

TEAS Working Group
Internet-Draft
Intended status: Standards Track
Expires: May 2, 2018

V. Beeram
Juniper Networks
T. Saad, Ed.
R. Gandhi
Cisco Systems, Inc.
X. Liu
Jabil
I. Bryskin
Huawei Technologies
H. Shah
Ciena
October 29, 2017

A YANG Data Model for RSVP-TE
[draft-ietf-teas-yang-rsvp-te-02](#)

Abstract

This document defines a YANG data model for the configuration and management of RSVP (Resource Reservation Protocol) to establish Traffic-Engineered (TE) Label-Switched Paths (LSPs) for MPLS (Multi-Protocol Label Switching) and other technologies.

The model defines a generic RSVP-TE module for signaling LSPs that is technology agnostic. The generic RSVP-TE module is to be augmented by technology specific RSVP-TE modules that define technology specific data. This document defines the augmentation for RSVP-TE MPLS LSPs model.

This model covers data for the configuration, operational state, remote procedural calls, and event notifications.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on May 2, 2018.

Copyright Notice

Copyright (c) 2017 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1. Introduction	2
1.1. Terminology	3
1.2. Tree Diagram	3
1.3. Prefixes in Data Node Names	4
2. Design Considerations	5
2.1. Module Hierarchy	5
2.2. State Data Organization	5
2.3. RSVP-TE Generic Model	6
2.3.1. Tree Diagram	6
2.3.2. YANG Module	14
2.4. RSVP-TE MPLS Model	25
2.4.1. Tree Diagram	26
2.4.2. YANG Module	28
3. IANA Considerations	40
4. Security Considerations	41
5. Acknowledgement	41
6. Contributors	41
7. References	42
7.1. Normative References	42
7.2. Informative References	43
Authors' Addresses	43

[1. Introduction](#)

YANG [[RFC6020](#)] is a data definition language that was introduced to define the contents of a conceptual data store that allows networked devices to be managed using NETCONF [[RFC6241](#)]. YANG is proving relevant beyond its initial confines, as bindings to other interfaces (e.g. REST) and encoding other than XML (e.g. JSON) are being

Beeram, et al.

Expires May 2, 2018

[Page 2]

defined. Furthermore, YANG data models can be used as the basis of implementation for other interfaces, such as CLI and programmatic APIs.

This document defines a generic YANG data model for configuring and managing RSVP-TE LSP(s) [RFC3209]. The RSVP-TE generic model augments the RSVP base and extended models defined in [[I-D.ietf-teas-yang-rsvp](#)], and adds TE extensions to the RSVP protocol [[RFC2205](#)] model configuration and state data. The technology specific RSVP-TE models augment the generic RSVP-TE model with additional technology specific parameters. For example, this document also defines the MPLS RSVP-TE model for configuring and managing MPLS RSVP TE LSP(s).

In addition to augmenting the RSVP YANG module, the modules defined in this document augment the TE Interfaces, Tunnels and LSP(s) YANG module defined in [[I-D.ietf-teas-yang-te](#)] to define additional parameters to enable signaling for RSVP-TE.

[1.1. Terminology](#)

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [BCP 14](#), [RFC 2119](#) [[RFC2119](#)].

[1.2. Tree Diagram](#)

A simplified graphical representation of the data model is presented in each section of the model. The following notations are used for the YANG model data tree representation.


```
<status> <flags> <name> <opts> <type>

<status> is one of:
+ for current
x for deprecated
o for obsolete

<flags> is one of:
rw for read-write configuration data
ro for read-only non-configuration data
-x for execution rpcs
-n for notifications

<name> is the name of the node
```

If the node is augmented into the tree from another module, its name is printed as <prefix>:<name>

```
<opts> is one of:
? for an optional leaf or node
! for a presence container
* for a leaf-list or list
Brackets [<keys>] for a list's keys
Curly braces {<condition>} for optional feature that make node
conditional
Colon : for marking case nodes
Ellipses (...) subtree contents not shown
```

Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").

<type> is the name of the type for leafs and leaf-lists.

1.3. Prefixes in Data Node Names

In this document, names of data nodes and other data model objects are prefixed using the standard prefix associated with the corresponding YANG imported modules, as shown in Table 1.

Prefix	YANG module	Reference
yang	ietf-yang-types	[RFC6991]
inet	ietf-inet-types	[RFC6991]
te	ietf-te	this document
te-types	ietf-te-types	this document
te-mpls-types	ietf-te-mpls-types	this document
te-dev	ietf-te-device	this document
te-mpls	ietf-te-mpls	this document
te-sr-mpls	ietf-te-sr-mpls	this document

Table 1: Prefixes and corresponding YANG modules

[2.](#) Design Considerations

[2.1.](#) Module Hierarchy

The data pertaining to RSVP-TE in this document is divided into two modules: a technology agnostic RSVP-TE module that holds generic parameters for RSVP-TE applicable to all technologies, and a technology specific RSVP-TE module (e.g. for MPLS RSVP-TE) that holds parameters specific to the technology.

This document defines YANG data models for RSVP-TE, and RSVP-TE MPLS configuration, state, notification and RPCs. The relationship between the different modules is depicted in Figure 1.

[2.2.](#) State Data Organization

The Network Management Datastore Architecture (NMDA) [[I-D.dsdt-nmda-guidelines](#)] addresses the "OpState" that was discussed in the IETF. As per NMDA guidelines for new models and models that are not concerned with the operational state of configuration information, this revision of the draft adopts the NMDA proposal for configuration and state data of this model.

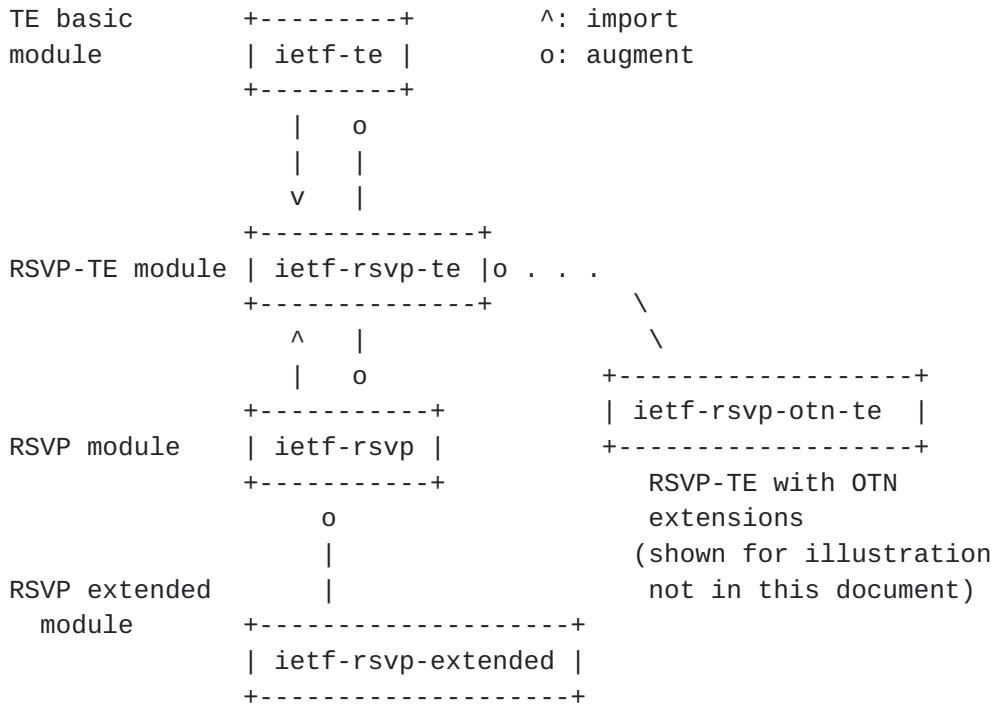


Figure 1: Relationship of RSVP and RSVP-TE modules with other protocol modules

[2.3. RSVP-TE Generic Model](#)

The RSVP-TE generic module augments the RSVP base and extended YANG modules defined in [[I-D.ietf-teas-yang-rsvp](#)] as well as the TE tunnels and interfaces module [[I-D.ietf-teas-yang-te](#)] to cover parameters specific to the configuration and management of RSVP-TE interfaces, tunnels and LSP(s).

