

CCAMP Working Group
Internet-Draft
Intended status: Informational
Expires: August 26, 2021

J. Lopez de Vergara
Naudit HPCN
D. Perdices Burrero
Universidad Autonoma de Madrid
D. King
Old Dog Consulting
V. Lopez
Telefonica I+D/GCTO
I. Busi
Huawei Technologies
O. Gonzalez de Dios
Telefonica I+D/GCTO
Y. Lee
Samsung
G. Galimberti
Cisco
February 22, 2021

A YANG Data Model for Flexi-Grid Media Channels
draft-ietf-ccamp-flexigrid-media-channel-yang-03

Abstract

This document defines a YANG model for managing flexi-grid optical media channels, complementing the information provided by the flexi-grid topology model.

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

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 <https://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 August 26, 2021.

Copyright Notice

Copyright (c) 2021 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 (<https://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
2.	Terminology	3
3.	Flexi-Grid Media-Channel Overview	3
4.	Example of Use	4
5.	YANG Model for Flexi-Grid Media Channel	6
5.1.	YANG Tree	6
5.2.	YANG Code	43
6.	Security Considerations	58
7.	IANA Considerations	58
8.	Contributors	58
9.	Acknowledgments	59
10.	References	59
10.1.	Normative References	59
10.2.	Informative References	59
	Authors' Addresses	60

[1.](#) Introduction

Transport networks are evolving from current DWDM systems towards elastic optical networks, based on flexi-grid transmission and switching technologies [[RFC7698](#)]. Such technology aims at increasing both transport network scalability and flexibility, allowing the optimization of bandwidth usage.

While [[I-D.ietf-ccamp-flexigrid-yang](#)] focuses on flexi-grid objects such as nodes, transponders and links, this document presents a YANG [[RFC7950](#)] model for the flexi-grid media-channel. This YANG module defines the whole path from a source transponder or node to the destination through a number of intermediate nodes in the flexi-grid network.

This document identifies the flexi-grid media-channel components, parameters and their values, characterizes the features and the performances of the flexi-grid elements. An application example is provided towards the end of the document to better understand their utility.

2. Terminology

Refer to [[RFC7446](#)] and [[RFC7699](#)] for the key terms used in this document.

The following terms are defined in [[RFC7950](#)] and are not redefined here:

- o client
- o server
- o augment
- o data model
- o data node

The following terms are defined in [[RFC6241](#)] and are not redefined here:

- o configuration data
- o state data

The terminology for describing YANG data models is found in [[RFC7950](#)].

3. Flexi-Grid Media-Channel Overview

The present model defines a flexi-grid media-channel mainly composed of:

- o source address
- o source flexi-grid port
- o source flexi-grid transponder
- o destination address
- o destination flexi-grid port

- o destination flexi-grid transponder
- o list of links that defines the path
- o other optical attributes

Each path can be a media-channel (only defined by source and destination node) or a network media-channel (additionally needs source and destination transponders). Therefore, all the attributes are optional to support both situations.

This is achieved by a combination of the traffic engineering tunnel attributes explained in [[I-D.ietf-teas-yang-te](#)] and augments when necessary. For instance, source address, source flexi-grid transponder, destination address and destination flexi-grid transponder attributes are directly taken from tunnel, whereas other attributes such as source flexi-grid port, destination flexi-grid port are defined, as they are specific for flexi-grid.

4. Example of Use

In order to explain how this model is used, we provide the following example. An optical network usually has multiple transponders, switches (nodes) and links. Figure 1 shows a simple topology, where two physical paths interconnect two optical transponders.

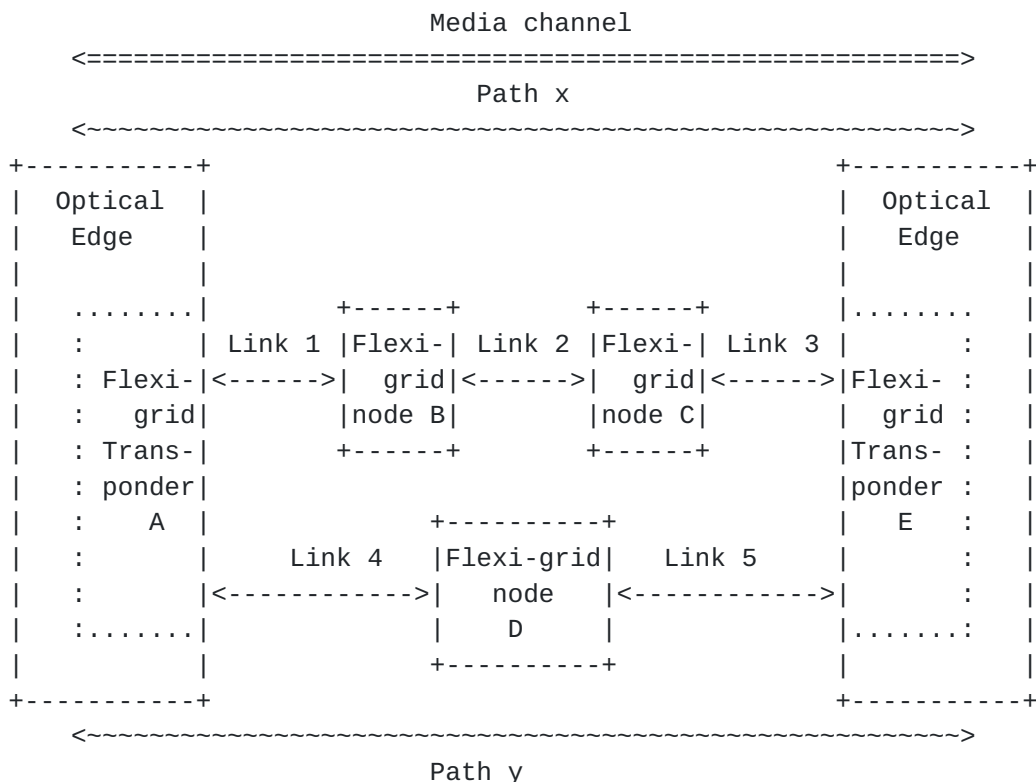


Figure 1: Topology Example

After the nodes, links and transponders have been defined using [\[I-D.ietf-ccamp-flexigrid-yang\]](#) we can configure the media-channel from the information we have stored in the flexi-grid topology, by querying which elements are available, and planning the resources that have to be provided on each situation. Note that every element in the flexi-grid topology has a reference, and this is the way in which they are called in the media-channel.

- o Depending on the case, it is possible to define either the source and destination node ports, or the source and destination node and transponder. In our case, we would define a network media channel, with source transponder A and source node B, and destination transponder E and destination node C. Thus, we are going to follow path x.
- o Then, for each link in the path x, we indicate which channel we are going to use, providing information about the slots, and what nodes are connected.
- o Finally, the flexi-grid topology has to be updated with each element usage status each time a media channel is created or torn down.

5. YANG Model for Flexi-Grid Media Channel

5.1. YANG Tree

```

module: ietf-te
  +--rw te!
    +--rw globals
      | +--rw named-admin-groups
      | | +--rw named-admin-group* [name]
      | | {te-types:extended-admin-groups,te-types:named-extended-
admin-groups}?
      | | +--rw name string
      | | +--rw bit-position? uint32
      | +--rw named-srlgs
      | | +--rw named-srlg* [name] {te-types:named-srlg-groups}?
      | | +--rw name string
      | | +--rw group? te-types:srlg
      | | +--rw cost? uint32
      | +--rw named-path-constraints
      | | +--rw named-path-constraint* [name]
      | | {te-types:named-path-constraints}?
      | | +--rw name string
      | | +--rw te-bandwidth
      | | | +--rw (technology)?
      | | | +--:(generic)
      | | | +--rw generic? te-bandwidth
      | | +--rw link-protection? identityref
      | | +--rw setup-priority? uint8
      | | +--rw hold-priority? uint8
      | | +--rw signaling-type? identityref
      | | +--rw path-metric-bounds
      | | | +--rw path-metric-bound* [metric-type]
      | | | +--rw metric-type identityref
      | | | +--rw upper-bound? uint64
      | | +--rw path-affinities-values
      | | | +--rw path-affinities-value* [usage]
      | | | +--rw usage identityref
      | | | +--rw value? admin-groups
      | | +--rw path-affinity-names
      | | | +--rw path-affinity-name* [usage]
      | | | +--rw usage identityref
      | | | +--rw affinity-name* [name]
      | | | +--rw name string
      | | +--rw path-srlgs-lists
      | | | +--rw path-srlgs-list* [usage]
      | | | +--rw usage identityref
      | | | +--rw values* srlg

```

| +--rw path-srlgs-names

```

|         | +--rw path-srlgs-name* [usage]
|         |         +--rw usage      identityref
|         |         +--rw names*    string
| +--rw disjointness?
|         |         te-path-disjointness
| +--rw explicit-route-objects-always
|         | +--rw route-object-exclude-always* [index]
|         |         +--rw index          uint32
|         |         +--rw (type)?
|         |         | +--:(numbered-node-hop)
|         |         | | +--rw numbered-node-hop
|         |         | | | +--rw node-id      te-node-id
|         |         | | | +--rw hop-type?    te-hop-type
|         |         | +--:(numbered-link-hop)
|         |         | | +--rw numbered-link-hop
|         |         | | | +--rw link-tp-id    te-tp-id
|         |         | | | +--rw hop-type?    te-hop-type
|         |         | | | +--rw direction?   te-link-direction
|         |         | +--:(unnumbered-link-hop)
|         |         | | +--rw unnumbered-link-hop
|         |         | | | +--rw link-tp-id    te-tp-id
|         |         | | | +--rw node-id      te-node-id
|         |         | | | +--rw hop-type?    te-hop-type
|         |         | | | +--rw direction?   te-link-direction
|         |         | +--:(as-number)
|         |         | | +--rw as-number-hop
|         |         | | | +--rw as-number    inet:as-number
|         |         | | | +--rw hop-type?    te-hop-type
|         |         | +--:(label)
|         |         | | +--rw label-hop
|         |         | | | +--rw te-label
|         |         | | | +--rw (technology)?
|         |         | | | | +--:(generic)
|         |         | | | | | +--rw generic?
|         |         | | | | | rt-types:generalized-label
|         |         | | | +--rw direction?
|         |         | | |         te-label-direction
| +--rw route-object-include-exclude* [index]
|         | +--rw explicit-route-usage?      identityref
|         | +--rw index          uint32
|         | +--rw (type)?
|         |         +--:(numbered-node-hop)
|         |         | +--rw numbered-node-hop
|         |         | | +--rw node-id      te-node-id
|         |         | | +--rw hop-type?    te-hop-type
|         |         | +--:(numbered-link-hop)
|         |         | | +--rw numbered-link-hop
|         |         | | | +--rw link-tp-id    te-tp-id

