

A Yang Data Model for Optical Impairment-aware Topology

[draft-ietf-ccamp-optical-impairment-topology-yang-08](#)

Co-authors (frontpage):

- Young Lee (SKKU)
- Jean Luc Auge (Orange)
- Victor Lopez (Nokia)
- Gabriele Galimberti (Cisco)
- Dieter Beller (Nokia)

Co-authors:

- Haomian Zheng (Huawei)
- Italo Busi (Huawei)
- Nicola Sambo (Scuola superior S.Anna)
- Julien Meuric (Orange)
- Esther Le Rouzic (Orange)
- Sergio Belotti (Nokia)
- Enrico Griseri (Nokia)
- Gert Grammel (Juniper)

Contributors

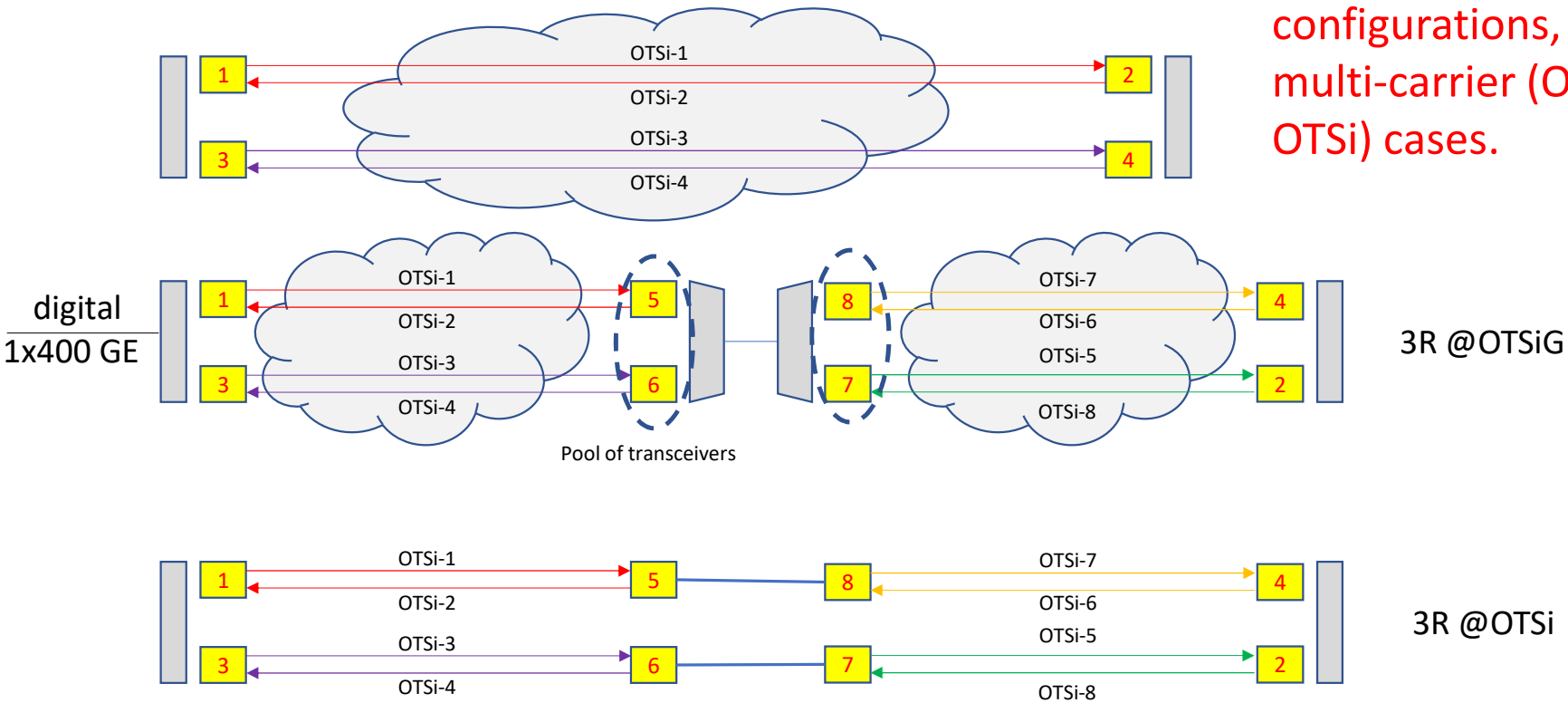
- Jonas Martenson (RISE)
- Aihua Guo (Futurewei)

