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A YANG Data Model for Flexi-Grid Optical Networks
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Abstract

This document defines a YANG module for managing flexi-grid optical networks. The model defined in this document specifies a flexi-grid traffic engineering database that is used to describe the topology of a flexi-grid network. It is based on and augments existing YANG models that describe network and traffic engineering topologies.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at <https://ietf-ccamp-wg.github.io/draft-ietf-ccamp-flexigrid-yang/draft-ietf-ccamp-flexigrid-yang.html>. Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-ietf-ccamp-flexigrid-yang/>.

Discussion of this document takes place on the Common Control and Measurement Plane Working Group mailing list (<mailto:ccamp@ietf.org>), which is archived at <https://mailarchive.ietf.org/arch/browse/ccamp/>. Subscribe at <https://www.ietf.org/mailman/listinfo/ccamp/>.

Source for this draft and an issue tracker can be found at <https://github.com/ietf-ccamp-wg/draft-ietf-ccamp-flexigrid-yang>.

Status of This Memo

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1. Introduction

The flexible grid (flexi-grid) optical network technology defined by the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) and documented in Recommendation ITU-T_G.694.1 [ITU-T_G.694.1] and ITU-T_G.872 [ITU-T_G.872] provides an enhanced Dense Wavelength Division Multiplexing (DWDM) grid by defining a set of nominal central frequencies, slot widths, and the concept of the "frequency slot". This technology increases both transport network scalability and flexibility, allowing the optimization of bandwidth usage.

[RFC7698] provides a framework for GMPLS-Based control of flexi-grid DWDM networks while [RFC7699] defines generalized labels for the use of GMPLS in flexi-grid networks.

[RFC8363] provides extensions to the OSPF-TE protocol so as to support GMPLS control of flexi-grid networks.

This document presents a YANG data model [RFC7950] for flexi-grid objects in the dynamic optical network, including nodes, transponders and links, as well as how such links interconnect nodes. This model is independent of control plane protocols.

This document identifies the flexi-grid components, parameters, and their values. It characterizes the features and the performances of the flexi-grid elements. For this, it augments [RFC8795], and imports the generic Layer 0 types and use of "media-channel" defined in [I-D.ietf-ccamp-rfc9093-bis].

An application example in Section 4 is also provided to better understand the utility of this YANG model.

A partner document defines a second YANG module that described flexi-grid tunnels, i.e., the paths from source to destination through a number of intermediate nodes [I-D.ietf-ccamp-flexigrid-tunnel-yang].

Impairment-aware traffic engineering topology is described in [I-D.ietf-ccamp-optical-impairment-topology-yang].

The YANG data model defined in this document conforms to the Network Management Datastore Architecture (NMDA) [RFC8342].

2. Terminology

Refer to [RFC7698] and [RFC7699] for the key terms used in this document.

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

- * client
- * server
- * augment
- * data model
- * data node

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

- * configuration data
- * state data

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

3. Tree Diagram

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is defined in [RFC8340].

3.1. 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. It uses prefixes from [I-D.ietf-ccamp-rfc9093-bis], [RFC8345], and [RFC8795].

Prefix	YANG module	Reference
l0-types	ietf-layer0-types	[RFCYYYY]
flexgt	ietf-flexi-grid-topology	RFC XXXX
nw	ietf-network	[RFC8345]
nt	ietf-network-topology	[RFC8345]
tet	ietf-te-topology	[RFC8795]

Table 1: Prefixes and corresponding YANG modules

RFC Editor Note: Please replace XXXX with the RFC number assigned to this document. Please replace YYYY with the RFC numbers assigned to [I-D.ietf-ccamp-rfc9093-bis]. Please remove this note.

4. Example of Use

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

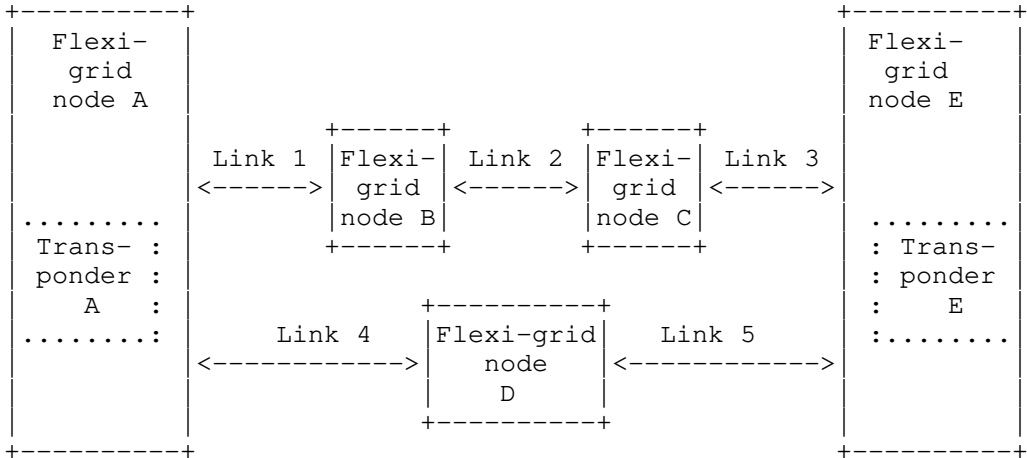


Figure 1: Topology Example

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

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

5. YANG Data Model for Flexi-Grid Topology

5.1. Flexi-Grid Topology Data Model Overview

This document describes the data model for flexi-grid topology. As a classic traffic engineering (TE) technology, flexi-grid provides WDM switching in transport network. Therefore the YANG module presented in this document augments from a more generic TE network topology data model, i.e., the `ietf-te-topology`, as specified in [RFC8795], following the guidelines provided in section 6 of [RFC8795].

Common types, identities, and groupings defined in [I-D.ietf-ccamp-rfc9093-bis] are reused in this document.

The figure below shows the augmentation relationship between YANG models.