[2.3.1. Tree Diagram](#)

There are three types of configuration and state data nodes in this module:

- o those augmenting or extending the base RSVP module
- o those augmenting or extending the base TE module
- o those that are specific to the RSVP-TE module

Below is a YANG tree representation for data items defined in the RSVP-TE generic module:

```
module: ietf-rsvp-te
  augment
```

Beeram, et al.

Expires May 2, 2018

[Page 6]

```
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:globals:
  +-rw global-soft-preemption!
    +-rw soft-preemption-timeout?  uint16
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:interfaces:
  +-rw rsvp-te-interface-attributes
    +-ro state
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:interfaces/rsvp:interface:
  +-rw rsvp-te-interface-attributes
    +-ro state
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:globals/rsvp:sessions/rsvp:session/rsvp:state/
rsvp:psbs/rsvp:psb:
  +-ro tspec-average-rate?  rt-types:bandwidth-ieee-float32
  +-ro tspec-size?          rt-types:bandwidth-ieee-float32
  +-ro tspec-peak-rate?     rt-types:bandwidth-ieee-float32
  +-ro min-policed-unit?   uint32
  +-ro max-packet-size?    uint32
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:globals/rsvp:sessions/rsvp:session/rsvp:state/
rsvp:rsbs/rsvp:rsb:
  +-ro fspec-average-rate?  rt-types:bandwidth-ieee-float32
  +-ro fspec-size?          rt-types:bandwidth-ieee-float32
  +-ro fspec-peak-rate?     rt-types:bandwidth-ieee-float32
  +-ro min-policed-unit?   uint32
  +-ro max-packet-size?    uint32
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:neighbors:
augment /te:te/te:tunnels/te:tunnel:
  +-rw lsp-signaled-name?      string
  +-rw local-recording-desired? boolean
  +-rw se-style-desired?       boolean
  +-rw path-reevaluation-request? boolean
  +-rw soft-preemption-desired? boolean
  +-rw lsp-rerouting?          enumeration
  +-rw lsp-integrity-required? boolean
  +-rw lsp-contiguous?         boolean
  +-rw lsp-stitching-desired?  boolean
  +-rw lsp-preplanned?         boolean
  +-rw lsp-oob-mapping?        boolean
  +-rw retry-timer?            uint16
```

Beeram, et al.

Expires May 2, 2018

[Page 7]

```
augment /te:te/te:tunnels/te:tunnel/te:state:  
  +-ro lsp-signaled-name?          string  
  +-ro local-recording-desired?   boolean  
  +-ro se-style-desired?          boolean  
  +-ro path-reevaluation-request? boolean  
  +-ro soft-preemption-desired?   boolean  
  +-ro lsp-rerouting?             enumeration  
  +-ro lsp-integrity-required?    boolean  
  +-ro lsp-contiguous?            boolean  
  +-ro lsp-stitching-desired?    boolean  
  +-ro lsp-preplanned?           boolean  
  +-ro lsp-oob-mapping?          boolean  
  +-ro retry-timer?              uint16  
augment /te:te/te:lsp-state/te:lsp:  
  +-ro associated-rsvp-session?      ->  
  /rt:routing/control-plane-protocols/control-plane-protocol/  
  rsvp:rsvp/globals/sessions/session/local-index  
  +-ro lsp-signaled-name?          string  
  +-ro local-recording-desired?   boolean  
  +-ro se-style-desired?          boolean  
  +-ro path-reevaluation-request? boolean  
  +-ro soft-preemption-desired?   boolean  
  +-ro lsp-rerouting?             enumeration  
  +-ro lsp-integrity-required?    boolean  
  +-ro lsp-contiguous?            boolean  
  +-ro lsp-stitching-desired?    boolean  
  +-ro lsp-preplanned?           boolean  
  +-ro lsp-oob-mapping?          boolean  
  +-ro explicit-route-objects  
  |  +-ro incoming-explicit-route-hop* [index]  
  |  |  +-ro index     -> ../state/index  
  |  |  +-ro state  
  |  |    +-ro index?        uint32  
  |  |    +-ro (type)?  
  |  |      +---(numbered)  
  |  |      |  +-ro numbered-hop  
  |  |      |    +-ro address?    te-types:te-tp-id  
  |  |      |    +-ro hop-type?  te-hop-type  
  |  |      +---(as-number)  
  |  |      |  +-ro as-number-hop  
  |  |      |    +-ro as-number?  binary  
  |  |      |    +-ro hop-type?  te-hop-type  
  |  |      +---(unnumbered)  
  |  |      |  +-ro unnumbered-hop  
  |  |      |    +-ro node-id?    te-types:te-node-id  
  |  |      |    +-ro link-tp-id?  te-types:te-tp-id  
  |  |      |    +-ro hop-type?  te-hop-type  
  |  |      +---(label)
```

Beeram, et al.

Expires May 2, 2018

[Page 8]

```
| | |   +-+ro label-hop
| | |   |   +-+ro value?    rt-types:generalized-label
| | |   +-+:sid)
| | |   |   +-+ro sid-hop
| | |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro outgoing-explicit-route-hop* [index]
| | |   +-+ro index      -> ../state/index
| | |   +-+ro state
| | |   |   +-+ro index?          uint32
| | |   |   +-+ro (type)?
| | |   |   +-+:numbered)
| | |   |   |   +-+ro numbered-hop
| | |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:as-number)
| | |   |   |   +-+ro as-number-hop
| | |   |   |   +-+ro as-number?  binary
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:unnumbered)
| | |   |   |   +-+ro unnumbered-hop
| | |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:label)
| | |   |   |   +-+ro label-hop
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   +-+:sid)
| | |   |   |   +-+ro sid-hop
| | |   |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro incoming-record-route-subobjects
| | |   |   +-+ro incoming-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
| | |   |   |   +-+ro index?          uint32
| | |   |   |   +-+ro (type)?
| | |   |   |   +-+:numbered)
| | |   |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   |   +-+ro ip-flags?  binary
| | |   |   |   +-+:unnumbered)
| | |   |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+:label)
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   |   |   +-+ro label-flags?  binary
| | |   +-+ro outgoing-record-route-subobjects
| | |   |   +-+ro outgoing-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
```

Beeram, et al.

Expires May 2, 2018

[Page 9]

```
    +-+ro index?          uint32
    +-+ro (type)?
      +--+:(numbered)
        |  +-+ro address?      te-types:te-tp-id
        |  +-+ro ip-flags?     binary
      +--+:(unnumbered)
        |  +-+ro node-id?      te-types:te-node-id
        |  +-+ro link-tp-id?   te-types:te-tp-id
      +--+:(label)
        +-+ro value?          rt-types:generalized-label
        +-+ro label-flags?    binary

augment
/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths/te:p2p-primary-path/
te:state/te:lsp/te:lsp:
  +-+ro associated-rsvp-session?          ->
  /rt:routing/control-plane-protocols/control-plane-protocol/
  rsvp:rsvp/globals/sessions/session/local-index
  +-+ro lsp-signaled-name?                string
  +-+ro local-recording-desired?         boolean
  +-+ro se-style-desired?                boolean
  +-+ro path-reevaluation-request?       boolean
  +-+ro soft-preemption-desired?        boolean
  +-+ro lsp-rerouting?                  enumeration
  +-+ro lsp-integrity-required?         boolean
  +-+ro lsp-contiguous?                 boolean
  +-+ro lsp-stitching-desired?         boolean
  +-+ro lsp-preplanned?                boolean
  +-+ro lsp-oob-mapping?               boolean
  +-+ro explicit-route-objects
    |  +-+ro incoming-explicit-route-hop* [index]
    |  |  +-+ro index      -> ../state/index
    |  |  +-+ro state
    |  |    +-+ro index?      uint32
    |  |    +-+ro (type)?
    |  |      +--+:(numbered)
    |  |        |  +-+ro numbered-hop
    |  |        |  +-+ro address?      te-types:te-tp-id
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(as-number)
    |  |        |  +-+ro as-number-hop
    |  |        |  +-+ro as-number?    binary
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(unnumbered)
    |  |        |  +-+ro unnumbered-hop
    |  |        |  +-+ro node-id?      te-types:te-node-id
    |  |        |  +-+ro link-tp-id?   te-types:te-tp-id
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(label)
```

Beeram, et al.

