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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.

A partner document defines a second YANG module for flexi-grid media channels, i.e., the paths from source to destination through a number of intermediate nodes.

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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 G.694.1 [[G.694.1](#)] and G.872 [[G.872](#)] provides an enhanced Dense Wavelength Division Multiplexing (DWDM) grid by defining a set of nominal central frequencies, channel spacings, and the concept of the "frequency slot". In such an environment, a data-plane connection is switched based on allocated, variable-sized frequency ranges within the optical spectrum, creating what is known as a flexible grid (flexi-grid). This technology increases both transport network

scalability and flexibility, allowing the optimization of bandwidth usage.

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

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

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

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

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-media-channel-yang].

2. Conventions

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 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Terminology

Refer to [RFC7446] and [RFC7581] for the key terms used in this document.

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

- o client
- o server
- o augment

- o data model
- o data node

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

- o configuration data
- o state data

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

4. 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 [\[RFC8340\]](#).

4.1. 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 Figure 1. It uses prefixes from [\[I-D.ietf-ccamp-layer0-types\]](#), [\[RFC8345\]](#), and [\[RFC8795\]](#).

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

Figure 1: Prefixes and Corresponding YANG modules

RFC Editor Note: Please replace XXXX with the RFC numbers assigned to [draft-ietf-ccamp-layer0-types](#). Please replace YYYY with the RFC number assigned to this document. Please remove this note.

5. Main Components of the Flexi-grid Topology

This section describes the YANG module. It is specified in [Section 8](#).

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

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

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

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

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

<config>: Contains the configuration of a node.

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

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

```
<list-interface> ::= <name> <port-number>  
                   <input-port> <output-port> <description>  
                   <interface-type>  
                   [<numbered-interface> / <unnumbered-interface>]
```

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

<name>: Determines the interface name.

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

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

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

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

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

<numbered-interface> ::= <n-i-ip-address>

<numbered-interface>: An interface with its own IP address.

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

<unnumbered-interface> ::= <u-i-ip-address> <label>

<unnumbered-interface>: An interface that needs a label to be unique.

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

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

<connectivity-matrix> ::= <connections>

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

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

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

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

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

<config>: Contains the configuration of a transponder.

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

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

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

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

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

<state>: Contains the state of a transponder.

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

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

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

<flexi-grid-link>: This element describes all the information of a link.

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

<config>: Contains the configuration of a link.

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

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

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

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

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

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

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

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


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

<state>: Contains the state of a link.

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

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

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

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

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

<config>: Contains the configuration of a transponder.

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

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

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

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

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

<state>: Contains the state of a transponder.

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

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

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

<flexi-grid-link>: This element describes all the information of a link.

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


<config>: Contains the configuration of a link.

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

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

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

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

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

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

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

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

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

<state>: Contains the state of a link.

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

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

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

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

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

<config>: Contains the configuration of a transponder.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

<state>: Contains the state of a link.

