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**A YANG Data Model for Routing in Fat Trees (RIFT)
draft-ietf-rift-yang-01**

Abstract

This document defines a YANG data model for the configuration and management of Routing in Fat Trees (RIFT) Protocol.

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1. Introduction

[I-D.ietf-rift-rift] introduces the protocol definition of RIFT. This document defines a YANG data model that can be used to configure and manage the RIFT protocol. The model is based on YANG 1.1 as defined in [RFC7950] and conforms to the Network Management Datastore Architecture (NDMA) as described in [RFC8342]

1.1. Terminology

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

- o augment
- o container
- o choice
- o data model
- o data node

- o grouping
- o identity
- o leaf
- o leaf-list
- o list
- o module
- o uses

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

RIFT: Routing in Fat Trees [[I-D.ietf-rift-rift](#)].

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]
key-chain	ietf-key-chain	[RFC8177]
rt-types	ietf-routing-types	[RFC8294]
iana-rt-types	iana-routing-types	[RFC8294]

Table 1

2. Design of the Data Model

2.1. Scope of Model

The model covers RIFT [[I-D.ietf-rift-rift](#)].

This model can be used to configure and manage the RIFT 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

This model imports and augments ietf-routing YANG model defined in [[RFC8349](#)]. Both configuration branch and state branch of [[RFC8349](#)] are augmented. The configuration branch covers node base and policy configuration. The container "rift" is the top level container in this data model. The presence of this container is expected to enable RIFT protocol functionality.

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].

2.3. Overview

The RIFT YANG module defined in this document has all the common building blocks for the RIFT protocol.

The RIFT YANG module augments the /routing/control-plane-protocols/control-plane-protocol path defined in the ietf-routing module. The ietf-rift model defines a single instance of RIFT. Multiple instances are instantiated as multiple control-plane protocols instances.

```

module: ietf-rift
augment /rt:routing/rt:control-plane-protocols/rt:control-plane-protocol:
  +--rw rift!
    +--rw node* [name]
      +--rw name                string
      +--ro level?              level
      +--rw system-id           system-id
      +--rw pod?                uint32
      +--rw configured-level?   level
      +--rw overload?           boolean
      +--ro protocol-minor-version uint16
      +--ro hierarchy-indications? enumeration
      +--rw flood-reduction?    boolean
      +--rw nonce-increasing-interval? uint16
      +--rw maximum-nonce-delta? uint8 {nonce-delta-adjust}?
      +--rw rx-lie-multicast-address
      | +--rw ipv4?   inet:ipv4-address
      | +--rw ipv6?   inet:ipv6-address
      +--rw tx-lie-multicast-address
      | +--rw ipv4?   inet:ipv4-address
      | +--rw ipv6?   inet:ipv6-address
      +--rw lie-tx-port?          inet:port-number
      +--rw global-link-capabilities
      | +--rw bfd?                boolean
      | +--rw v4-forwarding-capable? boolean
      +--rw rx-flood-port?       inet:port-number
      +--rw holdtime?            rt-types:timer-value-seconds16
      +--rw tide-generation-interval? rt-types:timer-value-seconds16
      +--rw tie-security-key-id?  uint32
      +--rw interface* [name]
      | +--ro link-id?            linkid-type
      | +--rw name                if:interface-ref

