A Yang Data Model for Optical Impairment-aware Topology

draft-ietf-ccamp-optical-impairment-topology-yang-01

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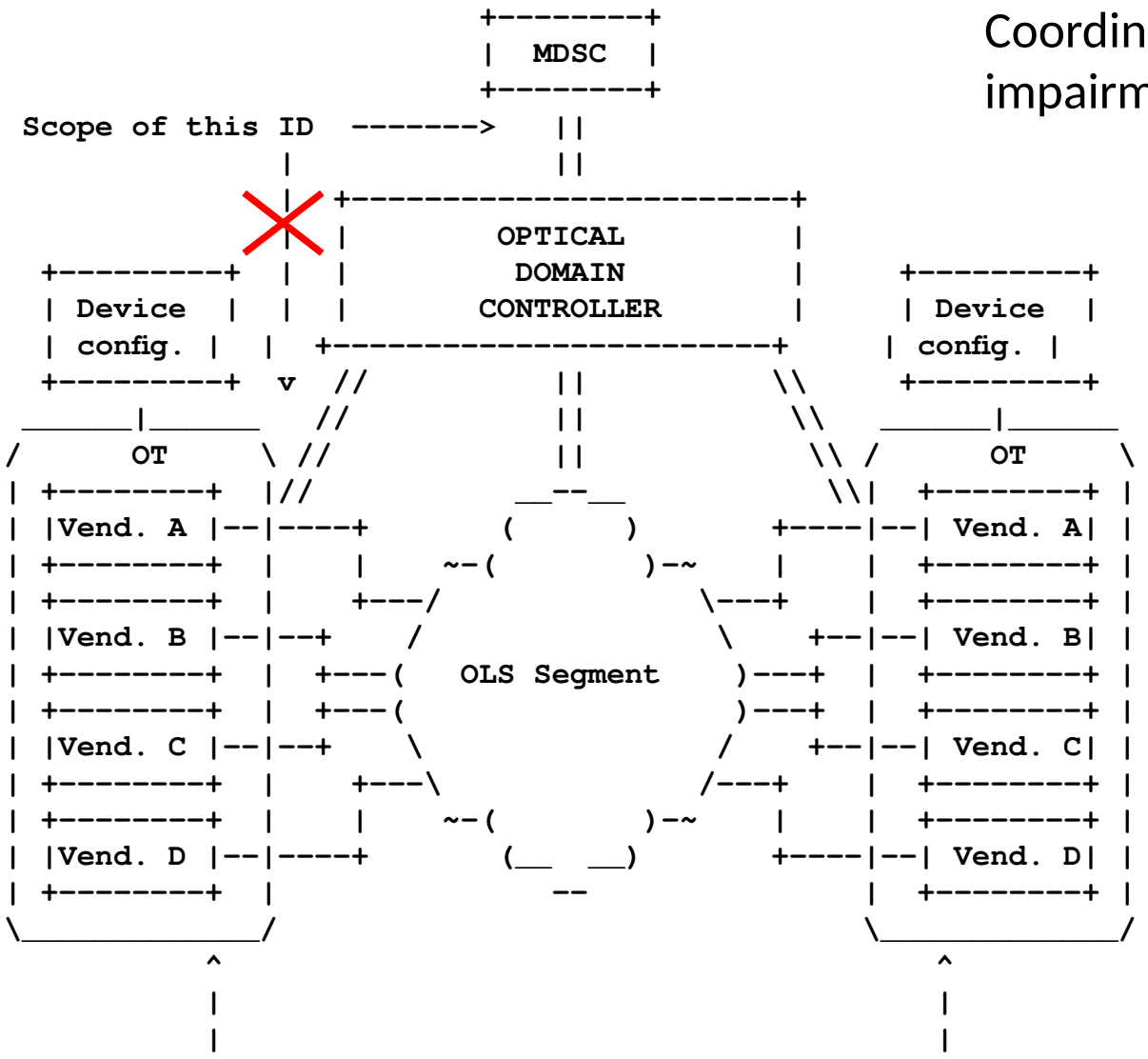
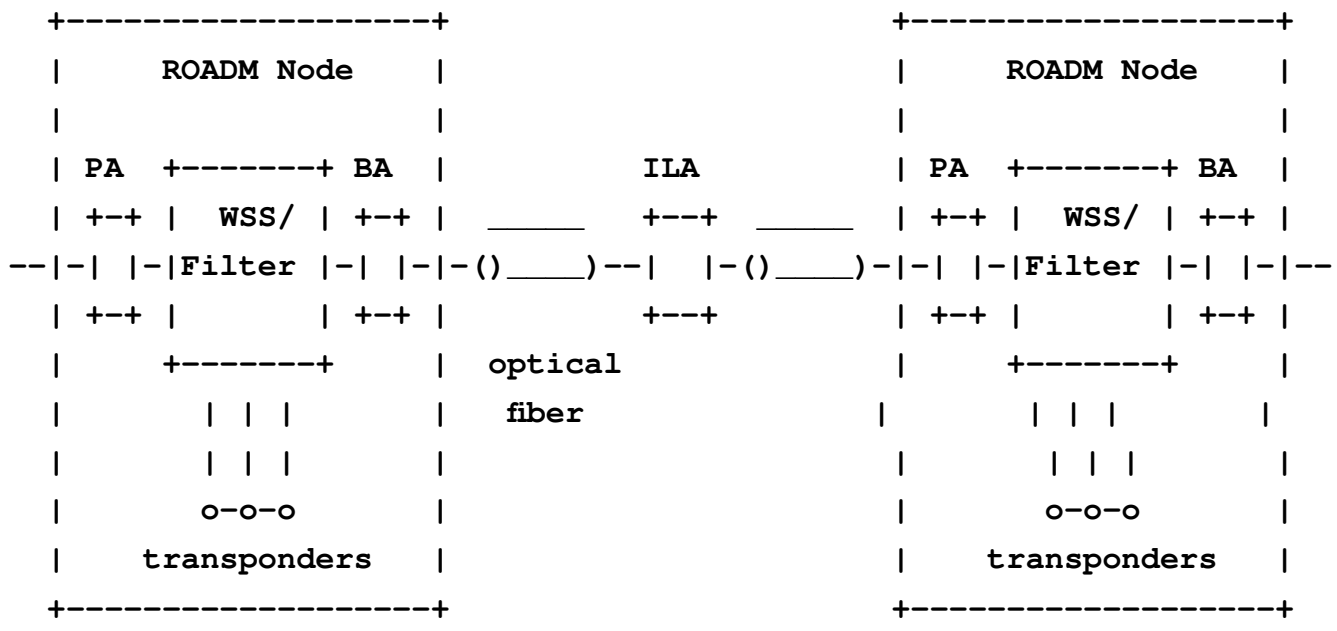
Scope of the document