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

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

6. Example of Use

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

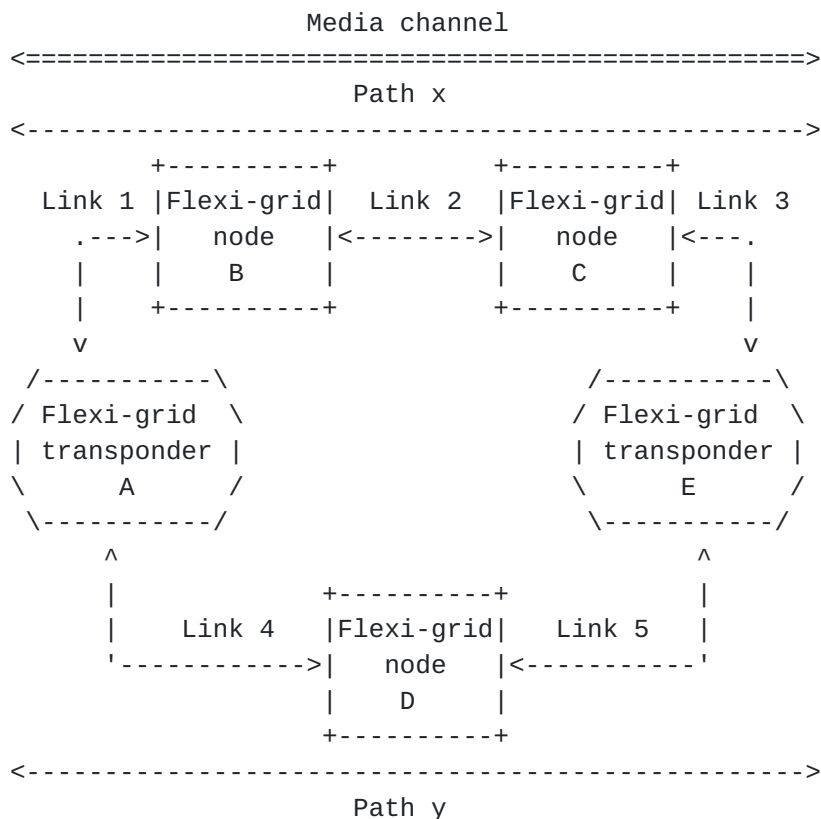


Figure 3: Topology Example

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

- o We define the transponders A and E, including their FEC type, if enabled, and modulation type. We also provide node identifiers and addresses for the transponders, as well as interfaces included in the transponders. Sliceable transponders can also be defined if needed.
- o We do the same for the nodes B, C and D, providing their identifiers, addresses and interfaces, as well as the internal connectivity matrix between interfaces.
- o Then, we also define the links 1 to 5 that interconnect nodes and transponders, indicating which flexi-grid labels are available.
- o Other information, such as the slot frequency and granularity are also provided.

- o Next, we can configure the media channel from the information we have stored in the flexi-grid TED, by querying which elements are available, and planning the resources that have to be provided on each situation. Note that every element in the flexi-grid TED has a reference, and this is the way in which they are called in the media channel. We refer to [\[I-D.ietf-ccamp-flexigrid-media-channel-yang\]](#) to complete this example.

