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H. Zheng
I. Busi
Huawei Technologies
X. Liu
Alef Edge
S. Belotti
Nokia
O. Gonzalez de Dios
Telefonica

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A YANG Data Model for Optical Transport Network Topology
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Abstract

This document defines a YANG data model for representing, retrieving, and manipulating Optical Transport Network (OTN) topologies. It is independent of control plane protocols and captures topological and resource-related information pertaining to OTN.

About This Document

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

The latest revision of this draft can be found at https://haomianzheng.github.io/ccamp-client-pm-yang/draft-zheng-ccamp-client-pm-yang.html. Status information for this document may be found at https://datatracker.ietf.org/doc/draft-ietf-ccamp-otn-topo-yang/.

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

Source for this draft and an issue tracker can be found at https://github.com/haomianzheng/ccamp-client-pm-yang.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

This Internet-Draft will expire on 12 May 2025.

Copyright Notice

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1. Introduction

A transport network is a server-layer network designed to provide connectivity services for a client-layer network to carry the client traffic transparently across the server-layer network resources. A transport network typically utilizes several different transport technologies such as the Optical Transport Networks (OTN) or packet transport such as provided by the MPLS-Transport Profile (MPLS-TP).

This document defines a data model of an OTN topology, using YANG version 1.1 [RFC7950]. The model can be used by an application communicating with a transport controller. Furthermore, it can be used by an application for the following purposes (but not limited to):

* To obtain a whole view of the network topology information of its interest;

* To receive notifications with regard to the information change of the OTN topology;

* To enforce the establishment and update to the network topology with the characteristics specified in the data model;

The YANG model defined in this document is independent of control plane protocols and captures topology-related information pertaining to OTN electrical layer, as the scope specified by [RFC7062] . Furthermore, it is not a stand-alone model, but augments from the TE topology YANG model defined in [RFC8795], and importing from the generic Layer 1 types defined in [I-D.ietf-ccamp-layer1-types]. Following TE topology YANG model, the YANG model defined in this document is interface independent. The model is included in [I-D.ietf-teas-actn-yang], which indicates the typical usage of IETF YANG models in ACTN architecture specified by [RFC8453]. More specifically, the usage of this model between controllers is described in [I-D.ietf-ccamp-transport-nbi-app-statement].

This model supports both client-configured and system-controlled OTN topologies, as described [RFC8345]. These OTN topologies can be used as overlay or underlay topologies, using the mechanisms defined in [RFC8345] and [RFC8795].

The reader of this document is assumed to be familiar with the OTN technology, as specified in [ITU-T_G.709] and with the TE topology YANG data model, as defined in [RFC8795].

[RFC7062] also provides a framework to allow the development of protocol extensions to support GMPLS and Path Computation Element (PCE) control of OTN.

Section 6 of [RFC8795] provides guidelines for writing technology-specific TE topology augmentations.

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

1.1. Terminology and Notations

Some of the key terms used in this document are listed as follows.

TS: Tributary Slot.

TSG: Tributary Slot Granularity.

TPN: Tributary Port Number.

Refer to [RFC7062] for the key terms used in this document.

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

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

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

* configuration data
* state data

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

1.2. Requirements Language

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.

1.3. Tree Diagram

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

1.4. Prefix in Data Node Names

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

Prefix	YANG module	Reference
l1-types	ietf-layer1-types	[RFCYYYY]
otnt	ietf-otn-topology	RFC XXXX
nw	ietf-network	[RFC8345]
nt	ietf-network-topology	[RFC8345]
tet	ietf-te-topology	[RFC8795]

Table 1: Prefixes and corresponding YANG modules

RFC Editor Note: Please replace XXXX with the number assigned to the RFC once this draft becomes an RFC. Please replace YYYY with the RFC numbers assigned to [I-D.ietf-ccamp-layer1-types].

2. YANG Data Model for OTN Topology

2.1. OTN Topology Data Model Overview

This document aims to describe the data model for OTN topology. As a classic Traffic-engineering (TE) technology, OTN provides TDM switching in transport network [ITU-T_G.709]. Therefore, the YANG module presented in this document augments from a more generic Traffic Engineered (TE) network topology data model, i.e., the ietf-te-topology, as specified in [RFC8795]. In Section 6 of [RFC8795], the guideline for augmenting TE topology model was provided, and in this draft, we augment the TE topology model to describe the topology in OTN. Common types, identities and groupings defined in [I-D.ietf-ccamp-layer1-types] is reused in this document. [RFC8345] describes a network topology model and provides the fundamental model for [RFC8795]. However, this work is not directly augmenting [RFC8345]. Figure 1 shows the augmentation relationship.

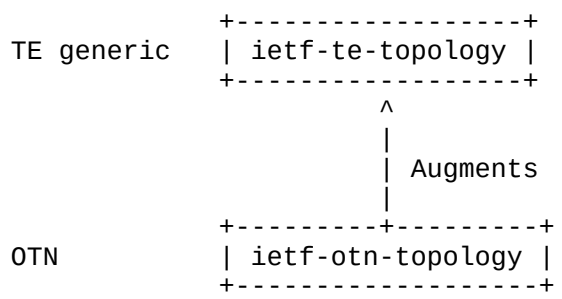

Figure 1: Relationship between OTN and TE topology models

The entities and TE attributes, such as node, termination points and links, are still applicable for describing an OTN topology and the model presented in this document only specifies technology-specific attributes/information. The OTN-specific attributes in [RFC7139], including the TPN, TS and TSG, can be used to represent the bandwidth and label information. These attributes have been specified in [I-D.ietf-ccamp-layer1-types], and used in this document for augmentation of the generic TE topology model.

2.2. Attributes Augmentation

There are a few characteristics augmenting the generic TE topology.

Following the guidelines described in [RFC8795], an otn-topology network-type is specified as the indicator of OTN in the topology.

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

Three OTN technology-specific parameters that augment the generic TE link attributes are specified.

```
      augment /nw:networks/nw:network/nt:link/tet:te
                /tet:te-link-attributes:
        +--rw otn-link
          +--rw odtu-flex-type?   l1-types:odtu-flex-type
          +--rw tsg?              identityref
          +--rw distance?         uint32
```

In OTN the resources is measured by the tributary slots (TS), as specified in [RFC7139]. The tributary slot granularity (TSG) attribute defines the granularity, such as 1.25G, 2.5G and 5G, used by the TSs of a given OTN link. The distance attribute describes the geographical distance between a pair of OTN link termination points. This is usually measured by the length of the fibre.

The OTN topology model also includes information about the access links that support the transparent client signals, defined in [I-D.ietf-ccamp-layer1-types]. These links can also be multi-function access links that can support one or more transparent client signals and OTN.

A client-svc presence container is specified to augment the generic TE link termination point to describe if the point is capable of carrying a client signal and what kind of signal can be carried as follows. The same presence container is also specified for the TE link.

```
      augment /nw:networks/nw:network/nw:node/nt:termination-point
                /tet:te:
        +--rw client-svc!
            +--rw supported-client-signal*   identityref
```

The list of supported-client-signal is used to provide the capabilities of the client signal specified in [I-D.ietf-ccamp-layer1-types].

2.3. Bandwidth Augmentation

Following the guidelines in [RFC8795], the model augments all the occurrences of the te-bandwidth container with the OTN technology-specific attributes using the otn-link-bandwidth and otn-path-bandwidth groupings defined in [I-D.ietf-ccamp-layer1-types].

The odtu-flex-type attribute of a given OTN Link (or Link Termination Point - LTP), shown in Section 2.2, is used, together with the OTN technology-specific attributes defined in the otn-link-bandwidth and

otn-path-bandwidth groupings, to compute the number of Tributary Slots (TS) required by the ODUflex LSPs set up on that OTN Link (or LTP).

In order to compute the number of Tributary Slots (TS) required by the ODUflex LSPs set up on an underlay path (e.g., the underlay path of a connectivity matrix entry), the odtu-flex-type attribute is added to the OTN technology-specific attributes defined in the otn-link-bandwidth and otn-path-bandwidth groupings.

