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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.

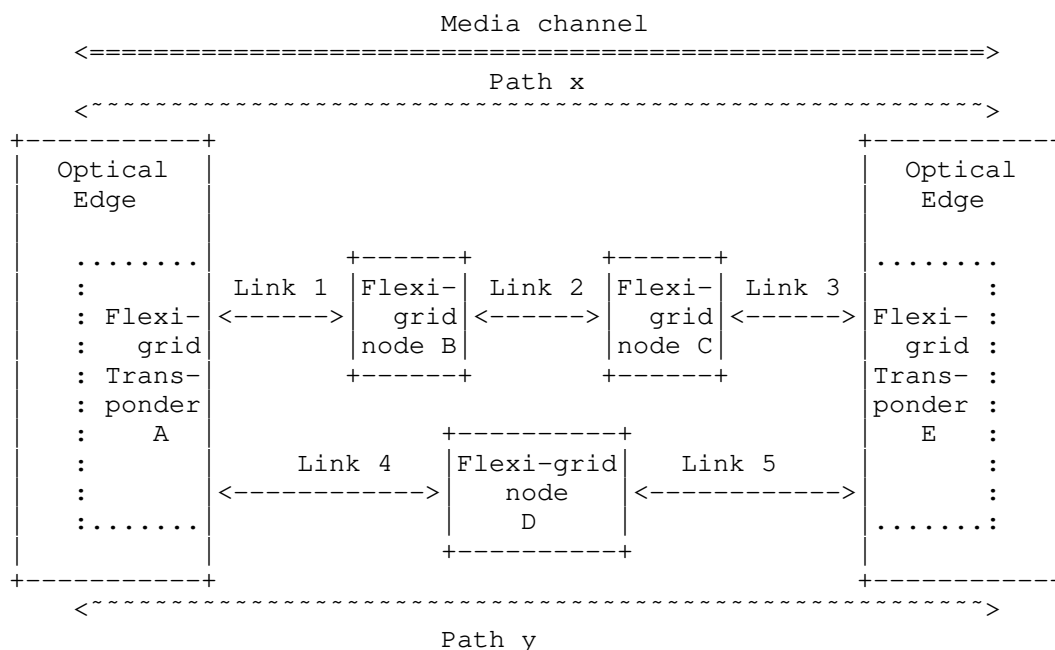


Figure 1: Topology Example

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?
+---rw 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?
+---rw rt-types:generalized-label
+---rw direction?
+---rw 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?
+---rw direction?
+---rw te-label-direction
+---rw label-end
+---rw te-label
+---rw (technology)?
+---: (generic)
+---rw generic?
+---rw direction?
+---rw 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

```

```

+--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
+--rw direction?
|
|   te-label-direction
+--:(srlg)
|
|   +--rw srlg
|   |
|   |   +--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?
+--rw rt-types:generalized-label
+--rw direction?
+--rw 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?
+--rw 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-la	
bel								
							+---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
+---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

```

```

+---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:generaliz
zed-label
|   |   +---rw direction?
|   |   |   te-label-direction
+---:(srlg)
|   +---rw srlg
|   |   +---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 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 node-id		te-tp-id
									te-node-id
							+---ro hop-type?		te-hop-type
									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?
-label]									rt-types:generalized
							+---ro direction?		
									te-label-direction
							+---ro shared-resources-tunnels		
							+---ro lsp-shared-resources-tunnel*		
							tunnel-ref		
						+---ro lsps			
						+---ro lsp*			
el-id]						[source destination tunnel-id lsp-id extended-tunn			
						+---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-la
|   |   |   |   |   |   |   |   |   |   +--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-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
        +---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 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
+---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*
+---ro [index]
+---ro index
+---ro | uint32
+---ro (type)?
+---:(numbered-node-hop)
+---ro | numbered-node-hop
+---ro | node-id te-node-id
+---ro | hop-type?
+---ro | te-hop-type
+---:(numbered-link-hop)
+---ro | numbered-link-hop
+---ro | link-tp-id te-tp-id
+---ro | hop-type?
+---ro | | te-hop-type
+---ro | direction?
+---ro | te-link-direction
+---:(unnumbered-link-hop)
+---ro | unnumbered-link-hop
+---ro | link-tp-id te-tp-id
+---ro | node-id
+---ro | | te-node-id
+---ro | hop-type?
+---ro | | te-hop-type
+---ro | direction?
+---ro | te-link-direction
+---:(as-number)
+---ro | as-number-hop
+---ro | as-number
+---ro | | inet:as-number
+---ro | hop-type?
+---ro | te-hop-type
+---:(label)
+---ro | label-hop
+---ro | te-label
+---ro | (technology)?
+---ro | | +---:(generic)

```

						+--ro generic?
bel						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-la
  |   |                   +---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/>
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description
  "This module defines a model for Flex-grid Media Channel
  Services.
  The model fully conforms to the Network Management
  Datastore Architecture (NMDA).

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```

```
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(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: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

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:

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