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**YANG data model for Flexi-Grid Optical Networks
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Abstract

This document defines a YANG model for managing flexi-grid optical Networks. The model described in this document defines a flexi-grid traffic engineering database. A complementary module is referenced to detail the flexi-grid media channels.

This module is grounded on other defined YANG abstract models.

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[1.](#) Introduction

Internet-based traffic is dramatically increasing every year. Moreover, such traffic is also becoming more dynamic. Thus, transport networks need to evolve from current DWDM systems towards elastic optical networks, based on flexi-grid transmission and switching technologies [[RFC7698](#)]. This technology aims at increasing both transport network scalability and flexibility, allowing the optimization of bandwidth usage.

This document presents a YANG [[RFC7950](#)] model for flexi-grid objects in the dynamic optical network, including the nodes, transponders and links between them, as well as how such links interconnect nodes and transponders.

The YANG model for flexi-grid networks allows the representation of the flexi-grid optical layer of a network, combined with the underlying physical layer.

This document identifies the flexi-grid 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. Conventions used in this document

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

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying [RFC-2119](#) significance.

In this document, the characters ">>" preceding an indented line(s) indicates a compliance requirement statement using the key words listed above. This convention aids reviewers in quickly identifying or finding the explicit compliance requirements of this RFC.

2.1. Terminology

Refer to [[RFC7446](#)] and [[RFC7581](#)] 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 [\[RFC7950\]](#).

2.2. Tree diagram

A simplified graphical representation of the data model is used in chapter 6 of this this document. The meaning of the symbols in these diagrams is defined in [\[RFC8340\]](#).

2.3. Prefixes in Data Node Names

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

Prefix	YANG module	Reference
layer0-type	ietf-layer0-types	[Layer0-Types]
flexi-grid	ietf-flexi-grid-topology	RFCXXXX
nw	ietf-network	[RFC8345]
nt	ietf-network-topology	[RFC8345]
tet	ietf-te-topology	[TE-TOPO]

Table 1: Prefixes and corresponding YANG modules

Note: The RFC Editor will replace XXXX with the number assigned to the RFC once this draft becomes an RFC.

3. Flexi-grid network topology model overview

YANG is a data modeling language used to model configuration data manipulated by the NETCONF protocol. Several YANG models have already been specified for network configurations. For instance, the work in [\[RFC8345\]](#) has proposed a generic YANG model for network/service topologies and inventories. The work in [\[TE-TOPO\]](#) presents a data model to represent, retrieve and manipulate Traffic Engineering (TE) Topologies. These models serve as base models that other technology specific models can augment. A YANG model has also been proposed in [\[I-D.draft-dharini-ccamp-dwdm-if-yang\]](#) to manage single channel optical interface parameters of DWDM applications, and in [\[I-D.draft-ietf-ccamp-wson-yang\]](#) another model has been specified for the routing and wavelength assignment TE topology in wavelength switched optical networks (WSONs). None of them are specific for flexi-grid technology.

Then, as stated before, we propose a model to describe a flexi-grid topology that is split in two YANG sub-modules:

- o Flexi-grid-topology: In order to be compatible with existing proposals, we augment the definitions contained in [RFC8345] and [TE-TOPO], by defining the different elements we can find in a flexi-grid network: a node, a transponder and a link. For that, each of those elements is defined as a container that includes a group of attributes. References to the elements are provided to be later used in the definition of a media channel. Data types for the type of modulation, the flexi-grid technology, the FEC, etc. are defined in [Layer0-Types].
- o Media-channel: This module defines the whole path from a source transponder to the destination through a number of intermediate nodes and links. For this, it takes the information defined before in the flexi-grid topology. This module is described in [I-D.draft-ietf-ccamp-flexigrid-media-channel-yang].

The following section provides a detailed view of the first module.

4. Main building blocks of the Flexi-grid topology

This section details the defined YANG module. It is listed below in [section 6](#).

The description of the three main components, flexi-grid-node, flexi-grid-transponder and flexi-grid-link is provided below. flexi-grid-sliceable-transponders are also defined.

```
<flexi-grid-node> ::= <config> <state>
```

```
<flexi-grid-node>: This element designates a node in the network.
```

```
<config> ::= <flexi-grid-node-attributes-config>
```

```
<config>: Contains the configuration of a node.
```

```
<flexi-grid-node-attributes-config> ::= <list-interface>
<connectivity_matrix>
```

```
<flexi-grid-node-attributes-config>: Contains all the attributes related to the node configuration, such as its interfaces or its management addresses.
```

```
<list-interface> ::= <name> <port-number>
```

```
<input-port> <output-port> <description>
```

```
<interface-type>
```

```
[<numbered-interface> / <unnumbered-interface>]
```

<list-interface>: The list containing all the information of the interfaces.

<name>: Determines the interface name.

<port-number>: Port number of the interface.

<input-port>: Boolean value that defines whether the interface is input or not.

<output-port>: Boolean value that defines whether the interface is output or not.

<description>: Description of the usage of the interface.

<interface-type>: Determines if the interface is numbered or unnumbered.

<numbered-interface> ::= <n-i-ip-address>
<numbered-interface>: An interface with its own IP address.

<n-i-ip-address>: Only available if <interface-type> is "numbered-interface". Determines the IP address of the interface.

<unnumbered-interface> ::= <u-i-ip-address>
<label>
<unnumbered-interface>: A interface that needs a label to be unique.

<u-i-ip-address>: Only available if <interface-type> is "numbered-interface". Determines the node IP address, which with the label defines the interface.

<label>: Label that determines the interface, joint with the node IP address.

<connectivity-matrix> ::= <connections>

<connectivity-matrix>: Determines whether a connection port in/port out exists.