```



```
| | | hop-type? te-hop-type
| | | +--rw direction? te-link-direction
| | +---:(unnumbered-link-hop)
| | | +--rw unnumbered-link-hop
| | | | +--rw link-tp-id te-tp-id
| | | | +--rw node-id te-node-id
| | | | +--rw hop-type? te-hop-type
| | | | +--rw direction? te-link-direction
| | +---:(as-number)
| | | +--rw as-number-hop
| | | | +--rw as-number inet:as-number
| | | | +--rw hop-type? te-hop-type
| | +---:(label)
| | | +--rw label-hop
| | | | +--rw te-label
| | | | | +--rw (technology)?
| | | | | | +---:(generic)
| | | | | | | +--rw generic?
| | | | | | | rt-types:generalized-label
| | | | +--rw direction?
| | | | | te-label-direction
| | +---:(srlg)
| | | +--rw srlg
| | | | +--rw srlg? uint32
+---rw shared-resources-tunnels
| +--rw lsp-shared-resources-tunnel* tunnel-ref
+---rw path-in-segment!
| +--rw label-restrictions
| | +--rw label-restriction* [index]
| | | +--rw restriction? enumeration
| | | +--rw index uint32
| | +--rw label-start
| | | +--rw te-label
| | | | +--rw (technology)?
| | | | | +---:(generic)
| | | | | | +--rw generic?
| | | | | | | rt-types:generalized-label
| | | | +--rw direction?
| | | | | te-label-direction
| | +--rw label-end
| | | +--rw te-label
| | | | +--rw (technology)?
| | | | | +---:(generic)
| | | | | | +--rw generic?
| | | | | | | rt-types:generalized-label
| | | | +--rw direction?
| | | | | te-label-direction
+---rw label-step
```



```

|         |         | +--rw (technology)?
|         |         |   +--:(generic)
|         |         |     +--rw generic?   int32
|         |         |   +--rw range-bitmap? yang:hex-string
| +--rw path-out-segment!
|   +--rw label-restrictions
|     +--rw label-restriction* [index]
|       +--rw restriction?   enumeration
|       +--rw index          uint32
|       +--rw label-start
|         +--rw te-label
|           +--rw (technology)?
|           | +--:(generic)
|           |   +--rw generic?
|           |     rt-types:generalized-label
|           |   +--rw direction?
|           |     te-label-direction
|       +--rw label-end
|         +--rw te-label
|           +--rw (technology)?
|           | +--:(generic)
|           |   +--rw generic?
|           |     rt-types:generalized-label
|           |   +--rw direction?
|           |     te-label-direction
|       +--rw label-step
|         +--rw (technology)?
|         | +--:(generic)
|         |   +--rw generic?   int32
|         |   +--rw range-bitmap? yang:hex-string
+--rw tunnels
| +--rw tunnel* [name]
| | +--ro operational-state?   identityref
| | +--rw name                 string
| | +--rw identifier?          uint16
| | +--rw description?         string
| | +--rw encoding?            identityref
| | +--rw switching-type?      identityref
| | +--rw provisioning-state?  identityref
| | +--rw preference?          uint8
| | +--rw reoptimize-timer?    uint16
| | +--rw source?              te-types:te-node-id
| | +--rw destination?         te-types:te-node-id
| | +--rw src-tp-id?           yang:hex-string
| | +--rw dst-tp-id?           yang:hex-string
| | +--rw bidirectional?       boolean
| | +--rw association-objects
| | | +--rw association-object*

```



```

| | | | [type ID source global-source]
| | | | +--rw type identityref
| | | | +--rw ID uint16
| | | | +--rw source te-types:te-node-id
| | | | +--rw global-source te-types:te-node-id
| | | +--rw association-object-extended*
| | | | [type ID source global-source extended-ID]
| | | | +--rw type identityref
| | | | +--rw ID uint16
| | | | +--rw source te-types:te-node-id
| | | | +--rw global-source te-types:te-node-id
| | | | +--rw extended-ID yang:hex-string
| | +--rw protection
| | | +--rw enable? boolean
| | | +--rw protection-type? identityref
| | | +--rw protection-reversion-disable? boolean
| | | +--rw hold-off-time? uint32
| | | +--rw wait-to-revert? uint16
| | | +--rw aps-signal-id? uint8
| | +--rw restoration
| | | +--rw enable? boolean
| | | +--rw restoration-type? identityref
| | | +--rw restoration-scheme? identityref
| | | +--rw restoration-reversion-disable? boolean
| | | +--rw hold-off-time? uint32
| | | +--rw wait-to-restore? uint16
| | | +--rw wait-to-revert? uint16
| | +--rw te-topology-identifier
| | | +--rw provider-id? te-global-id
| | | +--rw client-id? te-global-id
| | | +--rw topology-id? te-topology-id
| | +--rw te-bandwidth
| | | +--rw (technology)?
| | | | +--:(generic)
| | | | +--rw generic? te-bandwidth
| | +--rw link-protection? identityref
| | +--rw setup-priority? uint8
| | +--rw hold-priority? uint8
| | +--rw signaling-type? identityref
| | +--rw dependency-tunnels
| | | +--rw dependency-tunnel* [name]
| | | | +--rw name
| | | | | -> ../../../../tunnels/tunnel/name
| | | | +--rw encoding? identityref
| | | | +--rw switching-type? identityref
| | +--rw hierarchical-link
| | | +--rw local-te-node-id? te-types:te-node-id
| | | +--rw local-te-link-tp-id? te-types:te-tp-id

```



```

| | | +--rw remote-te-node-id?          te-types:te-node-id
| | | +--rw te-topology-identifier
| | |   +--rw provider-id?    te-global-id
| | |   +--rw client-id?      te-global-id
| | |   +--rw topology-id?    te-topology-id
| | +--rw p2p-primary-paths
| | | +--rw p2p-primary-path* [name]
| | |   +--rw name                string
| | |   +--rw path-setup-protocol? identityref
| | |   +--rw path-computation-method? identityref
| | |   +--rw path-computation-server?
| | |   |   inet:ip-address
| | |   +--rw compute-only?        empty
| | |   +--rw use-path-computation? boolean
| | |   +--rw lockdown?            empty
| | |   +--ro path-scope?          identityref
| | |   +--rw optimizations
| | |   |   +--rw (algorithm)?
| | |   |   |   +--:(metric) {path-optimization-metric}?
| | |   |   |   |   +--rw optimization-metric* [metric-type]
| | |   |   |   |   |   +--rw metric-type
| | |   |   |   |   |   |   identityref
| | |   |   |   |   |   +--rw weight?
| | |   |   |   |   |   |   uint8
| | |   |   |   |   |   +--rw explicit-route-exclude-objects
| | |   |   |   |   |   |   +--rw route-object-exclude-object*
| | |   |   |   |   |   |   [index]
| | |   |   |   |   |   |   +--rw index
| | |   |   |   |   |   |   |   uint32
| | |   |   |   |   |   +--rw (type)?
| | |   |   |   |   |   |   +--:(numbered-node-hop)
| | |   |   |   |   |   |   |   +--rw numbered-node-hop
| | |   |   |   |   |   |   |   |   +--rw node-id
| | |   |   |   |   |   |   |   |   |   te-node-id
| | |   |   |   |   |   |   |   |   +--rw hop-type?
| | |   |   |   |   |   |   |   |   |   te-hop-type
| | |   |   |   |   |   +--:(numbered-link-hop)
| | |   |   |   |   |   |   +--rw numbered-link-hop
| | |   |   |   |   |   |   |   +--rw link-tp-id
| | |   |   |   |   |   |   |   |   te-tp-id
| | |   |   |   |   |   |   |   +--rw hop-type?
| | |   |   |   |   |   |   |   |   te-hop-type
| | |   |   |   |   |   |   |   +--rw direction?
| | |   |   |   |   |   |   |   |   te-link-direction
| | |   |   |   |   |   +--:(unnumbered-link-hop)
| | |   |   |   |   |   |   +--rw unnumbered-link-hop
| | |   |   |   |   |   |   |   +--rw link-tp-id
| | |   |   |   |   |   |   |   |   te-tp-id

```


[illegible]

| | | | | | | | te-tp-id

```
| | | | | | +--rw node-id  
| | | | | | | te-node-id  
| | | | | | +--rw hop-type?  
| | | | | | | te-hop-type  
| | | | | | +--rw direction?  
| | | | | | | te-link-direction  
+---:(as-number)  
| +--rw as-number-hop  
| +--rw as-number  
| | inet:as-number  
| +--rw hop-type?  
| | te-hop-type  
+---:(label)  
| +--rw label-hop  
| +--rw te-label  
| +--rw (technology)?  
| | +---:(generic)  
| | +--rw generic?  
| rt-  
  
types:generalized-label  
| | | | | | +--rw direction?  
| | | | | | | te-label-direction  
| | | | | | +--rw tiebreakers  
| | | | | | | +--rw tiebreaker* [tiebreaker-type]  
| | | | | | | +--rw tiebreaker-type identityref  
+---:(objective-function)  
| {path-optimization-objective-function}?  
+--rw objective-function  
| +--rw objective-function-type?  
| identityref  
+--rw preference? uint8  
+--rw k-requested-paths? uint8  
+--rw named-path-constraint? leafref  
| {te-types:named-path-constraints}?  
+--rw te-bandwidth  
| +--rw (technology)?  
| +---:(generic)  
| +--rw generic? te-bandwidth  
+--rw link-protection? identityref  
+--rw setup-priority? uint8  
+--rw hold-priority? uint8  
+--rw signaling-type? identityref  
+--rw path-metric-bounds  
| +--rw path-metric-bound* [metric-type]  
| +--rw metric-type identityref  
| +--rw upper-bound? uint64  
+--rw path-affinities-values  
| +--rw path-affinities-value* [usage]
```

| | | | +-rw usage identityref

```

| | | | +--rw value?    admin-groups
| | | | +--rw path-affinity-names
| | | | | +--rw path-affinity-name* [usage]
| | | | | +--rw usage          identityref
| | | | | +--rw affinity-name* [name]
| | | | | +--rw name          string
| | | | +--rw path-srlgs-lists
| | | | | +--rw path-srlgs-list* [usage]
| | | | | +--rw usage          identityref
| | | | | +--rw values*      srlg
| | | | +--rw path-srlgs-names
| | | | | +--rw path-srlgs-name* [usage]
| | | | | +--rw usage          identityref
| | | | | +--rw names*       string
| | | | +--rw disjointness?
| | | | | te-path-disjointness
| | | | +--rw explicit-route-objects-always
| | | | | +--rw route-object-exclude-always* [index]
| | | | | | +--rw index                uint32
| | | | | | +--rw (type)?
| | | | | | | +--:(numbered-node-hop)
| | | | | | | | +--rw numbered-node-hop
| | | | | | | | +--rw node-id        te-node-id
| | | | | | | | +--rw hop-type?     te-hop-type
| | | | | | | +--:(numbered-link-hop)
| | | | | | | | +--rw numbered-link-hop
| | | | | | | | +--rw link-tp-id     te-tp-id
| | | | | | | | +--rw hop-type?     te-hop-type
| | | | | | | | +--rw direction?    te-link-direction
| | | | | | | +--:(unnumbered-link-hop)
| | | | | | | | +--rw unnumbered-link-hop
| | | | | | | | +--rw link-tp-id     te-tp-id
| | | | | | | | +--rw node-id        te-node-id
| | | | | | | | +--rw hop-type?     te-hop-type
| | | | | | | | +--rw direction?    te-link-direction
| | | | | | | +--:(as-number)
| | | | | | | | +--rw as-number-hop
| | | | | | | | +--rw as-number      inet:as-number
| | | | | | | | +--rw hop-type?     te-hop-type
| | | | | | | +--:(label)
| | | | | | | | +--rw label-hop
| | | | | | | | | +--rw te-label
| | | | | | | | | +--rw (technology)?
| | | | | | | | | | +--:(generic)
| | | | | | | | | | | +--rw generic?
| | | | | | | | | | | rt-types:generalized-label
| | | | | | | | +--rw direction?
| | | | | | | | | te-label-direction