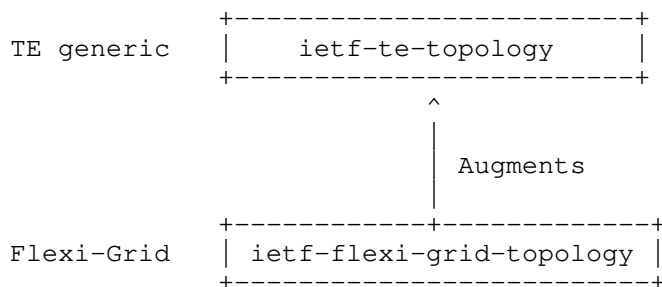


Figure 2: Relationship between Flexi-Grid and TE topology models

The entities and TE attributes, such as node, termination points and links, are still applicable for describing a flexi-grid topology and the model presented in this document only specifies the technology-specific attributes/information.

The flexi-grid specific attributes and label format is defined in [RFC7699], including the grid type, nominal central frequency granularity, slot width granularity, n and m parameters. A collection of common data types have also been specified in [I-D.ietf-ccamp-rfc9093-bis], and used in this document for augmentation of the generic TE topology model.

The YANG module ietf-flexi-grid-topology defined in this document conforms to the Network Management Datastore Architecture (NMDA) defined in [RFC8342].

5.2. Augmentations for Flexi-Grid Topology and Node

There are a few characteristics augmenting to the generic TE topology.

Following the guidelines in [RFC8795], a flexi-grid-topology network-type is specified as the indicator of flexi-grid in the topology as shown in Figure 3.

```
augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
  +---rw flexi-grid-topology!
```

Figure 3: Flexi-Grid Topology Augmentation

A flexi-grid-node presence container is specified, augmenting the generic TE node attributes, to indicate that the TE node is a Flexi-Grid node as shown in Figure 4.

```
augment /nw:networks/nw:network/nw:node/tet:te
  /tet:te-node-attributes:
    +---rw flexi-grid-node!
```

Figure 4: Flex-Grid Node Augmentation

It is assumed that all the flexi-grid nodes are reconfigurable.

5.3. Bandwidth Augmentation

No bandwidth augmentations are needed for this YANG module.

As described in Section 4.2 of [RFC7699], there is some overlap between bandwidth and label in Layer 0.

The flexi-grid label resource information described in Section 5.4, is sufficient to also describe the spectrum resources within a flexi-grid network. Therefore, the model does not define any augmentation for the te-bandwidth containers defined in [RFC8795].

5.4. Label Augmentation

The model augments all the occurrences of the label-restriction list in [RFC8795] with flexi-grid technology specific attributes using the flexi-grid-label-range-info grouping defined in [I-D.ietf-ccamp-rfc9093-bis].

Moreover, following the guidelines in [RFC8795], the model augments all the occurrences of the te-label container with the flexi-grid technology specific attributes using the flexi-grid-label-start-end, flexi-grid-label-hop and flexi-grid-label-step groupings defined in [I-D.ietf-ccamp-rfc9093-bis].

6. YANG Model (Tree Structure) for Flexi-Grid Topology

```

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/nw:node/tet:te
    /tet:te-node-attributes:
      +--rw flexi-grid-node!
  augment /nw:networks/nw:network/nw:node/tet:te
    /tet:te-node-attributes/tet:connectivity-matrices
      /tet:label-restrictions/tet:label-restriction:
        +--rw flexi-grid-label-range!
          +--rw grid-type?      identityref
          +--rw priority?       uint8
          +--rw flexi-grid
            +--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:
          +--rw flexi-grid-label-range!
            +--rw grid-type?      identityref
            +--rw priority?       uint8
            +--rw flexi-grid
              +--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:
+--rw flexi-grid-label-range!
+--rw grid-type?      identityref
+--rw priority?       uint8
+--rw flexi-grid
+--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:information-source-entry/tet:connectivity-matrices
  /tet:label-restrictions/tet:label-restriction:
+--ro flexi-grid-label-range!
+--ro grid-type?      identityref
+--ro priority?       uint8
+--ro flexi-grid
+--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:
+--ro flexi-grid-label-range!
+--ro grid-type?      identityref
+--ro priority?       uint8
+--ro flexi-grid
+--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:
+--ro flexi-grid-label-range!
+--ro grid-type?      identityref
+--ro priority?       uint8
+--ro flexi-grid
+--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:tunnel-termination-point
  /tet:local-link-connectivities/tet:label-restrictions
  /tet:label-restriction:
+--rw flexi-grid-label-range!

```

```

    +---rw grid-type?      identityref
    +---rw priority?       uint8
    +---rw flexi-grid
        +---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:
+---rw flexi-grid-label-range!
+---rw grid-type?      identityref
+---rw priority?       uint8
+---rw flexi-grid
    +---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:
+---rw flexi-grid-label-range!
+---rw grid-type?      identityref
+---rw priority?       uint8
+---rw flexi-grid
    +---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:information-source-entry/tet:label-restrictions
    /tet:label-restriction:
+---ro flexi-grid-label-range!
+---ro grid-type?      identityref
+---ro priority?       uint8
+---ro flexi-grid
    +---ro slot-width-granularity?  identityref
    +---ro min-slot-width-factor?    uint16
    +---ro 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:
+---rw flexi-grid-label-range!
+---rw grid-type?      identityref
+---rw priority?       uint8
+---rw flexi-grid
    +---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:label-restrictions/tet:label-restriction
  /tet:label-start/tet:te-label/tet:technology:
  +--:(flexi-grid)
    +--rw flexi-n? 10-types:flexi-n
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? 10-types:flexi-n
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)
    x--rw flexi-grid-channel-spacing? identityref
    +--rw flexi-ncfg? identityref
    +--rw flexi-n-step? uint8
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? 10-types:flexi-n
        | +--rw flexi-m? 10-types:flexi-m
      x--:(super)
        | +--rw subcarrier-flexi-n* [flexi-n]
        | +--rw flexi-n 10-types:flexi-n
        | +--rw flexi-m? 10-types:flexi-m
      +--:(multi)
        +--rw frequency-slots
          +--rw frequency-slot* [flexi-n]
            +--rw flexi-n 10-types:flexi-n
            +--rw flexi-m? 10-types:flexi-m
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? 10-types:flexi-n
        | +--rw flexi-m? 10-types:flexi-m
      x--:(super)