```



```

| +-rw cost?                               uint32
| +-rw advertised-source-addresses
| | +-rw ipv4?   inet:ipv4-address
| | +-rw ipv6?   inet:ipv6-address
| +-ro direction-type?                     enumeration
| +-ro was-the-last-lie-accepted?          boolean
| +-ro last-lie-reject-reason?            string
| +-ro advertised-in-lies
| | +-ro you-are-flood-repeater?          boolean
| | +-ro not-a-ztp-offer?                 boolean
| | +-ro you-are-sending-too-quickly?    boolean
| +-rw link-capabilities
| | +-rw bfd?                             boolean
| | +-rw v4-forwarding-capable?          boolean
| +-ro state                               enumeration
| +-ro neighbor
| | +-ro name?                            string
| | +-ro level?                           level
| | +-ro system-id                        system-id
| | +-ro pod?                             uint32
| | +-ro protocol-version?               uint16
| | +-ro address-families
| | | +-ro address-family* [address-family]
| | | | +-ro address-family   iana-rt-types:address-family
| | +-ro received-source-addresses
| | | +-ro ipv4?   inet:ipv4-address
| | | +-ro ipv6?   inet:ipv6-address
| | +-ro remote-id?                       uint32
| | +-ro cost?                             uint32
| | +-ro bandwidth?                       uint32
| | +-ro flood-reduction?                 boolean
| | +-ro sent-offer
| | | +-ro level?                         level
| | | +-ro not-a-ztp-offer?              boolean
| | +-ro received-offer
| | | +-ro level?                         level
| | | +-ro not-a-ztp-offer?              boolean
| | | +-ro best?                         boolean
| | | +-ro removed-from-consideration?   boolean
| | | +-ro removal-reason?               string
| | +-ro received-link-capabilities
| | | +-ro bfd?                           boolean
| | | +-ro v4-forwarding-capable?        boolean
| | +-ro received-in-lies
| | | +-ro you-are-flood-repeater?       boolean
| | | +-ro not-a-ztp-offer?              boolean
| | | +-ro you-are-sending-too-quickly?  boolean
| | +-ro tx-flood-port?                   inet:port-number

```



```

|     +--ro bfd-up?                               boolean
|     +--ro outer-security-key-id?               uint8
+--ro miscabled-links*                           linkid-type
+--rw (algorithm-type)?
|  +--:(spf)
|  +--:(all-path)
+--ro hal?                                       level
+--rw instance-label?                            uint32
+--ro database
|  +--ro ties* [direction-type originator tie-type tie-number]
|     +--ro direction-type                       enumeration
|     +--ro originator                           system-id
|     +--ro tie-type                             enumeration
|     +--ro tie-number                           uint32
|     +--ro seq?                                 uint64
|     +--ro origination-time?                    uint32
|     +--ro origination-lifetime?                uint32
|     +--ro node
|         |  +--ro name?                          string
|         |  +--ro level?                         level
|         |  +--ro system-id                       system-id
|         |  +--ro pod?                            uint32
|         |  +--ro flood-reduction?               boolean
|         |  +--ro overload?                       boolean
|         |  +--ro startup-time?                   uint64
|         |  +--ro neighbors* [system-id]
|         |      |  +--ro name?                     string
|         |      |  +--ro level?                     level
|         |      |  +--ro system-id                   system-id
|         |      |  +--ro pod?                         uint32
|         |      |  +--ro address-families
|         |      |      |  +--ro address-family* [address-family]
|         |      |      |      +--ro address-family  iana-rt-types:address-family
|         |      |  +--ro received-source-addresses
|         |      |      |  +--ro ipv4?               inet:ipv4-address
|         |      |      |  +--ro ipv6?               inet:ipv6-address
|         |      |      |  +--ro remote-id?           uint32
|         |      |      |  +--ro cost?                 uint32
|         |      |      |  +--ro bandwidth?           uint32
|         |      |      |  +--ro flood-reduction?     boolean
|         |      |      |  +--ro sent-offer
|         |      |      |      |  +--ro level?         level
|         |      |      |      |  +--ro not-a-ztp-offer?  boolean
|         |      |      |  +--ro received-offer
|         |      |      |      |  +--ro level?         level
|         |      |      |      |  +--ro not-a-ztp-offer?  boolean
|         |      |      |      |  +--ro best?           boolean
|         |      |      |      |  +--ro removed-from-consideration?  boolean