```



```

| | | | +--rw route-object-include-exclude* [index]
| | | |   +--rw explicit-route-usage?      identityref
| | | |   +--rw index                      uint32
| | | |   +--rw (type)?
| | | |     +--:(numbered-node-hop)
| | | |       | +--rw numbered-node-hop
| | | |         | +--rw node-id      te-node-id
| | | |         | +--rw hop-type?    te-hop-type
| | | |     +--:(numbered-link-hop)
| | | |       | +--rw numbered-link-hop
| | | |         | +--rw link-tp-id    te-tp-id
| | | |         | +--rw hop-type?    te-hop-type
| | | |         | +--rw direction?   te-link-direction
| | | |     +--:(unnumbered-link-hop)
| | | |       | +--rw unnumbered-link-hop
| | | |         | +--rw link-tp-id    te-tp-id
| | | |         | +--rw node-id      te-node-id
| | | |         | +--rw hop-type?    te-hop-type
| | | |         | +--rw direction?   te-link-direction
| | | |     +--:(as-number)
| | | |       | +--rw as-number-hop
| | | |         | +--rw as-number    inet:as-number
| | | |         | +--rw hop-type?    te-hop-type
| | | |     +--:(label)
| | | |       | +--rw label-hop
| | | |         | +--rw te-label
| | | |         |   +--rw (technology)?
| | | |         |     | +--:(generic)
| | | |         |     |   +--rw generic?
| | | |         |     |     rt-types:generalized-label
| | | |         |   +--rw direction?
| | | |         |     te-label-direction
| | | |     +--:(srlg)
| | | |       | +--rw srlg
| | | |         | +--rw srlg?    uint32
| | | | +--rw shared-resources-tunnels
| | | |   | +--rw lsp-shared-resources-tunnel*  tunnel-ref
| | | | +--rw path-in-segment!
| | | |   | +--rw label-restrictions
| | | |     | +--rw label-restriction* [index]
| | | |       | +--rw restriction?    enumeration
| | | |       | +--rw index          uint32
| | | |     | +--rw label-start
| | | |       | +--rw te-label
| | | |         | +--rw (technology)?
| | | |         |   | +--:(generic)
| | | |         |   |   +--rw generic?
| | | |         |   |     rt-types:generalized-label

```



```

| | | | |      +--rw direction?
| | | | |      |      te-label-direction
| | | | | +--rw label-end
| | | | | |      +--rw te-label
| | | | | |      +--rw (technology)?
| | | | | |      |      +--:(generic)
| | | | | |      |      +--rw generic?
| | | | | |      |      |      rt-types:generalized-label
| | | | | |      +--rw direction?
| | | | | |      |      te-label-direction
| | | | | +--rw label-step
| | | | | |      +--rw (technology)?
| | | | | |      +--:(generic)
| | | | | |      +--rw generic?   int32
| | | | | +--rw range-bitmap?   yang:hex-string
| | | | +--rw path-out-segment!
| | | | | +--rw label-restrictions
| | | | | |      +--rw label-restriction* [index]
| | | | | |      +--rw restriction?   enumeration
| | | | | |      +--rw index           uint32
| | | | | +--rw label-start
| | | | | |      +--rw te-label
| | | | | |      +--rw (technology)?
| | | | | |      |      +--:(generic)
| | | | | |      |      +--rw generic?
| | | | | |      |      |      rt-types:generalized-label
| | | | | |      +--rw direction?
| | | | | |      |      te-label-direction
| | | | | +--rw label-end
| | | | | |      +--rw te-label
| | | | | |      +--rw (technology)?
| | | | | |      |      +--:(generic)
| | | | | |      |      +--rw generic?
| | | | | |      |      |      rt-types:generalized-label
| | | | | |      +--rw direction?
| | | | | |      |      te-label-direction
| | | | | +--rw label-step
| | | | | |      +--rw (technology)?
| | | | | |      +--:(generic)
| | | | | |      +--rw generic?   int32
| | | | | +--rw range-bitmap?   yang:hex-string
| | | | +--ro computed-paths-properties
| | | | | +--ro computed-path-properties* [k-index]
| | | | | +--ro k-index           uint8
| | | | | +--ro path-properties
| | | | | |      +--ro path-metric* [metric-type]
| | | | | |      +--ro metric-type   identityref
| | | | | |      +--ro accumulative-value?   uint64

```



```

| | | | +--ro path-affinities-values
| | | | | +--ro path-affinities-value* [usage]
| | | | |   +--ro usage      identityref
| | | | |   +--ro value?    admin-groups
| | | | +--ro path-affinity-names
| | | | | +--ro path-affinity-name* [usage]
| | | | |   +--ro usage      identityref
| | | | |   +--ro affinity-name* [name]
| | | | |     +--ro name      string
| | | | +--ro path-srlgs-lists
| | | | | +--ro path-srlgs-list* [usage]
| | | | |   +--ro usage      identityref
| | | | |   +--ro values*    srlg
| | | | +--ro path-srlgs-names
| | | | | +--ro path-srlgs-name* [usage]
| | | | |   +--ro usage      identityref
| | | | |   +--ro names*     string
| | | | +--ro path-route-objects
| | | | | +--ro path-computed-route-object*
| | | | |   [index]
| | | | |   +--ro index
| | | | |   |   uint32
| | | | | +--ro (type)?
| | | | |   +--:(numbered-node-hop)
| | | | |   |   +--ro numbered-node-hop
| | | | |   |   |   +--ro node-id      te-node-id
| | | | |   |   |   +--ro hop-type?
| | | | |   |   |   |   te-hop-type
| | | | |   +--:(numbered-link-hop)
| | | | |   |   +--ro numbered-link-hop
| | | | |   |   |   +--ro link-tp-id    te-tp-id
| | | | |   |   |   +--ro hop-type?
| | | | |   |   |   |   te-hop-type
| | | | |   |   |   +--ro direction?
| | | | |   |   |   |   te-link-direction
| | | | |   +--:(unnumbered-link-hop)
| | | | |   |   +--ro unnumbered-link-hop
| | | | |   |   |   +--ro link-tp-id    te-tp-id
| | | | |   |   |   +--ro node-id
| | | | |   |   |   |   te-node-id
| | | | |   |   |   +--ro hop-type?
| | | | |   |   |   |   te-hop-type
| | | | |   |   |   +--ro direction?
| | | | |   |   |   |   te-link-direction
| | | | |   +--:(as-number)
| | | | |   |   +--ro as-number-hop
| | | | |   |   |   +--ro as-number
| | | | |   |   |   |   inet:as-number

```


							+--ro hop-type?
							te-hop-type
							+---:(label)
							+--ro label-hop
							+--ro te-label
							+--ro (technology)?
							+---:(generic)
							+--ro generic?
							rt-types:generalized-
label							
							+--ro direction?
							te-label-direction
							+--ro shared-resources-tunnels
							+--ro lsp-shared-resources-tunnel*
							tunnel-ref
							+--ro lsps
							+--ro lsp*
							[source destination tunnel-id lsp-id extended-
tunnel-id]							
							+--ro source
							te-types:te-node-id
							+--ro destination
							te-types:te-node-id
							+--ro tunnel-id
							uint16
							+--ro lsp-id
							uint16
							+--ro extended-tunnel-id
							yang:dotted-quad
							+--ro operational-state?
							identityref
							+--ro path-setup-protocol?
							identityref
							+--ro origin-type?
							enumeration
							+--ro lsp-resource-status?
							enumeration
							+--ro lockout-of-normal?
							boolean
							+--ro freeze?
							boolean
							+--ro lsp-protection-role?
							enumeration
							+--ro lsp-protection-state?
							identityref
							+--ro protection-group-ingress-node-id?
							te-types:te-node-id
							+--ro protection-group-egress-node-id?

```
| | | | | te-types:te-node-id
| | | | | +--ro lsp-shared-resources-tunnel?
```

						tunnel-ref
						+--ro lsp-record-route-information
						+--ro lsp-record-route-information* [index]
						+--ro index
						uint32
						+--ro (type)?
						+--:(numbered-node-hop)
						+--ro numbered-node-hop
						+--ro node-id te-node-id
						+--ro flags*
						path-attribute-flags
						+--:(numbered-link-hop)
						+--ro numbered-link-hop
						+--ro link-tp-id te-tp-id
						+--ro flags*
						path-attribute-flags
						+--:(unnumbered-link-hop)
						+--ro unnumbered-link-hop
						+--ro link-tp-id te-tp-id
						+--ro node-id? te-node-id
						+--ro flags*
						path-attribute-flags
						+--:(label)
						+--ro label-hop
						+--ro te-label
						+--ro (technology)?
						+--:(generic)
						+--ro generic?
						rt-types:generalized-
label						+--ro direction?
						te-label-direction
						+--ro flags*
						path-attribute-flags
						+--ro path-properties
						+--ro path-metric* [metric-type]
						+--ro metric-type identityref
						+--ro accumulative-value? uint64
						+--ro path-affinities-values
						+--ro path-affinities-value* [usage]
						+--ro usage identityref
						+--ro value? admin-groups
						+--ro path-affinity-names
						+--ro path-affinity-name* [usage]
						+--ro usage identityref
						+--ro affinity-name* [name]
						+--ro name string
						+--ro path-srlgs-lists

| | | | | +-ro path-srlgs-list* [usage]

```
| | | | |  
|         +--ro usage          identityref  
|         +--ro values*      srlg  
+--ro path-srlgs-names  
|   +--ro path-srlgs-name* [usage]  
|       +--ro usage        identityref  
|       +--ro names*       string  
+--ro path-route-objects  
|   +--ro path-computed-route-object*  
|       [index]  
|   +--ro index  
|       |           uint32  
+--ro (type)?  
    |--:(numbered-node-hop)  
    |   +--ro numbered-node-hop  
    |       +--ro node-id      te-node-id  
    |       +--ro hop-type?  
    |           te-hop-type  
    |--:(numbered-link-hop)  
    |   +--ro numbered-link-hop  
    |       +--ro link-tp-id    te-tp-id  
    |       +--ro hop-type?  
    |           |           te-hop-type  
    |       +--ro direction?  
    |           te-link-direction  
    |--:(unnumbered-link-hop)  
    |   +--ro unnumbered-link-hop  
    |       +--ro link-tp-id    te-tp-id  
    |       +--ro node-id  
    |           |           te-node-id  
    |       +--ro hop-type?  
    |           |           te-hop-type  
    |       +--ro direction?  
    |           te-link-direction  
    |--:(as-number)  
    |   +--ro as-number-hop  
    |       +--ro as-number  
    |           |           inet:as-number  
    |       +--ro hop-type?  
    |           te-hop-type  
    |--:(label)  
    |   +--ro label-hop  
    |       +--ro te-label  
    |           +--ro (technology)?  
    |               |   +--:(generic)  
    |                   +--ro generic?  
    |                       rt-types:generalized-  
  
label                                     +--ro direction?
```