```

```

    |   +---rw subcarrier-flexi-n* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
+---:(multi)
    |   +---rw frequency-slots
    |   |   +---rw frequency-slot* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   |   |   +---rw flexi-m?          10-types:flexi-m
    |   |   x---:(super)
    |   |   |   +---rw subcarrier-flexi-n* [flexi-n]
    |   |   |   +---rw flexi-n      10-types:flexi-n
    |   |   |   +---rw flexi-m?    10-types:flexi-m
    |   |   +---:(multi)
    |   |   |   +---rw frequency-slots
    |   |   |   |   +---rw frequency-slot* [flexi-n]
    |   |   |   |   +---rw flexi-n      10-types:flexi-n
    |   |   |   |   +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   |   |   +---rw flexi-m?          10-types:flexi-m
    |   |   x---:(super)
    |   |   |   +---rw subcarrier-flexi-n* [flexi-n]
    |   |   |   +---rw flexi-n      10-types:flexi-n
    |   |   |   +---rw flexi-m?    10-types:flexi-m
    |   |   +---:(multi)
    |   |   |   +---rw frequency-slots
    |   |   |   |   +---rw frequency-slot* [flexi-n]

```

```

        +--rw flexi-n      10-types:flexi-n
        +--rw flexi-m?    10-types:flexi-m
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?      10-types:flexi-n
            |   +--ro flexi-m?      10-types:flexi-m
        x---:(super)
            |   +--ro subcarrier-flexi-n* [flexi-n]
            |   |   +--ro flexi-n      10-types:flexi-n
            |   |   +--ro flexi-m?    10-types:flexi-m
        +---:(multi)
            +--ro frequency-slots
            |   +--ro frequency-slot* [flexi-n]
            |   +--ro flexi-n      10-types:flexi-n
            |   +--ro flexi-m?    10-types:flexi-m
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
    x--rw flexi-grid-channel-spacing?  identityref
    +--rw flexi-ncfg?                  identityref
    +--rw flexi-n-step?                 uint8
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
      x---rw flexi-grid-channel-spacing?    identityref
      +---rw flexi-ncfg?                    identityref
      +---rw flexi-n-step?                  uint8
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?                    10-types:flexi-n
          | +---rw flexi-m?                    10-types:flexi-m
        x---:(super)
          | +---rw subcarrier-flexi-n* [flexi-n]
          | +---rw flexi-n    10-types:flexi-n
          | +---rw flexi-m?   10-types:flexi-m
        +---:(multi)
          +---rw frequency-slots
          +---rw frequency-slot* [flexi-n]
          +---rw flexi-n    10-types:flexi-n
          +---rw flexi-m?   10-types:flexi-m
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?                    10-types:flexi-n
          | +---rw flexi-m?                    10-types:flexi-m
        x---:(super)
          | +---rw subcarrier-flexi-n* [flexi-n]

```

```

|      +---rw flexi-n      10-types:flexi-n
|      +---rw flexi-m?    10-types:flexi-m
+---:(multi)
|      +---rw frequency-slots
|      +---rw frequency-slot* [flexi-n]
|      +---rw flexi-n      10-types:flexi-n
|      +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
|      |      +---rw flexi-m?          10-types:flexi-m
|      x---:(super)
|      |      +---rw subcarrier-flexi-n* [flexi-n]
|      |      +---rw flexi-n      10-types:flexi-n
|      |      +---rw flexi-m?    10-types:flexi-m
|      +---:(multi)
|      |      +---rw frequency-slots
|      |      +---rw frequency-slot* [flexi-n]
|      |      +---rw flexi-n      10-types:flexi-n
|      |      +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
|      |      +---rw flexi-m?          10-types:flexi-m
|      x---:(super)
|      |      +---rw subcarrier-flexi-n* [flexi-n]
|      |      +---rw flexi-n      10-types:flexi-n
|      |      +---rw flexi-m?    10-types:flexi-m
|      +---:(multi)
|      |      +---rw frequency-slots
|      |      +---rw frequency-slot* [flexi-n]
|      |      +---rw flexi-n      10-types:flexi-n

```

```

        +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
|   +---ro flexi-m?          10-types:flexi-m
x---:(super)
|   +---ro subcarrier-flexi-n* [flexi-n]
|   +---ro flexi-n    10-types:flexi-n
|   +---ro flexi-m?   10-types:flexi-m
+---:(multi)
+---ro frequency-slots
+---ro frequency-slot* [flexi-n]
+---ro flexi-n    10-types:flexi-n
+---ro flexi-m?   10-types:flexi-m
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
x---ro flexi-grid-channel-spacing?   identityref
+---ro flexi-ncfg?                    identityref
+---ro flexi-n-step?                  uint8
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?          10-types:flexi-n

```



```

    | +--ro flexi-m?          10-types:flexi-m
x--:(super)
    | +--ro subcarrier-flexi-n* [flexi-n]
    |   +--ro flexi-n      10-types:flexi-n
    |   +--ro flexi-m?    10-types:flexi-m
+--:(multi)
    +--ro frequency-slots
    +--ro frequency-slot* [flexi-n]
    +--ro flexi-n      10-types:flexi-n
    +--ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    | +--ro flexi-m?          10-types:flexi-m
x--:(super)
    | +--ro subcarrier-flexi-n* [flexi-n]
    |   +--ro flexi-n      10-types:flexi-n
    |   +--ro flexi-m?    10-types:flexi-m
+--:(multi)
    +--ro frequency-slots
    +--ro frequency-slot* [flexi-n]
    +--ro flexi-n      10-types:flexi-n
    +--ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    | +--ro flexi-m?          10-types:flexi-m
x--:(super)
    | +--ro subcarrier-flexi-n* [flexi-n]
    |   +--ro flexi-n      10-types:flexi-n
    |   +--ro flexi-m?    10-types:flexi-m
+--:(multi)
    +--ro frequency-slots
    +--ro frequency-slot* [flexi-n]
    +--ro flexi-n      10-types:flexi-n

