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# A YANG Data Model for Client-layer Topology
# draft-zheng-ccamp-client-topo-yang-04

Abstract

A transport network is a server-layer network to provide connectivity services to its client. In this draft the topology of client is described.

Status of This Memo

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

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This Internet-Draft will expire on September 1, 2019.

Table of Contents



## 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. The topology model in Traffic-Engineered network has been defined in both generic way and technology-specific way. The generic model, which is the base TE YANG model, can be found at [I-D.ietf-teas-yang-te-topo]. Technology-specific models, such as OTN/WSON topology model, have also been defined in [I-D.ietf-ccamp-otn-topo-yang] and [I-D.ietf-ccamp-wson-yang] respectively. Corresponding topology on client-layer is also required, to have a complete topology view from the perspective of network controllers.

This document defines a data model of all client-layer Topology, using YANG language defined in [RFC7950]. The model is augmenting the generic TE topology model, and can be used by either applications exposing to a network controller or among controllers. Furthermore, it can be used by an application for topology description in client-layer network.

## 2. Terminology and Notations

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in the YANG data tree presented later in this document is defined in [RFC8340]. They are provided below for reference.

- Brackets "[" and "]" enclose list keys.
- Abbreviations before data node names: "rw" means configuration (read-write) and "ro" state data (read-only).
- Symbols after data node names: "?" means an optional node, "!" means a presence container, and "*" denotes a list and leaf-list.
- Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- Ellipsis ("...") stands for contents of subtrees that are not shown.

## 3. YANG Model for Topology of Client Layer

### 3.1. YANG Tree for Ethernet Topology

```
module: ietf-eth-te-topology
  augment /nd:networks/nd:network/nd:network-types/tet:te-topology:
    +--rw eth-tran-topology!
  augment /nd:networks/nd:network/lnk:link/tet:te/tet:te-link-attributes:
    +--rw max-bandwidth?          uint64
    +--rw available-bandwidth?    uint64
    +--rw available-vlan-range?   etht-types:vid-range-type
  augment /nd:networks/nd:network/nd:node/lnk:termination-point:
    +--rw ltp-mac-address?                    yang:mac-address
    +--rw port-vlan-id?                       etht-types:vlanid
    +--rw maximum-frame-size?                 uint16
    +--rw (direction)?
    |  +--:(symmetrical)
    |  |  +--rw ingress-egress-bandwidth-profile
    |  |     +--rw bandwidth-profile-name?   string
    |  |     +--rw bandwidth-profile-type?   etht-types:bandwidth-profile-type
    |  |     +--rw CIR?                      uint64
    |  |     +--rw CBS?                      uint64
    |  |     +--rw EIR?                      uint64
    |  |     +--rw EBS?                      uint64
```

```
|  |     +--rw color-aware?              boolean
|  |     +--rw coupling-flag?            boolean
|  +--:(asymmetrical)
|     +--rw ingress-bandwidth-profile
|     |  +--rw bandwidth-profile-name?   string
|     |  +--rw bandwidth-profile-type?   etht-types:bandwidth-profile-type
|     |  +--rw CIR?                      uint64
|     |  +--rw CBS?                      uint64
|     |  +--rw EIR?                      uint64
|     |  +--rw EBS?                      uint64
|     |  +--rw color-aware?              boolean
|     |  +--rw coupling-flag?            boolean
|     +--rw egress-bandwidth-profile
|        +--rw bandwidth-profile-name?   string
|        +--rw bandwidth-profile-type?   etht-types:bandwidth-profile-type
|        +--rw CIR?                      uint64
|        +--rw CBS?                      uint64
|        +--rw EIR?                      uint64
|        +--rw EBS?                      uint64
|        +--rw color-aware?              boolean
|        +--rw coupling-flag?            boolean
+--rw svc!
   +--rw client-facing?              boolean
   +--rw supported-classification
   |  +--rw port-classification?   boolean
   |  +--rw vlan-classification
   |     +--rw vlan-tag-classification?   boolean
   |     +--rw outer-tag
   |     |  +--rw supported-tag-types*   etht-types:eth-tag-classify
   |     |  +--rw vlan-bundling?         boolean
   |     |  +--rw vlan-range?            etht-types:vid-range-type
   |     +--rw second-tag
   |        +--rw second-tag-classification?   boolean
   |        +--rw supported-tag-types*         etht-types:eth-tag-classify
   |        +--rw vlan-bundling?               boolean
   |        +--rw vlan-range?                  etht-types:vid-range-type
   +--rw supported-vlan-operations
      +--rw asymmetrical-operations?       boolean
      +--rw transparent-vlan-operations?   boolean
      +--rw vlan-pop
      |  +--rw vlan-pop-operations?   boolean
      |  +--rw max-pop-tags?          uint8
      +--rw vlan-push
         +--rw vlan-push-operation?   boolean
         +--rw outer-tag
         |  +--rw supported-tag-types*   etht-types:eth-tag-type
         |  +--rw vlan-range?            etht-types:vid-range-type
         +--rw second-tag
```

```
               +--rw push-second-tag?       boolean
               +--rw supported-tag-types*   etht-types:eth-tag-type
               +--rw vlan-range?            etht-types:vid-range-type
```