<connections> ::= <input-port-id>
<output-port-id>

`<flexi-grid-transponder> ::= <transponder-type> <config> <state>`

`<flexi-grid-transponder>`: This item designates a transponder of a node.

`<config> ::= <flexi-grid-transponder-attributes-config>`

`<config>`: Contains the configuration of a transponder.

`<flexi-grid-transponder-attributes-config> ::=`
`<available-operational-mode> <operational-mode>`

`<flexi-grid-transponder-attributes>`: Contains all the attributes related to the transponder.

`<available-operational-mode>`: It provides a list of the operational modes available at this transponder.

`<operational-mode>`: Determines the type of operational mode in use.

`<state> ::= <flexi-grid-transponder-attributes-config>`
`<flexi-grid-transponder-attributes-state>`

`<state>`: Contains the state of a transponder.

`<flexi-grid-transponder-attributes-config>`: See above.

`<flexi-grid-transponder-attributes-state>`: Contains the state of a transponder.

`<link> ::= <config> <state>`

`<link>`: This element describes all the information of a link.

`<config> ::= <flexi-grid-link-attributes-config>`

`<config>`: Contains the configuration of a link.

```
<flexi-grid-link-attributes-config> ::= <technology-type>  
<available-label-flexi-grid> <N-max> <base-frequency>  
<nominal-central-frequency-granularity>  
<slot-width-granularity>
```

<flexi-grid-link-attributes>: Contains all the attributes related to the link, such as its unique id, its N value, its latency, etc.

<link-id>: Unique id of the link.

<available-label-flexi-grid>: Array of bits that determines, with each bit, the availability of each interface for flexi-grid technology.

<N-max>: The max value of N in this link, being N the number of slots.

<base-frequency>: The default central frequency used in the link.

<nominal-central-frequency-granularity>: It is the spacing between allowed nominal central frequencies and it is set to 6.25 GHz (note: sometimes referred to as 0.00625 THz).

<slot-width-granularity>: 12.5 GHz, as defined in G.694.1.

```
<state> ::= <flexi-grid-link-attributes-config>  
<flexi-grid-link-attributes-state>
```

<state>: Contains the state of a link.

<flexi-grid-link-attributes-config>: See above.

<flexi-grid-link-attributes-state>: Contains all the the information related to the state of a link.

4.1. Formal Syntax

The previous syntax specification uses the augmented Backus-Naur Form (BNF) as described in [[RFC5234](#)].

5. 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 between them. Figure 1 shows a simple topology, where two physical paths interconnect two optical transponders.

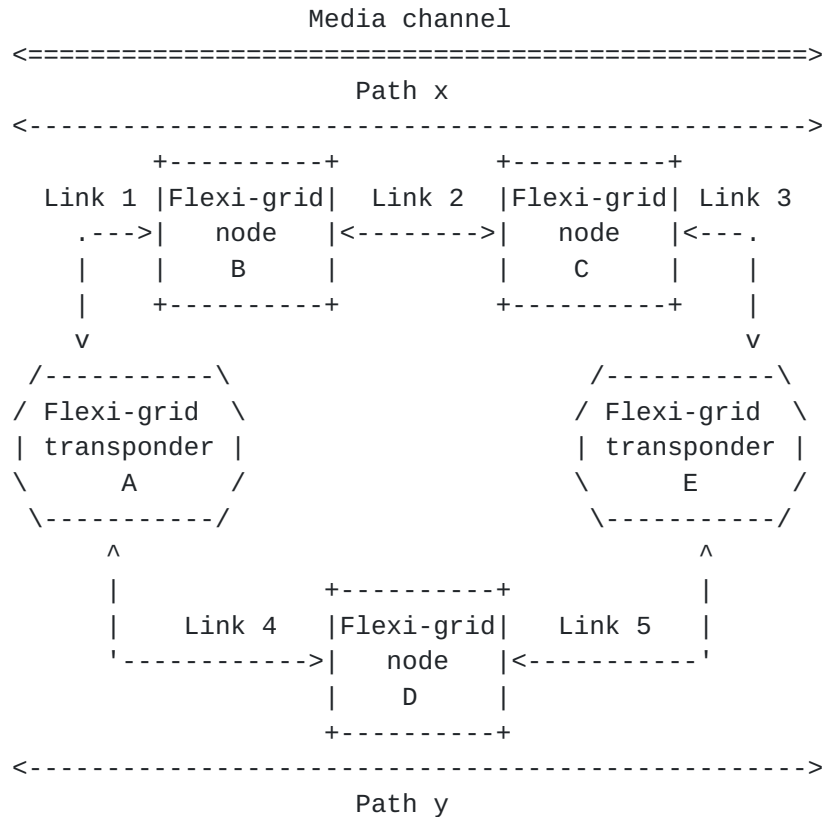


Figure 1. Topology example.

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

1. We define the transponders A and E, including their FEC type, if enabled, and modulation type. We also provide node identifiers and addresses for the transponders, as well as interfaces included in the transponders. Sliceable transponders can also be defined if needed.
2. 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.
3. Then, we also define the links 1 to 5 that interconnect nodes and transponders, indicating which flexi-grid labels are available.

Other information, such as the slot frequency and granularity are also provided.

Next, we can configure the media channel from the information we have stored in the flexi-grid TED, 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 TED has a reference, and this is the way in which they are called in the media channel. We refer to [\[I-D.draft-ietf-ccamp-flexigrid-media-channel-yang\]](#) to complete this example.