```



```

|   | | | +--ro removal-reason?          string
|   | | +--ro received-link-capabilities
|   | | | +--ro bfd?                    boolean
|   | | | +--ro v4-forwarding-capable?  boolean
|   | | +--ro received-in-lies
|   | | | +--ro you-are-flood-repeater?  boolean
|   | | | +--ro not-a-ztp-offer?         boolean
|   | | | +--ro you-are-sending-too-quickly?  boolean
|   | | +--ro tx-flood-port?            inet:port-number
|   | | +--ro bfd-up?                   boolean
|   | | +--ro outer-security-key-id?    uint8
|   | +--ro miscabled-links*  linkid-type
+--ro prefix
|   +--ro prefix?          inet:ip-prefix
|   +--ro (type)?
|   | +--:(prefix)
|   | +--:(positive-disaggregation)
|   | +--:(negative-disaggregation)
|   | +--:(external)
|   | +--:(positive-external-disaggregation)
|   | +--:(pgp)
|   +--ro metric?          uint32
|   +--ro tags*           uint64
|   +--ro monotonic-clock
|   | +--ro prefix-sequence-type
|   | | +--ro timestamp      ieee802-1as-timestamp-type
|   | | +--ro transaction-id?  uint8
|   +--ro loopback?       boolean
|   +--ro directly-attached?  boolean
|   +--ro from-link?      linkid-type
+--ro kv-store
|   +--ro kvs* [kvs-index]
|   | +--ro kvs-index      uint32
|   | +--ro kvs-tie
|   | | +--ro direction-type?  enumeration
|   | | +--ro originator?     system-id
|   | | +--ro tie-type?       enumeration
|   | | +--ro tie-number?     uint32
|   | | +--ro seq?            uint64
|   | | +--ro origination-time?  uint32
|   | | +--ro origination-lifetime?  uint32
|   | +--ro key-value
|   | | +--ro key?           uint16
|   | | +--ro value?        uint32

```

notifications:

```

+---n error-set
|   +--ro tie-level-error

```



```

| +--ro direction-type?      enumeration
| +--ro originator?         system-id
| +--ro tie-type?           enumeration
| +--ro tie-number?         uint32
| +--ro seq?                uint64
| +--ro origination-time?   uint32
| +--ro origination-lifetime? uint32
+--ro neighbor-error
  +--ro neighbor* [system-id]
    +--ro name?              string
    +--ro level?             level
    +--ro system-id          system-id
    +--ro pod?               uint32
    +--ro protocol-version?  uint16
    +--ro address-families
      | +--ro address-family* [address-family]
      |   +--ro address-family  iana-rt-types:address-family
    +--ro received-source-addresses
      | +--ro ipv4?  inet:ipv4-address
      | +--ro ipv6?  inet:ipv6-address
    +--ro remote-id?          uint32
    +--ro cost?               uint32
    +--ro bandwidth?         uint32
    +--ro flood-reduction?    boolean
    +--ro sent-offer
      | +--ro level?          level
      | +--ro not-a-ztp-offer? boolean
    +--ro received-offer
      | +--ro level?          level
      | +--ro not-a-ztp-offer? boolean
      | +--ro best?           boolean
      | +--ro removed-from-consideration? boolean
      | +--ro removal-reason? string
    +--ro received-link-capabilities
      | +--ro bfd?            boolean
      | +--ro v4-forwarding-capable? boolean
    +--ro received-in-lies
      | +--ro you-are-flood-repeater?    boolean
      | +--ro not-a-ztp-offer?           boolean
      | +--ro you-are-sending-too-quickly? boolean
    +--ro tx-flood-port?  inet:port-number
    +--ro bfd-up?         boolean
    +--ro outer-security-key-id? uint8

```


[2.4.](#) RIFT configuration

The configuration data nodes cover node configuration attributes. RIFT configurations require node base information configurations. Some features can be used to enhance protocol, such as BFD, flooding-reducing, community attribute.

[2.5.](#) RIFT State

The state data nodes include node, neighbor, database and kv-store information.

[2.6.](#) Notifications

Unexpected TIE and neighbor's layer error should be notified.