Expires May 2, 2018

[Page 10]

```
| | |   +-+ro label-hop
| | |   |   +-+ro value?    rt-types:generalized-label
| | |   +-+:sid)
| | |   |   +-+ro sid-hop
| | |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro outgoing-explicit-route-hop* [index]
| | |   +-+ro index      -> ../state/index
| | |   +-+ro state
| | |   |   +-+ro index?          uint32
| | |   |   +-+ro (type)?
| | |   |   +-+:numbered)
| | |   |   |   +-+ro numbered-hop
| | |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:as-number)
| | |   |   |   +-+ro as-number-hop
| | |   |   |   +-+ro as-number?  binary
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:unnumbered)
| | |   |   |   +-+ro unnumbered-hop
| | |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:label)
| | |   |   |   +-+ro label-hop
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   +-+:sid)
| | |   |   |   +-+ro sid-hop
| | |   |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro incoming-record-route-subobjects
| | |   |   +-+ro incoming-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
| | |   |   |   +-+ro index?          uint32
| | |   |   |   +-+ro (type)?
| | |   |   |   +-+:numbered)
| | |   |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   |   +-+ro ip-flags?  binary
| | |   |   |   +-+:unnumbered)
| | |   |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+:label)
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   |   |   +-+ro label-flags?  binary
| | |   +-+ro outgoing-record-route-subobjects
| | |   |   +-+ro outgoing-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
```

Beeram, et al.

Expires May 2, 2018

[Page 11]

```
    +-+ro index?          uint32
    +-+ro (type)?
      +--+:(numbered)
        |  +-+ro address?      te-types:te-tp-id
        |  +-+ro ip-flags?     binary
      +--+:(unnumbered)
        |  +-+ro node-id?      te-types:te-node-id
        |  +-+ro link-tp-id?   te-types:te-tp-id
      +--+:(label)
        +-+ro value?          rt-types:generalized-label
        +-+ro label-flags?    binary

augment
/telco-te/telco-tunnels/telco-tunnel/telco-p2p-secondary-paths/
telco-p2p-secondary-path/telco-state/telco-lsps/telco-lsp:
  +-+ro associated-rsvp-session?           ->
  /rt:routing/control-plane-protocols/control-plane-protocol/
  rsvp:rsvp/globals/sessions/session/local-index
  +-+ro lsp-signaled-name?                string
  +-+ro local-recording-desired?         boolean
  +-+ro se-style-desired?                boolean
  +-+ro path-reevaluation-request?       boolean
  +-+ro soft-preemption-desired?        boolean
  +-+ro lsp-rerouting?                  enumeration
  +-+ro lsp-integrity-required?         boolean
  +-+ro lsp-contiguous?                 boolean
  +-+ro lsp-stitching-desired?         boolean
  +-+ro lsp-preplanned?                boolean
  +-+ro lsp-oob-mapping?               boolean
  +-+ro explicit-route-objects
    |  +-+ro incoming-explicit-route-hop* [index]
    |  |  +-+ro index      -> ../state/index
    |  |  +-+ro state
    |  |    +-+ro index?      uint32
    |  |    +-+ro (type)?
    |  |      +--+:(numbered)
    |  |        |  +-+ro numbered-hop
    |  |        |  +-+ro address?      te-types:te-tp-id
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(as-number)
    |  |        |  +-+ro as-number-hop
    |  |        |  +-+ro as-number?    binary
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(unnumbered)
    |  |        |  +-+ro unnumbered-hop
    |  |        |  +-+ro node-id?      te-types:te-node-id
    |  |        |  +-+ro link-tp-id?   te-types:te-tp-id
    |  |        |  +-+ro hop-type?    te-hop-type
    |  |      +--+:(label)
```

Beeram, et al.

Expires May 2, 2018

[Page 12]

```
| | |   +-+ro label-hop
| | |   |   +-+ro value?    rt-types:generalized-label
| | |   +-+:sid)
| | |   |   +-+ro sid-hop
| | |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro outgoing-explicit-route-hop* [index]
| | |   +-+ro index      -> ../state/index
| | |   +-+ro state
| | |   |   +-+ro index?          uint32
| | |   |   +-+ro (type)?
| | |   |   +-+:numbered)
| | |   |   |   +-+ro numbered-hop
| | |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:as-number)
| | |   |   |   +-+ro as-number-hop
| | |   |   |   +-+ro as-number?  binary
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:unnumbered)
| | |   |   |   +-+ro unnumbered-hop
| | |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+ro hop-type?  te-hop-type
| | |   |   +-+:label)
| | |   |   |   +-+ro label-hop
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   +-+:sid)
| | |   |   |   +-+ro sid-hop
| | |   |   |   |   +-+ro sid?    rt-types:generalized-label
| | |   +-+ro incoming-record-route-subobjects
| | |   |   +-+ro incoming-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
| | |   |   |   +-+ro index?          uint32
| | |   |   |   +-+ro (type)?
| | |   |   |   +-+:numbered)
| | |   |   |   |   +-+ro address?    te-types:te-tp-id
| | |   |   |   |   +-+ro ip-flags?  binary
| | |   |   |   +-+:unnumbered)
| | |   |   |   |   +-+ro node-id?    te-types:te-node-id
| | |   |   |   |   +-+ro link-tp-id?  te-types:te-tp-id
| | |   |   |   +-+:label)
| | |   |   |   |   +-+ro value?    rt-types:generalized-label
| | |   |   |   |   +-+ro label-flags?  binary
| | |   +-+ro outgoing-record-route-subobjects
| | |   |   +-+ro outgoing-record-route-subobject* [index]
| | |   |   +-+ro index      -> ../state/index
| | |   |   +-+ro state
```

Beeram, et al.

Expires May 2, 2018

[Page 13]

```

    +-+ro index?          uint32
    +-+ro (type)?
      +--+(numbered)
      |  +-+ro address?    te-types:te-tp-id
      |  +-+ro ip-flags?   binary
      +--+(unnumbered)
      |  +-+ro node-id?    te-types:te-node-id
      |  +-+ro link-tp-id? te-types:te-tp-id
      +--+(label)
        +-+ro value?       rt-types:generalized-label
        +-+ro label-flags?  binary
augment /te:te/te-dev:interfaces/te-dev:interface:

```

Figure 2: RSVP-TE model Tree diagram

2.3.2. YANG Module

```

<CODE BEGINS> file "ietf-rsvp-te@2017-10-29.yang"
module ietf-rsvp-te {

  namespace "urn:ietf:params:xml:ns:yang:ietf-rsvp-te";

  prefix "rsvp-te";

  import ietf-rsvp {
    prefix rsvp;
  }

  import ietf-routing {
    prefix "rt";
  }

  import ietf-routing-types {
    prefix rt-types;
  }

  import ietf-te {
    prefix te;
  }

  import ietf-te-device {
    prefix te-dev;
  }

  /* Import TE generic types */
  import ietf-te-types {
    prefix te-types;
  }
}

```

Beeram, et al.

