

A Yang Data Model for Optical Impairment-aware Topology

draft-ietf-ccamp-optical-impairment-topology-yang-09

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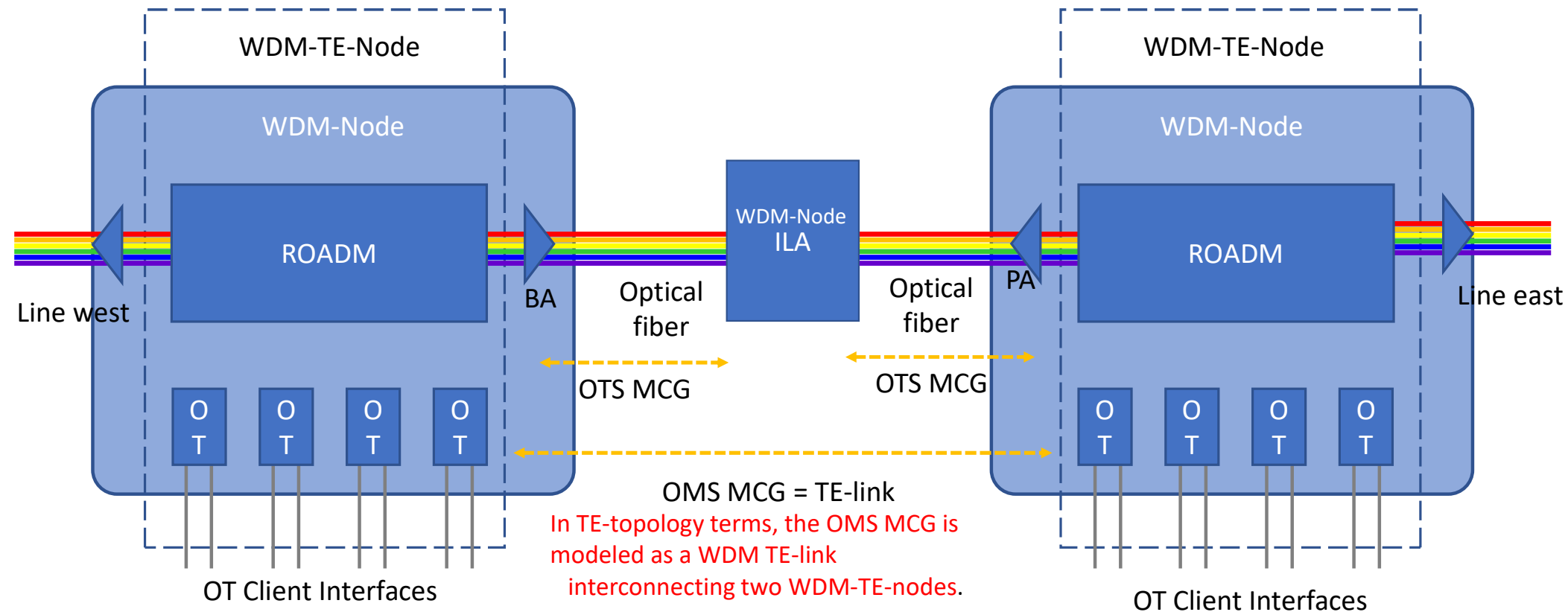
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Major Activities since IETF 112 Meeting

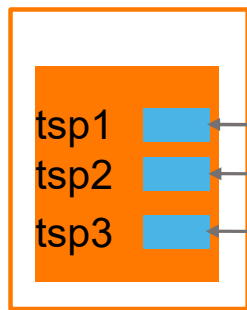
- Continuation of weekly CCAMP WebEx meetings (Tue, 2-3pm CET)
- Draft text update
 - Change front-page list addressing 5 front-page authors list
 - Text added in terminology section to clarify ROADM meaning, and introducing WDM-node, WDM-TE node to distinguish physical device form TE-node concept. (issue [#26](#))
 - Text added to section 2.3 replacing OMS/OTS Link with OMS/OTS Media Channel Group (MCG) in alignment with ITU-T Recommendations (G.872 and G.807) (issues [#101](#))
 - New text in section 2.4 to add the case of Raman amplification in the model (issue [#91](#))
 - Added text to clarify term “channel” vs. “media channel” (issue [#69](#))
- YANG model update fixing 4 issues ([#103](#), [#100](#), [#99](#) ,[#85](#)) while introducing Raman amplification feature ([#102](#))