7. 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 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 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 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 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 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 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 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 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 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 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 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)
    +--rw flexi-grid-channel-spacing?    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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n                l0-types:flexi-n
      +--rw flexi-m?                l0-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n                l0-types:flexi-n
      +--rw flexi-m?                l0-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n                l0-types:flexi-n
      +--rw flexi-m?                l0-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?          l0-types:flexi-n
      | +--rw flexi-m?          l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n          l0-types:flexi-n
        +--rw flexi-m?         l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n          l0-types:flexi-n
        +--ro flexi-m?         l0-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?          l0-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?          l0-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)
  +--rw flexi-grid-channel-spacing? 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?    l0-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?    l0-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)
  +--rw flexi-grid-channel-spacing?  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?                l0-types:flexi-n
    | +--rw flexi-m?                l0-types:flexi-m
    +---:(super)
    +--rw subcarrier-flexi-n* [flexi-n]
    +--rw flexi-n    l0-types:flexi-n
    +--rw flexi-m?   l0-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?                l0-types:flexi-n
    | +--rw flexi-m?                l0-types:flexi-m
    +---:(super)
    +--rw subcarrier-flexi-n* [flexi-n]
    +--rw flexi-n    l0-types:flexi-n
    +--rw flexi-m?   l0-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?                l0-types:flexi-n
    | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n                l0-types:flexi-n
      +--rw flexi-m?               l0-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?                l0-types:flexi-n
    | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n                l0-types:flexi-n
      +--rw flexi-m?               l0-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?                l0-types:flexi-n
    | +--ro flexi-m?                l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n                l0-types:flexi-n
      +--ro flexi-m?               l0-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?    l0-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?    l0-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)
    +--ro flexi-grid-channel-spacing?    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?                  l0-types:flexi-n
    |   +--ro flexi-m?                  l0-types:flexi-m
    +--:(super)
    |   +--ro subcarrier-flexi-n* [flexi-n]
    |   +--ro flexi-n    l0-types:flexi-n
    |   +--ro flexi-m?   l0-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?                  l0-types:flexi-n
    |   +--ro flexi-m?                  l0-types:flexi-m
    +--:(super)
    |   +--ro subcarrier-flexi-n* [flexi-n]
    |   +--ro flexi-n    l0-types:flexi-n
    |   +--ro flexi-m?   l0-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?          l0-types:flexi-n
        | +--ro flexi-m?          l0-types:flexi-m
      +--:(super)
        +--ro subcarrier-flexi-n* [flexi-n]
          +--ro flexi-n    l0-types:flexi-n
          +--ro flexi-m?   l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n    l0-types:flexi-n
        +--ro flexi-m?   l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
        +--ro flexi-n    l0-types:flexi-n
        +--ro flexi-m?   l0-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?    l0-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)
        +--ro flexi-grid-channel-spacing?    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)
        +--ro flexi-grid-channel-spacing?    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
            +--:(super)
                +--ro subcarrier-flexi-n* [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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n      l0-types:flexi-n
      +--ro flexi-m?     l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n      l0-types:flexi-n
      +--ro flexi-m?     l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n      l0-types:flexi-n
      +--ro flexi-m?     l0-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?                l0-types:flexi-n
      | +--ro flexi-m?                l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n    l0-types:flexi-n
      +--ro flexi-m?   l0-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?    l0-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?    l0-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-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n    l0-types:flexi-n
      +--rw flexi-m?   l0-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n      l0-types:flexi-n
        +--rw flexi-m?    l0-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n      l0-types:flexi-n
        +--rw flexi-m?    l0-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?                l0-types:flexi-n
      | +--rw flexi-m?                l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
        +--rw flexi-n      l0-types:flexi-n
        +--rw flexi-m?    l0-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?          l0-types:flexi-n
      | +--ro flexi-m?          l0-types:flexi-m
    +--:(super)
      +--ro subcarrier-flexi-n* [flexi-n]
      +--ro flexi-n      l0-types:flexi-n
      +--ro flexi-m?     l0-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?      l0-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?      l0-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)
  +--rw flexi-grid-channel-spacing?  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?          l0-types:flexi-n
      | +--rw flexi-m?          l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n      l0-types:flexi-n
      +--rw flexi-m?     l0-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?          l0-types:flexi-n
      | +--rw flexi-m?          l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n          l0-types:flexi-n
      +--rw flexi-m?         l0-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?          l0-types:flexi-n
      | +--rw flexi-m?          l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n          l0-types:flexi-n
      +--rw flexi-m?         l0-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?          l0-types:flexi-n
      | +--rw flexi-m?          l0-types:flexi-m
    +--:(super)
      +--rw subcarrier-flexi-n* [flexi-n]
      +--rw flexi-n          l0-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
+--:(super)
    +--ro subcarrier-flexi-n* [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
+--:(super)
    +--rw subcarrier-flexi-n* [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
+--:(super)
    +--rw subcarrier-flexi-n* [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)
    +--rw flexi-grid-channel-spacing?  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)
    +--ro flexi-grid-channel-spacing?  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
      +--:(super)
        +--rw subcarrier-flexi-n* [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?           l0-types:flexi-n
        | +--rw flexi-m?           l0-types:flexi-m
      +--:(super)
        +--rw subcarrier-flexi-n* [flexi-n]
          +--rw flexi-n           l0-types:flexi-n
          +--rw flexi-m?          l0-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?          l0-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?          l0-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-n-step?               uint8

```

8. The YANG Code for Flexi-grid topology

```

<CODE BEGINS> file "ietf-flexi-grid-topology@2020-09-21.yang"
module ietf-flexi-grid-topology {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-flexi-grid-topology";
  prefix "flexi-grid";

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

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

```



```
}

import ietf-te-topology {
  prefix "tet";
  reference
    "RFC 8795: YANG Data Model for Traffic Engineering
    (TE) Topologies";
}

import ietf-layer0-types {
  prefix "l0-types";
  reference
    "RFC XXXX: A YANG Data Model for Layer 0 Types";
}

/* Note: The RFC Editor will replace XXXX with the number assigned
   to the RFC once draft-ietf-ccamp-layer0-types becomes an RFC.*/

organization
  "IETF CCAMP Working Group";
contact
  "WG Web: <http://tools.ietf.org/wg/ccamp/>
  WG List: <mailto:ccamp@ietf.org>
  Editor: Jorge E. Lopez de Vergara
         <mailto:jorge.lopez\_vergara@uam.es>
  Editor: Daniel Perdices
         <mailto:daniel.perdices@naudit.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 module defines a model for flexi-grid topology.
  Copyright (c) 2020 IETF Trust and the persons identified
  as authors of the code. All rights reserved.
  Redistribution and use in source and binary forms, with
  or without modification, is permitted pursuant to, and
  subject to the license terms contained in, the Simplified
  BSD License set forth in Section 4.c of the IETF Trust's
  Legal Provisions Relating to IETF Documents
  (http://trustee.ietf.org/license-info).

