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**A YANG Data Model for Flexi-Grid Media Channels
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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

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[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.

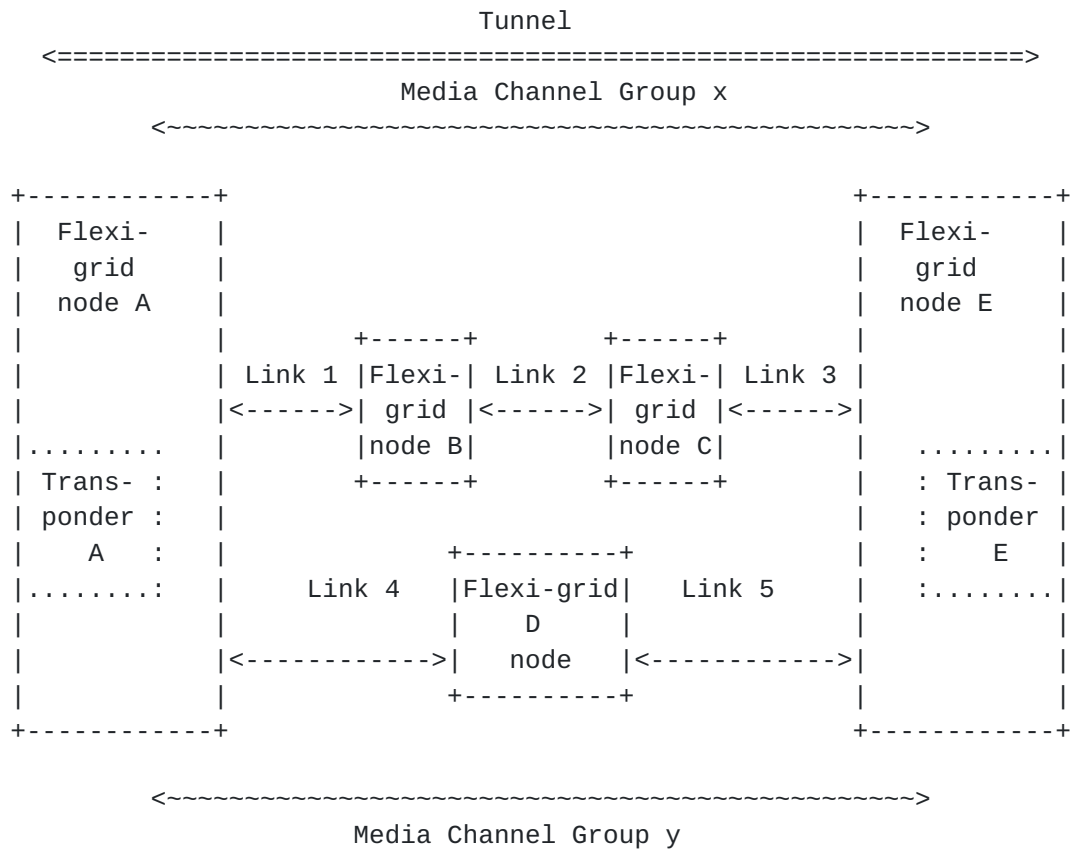


Figure 1: Topology Example

In order to configure a network media channel to interconnect transponders A and E, first of all we have to populate the flexi-grid topology YANG model with all elements in the network:

- o We define the transponders within nodes A and E as tunnel termination points (TTPs) and provide their internal local link connectivity towards the node interfaces. We also provide nodes A and B identifiers, addresses and interfaces.
- o We do the same for the nodes B, C and D, providing their identifiers, addresses and interfaces, as well as the internal connectivity matrix between interfaces.
- o Then, we also define the links 1 to 5 that interconnect nodes, indicating which flexi-grid labels are available.
- o Other information, such as the slot frequency and granularity are also provided.

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
|         |         |         |       |   +--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 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 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-
| | | | |     |       |   +--rw direction?
| | | | |     |       |     te-label-direction
| | | | |   +--rw tiebreakers
| | | | |   +--rw tiebreaker* [tiebreaker-type]
| | | | |   +--rw tiebreaker-type   identityref

```

types:generalized-label

| | | | +--:(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 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
| | | | | | | +--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 explicit-route-include-objects

| | | | |

identityref

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```

| | | | | +--:(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

```



```

| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |
types:generalized-label
| | | | |
| | | | |
| | | | |
| | | | |
+--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-
  |     +--ro direction?
  |       te-label-direction
+--ro shared-resources-tunnels
  +--ro lsp-shared-resources-tunnel*

```

| | | | |

tunnel-ref

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```

| | | | +--ro lspd
| | | | | +--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

| | | | | | | uint32

| | | +-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
| | |   |   |   |   |   |   |   |   |   +--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

```


| | | | | | | +-rw node-id

| | | | +-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?

```



```

| | | | +--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?

```



```
| | |      |      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

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```

+--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>
```

```
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<jorge.lopez\_vergara@uam.es>
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```

```
Editor: Victor Lopez  
<victor.lopez@nokia.com>
```

```
Editor: Young Lee  
<younglee.tx@gmail.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  
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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:lsp/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:lsp/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:lsp/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 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:lsps-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

The configuration, state, and action data defined in this document are designed to be accessed via a management protocol with a secure transport layer, such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. The NETCONF access control model [[RFC8341](#)] provides the means to restrict access for particular NETCONF users to a preconfigured subset of all available NETCONF protocol operations and content.

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

- o /te:te/te:tunnels/te:tunnel
- o /te:te/.../te:te-bandwidth/te:technology
- o /te:te/.../te:type/te:label/te:label-hop/te:te-label/te:technology
- o /te:te/.../te:label-restrictions/te:label-restriction/te:label-start/te:te-label/te:technology
- o /te:te/.../te:label-restrictions/te:label-restriction/te:label-end/te:te-label/te:technology
- o /te:te/.../te:label-restrictions/te:label-restriction/

Editors note: we are using simplified description by folding similar branches to avoid repetition.

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:

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