

A YANG Data Model for WDM Tunnels

draft-ietf-ccamp-wdm-tunnel-yang-02

Co-authors:

Aihua Guo (Futurewei)

Sergio Belotti (Nokia)

G. Galimberti (Individual)

J.E.L.d.V. Mendez (Naudit HPCN)

D.P. Burrero (Universidad
Autonoma de Madrid)

Contributors:

Daniel King (Olddog Consulting)

Haomian Zheng (Huawei)

Italo Busi (Huawei)

Victor Lopez (Nokia)

Contributors:

Dieter Beller (Nokia)

Ricard Vilalta (CTTC)

Young Lee (Samsung)

Bin Yeong Yoon (ETRI)

Daniel Michaud Vallinoto (Universidad Autonoma de
Madrid)

Zafar Ali (Cisco)

Esther Le Rouzic (Orange)

Julien Meuric (Orange)

Gert Grammel (Juniper)

Roberto Manzotti (Cisco)

Summary of Updates in -02

- Contains update for both YANG model and draft text
- Updates on YANG model
 - Imported latest changes in l0-types and ietf-te updates
 - Use transceiver-id as the key for transceiver list, also renamed lane-id to otsi-carrier-id, to align with the definition in l0-types and optical-impairment;
 - Addressed the relationship between TE LSP and E2E media channel
 - Report BER and Q-factor with timestamp information in the transceiver state
 - Also moved g-snr constraint configuration and estimated g-snr under the transceiver
- Updates on draft text
 - Enriched the introduction section with background regarding the use cases for the WDM tunnel
 - Added section to describe the applicability of WDM tunnel to both integrated and external (pluggable) transponders
 - Target is to use this model at NBI level to support WDM tunnel/tunnel segment provisioning for both integrated transponder (e2e) and remote transponder (book-ended).

Transceiver Modelling

Tunnel-scope transceiver constraints

```
augment /te:te/te:tunnels/te:tunnel:
  +--rw wdm-constraint
  +--rw transceiver-constraint
  |   +--rw operational-modes*          string
  |   +--rw otsi-carrier-frequency?    10-types:frequency-thz
  |   +--rw tx-tune-constraints
  |   |   +--rw min-central-frequency?  frequency-thz
  |   |   +--rw max-central-frequency?  frequency-thz
  |   |   +--rw transceiver-tunability? frequency-ghz
  |   +--rw line-coding-bitrate*       identityref
  |   +--rw tx-channel-power?          10-types:power-dbm
  |   +--rw preferred-rx-channel-power? 10-types:power-dbm
  |   +--rw gsnr-extra-margin?         snr
  +--rw use-regen?                     boolean
  +--rw wavelength-conversion?         boolean
  +--rw wavelength-assignment?        identityref
  +--rw guard-band-size?              10-types:frequency-thz
  +--rw matching-fwd-rev-wavelength?  boolean
  +--rw allow-retuning?               boolean
  +--rw delta-power?                  10-types:power-ratio
```

Path-scope transceiver configurations for starting/terminating/regen transceivers

```
augment /te:te/te:tunnels/te:tunnel/te:primary-paths
  /te:primary-path/te:explicit-route-objects
  /te:route-object-exclude-always/te:type
  /te:numbered-node-hop/te:numbered-node-hop:
  +--rw path-in-transceiver
  |   +--rw transponder-id?            uint32
  |   +--rw transceivers* [transceiver-id]
  |   |   +--rw transceiver-id        uint32
  |   |   +--rw otsi-carrier-id?      uint16
  |   |   +--rw operational-modes*    string
  |   |   +--rw otsi-carrier-frequency? 10-types:frequency-thz
  |   |   +--rw tx-tune-constraints
  |   |   |   +--rw min-central-frequency? frequency-thz
  |   |   |   +--rw max-central-frequency? frequency-thz
  |   |   |   +--rw transceiver-tunability? frequency-ghz
  |   |   +--rw line-coding-bitrate*   identityref
  |   |   +--rw tx-channel-power?      10-types:power-dbm
  |   |   +--rw preferred-rx-channel-power? 10-types:power-dbm
  |   |   +--rw gsnr-extra-margin?     snr
  |   +--rw path-out-transceiver
  |   |   +--rw transponder-id?        uint32
  |   |   +--rw transceivers* [transceiver-id]
  |   |   |   +--rw transceiver-id    uint32
  |   |   |   +--rw otsi-carrier-id?  uint16
  |   |   |   +--rw operational-modes* string
  |   |   |   +--rw otsi-carrier-frequency? 10-types:frequency-thz
  |   |   |   +--rw tx-tune-constraints
  |   |   |   |   +--rw min-central-frequency? frequency-thz
  |   |   |   |   +--rw max-central-frequency? frequency-thz
  |   |   |   |   +--rw transceiver-tunability? frequency-ghz
  |   |   |   +--rw line-coding-bitrate*   identityref
  |   |   |   +--rw tx-channel-power?      10-types:power-dbm
  |   |   |   +--rw preferred-rx-channel-power? 10-types:power-dbm
  |   |   |   +--rw gsnr-extra-margin?     snr
```

Transceiver Modelling (cont.)

