Profiles for Traffic Engineering (TE) Topology Data Model and Applicability to non-TE-centric Use Cases

TEAS WG, IETF 124, Montreal

draft-ietf-teas-te-topology-profiles-04

Authors:

Italo Busi (Huawei)

Xufeng Liu (Alef Edge)

Igor Bryskin

Tarek Saad (Cisco)

Oscar Gonzalez de Dios (Telefonica)

Contributors:

Aihua Guo (Futurewei)

Haomian Zheng (Huawei)

Sergio Belotti (Nokia)

Motivation

- Multiple similar discussions in IETF working groups
  - Scenario: TE-aware but non-TE-centric (“non-TE”) networks
  - Requirement: sub-set TE Topology attributes
- TE Topology Model (RFC8795) looks very complex at the first glance
  - Extensive model to support many features
    - Some applicable only to TE-centric networks
    - Others applicable to both TE-centric and non-TE-centric networks
  - Most of the features/attributes are optional
- Clarify that a sub-set (profile) of TE Topology can be used in specific scenarios
  - Including non-TE-centric scenarios

Examples of generic profiles

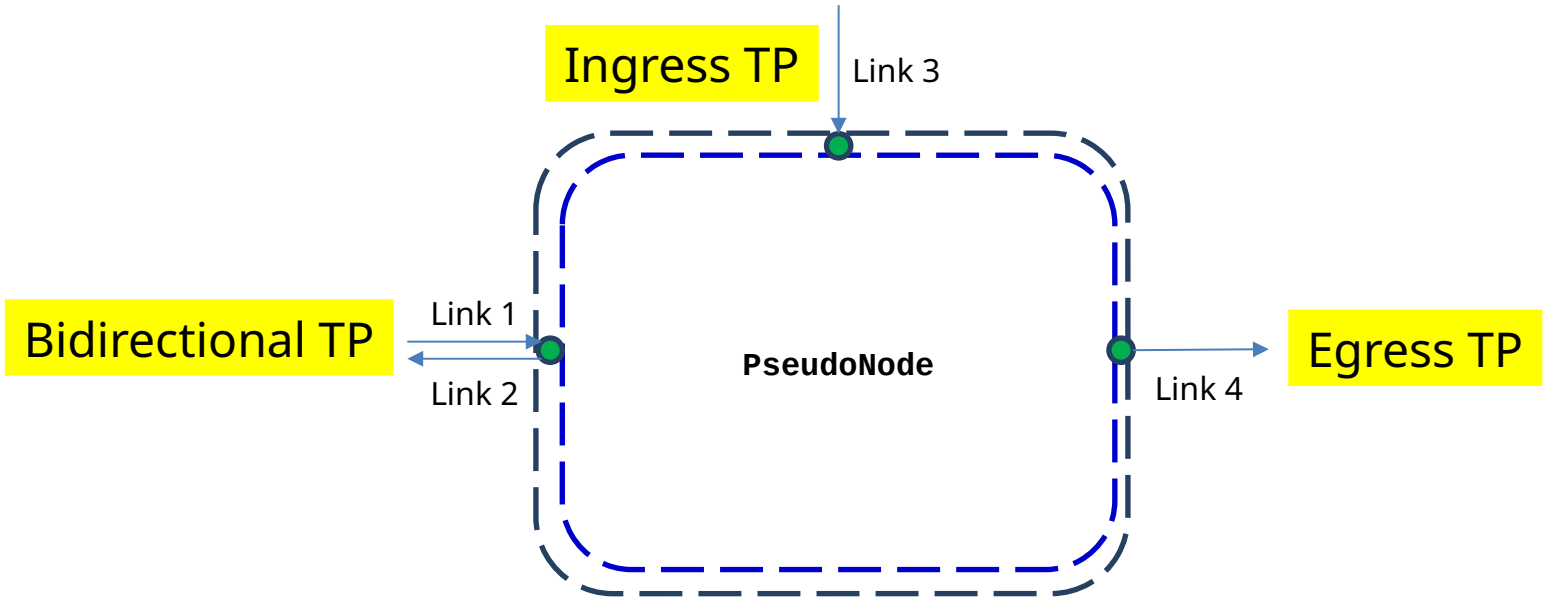
- UNI Topology Discovery
- Administrative and Operational State
- Overlay and Underlay Topology
- Nodes with switching limitations
- Multipoint links (New)