```

```

        +---ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
|   +---ro flexi-m?          10-types:flexi-m
x---:(super)
|   +---ro subcarrier-flexi-n* [flexi-n]
|   +---ro flexi-n           10-types:flexi-n
|   +---ro flexi-m?          10-types:flexi-m
+---:(multi)
+---ro frequency-slots
+---ro frequency-slot* [flexi-n]
+---ro flexi-n           10-types:flexi-n
+---ro flexi-m?          10-types:flexi-m
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?          10-types:flexi-n
|   +---ro flexi-m?          10-types:flexi-m
x---:(super)
|   +---ro subcarrier-flexi-n* [flexi-n]
|   +---ro flexi-n           10-types:flexi-n
|   +---ro flexi-m?          10-types:flexi-m
+---:(multi)
+---ro frequency-slots
+---ro frequency-slot* [flexi-n]
+---ro flexi-n           10-types:flexi-n
+---ro flexi-m?          10-types:flexi-m
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?    10-types:flexi-n

```

```

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?    10-types:flexi-n
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)
    x--ro flexi-grid-channel-spacing?  identityref
    +---ro flexi-ncfg?                  identityref
    +---ro flexi-n-step?                 uint8
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
    x--ro flexi-grid-channel-spacing?  identityref
    +---ro flexi-ncfg?                  identityref
    +---ro flexi-n-step?                 uint8
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?          10-types:flexi-n
        | +---ro flexi-m?          10-types:flexi-m
        x--:(super)

```

```

    |   +---ro subcarrier-flexi-n* [flexi-n]
    |   |   +---ro flexi-n      10-types:flexi-n
    |   |   +---ro flexi-m?    10-types:flexi-m
+---:(multi)
    |   +---ro frequency-slots
    |   |   +---ro frequency-slot* [flexi-n]
    |   |   |   +---ro flexi-n      10-types:flexi-n
    |   |   |   +---ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   |   |   +---ro flexi-m?          10-types:flexi-m
    |   |   x---:(super)
    |   |   |   +---ro subcarrier-flexi-n* [flexi-n]
    |   |   |   |   +---ro flexi-n      10-types:flexi-n
    |   |   |   |   +---ro flexi-m?    10-types:flexi-m
    |   |   +---:(multi)
    |   |   |   +---ro frequency-slots
    |   |   |   |   +---ro frequency-slot* [flexi-n]
    |   |   |   |   |   +---ro flexi-n      10-types:flexi-n
    |   |   |   |   |   +---ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   |   |   +---ro flexi-m?          10-types:flexi-m
    |   |   x---:(super)
    |   |   |   +---ro subcarrier-flexi-n* [flexi-n]
    |   |   |   |   +---ro flexi-n      10-types:flexi-n
    |   |   |   |   +---ro flexi-m?    10-types:flexi-m
    |   |   +---:(multi)
    |   |   |   +---ro frequency-slots
    |   |   |   |   +---ro frequency-slot* [flexi-n]
    |   |   |   |   |   +---ro flexi-n      10-types:flexi-n
    |   |   |   |   |   +---ro flexi-m?    10-types:flexi-m

```

```

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?          10-types:flexi-n
      |   +--ro flexi-m?          10-types:flexi-m
    x--:(super)
      |   +--ro subcarrier-flexi-n* [flexi-n]
      |   |   +--ro flexi-n      10-types:flexi-n
      |   |   +--ro flexi-m?     10-types:flexi-m
    +--:(multi)
      +--ro frequency-slots
      |   +--ro frequency-slot* [flexi-n]
      |   |   +--ro flexi-n      10-types:flexi-n
      |   |   +--ro flexi-m?     10-types:flexi-m
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?          10-types:flexi-n
      |   +--ro flexi-m?          10-types:flexi-m
    x--:(super)
      |   +--ro subcarrier-flexi-n* [flexi-n]
      |   |   +--ro flexi-n      10-types:flexi-n
      |   |   +--ro flexi-m?     10-types:flexi-m
    +--:(multi)
      +--ro frequency-slots
      |   +--ro frequency-slot* [flexi-n]
      |   |   +--ro flexi-n      10-types:flexi-n
      |   |   +--ro flexi-m?     10-types:flexi-m
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?  10-types:flexi-n
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?    10-types:flexi-n
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-grid-channel-spacing?    identityref
+---rw flexi-ncfg?                    identityref
+---rw flexi-n-step?                  uint8
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?                    10-types:flexi-n
|   +---rw flexi-m?                    10-types:flexi-m
x---:(super)
|   +---rw subcarrier-flexi-n* [flexi-n]
|   |   +---rw flexi-n    10-types:flexi-n
|   |   +---rw flexi-m?   10-types:flexi-m
+---:(multi)
+---rw frequency-slots
+---rw frequency-slot* [flexi-n]
+---rw flexi-n    10-types:flexi-n
+---rw flexi-m?   10-types:flexi-m
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?                    10-types:flexi-n
|   +---rw flexi-m?                    10-types:flexi-m
x---:(super)
|   +---rw subcarrier-flexi-n* [flexi-n]
|   |   +---rw flexi-n    10-types:flexi-n
|   |   +---rw flexi-m?   10-types:flexi-m
+---:(multi)

