

A YANG Data Model for WDM Tunnels

[draft-bgk-ccamp-merged-wdm-tunnel-00](#)

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)

Contributors:

Victor Lopez (Nokia)

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)

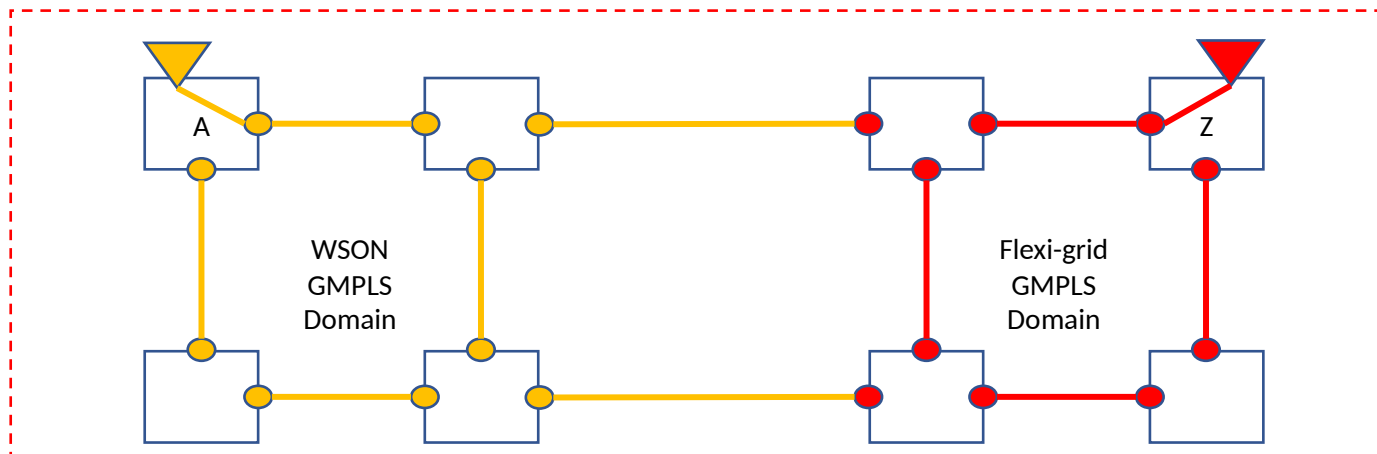
Julien Meuric (Orange)

Gert Grammel (Juniper)

Roberto Manzotti (Cisco)

Motivations

- Currently there are two separate WG drafts on WDM-related tunnel models
 - draft-ietf-ccamp-wson-tunnel for WSON fixed-grid wavelength switched optical networks
 - draft-ietf-ccamp-flexi-grid-tunnel for flexi-grid elastic optical networks
- Technology migration towards mixed WSON/flexi-grid optical networking
 - The YANG model needs to support scenarios where fixed-grid and flex-grid switches may co-exist in operator's networks
 - Shared definitions and model constructs between WSON and flexi-grid
- WG consensus to merge the two tunnel models into one common model



Logistics for Merging

- Create this new I-D, draft-bgk-merged-wdm-tunnel-00
- Asking WG to adopt it and replaces the two old WG drafts
- And...keep improving the draft following WG procedures

-00 Draft Update

- Updates to the text description to reflect a unified view of WDM tunnel models
 - The scope of this draft is to define data models for WDM tunnel provisioning in WSON, flexi-grid network or a mix of both networks
- Updates to the YANG model
 - Combined WSON and flexi-grid label-related structures (label-start-end, label-step, label-range, etc.)
 - Support both the integrated scenario and book-ended (OLS + external transponder, POI) scenario
 - Intending to reuse the same common grouping between WDM tunnel and optical path computation
- Updates to RFC9093-bis
 - Adding common WDM groupings
- Added new parameters to allow client to indicate WDM technology-specific constraints to influence path selections and WDM tunnel behaviour
 - Transceiver parameters (both tunnel- and path-scope), e.g. transceiver's operational mode
 - Optical impairment / performance constraints, e.g. G-SNR margin
 - WDM path constraints, e.g. wavelength conversion support, regeneration, transceiver retuning