| | | | |

te-label-direction

Lopez de Vergara, et al. Expires August 26, 2021

[Page 20]

```

| | | | +--ro shared-resources-tunnels
| | | | +--ro lsp-shared-resources-tunnel*
| | | | | tunnel-ref
| | | +--rw p2p-primary-reverse-path
| | | | +--rw name? string
| | | | +--rw path-setup-protocol?
| | | | | identityref
| | | | +--rw path-computation-method?
| | | | | identityref
| | | | +--rw path-computation-server?
| | | | | inet:ip-address
| | | | +--rw compute-only? empty
| | | | +--rw use-path-computation? boolean
| | | | +--rw lockdown? empty
| | | | +--ro path-scope?
| | | | | identityref
| | | | +--rw optimizations
| | | | | +--rw (algorithm)?
| | | | | | +--:(metric) {path-optimization-metric}?
| | | | | | | +--rw optimization-metric* [metric-type]
| | | | | | | | +--rw metric-type
| | | | | | | | | identityref
| | | | | | | +--rw weight?
| | | | | | | | uint8
| | | | | | +--rw explicit-route-exclude-objects
| | | | | | | +--rw route-object-exclude-object*
| | | | | | | | [index]
| | | | | | | +--rw index
| | | | | | | | uint32
| | | | | | +--rw (type)?
| | | | | | | +--:(numbered-node-hop)
| | | | | | | | +--rw numbered-node-hop
| | | | | | | | | +--rw node-id
| | | | | | | | | | te-node-id
| | | | | | | | | +--rw hop-type?
| | | | | | | | | | te-hop-type
| | | | | | | +--:(numbered-link-hop)
| | | | | | | | +--rw numbered-link-hop
| | | | | | | | | +--rw link-tp-id
| | | | | | | | | | te-tp-id
| | | | | | | | | +--rw hop-type?
| | | | | | | | | | te-hop-type
| | | | | | | | +--rw direction?
| | | | | | | | | te-link-direction
| | | | | | +--:(unnumbered-link-hop)
| | | | | | | +--rw unnumbered-link-hop
| | | | | | | | +--rw link-tp-id
| | | | | | | | | te-tp-id

```


[illegible]

| | | | | | | | | | te-tp-id

```

| | | | | | | | | +-rw node-id
| | | | | | | | | | te-node-id
| | | | | | | | | +-rw hop-type?
| | | | | | | | | | te-hop-type
| | | | | | | | | +-rw direction?
| | | | | | | | | | te-link-direction
| | | | | | | | | +---:(as-number)
| | | | | | | | | | +-rw as-number-hop
| | | | | | | | | | +-rw as-number
| | | | | | | | | | | inet:as-number
| | | | | | | | | | +-rw hop-type?
| | | | | | | | | | | te-hop-type
| | | | | | | | | +---:(label)
| | | | | | | | | | +-rw label-hop
| | | | | | | | | | +-rw te-label
| | | | | | | | | | +-rw (technology)?
| | | | | | | | | | | +---:(generic)
| | | | | | | | | | | +-rw generic?
| | | | | | | | | | | rt-
types:generalized-label
| | | | | | | | | +-rw direction?
| | | | | | | | | | te-label-direction
| | | | | | | | | +-rw tiebreakers
| | | | | | | | | | +-rw tiebreaker* [tiebreaker-type]
| | | | | | | | | | +-rw tiebreaker-type
| | | | | | | | | | identityref
| | | | | | | | | +---:(objective-function)
| | | | | | | | | | {path-optimization-objective-function}?
| | | | | | | | | | +-rw objective-function
| | | | | | | | | | +-rw objective-function-type?
| | | | | | | | | | identityref
| | | | | | | +-rw named-path-constraint? leafref
| | | | | | | | {te-types:named-path-constraints}?
| | | | | | | +-rw te-bandwidth
| | | | | | | | +-rw (technology)?
| | | | | | | | +---:(generic)
| | | | | | | | +-rw generic? te-bandwidth
| | | | | | | +-rw link-protection?
| | | | | | | | identityref
| | | | | | | +-rw setup-priority? uint8
| | | | | | | +-rw hold-priority? uint8
| | | | | | | +-rw signaling-type?
| | | | | | | | identityref
| | | | | | | +-rw path-metric-bounds
| | | | | | | | +-rw path-metric-bound* [metric-type]
| | | | | | | | +-rw metric-type identityref
| | | | | | | | +-rw upper-bound? uint64
| | | | | | | +-rw path-affinities-values

```

| | | | |--rw path-affinities-value* [usage]

```

| | | | | +--rw usage      identityref
| | | | | +--rw value?   admin-groups
| | | | | +--rw path-affinity-names
| | | | | | +--rw path-affinity-name* [usage]
| | | | | | +--rw usage      identityref
| | | | | | +--rw affinity-name* [name]
| | | | | | +--rw name      string
| | | | | +--rw path-srlgs-lists
| | | | | | +--rw path-srlgs-list* [usage]
| | | | | | +--rw usage      identityref
| | | | | | +--rw values*    srlg
| | | | | +--rw path-srlgs-names
| | | | | | +--rw path-srlgs-name* [usage]
| | | | | | +--rw usage      identityref
| | | | | | +--rw names*    string
| | | | | +--rw disjointness?
| | | | | | te-path-disjointness
| | | | | +--rw explicit-route-objects-always
| | | | | | +--rw route-object-exclude-always* [index]
| | | | | | | +--rw index                uint32
| | | | | | | +--rw (type)?
| | | | | | | +--:(numbered-node-hop)
| | | | | | | | +--rw numbered-node-hop
| | | | | | | | | +--rw node-id      te-node-id
| | | | | | | | | +--rw hop-type?   te-hop-type
| | | | | | | +--:(numbered-link-hop)
| | | | | | | | +--rw numbered-link-hop
| | | | | | | | | +--rw link-tp-id   te-tp-id
| | | | | | | | | +--rw hop-type?   te-hop-type
| | | | | | | | | +--rw direction?
| | | | | | | | | | te-link-direction
| | | | | | | +--:(unnumbered-link-hop)
| | | | | | | | +--rw unnumbered-link-hop
| | | | | | | | | +--rw link-tp-id   te-tp-id
| | | | | | | | | +--rw node-id      te-node-id
| | | | | | | | | +--rw hop-type?   te-hop-type
| | | | | | | | | +--rw direction?
| | | | | | | | | | te-link-direction
| | | | | | | +--:(as-number)
| | | | | | | | +--rw as-number-hop
| | | | | | | | | +--rw as-number   inet:as-number
| | | | | | | | | +--rw hop-type?   te-hop-type
| | | | | | | +--:(label)
| | | | | | | | +--rw label-hop
| | | | | | | | | +--rw te-label
| | | | | | | | | +--rw (technology)?
| | | | | | | | | | +--:(generic)
| | | | | | | | | | | +--rw generic?

```



```

|                                     | rt-types:generalized-label
|                                     | +--rw direction?
|                                     |         te-label-direction
|--rw route-object-include-exclude* [index]
|   +--rw explicit-route-usage?
|   |   identityref
|   +--rw index                               uint32
|   +--rw (type)?
|   |   +--:(numbered-node-hop)
|   |   |   +--rw numbered-node-hop
|   |   |   |   +--rw node-id       te-node-id
|   |   |   |   +--rw hop-type?    te-hop-type
|   |   +--:(numbered-link-hop)
|   |   |   +--rw numbered-link-hop
|   |   |   |   +--rw link-tp-id    te-tp-id
|   |   |   |   +--rw hop-type?    te-hop-type
|   |   |   |   +--rw direction?
|   |   |   |   |   te-link-direction
|   |   +--:(unnumbered-link-hop)
|   |   |   +--rw unnumbered-link-hop
|   |   |   |   +--rw link-tp-id    te-tp-id
|   |   |   |   +--rw node-id      te-node-id
|   |   |   |   +--rw hop-type?    te-hop-type
|   |   |   |   +--rw direction?
|   |   |   |   |   te-link-direction
|   |   +--:(as-number)
|   |   |   +--rw as-number-hop
|   |   |   |   +--rw as-number    inet:as-number
|   |   |   |   +--rw hop-type?    te-hop-type
|   |   +--:(label)
|   |   |   +--rw label-hop
|   |   |   |   +--rw te-label
|   |   |   |   |   +--rw (technology)?
|   |   |   |   |   |   +--:(generic)
|   |   |   |   |   |   |   +--rw generic?
|   |   |   |   |   |   |   |   rt-types:generalized-label
|   |   |   |   |   +--rw direction?
|   |   |   |   |   |   te-label-direction
|   |   +--:(srlg)
|   |   |   +--rw srlg
|   |   |   |   +--rw srlg?    uint32
|--rw shared-resources-tunnels
|   +--rw lsp-shared-resources-tunnel*
|   |   tunnel-ref
|--rw path-in-segment!
|   +--rw label-restrictions
|   |   +--rw label-restriction* [index]
|   |   |   +--rw restriction?    enumeration

```



```

| | | | | +--rw index          uint32
| | | | | +--rw label-start
| | | | | | +--rw te-label
| | | | | |   +--rw (technology)?
| | | | | |   | +--:(generic)
| | | | | |   |   +--rw generic?
| | | | | |   |       rt-types:generalized-label
| | | | | |   +--rw direction?
| | | | | |       te-label-direction
| | | | | +--rw label-end
| | | | | | +--rw te-label
| | | | | |   +--rw (technology)?
| | | | | |   | +--:(generic)
| | | | | |   |   +--rw generic?
| | | | | |   |       rt-types:generalized-label
| | | | | |   +--rw direction?
| | | | | |       te-label-direction
| | | | | +--rw label-step
| | | | | | +--rw (technology)?
| | | | | |   +--:(generic)
| | | | | |       +--rw generic?   int32
| | | | | +--rw range-bitmap? yang:hex-string
| | | | +--rw path-out-segment!
| | | | | +--rw label-restrictions
| | | | |   +--rw label-restriction* [index]
| | | | |   +--rw restriction?   enumeration
| | | | |   +--rw index          uint32
| | | | |   +--rw label-start
| | | | |   | +--rw te-label
| | | | |   |   +--rw (technology)?
| | | | |   |   | +--:(generic)
| | | | |   |   |   +--rw generic?
| | | | |   |   |       rt-types:generalized-label
| | | | |   |   +--rw direction?
| | | | |   |       te-label-direction
| | | | |   +--rw label-end
| | | | |   | +--rw te-label
| | | | |   |   +--rw (technology)?
| | | | |   |   | +--:(generic)
| | | | |   |   |   +--rw generic?
| | | | |   |   |       rt-types:generalized-label
| | | | |   |   +--rw direction?
| | | | |   |       te-label-direction
| | | | |   +--rw label-step
| | | | |   | +--rw (technology)?
| | | | |   |   +--:(generic)
| | | | |   |       +--rw generic?   int32
| | | | | +--rw range-bitmap? yang:hex-string