Updates since WG adoption

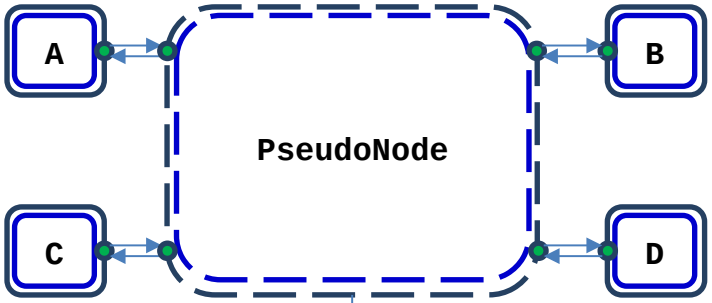
- WG adoption comments against the term «non-TE»:
  - Defined TE-aware, TE-centric and non-TE-centric terminology
  - Used the term «YANG topology data model defined in RFC8795»
    - Note: changing the name of the YANG module and of some of its data nodes (e.g. containers) would be a NBC change
- Removed references to RFC9408
- Added clarifcation about the use of
  - supporting relationships, defined in RFC8345, and
  - underlay/overlay relationships, defined in RFC8795
- Added profile to describe multipoint and p2mp links
  - Modelled as pseudonodes, as defined in RFC8345
  - Connectivity limitations can be described using a subset of the YANG topology model defined in RFC8795
- Editorial updates

Multipoint Link

- Defined in draft-ietf-nmop-simap-concept-07
- Modelled as a pseudonode
  - Defined section 4.4.5 of RFC 8345
  - Connectivity constraints specified using Connectivity Matrix, defined in RFC 8795
  - Directionality of the TPs defined by the terminated Links

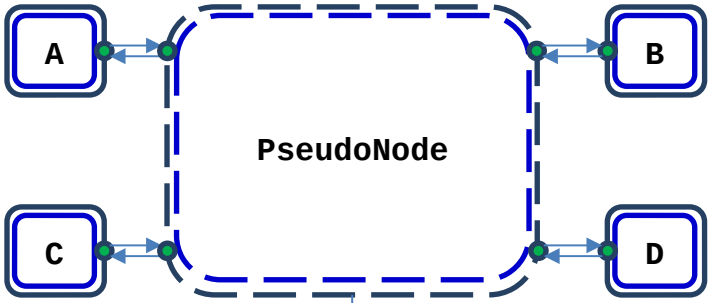


Underlay for multipoint connectivity



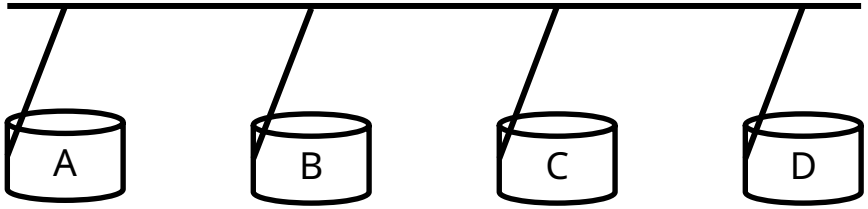
underlay-topology

Underlay Network (e.g., Ethernet Bridged Network)



Open issue (IVY WG): how to associate a node with a physical bus

Physical bus



Open Issue

- How to report to the client the profiles implemented by a server
  - May be different for different instances/network types
- Proposal
  - Out of scope from this draft (Informational)
  - Trigger discussion (and further work)
    - Define a generic solution within Netmod WG
    - RFC8795-bis or a new augmentation, within TEAS WG
- See: https://github.com/tsaad-dev/te/issues/161

Next Step

- Advertising this draft to other WGs
  - Relevant to the SIMAP modelling work in NMOP WG
  - Trigger work for reporting the profiles being implemented
- Get more review and feedbacks
  - No pending open issue
  - Ready for WG LC
- Github: https://github.com/tsaad-dev/te

Backup

UNI Topology Discovery

```
module: ietf-te-topology
  augment /nw:networks/nw:network/nw:network-types:
    +--rw te-topology!
  augment /nw:networks/nw:network/nw:node/nt:termination-point:
    +--rw te-tp-id?   te-types:te-tp-id
    +--rw te!
       +--rw admin-status?
       |       te-types:te-admin-status
       +--rw inter-domain-plug-id?          binary
       +--ro oper-status?                   te-types:te-oper-status
```