Transceiver Parameters

Tunnel-scope

```
augment /te:te/te:tunnels/te:tunnel:  
  +--rw wdm-constraint  
    +--rw transceiver-constraint  
      | +--rw operational-modes*      string  
      | +--rw tx-tune-constraints  
      |   +--rw min-central-frequency?  frequency-thz  
      |   +--rw max-central-frequency?  frequency-thz  
      |   +--rw transceiver-tunability?  frequency-ghz
```

- Unified transceiver specifications for both integrated and OLS / POI scenarios
- Inverse multiplexing for 400G and above
- Transceiver specifications aligned with draft-ietf-ccamp-optical-impairment-topology

Path-scope

```
augment /te:te/te:tunnels/te:tunnel/te:primary-paths  
  /te:primary-path/te:explicit-route-objects-always  
  /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* [lane-id]  
    | | +--rw lane-id                uint8  
    | | +--rw transceiver-id?       uint32  
    | +--rw operational-modes*      string  
    | +--rw tx-tune-constraints  
    |   +--rw min-central-frequency?  frequency-thz  
    |   +--rw max-central-frequency?  frequency-thz  
    |   +--rw transceiver-tunability?  frequency-ghz  
  +--rw path-out-transceiver  
    +--rw transponder-id?          uint32  
    +--rw transceivers* [lane-id]  
    | +--rw lane-id                uint8  
    | +--rw transceiver-id?       uint32  
    +--rw operational-modes*      string  
    +--rw tx-tune-constraints  
      +--rw min-central-frequency?  frequency-thz  
      +--rw max-central-frequency?  frequency-thz  
      +--rw transceiver-tunability?  frequency-ghz
```

WDM Label Specifications

- WSON
 - DWDM fixed-grid and CWDM
- Flexi-grid
- Single vs. Multi-carrier

```
augment /te:te/te:globals/te:named-path-constraints
  /te:named-path-constraint
  /te:explicit-route-objects-always
  /te:route-object-include-exclude/te:type/te:label
  /te:label-hop/te:te-label/te:technology:
+--:(wdm)
  +--rw (grid-type)?
  +--:(fixed-dwdm)
  | +--rw (fixed-single-or-super-channel)?
  |   +--:(single)
  |   | +--rw dwdm-n?          l0-types:dwdm-n
  |   +--:(multi)
  |     +--rw subcarrier-dwdm-n* l0-types:dwdm-n
  +--:(cwdm)
  | +--rw cwdm-n?          l0-types:cwdm-n
  +--:(flexi-grid)
  +--rw (single-or-super-channel)?
  +--:(single)
  | +--rw flexi-n?          l0-types:flexi-n
  | +--rw flexi-m?          l0-types:flexi-m
  x--:(super)
  | +--rw subcarrier-flexi-n* [flexi-n]
  |   +--rw flexi-n          l0-types:flexi-n
  |   +--rw flexi-m?         l0-types:flexi-m
  +--:(multi)
  +--rw frequency-slots
  +--rw frequency-slot* [flexi-n]
  +--rw flexi-n          l0-types:flexi-n
  +--rw flexi-m?         l0-types:flexi-m
```

WDM Constraints for Path Selection

```
+--rw gsnr-margin?          snr
+--rw use-regen?            boolean
+--rw wavelength-conversion? boolean
+--rw bit-stuffing?         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:gain-in-db-or-null
```

- Same constraints definition reused for optical path computation
- Align with optical impairment draft regarding the type of delta-power

Next Steps and Actions

- Request WG adoption to replace the WSON and flexi-grid tunnel draft
- Align this model with the model defined in draft-ietf-optical-path-computation
- Align this model with the model defined in draft-ietf-ccamp-optical-impairment, especially on the association between WDM tunnel Isps and OTSi/e2e-mc-path-id
- Address remaining open issues for WSON and flexi-grid tunnel

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