6. Flexi-grid TED YANG Model

6.1. Yang Model - Tree Structure

```

module: ietf-flexi-grid-topology
  augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
    +-rw flexi-grid-topology!
  augment /nw:networks/nw:network/nt:link/tet:te/
    tet:te-link-attributes:
  augment /nw:networks/nw:network/nw:node/nt:termination-point/tet:te:
    +-rw supported-payload-types* [index]
    | +-rw index          uint16
    | +-rw payload-type?  string
    +-rw client-facing?   boolean
  augment /nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes:
    +-rw flexi-grid-node
      +-rw node-type?    identityref
  augment /nw:networks/nw:network/nw:node/tet:te/
    tet:tunnel-termination-point:
    +-rw supported-operational-modes*    layer0-types:operational-mode
    +-rw configured-operational-modes?  layer0-types:operational-mode
    +-rw supported-fec-types*           identityref
    +-rw supported-termination-types*   identityref
    +-rw supports-bit-stuffing?         boolean
    +-rw is-tunable?                   boolean
    +-rw max-subcarrier-channel-num?    uint8
    +-rw supports-flexi-grid?          boolean
  augment /nw:networks/nw:network/nw:node/nt:termination-point/tet:te/
    tet:interface-switching-capability/tet:max-lsp-bandwidth/
    tet:te-bandwidth/tet:technology:
    +--:(flexi-grid)
      +-rw bandwidth-type?    identityref
  augment /nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/
    tet:connectivity-matrices/tet:path-constraints/tet:te-bandwidth/
    tet:technology:
    +--:(flexi-grid)
      +-rw supported-bandwidth-list*  identityref

```

```
augment /nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/
  tet:connectivity-matrices/tet:connectivity-matrix/
  tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--ro supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:path-constraints/tet:te-bandwidth/
  tet:technology:
  +--:(flexi-grid)
    +--ro supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:client-layer-adaptation/
  tet:switching-capability/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:path-constraints/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:interface-switching-capability/
  tet:max-lsp-bandwidth/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw bandwidth-type?  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:max-link-bandwidth/tet:te-bandwidth/
  tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:max-resv-link-bandwidth/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:unreserved-bandwidth/
```



```
tet:te-bandwidth/tet:technology:  
+--:(flexi-grid)  
  +-rw supported-bandwidth-list*  identityref
```

```
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:interface-switching-capability/
  tet:max-lsp-bandwidth/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--ro bandwidth-type?  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:max-link-bandwidth/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--ro supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:max-resv-link-bandwidth/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--ro supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:unreserved-bandwidth/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--ro supported-bandwidth-list*  identityref
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:interface-switching-capability/
  tet:max-lsp-bandwidth/tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw bandwidth-type?  identityref
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:max-link-bandwidth/tet:te-bandwidth/
  tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:max-resv-link-bandwidth/
  tet:te-bandwidth/tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:unreserved-bandwidth/tet:te-bandwidth/
  tet:technology:
  +--:(flexi-grid)
    +--rw supported-bandwidth-list*  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction:
  +--rw grid-type?      identityref
  +--rw priority?      uint8
  +--rw flexi-grid
    +--rw nominal-central-frequency-granularity?  identityref
    +--rw slot-width-granularity?                identityref
    +--rw min-slot-width-factor?                 uint16
```

+--rw max-slot-width-factor?

uint16

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```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-start/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-end/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-step/
  tet:technology:
  +--:(flexi-grid)
    +--rw flexi?  identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/tet:underlay/
  tet:primary-path/tet:path-element/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n  uint16
          +--rw flexi-m? uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/tet:underlay/
  tet:backup-path/tet:path-element/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n  uint16
          +--rw flexi-m? uint16
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/tet:optimizations/
  tet:algorithm/tet:metric/tet:optimization-metric/
  tet:explicit-route-exclude-objects/tet:route-object-exclude-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:optimizations/tet:algorithm/tet:metric/tet:optimization-metric/
  tet:explicit-route-include-objects/tet:route-object-include-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:path-properties/tet:path-route-objects/tet:path-route-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16

```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction:
  +-rw grid-type?      identityref
  +-rw priority?      uint8
  +-rw flexi-grid
    +-rw nominal-central-frequency-granularity?  identityref
    +-rw slot-width-granularity?                identityref
    +-rw min-slot-width-factor?                 uint16
    +-rw max-slot-width-factor?                 uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +-rw flexi-n?    uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +-rw flexi-n?    uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +-rw flexi?      identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction:
  +-rw grid-type?      identityref
  +-rw priority?      uint8
  +-rw flexi-grid
    +-rw nominal-central-frequency-granularity?  identityref
    +-rw slot-width-granularity?                identityref
    +-rw min-slot-width-factor?                 uint16
    +-rw max-slot-width-factor?                 uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +-rw flexi-n?    uint16
```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?   uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--rw flexi?   identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:underlay/tet:primary-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?           uint16
        | +--rw flexi-m?           uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n   uint16
          +--rw flexi-m?  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:underlay/tet:backup-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?           uint16
        | +--rw flexi-m?           uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n   uint16
          +--rw flexi-m?  uint16
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:optimizations/tet:algorithm/tet:metric/
  tet:optimization-metric/tet:explicit-route-exclude-objects/
  tet:route-object-exclude-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
+--:(flexi-grid)
  +--rw (single-or-super-channel)?
    +--:(single)
      | +--rw flexi-n?          uint16
      | +--rw flexi-m?          uint16
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n          uint16
        +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:optimizations/tet:algorithm/
  tet:metric/tet:optimization-metric/
  tet:explicit-route-include-objects/tet:route-object-include-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
+--:(flexi-grid)
  +--rw (single-or-super-channel)?
    +--:(single)
      | +--rw flexi-n?          uint16
      | +--rw flexi-m?          uint16
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n          uint16
        +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:te-node-attributes/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:path-properties/
  tet:path-route-objects/tet:path-route-object/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
+--:(flexi-grid)
  +--ro (single-or-super-channel)?
    +--:(single)
      | +--ro flexi-n?          uint16
      | +--ro flexi-m?          uint16
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n          uint16
        +--ro flexi-m?         uint16

```



