier-parameters;
                        list sub-domain{
              key "sub-domain-id";
                      leaf sub-domain-id{
                        type sub-domain-id;
                        description
                            "sub-domain ID.";
                       }
                      leaf igp-type {
                        type igp-type;
                        description
                            "IGP type.";
                      }
                     leaf mt-id {
                       type mt-id;
                       description
                           "multi-topology ID.";
                      }
                      leaf bfr-id{
                        type bfr-id;
                        description
                            "BIER bfr identifier.";
                      }
```

```
              leaf bitstringlength{
                                 type bsl;
                                   description
                                         "Disposition bitstringlength.";
                              }

                           container af {
                                 list ipv4 {
                                   key "bitstringlength bier-mpls-label-base";
                                   uses bier-mpls-cfg;

                                   description
                                         "Defines the necessary label ranges per
bitstring length in ipv4.";
                                         }
                                 list ipv6 {
                                   key "bitstringlength bier-mpls-label-base";
                                   uses bier-mpls-cfg;

                                   description
                                     "Defines the necessary label ranges per
bitstring length in ipv6.";
                                         }
                           description
                                 "Bier mapping entries.";
                                 }
            description
              "Denfines subdomain configuration";
                }
                description
                  "BIER global config.";
                }
             description "BIER config.";
            }
       container bier-state{
             config false;
                 description
                   "BIER operational state.";
                 container bier-global-state{
                   config false;
                   uses bier-parameters;
           list sub-domain{
              key "sub-domain-id";
                      leaf sub-domain-id{
                      type sub-domain-id;
                      description
                            "sub-domain ID.";
                    }
```

```
                    leaf igp-type {
                    type igp-type;
```

```
                    description
                         "IGP type.";
                    }
                   leaf mt-id {
                     type mt-id;
                     description
                           "multi-topology ID.";
                    }
                   leaf bfr-id{
                     type bfr-id;
                     description
                           "BIER bfr identifier.";
                   }

            leaf bitstringlength{
                      type bsl;
                          description
                            "Disposition bitstringlength.";
                  }
                         list ipv4 {
                           key "bitstringlength bier-mpls-label-base";
                           uses bier-mpls-cfg;
                             description
                                   "Show the necessary label ranges per
bitstring length in ipv4.";
                                 }
                         list ipv6 {
                           key "bitstringlength bier-mpls-label-base";
                                 uses bier-mpls-cfg;
                                   description
                                         "Show the necessary label ranges per
bitstring length in ipv6.";
                                 }
                         description
              "Denfines subdomain configuration";
                }
            description
                           "Parameters associated with bier.";
                         }

                container birts-state{
                  list birt{
                         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.";
                                        }
                                leaf f-bm{
                                  type uint16;
                                  description
                                        "BIER Forwarding Bit Mask.";
                                                }
                                leaf bier-mpls-in-label{
                                  type rt-types:mpls-label;
                                  description
                                        "BIER in-label.";
                                                }
                                leaf bfr-nbr{
                                  type inet:ip-address;
                                  description
                                  "BIER BFR Neighbors.";
                                                }
                                leaf bier-mpls-out-label{
                                  type rt-types:mpls-label;
                                  description
                                        "BIER out-label.";
                                                }
                           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.";
             }
                  description
                        "Shows Bit Index Routing Table.";
                  }
           }
      }
```

```
     augment "/rt:routing/rt:control-plane-protocols/"
```

```
           + "rt:control-plane-protocol/ospf:ospf/ospf:instance" {
       when "../../rt:type = 'ospf:ospfv2' or
             ../../rt:type = 'ospf:ospfv3'" {
         description
           "This augments the ospf routing protocol when used";
         }
       description
         "This augments ospf protocol configuration with bier.";
                container bier-ospf-cfg{
                  uses bier-protocol-extensions;
          description
                         "Control of bier advertisement and reception.";
                }
      }

     augment "/rt:routing/rt:control-plane-protocols/"
             +"rt:control-plane-protocol/isis:isis"{
       when "/rt:routing/rt:control-plane-protocols/"+
           "rt:control-plane-protocol/rt:type = 'isis:isis'" {
         description
         "This augment ISIS routing protocol when used";
       }
       description
         "This augments ISIS protocol configuration with bier.";
                  container bier-isis-cfg{
            uses bier-protocol-extensions;
                         description
                           "Control of bier advertisement and reception.";

                }
      }




          /* 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";
       }
     }

 <CODE ENDS>
```

8. Security Considerations

TBD.

9. Acknowledgements

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

10. IANA Considerations

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

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