2.4. Label Augmentation

The model augments all the occurrences of the label-restriction list with OTN technology specific attributes using the otn-label-range-info grouping defined in [I-D.ietf-ccamp-layer1-types].

Moreover, following the guidelines in [RFC8795], the model augments all the occurrences of the te-label container with the OTN technology specific attributes using the otn-label-start-end, otn-label-hop and otn-label-step groupings defined in [I-D.ietf-ccamp-layer1-types].

3. The YANG Model

This YANG module references [RFC8345], [RFC8795], [I-D.ietf-ccamp-layer1-types] and [ITU-T_G.709].

<CODE BEGINS> file "ietf-otn-topology@2024-06-21.yang"

```
module ietf-otn-topology {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-otn-topology";
  prefix "otnt";

  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-layer1-types {
        prefix "l1-types";
        reference
          "RFC YYYY: A YANG Data Model for Layer 1 Types";
      }
      // RFC Editor: replace YYYY with actual RFC number assigned to
      // [I-D.ietf-ccamp-layer1-types] and remove this note

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

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

         Editor: Italo Busi
                 <mailto:italo.busi@huawei.com>

         Editor: Xufeng Liu
                 <mailto:xufeng.liu.ietf@gmail.com>

         Editor: Sergio Belotti
                 <mailto:sergio.belotti@nokia.com>

         Editor: Oscar Gonzalez de Dios
                 <mailto:oscar.gonzalezdedios@telefonica.com>";

      description
        "This module defines a protocol independent Layer 1/ODU topology
         data model. The model fully conforms
         to the Network Management Datastore Architecture (NMDA).

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         as authors of the code.  All rights reserved.

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         set forth in Section 4.c of the IETF Trust's Legal Provisions
         Relating to IETF Documents
         (https://trustee.ietf.org/license-info).

         This version of this YANG module is part of RFC XXXX; see
```

```
        the RFC itself for full legal notices.

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

      revision 2024-06-21 {
        description
          "Initial Revision";
        reference
          "RFC XXXX: A YANG Data Model for Optical Transport Network
          Topology";
      }
      // RFC Editor: replace XXXX with actual RFC number, update date
      // information and remove this note

      /*
       * Groupings
       */

      grouping label-range-info {
        description
          "OTN technology-specific label range related information with
          a presence container indicating that the label range is an
          OTN technology-specific label range.

          This grouping SHOULD be used together with the
          otn-label-start-end and otn-label-step groupings to provide
          OTN technology-specific label information to the models which
          use the label-restriction-info grouping defined in the module
          ietf-te-types.";
        uses l1-types:otn-label-range-info {
          refine otn-label-range {
            presence
              "Indicates the label range is an OTN label range.

              This container MUST NOT be present if there are other
              presence containers or attributes indicating another type
              of label range.";
          }
        }
      }

      /*
       * Data nodes
       */
```

```
    augment "/nw:networks/nw:network/nw:network-types/"
          + "tet:te-topology" {
      container otn-topology {
        presence "indicates a topology type of Optical Transport
                  Network (OTN)-electrical layer.";
        description "OTN topology type";
      }
      description "augment network types to include OTN.";
    }

    augment "/nw:networks/nw:network/nw:node/tet:te"
          + "/tet:te-node-attributes" {
      when "../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description "Augment only for OTN.";
      }
      description "Augment TE node attributes.";
      container otn-node {
        presence "The TE node is an OTN node.";
        description
          "Introduce new TE node type for OTN node.";
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes" {
      when "../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description "Augment only for OTN.";
      }
      description "Augment link configuration";

      container otn-link {
        description
          "Attributes of the OTN Link.";
        leaf odtu-flex-type {
          type l1-types:odtu-flex-type;
          description
            "The type of Optical Data Tributary Unit (ODTU)
            whose nominal bitrate is used to compute the number of
            Tributary Slots (TS) required by the ODUflex LSPs set up
            on this OTN Link.";
        }
        leaf tsg {
          type identityref {
            base l1-types:tributary-slot-granularity;
          }
          description "Tributary slot granularity.";
```

```
          reference
            "ITU-T G.709 v6.0 (06/2020): Interfaces for the Optical
            Transport Network (OTN)";
        }
        leaf distance {
          type uint32;
          description "distance in the unit of kilometers";
        }
      }
      container client-svc {
        presence
          "When present, indicates that the Link supports Constant
          Bit Rate (CBR) client signals.";
        description
          "Attributes of the Link supporting CBR client signals.";
        leaf-list supported-client-signal {
          type identityref {
            base l1-types:client-signal;
          }
          min-elements 1;
          description
            "List of client signal types supported by the Link.";
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/nt:termination-point/"
          + "tet:te" {
      when "../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description "Augment only for OTN.";
      }
      description
        "Augment link termination point (LTP) configuration.";

      container otn-link-tp {
        description
          "Attributes of the OTN Link Termination Point (LTP).";
        leaf odtu-flex-type {
          type l1-types:odtu-flex-type;
          description
            "The type of Optical Data Tributary Unit (ODTU)
            whose nominal bitrate is used to compute the number of
            Tributary Slots (TS) required by the ODUflex LSPs set up
            on this OTN Link Termination Point (LTP).";
        }
      }
      container client-svc {
```

```
          presence
            "When present, indicates that the Link Termination Point
            (LTP) supports Constant Bit Rate (CBR) client signals.";
          description
            "OTN LTP Service attributes.";
          leaf-list supported-client-signal {
            type identityref {
              base l1-types:client-signal;
            }
            description
              "List of client signal types supported by the LTP.";
          }
        }
      }

      /*
       * Augment TE bandwidth
       */

      augment "/nw:networks/nw:network/nw:node/nt:termination-point/"
            + "tet:te/"
            + "tet:interface-switching-capability/tet:max-lsp-bandwidth/"
            + "tet:te-bandwidth/tet:technology" {
        when "../../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment maximum LSP TE bandwidth for the link termination
           point (LTP).";
        case otn {
          uses l1-types:otn-max-path-bandwidth {
            description
              "The odtu-flex-type attribute of the OTN Link Termination
              Point (LTP) is used to compute the number of Tributary
              Slots (TS) required by the ODUflex LSPs set up on this
              OTN LTP.";
          }
        }
      }

      augment "/nw:networks/nw:network/nw:node/tet:te/"
            + "tet:te-node-attributes/tet:connectivity-matrices/"
            + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
        when "../../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
```

```
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints of the TE node
         connectivity matrices.";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                 whose nominal bitrate is used to compute the number of
                 Tributary Slots (TS) required by the ODUflex LSPs
                 set up along the underlay paths of these OTN
                 connectivity matrices.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/"
          + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
      when "../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints of the
         connectivity matrix entry.";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
```

```
                whose nominal bitrate is used to compute the number of
                Tributary Slots (TS) required by the ODUflex LSPs
                set up along the underlay path of this OTN
                connectivity matrix entry.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:information-source-entry/tet:connectivity-matrices/"
          + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints of the TE node
         connectivity matrices information source.";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                whose nominal bitrate is used to compute the number of
                Tributary Slots (TS) required by the ODUflex LSPs
                set up along the underlay paths of these OTN
                connectivity matrices.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:information-source-entry/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/"
          + "tet:path-constraints/tet:te-bandwidth/tet:technology" {
      when "../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
```

```
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints of the
         connectivity matrix entry information source";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                 whose nominal bitrate is used to compute the number of
                 Tributary Slots (TS) required by the ODUflex LSPs
                 set up along the underlay path of this OTN
                 connectivity matrix entry.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:tunnel-termination-point/"
          + "tet:client-layer-adaptation/tet:switching-capability/"
          + "tet:te-bandwidth/tet:technology" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment client TE bandwidth of the tunnel termination point
         (TTP)";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                 whose nominal bitrate is used to compute the number of
```

```
                Tributary Slots (TS) required by the ODUflex LSPs
                terminated on this OTN Tunnel Termination Point
                (TTP).";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:tunnel-termination-point/"
          + "tet:local-link-connectivities/tet:path-constraints/"
          + "tet:te-bandwidth/tet:technology" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints for the TTP
         Local Link Connectivities.";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                whose nominal bitrate is used to compute the number of
                Tributary Slots (TS) required by the ODUflex LSPs
                set up along the underlay paths of these OTN Local
                Link Connectivities.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:tunnel-termination-point/"
          + "tet:local-link-connectivities/"
          + "tet:local-link-connectivity/tet:path-constraints/"
          + "tet:te-bandwidth/tet:technology" {
      when "../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
```

```
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE bandwidth path constraints for the TTP
         Local Link Connectivity entry.";
      case otn {
        uses l1-types:otn-link-bandwidth {
          augment otn-bandwidth {
            description
              "Augment OTN link bandwidth information.";
            leaf odtu-flex-type {
              type l1-types:odtu-flex-type;
              description
                "The type of Optical Data Tributary Unit (ODTU)
                whose nominal bitrate is used to compute the number of
                Tributary Slots (TS) required by the ODUflex LSPs
                set up along the underlay path of this OTN Local
                Link Connectivity entry.";
            }
          }
        }
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes/"
          + "tet:interface-switching-capability/tet:max-lsp-bandwidth/"
          + "tet:te-bandwidth/tet:technology" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment maximum LSP TE bandwidth for the TE link.";
      case otn {
        uses l1-types:otn-max-path-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on this OTN Link.";
        }
      }
    }
```

```
    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes/"
          + "tet:max-link-bandwidth/"
          + "tet:te-bandwidth" {
      when "../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment maximum TE bandwidth for the TE link";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
          by the ODUflex LSPs set up on this OTN Link.";
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes/"
          + "tet:max-resv-link-bandwidth/"
          + "tet:te-bandwidth" {
      when "../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment maximum reservable TE bandwidth for the TE link";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
          by the ODUflex LSPs set up on this OTN Link.";
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:te-link-attributes/"
          + "tet:unreserved-bandwidth/"
          + "tet:te-bandwidth" {
      when "../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
```

```
           OTN topology type.";
      }
      description
        "Augment unreserved TE bandwidth for the TE Link";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
          by the ODUflex LSPs set up on this OTN Link.";
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:information-source-entry/"
          + "tet:interface-switching-capability/"
          + "tet:max-lsp-bandwidth/"
          + "tet:te-bandwidth/tet:technology" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment maximum LSP TE bandwidth for the TE link
         information source";
      case otn {
        uses l1-types:otn-max-path-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on this OTN Link.";
        }
      }
    }

    augment "/nw:networks/nw:network/nt:link/tet:te/"
          + "tet:information-source-entry/"
          + "tet:max-link-bandwidth/"
          + "tet:te-bandwidth" {
      when "../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment maximum TE bandwidth for the TE link
```

```
          information source";
        uses l1-types:otn-link-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on this OTN Link.";
        }
      }

      augment "/nw:networks/nw:network/nt:link/tet:te/"
            + "tet:information-source-entry/"
            + "tet:max-resv-link-bandwidth/"
            + "tet:te-bandwidth" {
        when "../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment maximum reservable TE bandwidth for the TE link
           information-source";
        uses l1-types:otn-link-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on this OTN Link.";
        }
      }

      augment "/nw:networks/nw:network/nt:link/tet:te/"
            + "tet:information-source-entry/"