```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction:
  +--ro grid-type?      identityref
  +--ro priority?      uint8
  +--ro flexi-grid
    +--ro nominal-central-frequency-granularity?  identityref
    +--ro slot-width-granularity?                identityref
    +--ro min-slot-width-factor?                  uint16
    +--ro max-slot-width-factor?                  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-start/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-end/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:label-restrictions/tet:label-restriction/tet:label-step/
  tet:technology:
  +--:(flexi-grid)
    +--ro flexi?      identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:underlay/tet:primary-path/tet:path-element/tet:type/
  tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?      uint16
        | +--ro flexi-m?      uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n      uint16
          +--ro flexi-m?     uint16
```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:underlay/tet:backup-path/tet:path-element/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:optimizations/tet:algorithm/tet:metric/tet:optimization-metric/
  tet:explicit-route-exclude-objects/tet:route-object-exclude-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:optimizations/tet:algorithm/tet:metric/tet:optimization-metric/
  tet:explicit-route-include-objects/tet:route-object-include-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:path-properties/tet:path-route-objects/tet:path-route-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction:
  +--ro grid-type?      identityref
  +--ro priority?       uint8
  +--ro flexi-grid
    +--ro nominal-central-frequency-granularity?  identityref
    +--ro slot-width-granularity?                identityref
    +--ro min-slot-width-factor?                 uint16
    +--ro max-slot-width-factor?                 uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:from/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--ro flexi?       identityref
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction:
  +--ro grid-type?      identityref
  +--ro priority?      uint8
  +--ro flexi-grid
    +--ro nominal-central-frequency-granularity?  identityref
    +--ro slot-width-granularity?                identityref
    +--ro min-slot-width-factor?                  uint16
    +--ro max-slot-width-factor?                  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?    uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?    uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:to/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--ro flexi?      identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:underlay/tet:primary-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n    uint16
          +--ro flexi-m?   uint16

```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:underlay/tet:backup-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:optimizations/tet:algorithm/
  tet:metric/tet:optimization-metric/
  tet:explicit-route-exclude-objects/
  tet:route-object-exclude-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:optimizations/tet:algorithm/
  tet:metric/tet:optimization-metric/
  tet:explicit-route-include-objects/
  tet:route-object-include-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:information-source-entry/tet:connectivity-matrices/
  tet:connectivity-matrix/tet:path-properties/
  tet:path-route-objects/tet:path-route-object/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
+--:(flexi-grid)
  +--ro (single-or-super-channel)?
    +--:(single)
      | +--ro flexi-n?          uint16
      | +--ro flexi-m?          uint16
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n          uint16
        +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:label-restrictions/tet:label-restriction:
+--rw grid-type?      identityref
+--rw priority?       uint8
+--rw flexi-grid
  +--rw nominal-central-frequency-granularity?  identityref
  +--rw slot-width-granularity?                 identityref
  +--rw min-slot-width-factor?                   uint16
  +--rw max-slot-width-factor?                   uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:label-restrictions/tet:label-restriction/tet:label-start/
  tet:te-label/tet:technology:
+--:(flexi-grid)
  +--rw flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:label-restrictions/tet:label-restriction/tet:label-end/
  tet:te-label/tet:technology:
+--:(flexi-grid)
  +--rw flexi-n?      uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:label-restrictions/tet:label-restriction/tet:label-step/
  tet:technology:
+--:(flexi-grid)
  +--rw flexi?        identityref

```

```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:underlay/tet:primary-path/tet:path-element/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:underlay/tet:backup-path/tet:path-element/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:optimizations/tet:algorithm/tet:metric/
  tet:optimization-metric/tet:explicit-route-exclude-objects/
  tet:route-object-exclude-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:optimizations/tet:algorithm/tet:metric/
  tet:optimization-metric/tet:explicit-route-include-objects/
  tet:route-object-include-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:path-properties/tet:path-route-objects/tet:path-route-object/
  tet:type/tet:label/tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:label-restrictions/
  tet:label-restriction:
  +--rw grid-type?      identityref
  +--rw priority?       uint8
  +--rw flexi-grid
    +--rw nominal-central-frequency-granularity?  identityref
    +--rw slot-width-granularity?                identityref
    +--rw min-slot-width-factor?                  uint16
    +--rw max-slot-width-factor?                  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?      uint16

```



```
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?   uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--rw flexi?   identityref
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:underlay/tet:primary-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?           uint16
        | +--rw flexi-m?           uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n   uint16
          +--rw flexi-m?  uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:underlay/tet:backup-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?           uint16
        | +--rw flexi-m?           uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n   uint16
          +--rw flexi-m?  uint16
```

```

augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:optimizations/tet:algorithm/
  tet:metric/tet:optimization-metric/
  tet:explicit-route-exclude-objects/
  tet:route-object-exclude-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:optimizations/tet:algorithm/
  tet:metric/tet:optimization-metric/
  tet:explicit-route-include-objects/
  tet:route-object-include-object/tet:type/tet:label/tet:label-hop/
  tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nw:node/tet:te/
  tet:tunnel-termination-point/tet:local-link-connectivities/
  tet:local-link-connectivity/tet:path-properties/
  tet:path-route-objects/tet:path-route-object/tet:type/tet:label/
  tet:label-hop/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro (single-or-super-channel)?
      +--:(single)
        | +--ro flexi-n?          uint16
        | +--ro flexi-m?          uint16
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n          uint16
          +--ro flexi-m?         uint16

```