```

```

        +---rw frequency-slots
            +---rw frequency-slot* [flexi-n]
                +---rw flexi-n      10-types:flexi-n
                +---rw flexi-m?     10-types:flexi-m
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?          10-types:flexi-n
            | +---rw flexi-m?          10-types:flexi-m
        x---:(super)
            | +---rw subcarrier-flexi-n* [flexi-n]
            | +---rw flexi-n      10-types:flexi-n
            | +---rw flexi-m?     10-types:flexi-m
        +---:(multi)
            +---rw frequency-slots
                +---rw frequency-slot* [flexi-n]
                    +---rw flexi-n      10-types:flexi-n
                    +---rw flexi-m?     10-types:flexi-m
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?          10-types:flexi-n
            | +---rw flexi-m?          10-types:flexi-m
        x---:(super)
            | +---rw subcarrier-flexi-n* [flexi-n]
            | +---rw flexi-n      10-types:flexi-n
            | +---rw flexi-m?     10-types:flexi-m
        +---:(multi)
            +---rw frequency-slots
                +---rw frequency-slot* [flexi-n]
                    +---rw flexi-n      10-types:flexi-n
                    +---rw flexi-m?     10-types:flexi-m
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?           10-types:flexi-n
|   +--ro flexi-m?           10-types:flexi-m
x--:(super)
|   +--ro subcarrier-flexi-n* [flexi-n]
|   +--ro flexi-n           10-types:flexi-n
|   +--ro flexi-m?          10-types:flexi-m
+---:(multi)
+--ro frequency-slots
+--ro frequency-slot* [flexi-n]
+--ro flexi-n           10-types:flexi-n
+--ro flexi-m?          10-types:flexi-m
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?          10-types:flexi-n
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?          10-types:flexi-n
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)
x--rw flexi-grid-channel-spacing?  identityref
+--rw flexi-ncfg?                  identityref
+--rw flexi-n-step?                uint8
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?           10-types:flexi-n
      |   +---rw flexi-m?           10-types:flexi-m
    x---:(super)
      |   +---rw subcarrier-flexi-n* [flexi-n]
      |   +---rw flexi-n           10-types:flexi-n
      |   +---rw flexi-m?          10-types:flexi-m
    +---:(multi)
      +---rw frequency-slots
        +---rw frequency-slot* [flexi-n]
          +---rw flexi-n           10-types:flexi-n
          +---rw flexi-m?          10-types:flexi-m
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?           10-types:flexi-n
      |   +---rw flexi-m?           10-types:flexi-m
    x---:(super)
      |   +---rw subcarrier-flexi-n* [flexi-n]
      |   +---rw flexi-n           10-types:flexi-n
      |   +---rw flexi-m?          10-types:flexi-m
    +---:(multi)
      +---rw frequency-slots
        +---rw frequency-slot* [flexi-n]
          +---rw flexi-n           10-types:flexi-n
          +---rw flexi-m?          10-types:flexi-m
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?           10-types:flexi-n
      |   +---rw flexi-m?           10-types:flexi-m
    x---:(super)

```

```

    |   +---rw subcarrier-flexi-n* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
+---:(multi)
    |   +---rw frequency-slots
    |   |   +---rw frequency-slot* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   +---rw flexi-m?          10-types:flexi-m
    x---:(super)
    |   +---rw subcarrier-flexi-n* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
    +---:(multi)
    |   +---rw frequency-slots
    |   |   +---rw frequency-slot* [flexi-n]
    |   |   +---rw flexi-n      10-types:flexi-n
    |   |   +---rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
    |   +---ro flexi-m?          10-types:flexi-m
    x---:(super)
    |   +---ro subcarrier-flexi-n* [flexi-n]
    |   |   +---ro flexi-n      10-types:flexi-n
    |   |   +---ro flexi-m?    10-types:flexi-m
    +---:(multi)
    |   +---ro frequency-slots
    |   |   +---ro frequency-slot* [flexi-n]

```

```

        +--ro flexi-n      10-types:flexi-n
        +--ro flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
      | +--rw flexi-m?          10-types:flexi-m
    x--:(super)
      | +--rw subcarrier-flexi-n* [flexi-n]
      | +--rw flexi-n      10-types:flexi-n
      | +--rw flexi-m?    10-types:flexi-m
    +--:(multi)
      +--rw frequency-slots
      +--rw frequency-slot* [flexi-n]
      +--rw flexi-n      10-types:flexi-n
      +--rw flexi-m?    10-types:flexi-m
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?          10-types:flexi-n
      | +--rw flexi-m?          10-types:flexi-m
    x--:(super)
      | +--rw subcarrier-flexi-n* [flexi-n]
      | +--rw flexi-n      10-types:flexi-n
      | +--rw flexi-m?    10-types:flexi-m
    +--:(multi)
      +--rw frequency-slots
      +--rw frequency-slot* [flexi-n]
      +--rw flexi-n      10-types:flexi-n
      +--rw flexi-m?    10-types:flexi-m
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
  x---rw flexi-grid-channel-spacing?  identityref
  +---rw flexi-ncfg?                  identityref
  +---rw flexi-n-step?                uint8
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?    10-types:flexi-n
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?    10-types:flexi-n
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)
  x---ro flexi-grid-channel-spacing?  identityref
  +---ro flexi-ncfg?                  identityref
  +---ro flexi-n-step?                uint8
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?          10-types:flexi-n
      | +---rw flexi-m?          10-types:flexi-m
    x---:(super)
      | +---rw subcarrier-flexi-n* [flexi-n]
      |   +---rw flexi-n    10-types:flexi-n
      |   +---rw flexi-m?   10-types:flexi-m
    +---:(multi)
      +---rw frequency-slots
        +---rw frequency-slot* [flexi-n]
          +---rw flexi-n    10-types:flexi-n
          +---rw flexi-m?   10-types:flexi-m
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?           10-types:flexi-n
|   +---rw flexi-m?           10-types:flexi-m
x---:(super)
|   +---rw subcarrier-flexi-n* [flexi-n]
|   +---rw flexi-n           10-types:flexi-n
|   +---rw flexi-m?          10-types:flexi-m
+---:(multi)
+---rw frequency-slots
+---rw frequency-slot* [flexi-n]
+---rw flexi-n           10-types:flexi-n
+---rw flexi-m?          10-types:flexi-m
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?          10-types:flexi-n
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?          10-types:flexi-n
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-grid-channel-spacing? identityref
+---rw flexi-ncfg?               identityref
+---rw flexi-n-step?             uint8

```

Figure 5

7. The YANG Code for Flexi-grid topology

```

<CODE BEGINS> file "ietf-flexi-grid-topology@2023-12-15.yang"
module ietf-flexi-grid-topology {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-flexi-grid-topology";
  prefix "flexgt";

  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 8795: YANG Data Model for Traffic Engineering
      (TE) Topologies";
  }

  import ietf-layer0-types {
    prefix "l0-types";
    reference
      "RFC YYYY: A YANG Data Model for Layer 0 Types";
  }
  /* Note: The RFC Editor will replace YYYY with the number assigned
     to the RFC once draft-ietf-ccamp-rfc9093-bis becomes an RFC.*/

  organization
    "IETF CCAMP Working Group";
  contact
    "WG Web: <https://datatracker.ietf.org/wg/ccamp/>

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

    Editor: Jorge E. Lopez de Vergara
           <mailto:jorge.lopez\_vergara@uam.es>

    Editor: Daniel Perdices
           <mailto:daniel.perdices@uam.es>

    Editor: Haomian Zheng
           <mailto:zhenghaomian@huawei.com>

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

    Editor: Young Lee
           <mailto:younglee.tx@gmail.com>";

  description
```

"This YANG module defines a topology model for flexi-grid optical networks. The model augments the technology-agnostic TE topology model with flexi-grid technology specific definitions, based on RFC 7698 and RFC 7699.