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



```
revision 2020-09-21 {
  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
}

/*
 * 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/flexi-grid: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 "Flexi-grid node attributes";
  }
}

/*
 * 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/"
```



```
    + "flexi-grid: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 l0-types:flexi-grid-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/"
    + "flexi-grid: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.";
  uses l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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/"
```



```
    + "flexi-grid: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 l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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/"
```



```
    + "flexi-grid: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 Connectivities.";
  uses l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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/"
    + "flexi-grid: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 l0-types:flexi-grid-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 l0-types:flexi-grid-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/"
        + "flexi-grid: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/"
        + "flexi-grid: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 10-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/"
    + "flexi-grid: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 10-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/"
    + "flexi-grid: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 10-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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
```



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    + "tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../..."
    + "nw:network-types/tet:te-topology/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with

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```
        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/"
        + "flexi-grid: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/"
        + "flexi-grid: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.";
    case flexi-grid {
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```
    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/"
    + "flexi-grid: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/"
    + "flexi-grid: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;
  }
}

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



```

    + "tet:connectivity-matrix/"
    + "tet:underlay/tet:backup-path/tet:path-element/"
    + "tet:type/tet:label/tet:label-hop/"
    + "tet:te-label/tet:technology" {
when "../../../../../../../../../../../../../../../"
    + "nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
description
    "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/"
    + "flexi-grid: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/"
    + "tet:connectivity-matrix/tet:optimizations/"
    + "tet:algorithm/tet:metric/tet:optimization-metric/"
    + "tet:explicit-route-include-objects/"
    + "tet:route-object-include-object/tet:type/"
    + "tet:label/tet:label-hop/tet:te-label/tet:technology" {

```



```
when "../../../../../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
  description
    "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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
+ "flexi-grid: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/"
+ "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "tet:optimization-metric/"
  + "tet:explicit-route-exclude-objects/"
  + "tet:route-object-exclude-object/tet:type/"
  + "tet:label/tet:label-hop/tet:te-label/tet:technology" {
when "../.../.../.../.../.../.../.../.../..."
```



```

    + "nw:network-types/tet:te-topology/"
    + "flexi-grid:flexi-grid-topology" {
description
    "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/"
    + "flexi-grid: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/"
    + "flexi-grid:flexi-grid-topology" {
description
    "Augmentation parameters apply only for networks with

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```
        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/"
        + "flexi-grid: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/"
        + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
+ "flexi-grid: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/"
+ "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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 l0-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/"
  + "flexi-grid: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 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:label-restrictions/tet:label-restriction/"
  + "tet:label-end/"
  + "tet:te-label/tet:technology"{
when "../.../.../.../.../.../.../.../..."
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid:flexi-grid-topology" {
description
  "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 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:label-restrictions/tet:label-restriction/"
  + "tet:label-step/"
  + "tet:technology"{
```



```
when "../../../../../../../"
  + "nw:network-types/tet:te-topology/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
+ "flexi-grid: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/"
+ "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
    + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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/"
  + "flexi-grid: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>
```

9. Security Considerations

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

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

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

There are a number of data nodes defined in this YANG module that are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable

in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

```
/nw:networks/nw:network/nw:network-types/tet:te-topology  
  
/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes  
  
/nw:networks/nw:network/nw:node/nt:termination-point/tet:te  
  
/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes  
/te-connectivity-matrices/te-connectivity-matrix/tet:path-  
constraints/tet:te-bandwidth/tet:technology  
  
/nw:networks/nw:network/nw:node/tet:te  
/tet:tunnel-termination-point/tet:local-link-connectivities  
/tet:label-restrictions/tet:label-restriction
```

10. 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: flexi-grid-topology  
Reference: [This.I-D]
```

11. Contributors

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

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