The intent of this document is to provide a Yang data model, which can be utilized by an Multi Domain Service Coordinator (MDSC) to collect states of WSON/SSON impairment aware topology data from the Transport PNCs

- This draft is a network topology model (that has a larger scope than interface model)
- draft-ietf-ccamp-dwdm-if-param-yang is an interface model.
- These two drafts are complementary and full consistency will be ensured at the WG level.
- Ietf-ccamp-layer0-types already contains groupings/types.

Reference Architecture



PA: Pre-Amplifier

BA: Booster Amplifier

ILA: In-Line Amplifier

Major Changes since IETF 104

- Aligned the co-authors – contributors header list to the IETF rules
- Updated reference documents
- Fixed Figures in ascii
- Added Media Channel (MC) and Media Channel Group (MCG) definitions
- Added OTSi – OTSiG interpretation from G.959.1 and G.807
- Added new parameters and reviewed existing

ITU-T contribution to SG15 Q6&Q12/15

- Multi-company contribution submitted to highlight the problem identified in the draft about the definition of OTSi and his relationship with OTSiG
  - OTSi is defined as consisting of “a single modulated optical carrier or a group of modulated optical carriers or subcarriers” (section 3.2.4 of G.959.1)
  - OTSiG is defined as “the set of OTSi signals that supports a single digital client”
    - The OTSiG definition has been recently moved from G.709 to the G.807 (former G.media)
  - The relationship between OTSiG and OTSi is described in G.807 such as an OTSiG is “a group of one or more OTSi that carry the digital information stream (CI) of one client” ▭ relationship cardinality between the two entities is in general 1:N
  - A typical application of an OTSiG consisting of more than one OTSi is inverse multiplexing
  - One level of inverse multiplexing is already implicit in the relationship between OTSiG and OTSi ▭ no reason to create a second level of potential inverse multiplexing defining OTSi as carrying multiple carriers
  - **Proposed to update G.959.1 and restrict the OTSi to be a single modulated carrier**

Feedbacks from SG15 Q6&Q12/15 and impact on the draft

1. Q6 rejected to change text in G.959.1 and mandate Q12 and G.807 to clarify the OTSi definition
2. Q12 clarifies that even if an OTSi could in principle be a multi-carrier modulated signal, the key distinguishing factor is that the OTSi carriers are managed as a single entity:
   - "The OTSi is carried by a network media channel. Even in the case where the OTSi consists of a group of modulated optical carriers or subcarriers, these multiple optical carriers or subcarriers are carried in a single network media channel and the OTSi is managed as a single entity within the media network."
   - https://www.ietf.org/lib/dt/documents/LIAISON/liaison-2019-07-18-itu-t-sg-15-ccamp-ls-on-description-of-otsi-and-network-media-channel-attachment-1.pdf
3. It is possible to manage each carrier individually as multiple OTSi'es within one common MC

Feedbacks from SG15 Q6&Q12/15 and impact on the draft

- Base on the # 3 **the current Yang model is aligned to the G. 807**

- **Based on the above the models assumptions are:**
  - **A single modulated optical carrier is modelled as an OTSi**
  - **The carrier frequency may not be on the ITU-T grid**
  - **Media Channel can contain multiple OTSis**