[3.](#) RIFT YANG model

This module references [[I-D.ietf-rift-rift](#)], [[RFC5881](#)], [[RFC6991](#)], [[RFC8177](#)], [[RFC8294](#)], [[RFC8343](#)], [[RFC8349](#)], [[RFC8505](#)].

```
<CODE BEGINS> file "ietf-rift@2020-07-11.yang"
module ietf-rift {

  yang-version 1.1;

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

  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-routing-types {
```



```
    prefix "rt-types";
    reference
      "RFC 8294: Common YANG Data Types for the Routing Area";
  }
```

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

```
organization
  "IETF RIFT (Routing In Fat Trees) Working Group";
```

```
contact
  "WG Web: <http://tools.ietf.org/wg/rift/>
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  Editor: Xufeng Liu
         <mailto:Xufeng\_Liu@jabil.com>;
```

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

```
description
  "The module defines the YANG definitions for Routing in Fat
  Trees (RIFT)."
```

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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 2020-07-11 {
  description "Initial revision.";
  reference "RFC XXXX: A YANG Data Model for RIFT.";
}

/*
 * Features
 */

feature nonce-delta-adjust {
  description
    "Support weak nonce delta adjusting which is used in security
    in section 4.4.";
}

typedef system-id {
  type string {
    pattern
      '[0-9A-Fa-f]{4}\.[0-9A-Fa-f]{4}\.[0-9A-Fa-f]{4}\.[0-9A-Fa-f]{4}';
  }
  description
    "This type defines RIFT system id using pattern,
    the system id looks like: 0143.0438.0100.AeF0";
}

typedef level {
  type uint8 {
    range "0 .. 24";
  }
  default "0";
  description "The value of node level. The max value is 24.";
}

typedef linkid-type {
  type uint32;
  description "This type defines the link id of an interface.";
}
```



```
typedef ieee802-1as-timestamp-type {
  type uint64;
  description
    "Timestamp per 802.1AS. It is advertised with prefix to
    achieve mobility as described in section 4.3.3.";
}

/*
 * Identity
 */
identity rift {
  base rt:routing-protocol;
  description "Identity for the RIFT routing protocol.";
}

/*
 * Groupings
 */

grouping base-node-info {
  leaf name {
    type string;
    description
      "The name of this node. It won't be used as the key of node,
      just used for description.";
  }
  leaf level {
    type level;
    config false;
    description "The level of this node.";
  }
  leaf system-id {
    type system-id;
    mandatory true;
    description
      "Each node is identified via a system-id which is 64 bits
      wide.";
  }
  leaf pod {
    type uint32;
    description
      "Point of Delivery. The self-contained vertical slice of a
      Clos or Fat Tree network containing normally only level 0 and
      level 1 nodes. It communicates with nodes in other PoDs via
      the spine. We number PoDs to distinguish them and use PoD #0
      to denote 'undefined' PoD.";
  }
  description "The base information of a node.";
}
```



```
} // base-node-info

grouping node-flag {
  leaf overload {
    type boolean;
    description "If the overload bit in TIEs can be set.";
  }
  description "The node flag information.";
}

grouping link-capabilities {
  leaf bfd {
    type boolean;
    description
      "If this value is set to true, it means that
      BFD [RFC5881] function is enabled on the neighbor.";
  }
  leaf v4-forwarding-capable {
    type boolean;
    description
      "If this value is set to true, it means that
      the neighbor supports v4 forwarding.";
  }
  description "The features of neighbor.";
} // link-capabilities

grouping addresses {
  leaf ipv4 {
    type inet:ipv4-address;
    description "IPv4 address to be used.";
  }
  leaf ipv6 {
    type inet:ipv6-address;
    description "IPv6 address to be used.";
  }
  description "IPv4 or IPv6 address to be used.";
}

grouping lie-elements{
  leaf you-are-flood-repeater {
    type boolean;
    description
      "If the neighbor on this link is flooding repeater
      described in section 4.2.3.9. When this value is set
      to true, the value can be carried in exchanged
      packet.";
  }
  leaf not-a-ztp-offer {
```



```
    type boolean;
    description
      "As described in section 4.2.7. When this value is
      set to true, the flag can be carried in the LIE
      packet. When the value received in the LIE from
      neighbor, it indicates the level on the LIE MUST
      NOT be used to derive a ZTP level by the receiving
      node.";
  }
  leaf you-are-sending-too-quickly {
    type boolean;
    description
      "Can be optionally set to indicate to neighbor that
      packet losses are seen on reception based on packet
      numbers or the rate is too high. The receiver SHOULD
      temporarily slow down flooding rates. When this value
      is set to true, the flag can be carried in packet.";
  }
  description "The elements set in the LIEs.";
} // lie-elements

grouping neighbor {
  container address-families {
    list address-family {
      key address-family;
      leaf address-family {
        type iana-rt-types:address-family;
        description
          "Indication which address families are up on the
          interface.";
      }
    }
  }
  container received-source-addresses {
    uses addresses;
    description
      "The source address of LIE and TIE packets from
      the neighbor.";
  }
  leaf remote-id {
    type uint32;
    description "The remote-id to reach this neighbor.";
  }
  leaf cost {
    type uint32;
    description "The cost value advertised by the neighbor.";
  }
  leaf bandwidth {
```