Optical Transport network with new terminology



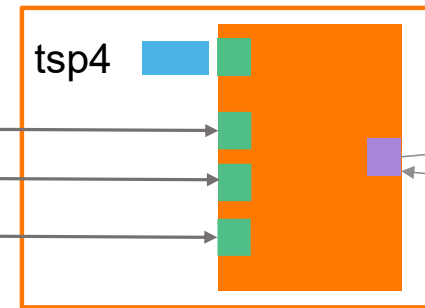
Issue [#86](#) : transponder external shelves

External shelf = WDM-TE-node



Links (OMS (list of media channels and OTSiG; list of elements (eg Loss;Fiber;Loss))

WDM-TE-node



Node (list of TTP with Transponder/transceiver and OTSiG reference; list of add-drop optical impairments)

Node (list of TTP with Transponder/transceiver and OTSiG reference; list of add-drop optical impairments)

- The impairments related to the link between remote optical transponders located in a different shelf from the ROADM itself, can also be modelled using the same optical impairments as those defined for a link between WDM-TE-node(s) (OMS).
- In the scenario the external shelf can be considered as WDM-TE-node with termination capability only (not switching)

Raman amplifier model issue [#102](#)

- Both **co-propagating** (optical pump signal is injected in the same direction of amplified signal) and **counter-propagating** (optical pump signal is injected in opposite direction to the optical signal that is amplified) have been modeled.
- Raman amplifier is distributed amplifier and is modeled as 2 OMS line “elements”:
 - A passive fiber element accounting for the fiber loss
 - An amplifier element providing all optical properties (gain, tilt, etc)
- Amplifier element is placed where the pump is located and the geolocation information also indicates the location of the pump.
- To figure out whether an optical amplifier is a Raman amplifier, the “type-variety” attribute is used.
- 2 attributes in the model (optional and only applicable for Raman amplifier) :
 - Raman-direction with respect to the signal that is amplified
 - Raman-pump list with related frequency and power.

YANG model – Raman amplifier and optical power

```
+--ro (element)
  +--:(amplifier)
  | +--ro geolocation
  | | +--ro altitude? int64
  | | +--ro latitude? geographic-coordinate-degree
  | | +--ro longitude? geographic-coordinate-degree
  | +--ro amplifier
  |   +--ro type-variety string
  |   +--ro operational
  |     +--ro amplifier-element* []
  |     .....
  |     +--ro total-output-power
  |       | IO-types:power-in-db-or-null
  |       +--ro raman-direction?
  |         | enumeration
  |         +--ro raman-pump* []
  |           +--ro frequency? IO-types:frequency-thz
  |           +--ro power?
  |             IO-types:decimal-2-digits-or-null
```

- Added “total-output-power” issue [#85](#) in the container "operational" in the grouping "amplifier-params“
- It represent total output power measured in the range specified by fmin and fmax . Optical power is especially needed to re-compute / check consistency of span (fiber+ concentrated loss) loss value, with respect to loss/gain information on elements.

Added Raman amplifier attributes

Use of union type with empty type issue [#99](#)

- To avoid unspecified behavior (e.g. mandatory value is not present for server problem and an inconsistency data is reported or even for optional to distinguish wrong report from not applicable cases)
In order to avoid these unspecified behaviors, it is proposed to explicitly use the empty type, so that if a mandatory data is not found the response should be of the empty type with "[null]" for json case in [RFC7951].
- In optical impairments model added the sentence in the module description:
 - if the value of a mandatory attribute is unknown, it MUST be reported using the empty type
 - If an optional attribute is applicable but its value is unknown, it MUST be reported using the empty type.
 - If an optional attribute is not applicable to an entity, it MUST be omitted (not be present in the datastore)
- YANG details in layer0-types-ext