Major Activities since IETF 111 Meeting

- Continuation of weekly CCAMP WebEx meetings (Tue, 2-3pm CET)
- Draft text update
 - Text added to section 2.3.1 to clarify the need to know the existing OTSi signals for each OMS link (issue [#89](#))
 - Text added to section 2.3 OMS Media Links and 2.5 Transponders, to clarify the bidirectionality of both link termination point (LTP) and tunnel termination point (TTP) (issues [#77](#))
 - Text added to section 2.4 about geolocation information (issue [#70](#))
- YANG model update resolving issue [#83](#) regarding modeling of 3R regenerators
 - Fixed issues: [#42](#), [#55](#), [#56](#), [#57](#), [#72](#), [#74](#), [#75](#), [#76](#)

Solved “pending” Issue #83 (1): How to connect transceivers in 3R ?

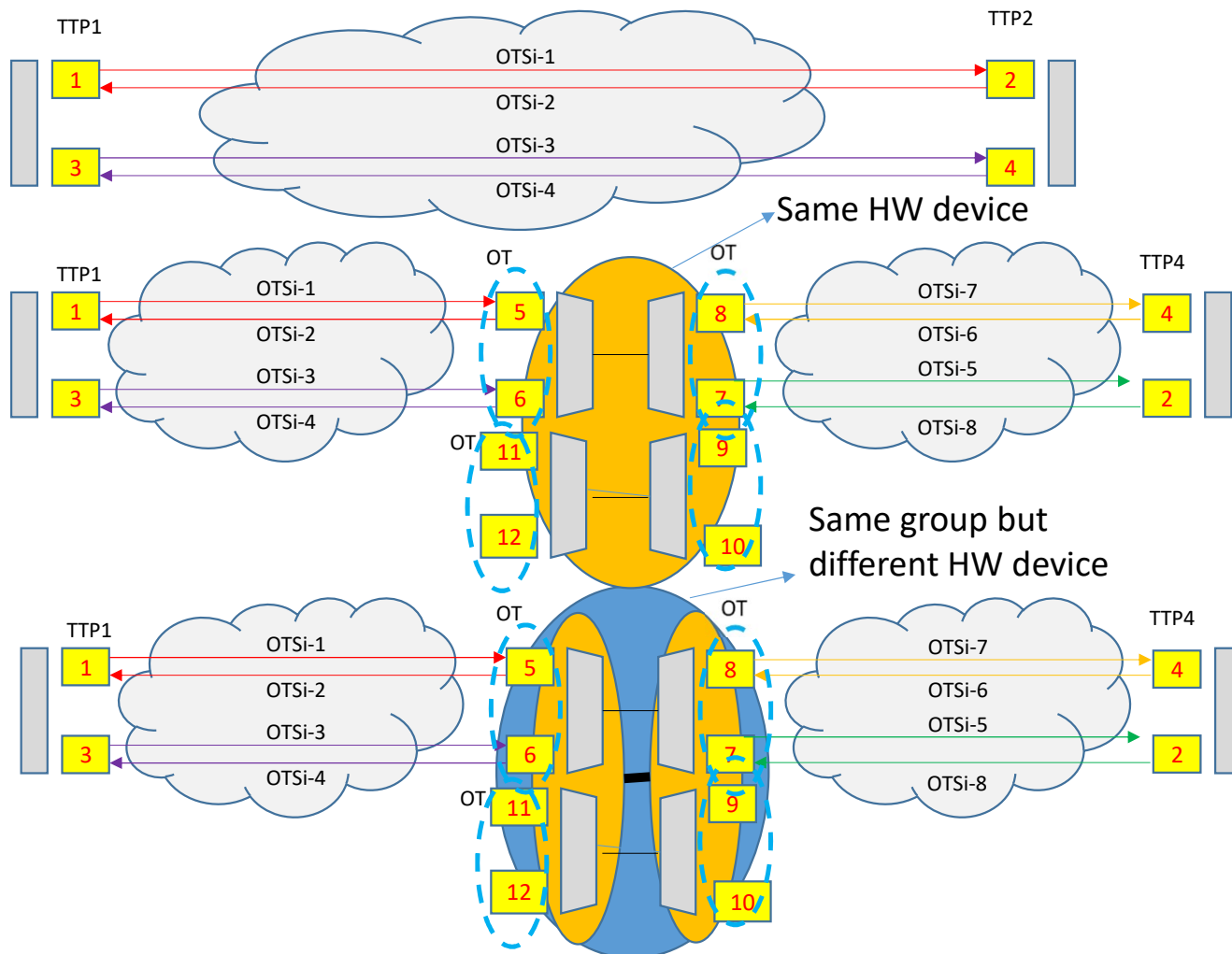
Problem: how to associate transceivers used in a 3R configurations, in case of multi-carrier (OTSiG with >1 OTSi) cases.