Transceiver state on computed path

```
augment /te:te/te:tunnels/te:tunnel/te:primary-paths
  /te:primary-path/te:computed-paths-properties
  /te:computed-path-properties/te:path-properties
  /te:path-route-objects/te:path-route-object/te:type
  /te:numbered-node-hop/te:numbered-node-hop:
+--ro path-in-transceiver
|  +--ro transponder-id?   uint32
|  +--ro transceivers* [transceiver-id]
|    +--ro otsi-carrier-id?   uint16
|    +--ro transceiver-id     uint32
|    +--ro otsi-carrier-frequency? union
|    +--ro rx-channel-power?  power-dbm-or-null
|    +--ro rx-total-power?    power-dbm-or-null
|    +--ro estimated-gsnr?    snr
|    +--ro estimated-eol-gsnr? snr
|    +--ro estimated-lowest-gsnr? snr
+--ro path-out-transceiver
  +--ro transponder-id?   uint32
  +--ro transceivers* [transceiver-id]
    +--ro otsi-carrier-id?   uint16
    +--ro transceiver-id     uint32
    +--ro otsi-carrier-frequency? union
    +--ro rx-channel-power?  power-dbm-or-null
    +--ro rx-total-power?    power-dbm-or-null
    +--ro estimated-gsnr?    snr
    +--ro estimated-eol-gsnr? snr
    +--ro estimated-lowest-gsnr? snr
```

Transceiver state on established TE LSP

```
augment /te:te/te:lsp/te:lsp/te:lsp-actual-route-information
  /te:lsp-actual-route-information/te:type
  /te:numbered-node-hop/te:numbered-node-hop:
+--ro path-in-transceiver
|  +--ro transponder-id?   uint32
|  +--ro transceivers* [transceiver-id]
|    +--ro otsi-carrier-id?   uint16
|    +--ro transceiver-id     uint32
|    +--ro otsi-carrier-frequency? union
|    +--ro rx-channel-power?  power-dbm-or-null
|    +--ro rx-total-power?    power-dbm-or-null
|    +--ro pre-fec-ber
|      +--ro timestamp?  yang:timestamp
|      +--ro value?     decimal64
|    +--ro q-factor
|      +--ro timestamp?  yang:timestamp
|      +--ro value?     10-types:decimal-2-or-null
+--ro path-out-transceiver
  +--ro transponder-id?   uint32
  +--ro transceivers* [transceiver-id]
    +--ro otsi-carrier-id?   uint16
    +--ro transceiver-id     uint32
    +--ro otsi-carrier-frequency? union
    +--ro rx-channel-power?  power-dbm-or-null
    +--ro rx-total-power?    power-dbm-or-null
    +--ro pre-fec-ber
|    +--ro timestamp?  yang:timestamp
|    +--ro value?     decimal64
  +--ro q-factor
    +--ro timestamp?  yang:timestamp
    +--ro value?     10-types:decimal-2-or-null
```

Modelling the Relationship between TE LSP and Optical Media Channel

- Discussed under issue [#47](#).
 - An E2E media channel is defined as “a type of MC, which is formed by the serial concatenation of all the MCs from source transceiver media ports to destination transceiver media ports.” See Section 2.3.3 of draft-ietf-ccamp-optical-impairment-topology
 - Depending on whether 3R regens are deployed or not on working or protection path, or both, and depending on whether the 3R deployment is unidirectional or not, the number of e2e-mc-paths and OTSis are also different.
 - The number of LSPs per WDM tunnel is implementation specific depending on whether the LSP is contiguous or stitching (RFC5150 and RFC5151). A TE LSP may traverse one or multiple regenerator nodes along the path.
- Therefore, it was agreed that **there does not exist a simple 1:1 mapping** between the lsp-id and e2e-mc-path-id. The best way to move forward is to add a mapping of lsp-id to e2e-mc-path-id on the LSP reporting in the WDM tunnel model.
- It was further agreed that the mapping should be contained within each link hop of an LSP. One LSP link hop can be mapped to more than one e2e-mc-path-id. The YANG model should be updated accordingly.

```
augment /te:te/te:lsp/te:lsp-actual-route-information
  /te:lsp-actual-route-information/te:type
  /te:numbered-link-hop/te:numbered-link-hop:
  +---ro e2e-mc-path-id*   uint16
```

```
augment /te:te/te:lsp/te:lsp-actual-route-information
  /te:lsp-actual-route-information/te:type
  /te:unnumbered-link-hop/te:unnumbered-link-hop:
  +---ro e2e-mc-path-id*   uint16
```

Open Issues

- Draft text needs further refinement to describe e.g. the steps for WDM tunnel provisioning and maintenance, and to align with the YANG model changes
- Possible impact from L0/L1 boundary issue discussion
 - E.g. provisioning OTU types, OTU/ODU payload handling on OTU-supported transceivers
- In the case of remote DWDM interface hosted in packets devices the expectation is to adopt the model as NBI for both IP and Optical controllers. Further gap analysis is needed to ensure this model can cover all the scenarios

Next Steps and Actions

- Address the open issues
- Align the modeling changes with WDM path computation (reuse the same grouping)
- Seek feedbacks from the WG

Weekly team meeting:

Thursday, 14:00 (CET)

CCAMP WebEx Details

<https://ietf.webex.com/ietf/j.php?MTID=ma1ca3bcec716fe1ff93e0a28b3558294>

Join by meeting number

Meeting number (access code): 2422 698 1495

Meeting password: 6UbM2tEJd6

Thank you!