```



```

| | | | +--ro computed-paths-properties
| | | | | +--ro computed-path-properties* [k-index]
| | | | | | +--ro k-index          uint8
| | | | | | +--ro path-properties
| | | | | | | +--ro path-metric* [metric-type]
| | | | | | | | +--ro metric-type
| | | | | | | | | identityref
| | | | | | | | +--ro accumulative-value?  uint64
| | | | | | +--ro path-affinities-values
| | | | | | | +--ro path-affinities-value* [usage]
| | | | | | | | +--ro usage      identityref
| | | | | | | | +--ro value?    admin-groups
| | | | | | +--ro path-affinity-names
| | | | | | | +--ro path-affinity-name* [usage]
| | | | | | | | +--ro usage      identityref
| | | | | | | | +--ro affinity-name* [name]
| | | | | | | | | +--ro name     string
| | | | | | +--ro path-srlgs-lists
| | | | | | | +--ro path-srlgs-list* [usage]
| | | | | | | | +--ro usage      identityref
| | | | | | | | +--ro values*    srlg
| | | | | | +--ro path-srlgs-names
| | | | | | | +--ro path-srlgs-name* [usage]
| | | | | | | | +--ro usage      identityref
| | | | | | | | +--ro names*    string
| | | | | | +--ro path-route-objects
| | | | | | | +--ro path-computed-route-object*
| | | | | | | | [index]
| | | | | | | | +--ro index
| | | | | | | | | uint32
| | | | | | | +--ro (type)?
| | | | | | | | +--:(numbered-node-hop)
| | | | | | | | | +--ro numbered-node-hop
| | | | | | | | | | +--ro node-id
| | | | | | | | | | | te-node-id
| | | | | | | | | | +--ro hop-type?
| | | | | | | | | | | te-hop-type
| | | | | | | | +--:(numbered-link-hop)
| | | | | | | | | +--ro numbered-link-hop
| | | | | | | | | | +--ro link-tp-id
| | | | | | | | | | | te-tp-id
| | | | | | | | | | +--ro hop-type?
| | | | | | | | | | | te-hop-type
| | | | | | | | | | +--ro direction?
| | | | | | | | | | | te-link-direction
| | | | | | | | +--:(unnumbered-link-hop)
| | | | | | | | | +--ro unnumbered-link-hop
| | | | | | | | | | +--ro link-tp-id

```


					+--ro lockout-of-normal?
					boolean

					+--ro freeze?
					boolean
					+--ro lsp-protection-role?
					enumeration
					+--ro lsp-protection-state?
					identityref
					+--ro protection-group-ingress-node-id?
					te-types:te-node-id
					+--ro protection-group-egress-node-id?
					te-types:te-node-id
					+--ro lsp-shared-resources-tunnel?
					tunnel-ref
					+--ro lsp-record-route-information
					+--ro lsp-record-route-information*
					[index]
					+--ro index
					uint32
					+--ro (type)?
					+--:(numbered-node-hop)
					+--ro numbered-node-hop
					+--ro node-id te-node-id
					+--ro flags*
					path-attribute-flags
					+--:(numbered-link-hop)
					+--ro numbered-link-hop
					+--ro link-tp-id te-tp-id
					+--ro flags*
					path-attribute-flags
					+--:(unnumbered-link-hop)
					+--ro unnumbered-link-hop
					+--ro link-tp-id te-tp-id
					+--ro node-id?
					te-node-id
					+--ro flags*
					path-attribute-flags
					+--:(label)
					+--ro label-hop
					+--ro te-label
					+--ro (technology)?
					+--:(generic)
					+--ro generic?
					rt-types:generalized-
label					+--ro direction?
					te-label-direction
					+--ro flags*
					path-attribute-flags
					+--ro path-properties

Lopez de Vergara, et al. Expires August 26, 2021

[Page 29]

```

| | | | | | +--ro metric-type
| | | | | | | identityref
| | | | | | +--ro accumulative-value? uint64
+--ro path-affinities-values
| +--ro path-affinities-value* [usage]
|   +--ro usage identityref
|   +--ro value? admin-groups
+--ro path-affinity-names
| +--ro path-affinity-name* [usage]
|   +--ro usage identityref
|   +--ro affinity-name* [name]
|     +--ro name string
+--ro path-srlgs-lists
| +--ro path-srlgs-list* [usage]
|   +--ro usage identityref
|   +--ro values* srlg
+--ro path-srlgs-names
| +--ro path-srlgs-name* [usage]
|   +--ro usage identityref
|   +--ro names* string
+--ro path-route-objects
| +--ro path-computed-route-object*
|   [index]
|   +--ro index
|     | uint32
|   +--ro (type)?
|     +--:(numbered-node-hop)
|       | +--ro numbered-node-hop
|       |   +--ro node-id
|       |     | te-node-id
|       |   +--ro hop-type?
|       |     | te-hop-type
|     +--:(numbered-link-hop)
|       | +--ro numbered-link-hop
|       |   +--ro link-tp-id
|       |     | te-tp-id
|       |   +--ro hop-type?
|       |     | te-hop-type
|       |   +--ro direction?
|       |     | te-link-direction
|     +--:(unnumbered-link-hop)
|       | +--ro unnumbered-link-hop
|       |   +--ro link-tp-id
|       |     | te-tp-id
|       |   +--ro node-id
|       |     | te-node-id
|       |   +--ro hop-type?
|       |     | te-hop-type

```



```

| | | | | | | | | | +--ro direction?
| | | | | | | | | | te-link-direction
| | | | | | | | | | +---:(as-number)
| | | | | | | | | | | +--ro as-number-hop
| | | | | | | | | | | +--ro as-number
| | | | | | | | | | | | inet:as-number
| | | | | | | | | | | +--ro hop-type?
| | | | | | | | | | | te-hop-type
| | | | | | | | | | +---:(label)
| | | | | | | | | | | +--ro label-hop
| | | | | | | | | | | +--ro te-label
| | | | | | | | | | | +--ro (technology)?
| | | | | | | | | | | | +---:(generic)
| | | | | | | | | | | | +--ro generic?
| | | | | | | | | | | rt-
types:generalized-label
| | | | | | | | | | +--ro direction?
| | | | | | | | | | te-label-direction
| | | | | | | | | | +--ro shared-resources-tunnels
| | | | | | | | | | +--ro lsp-shared-resources-tunnel*
| | | | | | | | | | tunnel-ref
| | | | | | | | | | +--rw p2p-secondary-reverse-path
| | | | | | | | | | | +--rw secondary-path? leafref
| | | | | | | | | | | +--rw path-setup-protocol? identityref
| | | | | | | | | | +--rw candidate-p2p-secondary-paths
| | | | | | | | | | | +--rw candidate-p2p-secondary-path*
| | | | | | | | | | | [secondary-path]
| | | | | | | | | | | +--rw secondary-path leafref
| | | | | | | | | | | +--rw path-setup-protocol? identityref
| | | | | | | | | | | +--ro active? boolean
| | | | | | | | | | +--rw p2p-secondary-paths
| | | | | | | | | | | +--rw p2p-secondary-path* [name]
| | | | | | | | | | | | +--rw name string
| | | | | | | | | | | | +--rw path-setup-protocol? identityref
| | | | | | | | | | | | +--rw path-computation-method? identityref
| | | | | | | | | | | | +--rw path-computation-server?
| | | | | | | | | | | | | inet:ip-address
| | | | | | | | | | | +--rw compute-only? empty
| | | | | | | | | | | +--rw use-path-computation? boolean
| | | | | | | | | | | +--rw lockdown? empty
| | | | | | | | | | | +--ro path-scope? identityref
| | | | | | | | | | +--rw optimizations
| | | | | | | | | | | +--rw (algorithm)?
| | | | | | | | | | | | +---:(metric) {path-optimization-metric}?
| | | | | | | | | | | | | +--rw optimization-metric* [metric-type]
| | | | | | | | | | | | | | +--rw metric-type
| | | | | | | | | | | | | | identityref
| | | | | | | | | | | | | +--rw weight?

```

```
| | | | | | | uint8
```

```
+--rw explicit-route-exclude-objects
+--rw route-object-exclude-object*
    [index]
+--rw index
|     uint32
+--rw (type)?
+---:(numbered-node-hop)
|   +--rw numbered-node-hop
|       |         te-node-id
|       +--rw hop-type?
|           te-hop-type
+---:(numbered-link-hop)
|   +--rw numbered-link-hop
|       +--rw link-tp-id
|           |         te-tp-id
|       +--rw hop-type?
|           |         te-hop-type
|       +--rw direction?
|           te-link-direction
+---:(unnumbered-link-hop)
|   +--rw unnumbered-link-hop
|       +--rw link-tp-id
|           |         te-tp-id
|       +--rw node-id
|           |         te-node-id
|       +--rw hop-type?
|           |         te-hop-type
|       +--rw direction?
|           te-link-direction
+---:(as-number)
|   +--rw as-number-hop
|       +--rw as-number
|           |         inet:as-number
|       +--rw hop-type?
|           te-hop-type
+---:(label)
|   +--rw label-hop
|       +--rw te-label
|           +--rw (technology)?
|               |         +---:(generic)
|                   |         +--rw generic?
|                       rt-
types:generalized-label
|       +--rw direction?
|           te-label-direction
+---:(srllg)
+--rw srllg
```

| | | | | +-rw srlg? uint32

```

+--rw explicit-route-include-objects
+--rw route-object-include-object*
    [index]
+--rw index
    |      uint32
+--rw (type)?
    +--:(numbered-node-hop)
    |   +--rw numbered-node-hop
    |       +--rw node-id
    |           |      te-node-id
    |       +--rw hop-type?
    |           |      te-hop-type
    +--:(numbered-link-hop)
    |   +--rw numbered-link-hop
    |       +--rw link-tp-id
    |           |      te-tp-id
    |       +--rw hop-type?
    |           |      te-hop-type
    |       +--rw direction?
    |           |      te-link-direction
    +--:(unnumbered-link-hop)
    |   +--rw unnumbered-link-hop
    |       +--rw link-tp-id
    |           |      te-tp-id
    |       +--rw node-id
    |           |      te-node-id
    |       +--rw hop-type?
    |           |      te-hop-type
    |       +--rw direction?
    |           |      te-link-direction
    +--:(as-number)
    |   +--rw as-number-hop
    |       +--rw as-number
    |           |      inet:as-number
    |       +--rw hop-type?
    |           |      te-hop-type
    +--:(label)
    |   +--rw label-hop
    |       +--rw te-label
    |           +--rw (technology)?
    |               |   +--:(generic)
    |                   |   +--rw generic?
    |                       |   rt-
types:generalized-label
    +--rw direction?
    |       te-label-direction
+--rw tiebreakers
+--rw tiebreaker* [tiebreaker-type]