            + "tet:unreserved-bandwidth/"
            + "tet:te-bandwidth" {
        when "../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment unreserved TE bandwidth of the TE link
           information source";
        uses l1-types:otn-link-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on this OTN Link.";
```

```
      }
    }

    augment "/nw:networks/tet:te/tet:templates/"
          + "tet:link-template/tet:te-link-attributes/"
          + "tet:interface-switching-capability/"
          + "tet:max-lsp-bandwidth/"
          + "tet:te-bandwidth/tet:technology" {
      description
        "Augment maximum LSP TE bandwidth of the TE link
         template";
      case otn {
        uses l1-types:otn-max-path-bandwidth {
          description
            "The odtu-flex-type attribute of the OTN Link is used
            to compute the number of Tributary Slots (TS) required
            by the ODUflex LSPs set up on the OTN Link that uses this
            Link Template.";
        }
      }
    }

    augment "/nw:networks/tet:te/tet:templates/"
          + "tet:link-template/tet:te-link-attributes/"
          + "tet:max-link-bandwidth/"
          + "tet:te-bandwidth" {
      description
        "Augment maximum TE bandwidth the TE link template";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
          by the ODUflex LSPs set up on the OTN Link that uses this
          Link Template.";
      }
    }

    augment "/nw:networks/tet:te/tet:templates/"
          + "tet:link-template/tet:te-link-attributes/"
          + "tet:max-resv-link-bandwidth/"
          + "tet:te-bandwidth" {
      description
        "Augment maximum reservable TE bandwidth for the TE link
         template.";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
```

```
          by the ODUflex LSPs set up on the OTN Link that uses this
          Link Template.";
      }
    }

    augment "/nw:networks/tet:te/tet:templates/"
          + "tet:link-template/tet:te-link-attributes/"
          + "tet:unreserved-bandwidth/"
          + "tet:te-bandwidth" {
      description
        "Augment unreserved TE bandwidth the TE link template";
      uses l1-types:otn-link-bandwidth {
        description
          "The odtu-flex-type attribute of the OTN Link is used
          to compute the number of Tributary Slots (TS) required
          by the ODUflex LSPs set up on the OTN Link that uses this
          Link Template.";
      }
    }

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

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/tet:from/"
          + "tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
```

```
      }
      description
        "Augment TE label range information for the source LTP
         of the connectivity matrix entry.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/tet:to/"
          + "tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range information for the destination LTP
         of the connectivity matrix entry.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:information-source-entry/"
          + "tet:connectivity-matrices/tet:label-restrictions/"
          + "tet:label-restriction" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range information for the TE node
         connectivity matrices information source.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:information-source-entry/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/"
          + "tet:from/tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
```

```
      }
      description
        "Augment TE label range information for the source LTP
         of the connectivity matrix entry information source.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:information-source-entry/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/"
          + "tet:to/tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range information for the destination LTP
         of the connectivity matrix entry information source.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:tunnel-termination-point/"
          + "tet:local-link-connectivities/"
          + "tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range information for the TTP
         Local Link Connectivities.";
      uses label-range-info;
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:tunnel-termination-point/"
          + "tet:local-link-connectivities/"
          + "tet:local-link-connectivity/"
          + "tet:label-restrictions/tet:label-restriction" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
```

```
            OTN topology type.";
        }
        description
          "Augment TE label range information for the TTP
           Local Link Connectivity entry.";
        uses label-range-info;
      }

      augment "/nw:networks/nw:network/nt:link/tet:te/"
            + "tet:te-link-attributes/"
            + "tet:label-restrictions/tet:label-restriction" {
        when "../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range information for the TE link.";
        uses label-range-info;
      }

      augment "/nw:networks/nw:network/nt:link/tet:te/"
            + "tet:information-source-entry/"
            + "tet:label-restrictions/tet:label-restriction" {
        when "../../../../../nw:network-types/tet:te-topology/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range information for the TE link
           information source.";
        uses label-range-info;
      }

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

      /*
       * Augment TE label
       */
```

```
    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes/tet:connectivity-matrices/"
          + "tet:label-restrictions/tet:label-restriction/"
          + "tet:label-start/"
          + "tet:te-label/tet:technology" {
      when "../../../../../../../../nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the TE node
         connectivity matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the TE node
         connectivity matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
```

```
      }
      description
        "Augment TE label range step for the TE node
         connectivity matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay primary path of the
         TE node connectivity matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay backup path of the
         TE node connectivity matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the explicit route objects excluded
         by the path computation of the TE node connectivity
         matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the explicit route objects included
         by the path computation of the TE node connectivity
         matrices";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the computed path route objects
         of the TE node connectivity matrices";
      case otn {
        uses l1-types:otn-label-hop;
      }
    }

    augment "/nw:networks/nw:network/nw:node/tet:te/"
          + "tet:te-node-attributes/tet:connectivity-matrices/"
          + "tet:connectivity-matrix/tet:from/"
          + "tet:label-restrictions/tet:label-restriction/"
          + "tet:label-start/"
          + "tet:te-label/tet:technology" {
      when "../../../../../../../../../../"
         + "nw:network-types/tet:te-topology/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the source LTP
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
          + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the source LTP
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range step for the source LTP
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
```

```
        description
          "Augment TE label range start for the destination LTP
           of the connectivity matrix entry.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range end for the destination LTP
           of the connectivity matrix entry.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range step for the destination LTP
           of the connectivity matrix entry.";
        case otn {
          uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay primary path
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay backup path
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the explicit route objects excluded
         by the path computation of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the explicit route objects included
         by the path computation of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
```

```
          + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the computed path route objects
         of the connectivity matrix entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the TE node connectivity
         matrices information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the TE node connectivity
         matrices information source.";
```

```
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range step for the TE node connectivity
         matrices information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay primary path
         of the TE node connectivity matrices of the information
         source entry.";
      case otn {
        uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label hop for the underlay backup path
           of the TE node connectivity matrices of the information
           source entry.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN 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 otn {
          uses l1-types:otn-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/"
          + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN 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 otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the computed path route objects
         of the TE node connectivity matrices information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
```

```
        description
          "Augment TE label range start for the source LTP
           of the connectivity matrix entry information source.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range end for the source LTP
           of the connectivity matrix entry information source.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range step for the source LTP
           of the connectivity matrix entry information source.";
        case otn {
          uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the destination LTP
         of the connectivity matrix entry information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the destination LTP
         of the connectivity matrix entry information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
```

```
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range step for the destination LTP
         of the connectivity matrix entry information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay primary path
         of the connectivity matrix entry information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay backup path
         of the connectivity matrix entry information source.";
      case otn {
```

```
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN 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 otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN 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 otn {
```

```
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the computed path route objects
         of the connectivity matrix entry information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the TTP
         Local Link Connectivities.";
      case otn {
        uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range end for the TTP
           Local Link Connectivities.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range step for the TTP
           Local Link Connectivities.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
```

```
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay primary path
         of the TTP Local Link Connectivities.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay backup path
         of the TTP Local Link Connectivities.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
```

```
          "Augment TE label hop for the explicit route objects excluded
           by the path computation of the TTP Local Link
           Connectivities.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label hop for the explicit route objects included
           by the path computation of the TTP Local Link
           Connectivities.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label hop for the computed path route objects
           of the TTP Local Link Connectivities.";
```

```
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the TTP
         Local Link Connectivity entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the TTP
         Local Link Connectivity entry.";
      case otn {
        uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range step for the TTP
           Local Link Connectivity entry.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label hop for the underlay primary path
           of the TTP Local Link Connectivity entry.";
        case otn {
          uses l1-types:otn-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/"
          + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the underlay backup path
         of the TTP Local Link Connectivity entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN 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 otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN 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 otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label hop for the computed path route objects
         of the TTP Local Link Connectivity entry.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
```

```
        description
          "Augment TE label hop for the underlay primary path
           of the TE link.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label hop for the underlay backup path
           of the TE link.";
        case otn {
          uses l1-types:otn-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/"
           + "otnt:otn-topology" {
          description
            "Augmentation parameters apply only for networks with
             OTN topology type.";
        }
        description
          "Augment TE label range start for the TE link.";
        case otn {
          uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the TE link.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range step for the TE link.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range start for the TE link
         information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range end for the TE link
         information source.";
      case otn {
        uses l1-types:otn-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/"
         + "otnt:otn-topology" {
        description
          "Augmentation parameters apply only for networks with
           OTN topology type.";
      }
      description
        "Augment TE label range step for the TE link
         information source.";
      case otn {
        uses l1-types:otn-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 otn {
        uses l1-types:otn-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 otn {
        uses l1-types:otn-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 otn {
        uses l1-types:otn-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 otn {
        uses l1-types:otn-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 otn {
        uses l1-types:otn-label-step;
      }
    }
  }
  <CODE ENDS>
```