The model fully conforms to the Network Management Datastore Architecture (NMDA).

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.

The key words 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL', 'SHALL NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED', 'NOT RECOMMENDED', 'MAY', and 'OPTIONAL' in this document are to be interpreted as described in BCP 14 (RFC 2119) (RFC 8174) when, and only when, they appear in all capitals, as shown here.";

reference

"RFC 7698: Framework and Requirements for GMPLS-Based Control of Flexi-Grid Dense Wavelength Division Multiplexing (DWDM) Networks;

RFC 7699: Generalized Labels for the Flexi-Grid in Lambda Switch Capable (LSC) Label Switching Routers.";

```
revision 2023-12-15 {
  description
    "Initial Version";
  reference
    "RFC XXXX: A YANG Data Model for Flexi-Grid Optical Networks";
  // RFC Ed.: replace XXXX with actual RFC number, update date
  // information and remove this note
}
```

```
/*
 * Groupings
 */
```

```
grouping label-range-info {
  description
```

```
    "Flexi-grid-specific label range related information with a
    presence container indicating whether the label range is a
    flexi-grid label range.";
  container flexi-grid-label-range {
    presence
      "Indicates the label range is a flexi-grid label range.

      This container MUST NOT be present if there are other
      presence containers or attributes indicating another type
      of label range.";
    description
      "Flexi-grid-specific label range related information.";
    uses 10-types:flexi-grid-label-range-info;
  }
}

/*
 * Data nodes
 */

augment "/nw:networks/nw:network/nw:network-types"
  + "/tet:te-topology" {
  description
    "Augment network types to define flexi-grid topology type.";
  container flexi-grid-topology {
    presence
      "Its presence identifies the flexi-grid topology type.";
    description
      "Introduce new network type for flexi-grid topology.";
  }
}

augment "/nw:networks/nw:network/nw:node/tet:te"
  + "/tet:te-node-attributes" {
  when "/nw:networks/nw:network/nw:network-types"
    + "/tet:te-topology/flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description "Augment TE node attributes.";
  container flexi-grid-node {
    presence "The TE node is a flexi-grid node.";
    description
      "Introduce new TE node type for flexi-grid node.";
  }
}
```



```

/*
 * Augment TE label range information
 */

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range information for the TE node
    connectivity matrices.";
  uses label-range-info;
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range information for the source Link
    Termination Point (LTP) of the connectivity matrix entry.";
  uses label-range-info;
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range information for the destination LTP
    of the connectivity matrix entry.";
}

```

```

    uses label-range-info;
}
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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range information for the TE node
    connectivity matrices information source.";
uses label-range-info;
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range information for the source LTP
    of the connectivity matrix entry information source.";
uses label-range-info;
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range information for the destination LTP
    of the connectivity matrix entry information source.";
uses label-range-info;
}

```

```

}

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/"
+ "flexgt:flexi-grid-topology" {
description
"Augmentation parameters apply only for networks with
flexi-grid topology type.";
}
description
"Augment TE label range information for the Tunnel
Termination Point (TTP) Local Link Connectivities.";
uses label-range-info;
}

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/"
+ "flexgt:flexi-grid-topology" {
description
"Augmentation parameters apply only for networks with
flexi-grid topology type.";
}
description
"Augment TE label range information for the TTP
Local Link Connectivity entry.";
uses label-range-info;
}

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/"
+ "flexgt:flexi-grid-topology" {
description
"Augmentation parameters apply only for networks with
flexi-grid topology type.";
}
description
"Augment TE label range information for the TE link.";
uses label-range-info;
}

```

```

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/"
+ "flexgt:flexi-grid-topology" {
description
"Augmentation parameters apply only for networks with
flexi-grid topology type.";
}
description
"Augment TE label range information for the TE link
information source.";
uses label-range-info;
}

augment "/nw:networks/tet:te/tet:templates/"
+ "tet:link-template/tet:te-link-attributes/"
+ "tet:label-restrictions/tet:label-restriction" {
description
"Augment TE label range information for the TE link template.";
uses label-range-info;
}

/*
* Augment TE label
*/

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/"
+ "flexgt:flexi-grid-topology" {
description
"Augmentation parameters apply only for networks with
flexi-grid topology type.";
}
description
"Augment TE label range start for the TE node
connectivity matrices.";
case flexi-grid {
uses l0-types:flexi-grid-label-start-end;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
}
description
    "Augment TE label range end for the TE node
      connectivity matrices.";
case flexi-grid {
uses l0-types:flexi-grid-label-start-end;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
}
description
    "Augment TE label range step for the TE node
      connectivity matrices.";
case flexi-grid {
uses l0-types:flexi-grid-label-step;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
}
```

```

    description
      "Augment TE label hop for the underlay primary path of the
       TE node connectivity matrices.";
    case flexi-grid {
      uses l0-types:flexi-grid-label-hop;
    }
  }

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
       flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the underlay backup path of the
     TE node connectivity matrices.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
       flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the explicit route objects excluded
     by the path computation of the TE node connectivity
     matrices.";
  case flexi-grid {

```

```

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

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/"
+ "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the explicit route objects included
  by the path computation of the TE node connectivity
  matrices.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the computed path route objects
  of the TE node connectivity matrices.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}
}

```

```
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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label range start for the source LTP
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-start-end;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label range end for the source LTP
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-start-end;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
  }
description
  "Augment TE label range step for the source LTP
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-step;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
  }
description
  "Augment TE label range start for the destination LTP
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-start-end;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
  }
}

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    }
    description
      "Augment TE label range end for the destination LTP
      of the connectivity matrix entry.";
    case flexi-grid {
      uses l0-types:flexi-grid-label-start-end;
    }
  }

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label range step for the destination LTP
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-step;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the underlay primary path
  of the connectivity matrix entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}

```

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    }
  }

  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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the underlay backup path
      of the connectivity matrix entry.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the explicit route objects excluded
      by the path computation of the connectivity matrix entry.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:te-node-attributes/tet:connectivity-matrices/"