```

augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:underlay/tet:primary-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:underlay/tet:backup-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction:
  +--rw grid-type?      identityref
  +--rw priority?       uint8
  +--rw flexi-grid
    +--rw nominal-central-frequency-granularity? identityref
    +--rw slot-width-granularity?               identityref
    +--rw min-slot-width-factor?                 uint16
    +--rw max-slot-width-factor?                 uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?      uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?      uint16

```

```

augment /nw:networks/nw:network/nt:link/tet:te/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--rw flexi?  identityref
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:label-restrictions/
  tet:label-restriction:
  +--ro grid-type?  identityref
  +--ro priority?   uint8
  +--ro flexi-grid
    +--ro nominal-central-frequency-granularity?  identityref
    +--ro slot-width-granularity?                identityref
    +--ro min-slot-width-factor?                 uint16
    +--ro max-slot-width-factor?                 uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?  uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--ro flexi-n?  uint16
augment /nw:networks/nw:network/nt:link/tet:te/
  tet:information-source-entry/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--ro flexi?  identityref
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:underlay/tet:primary-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n          uint16
          +--rw flexi-m?         uint16

```

```
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:underlay/tet:backup-path/
  tet:path-element/tet:type/tet:label/tet:label-hop/tet:te-label/
  tet:technology:
  +--:(flexi-grid)
    +--rw (single-or-super-channel)?
      +--:(single)
        | +--rw flexi-n?          uint16
        | +--rw flexi-m?          uint16
        +--:(super)
          +--rw subcarrier-flexi-n* [flexi-n]
            +--rw flexi-n    uint16
            +--rw flexi-m?  uint16
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction:
  +--rw grid-type?    identityref
  +--rw priority?    uint8
  +--rw flexi-grid
    +--rw nominal-central-frequency-granularity?  identityref
    +--rw slot-width-granularity?                identityref
    +--rw min-slot-width-factor?                  uint16
    +--rw max-slot-width-factor?                  uint16
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?    uint16
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-end/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n?    uint16
augment /nw:networks/tet:te/tet:templates/tet:link-template/
  tet:te-link-attributes/tet:label-restrictions/
  tet:label-restriction/tet:label-step/tet:technology:
  +--:(flexi-grid)
    +--rw flexi?     identityref
```

6.2. YANG Model - Code

```
<CODE BEGINS> file "ietf-flexi-grid-topology@2019-07-07.yang"
module ietf-flexi-grid-topology {

  yang-version 1.1;

  namespace "urn:ietf:params:xml:ns:yang:ietf-flexi-grid-topology";

  prefix "flexi-grid";

  import ietf-network {
    prefix "nw";
    reference
      "RFC 8345: A YANG Data Model for Network Topologies";
  }

  import ietf-network-topology {
    prefix "nt";
    reference
      "RFC 8345: A YANG Data Model for Network Topologies";
  }

  import ietf-te-topology {
    prefix "tet";
    reference
      "RFC YYYY: YANG Data Model for
      Traffic Engineering (TE) Topologies";
  }

  /* Note: The RFC Editor will replace YYYY with the number assigned
     to the RFC once draft-ietf-teas-yang-te-topo becomes an RFC.*/

  import ietf-layer0-types {
    prefix "layer0-types";
    reference
      "RFC XXXX: A YANG Data Model for WSON
      (Wavelength Switched Optical Networks)";
  }

  /* Note: The RFC Editor will replace XXXX with the number assigned
     to the RFC once draft-ietf-ccamp-wson-yang becomes an RFC.*/
}
```

organization

```
"IETF CCAMP Working Group";
```

contact

```
"WG Web: <http://tools.ietf.org/wg/ccamp/>
```

```
WG List: <mailto:ccamp@ietf.org>
```

```
WG Chair: Daniele Ceccarelli
```

```
<mailto:daniele.ceccarelli@ericsson.com>
```

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WG Chair: Fatai Zhang
```

```
<mailto:zhangfatai@huawei.com>
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```

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Editor: Daniel Perdices <daniel.perdices@naudit.es>
```

```
Editor: Victor Lopez <victor.lopezalvarez@telefonica.com>
```

```
Editor: Daniel King <d.king@lancaster.ac.uk>
```

```
Editor: Young Lee <leeyoung@huawei.com>";
```