Expires May 2, 2018

[Page 14]

```
organization
  "IETF Traffic Engineering Architecture and Signaling (TEAS)
   Working Group";

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

  WG Chair: Lou Berger
             <mailto:lberger@labn.net>

  WG Chair: Vishnu Pavan Beeram
             <mailto:vbeeram@juniper.net>

  Editor:   Vishnu Pavan Beeram
             <mailto:vbeeram@juniper.net>

  Editor:   Tarek Saad
             <mailto:tsaad@cisco.com>

  Editor:   Rakesh Gandhi
             <mailto:rgandhi@cisco.com>

  Editor:   Himanshu Shah
             <mailto:hshah@ciena.com>

  Editor:   Xufeng Liu
             <mailto:xliu@kuatrotech.com>

  Editor:   Xia Chen
             <mailto:jescia.chenxia@huawei.com>

  Editor:   Raqib Jones
             <mailto:raqib@Brocade.com>

  Editor:   Bin Wen
             <mailto:Bin_Wen@cable.comcast.com>";

description
  "This module contains the RSVP-TE YANG generic data model.";

revision "2017-10-29" {
  description "Latest revision to RSVP-TE generic YANG module";
  reference "RFC2205, RFC3209, etc.";
}
```

/**

Beeram, et al.

Expires May 2, 2018

[Page 15]

```
* RSVP-TE LSPs groupings.  
*/  
  
grouping lsp-record-route-information_state {  
    description "recorded route information grouping";  
    container incoming-record-route-subobjects {  
        description "RSVP recorded route object incoming information";  
        list incoming-record-route-subobject {  
            when ".../te:origin-type != 'ingress'" {  
                description "Applicable on non-ingress LSPs only";  
            }  
            key "index";  
            description  
                "List of RSVP Path record-route objects";  
            leaf index {  
                type leafref {  
                    path "../state/index";  
                }  
                description "RRO subobject index";  
            }  
            container state {  
                config false;  
                description  
                    "State parameters for the record route hop";  
                uses te-types:record-route-subobject_state;  
            }  
        }  
    }  
    container outgoing-record-route-subobjects {  
        description "RSVP recorded route object outgoing information";  
        list outgoing-record-route-subobject {  
            when ".../te:origin-type != 'egress'" {  
                description "Applicable on non-egress LSPs only";  
            }  
            key "index";  
            description  
                "List of RSVP Resv record-route objects";  
            leaf index {  
                type leafref {  
                    path "../state/index";  
                }  
                description "RRO subobject index";  
            }  
            container state {  
                config false;  
                description  
                    "State parameters for the record route hop";  
                uses te-types:record-route-subobject_state;  
            }  
        }  
    }  
}
```

Beeram, et al.

Expires May 2, 2018

[Page 16]

```
        }
    }
}

grouping lsp-explicit-route-information_state {
    description "RSVP-TE LSP explicit-route information";
    container explicit-route-objects {
        description "Explicit route object information";
        list incoming-explicit-route-hop {
            when ".../te:origin-type != 'ingress'" {
                description "Applicable on non-ingress LSPs only";
            }
            key "index";
            description
                "List of incoming RSVP Path explicit-route objects";
            leaf index {
                type leafref {
                    path ".../state/index";
                }
                description "ERO subobject index";
            }
            container state {
                config false;
                description
                    "State parameters for the explicit route hop";
                uses te-types:explicit-route-hop_config;
            }
        }
        list outgoing-explicit-route-hop {
            when ".../te:origin-type != 'egress'" {
                description "Applicable on non-egress LSPs only";
            }
            key "index";
            description
                "List of outgoing RSVP Path explicit-route objects";
            leaf index {
                type leafref {
                    path ".../state/index";
                }
                description "ERO subobject index";
            }
            container state {
                config false;
                description
                    "State parameters for the explicit route hop";
                uses te-types:explicit-route-hop_config;
            }
        }
    }
}
```

Beeram, et al.

Expires May 2, 2018

[Page 17]

```
        }
```

```
    }
```

```
}
```

```
grouping lsp-attributes-flags_config {
```

```
    description
```

```
        "Configuration parameters relating to RSVP-TE LSP
```

```
        attribute flags";
```

```
leaf lsp-rerouting {
```

```
    type enumeration {
```

```
        enum end-to-end-routing {
```

```
            description
```

```
                "End-to-end routing desired";
```

```
                reference "RFC4920, RFC5420";
```

```
        }
```

```
        enum boundary-rerouting {
```

```
            description
```

```
                "Boundary rerouting desired";
```

```
                reference "RFC4920, RFC5420";
```

```
        }
```

```
        enum segment-based-rerouting {
```

```
            description
```

```
                "Segment-based rerouting desired";
```

```
                reference "RFC4920, RFC5420";
```

```
        }
```

```
    }
```

```
    description "LSP rerouting types";
```

```
}
```

```
leaf lsp-integrity-required {
```

```
    type boolean;
```

```
    description "LSP integrity desired";
```

```
    reference "RFC4875";
```

```
}
```

```
leaf lsp-contiguous {
```

```
    type boolean;
```

```
    description "Contiguous LSP";
```

```
    reference "RFC5151";
```

```
}
```

```
leaf lsp-stitching-desired {
```

```
    type boolean;
```

```
    description "Stitched LSP";
```

```
    reference "RFC5150";
```

```
}
```

```
leaf lsp-preplanned {
```

```
    type boolean;
```

```
    description "Preplanned LSP";
```

```
    reference "RFC6001";
```

```
}
```

Beeram, et al.

Expires May 2, 2018

[Page 18]

```
leaf lsp-oob-mapping {
    type boolean;
    description
        "Mapping is done out-of-band";
    reference "RFC6511";
}
}

grouping lsp-session-attributes-obj-flags_config {
    description
        "Configuration parameters relating to RSVP-TE LSP
         session attribute flags";
    reference
        "RFC4859: Registry for RSVP-TE Session Flags";
leaf local-recording-desired {
    type boolean;
    description "Path recording is desired.";
    reference "RFC3209";
}
leaf se-style-desired {
    type boolean;
    description "SE Style desired";
    reference "RFC3209";
}
leaf path-reevaluation-request {
    type boolean;
    description "Path re-evaluation request";
    reference "RFC4736";
}
leaf soft-preemption-desired {
    type boolean;
    description "Soft-preemption is desired";
    reference "RFC5712";
}
}

grouping lsp-properties_config {
    description
        "Configuration parameters relating to RSVP-TE LSP
         session attribute flags";
    leaf lsp-signaled-name {
        type string;
        description
            "Sets the session name to use in the session
             attribute object.";
    }
    uses lsp-session-attributes-obj-flags_config;
    uses lsp-attributes-flags_config;
```

Beeram, et al.

Expires May 2, 2018

[Page 19]

```
}

grouping tunnel-properties_config {
    description "RSVP-TE Tunnel properties grouping";
    leaf retry-timer {
        type uint16 {
            range 1..600;
        }
        units seconds;
        description
            "sets the time between attempts to establish the
             LSP";
    }
}

/** End of RSVP-TE LSP groupings **/


/**
 * RSVP-TE generic global properties.
 */

grouping global-soft-preemption_config {
    description
        "Configuration for global RSVP-TE soft preemption";
    leaf soft-preemption-timeout {
        type uint16 {
            range 0..300;
        }
        default 0;
        description
            "Timeout value for soft preemption to revert
             to hard preemption";
    }
}

grouping global-soft-preemption {
    description
        "Top level group for RSVP-TE soft-preemption";
    container global-soft-preemption {
        presence "Enables soft preemption on a node.";
        description
            "Top level container for RSVP-TE soft-preemption";
        uses global-soft-preemption_config;
    }
}
/** End of RSVP-TE generic global properties. **/


/**
```

Beeram, et al.

Expires May 2, 2018

[Page 20]

```
* RSVP-TE interface generic groupings.  
*/  
  
grouping rsvp-te-interface-attributes {  
    description  
        "Top level grouping for RSVP-TE interface properties.";  
    container rsvp-te-interface-attributes {  
        description  
            "Top level container for RSVP-TE interface  
            properties";  
        container state {  
            config false;  
            description  
                "State information associated with RSVP-TE  
                bandwidth";  
        }  
    }  
}  
}/* End of RSVP-TE generic groupings ***/  
  
/* RSVP-TE global properties */  
augment "/rt:routing/rt:control-plane-protocols/"  
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:globals" {  
    description  
        "RSVP-TE augmentation to RSVP globals";  
    uses global-soft-preemption;  
}  
  
/* Linkage to the base RSVP all links */  
augment "/rt:routing/rt:control-plane-protocols/"  
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:interfaces" {  
    description  
        "RSVP-TE generic data augmentation pertaining to interfaces";  
    uses rsvp-te-interface-attributes;  
}  
  
/* Linkage to per RSVP interface */  
augment "/rt:routing/rt:control-plane-protocols/"  
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:interfaces/" +  
"rsvp:interface" {  
    description  
        "RSVP-TE generic data augmentation pertaining to specific  
        interface";  
    uses rsvp-te-interface-attributes;  
}  
  
/* add augmentation for sessions and neighbors */
```

Beeram, et al.