```
    type uint32;
    description
      "Total bits bandwidth to neighbor, this will be
      normally sum of the bandwidths of all the
      parallel links.";
  }
  leaf flood-reduction {
    type boolean;
    description
      "If this neighbor enables the flood reduction function.";
  }
  container sent-offer {
    leaf level {
      type level;
      description
        "The level value.";
    }
    leaf not-a-ztp-offer {
      type boolean;
      description
        "If the neighbor needs to be offer a level.";
    }
  }
  description
    "The level sent to the neighbor in case the neighbor
    needs to be offered.";
}
container received-offer {
  leaf level {
    type level;
    description
      "The level value.";
  }
  leaf not-a-ztp-offer {
    type boolean;
    description
      "If this interface needs to be offered a level.";
  }
  leaf best {
    type boolean;
    description
      "If level is the best level received from all
      the neighbors.";
  }
  leaf removed-from-consideration {
    type boolean;
    description
      "If the level value is considered to be used. If the
      value is not considered to be used, this value is set
```



```
        to 'TRUE.';
    }
    leaf removal-reason {
        type string;
        description
            "The reason why this value is not considered to be used.";
    }
    description
        "The level offered to the interface from the neighbor.
        And if the level value is considered to be used.";
}
container received-link-capabilities {
    uses link-capabilities;
    description
        "The link capabilities advertised by the neighbor.";
}
container received-in-lies {
    uses lie-elements;
    description "The attributes received from this neighbor.";
}
leaf tx-flood-port {
    type inet:port-number;
    default "915";
    description
        "The UDP port which is used by the neighbor to flood TIEs.";
}
leaf bfd-up {
    type boolean;
    description
        "Indication whether the link is protected by established
        BFD session.";
}
leaf outer-security-key-id {
    type uint8;
    description
        "As described in section 4.4.3, the received security
        key id from the neighbor.";
}
description "The neighbor information.";
} // neighbor

grouping direction-type {
    leaf direction-type {
        config false;
        type enumeration {
            enum illegal {
                description "Illegal direction.";
            }
        }
    }
}
```



```
    enum south {
      description "A link to a node one level down.";
    }
    enum north {
      description "A link to a node one level up.";
    }
    enum east-west {
      description "A link to a node in the same level.";
    }
    enum max {
      description "The max value of direction.";
    }
  }
  description "The type of a link.";
}
description "The type of a link.";
} // direction-type

grouping tie-header {
  uses direction-type;
  leaf originator {
    type system-id;
    description "The originator's system-id of this TIE.";
  }
}

leaf tie-type {
  type enumeration {
    enum "node" {
      description "The node TIE.";
    }
    enum "prefix" {
      description "The prefix TIE.";
    }
    enum "positive-disaggregation-prefix" {
      description "The positive disaggregation prefix TIE.";
    }
    enum "negative-disaggregation-prefix" {
      description "The negative disaggregation prefix TIE.";
    }
    enum "pgp-prefix" {
      description "The policy guide prefix TIE.";
    }
    enum "key-value" {
      description "The key value TIE.";
    }
    enum "external-prefix" {
      description "The external prefix TIE.";
    }
  }
}
```