Administrative and Operational State

```
module: ietf-te-topology
  augment /nw:networks/nw:network/nw:network-types:
    +--rw te-topology!
  augment /nw:networks/nw:network:
    +--rw te-topology-identifier
    |  +--rw provider-id?   te-global-id
    |  +--rw client-id?     te-global-id
    |  +--rw topology-id?   te-topology-id
    +--rw te!
       +--rw name?                    string
  augment /nw:networks/nw:network/nw:node:
    +--rw te-node-id?   te-types:te-node-id
    +--rw te!
       +--rw te-node-attributes
       |  +--rw admin-status?              te-types:te-admin-status
       |  +--rw name?                      string
       +--ro oper-status?                  te-types:te-oper-status
  augment /nw:networks/nw:network/nt:link:
    +--rw te!
       +--rw te-link-attributes
       |  +--rw name?                      string
       |  +--rw admin-status?              te-types:te-admin-status
       +--ro oper-status?                  te-types:te-oper-status
  augment /nw:networks/nw:network/nw:node/nt:termination-point:
    +--rw te-tp-id?   te-types:te-tp-id
    +--rw te!
       +--rw admin-status?                 te-types:te-admin-status
       +--rw name?                         string
       +--ro oper-status?                  te-types:te-oper-status
```

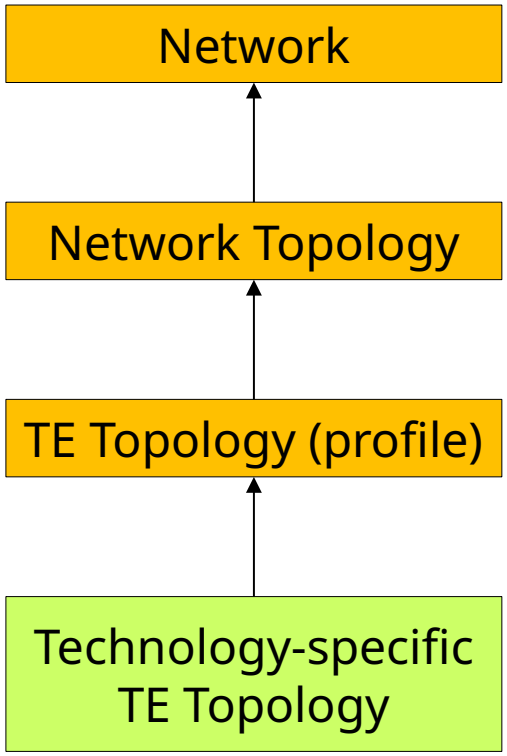
Overlay and Underlay Topology

```
module: ietf-te-topology
  augment /nw:netorks/nw:network/nw:network-types:
    +--rw te-topology!
  augment /nw:networks/nw:network/nw:node:
    +--rw te-node-id?   te-types:te-node-id
    +--rw te!
       +--rw te-node-attributes
          +--rw underlay-topology {te-topology-hierarchy}?
             +--rw network-ref?   -> /nw:networks/network/network-id
  augment /nw:networks/nw:network/nt:link:
    +--rw te!
       +--rw te-link-attributes
          +--rw underlay {te-topology-hierarchy}?
             +--rw enabled?                    boolean
             +--rw primary-path
                +--rw network-ref?
                |       -> /nw:networks/network/network-id
                +--rw path-element* [path-element-id]
                   +--rw path-element-id              uint32
                   +--rw (type)?
                      +--:(numbered-link-hop)
                      |  +--rw numbered-link-hop
                      |     +--rw link-tp-id    te-tp-id
                      |     +--rw hop-type?     te-hop-type
                      |     +--rw direction?    te-link-direction
                      +--:(unnumbered-link-hop)
                         +--rw unnumbered-link-hop
                            +--rw link-tp-id    te-tp-id
                            +--rw node-id       te-node-id
                            +--rw hop-type?     te-hop-type
                            +--rw direction?    te-link-direction
```