Expires May 2, 2018

[Page 21]

```
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:globals/"
+ "rsvp:sessions/rsvp:session/rsvp:state/rsvp:psbs/rsvp:psb" {
    description
        "RSVP-TE generic data augmentation pertaining to session";
    /* To be added */
    leaf tspec-average-rate {
        type rt-types:bandwidth-ieee-float32;
        units "Bytes per second";
        description "Tspec Token Bucket Average Rate";
        reference "RFC2210: RSVP with INTSERV";
    }
    leaf tspec-size {
        type rt-types:bandwidth-ieee-float32;
        units "Bytes per second";
        description "Tspec Token Bucket Burst Rate";
        reference "RFC2210";
    }
    leaf tspec-peak-rate {
        type rt-types:bandwidth-ieee-float32;
        units "Bytes per second";
        description "Tspec Token Bucket Peak Data Rate";
        reference "RFC2210";
    }
    leaf min-policed-unit {
        type uint32;
        description "Tspec Minimum Policed Unit";
        reference "RFC2210";
    }
    leaf max-packet-size {
        type uint32;
        description "Tspec Maximum Packet Size";
        reference "RFC2210";
    }
}
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:globals/"
+ "rsvp:sessions/rsvp:session/rsvp:state/rsvp:rsbs/rsvp:rsb" {
    description
        "RSVP-TE generic data augmentation pertaining to session";
    leaf fspec-average-rate {
        type rt-types:bandwidth-ieee-float32;
        units "Bytes per second";
        description "Fspec Token Bucket Average Rate";
        reference "RFC2210";
    }
    leaf fspec-size {
        type rt-types:bandwidth-ieee-float32;
```

Beeram, et al.

Expires May 2, 2018

[Page 22]

```
units "Bytes per second";
description "Fspec Token Bucket Burst Rate";
reference "RFC2210";
}
leaf fspec-peak-rate {
    type rt-types:bandwidth-ieee-float32;
    units "Bytes per second";
    description "Fspec Token Bucket Peak Data Rate";
    reference "RFC2210";
}
leaf min-policed-unit {
    type uint32;
    description "Fspec Minimum Policed Unit";
    reference "RFC2210";
}
leaf max-packet-size {
    type uint32;
    description "Fspec Maximum Packet Size";
    reference "RFC2210";
}
}

augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:neighbors" {
    description
        "RSVP-TE generic data augmentation pertaining to neighbors";
    /* To be added */
}

/***
 * RSVP-TE generic augmentations of generic TE model.
 */

/* TE tunnel augmentation */
augment "/te:te/te:tunnels/te:tunnel" {
    when "/te:te/te:tunnels/te:tunnel" +
        "/te:p2p-primary-paths/te:p2p-primary-path" +
        "/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
            description
                "When the path signaling protocol is RSVP-TE ";
        }
    description
        "RSVP-TE generic data augmentation pertaining to TE tunnels";
    uses lsp-properties_config;
    uses tunnel-properties_config;
}
augment "/te:te/te:tunnels/te:tunnel/te:state" {
```

Beeram, et al.

Expires May 2, 2018

[Page 23]

```
when "/te:te/te:tunnels/te:tunnel" +
    "/te:p2p-primary-paths/te:p2p-primary-path" +
    "/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
    description
        "When the path signaling protocol is RSVP-TE ";
}
description
    "RSVP-TE generic data augmentation pertaining to TE tunnels";
uses lsp-properties_config;
uses tunnel-properties_config;
}

/* TE LSP augmentation */
grouping rsvp-te-lsp-properties {
    description "RSVP-TE LSP properties grouping";
    leaf associated-rsvp-session {
        type leafref {
            path "/rt:routing/rt:control-plane-protocols/"
                + "rt:control-plane-protocol/rsvp:rsvp/rsvp:globals/"
                + "rsvp:sessions/rsvp:session/rsvp:local-index";
        }
        description
            "If the signalling protocol specified for this path is
            RSVP-TE, this leaf provides a reference to the associated
            session within the RSVP-TE protocol sessions list, such
            that details of the signaling can be retrieved.";
    }
    uses lsp-properties_config;
    uses lsp-explicit-route-information_state;
    uses lsp-record-route-information_state;
}

augment "/te:te/te:lsps-state/te:lsp" {
    when "/te:te/te:lsps-state/te:lsp" +
        "/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
        description
            "When the signaling protocol is RSVP-TE ";
    }
    description
        "RSVP-TE generic data augmentation pertaining to specific TE
        LSP";
    uses rsvp-te-lsp-properties;
}

augment "/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths" +
    "/te:p2p-primary-path/te:state/te:lsps/te:lsp" {
    when "/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths" +
```

Beeram, et al.

Expires May 2, 2018

[Page 24]

```

"/te:p2p-primary-path/te:state/te:lsp" +
"/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
description
"When the signaling protocol is RSVP-TE ";
}
description
"RSVP-TE generic data augmentation pertaining to specific TE
LSP";
uses rsvp-te-lsp-properties;
}

augment "/te:te/te:tunnels/te:tunnel/te:p2p-secondary-paths" +
"/te:p2p-secondary-path/te:state/te:lsp" {
when "/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths" +
"/te:p2p-primary-path/te:state/te:lsp" +
"/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
description
"When the signaling protocol is RSVP-TE ";
}
description
"RSVP-TE generic data augmentation pertaining to specific TE
LSP";
uses rsvp-te-lsp-properties;
}

/* TE interface augmentation */
augment "/te:te/te-dev:interfaces/te-dev:interface" {
description
"RSVP-TE generic data augmentation pertaining to specific TE
interface";
}
}

<CODE ENDS>

```

Figure 3: RSVP TE generic YANG module

2.4. RSVP-TE MPLS Model

The MPLS RSVP-TE YANG module augments the RSVP-TE generic module with parameters to configure and manage signaling of MPLS RSVP-TE LSPs. RSVP-TE YANG modules for other dataplane technologies (e.g. OTN or WDM) are outside the scope of this document and are defined in other documents.

Beeram, et al.

Expires May 2, 2018

[Page 25]

[2.4.1. Tree Diagram](#)

The following are possible types of configuration and state data nodes in this module:

- o those augmenting or extending the generic RSVP-TE module
- o those augmenting or extending the TE module
- o those that are specific to the RSVP-TE MPLS module

Below is a YANG tree representation for data items defined in the RSVP-TE MPLS module:

```
module: ietf-rsvp-te-mpls
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp:
  +-rw fast-reroute-local-revertive
    +-rw rsvp-frr-local-revert-delay?  uint32
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:interfaces:
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:interfaces/rsvp:interface:
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:globals/rsvp:sessions/rsvp:session/rsvp:state:
augment
/rt:routing/rt:control-plane-protocols/rt:control-plane-protocol/
rsvp:rsvp/rsvp:neighbors:
augment /te:te/te:tunnels/te:tunnel:
  +-rw local-protection-desired?      empty
  +-rw bandwidth-protection-desired?  empty
  +-rw node-protection-desired?       empty
  +-rw non-php-desired?              empty
  +-rw entropy-label-cap?           empty
  +-rw oam-mep-entities-desired?     empty
  +-rw oam-mip-entities-desired?     empty
augment /te:te/te:lsp:lsps-state/te:lsp:
  +-ro state
  |  +-ro local-protection-desired?  empty
  |  +-ro bandwidth-protection-desired?  empty
  |  +-ro node-protection-desired?  empty
  |  +-ro non-php-desired?        empty
  |  +-ro entropy-label-cap?      empty
  |  +-ro oam-mep-entities-desired?  empty
```

Beeram, et al.