Solved “pending” Issue #83(2): transceivers association assumptions

- After detailed discussions, the basic conclusion was to model this connectivity taking into consideration primarily the real physical constraints in the equipment at the node level. The main assumptions are:
 1. We define “groups” created at transponder level (not transceivers)
 2. Any group represents a set of transponders where electrical connectivity is either in place (pre-provisioned) or could be dynamically provisioned to associate transponders used for 3R regeneration
 3. A regen-metric cost attribute has been added allowing to express preference among different groups during path computation.
 4. There are no constraints among transponders in the same group, that means, any transceiver can be connected with any other transceiver (provided that you connect inbound ltp to outbound ltp)
 5. The group is characterized by HW device characteristics, not to be exposed at NBI, but deduced by the controller e.g. at SBI.
 - Text describing examples how the model is applied to different 3R configurations will be added to the draft

Solved “pending” Issue #83(3)



In the orange oval is indicating that the entities are belonging to the same HW device

The OT used for 3R does not belong to the same HW device. Always 1 group, Hw devices are connected via cable. The related transponders are 3R only configuration, no optical tunnel termination

Solved “pending” Issue #83(4) : YANG model

augment /nw:networks/nw:network/nw:node:

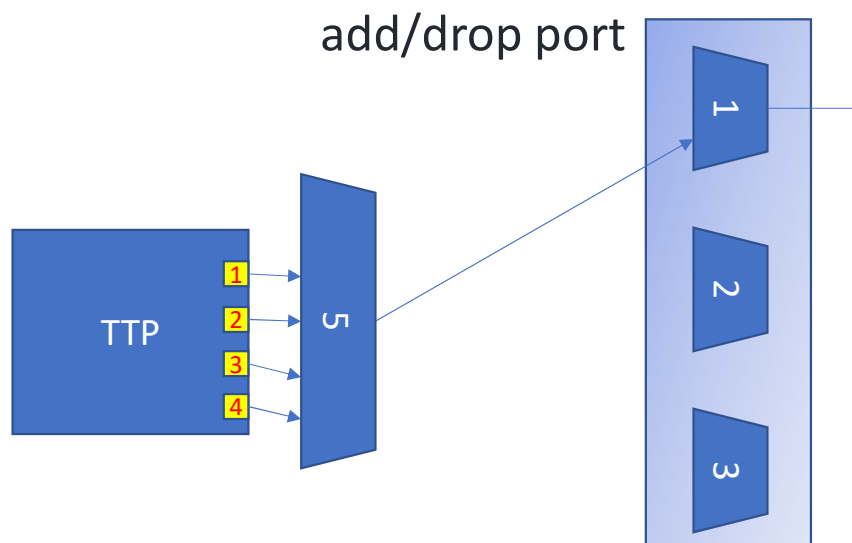
```
+--ro transponder* [transponder-id]
| +--ro transponder-id          uint32
| +--ro termination-type-capabilities? enumeration
| +--ro supported-3r-mode?      enumeration
| +--ro transceiver* [transceiver-id]
|   +--ro transceiver-id        uint32
|   +--ro supported-modes
| .....
| .....
+--ro regen-group* [group-id]
  +--ro group-id                uint32
  +--ro regen-metric?           uint32
  +--ro transponder-ref* -> .././transponder/transponder-id
```

Is LLC per transponder or per transceivers?

Issue [#72](#) (1)

- In the model, a TTP can host one or more transceivers which can belong to one or more transponders.
- It also does not preclude that multiple TTPs point to the same transceiver.
- LLCL is used in the model to provide the impairments of the ROADM add-drop paths.
- The issue is that Local Link Connectivity List permits only one entry for any TTP-LTP pair, representing one set of optical impairments in the 2 directions (TTP→LTP and LTP→TTP)
- The model is now flexible enough to describe different optical impairments if needed for transceivers belonging to the same TTP/LTP pair in LLCL.