Nodes with switching limitations

```
module: ietf-te-topology
  augment /nw:networks/nw:network/nw:network-types:
    +--rw te-topology!
  augment /nw:networks/nw:network/nw:node:
    +--rw te-node-id?   te-types:te-node-id
    +--rw te!
       +--rw te-node-attributes
          +--rw connectivity-matrices
             +--rw number-of-entries?     uint16
             +--rw is-allowed?            boolean
             +--rw connectivity-matrix* [id]
                +--rw id                  uint32
                +--rw from
                |  +--rw tp-ref?               leafref
                +--rw to
                |  +--rw tp-ref?               leafref
                +--rw is-allowed?            boolean
```

Technology-specific Augmentations Option 1



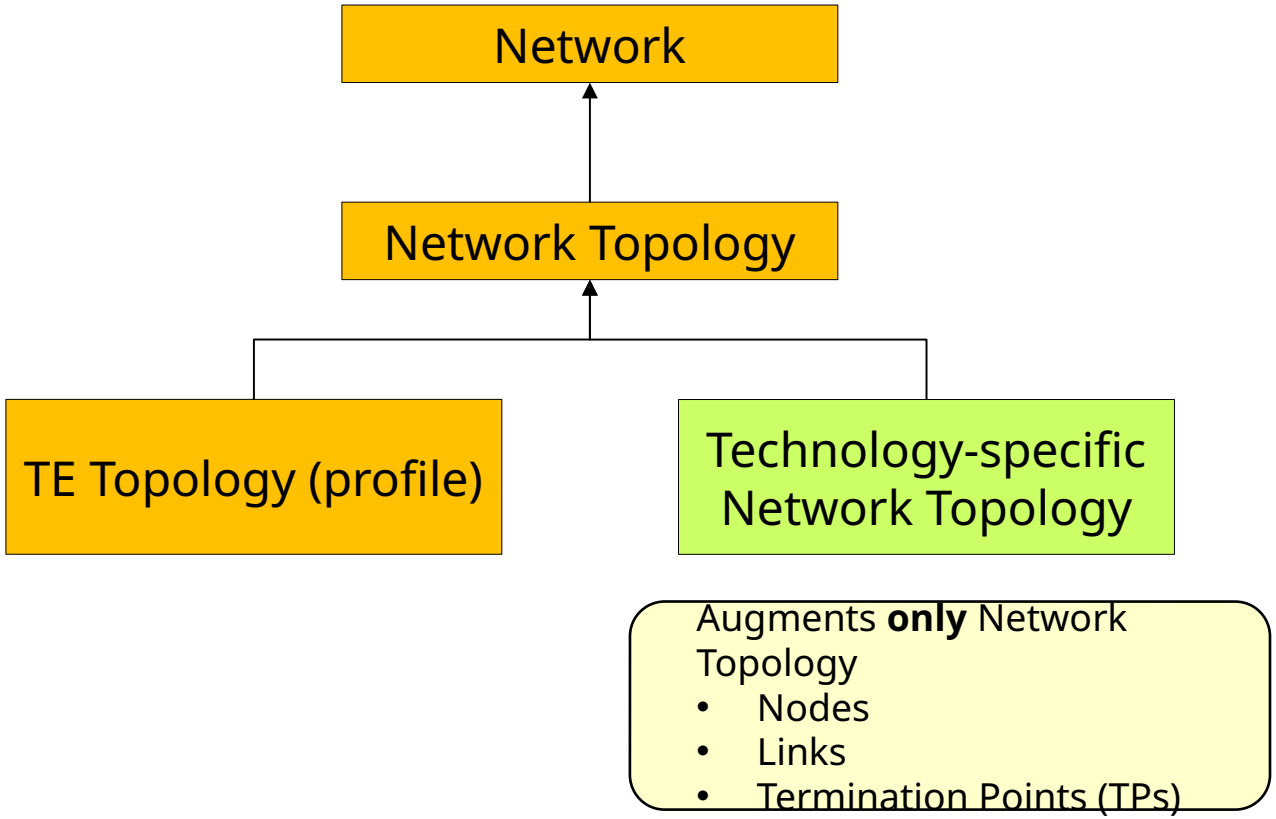
Augments Network Topology:

- Nodes
- Links
- Termination Points (TPs)