```
        enum "positive-external-disaggregation-prefix" {
            description
                "The positive external disaggregation prefix TIE.";
        }
    }
    description "The types of TIE.";
}

leaf tie-number {
    type uint32;
    description "The number of this TIE";
}

leaf seq {
    type uint64;
    description
        "As described in section 4.2.3.1, the sequence number
        of a TIE.";
}

leaf origination-time {
    type uint32;
    description
        "Absolute timestamp when the TIE was generated. This can
        be used on fabrics with synchronized clock to prevent
        lifetime modification attacks.";
}

leaf origination-lifetime {
    type uint32;
    description
        "Original lifetime when the TIE was generated.
        This can be used on fabrics with synchronized clock to
        prevent lifetime modification attacks.";
}

description
    "TIE is the acronym for 'Topology Information Element'.
    TIEs are exchanged between RIFT nodes to describe parts
    of a network such as links and address prefixes.
    This is the TIE header information.";
} // tie-header

/*
 * Data nodes
 */
augment "/rt:routing/rt:control-plane-protocols"
    + "/rt:control-plane-protocol" {
    when "rt:type = 'rift:rft'" {
        description
```



```
    "This augment is only valid when routing protocol
      instance type is 'RIFT'.";
  }
description "RIFT ( Routing in Fat Trees ) YANG model.";

container rift {
  presence "Container for RIFT protocol.";
  description "RIFT configuration data.";

  list node {
    description "The node information about RIFT.";

    key "name";
    uses base-node-info;
    leaf configured-level {
      type level;
      description
        "The configured level value of this node.";
    }
    uses node-flag;

    leaf protocol-minor-version {
      config false;
      type uint16;
      mandatory true;
      description
        "Represents protocol encoding schema minor version.";
    }
  }
  leaf hierarchy-indications {
    config false;
    type enumeration {
      enum "leaf-only" {
        description
          "The node will never leave the
            'bottom of the hierarchy'.";
      }
      enum "leaf-only-and-leaf-2-leaf-procedures" {
        description "This means leaf to leaf.";
      }
      enum "top-of-fabric" {
        description "The node is 'top of fabric'.";
      }
    }
    description "The hierarchy indications of this node.";
  }
}

leaf flood-reduction {
  type boolean;
```



```
    description
      "If the node supports flood reduction function defined in
      section 4.2.3.8. If this value is set to 'FALSE', it means
      that the flood reduction function is disabled.";
  }

  leaf nonce-increasing-interval {
    type uint16;
    units seconds;
    description
      "The configurable nonce increasing interval.";
  }

  leaf maximum-nonce-delta {
    if-feature nonce-delta-adjust;
    type uint8 {
      range "1..5";
    }
    description
      "The configurable valid nonce delta value used for security.
      It is used as vulnerability window defined in section 4.4.7.
      If the nonces in received packet exceeds the range indicated
      by this value, the packet MUST be discarded.";
  }

  container rx-lie-multicast-address {
    uses addresses;
    description
      "The configurable LIE receiving IPv4/IPv6 multicast
      address. '224.0.0.120' is default address value.
      Different multicast addresses can be used for receiving
      and sending.";
  }

  container tx-lie-multicast-address {
    uses addresses;
    description
      "The configurable LIE sending IPv4/IPv6 multicast
      address. 'FF02::A1F7' is default address value.
      Different multicast addresses can be used for receiving
      and sending.";
  }

  leaf lie-tx-port {
    type inet:port-number;
    description
      "The UDP port of LIE packet sending. The default port
      number is 914. The value can be set to other value
      associated with different RIFT instance.";
  }

  /*leaf lie-ipv4-multicast-address {
    type rt-types:ipv4-multicast-group-address;
```



```
    default "224.0.0.120";
    description "The configurable LIE IPv4 multicast address.";
}
leaf lie-ipv6-multicast-address {
    type rt-types:ipv6-multicast-group-address;
    default "FF02::A1F7";
    description "The configurable LIE IPv6 multicast address.";
}*/

container global-link-capabilities {
    uses link-capabilities;
    description
        "The node default link capabilities. It can be overwrite
        by the configuration underneath interface and neighbor.";
}

leaf rx-flood-port {
    type inet:port-number;
    default "915";
    description
        "The UDP port which can be used to receive flooded
        TIEs. The default port number is 915. The value can
        be set to other value associated with different
        RIFT instance.";
}

leaf holdtime {
    type rt-types:timer-value-seconds16;
    units seconds;
    default "3";
    description "The holding time of LIE.";
}