# 4. YANG Code for Topology Client Layer

## 4.1. The ETH Topology YANG Code

<CODE BEGINS> file "ietf-eth-te-topology@2018-03-01.yang"

```
module ietf-eth-te-topology {

    namespace "urn:ietf:params:xml:ns:yang:ietf-eth-te-topology";

    prefix "ethtetopo";

    import ietf-network {
        prefix "nd";
    }

    import ietf-network-topology {
        prefix "lnk";
    }

    import ietf-te-topology {
        prefix "tet";
    }

    import ietf-yang-types {
        prefix "yang";
    }

    import ietf-eth-tran-types {
        prefix "etht-types";
    }

    organization
        "Internet Engineering Task Force (IETF) CCAMP WG";
  contact
    "
      WG List: <mailto:ccamp@ietf.org>

      ID-draft editor:
        Haomian Zheng (zhenghaomian@huawei.com);
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    ";

    description
        "This module defines a YANG data model for describing
        layer-2 Ethernet transport topologies.";

    revision 2018-03-01 {
        description
            "Initial revision";
        reference
            "draft-zheng-ccamp-client-topo-yang";
    }

    /*
    Groupings
    */

    grouping eth-tran-topology-type {
        description
            "Identifies the Ethernet Transport topology type";

        container eth-tran-topology {
            presence "indicates a topology type of Ethernet
                                Transport Network.";
            description "Eth transport topology type";
        }
    }

    grouping eth-link-te-attributes {
        description "Ethernet TE link attributes";

        leaf max-bandwidth {
            type uint64{
                range "0..10000000000";
            }
            units "Kbps";
            description
                "Maximum bandwith value expressed in kilobits per second";
        }

        leaf available-bandwidth {
            type uint64{
```

```
                range "0..10000000000";
            }
            units "Kbps";
            description
                "Available bandwith value expressed in kilobits per second";
        }

        leaf available-vlan-range {
            type etht-types:vid-range-type;
            description
                "The range of the VLAN values that are available.";
        }
    }

    grouping ltp-bandwidth-profiles {
        description
            "A grouping which represents the bandwidt profile(s) for the ETH
LTP.";

        choice direction {
            description
                "Whether the bandwidth profiles are symmetrical or
                 asymmetrical";
            case symmetrical {
                description
                    "The same bandwidth profile is used to describe the ingress
                    and the egress bandwidth profile.";

                container ingress-egress-bandwidth-profile {
                    description
                        "The bandwith profile used in the ingress and egress
direction.";
                    uses etht-types:etht-bandwidth-profiles;
                }
            }
            case asymmetrical {
                description
                    "Different ingress and egress bandwidth profiles
                    can be specified.";
                container ingress-bandwidth-profile {
                    description
                        "The bandwidth profile used in the ingress direction.";
                    uses etht-types:etht-bandwidth-profiles;
                }
                container egress-bandwidth-profile {
                    description
                        "The bandwidth profile used in the egress direction.";
                    uses etht-types:etht-bandwidth-profiles;
                }
            }
```

```
        }
    }

    grouping eth-ltp-attributes {
        description
            "Ethernet transport link termination point attributes";

        /*
            Open Issue: should we remove this attribute (duplicates with I2RS
L2 attributes)?
        */
        leaf ltp-mac-address {
            type yang:mac-address;
            description "the MAC address of the LTP.";
        }
        /*
            Open Issue: should we remove this attribute (duplicates with I2RS
L2 attributes)?
        */
        leaf port-vlan-id {
            type etht-types:vlanid;
            description "the port VLAN ID of the LTP.";
        }
        /*
            Open Issue: should we remove this attribute (duplicates with I2RS
L2 attributes)?
        */
        leaf maximum-frame-size {
            type uint16 {
                range "64 .. 65535";
            }
            description
                "Maximum frame size";
        }
        uses ltp-bandwidth-profiles;
    }

    grouping svc-vlan-classification {
        description
            "Grouping defining the capabilities for VLAN classification.";

        leaf-list supported-tag-types {
            type etht-types:eth-tag-classify;
            description
                "List of VLAN tag types that can be used for the VLAN
classification.
                In case VLAN classification is not supported, the list is
empty.";
        }
        leaf vlan-bundling {
            type boolean;
            description
                "In case VLAN classification is supported, indicates whether
```

```
VLAN bundling classification is also supported.";
```

```
        }
        leaf vlan-range {
            type etht-types:vid-range-type;
            description
                "In case VLAN classification is supported, indicates the of
available VLAN ID values.";
        }
    }

    grouping svc-vlan-push {
        description
            "Grouping defining the capabilities for VLAN push or swap
operations.";

        leaf-list supported-tag-types {
            type etht-types:eth-tag-type;
            description
                "List of VLAN tag types that can be used to push or swap a VLAN
tag.
                In case VLAN push/swap is not supported, the list is empty.";