4. IANA Considerations

It is proposed to IANA to assign new URIs from the "IETF XML Registry" [RFC3688] as follows:

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

This document registers a YANG module in the YANG Module Names registry [RFC7950].

```
name:         ietf-otn-topology
namespace:    urn:ietf:params:xml:ns:yang:ietf-otn-topology
prefix:       otnt
reference:    RFC XXXX
```

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

5. Security Considerations

This section is modeled after the template described in Section 3.7 of [I-D.ietf-netmod-rfc8407bis].

The "ietf-te-types" and the "ietf-te-packet-types" YANG modules define data models that are designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] and RESTCONF [RFC8040]. These protocols have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and have to use mutual authentication.

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.

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 can 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. Specifically, the following subtrees and data nodes have particular sensitivities/vulnerabilities:

* "/nw:networks/nw:network/nw:network-types/tet:te-topology/otnt:otn-topology"

This subtree specifies the OTN topology type. Modifying the configurations can render the OTN topology type invalid. By making such modifications, a malicious attacker may disable the OTN capabilities on the related networks and cause traffic to be disrupted or misrouted.

* "/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/otnt:otn-node"

This subtree specifies the OTN node type. By configuring the OTN node type, an attacker may create an unauthorized OTN traffic path. By removing it, a malicious attacker may cause OTN traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:odtu-flex-type"

This node is used, together with the other attributes in the otn-bandwidth container, to compute the OTN bandwidth information for an OTN link, as described in Section 2.3. By configuring, modifying or removing this data node, a malicious attacker may modify the OTN bandwidth. The consequences of modifying the OTN bandwidth are reported below for the otn-bandwidth container.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:tsg"

This node represents the TSG of the OTN link, as described in Section 2.2. By configuring, modifying or removing this data node, a malicious attacker may modify the resouces assigned to the OTN LSPs setup over that OTN link. The consequences of modifying the TSG would be to disrupt the traffic carried by the OTN LSPs setup over that OTN link.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:distance"

This node is describes the geographical distance between a pair of OTN link termination points. By configuring, modifying or removing the distance, an attacker may cause OTN traffic to be misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:client-svc"

This subtree specifies the client traffic type supported by a link. By configuring it, an attacker may create an unauthorized client traffic path. By removing it, a malicious attacker may cause client traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

* "/nw:networks/nw:network/nw:node/nt:termination-point/tet:te/otnt:otn-link-tp/otnt:odtu-flex-type"

  This node is used, together with the other attributes in the otn-bandwidth container, to compute the OTN bandwidth information for an OTN link termination point, as described in Section 2.3. By configuring, modifying or removing this data node, a malicious attacker may modify the OTN bandwidth. The consequences of modifying the OTN bandwidth are reported below for the otn-bandwidth container.

* "/nw:networks/nw:network/nw:node/nt:termination-point/tet:te/otnt:client-svc"

  This subtree specifies the client traffic type supported by a link termination point. By configuring it, an attacker may create an unauthorized client traffic path. By removing it, a malicious attacker may cause client traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected topologies.