Expires May 2, 2018

[Page 26]

```
|  +-+ro oam-mip-entities-desired?      empty
++-ro backup-info
    +-+ro state
        +-+ro backup-tunnel-name?          string
        +-+ro backup-frr-on?              uint8
        +-+ro backup-protected-lsp-num?   uint32
augment
/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths/te:p2p-primary-path/
te:state/te:lsp/te:lsp:
    +-+ro state
    |  +-+ro local-protection-desired?  empty
    |  +-+ro bandwidth-protection-desired? empty
    |  +-+ro node-protection-desired?    empty
    |  +-+ro non-php-desired?           empty
    |  +-+ro entropy-label-cap?        empty
    |  +-+ro oam-mep-entities-desired?  empty
    |  +-+ro oam-mip-entities-desired?  empty
    +-+ro backup-info
        +-+ro state
            +-+ro backup-tunnel-name?          string
            +-+ro backup-frr-on?              uint8
            +-+ro backup-protected-lsp-num?   uint32
augment
/te:te/te:tunnels/te:tunnel/te:p2p-secondary-paths/
te:p2p-secondary-path/te:state/te:lsp/te:lsp:
    +-+ro state
    |  +-+ro local-protection-desired?  empty
    |  +-+ro bandwidth-protection-desired? empty
    |  +-+ro node-protection-desired?    empty
    |  +-+ro non-php-desired?           empty
    |  +-+ro entropy-label-cap?        empty
    |  +-+ro oam-mep-entities-desired?  empty
    |  +-+ro oam-mip-entities-desired?  empty
    +-+ro backup-info
        +-+ro state
            +-+ro backup-tunnel-name?          string
            +-+ro backup-frr-on?              uint8
            +-+ro backup-protected-lsp-num?   uint32
augment /te:te/te-dev:interfaces/te-dev:interface:
    +-+rw bandwidth-mpls-reservable
        +-+rw (bandwidth-value)?
            |  +-+:(absolute)
            |  |  +-+rw absolute-value?  uint32
            |  +-+:(percentage)
            |  |  +-+rw percent-value?  uint32
        +-+rw (bc-model-type)?
            +-+:(bc-model-rdm)
            |  +-+rw bc-model-rdm
```

Beeram, et al.

Expires May 2, 2018

[Page 27]

```

|      +-+rw bandwidth-mpls-constraints
|          +-+rw maximum-reservable?    uint32
|          +-+rw bc-value*           uint32
+--:(bc-model-mam)
|  +-+rw bc-model-mam
|      +-+rw bandwidth-mpls-constraints
|          +-+rw maximum-reservable?    uint32
|          +-+rw bc-value*           uint32
+--:(bc-model-mar)
|  +-+rw bc-model-mar
|      +-+rw bandwidth-mpls-constraints
|          +-+rw maximum-reservable?    uint32
|          +-+rw bc-value*           uint32
augment /te:te/te-dev:interfaces/te-dev:interface:
  +-+rw rsvp-te-frr-backups
    +-+rw (type)?
      +--+:(static-tunnel)
      |  +-+rw static-backups
      |      +-+rw static-backup* [backup-tunnel-name]
      |          +-+rw backup-tunnel-name    ->
      /te:te/tunnels/tunnel/name
      +--+:(auto-tunnel)
        +-+rw auto-tunnel-backups
          +-+rw auto-backup-protection?      identityref
          +-+rw auto-backup-path-computation?  identityref

```

Figure 4: RSVP-TE MPLS Tree diagram

2.4.2. YANG Module

```

<CODE BEGINS> file "ietf-rsvp-te-mpls@2017-10-29.yang"
module ietf-rsvp-te-mpls {

  namespace "urn:ietf:params:xml:ns:yang:ietf-rsvp-te-mpls";

  prefix "rsvp-te-mpls";

  import ietf-rsvp {
    prefix "rsvp";
  }

  import ietf-routing {
    prefix "rt";
  }

  import ietf-te-mpls-types {
    prefix "te-mpls-types";
  }
}

```

Beeram, et al.

Expires May 2, 2018

[Page 28]

```
import ietf-te-types {
    prefix "te-types";
}

import ietf-te {
    prefix "te";
}

import ietf-te-device {
    prefix "te-dev";
}

organization
    "IETF Traffic Engineering Architecture and Signaling (TEAS)
     Working Group";

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

     WG Chair: Lou Berger
                 <mailto:lberger@labn.net>

     WG Chair: Vishnu Pavan Beeram
                 <mailto:vbeeram@juniper.net>

     Editor: Vishnu Pavan Beeram
              <mailto:vbeeram@juniper.net>

     Editor: Tarek Saad
              <mailto:tsaad@cisco.com>

     Editor: Rakesh Gandhi
              <mailto:rgandhi@cisco.com>

     Editor: Himanshu Shah
              <mailto:hshah@ciena.com>

     Editor: Xufeng Liu
              <mailto:xliu@kuatrotech.com>

     Editor: Xia Chen
              <mailto:jescia.chenxia@huawei.com>

     Editor: Raqib Jones
              <mailto:raqib@Brocade.com>

     Editor: Bin Wen
```

Beeram, et al.

Expires May 2, 2018

[Page 29]

```
<mailto:Bin_Wen@cable.comcast.com>";

description
  "Latest update to MPLS RSVP-TE YANG data model./";

revision "2017-10-29" {
  description "Update to MPLS RSVP-TE YANG initial revision.";
  reference "RFC3209, RFC6511, RFC6790, RFC7260, RFC4859, RFC4090";
}

/* RSVP-TE MPLS LSPs groupings */
grouping lsp-attributes-flags-mpls_config {
  description
    "Configuration parameters relating to RSVP-TE MPLS LSP
     attribute flags";
  leaf non-php-desired {
    type empty;
    description
      "Non-PHP is desired";
    reference "RFC6511";
  }
  leaf entropy-label-cap {
    type empty;
    description "Entropy label capability";
    reference "RFC6790";
  }
  leaf oam-mep-entities-desired {
    type empty;
    description "OAM MEP entities desired";
    reference "RFC7260";
  }
  leaf oam-mip-entities-desired {
    type empty;
    description "OAM MIP entities desired";
    reference "RFC7260";
  }
}

grouping lsp-session-attributes-obj-flags-mpls_config {
  description
    "Configuration parameters relating to RSVP-TE MPLS LSP
     session attribute flags";
  reference
    "RFC4859: Registry for RSVP-TE Session Flags";
  leaf local-protection-desired {
    type empty;
    description "Fastreroute local protection is desired.";
    reference

```

Beeram, et al.

Expires May 2, 2018

[Page 30]

```
        "RFC4859: Registry for RSVP-TE Session Flags";
    }
leaf bandwidth-protection-desired {
    type empty;
    description
        "Request FRR bandwidth protection on LSRs if
         present.";
    reference "RFC4090";
}
leaf node-protection-desired {
    type empty;
    description
        "Request FRR node protection on LSRs if
         present.";
    reference "RFC4090";
}
grouping tunnel-properties-mpls_config {
    description
        "Top level grouping for LSP properties.";
    uses lsp-session-attributes-obj-flags-mpls_config;
    uses lsp-attributes-flags-mpls_config;
}
grouping lsp-properties-mpls {
    description
        "Top level grouping for LSP properties.";
    container state {
        config false;
        description
            "Configuration applied parameters and state";
        uses lsp-session-attributes-obj-flags-mpls_config;
        uses lsp-attributes-flags-mpls_config;
    }
}
/* End of RSVP-TE MPLS LSPs groupings */

/* MPLS RSVP-TE interface groupings */
grouping rsvp-te-interface_state {
    description
        "The RSVP-TE interface state grouping";
leaf over-subscribed-bandwidth {
    type uint32;
    description
        "The amount of over-subscribed bandwidth on
         the interface";
}
```

Beeram, et al.