description

```
"This module defines a model for flexi-grid topology
```

```
Copyright (c) 2019 IETF Trust and the persons identified  
as authors of the code. All rights reserved.
```

```
Redistribution and use in source and binary forms, with  
or without modification, is permitted pursuant to, and  
subject to the license terms contained in, the Simplified BSD  
License set forth in Section 4.c of the IETF Trust's Legal  
Provisions Relating to IETF Documents  
(http://trustee.ietf.org/license-info).";
```

```
revision 2019-07-07 {
```

```
description
```

```
"version 2.";
```

```
reference
```

```
"RFC XXXX: A Yang Data Model for flexi-grid Optical Networks ";
```

```
}
```

```
/*
 * Groupings
 */
grouping flexi-grid-node-attributes {
  description "flexi-grid node attributes.";

  container flexi-grid-node {
    description "flexi-grid node attributes.";
    leaf node-type {
      type identityref {
        base layer0-types:layer0-node-type;
      }
      description "flexi-grid node type.";
    }
  }
}

grouping flexi-grid-link-attributes {
  description
    "Future flexi-grid link attributes extensions";
}

grouping flexi-grid-tp-attributes {
  description "flexi-grid-tp-attributes";

  list supported-payload-types {
    key "index";
    description
      "Supported payload types of a TP. The payload type is defined
      as the generalized PIDs in GMPLS.";
    leaf index {
      type uint16;
      description "payload type index";
    }
    leaf payload-type {
      type string;
      description "the payload type supported by this client tp";
      reference
        "http://www.iana.org/assignments/gmpls-sig-parameters
        /gmpls-sig-parameters.xhtml";
    }
  }
}

leaf client-facing {
  type boolean;
  default 'false';
  description
    "Indicating if it is a client-facing TP.";
}
}
```



```
grouping flexi-grid-ttp-attributes {
  description
    "flexi-grid tunnel termination point (e.g.transponder)
    attributes";
  leaf-list supported-operational-modes {
    type layer0-types:operational-mode;
    description
      "List of all supported vendor-specific
      mode identifiers";
  }
  leaf configured-operational-modes {
    type layer0-types:operational-mode;
    description
      "Vendor-specific mode identifier configured
      on the TTP.";
  }

  leaf-list supported-fec-types {
    type identityref {
      base layer0-types:fec-type;
    }
    description
      "List of all supported FEC types by this TTP.";
  }

  leaf-list supported-termination-types {
    type identityref {
      base layer0-types:term-type;
    }
    description
      "List of all supported termination types by this TTP.";
  }

  leaf supports-bit-stuffing {
    type boolean;
    description
      "Indicate whether bit stuffing is supported by this TTP.";
  }

  leaf is-tunable {
    type boolean;
    description
      "Indicates if the TTP, or transponder, is tunable. Tunable
      transponders are assumed to be fully tunable to any of the
      96 channels within DWDM C-band.";
  }
}
```

```
leaf max-subcarrier-channel-num {
  type uint8 {
    range "1..max";
  }
  default 1;
  description
    "Indicate the maximum number of subcarrier channels for
    super-channel transponders. When the value equals 1 it
    represents regular single-channel transponder.";
}
leaf supports-flexi-grid {
  type boolean;
  description
    "Indicates if the TTP, or transponder, supports flex grid.";
}
}

/*
 * Data nodes
 */

augment "/nw:networks/nw:network/nw:network-types"
+ "/tet:te-topology" {
  description "flexi-grid-topology augmented";
  container flexi-grid-topology {
    presence "indicates a topology of Flex Grid";
    description
      "Container to identify flexi-grid topology type";
  }
}

augment "/nw:networks/nw:network/nt:link/tet:te"
+ "/tet:te-link-attributes" {
  when "/nw:networks/nw:network/nw:network-types"
  +"/tet:te-topology/flexi-grid:flexi-grid-topology" {
    description "This augment is only valid for flexi-grid.";
  }
  description "flexi-grid Link augmentation.";
  uses flexi-grid-link-attributes;
}
```

```
augment "/nw:networks/nw:network/nw:node/nt:termination-point/"
  + "tet:te" {
  when "/nw:networks/nw:network/nw:network-types"
    + "/tet:te-topology/flexi-grid:flexi-grid-topology" {
    description "This augment is only valid for flexi-grid.";
  }
  description "flexi-grid TP attributes.";
  uses flexi-grid-tp-attributes;
}

augment "/nw:networks/nw:network/nw:node/tet:te"
  + "/tet:te-node-attributes" {
  when "/nw:networks/nw:network/nw:network-types"
    + "/tet:te-topology/flexi-grid:flexi-grid-topology" {
    description "This augment is only valid for flexi-grid.";
  }
  description "flexi-grid Node augmentation.";
  uses flexi-grid-node-attributes;
}

augment "/nw:networks/nw:network/nw:node/tet:te"
  + "/tet:tunnel-termination-point" {
  when "/nw:networks/nw:network/nw:network-types"
    + "/tet:te-topology/flexi-grid:flexi-grid-topology" {
    description "This augment is only valid for flexi-grid.";
  }
  description "flexi-grid tunnel termination point augmentation.";
  uses flexi-grid-ttp-attributes;
}

/*
 * Augment TE bandwidth
 */

/* Augment maximum LSP bandwidth of link terminationpoint (LTP) */
augment "/nw:networks/nw:network/nw:node/nt:termination-point/"
  + "tet:te/"
  + "tet:interface-switching-capability/tet:max-lsp-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
  when "../..../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "Augment flexi-grid TE bandwidth";
  }
  description "flexi-grid bandwidth.";
  case flexi-grid {
    uses layer0-types:flexi-grid-path-bandwidth;
  }
}
```



```
/* Augment bandwidth path constraints of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}

/* Augment bandwidth path constraints of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}

/* Augment bandwidth path constraints of connectivity-matrices
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
}
```

```
/* Augment bandwidth path constraints of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment client bandwidth of tunnel termination point (TTP) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:client-layer-adaptation/tet:switching-capability/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment bandwidth path constraints of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/tet:path-constraints/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
```

```
/* Augment bandwidth path constraints of local-link-connectivity
(LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/tet:path-constraints/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE bandwidth";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment maximum LSP bandwidth of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:interface-switching-capability/tet:max-lsp-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-bandwidth;
}
}
/* Augment maximum bandwidth of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:max-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
```



```
/* Augment maximum reservable bandwidth of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:max-resv-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment unreserved bandwidth of TE Link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:unreserved-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment maximum LSP bandwidth of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:interface-switching-capability/"
  + "tet:max-lsp-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-bandwidth;
}
}
```

```
/* Augment maximum bandwidth of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:max-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
/* Augment maximum reservable bandwidth of TE link information-source
*/
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:max-resv-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}

/* Augment unreserved bandwidth of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:unreserved-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "flexi-grid TE bandwidth.";
}
description "flexi-grid bandwidth.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-bandwidth;
}
}
}
```

```
/* Augment maximum LSP bandwidth of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:interface-switching-capability/"
  + "tet:max-lsp-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
/*
  when "../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "flexi-grid TE bandwidth.";
  }
*/
  description "flexi-grid bandwidth.";
  case flexi-grid {
    uses layer0-types:flexi-grid-path-bandwidth;
  }
}
/* Augment maximum bandwidth of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:max-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
/*
  when "../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "flexi-grid TE bandwidth.";
  }
*/
  description "flexi-grid bandwidth.";
  case flexi-grid {
    uses layer0-types:flexi-grid-link-bandwidth;
  }
}
```

```

/* Augment maximum reservable bandwidth of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:max-resv-link-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
      description "flexi-grid TE bandwidth.";
    }
*/
  description "flexi-grid bandwidth.";
  case flexi-grid {
    uses layer0-types:flexi-grid-link-bandwidth;
  }
}

/* Augment unreserved bandwidth of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:unreserved-bandwidth/"
  + "tet:te-bandwidth/tet:technology" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
      description "flexi-grid TE bandwidth.";
    }
*/
  description "flexi-grid bandwidth.";
  case flexi-grid {
    uses layer0-types:flexi-grid-link-bandwidth;
  }
}

/*
* Augment TE label.
*/

/* Augment label restrictions of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:label-restrictions/tet:label-restriction" {
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "Augment flexi-grid TE label";
  }
  description "flexi-grid label.";
  uses layer0-types:flexi-grid-label-restriction;
}