leaf tide-generation-interval {
    type rt-types:timer-value-seconds16;
    units seconds;
    default "5";
    description "The TIDE generation interval.";
}

leaf tie-security-key-id {
    type uint32;
    description
        "As described in section 4.4.3, this value implies key
        type and algorithm. Value 0 means that no valid
        fingerprint was computed. This key ID scope is local
        to the nodes on both ends of the adjacency.";
}

list interface {
```



```
key "name";
leaf link-id {
  config false;
  type linkid-type;
  description "The local id of this interface.";
}
leaf name {
  type if:interface-ref;
  description "The interface's name.";
}
leaf cost {
  type uint32;
  description "The cost from this interface to the neighbor.";
}

container advertised-source-addresses {
  uses addresses;
  description
    "The address used in the advertised LIE and TIE packets.";
}
uses direction-type;

leaf was-the-last-lie-accepted {
  config false;
  type boolean;
  description
    "If the most recently received LIE was accepted or
    rejected. If the LIE was rejected, the neighbor error
    notifications should be used to find the reason.";
}
leaf last-lie-reject-reason {
  config false;
  type string;
  description
    "Description for the reject reason of the last LIE.";
}
container advertised-in-lies {
  config false;
  uses lie-elements;
  description
    "The attributes advertised in the LIEs from
    this interface.";
}
container link-capabilities {
  uses link-capabilities;
  description
    "The interface's link capabilities.";
}
```



```
leaf state {
  config false;
  mandatory true;
  type enumeration {
    enum "OneWay" {
      description "The initial state of neighbor.";
    }
    enum "TwoWay" {
      description "This means leaf to leaf.";
    }
    enum "ThreeWay" {
      description "The node is 'top of fabric'.";
    }
    enum "Multiple-Neighbors-Wait" {
      description "The node is 'top of fabric'.";
    }
  }
  description "The hierarchy indications of this node.";
}
container neighbor {
  config false;
  uses base-node-info;
  leaf protocol-version {
    type uint16;
    description
      "Represents the protocol encoding schema version of
      this neighbor.";
  }
  uses neighbor;
  description "The neighbor's information.";
} // container neighbor
description "The interface information on this node.";
} // list interface

leaf-list miscabled-links {
  config false;
  type linkid-type;
  description "List of miscabled links.";
}

choice algorithm-type {
  case spf {
    description "The algorithm is SPF.";
  }
  case all-path {
    description "The algorithm is all-path.";
  }
}
description "The possible algorithm types.";
```



```
}

leaf hal {
  type level;
  config false;
  description
    "The highest defined level value seen from all valid level
    offers received.";
}

leaf instance-label {
  type uint32;
  description
    "As per section 4.3.7, a locally significant, downstream
    assigned, interface specific label may be advertised in
    its LIEs. This value can be used to distinguish among
    multiple RIFT instances.";
}

container database {
  config false;
  list ties {
    key "direction-type originator tie-type tie-number";
    uses tie-header;

    container node {
      uses base-node-info;
      leaf flood-reduction {
        type boolean;
        description
          "If the node enable the flood reduction function.";
      }
      uses node-flag;
      leaf startup-time {
        type uint64;
        description "Startup time of the node.";
      }
    }
    list neighbors {
      key "system-id";
      uses base-node-info;
      uses neighbor;
      description "The node TIE information of a neighbor.";
    }
  }

  leaf-list miscabled-links {
    config false;
    type linkid-type;
    description "List of miscabled links.";
  }
}
```



```
    }
    description "The node element information in this TIE.";
  }

  container prefix {
    leaf prefix {
      type inet:ip-prefix;
      description "The prefix information.";
    }

    choice type {
      case prefix {
        description "It is the prefixes TIE element.";
      }
      case positive-disaggregation {
        description
          "It is the positive disaggregation prefixes
          TIE element.";
      }
      case negative-disaggregation {
        description
          "It is the negative disaggregation prefixes
          TIE element.";
      }
      case external {
        description
          "It is the external prefixes TIE element.";
      }
      case positive-external-disaggregation {
        description
          "It is the positive external disaggregation
          prefixes TIE element.";
      }
      case pgp {
        description
          "It is the policy guide prefixes TIE element.";
      }
    }
    description "The type of prefix TIE.";
  }

  leaf metric {
    type uint32;
    description "The metric of this prefix.";
  }
  leaf-list tags {
    type uint64;
    description "The tags of this prefix.";
  }
}
```