* "otnt:otn-bandwidth"

  This subtree specifies the configurations of OTN technology-specific information under any occurrence of the tet:te-bandwidth container, as defined in [RFC8795] (e.g., "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/tet:max-resv-link-bandwidth/tet:te-bandwidth/otnt:otn-bandwidth"). By configuring the OTN bandwidth attributes, an attacker may create an unauthorized OTN traffic path. By removing or modifying it, a malicious attacker may cause OTN traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

* "otnt:otn-label-range"

This subtree specifies the configurations of OTN technology-specific label range information under any occurrence of the tet:te-label-restriction container, as defined in [RFC8795] (e.g., "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/tet:label-restrictions/tet:label-restriction\otnt:otn-label-range"). By configuring the OTN label range attributes, an attacker may create an unauthorized OTN traffic path. By removing or modifying, a malicious attacker may cause OTN traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

* "otnt:otn-label"

  This subtree specifies the configurations of OTN technology-specific label information under any occurrence of the tet:te-label container, as defined in [RFC8795] (e.g., "/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/otnt:otn-label"). By configuring, removing or modifying the OTN label attributes, a malicious attacker may cause OTN traffic to be disabled or misrouted. Such traffic changes may also affect the traffic on the surrounding OTN nodes and OTN links in this OTN topology and the connected OTN topologies.

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. Specifically, the following subtrees and data nodes have particular sensitivities/vulnerabilities:

* "/nw:networks/nw:network/nw:network-types/tet:te-topology/otnt:otn-topology"

  Unauthorized access to this subtree can disclose the OTN topology type.

* "/nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes/otnt:otn-node"

  Unauthorized access to this subtree can disclose the OTN nodes.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:odtu-flex-type"

This node is used, together with the other attributes in the otn-bandwidth container, to compute the OTN bandwidth information for an OTN link, as described in Section 2.3. Unauthorized access to this data node can disclose the OTN bandwidth information of OTN links.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:tsg"

  Unauthorized access to this data node can disclose configuration information of OTN links.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:otn-link/otnt:distance"

  Unauthorized access to this data node can disclose state information of OTN links.

* "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/otnt:client-svc"

  Unauthorized access to this data node can disclose capabilities of OTN links.

* "/nw:networks/nw:network/nw:node/nt:termination-point/tet:te/otnt:otn-link-tp/otnt:odtu-flex-type"

  This node is used, together with the other attributes in the otn-bandwidth container, to compute the OTN bandwidth information for an OTN link termination point, as described in Section 2.3. Unauthorized access to this data node can disclose the OTN bandwidth information of OTN link termination points.

* "/nw:networks/nw:network/nw:node/nt:termination-point/tet:te/otnt:client-svc"

  Unauthorized access to this data node can disclose capabilities of OTN link termination points.

* "otnt:otn-bandwidth"

  This subtree specifies the configurations of OTN technology-specific information under any occurrence of the tet:te-bandwidth container, as defined in [RFC8795] (e.g., "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/tet:max-resv-link-bandwidth/tet:te-bandwidth/otnt:otn-bandwidth"). Unauthorized access to this data node can disclose the OTN bandwidth information of OTN links and link termination points.

* "otnt:otn-label-range"

  This subtree specifies the configurations of OTN technology-specific label range information under any occurrence of the tet:te-label-restriction container, as defined in [RFC8795] (e.g., "/nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes/tet:label-restrictions/tet:label-restriction\otnt:otn-label-range"). Unauthorized access to this data node can disclose the state information of OTN links and link termination points.

* "otnt:otn-label"

  This subtree specifies the configurations of OTN technology-specific label information under any occurrence of the tet:te-label container, as defined in [RFC8795] (e.g., "/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/otnt:otn-label"). Unauthorized access to this data node can disclose the state information of OTN links and link termination points.

This YANG module does not define RPC operations.

This YANG module uses groupings from other YANG modules that define nodes that may be considered sensitive or vulnerable in network environments. Refer to the Security Considerations of [I-D.ietf-ccamp-layer1-types] for information as to which nodes may be considered sensitive or vulnerable in network environments.

Finally, the YANG module described in this document augments the "ietf-network" YANG module [RFC8345] and the "ietf-te-topology" YANG module [RFC8795] by adding data nodes. The security considerations for the subtrees described in those RFCs apply equally to the new data nodes that this module adds.