```



```
/* Augment label restrictions start of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions end of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:label-restrictions/"
  + "tet:label-restriction/tet:label-end/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions step of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:label-restrictions/"
  + "tet:label-restriction/tet:label-step/"
  + "tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label step.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}
```



```
/* Augment label hop of underlay primary path of connectivity-matrices
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:underlay/tet:primary-path/tet:path-element/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of underlay backup path of connectivity-matrices
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:underlay/tet:backup-path/tet:path-element/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of route-exclude of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
}
```



```
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
```

```
/* Augment label hop of route-include of connectivity-matrices (added)
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of path-route of connectivity-matrices */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology"{
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment ingress label restrictions of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:from/"
  + "tet:label-restrictions/tet:label-restriction" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
```

```
    uses layer0-types:flexi-grid-label-restriction;  
}
```

```
/* Augment ingress label restrictions start of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:from/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}

/* Augment ingress label restrictions end of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:from/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}

/* Augment ingress label restrictions step of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:from/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/"
  + "tet:technology" {
when "../../../../../../../../../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
```

}
}

```
/* Augment egress label restrictions of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:to/"
  + "tet:label-restrictions/tet:label-restriction" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}

/* Augment egress label restrictions start of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:to/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}

/* Augment egress label restrictions end of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:to/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
}
```



```
/* Augment egress label restrictions step of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:to/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/"
  + "tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}
/* Augment label hop of underlay primary path of connectivity-matrix
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:underlay/tet:primary-path/tet:path-element/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of underlay backup path of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:underlay/tet:backup-path/tet:path-element/"
  + "tet:type/tet:label/tet:label-hop/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
```



```
    uses layer0-types:flexi-grid-path-label;  
  }  
}
```

```
/* Augment label hop of route-exclude of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:optimizations/"
  + "tet:algorithm/tet:metric/tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of route-include of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/tet:optimizations/"
  + "tet:algorithm/tet:metric/tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of path-route of connectivity-matrix */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
```

```
case flexi-grid {  
  uses layer0-types:flexi-grid-path-label;  
}  
}
```

```
/* Augment label restrictions of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/"
  + "tet:connectivity-matrices/tet:label-restrictions/"
  + "tet:label-restriction" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}

/* Augment label restrictions start of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/"
  + "tet:connectivity-matrices/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}

/* Augment label restrictions end of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/"
  + "tet:connectivity-matrices/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
}
```



```
/* Augment label restrictions step of connectivity-matrices
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/"
  + "tet:connectivity-matrices/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-step/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}

/* Augment label hop of underlay primary path of connectivity-matrices
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of underlay backup path of connectivity-matrices
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
```

}
}

```

/* Augment label hop of route-exclude of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of route-include of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

```



```
/* Augment label hop of path-route of connectivity-matrices
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment ingress label restrictions of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:from/tet:label-restrictions/tet:label-restriction" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}

/* Augment ingress label restrictions start of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:from/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
```

```
    uses layer0-types:flexi-grid-link-label;  
  }  
}
```

```
/* Augment ingress label restrictions end of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:from/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment ingress label restrictions step of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:from/tet:label-restrictions/"
  + "tet:label-restriction/"
  + "tet:label-step/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}
/* Augment egress label restrictions of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:to/tet:label-restrictions/tet:label-restriction" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
```

}

```
/* Augment egress label restrictions start of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:to/tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment egress label restrictions end of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:to/tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment egress label restrictions step of connectivity-matrix
information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:to/tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
```

```
    uses layer0-types:flexi-grid-label-step;  
  }  
}
```

```
/* Augment label hop of underlay primary path of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of underlay backup path of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}
```

```
/* Augment label hop of route-exclude of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of route-include of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}
```



```
/* Augment label hop of path-route of connectivity-matrix
   information-source */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:connectivity-matrix/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label restrictions of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:label-restrictions/tet:label-restriction" {
when "../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}

/* Augment label restrictions start of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/"
  + "tet:te-label/tet:technology" {
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
```