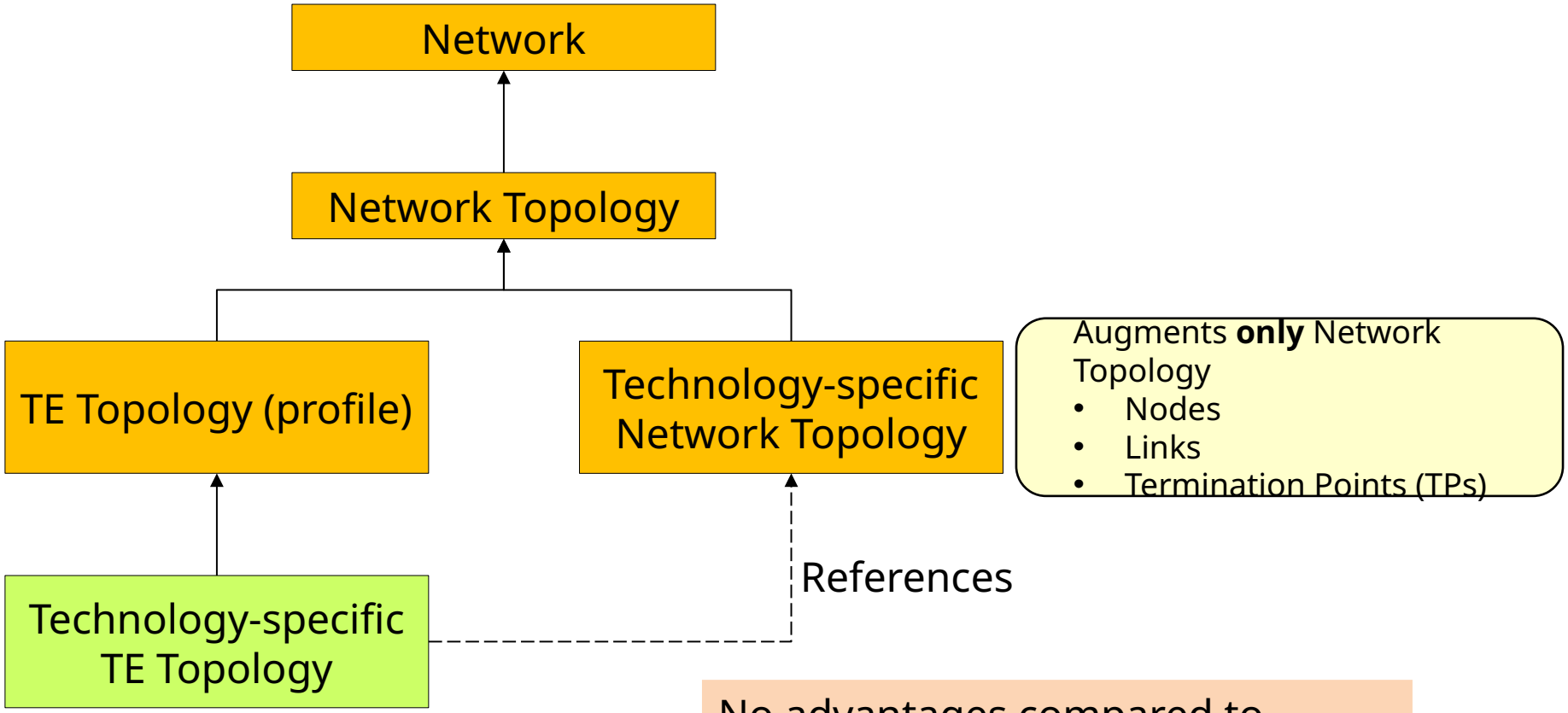
Augment **also** TE Topology:

- Bandwidth
- Tunnel Termination Points (TTPs)
- Connectivity Matrix

Technology-specific Augmentations Option 2



Technology-specific Augmentations Option 3



No advantages compared to Option 1

Useful only if the Technology-specific Network Topology already

Example: Technology-specific Augmentations (Link)

```
+--rw link* [link-id]
   +--rw link-id              link-id
   <...>
   +--rw example-link-attributes        // augment TE (Option 1) OR
   |   <...>      // augment NT (Option 2 or 3)
   +--rw te!
      +--rw te-link-attributes
         +--rw name?                                string
         +--rw example-te-link-attributes  // augment TE (Option 1 or 3)
         |   <...>
         +--rw max-link-bandwidth
            +--rw te-bandwidth
               +--rw (technology)?
                  +--:(generic)
                  |  +--rw generic?   te-bandwidth
                  +--:(foo)      // augment TE (Option 1 or 3)
                     +--rw foo?         foo-bandwidth
```