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    + "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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects included
    by the path computation of the connectivity matrix entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the computed path route objects
    of the connectivity matrix entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"

```

```

    + "flexgt:flexi-grid-topology" {
      description
        "Augmentation parameters apply only for networks with
         flexi-grid topology type.";
    }
  description
    "Augment TE label range start for the TE node connectivity
     matrices information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
       flexi-grid topology type.";
  }
  description
    "Augment TE label range end for the TE node connectivity
     matrices information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
       flexi-grid topology type.";
  }
  description
    "Augment TE label range step for the TE node connectivity
     matrices information source.";
}

```

```

    case flexi-grid {
      uses l0-types:flexi-grid-label-step;
    }
  }

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the underlay primary path
      of the TE node connectivity matrices of the information
      source entry.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the underlay backup path
      of the TE node connectivity matrices of the information
      source entry.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

augment "/nw:networks/nw:network/nw:node/tet:te/"
  + "tet:information-source-entry/tet:connectivity-matrices/"
  + "tet:optimizations/tet:algorithm/tet:metric/"

```

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    + "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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects excluded
    by the path computation of the TE node connectivity matrices
    information source.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects included
    by the path computation of the TE node connectivity matrices
    information source.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
  }
  description
    "Augment TE label hop for the computed path route objects
    of the TE node connectivity matrices information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
    }
  description
    "Augment TE label range start for the source LTP
    of the connectivity matrix entry information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
    }
  }
}

```



```

    description
      "Augment TE label range end for the source LTP
        of the connectivity matrix entry information source.";
    case flexi-grid {
      uses l0-types:flexi-grid-label-start-end;
    }
  }

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range step for the source LTP
      of the connectivity matrix entry information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-step;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range start for the destination LTP
      of the connectivity matrix entry information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

```

```

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label range end for the destination LTP
  of the connectivity matrix entry information source.";
case flexi-grid {
  uses l0-types:flexi-grid-label-start-end;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label range step for the destination LTP
  of the connectivity matrix entry information source.";
case flexi-grid {
  uses l0-types:flexi-grid-label-step;
}
}

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/"
  + "flexgt:flexi-grid-topology" {

```

```

        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the underlay primary path
        of the connectivity matrix entry information source.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the underlay backup path
        of the connectivity matrix entry information source.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description

```

```

    "Augment TE label hop for the explicit route objects excluded
    by the path computation of the connectivity matrix entry
    information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
+ "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the explicit route objects included
  by the path computation of the connectivity matrix entry
  information source.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
+ "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the computed path route objects
  of the connectivity matrix entry information source.";

```

```

    case flexi-grid {
      uses 10-types:flexi-grid-label-hop;
    }
  }

  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/"
      + "flexgt:flexi-grid-topology" {
      description
        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
      "Augment TE label range start for the TTP
      Local Link Connectivities.";
    case flexi-grid {
      uses 10-types:flexi-grid-label-start-end;
    }
  }

  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/"
      + "flexgt:flexi-grid-topology" {
      description
        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
      "Augment TE label range end for the TTP
      Local Link Connectivities.";
    case flexi-grid {
      uses 10-types:flexi-grid-label-start-end;
    }
  }

  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/"
    + "flexgt:flexi-grid-topology" {
    description
        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
        "Augment TE label range step for the TTP
        Local Link Connectivities.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-step;
    }
}

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/"
    + "flexgt:flexi-grid-topology" {
    description
        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the underlay primary path
        of the TTP Local Link Connectivities.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
    + "flexgt:flexi-grid-topology" {

```

```

        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the underlay backup path
        of the TTP Local Link Connectivities.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
+ "flexgt:flexi-grid-topology" {
    description
        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects excluded
    by the path computation of the TTP Local Link
    Connectivities.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
    description

```

```

        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the explicit route objects included
        by the path computation of the TTP Local Link
        Connectivities.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label hop for the computed path route objects
        of the TTP Local Link Connectivities.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-hop;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label range start for the TTP

```



```

        Local Link Connectivity entry.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range end for the TTP
    Local Link Connectivity entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
}
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range step for the TTP
    Local Link Connectivity entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-step;
}
}

```

```

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the underlay primary path
  of the TTP Local Link Connectivity entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}

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/"
  + "flexgt:flexi-grid-topology" {
  description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
  "Augment TE label hop for the underlay backup path
  of the TTP Local Link Connectivity entry.";
case flexi-grid {
  uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects excluded
    by the path computation of the TTP Local Link
    Connectivity entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the explicit route objects included
    by the path computation of the TTP Local Link
    Connectivity entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the computed path route objects
    of the TTP Local Link Connectivity entry.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}
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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label hop for the underlay primary path
    of the TE link.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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/"
    + "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description

```

```

    "Augment TE label hop for the underlay backup path
    of the TE link.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range start for the TE link.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
    description
      "Augmentation parameters apply only for networks with
      flexi-grid topology type.";
  }
  description
    "Augment TE label range end for the TE link.";
  case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;
  }
}

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/"
  + "flexgt:flexi-grid-topology" {
    description

```

```

        "Augmentation parameters apply only for networks with
        flexi-grid topology type.";
    }
    description
        "Augment TE label range step for the TE link.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-step;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label range start for the TE link
        information source.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

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/"
        + "flexgt:flexi-grid-topology" {
        description
            "Augmentation parameters apply only for networks with
            flexi-grid topology type.";
    }
    description
        "Augment TE label range end for the TE link
        information source.";
    case flexi-grid {
        uses l0-types:flexi-grid-label-start-end;
    }
}

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/"
+ "flexgt:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with
    flexi-grid topology type.";
}
description
    "Augment TE label range step for the TE link
    information source.";
case flexi-grid {
    uses l0-types:flexi-grid-label-step;
}
}

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" {
description
    "Augment TE label hop for the underlay primary path
    of the TE link template.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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" {
description
    "Augment TE label hop for the underlay backup path
    of the TE link template.";
case flexi-grid {
    uses l0-types:flexi-grid-label-hop;
}
}

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" {
description
    "Augment TE label range start for the TE link template.";
case flexi-grid {
    uses l0-types:flexi-grid-label-start-end;