Expires May 2, 2018

[Page 31]

```
}

grouping rsvp-te-interface-softpreemption_state {
  description
    "The RSVP-TE interface preeemptions state grouping";
  container interface-softpreemption-state {
    description
      "The RSVP-TE interface preeemptions state grouping";
    leaf soft-preempted-bandwidth {
      type uint32;
      description
        "The amount of soft-preempted bandwidth on
         this interface";
    }
    list lsps {
      key
        "source destination tunnel-id lsp-id "+
        "extended-tunnel-id";
      description
        "List of LSPs that are soft-preempted";
      leaf source {
        type leafref {
          path "/te:te/te:lsps-state/te:lsp/" +
            "te:source";
        }
        description
          "Tunnel sender address extracted from
           SENDER_TEMPLATE object";
        reference "RFC3209";
      }
      leaf destination {
        type leafref {
          path "/te:te/te:lsps-state/te:lsp/" +
            "te:destination";
        }
        description
          "Tunnel endpoint address extracted from
           SESSION object";
        reference "RFC3209";
      }
      leaf tunnel-id {
        type leafref {
          path "/te:te/te:lsps-state/te:lsp/" +
            "te:tunnel-id";
        }
        description
          "Tunnel identifier used in the SESSION
           that remains constant over the life
```

Beeram, et al.

Expires May 2, 2018

[Page 32]

```
        of the tunnel.";
        reference "RFC3209";
    }
leaf lsp-id {
    type leafref {
        path "/te:te/te:lsp-state/te:lsp/"+ "te:lsp-id";
    }
    description
        "Identifier used in the SENDER_TEMPLATE
        and the FILTER_SPEC that can be changed
        to allow a sender to share resources with
        itself.";
    reference "RFC3209";
}
leaf extended-tunnel-id {
    type leafref {
        path "/te:te/te:lsp-state/te:lsp/"+ "te:extended-tunnel-id";
    }
    description
        "Extended Tunnel ID of the LSP.";
    reference "RFC3209";
}
leaf type {
    type leafref {
        path "/te:te/te:lsp-state/te:lsp/"+ "te:type";
    }
    description "LSP type P2P or P2MP";
}
}
grouping bandwidth-mpls-constraints {
    description "Bandwidth constraints.";
    container bandwidth-mpls-constraints {
        description
            "Holds the bandwidth constraints properties";
        leaf maximum-reservable {
            type uint32 {
                range "0..4294967295";
            }
            description
                "The maximum reservable bandwidth on the
                interface";
        }
    }
}
```

Beeram, et al.

Expires May 2, 2018

[Page 33]

```
leaf-list bc-value {
    type uint32 {
        range "0..4294967295";
    }
    max-elements 8;
    description
        "The bandwidth constraint type";
}
}

grouping bandwidth-constraint-values {
    description
        "Packet bandwidth constraints values";
    choice value-type {
        description
            "Value representation";
        case percentages {
            container perc-values {
                uses bandwidth-mpls-constraints;
                description
                    "Percentage values";
            }
        }
        case absolutes {
            container abs-values {
                uses bandwidth-mpls-constraints;
                description
                    "Absolute values";
            }
        }
    }
}

grouping bandwidth-mpls-reservable_config {
    description
        "Interface bandwidth reservable configuration grouping";
    choice bandwidth-value {
        description "Reservable bandwidth configuration choice";
        case absolute {
            leaf absolute-value {
                type uint32;
                description "Absolute value of the bandwidth";
            }
        }
        case percentage {
            leaf percent-value {
                type uint32 {

```

Beeram, et al.

Expires May 2, 2018

[Page 34]

```
        range "0..4294967295";
    }
    description "Percentage reservable bandwidth";
}
description
"The maximum reservable bandwidth on the
interface";
}
}

choice bc-model-type {
description
"Reservable bandwidth percentage capacity
values.";
case bc-model-rdm {
container bc-model-rdm {
description
"Russian Doll Model Bandwidth Constraints.";
uses bandwidth-mpls-constraints;
}
}

case bc-model-mam {
container bc-model-mam {
uses bandwidth-mpls-constraints;
description
"Maximum Allocation Model Bandwidth
Constraints.";
}
}

case bc-model-mar {
container bc-model-mar {
uses bandwidth-mpls-constraints;
description
"Maximum Allocation with Reservation Model
Bandwidth Constraints.";
}
}
}

grouping bandwidth-mpls-reservable {
description
"Packet reservable bandwidth";
container bandwidth-mpls-reservable {
description
"Interface bandwidth reservable container";
uses bandwidth-mpls-reservable_config;
}
}
```

Beeram, et al.

Expires May 2, 2018

[Page 35]

```
/* End of RSVP-TE interface groupings */

/* RSVP-TE FRR groupings */
grouping rsvp-te-frr-auto-tunnel-backup_config {
    description
        "Auto-tunnel backup configuration grouping";
    leaf auto-backup-protection {
        type identityref {
            base te-mpls-types:backup-protection-type;
        }
        default
            te-mpls-types:backup-protection-node-link;
        description
            "Describes whether the backup should offer
            protection against link, node, or either";
    }
    leaf auto-backup-path-computation {
        type identityref {
            base
                te-types:path-computation-srlg-type;
        }
        description
            "FRR backup computation type";
    }
}

grouping rsvp-te-frr-backups_config {
    description
        "Top level container for RSVP-TE FRR backup parameters";
    choice type {
        description
            "FRR backup tunnel type";
        case static-tunnel {
            container static-backups {
                description "List of static backups";
                list static-backup {
                    key "backup-tunnel-name";
                    description
                        "List of static backup tunnels that
                        protect the RSVP-TE interface.";
                    leaf backup-tunnel-name {
                        type leafref {
                            path "/te:te/te:tunnels/te:tunnel/te:name";
                        }
                        description "FRR Backup tunnel name";
                    }
                }
            }
        }
    }
}
```

Beeram, et al.

Expires May 2, 2018

[Page 36]

```
        }
```

```
    case auto-tunnel {
```

```
        container auto-tunnel-backups {
```

```
            description "Auto-tunnel choice";
```

```
            uses rsvp-te-frr-auto-tunnel-backup_config;
```

```
        }
```

```
    }
```

```
}
```

```
grouping rsvp-te-frr-backups {
```

```
    description
```

```
        "RSVP-TE facility backup grouping";
```

```
    container rsvp-te-frr-backups {
```

```
        description
```

```
            "RSVP-TE facility backup properties";
```

```
            uses rsvp-te-frr-backups_config;
```

```
        }
```

```
}
```

```
grouping lsp-backup-info_state {
```

```
    description "LSP backup information grouping";
```

```
    leaf backup-tunnel-name {
```

```
        type string;
```

```
        description
```

```
            "If an LSP has an FRR backup LSP that can protect it,
```

```
            this field identifies the tunnel name of the backup LSP.
```

```
            Otherwise, this field is empty.";
```

```
    }
```

```
    leaf backup-frr-on {
```

```
        type uint8;
```

```
        description
```

```
            "Whether currently this backup is carrying traffic";
```

```
    }
```

```
    leaf backup-protected-lsp-num {
```

```
        type uint32;
```

```
        description
```

```
            "Number of LSPs protected by this backup";
```

```
    }
```

```
}
```

```
grouping lsp-backup-info {
```

```
    description "Backup/bypass LSP related information";
```

```
    container backup-info {
```

```
        description
```

```
            "backup information";
```

```
        container state {
```

```
            config false;
```

Beeram, et al.

Expires May 2, 2018

[Page 37]

```
description
  "Configuration applied parameters and state";
  uses lsp-backup-info_state;
}
}
}

grouping fast-reroute-local-revertive_config {
  description "RSVP-TE FRR local revertive grouping";
  leaf rsvp-frr-local-revert-delay {
    type uint32;
    description
      "Time to wait after primary link is restored
       before node attempts local revertive
       procedures.";
  }
}

/** End of RSVP-TE FRR backup information **/


grouping fast-reroute-local-revertive {
  description
    "Top level grouping for globals properties";
  container fast-reroute-local-revertive {
    description "RSVP-TE FRR local revertive container";
    uses fast-reroute-local-revertive_config;
  }
}

/* RSVP-TE global properties */
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp" {
  description
    "RSVP-TE augmentation to RSVP globals";
  uses fast-reroute-local-revertive;
}

/* Linkage to the base RSVP all interfaces */
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:interfaces" {
  description
    "Augmentations for RSVP-TE MPLS all interfaces properties";
  /* To be added */
}

/* Linkage to per RSVP interface */
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp/rsvp:interfaces/" +
```

Beeram, et al.