Is LLC per transponder or per transceivers? Issue [#72](#) (2)



- all the four transceivers of the transponder can only be connected to the LTP 1
- If they had different impairments, we would need to report 4 different set of optical impairments for each direction in one entry of LLC, which supports only one set for each direction.
- See in github other examples in [transceivers-llc-01-ppx](#)

11/7/2021

```
augment /nw:networks/nw:network/nw:node/tet:te
  /tet:tunnel-termination-point:
  +--ro ttp-transceiver* [transponder-ref transceiver-ref]
  +--ro transponder-ref
  |   -> ../../../../transponder/transponder-id
```

```
augment /nw:networks/nw:network/nw:node/tet:te
  /tet:tunnel-termination-point
  /tet:local-link-connectivities:
  +--ro add-path-impairments? leafref
  +--ro drop-path-impairments? leafref
  +--ro llc-transceiver* [ttp-transponder-ref ttp-
  transceiver-ref]
  +--ro ttp-transponder-ref
  |   -> ../../../../ttp-transceiver/transponder-ref
  +--ro ttp-transceiver-ref
  |   -> ../../../../ttp-transceiver/transceiver-ref
  +--ro is-allowed?          boolean
  +--ro add-path-impairments? leafref
  +--ro drop-path-impairments? leafref
```

IETF-112 on line meeting, November 2021

Other YANG extension (1)

- Added geolocation of amplifiers issue [#70](#)

```
+--ro (element)
  +--:(amplifier)
    | +--ro geolocation
    | | +--ro altitude?  int64
    | | +--ro latitude?  geographic-coordinate-degree
    | | +--ro longitude? geographic-coordinate-degree
```

- Added identification OTSi in reverse direction issue [#76](#)

```
+--ro outgoing-otsi
| | +--ro otsi-group-ref?
| | |   -> ../../../../otsi-group/otsi-group-id
| | +--ro otsi-ref?      leafref
+--ro incoming-otsi
| | +--ro otsi-group-ref?
| | |   -> ../../../../otsi-group/otsi-group-id
| | +--ro otsi-ref?      leafref
```

Other YANG extension (2)

Fixed issue [#74](#)

- Need to identify association between unidirectional link in case of parallel links between two nodes
- Need to associate OMS element in the reverse direction

```
+--ro OMS-elements* [elt-index]
  +--ro elt-index          uint16
  +--ro oms-element-uid?   string
  +--ro reverse-element-ref
  | +--ro link-ref?
  | |   -> ../../../../nt:link/link-id
  | +--ro oms-element-ref* leafref
```