        }
        leaf vlan-range {
            type etht-types:vid-range-type;
            description
                "In case VLAN push/swap operation is supported, the range of
available VLAN ID values.";
        }
    }

    grouping eth-ltp-svc-attributes {
        description
            "Ethernet link termination point (LTP) service attributes.";

        leaf client-facing {
            type boolean;
            description
                "indicates whether this LTP is a client-facing ltp.";
        }

        container supported-classification {
            description
                "Service classification capabilities supported by the ETH
LTP.";

            leaf port-classification {
                type boolean;
                description
                    "Indicates that the ETH LTP support port-based service
classification.";
            }
            container vlan-classification {
                description
                    "Service classification capabilities based on the VLAN
```

```
tag(s)
                    supported by the ETH LTP.";
```

```
                leaf vlan-tag-classification {
                    type boolean;
                    description
                        "Indicates that the ETH LTP supports VLAN service
classification.";
                }
                container outer-tag {
                    description
                        "Service classification capabilities based on the outer
VLAN tag,
                        supported by the ETH LTP.";
                    uses svc-vlan-classification;
                }
                container second-tag {
                    description
                        "Service classification capabilities based on the
second VLAN tag,
                        supported by the ETH LTP.";
                    /*
                        Open issue: indicates that second-tag-classification
can be True only if
                        outer-tag-classification is also True.
                    */
                    leaf second-tag-classification {
                        type boolean;
                        description
                            "Indicates that the ETH LTP support  VLAN service
classification
                            based on the second VLAN tag.";
                    }
                    uses svc-vlan-classification;
                }
            }
        }

        container supported-vlan-operations {
        description
                    "Description.";
            leaf asymmetrical-operations {
                type boolean;
                description
                    "Indicates whether the ETH LTP supports also asymmetrical
VLAN operations.
                    It is assumed that symmetrical VLAN operations are alwyas
supported.";
            }
            leaf transparent-vlan-operations {
                type boolean;
                description
                    "Indicates that the ETH LTP supports transparent
operations.";
            }
            container vlan-pop {
```

```
            description
                "Indicates VLAN pop or swap operations capabilities.";
```

```
                leaf vlan-pop-operations {
                    type boolean;
                    description
                        "Indicates that the ETH LTP supports VLAN pop or swap
operations.";
                }
                leaf max-pop-tags {
                    type uint8 {
                        range "1..2";
                    }
                    description
                        "Indicates the maximum number of tags that can be
popped/swapped.";
                }
            }
            container vlan-push {
                description
                    "Indicates VLAN push or swap operations capabilities.";

                leaf vlan-push-operation {
                    type boolean;
                    description
                        "Indicates that the ETH LTP supports VLAN push or swap
operations.";
                }
                container outer-tag {
                    description
                        "Indicates the supported VLAN operation capabilities on
the outer VLAN tag.";
                    uses svc-vlan-push;
                }
                container second-tag {
                    description
                        "Indicates the supported VLAN operation capabilities on
the second VLAN tag.";

                    leaf push-second-tag {
                        type boolean;
                        description
                            "Indicates that the ETH LTP supports VLAN push or
swap operations
                            for the second VLAN tag.";
                    }
                    uses svc-vlan-push;
                }
            }
        }
    }


    /*
    Data nodes
    */
```

```
    augment "/nd:networks/nd:network/nd:network-types/tet:te-topology" {
        description
            "Augment network types to include ETH transport newtork";

        uses eth-tran-topology-type;
    }

    augment "/nd:networks/nd:network/lnk:link/tet:te/tet:te-link-attributes" {
        when "../../../nd:network-types/tet:te-topology/eth-tran-topology" {
            description
                "Augment only for ETH transport network.";
        }
        description
            "Augment ETH transport link config attributes";

        uses eth-link-te-attributes;
    }

    augment "/nd:networks/nd:network/nd:node/lnk:termination-point" {
        when "../../nd:network-types/tet:te-topology/eth-tran-topology" {
            description
                "Augment only for ETH transport network";
        }
        description
            "Augment ETH LTP attributes";

        uses eth-ltp-attributes;
        container svc {
            presence "client-facing LTP.";

            description
                "ETH LTP Service attributes.";
            uses eth-ltp-svc-attributes;
        }
    }
}
```