```

```
    }  
  }  
  
  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" {  
    description  
      "Augment TE label range end for the TE link template.";  
    case flexi-grid {  
      uses l0-types:flexi-grid-label-start-end;  
    }  
  }  
  
  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" {  
    description  
      "Augment TE label range step for the TE link template.";  
    case flexi-grid {  
      uses l0-types:flexi-grid-label-step;  
    }  
  }  
}  
<CODE ENDS>
```

Figure 6

8. 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 Transport Layer Security (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 SSH [RFC6242] describes a method for invoking and running NETCONF within a 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
```

9. IANA Considerations

IANA is requested to assigned a new URI from the "IETF XML Registry" [RFC3688] as follows:

```
URI: urn:ietf:params:xml:ns:yang:ietf-flexi-grid-topology
Registrant Contact: The IESG
XML: N/A; the requested URI is an XML namespace.
```

IANA is requested to assign a new YANG module name in the "YANG Module Names" registry [RFC6020] as follows:

```
Name: ietf-flexi-grid-topology
Namespace: urn:ietf:params:xml:ns:yang:ietf-flexi-grid-topology
Prefix: flexgt
Reference: RFC XXXX
```

10. References

10.1. Normative References

- [I-D.ietf-ccamp-rfc9093-bis]
Belotti, S., Busi, I., Beller, D., Zheng, H., Le Rouzic, E., Guo, A., and D. King, "A YANG Data Model for Layer 0 Types", Work in Progress, Internet-Draft, draft-ietf-ccamp-rfc9093-bis-07, 23 October 2023, <<https://datatracker.ietf.org/doc/html/draft-ietf-ccamp-rfc9093-bis-07>>.
- [ITU-T_G.694.1]
ITU-T Recommendation G.694.1, "Spectral grids for WDM applications: DWDM frequency grid", ITU-T G.694.1 , October 2020.
- [ITU-T_G.872]
International Telecommunication Union, "Architecture of optical transport networks", ITU-T G.872 Amendment 1 , January 2021.
- [RFC3688] Mealling, M., "The IETF XML Registry", BCP 81, RFC 3688, DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/rfc/rfc3688>>.
- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/rfc/rfc6020>>.
- [RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <<https://www.rfc-editor.org/rfc/rfc6241>>.
- [RFC6242] Wasserman, M., "Using the NETCONF Protocol over Secure Shell (SSH)", RFC 6242, DOI 10.17487/RFC6242, June 2011, <<https://www.rfc-editor.org/rfc/rfc6242>>.
- [RFC7699] Farrel, A., King, D., Li, Y., and F. Zhang, "Generalized Labels for the Flexi-Grid in Lambda Switch Capable (LSC) Label Switching Routers", RFC 7699, DOI 10.17487/RFC7699, November 2015, <<https://www.rfc-editor.org/rfc/rfc7699>>.
- [RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <<https://www.rfc-editor.org/rfc/rfc7950>>.
- [RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", RFC 8040, DOI 10.17487/RFC8040, January 2017, <<https://www.rfc-editor.org/rfc/rfc8040>>.

- [RFC8341] Bierman, A. and M. Bjorklund, "Network Configuration Access Control Model", STD 91, RFC 8341, DOI 10.17487/RFC8341, March 2018, <<https://www.rfc-editor.org/rfc/rfc8341>>.
- [RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", RFC 8342, DOI 10.17487/RFC8342, March 2018, <<https://www.rfc-editor.org/rfc/rfc8342>>.
- [RFC8345] Clemm, A., Medved, J., Varga, R., Bahadur, N., Ananthakrishnan, H., and X. Liu, "A YANG Data Model for Network Topologies", RFC 8345, DOI 10.17487/RFC8345, March 2018, <<https://www.rfc-editor.org/rfc/rfc8345>>.
- [RFC8363] Zhang, X., Zheng, H., Casellas, R., Gonzalez de Dios, O., and D. Ceccarelli, "GMPLS OSPF-TE Extensions in Support of Flexi-Grid Dense Wavelength Division Multiplexing (DWDM) Networks", RFC 8363, DOI 10.17487/RFC8363, May 2018, <<https://www.rfc-editor.org/rfc/rfc8363>>.
- [RFC8446] Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", RFC 8446, DOI 10.17487/RFC8446, August 2018, <<https://www.rfc-editor.org/rfc/rfc8446>>.
- [RFC8795] Liu, X., Bryskin, I., Beeram, V., Saad, T., Shah, H., and O. Gonzalez de Dios, "YANG Data Model for Traffic Engineering (TE) Topologies", RFC 8795, DOI 10.17487/RFC8795, August 2020, <<https://www.rfc-editor.org/rfc/rfc8795>>.

10.2. Informative References

- [I-D.ietf-ccamp-flexigrid-tunnel-yang]
de Madrid, U. A., Burrero, D. P., King, D., Lopez, V., Busi, I., Belotti, S., and G. Galimberti, "A YANG Data Model for Flexi-Grid Tunnels", Work in Progress, Internet-Draft, draft-ietf-ccamp-flexigrid-tunnel-yang-03, 10 July 2023, <<https://datatracker.ietf.org/doc/html/draft-ietf-ccamp-flexigrid-tunnel-yang-03>>.
- [I-D.ietf-ccamp-optical-impairment-topology-yang]
Beller, D., Le Rouzic, E., Belotti, S., Galimberti, G., and I. Busi, "A YANG Data Model for Optical Impairment-aware Topology", Work in Progress, Internet-Draft, draft-ietf-ccamp-optical-impairment-topology-yang-14, 23 October 2023, <<https://datatracker.ietf.org/doc/html/draft-ietf-ccamp-optical-impairment-topology-yang-14>>.

- [RFC7698] Gonzalez de Dios, O., Ed., Casellas, R., Ed., Zhang, F., Fu, X., Ceccarelli, D., and I. Hussain, "Framework and Requirements for GMPLS-Based Control of Flexi-Grid Dense Wavelength Division Multiplexing (DWDM) Networks", RFC 7698, DOI 10.17487/RFC7698, November 2015, <<https://www.rfc-editor.org/rfc/rfc7698>>.
- [RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <<https://www.rfc-editor.org/rfc/rfc8340>>.

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