```
container monotonic-clock {
  container prefix-sequence-type {
    leaf timestamp {
      mandatory true;
      type ieee802-1as-timestamp-type;
      description
        "The timestamp per 802.1AS can be advertised
         with the desired prefix North TIEs.";
    }
    leaf transaction-id {
      type uint8;
      description
        "As per RFC 8505, a sequence number called a
         Transaction ID (TID) with a prefix can be
         advertised.";
    }
    description
      "As described in section 4.3.3, the prefix sequence
       attribute which can be advertised for mobility.";
  }
  description "The monotonic clock for mobile addresses.";
}
leaf loopback {
  type boolean;
  description
    "Indicates if the interface is a node loopback.
     According to section 4.3.10, the node's loopback
     address can be injected into North and South
     Prefix TIEs for node reachability.";
}
leaf directly-attached {
  type boolean;
  description
    "Indicates that the prefix is directly attached,
     i.e. should be routed to even if the node is
     in overload.";
}
leaf from-link {
  type linkid-type;
  description
    "In case of locally originated prefixes,
     i.e. interface addresses this can describe which
     link the address belongs to.";
}
description "The detail information of a prefix.";
}
}
description "The TIEs information in database.";
```



```
    }// container database

    container kv-store {
        config false;
        list kvs {
            key "kvs-index";
            leaf kvs-index {
                type uint32;
                description "The index of a kv pair.";
            }

            container kvs-tie {
                uses tie-header;
                container key-value {
                    leaf key {
                        type uint16;
                        description "The type of key value combination.";
                    }
                    leaf value {
                        type uint32;
                        description "The value of key value combination.";
                    }
                }
                description "The key-value store information.";
            }
            description "The TIEs in the kv-store.";
        }
        description
            "The information used to distinguish a Key/Value pair.
            When the type of kv is set to 'node', node-element is
            making sense. When the type of kv is set to other values
            except 'node', prefix-info is making sense.";
    }
    description "The Key/Value store information.";
} // container kv-store
} // rift
} // augment

/*
 * Notifications
 */
notification error-set {
    description "The errors notification of RIFT.";
    container tie-level-error {
        uses tie-header;
        description "The level is undefined in the LIEs.";
    }
    container neighbor-error {
```



```
list neighbor {
  key "system-id";
  uses base-node-info;
  leaf protocol-version {
    type uint16;
    description
      "Represents the protocol encoding schema version of
       this neighbor.";
  }

  uses neighbor;
  description "The information of a neighbor.";
}
description "The neighbor errors set.";
}
}
}
<CODE ENDS>
```

4. Security Considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [[RFC6242](#)]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [[RFC8446](#)].

The 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. Writable data node represent configuration of each instance, node, interface, etc. These correspond to the following schema nodes:

- o /rift
- o /rift/node/

Modifying the configuration may cause all the RIFT neighborhood to be rebuilt. For example, the configuration changing of level or systemid, will lead to all the neighbor connections of this node rebuilt. The incorrect modification of authentication, except for the neighbor connection broken, will lead to the permanent connection broken. The modification of interface, will lead to the neighbor state changing. In general, unauthorized modification of most RIFT configurations will pose their own set of security risks and the "Security Considerations" in the respective reference RFCs should be consulted.

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 are the subtrees and data nodes and their sensitivity/vulnerability:

- o /rift
- o /rift/interface
- o /rift/database
- o /rift/kv-store

The exposure of the database will expose the detailed topology of the network. Network operators may consider their topologies to be sensitive confidential data.

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

5. IANA Considerations

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

This document registers a URI in the IETF XML registry [[RFC3688](#)]. Following the format in [[RFC3688](#)], the following registration is requested to be made:

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

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-rift

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

prefix: rift

reference: RFC XXXX

6. Contributors

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