Expires May 2, 2018

[Page 38]

```
"rsvp:interface" {
  description
    "Augmentations for RSVP-TE MPLS per interface properties";
  /* To be added */
}

/* add augmentation for sessions neighbors */
augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp:globals/"
+ "rsvp:sessions/rsvp:session/rsvp:state" {
  description
    "Augmentations for RSVP-TE MPLS sessions";
  /* To be added */
}

augment "/rt:routing/rt:control-plane-protocols/"
+ "rt:control-plane-protocol/rsvp:rsvp:neighbors" {
  description
    "Augmentations for RSVP-TE MPLS neighbors properties";
  /* To be added */
}

/**
 * Augmentation to TE generic module
 */
augment "/te:te/te:tunnels/te:tunnel" {
  description
    "Augmentations for RSVP-TE MPLS TE tunnel properties";
  uses tunnel-properties-mpls_config;
}

augment "/te:te/te:lsp-state/te:lsp" {
  when "/te:te/te:lsp-state/te:lsp" +
  "/te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
    description
      "When the signaling protocol is RSVP-TE ";
  }
  description
    "RSVP-TE MPLS LSP state properties";
  uses lsp-properties-mpls;
  uses lsp-backup-info;
}

augment "/te:te/te:tunnels/te:tunnel/te:p2p-primary-paths" +
"/te:p2p-primary-path/te:state/te:lsp/te:lsp" {
  when "/te:te/te:tunnels/te:tunnel" +
  "/te:p2p-secondary-paths/te:p2p-secondary-path/" +
  "te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
```

Beeram, et al.

Expires May 2, 2018

[Page 39]

```

description
"When the signaling protocol is RSVP-TE ";
}

description
"RSVP-TE MPLS LSP state properties";
uses lsp-properties-mpls;
uses lsp-backup-info;
}

augment "/te:te/te:tunnels/te:tunnel/te:p2p-secondary-paths" +
"/te:p2p-secondary-path/te:state/te:lsp/te:lsp" {
when "/te:te/te:tunnels/te:tunnel" +
"/te:p2p-secondary-paths/te:p2p-secondary-path/" +
"te:path-setup-protocol = 'te-types:te-path-setup-rsvp'" {
description
"When the signaling protocol is RSVP-TE ";
}
description
"RSVP-TE MPLS LSP state properties";
uses lsp-properties-mpls;
uses lsp-backup-info;
}

augment "/te:te/te-dev:interfaces/te-dev:interface" {
description
"RSVP reservable bandwidth configuration properties";
uses bandwidth-mpls-reservable;
}

augment "/te:te/te-dev:interfaces/te-dev:interface" {
description
"RSVP reservable bandwidth configuration properties";
uses rsvp-te-frr-backups;
}
}

<CODE ENDS>

```

Figure 5: RSVP TE MPLS YANG module

Figure 5 shows the YANG tree representation of the RSVP TE MPLS module that augments RSVP-TE module as well as RSVP and TE YANG modules.

[3. IANA Considerations](#)

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

Beeram, et al.

Expires May 2, 2018

[Page 40]

URI: urn:ietf:params:xml:yang:ietf-rsvp-te XML: N/A, the requested URI is an XML namespace.

URI: urn:ietf:params:xml:yang:ietf-rsvp-te-mpls XML: N/A, the requested URI is an XML namespace.

This document registers a YANG module in the YANG Module Names registry [[RFC6020](#)].

name: ietf-rsvp namespace: urn:ietf:params:xml:yang:ietf-rsvp-te
prefix: ietf-rsvp reference: [RFC3209](#)

name: ietf-rsvp-te namespace: urn:ietf:params:xml:ns.yang:ietf-rsvp-te-mpls
prefix: ietf-rsvp-te reference: [RFC3209](#)

[4. Security Considerations](#)

The YANG module defined in this memo is designed to be accessed via the NETCONF protocol [[RFC6241](#)]. The lowest NETCONF layer is the secure transport layer and the mandatory-to-implement secure transport is SSH [[RFC6242](#)]. The NETCONF access control model [[RFC6536](#)] provides means to restrict access for particular NETCONF

users to a pre-configured subset of all available NETCONF protocol operations and content.

There are a number of data nodes defined in the YANG module which 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.

[5. Acknowledgement](#)

The authors would like to thank Lou Berger for reviewing and providing valuable feedback on this document.

[6. Contributors](#)

Xia Chen
Huawei Technologies

Email: jescia.chenxia@huawei.com

Raqib Jones
Brocade

Email: raqib@Brocade.com

Bin Wen
Comcast

Email: Bin_Wen@cable.comcast.com

[7. References](#)

[7.1. Normative References](#)

[I-D.ietf-teas-yang-rsvp]

Beeram, V., Saad, T., Gandhi, R., Liu, X., Bryskin, I., and H. Shah, "A YANG Data Model for Resource Reservation Protocol (RSVP)", [draft-ietf-teas-yang-rsvp-07](#) (work in progress), March 2017.

[I-D.ietf-teas-yang-te]

Saad, T., Gandhi, R., Liu, X., Beeram, V., Shah, H., and I. Bryskin, "A YANG Data Model for Traffic Engineering Tunnels and Interfaces", [draft-ietf-teas-yang-te-08](#) (work in progress), July 2017.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/[RFC2119](#), March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

[RFC2205] Braden, R., Ed., Zhang, L., Berson, S., Herzog, S., and S. Jamin, "Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification", [RFC 2205](#), DOI 10.17487/RFC2205, September 1997, <<https://www.rfc-editor.org/info/rfc2205>>.

[RFC3209] Awduch, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", [RFC 3209](#), DOI 10.17487/RFC3209, December 2001, <<https://www.rfc-editor.org/info/rfc3209>>.

Beeram, et al.

Expires May 2, 2018

[Page 42]

- [RFC3688] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/info/rfc3688>>.
- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", [RFC 6020](#), DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.
- [RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", [RFC 6241](#), DOI 10.17487/RFC6241, June 2011, <<https://www.rfc-editor.org/info/rfc6241>>.
- [RFC6242] Wasserman, M., "Using the NETCONF Protocol over Secure Shell (SSH)", [RFC 6242](#), DOI 10.17487/RFC6242, June 2011, <<https://www.rfc-editor.org/info/rfc6242>>.
- [RFC6536] Bierman, A. and M. Bjorklund, "Network Configuration Protocol (NETCONF) Access Control Model", [RFC 6536](#), DOI 10.17487/RFC6536, March 2012, <<https://www.rfc-editor.org/info/rfc6536>>.
- [RFC6991] Schoenwaelder, J., Ed., "Common YANG Data Types", [RFC 6991](#), DOI 10.17487/RFC6991, July 2013, <<https://www.rfc-editor.org/info/rfc6991>>.

[7.2. Informative References](#)

- [I-D.dsdt-nmda-guidelines] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Guidelines for YANG Module Authors (NMDA)", [draft-dsdt-nmda-guidelines-01](#) (work in progress), May 2017.

Authors' Addresses

Vishnu Pavan Beeram
Juniper Networks

Email: vbeeram@juniper.net

Tarek Saad (editor)
Cisco Systems, Inc.

Email: tsaad@cisco.com

Beeram, et al.

Expires May 2, 2018

[Page 43]

Rakesh Gandhi
Cisco Systems, Inc.

Email: rgandhi@cisco.com

Xufeng Liu
Jabil

Email: Xufeng_Liu@jabil.com

Igor Bryskin
Huawei Technologies

Email: Igor.Bryskin@huawei.com

Himanshu Shah
Ciena

Email: hshah@ciena.com