- The only pending issue is about spectrum efficiency
  - OTSi is 1:1 associated with a NMC and the NMC, like any other MC, has a frequency slot on the ITU-T grid (i.e., defined by n and m parameters) so multiple OTSi cannot be placed closer together in order to optimize the spectrum utilization
- Need to continue working within ITU-T to address the pending issues

Yang Model (Part 1)

```
module: ietf-optical-impairment-topology
  augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
    +--rw optical-impairment-topology!
  augment /nw:networks/nw:network/nt:link/tet:te/tet:te-link-
attributes:
    +--ro OMS-attributes
       +--ro generalized-snr?                          decimal64
       +--ro equalization-mode                         identityref
       +--ro (power-param)?
       |  +--:(channel-power)
       |  |  +--ro nominal-channel-power?              decimal64
       |  +--:(power-spectral-density)
       |     +--ro nominal-power-spectral-density?     decimal64
       +--ro media-channel-group* [i]
       |  +--ro i                   int16
       |  +--ro media-channels* [flexi-n]
       |     +--ro flexi-n       uint16
       |     +--ro flexi-m?      uint16
       |     +--ro OTSiG-ref?    leafref
       |     +--ro OTSi-ref?     leafref
       +--ro OMS-elements* [elt-index]
i
```

Yang Model (Part 2)

```
+--ro OMS-elements* [elt-index]
        +--ro elt-index    uint16
        +--ro uid?         string
        +--ro type         identityref
        +--ro element
           +--ro (element)?
              +--:(amplifier)
              |  +--ro amplifier
              |     +--ro type_variety    string
              |     +--ro operational
              |        +--ro actual-gain
              |        |       decimal64
              |        +--ro tilt-target
              |        |       decimal64
              |        +--ro out-voa
              |        |       decimal64
              |        +--ro in-voa
              |        |       decimal64
              |        +--ro (power-param)?
              |           +--:(channel-power)
              |           |  +--ro nominal-channel-power?
              |           |          decimal64
              |           +--:(power-spectral-density)
              |              +--ro nominal-power-spectral-density?
              |                      decimal64
              +--:(fiber)
              |  +--ro fiber
              |     +--ro type_variety    string
              |     +--ro length          decimal64
              |     +--ro loss_coef       decimal64
              |     +--ro total_loss      decimal64
              |     +--ro pmd?            decimal64
              |     +--ro conn_in?        decimal64
              |     +--ro conn_out?       decimal64
              +--:(concentratedloss)
                 +--ro concentratedloss
                    +--ro loss?   decimal64
```

Yang Model (Part 3)

```
augment /nw:networks/nw:network/nw:node/tet:te
          /tet:tunnel-termination-point:
   +--ro OTSiG-element* [OTSiG-identifier]
   |  +--ro OTSiG-identifier    int16
   |  +--ro OTSiG-container
   |     +--ro OTSi* [OTSi-carrier-id]
   |        +--ro OTSi-carrier-id           int16
   |        +--ro OTSi-carrier-frequency?   decimal64
   |        +--ro OTSi-signal-width?        decimal64
   |        +--ro channel-delta-power?      decimal64
   +--ro transponders-list* [transponder-id]
      +--ro transponder-id                   uint32
      +--ro (mode)?
      |  +--:(G.692.2)
      |  |  +--ro standard_mode?             layer0-types:standard-mode
      |  +--:(organizational_mode)
      |  |  +--ro operational-mode?
      |  |  |       layer0-types:operational-mode
      |  |  +--ro organization-identifier?
      |  |          layer0-types:vendor-identifier
      |  +--:(explicit_mode)
      |     +--ro available-modulation*      identityref
      |     +--ro modulation-type?           identityref
      |     +--ro available-baud-rates*      uint32
      |     +--ro configured-baud-rate?      uint32
      |     +--ro available-FEC*             identityref
      |     +--ro FEC-type?                  identityref
      |     +--ro FEC-code-rate?             decimal64
      |     +--ro FEC-threshold?             decimal64
      +--ro power?                           int32
      +--ro power-min?                       int32
      +--ro power-max?                       int32
 augment /nw:networks/nw:network/nw:node/tet:te
          /tet:tunnel-termination-point:
   +--ro transponder-list* [carrier-id]
      +--ro carrier-id    uint32
```

GitHub - Open Issues

- https://github.com/younglee-ietf/ietf-optical-impairment-yang/issues?q=is%3Aopen
- HAVE a LOOK !!!
- Total 24 issues: 12 closed from last interim meeting
- Most important OPEN issues are:
  - Available OTSi capabilities and configured property #12
  - Modeling of optical impairments for ROADMs #9
  - Modelling of 3R Regenerators #23

Next Steps

- Continue the interactions with ITU-T to improve the alignment of the models as closely as possible to the ITU-T definitions (see Liaison from ITU-T)
- Keep alignment with draft-ietf-ccamp-dwdm-if-param-yang
- Add 3R Regenerator models
- Maintain GitHub

Thank You!