Example usage of union type with empty type

module ietf-optical-impairment-topology

```
|   +--ro tilt-target
|   |   I0-types:decimal-2-digits-or-null
|   +--ro out-voa
|   |   I0-types:power-in-db-or-null
|   +--ro in-voa
|   |   I0-types:power-in-db-or-null
|   +--ro total-output-power
|   |   I0-types:power-in-db-or-null
```

module ietf-layer0-types

```
typedef power-in-db-or-null {
  type union {
    type power-in-db;
    type empty;
  }
  description
    "The power in dB, when it is
    known or
    an empty value when the
    power is not known.";
}
typedef power-in-db {
  type decimal-2-digits;
  units dB;
  description
    "The power in dB.";
}
```

```
typedef decimal-2-digits-or-null {
  type union {
    type decimal-2-digits;
    type empty;
  }
  description
    "A decimal64 value with two
    digits, when the value is known
    or an empty value when the
    value is not known.";
}
typedef decimal-2-digits {
  type decimal64 {
    fraction-digits 2;
  }
  description
    "A decimal64 value with two
    digits."; }
```


Open issues

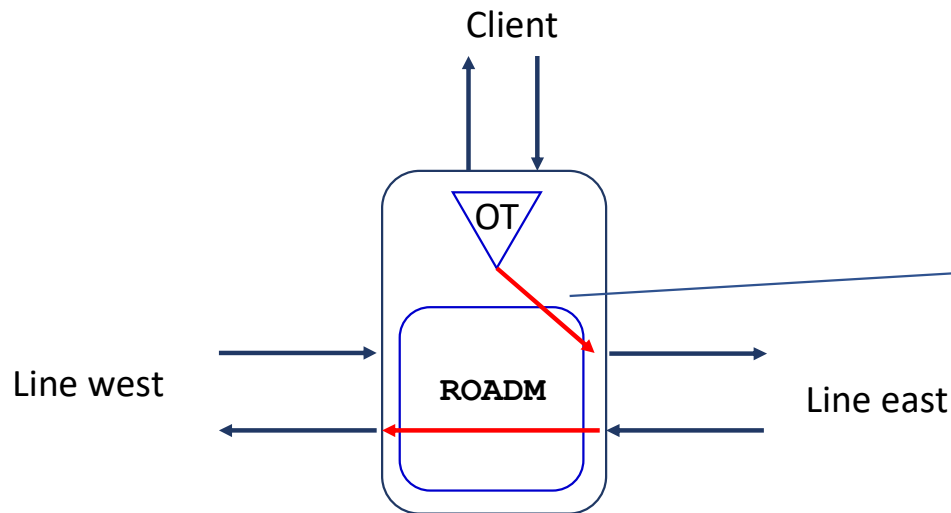
- Tracking Open Issues, discussions and resolutions linked to YANG model <https://github.com/ietf-ccamp-wg/draft-ietf-ccamp-optical-impairment-topology-yang/issues>:
- 9 issues closed since IETF-112
- Still 11 open issues
 - Issues #24, #38, #97, #98 will be solved with the next PR (already discussed and agreed)
 - The issue has been discussed and clarified. Text proposal is expecting [#88](#)
 - Issue #79 related to relative xpath in leafref needs clarification from NETMOD WG where the suggested solution using “ancestor” function of Xpath is still debated.
 - Review terminology [#25](#), [#95](#)
 - Pending enhancement of the model (#8)
 - YANG model development process improvement on github (#71)
 - Analysis is ongoing [#106](#)
- <https://github.com/ietf-ccamp-wg>

Next Steps

- The model is in very good shape : analyze possible needed enhancement covering new feature requirement
- Addressing the issues still on the list
- Be ready for YANG doctor review
- Stable version by end of the year (IETF-115)

backup

Impairments attributes on LLCL



TTP local link connectivity would provide the impairments of the ROADM add/drop paths towards the 3R.

```
• +--rw tunnel-termination-point* [tunnel-tp-id]
•   +--rw tunnel-tp-id                binary
•   .....
•   +--rw local-link-connectivities
•     | +--rw number-of-entries?      uint16
•     | .....
•     | +--rw is-allowed?             boolean
•     | .....
•     | +--ro path-properties
•     | | .....
•   /* ADD (Start) */
•     | +--ro add-path-impairments    leafref
•     | +--ro drop-path-impairments  leafref
•   /* ADD (End) */
•     | +--rw local-link-connectivity* [link-tp-ref]
•     | +--rw link-tp-ref
•     | |   -> ../../../../nt:termination-point/tp-id
•     | .....
•     | +--rw is-allowed?             boolean
•     | .....
•     | +--ro path-properties
•     | | .....
•   /* ADD (Start) */
•     | +--ro add-path-impairments    leafref
•     | +--ro drop-path-impairments  leafref
•   /* ADD (End) */
```