

CCAMP Working Group
Internet-Draft
Intended status: Standards Track
Expires: September 1, 2019

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February 28, 2019

**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.

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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. 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.

- o Brackets "[" and "]" enclose list keys.
- o Abbreviations before data node names: "rw" means configuration (read-write) and "ro" state data (read-only).
- o Symbols after data node names: "?" means an optional node, "!" means a presence container, and "*" denotes a list and leaf-list.
- o Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- o 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";
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        WG List: <mailto:ccamp@ietf.org>
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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..100000000000";
        }
        units "Kbps";
        description
            "Maximum bandwidth value expressed in kilobits per second";
    }

    leaf available-bandwidth {
        type uint64{
```



```
        range "0..10000000000";
    }
    units "Kbps";
    description
        "Available bandwidth 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 bandwidth 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 bandwidth 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 eth-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 eth-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 always
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.";
```



```
/*  
Data nodes  
*/
```

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

  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

We would like to thank Igor Bryskin and Daniel King for their comments and discussions.

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11.2. Informative References

- [I-D.ietf-ccamp-wson-yang]
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- [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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