6. References

6.1. Normative References

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Appendix A. YANG Tree

This section provides the YANG Tree of the OTN topology data model.

```
module: ietf-otn-topology

  augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
    +--rw otn-topology!
  augment /nw:networks/nw:network/nw:node/tet:te
            /tet:te-node-attributes:
    +--rw otn-node!
  augment /nw:networks/nw:network/nt:link/tet:te
            /tet:te-link-attributes:
    +--rw otn-link
    |  +--rw odtu-flex-type?   l1-types:odtu-flex-type
    |  +--rw tsg?              identityref
    |  +--rw distance?         uint32
    +--rw client-svc!
       +--rw supported-client-signal*   identityref
  augment /nw:networks/nw:network/nw:node/nt:termination-point
            /tet:te:
    +--rw otn-link-tp
    |  +--rw odtu-flex-type?   l1-types:odtu-flex-type
    +--rw client-svc!
       +--rw supported-client-signal*   identityref
  augment /nw:networks/nw:network/nw:node/nt:termination-point/tet:te
```

```
            /tet:interface-switching-capability/tet:max-lsp-bandwidth
            /tet:te-bandwidth/tet:technology:
      +--:(otn)
         +--rw otn-bandwidth
            +--rw odu-type?        identityref
            +--rw max-ts-number?   uint16
    augment /nw:networks/nw:network/nw:node/tet:te
            /tet:te-node-attributes/tet:connectivity-matrices
            /tet:path-constraints/tet:te-bandwidth/tet:technology:
      +--:(otn)
         +--rw otn-bandwidth
            +--rw odulist* [odu-type]
            |  +--rw odu-type     identityref
            |  +--rw number?      uint16
            |  +--rw ts-number?   uint16
            +--rw odtu-flex-type?   l1-types:odtu-flex-type
    augment /nw:networks/nw:network/nw:node/tet:te
            /tet:te-node-attributes/tet:connectivity-matrices
            /tet:connectivity-matrix/tet:path-constraints
            /tet:te-bandwidth/tet:technology:
      +--:(otn)
         +--rw otn-bandwidth
            +--rw odulist* [odu-type]
            |  +--rw odu-type     identityref
            |  +--rw number?      uint16
            |  +--rw ts-number?   uint16
            +--rw odtu-flex-type?   l1-types:odtu-flex-type
    augment /nw:networks/nw:network/nw:node/tet:te
            /tet:information-source-entry/tet:connectivity-matrices
            /tet:path-constraints/tet:te-bandwidth/tet:technology:
      +--:(otn)
         +--ro otn-bandwidth
            +--ro odulist* [odu-type]
            |  +--ro odu-type     identityref
            |  +--ro number?      uint16
            |  +--ro ts-number?   uint16
            +--ro odtu-flex-type?   l1-types:odtu-flex-type
    augment /nw:networks/nw:network/nw:node/tet:te
            /tet:information-source-entry/tet:connectivity-matrices
            /tet:connectivity-matrix/tet:path-constraints
            /tet:te-bandwidth/tet:technology:
      +--:(otn)
         +--ro otn-bandwidth
            +--ro odulist* [odu-type]
            |  +--ro odu-type     identityref
            |  +--ro number?      uint16
            |  +--ro ts-number?   uint16
            +--ro odtu-flex-type?   l1-types:odtu-flex-type
```

```
augment /nw:networks/nw:network/nw:node/tet:te
          /tet:tunnel-termination-point/tet:client-layer-adaptation
          /tet:switching-capability/tet:te-bandwidth
          /tet:technology:
  +--:(otn)
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
        |  +--rw odu-type     identityref
        |  +--rw number?      uint16
        |  +--rw ts-number?   uint16
        +--rw odtu-flex-type?   l1-types:odtu-flex-type
augment /nw:networks/nw:network/nw:node/tet:te
          /tet:tunnel-termination-point
          /tet:local-link-connectivities/tet:path-constraints
          /tet:te-bandwidth/tet:technology:
  +--:(otn)
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
        |  +--rw odu-type     identityref
        |  +--rw number?      uint16
        |  +--rw ts-number?   uint16
        +--rw odtu-flex-type?   l1-types:odtu-flex-type
augment /nw:networks/nw:network/nw:node/tet:te
          /tet:tunnel-termination-point
          /tet:local-link-connectivities
          /tet:local-link-connectivity/tet:path-constraints
          /tet:te-bandwidth/tet:technology:
  +--:(otn)
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
        |  +--rw odu-type     identityref
        |  +--rw number?      uint16
        |  +--rw ts-number?   uint16
        +--rw odtu-flex-type?   l1-types:odtu-flex-type
augment /nw:networks/nw:network/nt:link/tet:te
          /tet:te-link-attributes
          /tet:interface-switching-capability/tet:max-lsp-bandwidth
          /tet:te-bandwidth/tet:technology:
  +--:(otn)
     +--rw otn-bandwidth
        +--rw odu-type?        identityref
        +--rw max-ts-number?   uint16
augment /nw:networks/nw:network/nt:link/tet:te
          /tet:te-link-attributes/tet:max-link-bandwidth
          /tet:te-bandwidth:
  +--rw otn-bandwidth
     +--rw odulist* [odu-type]
        +--rw odu-type     identityref
```

```
          +--rw number?      uint16
          +--rw ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:te-link-attributes/tet:max-resv-link-bandwidth
               /tet:te-bandwidth:
       +--rw otn-bandwidth
          +--rw odulist* [odu-type]
             +--rw odu-type     identityref
             +--rw number?      uint16
             +--rw ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:te-link-attributes/tet:unreserved-bandwidth
               /tet:te-bandwidth:
       +--rw otn-bandwidth
          +--rw odulist* [odu-type]
             +--rw odu-type     identityref
             +--rw number?      uint16
             +--rw ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:information-source-entry
               /tet:interface-switching-capability/tet:max-lsp-bandwidth
               /tet:te-bandwidth/tet:technology:
       +--:(otn)
          +--ro otn-bandwidth
             +--ro odu-type?        identityref
             +--ro max-ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:information-source-entry/tet:max-link-bandwidth
               /tet:te-bandwidth:
       +--ro otn-bandwidth
          +--ro odulist* [odu-type]
             +--ro odu-type     identityref
             +--ro number?      uint16
             +--ro ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:information-source-entry/tet:max-resv-link-bandwidth
               /tet:te-bandwidth:
       +--ro otn-bandwidth
          +--ro odulist* [odu-type]
             +--ro odu-type     identityref
             +--ro number?      uint16
             +--ro ts-number?   uint16
     augment /nw:networks/nw:network/nt:link/tet:te
               /tet:information-source-entry/tet:unreserved-bandwidth
               /tet:te-bandwidth:
       +--ro otn-bandwidth
          +--ro odulist* [odu-type]
             +--ro odu-type     identityref
```

```
         +--ro number?      uint16
         +--ro ts-number?   uint16
   augment /nw:networks/tet:te/tet:templates/tet:link-template
             /tet:te-link-attributes
             /tet:interface-switching-capability/tet:max-lsp-bandwidth
             /tet:te-bandwidth/tet:technology:
     +--:(otn)
        +--rw otn-bandwidth
           +--rw odu-type?        identityref
           +--rw max-ts-number?   uint16
   augment /nw:networks/tet:te/tet:templates/tet:link-template
             /tet:te-link-attributes/tet:max-link-bandwidth
             /tet:te-bandwidth:
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
           +--rw odu-type     identityref
           +--rw number?      uint16
           +--rw ts-number?   uint16
   augment /nw:networks/tet:te/tet:templates/tet:link-template
             /tet:te-link-attributes/tet:max-resv-link-bandwidth
             /tet:te-bandwidth:
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
           +--rw odu-type     identityref
           +--rw number?      uint16
           +--rw ts-number?   uint16
   augment /nw:networks/tet:te/tet:templates/tet:link-template
             /tet:te-link-attributes/tet:unreserved-bandwidth
             /tet:te-bandwidth:
     +--rw otn-bandwidth
        +--rw odulist* [odu-type]
           +--rw odu-type     identityref
           +--rw number?      uint16
           +--rw ts-number?   uint16
   augment /nw:networks/nw:network/nw:node/tet:te
             /tet:te-node-attributes/tet:connectivity-matrices
             /tet:label-restrictions/tet:label-restriction:
     +--rw otn-label-range!
        +--rw range-type?      otn-label-range-type
        +--rw tsg?             identityref
        +--rw odu-type-list*   identityref
        +--rw priority?        uint8
   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 otn-label-range!
        +--rw range-type?      otn-label-range-type
```

```
        +--rw tsg?              identityref
        +--rw odu-type-list*    identityref
        +--rw priority?         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:
        +--rw otn-label-range!
           +--rw range-type?      otn-label-range-type
           +--rw tsg?             identityref
           +--rw odu-type-list*   identityref
           +--rw priority?        uint8
      augment /nw:networks/nw:network/nw:node/tet:te
                /tet:information-source-entry/tet:connectivity-matrices
                /tet:label-restrictions/tet:label-restriction:
        +--ro otn-label-range!
           +--ro range-type?      otn-label-range-type
           +--ro tsg?             identityref
           +--ro odu-type-list*   identityref
           +--ro priority?        uint8
      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 otn-label-range!
           +--ro range-type?      otn-label-range-type
           +--ro tsg?             identityref
           +--ro odu-type-list*   identityref
           +--ro priority?        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:
        +--ro otn-label-range!
           +--ro range-type?      otn-label-range-type
           +--ro tsg?             identityref
           +--ro odu-type-list*   identityref
           +--ro priority?        uint8
      augment /nw:networks/nw:network/nw:node/tet:te
                /tet:tunnel-termination-point
                /tet:local-link-connectivities/tet:label-restrictions
                /tet:label-restriction:
        +--rw otn-label-range!
           +--rw range-type?      otn-label-range-type
           +--rw tsg?             identityref
           +--rw odu-type-list*   identityref
           +--rw priority?        uint8
      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 otn-label-range!
         +--rw range-type?      otn-label-range-type
         +--rw tsg?             identityref
         +--rw odu-type-list*   identityref
         +--rw priority?        uint8
    augment /nw:networks/nw:network/nt:link/tet:te
            /tet:te-link-attributes/tet:label-restrictions
            /tet:label-restriction:
      +--rw otn-label-range!
         +--rw range-type?      otn-label-range-type
         +--rw tsg?             identityref
         +--rw odu-type-list*   identityref
         +--rw priority?        uint8
    augment /nw:networks/nw:network/nt:link/tet:te
            /tet:information-source-entry/tet:label-restrictions
            /tet:label-restriction:
      +--ro otn-label-range!
         +--ro range-type?      otn-label-range-type
         +--ro tsg?             identityref
         +--ro odu-type-list*   identityref
         +--ro priority?        uint8
    augment /nw:networks/tet:te/tet:templates/tet:link-template
            /tet:te-link-attributes/tet:label-restrictions
            /tet:label-restriction:
      +--rw otn-label-range!
         +--rw range-type?      otn-label-range-type
         +--rw tsg?             identityref
         +--rw odu-type-list*   identityref
         +--rw priority?        uint8
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
```

```
         +--rw ts?    otn-ts
   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:
     +--:(otn)
        +--rw otn-label-step
           +--rw tpn?   otn-tpn
           +--rw ts?    otn-ts
   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:
     +--:(otn)
        +--rw otn-label
           +--rw tpn?       otn-tpn
           +--rw tsg?       identityref
           +--rw ts-list?   string
   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:
     +--:(otn)
        +--rw otn-label
           +--rw tpn?       otn-tpn
           +--rw tsg?       identityref
           +--rw ts-list?   string
   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:
     +--:(otn)
        +--rw otn-label
           +--rw tpn?       otn-tpn
           +--rw tsg?       identityref
           +--rw ts-list?   string
   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:
     +--:(otn)
        +--rw otn-label
```

```
          +--rw tpn?       otn-tpn
          +--rw tsg?       identityref
          +--rw ts-list?   string
    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:
      +--:(otn)
         +--ro otn-label
            +--ro tpn?       otn-tpn
            +--ro tsg?       identityref
            +--ro ts-list?   string
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label-step
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
```

```
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?   otn-tpn
        +--rw ts?    otn-ts
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:
  +--:(otn)
     +--rw otn-label-step
        +--rw tpn?   otn-tpn
        +--rw ts?    otn-ts
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
        +--rw ts-list?   string
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
        +--rw ts-list?   string
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
```

```
          +--rw ts-list?   string
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?       otn-tpn
             +--rw tsg?       identityref
             +--rw ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label-step
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
```

```
          +--ro tpn?       otn-tpn
          +--ro tsg?       identityref
          +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label-step
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label-step
             +--ro tpn?   otn-tpn
             +--ro ts?    otn-ts
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
```

```
          +--ro tpn?       otn-tpn
          +--ro tsg?       identityref
          +--ro ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?   otn-tpn
             +--rw ts?    otn-ts
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?   otn-tpn
             +--rw ts?    otn-ts
     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:
       +--:(otn)
          +--rw otn-label-step
             +--rw tpn?   otn-tpn
             +--rw ts?    otn-ts
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?       otn-tpn
             +--rw tsg?       identityref
```

```
          +--rw ts-list?   string
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?       otn-tpn
             +--rw tsg?       identityref
             +--rw ts-list?   string
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?       otn-tpn
             +--rw tsg?       identityref
             +--rw ts-list?   string
     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:
       +--:(otn)
          +--rw otn-label
             +--rw tpn?       otn-tpn
             +--rw tsg?       identityref
             +--rw ts-list?   string
     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:
       +--:(otn)
          +--ro otn-label
             +--ro tpn?       otn-tpn
             +--ro tsg?       identityref
             +--ro ts-list?   string
     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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label-step
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?       otn-tpn
            +--rw tsg?       identityref
            +--rw ts-list?   string
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?       otn-tpn
            +--rw tsg?       identityref
            +--rw ts-list?   string
```

```
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
        +--rw ts-list?   string
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
        +--rw ts-list?   string
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:
  +--:(otn)
     +--ro otn-label
        +--ro tpn?       otn-tpn
        +--ro tsg?       identityref
        +--ro ts-list?   string
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:
  +--:(otn)
     +--rw otn-label
        +--rw tpn?       otn-tpn
        +--rw tsg?       identityref
        +--rw ts-list?   string
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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?       otn-tpn
            +--rw tsg?       identityref
            +--rw ts-list?   string
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    augment /nw:networks/nw:network/nt:link/tet:te
            /tet:te-link-attributes/tet:label-restrictions
            /tet:label-restriction/tet:label-step/tet:technology:
      +--:(otn)
         +--rw otn-label-step
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--ro otn-label
            +--ro tpn?   otn-tpn
            +--ro ts?    otn-ts
    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:
      +--:(otn)
         +--ro otn-label
            +--ro tpn?   otn-tpn
            +--ro ts?    otn-ts
    augment /nw:networks/nw:network/nt:link/tet:te
            /tet:information-source-entry/tet:label-restrictions
```

```
            /tet:label-restriction/tet:label-step/tet:technology:
      +--:(otn)
         +--ro otn-label-step
            +--ro tpn?   otn-tpn
            +--ro ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?       otn-tpn
            +--rw tsg?       identityref
            +--rw ts-list?   string
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?       otn-tpn
            +--rw tsg?       identityref
            +--rw ts-list?   string
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
    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:
      +--:(otn)
         +--rw otn-label-step
            +--rw tpn?   otn-tpn
            +--rw ts?    otn-ts
```