```

| | | | +-rw tiebreaker-type identityref

```

| | | | +--:(objective-function)
| | | | | {path-optimization-objective-function}?
| | | | | +--rw objective-function
| | | | | +--rw objective-function-type?
| | | | | identityref
| | | | +--rw preference? uint8
| | | | +--rw k-requested-paths? uint8
| | | | +--rw named-path-constraint? leafref
| | | | | {te-types:named-path-constraints}?
| | | | +--rw te-bandwidth
| | | | | +--rw (technology)?
| | | | | +--:(generic)
| | | | | | +--rw generic? te-bandwidth
| | | | +--rw link-protection? identityref
| | | | +--rw setup-priority? uint8
| | | | +--rw hold-priority? uint8
| | | | +--rw signaling-type? identityref
| | | | +--rw path-metric-bounds
| | | | | +--rw path-metric-bound* [metric-type]
| | | | | | +--rw metric-type identityref
| | | | | | +--rw upper-bound? uint64
| | | | +--rw path-affinities-values
| | | | | +--rw path-affinities-value* [usage]
| | | | | | +--rw usage identityref
| | | | | | +--rw value? admin-groups
| | | | +--rw path-affinity-names
| | | | | +--rw path-affinity-name* [usage]
| | | | | | +--rw usage identityref
| | | | | | +--rw affinity-name* [name]
| | | | | | +--rw name string
| | | | +--rw path-srlgs-lists
| | | | | +--rw path-srlgs-list* [usage]
| | | | | | +--rw usage identityref
| | | | | | +--rw values* srlg
| | | | +--rw path-srlgs-names
| | | | | +--rw path-srlgs-name* [usage]
| | | | | | +--rw usage identityref
| | | | | | +--rw names* string
| | | | +--rw disjointness?
| | | | | te-path-disjointness
| | | | +--rw explicit-route-objects-always
| | | | | +--rw route-object-exclude-always* [index]
| | | | | | +--rw index uint32
| | | | | | +--rw (type)?
| | | | | | +--:(numbered-node-hop)
| | | | | | | +--rw numbered-node-hop
| | | | | | | +--rw node-id te-node-id
| | | | | | | +--rw hop-type? te-hop-type

```



```

| | | | | +--:(numbered-link-hop)
| | | | | | +--rw numbered-link-hop
| | | | | |   +--rw link-tp-id    te-tp-id
| | | | | |   +--rw hop-type?    te-hop-type
| | | | | |   +--rw direction?   te-link-direction
| | | | | +--:(unnumbered-link-hop)
| | | | | | +--rw unnumbered-link-hop
| | | | | |   +--rw link-tp-id    te-tp-id
| | | | | |   +--rw node-id      te-node-id
| | | | | |   +--rw hop-type?    te-hop-type
| | | | | |   +--rw direction?   te-link-direction
| | | | | +--:(as-number)
| | | | | | +--rw as-number-hop
| | | | | |   +--rw as-number    inet:as-number
| | | | | |   +--rw hop-type?    te-hop-type
| | | | | +--:(label)
| | | | |   +--rw label-hop
| | | | |   +--rw te-label
| | | | |       +--rw (technology)?
| | | | |       | +--:(generic)
| | | | |       |   +--rw generic?
| | | | |       |       rt-types:generalized-label
| | | | |       +--rw direction?
| | | | |           te-label-direction
| | | | +--rw route-object-include-exclude* [index]
| | | |   +--rw explicit-route-usage?    identityref
| | | |   +--rw index                    uint32
| | | | +--rw (type)?
| | | |   +--:(numbered-node-hop)
| | | |   | +--rw numbered-node-hop
| | | |   |   +--rw node-id    te-node-id
| | | |   |   +--rw hop-type?  te-hop-type
| | | |   +--:(numbered-link-hop)
| | | |   | +--rw numbered-link-hop
| | | |   |   +--rw link-tp-id    te-tp-id
| | | |   |   +--rw hop-type?    te-hop-type
| | | |   |   +--rw direction?   te-link-direction
| | | |   +--:(unnumbered-link-hop)
| | | |   | +--rw unnumbered-link-hop
| | | |   |   +--rw link-tp-id    te-tp-id
| | | |   |   +--rw node-id      te-node-id
| | | |   |   +--rw hop-type?    te-hop-type
| | | |   |   +--rw direction?   te-link-direction
| | | |   +--:(as-number)
| | | |   | +--rw as-number-hop
| | | |   |   +--rw as-number    inet:as-number
| | | |   |   +--rw hop-type?    te-hop-type
| | | |   +--:(label)

```



```

| | | | | +--rw label-hop
| | | | |   +--rw te-label
| | | | |     +--rw (technology)?
| | | | |       | +--:(generic)
| | | | |       |   +--rw generic?
| | | | |       |     rt-types:generalized-label
| | | | |     +--rw direction?
| | | | |       te-label-direction
| | | | | +--:(srlg)
| | | | |   +--rw srlg
| | | | |     +--rw srlg?   uint32
| | | | +--rw shared-resources-tunnels
| | | | | +--rw lsp-shared-resources-tunnel*   tunnel-ref
| | | | +--rw path-in-segment!
| | | | | +--rw label-restrictions
| | | | |   +--rw label-restriction* [index]
| | | | |     +--rw restriction?   enumeration
| | | | |     +--rw index           uint32
| | | | |     +--rw label-start
| | | | |       | +--rw te-label
| | | | |       |   +--rw (technology)?
| | | | |       |     | +--:(generic)
| | | | |       |     |   +--rw generic?
| | | | |       |     |     rt-types:generalized-label
| | | | |     +--rw direction?
| | | | |       te-label-direction
| | | | | +--rw label-end
| | | | |   | +--rw te-label
| | | | |     +--rw (technology)?
| | | | |     | +--:(generic)
| | | | |     |   +--rw generic?
| | | | |     |     rt-types:generalized-label
| | | | |   +--rw direction?
| | | | |     te-label-direction
| | | | | +--rw label-step
| | | | |   | +--rw (technology)?
| | | | |     +--:(generic)
| | | | |     | +--rw generic?   int32
| | | | |   +--rw range-bitmap?   yang:hex-string
| | | | +--rw path-out-segment!
| | | | | +--rw label-restrictions
| | | | |   +--rw label-restriction* [index]
| | | | |     +--rw restriction?   enumeration
| | | | |     +--rw index           uint32
| | | | |     +--rw label-start
| | | | |       | +--rw te-label
| | | | |       |   +--rw (technology)?
| | | | |       |     | +--:(generic)

```



```

| | | | | +--rw generic?
| | | | | |
| | | | | | rt-types:generalized-label
| | | | | |
| | | | | | +--rw direction?
| | | | | | |
| | | | | | | te-label-direction
| | | | | |
| | | | | | +--rw label-end
| | | | | | |
| | | | | | | +--rw te-label
| | | | | | |
| | | | | | | +--rw (technology)?
| | | | | | | |
| | | | | | | | +--:(generic)
| | | | | | | |
| | | | | | | | +--rw generic?
| | | | | | | |
| | | | | | | | rt-types:generalized-label
| | | | | | | |
| | | | | | | | +--rw direction?
| | | | | | | | |
| | | | | | | | | te-label-direction
| | | | | | |
| | | | | | | +--rw label-step
| | | | | | | |
| | | | | | | | +--rw (technology)?
| | | | | | | | |
| | | | | | | | | +--:(generic)
| | | | | | | | |
| | | | | | | | | +--rw generic? int32
| | | | | | | +--rw range-bitmap? yang:hex-string
| | | | | +--rw protection
| | | | | |
| | | | | | +--rw enable? boolean
| | | | | | +--rw protection-type? identityref
| | | | | | +--rw protection-reversion-disable? boolean
| | | | | | +--rw hold-off-time? uint32
| | | | | | +--rw wait-to-revert? uint16
| | | | | | +--rw aps-signal-id? uint8
| | | | | +--rw restoration
| | | | | |
| | | | | | +--rw enable? boolean
| | | | | | +--rw restoration-type?
| | | | | | |
| | | | | | | identityref
| | | | | | +--rw restoration-scheme?
| | | | | | |
| | | | | | | identityref
| | | | | | +--rw restoration-reversion-disable? boolean
| | | | | | +--rw hold-off-time? uint32
| | | | | | +--rw wait-to-restore? uint16
| | | | | | +--rw wait-to-revert? uint16
| | | | | +--ro computed-paths-properties
| | | | | |
| | | | | | +--ro computed-path-properties* [k-index]
| | | | | | |
| | | | | | | +--ro k-index uint8
| | | | | | |
| | | | | | | +--ro path-properties
| | | | | | | |
| | | | | | | | +--ro path-metric* [metric-type]
| | | | | | | | |
| | | | | | | | | +--ro metric-type identityref
| | | | | | | | | +--ro accumulative-value? uint64
| | | | | | |
| | | | | | | +--ro path-affinities-values
| | | | | | | |
| | | | | | | | +--ro path-affinities-value* [usage]
| | | | | | | | |
| | | | | | | | | +--ro usage identityref
| | | | | | | | | +--ro value? admin-groups
| | | | | | |
| | | | | | | +--ro path-affinity-names
| | | | | | | |
| | | | | | | | +--ro path-affinity-name* [usage]
| | | | | | | |
| | | | | | | | +--ro usage identityref

```



```

| | | | |      +--ro affinity-name* [name]
| | | | |      |      +--ro name      string
| | | | | +--ro path-srlgs-lists
| | | | | |      +--ro path-srlgs-list* [usage]
| | | | | |      +--ro usage      identityref
| | | | | |      +--ro values*    srlg
| | | | | +--ro path-srlgs-names
| | | | | |      +--ro path-srlgs-name* [usage]
| | | | | |      +--ro usage      identityref
| | | | | |      +--ro names*    string
| | | | | +--ro path-route-objects
| | | | | |      +--ro path-computed-route-object*
| | | | | |      |      [index]
| | | | | |      +--ro index
| | | | | |      |      uint32
| | | | | +--ro (type)?
| | | | | |      +--:(numbered-node-hop)
| | | | | |      |      +--ro numbered-node-hop
| | | | | |      |      |      +--ro node-id      te-node-id
| | | | | |      |      |      +--ro hop-type?
| | | | | |      |      |      |      te-hop-type
| | | | | |      +--:(numbered-link-hop)
| | | | | |      |      +--ro numbered-link-hop
| | | | | |      |      |      +--ro link-tp-id      te-tp-id
| | | | | |      |      |      +--ro hop-type?
| | | | | |      |      |      |      te-hop-type
| | | | | |      |      |      +--ro direction?
| | | | | |      |      |      |      te-link-direction
| | | | | |      +--:(unnumbered-link-hop)
| | | | | |      |      +--ro unnumbered-link-hop
| | | | | |      |      |      +--ro link-tp-id      te-tp-id
| | | | | |      |      |      +--ro node-id
| | | | | |      |      |      |      te-node-id
| | | | | |      |      |      +--ro hop-type?
| | | | | |      |      |      |      te-hop-type
| | | | | |      |      |      +--ro direction?
| | | | | |      |      |      |      te-link-direction
| | | | | |      +--:(as-number)
| | | | | |      |      +--ro as-number-hop
| | | | | |      |      |      +--ro as-number
| | | | | |      |      |      |      inet:as-number
| | | | | |      |      |      +--ro hop-type?
| | | | | |      |      |      |      te-hop-type
| | | | | |      +--:(label)
| | | | | |      |      +--ro label-hop
| | | | | |      |      |      +--ro te-label
| | | | | |      |      |      +--ro (technology)?
| | | | | |      |      |      |      +--:(generic)