}

```
/* Augment label restrictions end of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/"
  + "tet:te-label/tet:technology"{
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions step of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/"
  + "tet:technology"{
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}
/* Augment label hop of underlay primary path of
local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
```

```
    uses layer0-types:flexi-grid-path-label;  
  }  
}
```

```
/* Augment label hop of underlay backup path of
   local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of route-exclude of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}
```

```
/* Augment label hop of route-include of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label hop of path-route of local-link-connectivities */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}

/* Augment label restrictions of local-link-connectivity (LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:label-restrictions/tet:label-restriction" {
when "../../../../../../../../../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}
```



```
/* Augment label restrictions start of local-link-connectivity (LLC)
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions end of local-link-connectivity (LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions step of local-link-connectivity (LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
```



```
    uses layer0-types:flexi-grid-label-step;  
  }  
}
```

```

/* Augment label hop of underlay primary path of
   local-link-connectivity (LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of underlay backup path of
   local-link-connectivity (LLC) */
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}

```

```

/* Augment label hop of route-exclude of local-link-connectivity (LLC)
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of route-include of local-link-connectivity (LLC)
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:optimizations/tet:algorithm/tet:metric/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-include-objects/"
  + "tet:route-object-include-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../../../../../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}

```

```
/* Augment label hop of path-route of local-link-connectivity (LLC)
*/
augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:tunnel-termination-point/"
  + "tet:local-link-connectivities/"
  + "tet:local-link-connectivity/"
  + "tet:path-properties/tet:path-route-objects/"
  + "tet:path-route-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of underlay primary path of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
/* Augment label hop of underlay backup path of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-path-label;
}
}
}
```



```
/* Augment label restrictions of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction" {
  when "../..../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
  }
  description "flexi-grid label.";
  uses layer0-types:flexi-grid-label-restriction;
}
/* Augment label restrictions start of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
  when "../..../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
  }
  description "flexi-grid label.";
  case flexi-grid {
    uses layer0-types:flexi-grid-link-label;
  }
}
/* Augment label restrictions end of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
  when "../..../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
  }
  description "flexi-grid label.";
  case flexi-grid {
    uses layer0-types:flexi-grid-link-label;
  }
}
/* Augment label restrictions step of TE link */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/tet:technology" {
  when "../..../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
  }
  description "flexi-grid label.";
```

```
case flexi-grid {  
  uses layer0-types:flexi-grid-label-step;  
}  
}
```

```
/* Augment label restrictions of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:label-restrictions/tet:label-restriction" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
uses layer0-types:flexi-grid-label-restriction;
}
/* Augment label restrictions start of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions end of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions step of TE link information-source */
augment "/nw:networks/nw:network/nt:link/tet:te/"
  + "tet:information-source-entry/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/tet:technology" {
when "../../../nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description "Augment flexi-grid TE label";
}
}
description "flexi-grid label.";
```



```
case flexi-grid {  
  uses layer0-types:flexi-grid-label-step;  
}  
}
```

```

/* Augment label hop of underlay primary path of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:underlay/tet:primary-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
/*
  when "../../../../../../../../../../../"
    + "nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
      description "Augment flexi-grid TE label";
    }
*/
  description "flexi-grid label.";
  case flexi-grid {
    uses layer0-types:flexi-grid-path-label;
  }
}
/* Augment label hop of underlay backup path of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:underlay/tet:backup-path/tet:path-element/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
/*
  when "../../../../../../../../../../../"
    + "nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
      description "Augment flexi-grid TE label";
    }
*/
  description "flexi-grid label.";
  case flexi-grid {
    uses layer0-types:flexi-grid-path-label;
  }
}
/* Augment label restrictions of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
      description "Augment flexi-grid TE label";
    }
*/
  description "flexi-grid label.";
  uses layer0-types:flexi-grid-label-restriction;
}

```

```
/* Augment label restrictions start of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-start/tet:te-label/tet:technology" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "Augment flexi-grid TE label";
  }
*/
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}
/* Augment label restrictions end of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-end/tet:te-label/tet:technology" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "Augment flexi-grid TE label";
  }
*/
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-link-label;
}
}

/* Augment label restrictions step of TE link template */
augment "/nw:networks/tet:te/tet:templates/"
  + "tet:link-template/tet:te-link-attributes/"
  + "tet:label-restrictions/tet:label-restriction/"
  + "tet:label-step/tet:technology" {
/*
  when "../../../../../../../nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
    description "Augment flexi-grid TE label";
  }
*/
description "flexi-grid label.";
case flexi-grid {
  uses layer0-types:flexi-grid-label-step;
}
}
}
```

}
<CODE ENDS>

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6.3. License

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7. Security Considerations

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

The NETCONF access control model [[RFC8341](#)] provides the means to restrict access for particular NETCONF users to a preconfigured subset of all available NETCONF protocol operations and content. The NETCONF Protocol over Secure Shell (SSH) [[RFC6242](#)] describes a method for invoking and running NETCONF within a Secure Shell (SSH) session as an SSH subsystem. The Network Configuration Access Control Model (NACM) [[RFC8341](#)] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

A number of configuration data nodes defined in this document are writable/deletable (i.e., "config true"). These data nodes may be considered sensitive or vulnerable in some network environments.

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:

```
/nw:networks/nw:network/nw:network-types/tet:te-topology
```

```
/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes
```

```
/nw:networks/nw:network/nw:node/nt:termination-point/tet:te
```

```
/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes  
/te-connectivity-matrices/te-connectivity-matrix/tet:path-  
constraints/tet:te-bandwidth/tet:technology
```

```
/nw:networks/nw:network/nw:node/tet:te
```

```
/tet:tunnel-termination-point/tet:local-link-connectivities
```

```
/tet:label-restrictions/tet:label-restriction
```

8. IANA Considerations

The namespace used in the defined model has to register a URI in the IETF XML registry [[RFC3688](#)], as well as in the YANG Module Names registry [[RFC6020](#)].

9. References

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10. Contributors

The model presented in this paper was contributed to by more people than can be listed on the author list. Additional contributors include:

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