Open issues

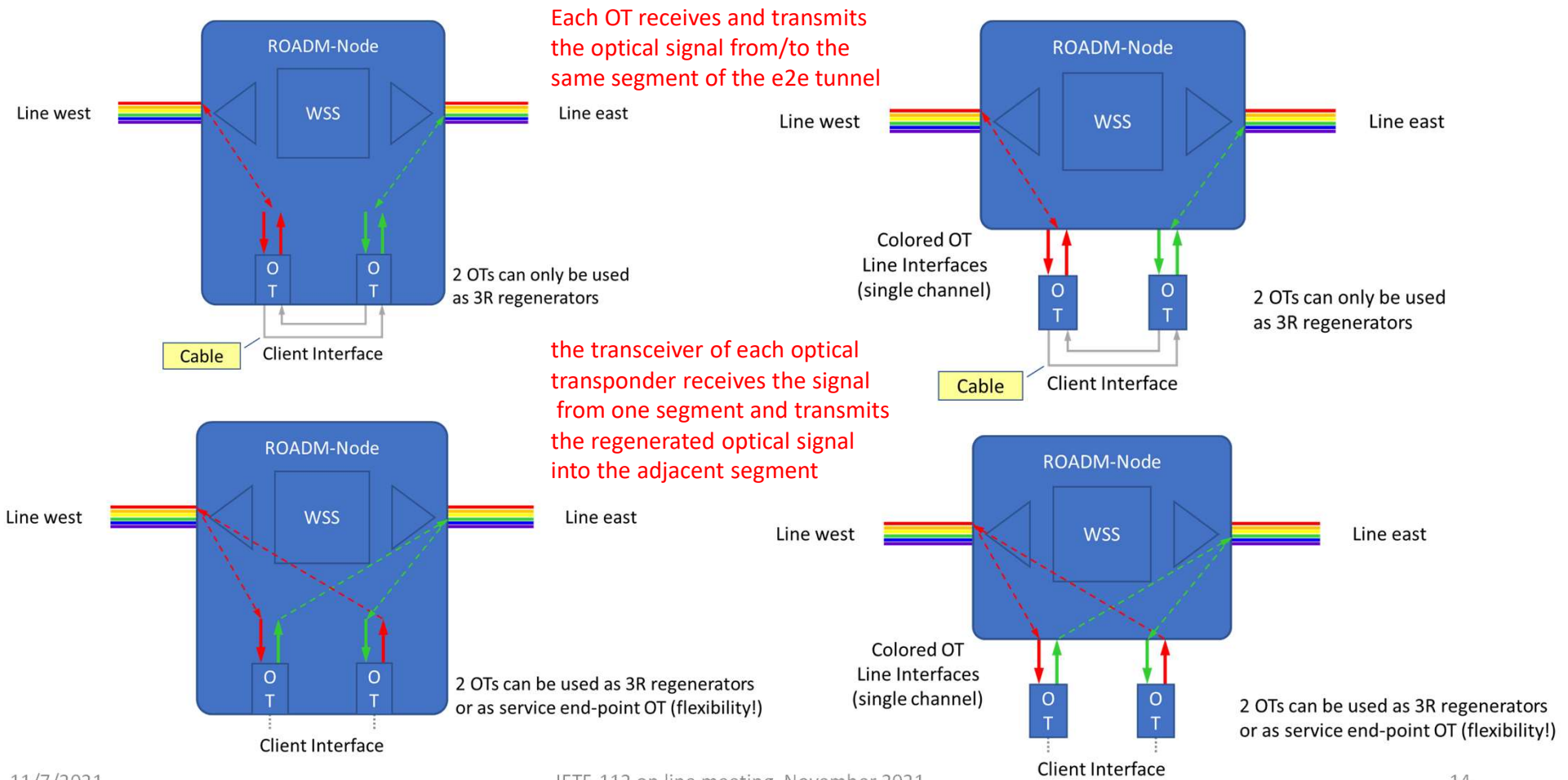
- Tracking Open Issues, discussions and resolutions linked to YANG model <https://github.com/ietf-ccamp-wg/draft-ietf-ccamp-optical-impairment-topology-yang/issues>:
- 12 issues closed since IETF-111
- Still 16 open issues
 - Issue #92 will be solved with the next PR
 - 2 issues are general YANG issues that need clarification by the NETMOD WG (issues #79, #84)
 - Draft text update required (#86)
 - Review terminology (#24, #25, #26, #69, #95)
 - Pending enhancement of the model (#8, #85)
 - Still clarifications are required (#87, #88, #38, #91)
 - YANG model development process improvement on github (#71)
 - <https://github.com/ietf-ccamp-wg>

Next Steps

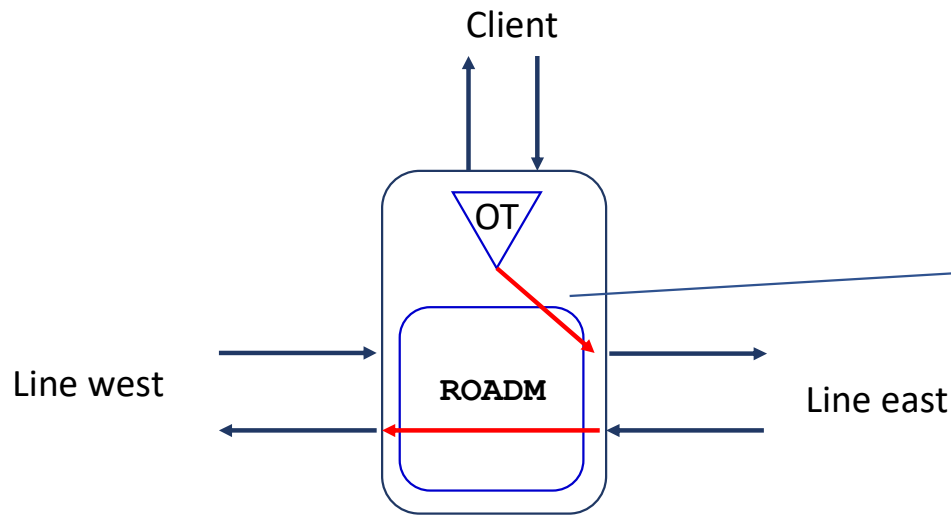
- Addressing the issues still on the list (both model enhancement and editorial)
- Be ready for YANG doctor review
- Stable version by next IETF 113

backup

Bidir back-to-back and unidir (with internal loop) 3R configuration



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) */

```