```


						+--ro generic?
						rt-types:generalized-
label						
						+--ro direction?
						te-label-direction
						+--ro shared-resources-tunnels
						+--ro lsp-shared-resources-tunnel*
						tunnel-ref
						+--ro lsps
						+--ro lsp*
						[source destination tunnel-id lsp-id extended-
tunnel-id]						
						+--ro source
						te-types:te-node-id
						+--ro destination
						te-types:te-node-id
						+--ro tunnel-id
						uint16
						+--ro lsp-id
						uint16
						+--ro extended-tunnel-id
						yang:dotted-quad
						+--ro operational-state?
						identityref
						+--ro path-setup-protocol?
						identityref
						+--ro origin-type?
						enumeration
						+--ro lsp-resource-status?
						enumeration
						+--ro lockout-of-normal?
						boolean
						+--ro freeze?
						boolean
						+--ro lsp-protection-role?
						enumeration
						+--ro lsp-protection-state?
						identityref
						+--ro protection-group-ingress-node-id?
						te-types:te-node-id
						+--ro protection-group-egress-node-id?
						te-types:te-node-id
						+--ro lsp-shared-resources-tunnel?
						tunnel-ref
						+--ro lsp-record-route-information
						+--ro lsp-record-route-information* [index]
						+--ro index
						uint32

				+-ro (type)?
				+-:(numbered-node-hop)

```

| | | | | +-ro numbered-node-hop
| | | | |   +--ro node-id      te-node-id
| | | | |   +--ro flags*
| | | | |       path-attribute-flags
| | | | | +-:(numbered-link-hop)
| | | | |   +--ro numbered-link-hop
| | | | |     +--ro link-tp-id    te-tp-id
| | | | |     +--ro flags*
| | | | |         path-attribute-flags
| | | | | +-:(unnumbered-link-hop)
| | | | |   +--ro unnumbered-link-hop
| | | | |     +--ro link-tp-id    te-tp-id
| | | | |     +--ro node-id?      te-node-id
| | | | |     +--ro flags*
| | | | |         path-attribute-flags
| | | | | +-:(label)
| | | | |   +--ro label-hop
| | | | |   +--ro te-label
| | | | |       | +--ro (technology)?
| | | | |       | | +-:(generic)
| | | | |       | |   +--ro generic?
| | | | |       | | rt-types:generalized-
label | | | | |
| | | | |       | +--ro direction?
| | | | |       |           te-label-direction
| | | | |       +--ro flags*
| | | | |           path-attribute-flags
| | | | | +-ro path-properties
| | | | |   +-ro path-metric* [metric-type]
| | | | |     | +--ro metric-type      identityref
| | | | |     | +--ro accumulative-value? uint64
| | | | |   +-ro path-affinities-values
| | | | |     | +--ro path-affinities-value* [usage]
| | | | |     |   +--ro usage      identityref
| | | | |     |   +--ro value?    admin-groups
| | | | |   +-ro path-affinity-names
| | | | |     | +--ro path-affinity-name* [usage]
| | | | |     |   +--ro usage      identityref
| | | | |     |   +--ro affinity-name* [name]
| | | | |     |     +--ro name      string
| | | | |   +-ro path-srlgs-lists
| | | | |     | +--ro path-srlgs-list* [usage]
| | | | |     |   +--ro usage      identityref
| | | | |     |   +--ro values*    srlg
| | | | |   +-ro path-srlgs-names
| | | | |     | +--ro path-srlgs-name* [usage]
| | | | |     |   +--ro usage      identityref
| | | | |     |   +--ro names*     string

```

| | | +--ro path-route-objects

```

| | | | +--ro path-computed-route-object*
| | | | | [index]
| | | | +--ro index
| | | | | | uint32
| | | | +--ro (type)?
| | | | | +--:(numbered-node-hop)
| | | | | | +--ro numbered-node-hop
| | | | | | | +--ro node-id te-node-id
| | | | | | | +--ro hop-type?
| | | | | | | | te-hop-type
| | | | | +--:(numbered-link-hop)
| | | | | | +--ro numbered-link-hop
| | | | | | | +--ro link-tp-id te-tp-id
| | | | | | | +--ro hop-type?
| | | | | | | | te-hop-type
| | | | | | | +--ro direction?
| | | | | | | | te-link-direction
| | | | | +--:(unnumbered-link-hop)
| | | | | | +--ro unnumbered-link-hop
| | | | | | | +--ro link-tp-id te-tp-id
| | | | | | | +--ro node-id
| | | | | | | | te-node-id
| | | | | | | +--ro hop-type?
| | | | | | | | te-hop-type
| | | | | | | +--ro direction?
| | | | | | | | te-link-direction
| | | | | +--:(as-number)
| | | | | | +--ro as-number-hop
| | | | | | | +--ro as-number
| | | | | | | | inet:as-number
| | | | | | | +--ro hop-type?
| | | | | | | | te-hop-type
| | | | | +--:(label)
| | | | | | +--ro label-hop
| | | | | | | +--ro te-label
| | | | | | | | +--ro (technology)?
| | | | | | | | | +--:(generic)
| | | | | | | | | | +--ro generic?
| | | | | | | | | | rt-types:generalized-
label | | | | | +--ro direction?
| | | | | | te-label-direction
| | | | +--ro shared-resources-tunnels
| | | | +--ro lsp-shared-resources-tunnel*
| | | | | tunnel-ref
| | +---x tunnel-action
| | | +---w input
| | | | +---w action-type? identityref

```

| | | +--ro output

```

| | | +--ro action-result?  identityref
| | +---x protection-external-commands
| |   +---w input
| |     +---w protection-external-command?
| |       | identityref
| |     +---w protection-group-ingress-node-id?
| |       | te-types:te-node-id
| |     +---w protection-group-egress-node-id?
| |       | te-types:te-node-id
| |     +---w path-ref?                                path-ref
| |     +---w traffic-type?
| |       | enumeration
| |     +---w extra-traffic-tunnel-ref?                tunnel-ref
| +--rw tunnel-p2mp* [name]
|   +--rw name                string
|   +--rw identifier?         uint16
|   +--rw description?        string
|   +--ro operational-state?  identityref
+--ro lsps-state
  +--ro lsp*
    [source destination tunnel-id lsp-id extended-tunnel-id]
    +--ro source
      | te-types:te-node-id
    +--ro destination
      | te-types:te-node-id
    +--ro tunnel-id                uint16
    +--ro lsp-id                  uint16
    +--ro extended-tunnel-id       yang:dotted-quad
    +--ro operational-state?       identityref
    +--ro path-setup-protocol?     identityref
    +--ro origin-type?             enumeration
    +--ro lsp-resource-status?     enumeration
    +--ro lockout-of-normal?       boolean
    +--ro freeze?                  boolean
    +--ro lsp-protection-role?     enumeration
    +--ro lsp-protection-state?    identityref
    +--ro protection-group-ingress-node-id?
      | te-types:te-node-id
    +--ro protection-group-egress-node-id?
      | te-types:te-node-id
    +--ro lsp-record-route-information
      +--ro lsp-record-route-information* [index]
        +--ro index                uint32
        +--ro (type)?
          +--:(numbered-node-hop)
            | +--ro numbered-node-hop
            |   +--ro node-id      te-node-id
            |   +--ro flags*       path-attribute-flags

```



```

+--:(numbered-link-hop)
| +--ro numbered-link-hop
|   +--ro link-tp-id    te-tp-id
|   +--ro flags*        path-attribute-flags
+--:(unnumbered-link-hop)
| +--ro unnumbered-link-hop
|   +--ro link-tp-id    te-tp-id
|   +--ro node-id?      te-node-id
|   +--ro flags*        path-attribute-flags
+--:(label)
  +--ro label-hop
  +--ro te-label
  | +--ro (technology)?
  | | +--:(generic)
  | |   +--ro generic?
  | |       rt-types:generalized-label
  | +--ro direction?
  |       te-label-direction
  +--ro flags*        path-attribute-flags

```

rpcs:

```

+---x globals-rpc
+---x interfaces-rpc
+---x tunnels-rpc
  +---w input
  | +---w tunnel-info
  |   +---w (type)?
  |     +--:(tunnel-p2p)
  |       | +---w p2p-id?    tunnel-ref
  |       +--:(tunnel-p2mp)
  |         +---w p2mp-id?    tunnel-p2mp-ref
  +--ro output
    +--ro result
      +--ro result?    enumeration

```

notifications:

```

+---n globals-notif
+---n tunnels-notif

```

5.2. YANG Code

```

<CODE BEGINS> file "ietf-flexi-grid-topology@2020-10-21.yang"
module ietf-flexi-grid-media-channel {
  yang-version 1.1;
  namespace

```



```
"urn:ietf:params:xml:ns:yang:ietf-flexi-grid-media-channel";
prefix "flexi-grid-media-channel";

import ietf-te {
  prefix "te";
  revision-date "2019-02-15";
  reference
    "I-D.ietf-teas-yang-te-19: A YANG Data Model for Traffic
    Engineering Tunnels and Interfaces. ";
}

import ietf-layer0-types{
  prefix "l0-types";
}

import ietf-layer0-types-ext {
  prefix "l0-types-ext";
}

import ietf-te-path-computation {
  prefix "tepc";
  revision-date "2019-03-11";
  reference
    "I-D.ietf-teas-yang-path-computation-05: Yang model
    for requesting Path Computation.";
}

organization
  "IETF CCAMP Working Group";
contact
  "WG Web:   <http://tools.ietf.org/wg/ccamp/>
  WG List:   <mailto:ccamp@ietf.org>
  Editor:    Jorge E. Lopez de Vergara
             <jorge.lopez_vergara@uam.es>
  Editor:    Daniel Perdices
             <daniel.perdices@naudit.es>
  Editor:    Victor Lopez
             <victor.lopezalvarez@telefonica.com>
  Editor:    Young Lee
             <leeyoung@huawei.com>";

description
  "This module defines a model for Flex-grid Media Channel
  Services.
  The model fully conforms to the Network Management
  Datastore Architecture (NMDA).

  Copyright (c) 2021 IETF Trust and the persons
```