Appendix B. JSON Examples

This appendix contains an example of an instance data tree in JSON encoding [RFC7951].

The example instantiates the "ietf-otn-topology" model for the OTN topology depicted in Figure 2 below.

The OTN topology consists of three nodes (D1, D2, and D3) with three link termination (LTPs) each: two LTPs which terminates the links that belongs to the OTN topology and one LTP which terminates inter-domain links, as defined in [RFC8795].

The OTN links within the OTN network are 100G OTN links while the links at the edge of the network are 10G links. All these OTN links support ODU4, ODU2 and ODU0 connections. The link between nodes D1 and D2 also supports ODUflex.

The OTN links within the OTN network are bidirectional and symmetrical: for this reasons, the link attributes (e.g., support for OTN switching capability or transparent client signal and the OTN maximum link bandwidth) are instantiated only on the link representing the forward direction, while the link representing the reverse direction are instantiated without any link attribute (other than the name) to indicate that the OTN links are bidirectional and symmetrical.

The link between nodes D1 and D2 is an example of a multi-function link, as defined in Section 2.2, which can support both OTN and 100G client signal (e.g., 100GE): the interface-switching-capability list indicates support for OTN switching capability and the client-svc presence container is instantiated.

For the LTPs which terminate OTN links, only the identifiers information is instantiated. All the other properties are defined in the links they terminate.

For the LTPs at the edge network, additional properties are instantiated to indicate whether the link can support OTN or transparent client signals. In particular:

* LTP 1 on Node D1 is an example of an LTP terminating a multi-function access link, as defined in Section 2.2, which can support both OTN and 10G client signals (e.g., 10GE and STM-64): the interface-switching-capability list indicates support for OTN switching capability and the client-svc presence container is instantiated;

* LTP 2 on Node D2 is an example of an LTP which can support only 10G OTN (ODU2) signal: the interface-switching-capability list indicates support for OTN switching capability and the client-svc presence container is not instantiated;

* LTP 3 on Node D3 is an example of an LTP which can support only 10G (e.g., 10GE and STM-64) client signals: the interface-switching-capability list does not indicate support for OTN switching capability and the client-svc presence container is instantiated.