<CODE ENDS>

## 5. Considerations and Open Issue

Editor Notes: This section is used to note temporary discussion/ conclusion that to be fixed in the future version, and will be removed before publication. 201902: we have noticed that Ethernet is the only client signal (on the perspective of OTN) which need a topology. So it is possible that the title of this document will be

changed to "A YANG Data Model for Ethernet Topology". The proposal of this work is that the document will follow up the progress of draft-zheng-ccamp-client-signal-yang, with draft-zheng-ccamp-client-tunnel-yang together. 201902: will have to align with TE topology model, currently is a totally different format with necessary parameters, a big change is expected.

## 6. IANA Considerations

TBD.

## 7. Manageability Considerations

TBD.

## 8. Security Considerations

The data following the model defined in this document is exchanged via, for example, the interface between an orchestrator and a transport network controller. The security concerns mentioned in [I-D.ietf-teas-yang-te-topo] for using ietf-te-topology.yang model also applies to this document.

The YANG module defined in this document can be accessed via the RESTCONF protocol defined in [RFC8040], or maybe via the NETCONF protocol [RFC6241].

There are a number of data nodes defined in the YANG module which are writable/creatable/deletable (i.e., config true, which is the default). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., POST) to these data nodes without proper protection can have a negative effect on network operations.

Editors note: to list specific subtrees and data nodes and their sensitivity/vulnerability.

## 9. Acknowledgements

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## 11. References

### 11.1. Normative References

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[RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <https://www.rfc-editor.org/info/rfc6241>.

[RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <https://www.rfc-editor.org/info/rfc7950>.

[RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", RFC 8040, DOI 10.17487/RFC8040, January 2017, <https://www.rfc-editor.org/info/rfc8040>.

### 11.2. Informative References

[I-D.ietf-ccamp-wson-yang]
Lee, Y., Dhody, D., Guo, A., Lopezalvarez, V., and D. King, "A YANG Data Model for WSON (Wavelength Switched Optical Networks)", draft-ietf-ccamp-wson-yang-19 (work in progress), February 2019.

[RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <https://www.rfc-editor.org/info/rfc8340>.

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