identified as authors of the code. All rights reserved.
Redistribution and use in source and binary forms, with or
without modification, is permitted pursuant to, and subject
to the license terms contained in, the Simplified BSD License
set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions
Relating to IETF Documents
(<https://trustee.ietf.org/license-info>).
This version of this YANG module is part of RFC XXXX; see
the RFC itself for full legal notices.";

```
revision "2021-02-12" {
  description
    "Initial Revision";
  reference
    "RFC XXXX: YANG data model for Flexi-Grid media-channels";
  // RFC Ed.: replace XXXX with actual RFC number, update date
  // information and remove this note
}

/*
 * Data nodes
 */

augment "/te:te/te:tunnels/te:tunnel" {
  description
    "Augment with additional parameters required for flexi-grid
    media channel.";
  uses l0-types-ext:l0-tunnel-attributes;
}

/*
 * Augment TE label.
 */

/* Augment label hop of route-object-exclude-always of
   named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
  + "te:named-path-constraint/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-exclude-always/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of route-object-include-exclude of
```



```
    named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/"
    + "te:explicit-route-objects-always/"
    + "te:route-object-include-exclude/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label restrictions for the forwarding direction of
   path-in-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-in-segment/"
    + "te:label-restrictions/te:label-restriction" {
description "Flex-grid label.";
uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-in-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-in-segment/"
    + "te:label-restrictions/"
    + "te:label-restriction/te:label-start/"
    + "te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
}
}

/* Augment label restrictions end for the forwarding direction of
   path-in-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-in-segment/"
    + "te:label-restrictions/"
    + "te:label-restriction/te:label-end/"
    + "te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
}
}

/* Augment label restrictions for the forwarding direction of
```



```
    path-out-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-out-segment/"
    + "te:label-restrictions/"
    + "te:label-restriction" {
    description "Flex-grid label.";
    uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-out-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-out-segment/"
    + "te:label-restrictions/"
    + "te:label-restriction/te:label-start/"
    + "te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

/* Augment label restrictions end for the forwarding direction of
   path-out-segment of named-path-constraints */
augment "/te:te/te:globals/te:named-path-constraints/"
    + "te:named-path-constraint/te:path-out-segment/"
    + "te:label-restrictions/"
    + "te:label-restriction/te:label-end/"
    + "te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

/* Augment label hop of route-exclude of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:optimizations/te:algorithm/te:metric/"
    + "te:optimization-metric/te:explicit-route-exclude-objects/"
    + "te:route-object-exclude-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}
```



```
/* Augment label hop of route-include of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:optimizations/te:algorithm/te:metric/"
  + "te:optimization-metric/te:explicit-route-include-objects/"
  + "te:route-object-include-object/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of route-object-exclude-always of
   primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-exclude-always/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of route-object-include-exclude of
   primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-include-exclude/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label restrictions for the path-in-segment of
   primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction" {
  description "Flex-grid label.";
  uses l0-types:flexi-grid-label-range-info;
}
```



```
/* Augment label restrictions start for the forwarding direction of
   path-in-segment of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label restrictions end for the forwarding direction of
   path-in-segment of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-end/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label restrictions for the forwarding direction of
   path-out-segment of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction" {
  description "Flex-grid label.";
  uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-out-segment of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}
```



```
/* Augment label restrictions end for the forwarding direction of
   path-out-segment of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-end/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label hop of path-route of primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:computed-paths-properties/"
  + "te:computed-path-properties/te:path-properties/"
  + "te:path-route-objects/te:path-computed-route-object/"
  + "te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of record-route of primary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:lsps/te:lsp/te:lsp-record-route-information/"
  + "te:lsp-record-route-information/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of path-route of primary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:lsps/te:lsp/te:path-properties/"
  + "te:path-route-objects/te:path-computed-route-object/"
  + "te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
```



```
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of route-exclude of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:p2p-primary-reverse-path/"
    + "te:optimizations/te:algorithm/te:metric/"
    + "te:optimization-metric/te:explicit-route-exclude-objects/"
    + "te:route-object-exclude-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of route-include of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:p2p-primary-reverse-path/"
    + "te:optimizations/te:algorithm/te:metric/"
    + "te:optimization-metric/te:explicit-route-include-objects/"
    + "te:route-object-include-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of route-object-exclude-always of
reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:p2p-primary-reverse-path/"
    + "te:explicit-route-objects-always/"
    + "te:route-object-exclude-always/"
    + "te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of route-object-include-exclude of
```



```
reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-include-exclude/"
  + "te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label restrictions for the forwarding direction of
   path-in-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction" {
description "Flex-grid label.";
uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-in-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
  uses l0-types:flexi-grid-label-start-end;
}
}

/* Augment label restrictions end for the forwarding direction of
   path-in-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-end/"
  + "te:te-label/te:technology" {
description "Flex-grid label.";
```



```
    case flexi-grid {
      uses l0-types:flexi-grid-label-start-end;
    }
  }

/* Augment label restrictions for the forwarding direction of
   path-out-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction" {
  description "Flex-grid label.";
  uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-out-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label restrictions end for the forwarding direction of
   path-out-segment of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-end/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label hop of path-route of reverse primary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-primary-paths/te:p2p-primary-path/"
  + "te:p2p-primary-reverse-path/"
```



```
    + "te:computed-paths-properties/te:computed-path-properties/"
    + "te:path-properties/te:path-route-objects/"
    + "te:path-computed-route-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label hop of record-route of reverse primary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:p2p-primary-reverse-path/"
    + "te:lsps/te:lsp/te:lsp-record-route-information/"
    + "te:lsp-record-route-information/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label hop of path-route of reverse primary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-primary-paths/te:p2p-primary-path/"
    + "te:p2p-primary-reverse-path/"
    + "te:lsps/te:lsp/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label hop of route-exclude of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-secondary-paths/te:p2p-secondary-path/"
    + "te:optimizations/te:algorithm/te:metric/"
    + "te:optimization-metric/te:explicit-route-exclude-objects/"
    + "te:route-object-exclude-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}
```



```
}

/* Augment label hop of route-include of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:optimizations/te:algorithm/te:metric/"
  + "te:optimization-metric/te:explicit-route-include-objects/"
  + "te:route-object-include-object/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of route-object-exclude-always of
   secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-exclude-always/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label hop of route-object-include-exclude of
   secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:explicit-route-objects-always/"
  + "te:route-object-include-exclude/te:type/te:label/"
  + "te:label-hop/te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

/* Augment label restrictions for the forwarding direction of
   path-in-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction" {
  description "Flex-grid label.;"
```



```
    uses l0-types:flexi-grid-label-range-info;
  }

/* Augment label restrictions start for the forwarding direction of
   path-in-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label restrictions end for the forwarding direction of
   path-in-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:path-in-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-end/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

/* Augment label restrictions for the forwarding direction of
   path-out-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction" {
  description "Flex-grid label.";
  uses l0-types:flexi-grid-label-range-info;
}

/* Augment label restrictions start for the forwarding direction of
   path-out-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
  + "te:p2p-secondary-paths/te:p2p-secondary-path/"
  + "te:path-out-segment/te:label-restrictions/"
  + "te:label-restriction/te:label-start/"
  + "te:te-label/te:technology" {
  description "Flex-grid label.";
  case flexi-grid {
```



```
        uses l0-types:flexi-grid-label-start-end;
    }
}

/* Augment label restrictions end for the forwarding direction of
   path-out-segment of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-secondary-paths/te:p2p-secondary-path/"
    + "te:path-out-segment/te:label-restrictions/"
    + "te:label-restriction/te:label-end/"
    + "te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

/* Augment label hop of path-route of secondary path */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-secondary-paths/te:p2p-secondary-path/"
    + "te:computed-paths-properties/"
    + "te:computed-path-properties/"
    + "te:path-properties/te:path-route-objects/"
    + "te:path-computed-route-object/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of record-route of secondary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-secondary-paths/te:p2p-secondary-path/"
    + "te:lsps/te:lsp/te:lsp-record-route-information/"
    + "te:lsp-record-route-information/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
    description "Flex-grid label.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

/* Augment label hop of path-route of secondary LSP */
augment "/te:te/te:tunnels/te:tunnel/"
    + "te:p2p-secondary-paths/te:p2p-secondary-path/"
    + "te:lsps/te:lsp/te:path-properties/"
    + "te:path-route-objects/"
```



```
        + "te:path-computed-route-object/te:type/te:label/"
        + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

/* Augment label hop of record-route of LSP */
augment "/te:te/te:lsp-state/"
    + "te:lsp/te:lsp-record-route-information/"
    + "te:lsp-record-route-information/te:type/te:label/"
    + "te:label-hop/te:te-label/te:technology" {
description "Flex-grid label.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

augment "/te:tunnels-rpc/te:input/te:tunnel-info/"
    + "tepc:path-request" {
description
    "Augment with additional constraints flexi-grid
    media channel.";
uses l0-types-ext:l0-tunnel-attributes;
uses l0-types-ext:l0-path-constraints;
}
}
<CODE ENDS>
```

6. Security Considerations

To Be discussed.

7. IANA Considerations

To be discussed.

8. Contributors

This work was developed by several additional people, who due to frontpage author restrictions, are listed below:

Zafar Ali
Cisco
Email: zali@cisco.com

Daniel Michaud Vallinoto
Universidad Autonoma de Madrid
Email: daniel.michaud@estudiante.uam.es

9. Acknowledgments

This work is also partially funded by the Spanish State Research Agency under the project AgileMon (AEI PID2019-104451RB-C21) and by the Spanish Ministry of Science, Innovation and Universities under the program for the training of university lecturers (Grant number: FPU19/05678).

10. References

10.1. Normative References

- [I-D.ietf-ccamp-flexigrid-yang]
Madrid, U., Perdices, D., King, D., Lee, Y., and H. Zheng,
"A YANG Data Model for Flexi-Grid Optical Networks",
[draft-ietf-ccamp-flexigrid-yang-08](#) (work in progress),
November 2020.
- [I-D.ietf-teas-yang-te]
Saad, T., Gandhi, R., Liu, X., Beeram, V., and I. Bryskin,
"A YANG Data Model for Traffic Engineering Tunnels, Label
Switched Paths and Interfaces", [draft-ietf-teas-yang-te-25](#)
(work in progress), July 2020.
- [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>>.
- [RFC7699] Farrel, A., King, D., Li, Y., and F. Zhang, "Generalized
Labels for the Flexi-Grid in Lambda Switch Capable (LSC)
Label Switching Routers", [RFC 7699](#), DOI 10.17487/RFC7699,
November 2015, <<https://www.rfc-editor.org/info/rfc7699>>.
- [RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language",
[RFC 7950](#), DOI 10.17487/RFC7950, August 2016,
<<https://www.rfc-editor.org/info/rfc7950>>.

10.2. Informative References

- [RFC7446] Lee, Y., Ed., Bernstein, G., Ed., Li, D., and W. Imajuku, "Routing and Wavelength Assignment Information Model for Wavelength Switched Optical Networks", [RFC 7446](#), DOI 10.17487/RFC7446, February 2015, <<https://www.rfc-editor.org/info/rfc7446>>.
- [RFC7698] Gonzalez de Dios, O., Ed., Casellas, R., Ed., Zhang, F., Fu, X., Ceccarelli, D., and I. Hussain, "Framework and Requirements for GMPLS-Based Control of Flexi-Grid Dense Wavelength Division Multiplexing (DWDM) Networks", [RFC 7698](#), DOI 10.17487/RFC7698, November 2015, <<https://www.rfc-editor.org/info/rfc7698>>.

Authors' Addresses

Jorge E. Lopez de Vergara Mendez
Naudit HPCN

Email: jorge.lopez_vergara@uam.es

Daniel Perdices Burrero
Universidad Autonoma de Madrid

Email: daniel.perdices@uam.es

Daniel King
Old Dog Consulting

Email: daniel@olddog.co.uk

Victor Lopez
Telefonica I+D/GCTO

Email: victor.lopezalvarez@telefonica.com

Italo Busi
Huawei Technologies

Email: Italo.Busi@huawei.com

Oscar Gonzalez de Dios
Telefonica I+D/GCTO

Email: oscar.gonzalezdedios@telefonica.com

Young Lee
Samsung

Email: younglee.tx@gmail.co

G. Galimberti
Cisco

Email: ggalimbe@cisco.com