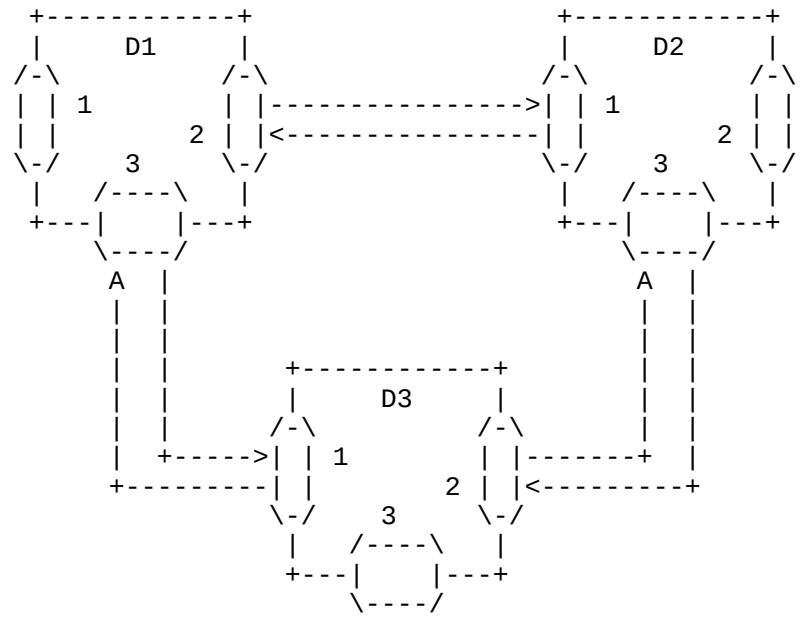

Figure 2: Example of OTN topology


```
=============== NOTE: '\' line wrapping per RFC 8792 ================

{
  "ietf-network:networks": {
    "network": [
      {
        "network-id": "example:otn-topology-example",
        "network-types": {
          "ietf-te-topology:te-topology": {
            "ietf-otn-topology:otn-topology": {}
          }
        },
        "ietf-te-topology:te-topology-identifier": {
```

```
            "topology-id": "otn-topology-example"
          },
          "ietf-te-topology:te": {},
          "node": [
            {
              "node-id": "example:D1",
              "ietf-te-topology:te-node-id": "192.0.0.1",
              "ietf-te-topology:te": {
                "te-node-attributes": {
                  "name": "Node D1",
                  "ietf-otn-topology:otn-node": {}
                }
              },
              "ietf-network-topology:termination-point": [
                {
                  "tp-id": "example:D1-1",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 1 of Node D1",
                    "interface-switching-capability": [
                      {
                        "switching-capability": "ietf-te-types:switchi\
ng-otn",
                        "encoding": "ietf-te-types:lsp-encoding-oduk"
                      }
                    ],
                    "ietf-otn-topology:client-svc": {
                      "supported-client-signal": [
                        "ietf-layer1-types:ETH-10Gb-LAN",
                        "ietf-layer1-types:STM-64"
                      ]
                    }
                  }
                },
                {
                  "tp-id": "example:D1-2",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 2 of Node D1"
                  }
                },
                {
                  "tp-id": "example:D1-3",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 3 of Node D1"
                  }
                }
```

```
            ]
          },
          {
            "node-id": "example:D2",
            "ietf-te-topology:te-node-id": "192.0.0.2",
            "ietf-te-topology:te": {
              "te-node-attributes": {
                "name": "Node D2",
                "ietf-otn-topology:otn-node": {}
              }
            },
            "ietf-network-topology:termination-point": [
              {
                "tp-id": "example:D2-1",
                "ietf-te-topology:te-tp-id": 1,
                "ietf-te-topology:te": {
                  "name": "Interface 1 of Node D2"
                }
              },
              {
                "tp-id": "example:D2-2",
                "ietf-te-topology:te-tp-id": 1,
                "ietf-te-topology:te": {
                  "name": "Interface 2 of Node D2",
                  "interface-switching-capability": [
                    {
                      "switching-capability": "ietf-te-types:switchi\
ng-otn",
                      "encoding": "ietf-te-types:lsp-encoding-oduk"
                    }
                  ]
                }
              },
              {
                "tp-id": "example:D2-3",
                "ietf-te-topology:te-tp-id": 1,
                "ietf-te-topology:te": {
                  "name": "Interface 3 of Node D2"
                }
              }
            ]
          },
          {
            "node-id": "example:D3",
            "ietf-te-topology:te-node-id": "192.0.0.3",
            "ietf-te-topology:te": {
              "te-node-attributes": {
                "name": "Node D3",
```

```
                  "ietf-otn-topology:otn-node": {}
                }
              },
              "ietf-network-topology:termination-point": [
                {
                  "tp-id": "example:D3-1",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 1 of Node D3"
                  }
                },
                {
                  "tp-id": "example:D3-2",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 2 of Node D3"
                  }
                },
                {
                  "tp-id": "example:D3-3",
                  "ietf-te-topology:te-tp-id": 1,
                  "ietf-te-topology:te": {
                    "name": "Interface 3 of Node D3",
                    "ietf-otn-topology:client-svc": {
                      "supported-client-signal": [
                        "ietf-layer1-types:ETH-10Gb-LAN",
                        "ietf-layer1-types:STM-64"
                      ]
                    }
                  }
                }
              ]
            }
          ],
          "ietf-network-topology:link": [
            {
              "link-id": "example:link/D1-2/D2-1",
              "ietf-te-topology:te": {
                "te-link-attributes": {
                  "name": "Link between Node D1 and Node D2 (forward d\
irection)",
                  "interface-switching-capability": [
                    {
                      "switching-capability": "ietf-te-types:switching\
-otn",
                      "encoding": "ietf-te-types:lsp-encoding-oduk"
                    }
                  ],
```

```
                  "max-link-bandwidth": {
                    "te-bandwidth": {
                      "ietf-otn-topology:otn-bandwidth": {
                        "odulist": [
                          {
                            "odu-type": "ietf-layer1-types:ODU4",
                            "number": 1
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU2",
                            "number": 10
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU0",
                            "number": 80
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODUflex",
                            "number": 80,
                            "ts-number": 80
                          }
                        ]
                      }
                    }
                  },
                  "ietf-otn-topology:otn-link": {
                    "odtu-flex-type": "4"
                  },
                  "ietf-otn-topology:client-svc": {
                    "supported-client-signal": [
                      "ietf-layer1-types:ETH-100Gb"
                    ]
                  }
                }
              }
            },
            {
              "link-id": "example:link/D2-1/D1-2",
              "ietf-te-topology:te": {
                "te-link-attributes": {
                  "name": "Link between Node D1 and Node D2 (reverse d\
irection)"
                }
              }
            },
            {
              "link-id": "example:link/D2-3/D3-2",
              "ietf-te-topology:te": {
```

```
                "te-link-attributes": {
                  "name": "Link between Node D2 and Node D3 (forward d\
   irection)",
                  "interface-switching-capability": [
                    {
                      "switching-capability": "ietf-te-types:switching\
   -otn",
                      "encoding": "ietf-te-types:lsp-encoding-oduk"
                    }
                  ],
                  "max-link-bandwidth": {
                    "te-bandwidth": {
                      "ietf-otn-topology:otn-bandwidth": {
                        "odulist": [
                          {
                            "odu-type": "ietf-layer1-types:ODU4",
                            "number": 1
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU2",
                            "number": 10
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU0",
                            "number": 80
                          }
                        ]
                      }
                    }
                  }
                }
              }
            },
            {
              "link-id": "example:link/D3-2/D2-3",
              "ietf-te-topology:te": {
                "te-link-attributes": {
                  "name": "Link between Node D2 and Node D3 (reverse d\
   irection)"
                }
              }
            },
            {
              "link-id": "example:link/D3-1/D1-3",
              "ietf-te-topology:te": {
                "te-link-attributes": {
                  "name": "Link between Node D1 and Node D3 (reverse d\
   irection)"
```

```
                }
              }
            },
            {
              "link-id": "example:link/D1-3/D3-1",
              "ietf-te-topology:te": {
                "te-link-attributes": {
                  "name": "Link between Node D1 and Node D3 (forward d\
irection)",
                  "interface-switching-capability": [
                    {
                      "switching-capability": "ietf-te-types:switching\
-otn",
                      "encoding": "ietf-te-types:lsp-encoding-oduk"
                    }
                  ],
                  "max-link-bandwidth": {
                    "te-bandwidth": {
                      "ietf-otn-topology:otn-bandwidth": {
                        "odulist": [
                          {
                            "odu-type": "ietf-layer1-types:ODU4",
                            "number": 1
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU2",
                            "number": 10
                          },
                          {
                            "odu-type": "ietf-layer1-types:ODU0",
                            "number": 80
                          }
                        ]
                      }
                    }
                  }
                }
              }
            }
          ]
        }
      ]
    }
  }
```

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Contributors

Aihua Guo
Futurewei
Email: aihuaguo.ietf@gmail.com

Anurag Sharma
Google
Email: ansha@google.com

Yunbin Xu
CAICT
Email: xuyunbin@caict.ac.cn

Lei Wang
China Mobile
Email: wangleiyj@chinamobile.com

Baoquan Rao
Huawei Technologies
Email: raobaoquan@huawei.com

Xian Zhang
Huawei Technologies
Email: Huawei Technologies

Huub van Helvoort
Hai Gaoming BV
Email: huubatwork@gmail.com

Victor Lopez
Nokia
Email: victor.lopez@nokia.com

Yunbo Li
China Mobile
Email: liyunbo@chinamobile.com

Dieter Beller
Nokia
Email: dieter.beller@nokia.com

TBD

Authors' Addresses

Haomian Zheng
Huawei Technologies
H1, Huawei Industrial Base, Songshan Lake
Dongguan
Guangdong, 523808
China
Email: zhenghaomian@huawei.com

Italo Busi
Huawei Technologies
Email: italo.busi@huawei.com

Xufeng Liu
Alef Edge
Email: xufeng.liu.ietf@gmail.com

Sergio Belotti
Nokia
Email: sergio.belotti@nokia.com

Oscar Gonzalez de Dios
Telefonica
Email: oscar.gonzalezdedios@telefonica.com