A YANG Data Model for WDM Tunnels

draft-ietf-ccamp-wdm-tunnel-yang-06

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Summary of Updates in -05

- YANG model updates
  - Aligned with the latest WG LC changes for rfc9093-bis
  - Updated model for regenerators reflecting the resolution of L0/L1 boundary scenarios
    - Support back-to-back and uni-directional regenerators
    - Support single or multiple-transponder pairs as regenerator(s), single or multi-carrier
    - Defined base identity for regeneration layer, digital layer mapping/termination (with order) and inverse multiplexing
    - Matching digital mapping between source/destination/regenerator

- Text updates
  - Added text for 3R regenerators
    - 3R regenerator scenarios (also referencing the definition from rfc9093-bis)
    - Added definition of some terminologies to facilitate modelling, e.g., incoming and outgoing transponders

Open Issues & Ongoing discussion

- Address Rtgdir and YANG Doctor review comments (#74, #76)
- Improve the text on the WDM tunnel provisioning steps
- Need a diagram to illustrate the relationship between this model, the optical impairment , RFC 9093 bis, optical path computation.(#25)
- Provide the identity definitions for regeneration layer, digital layer mapping/termination (with order) and inverse multiplexing
- Consider defining optical layer-specific operations (RPCs), for example automatic power equalization, that are application to a WDM tunnel
- Related work in CCAMP may require additional changes to this draft
  - WDM path computation
  - Ongoing work on pluggable management & control, including the gap analysis and use cases documents, may require additional changes to the model

Defining “Incoming” and “Outgoing” Transponder in Regenerator Scenarios

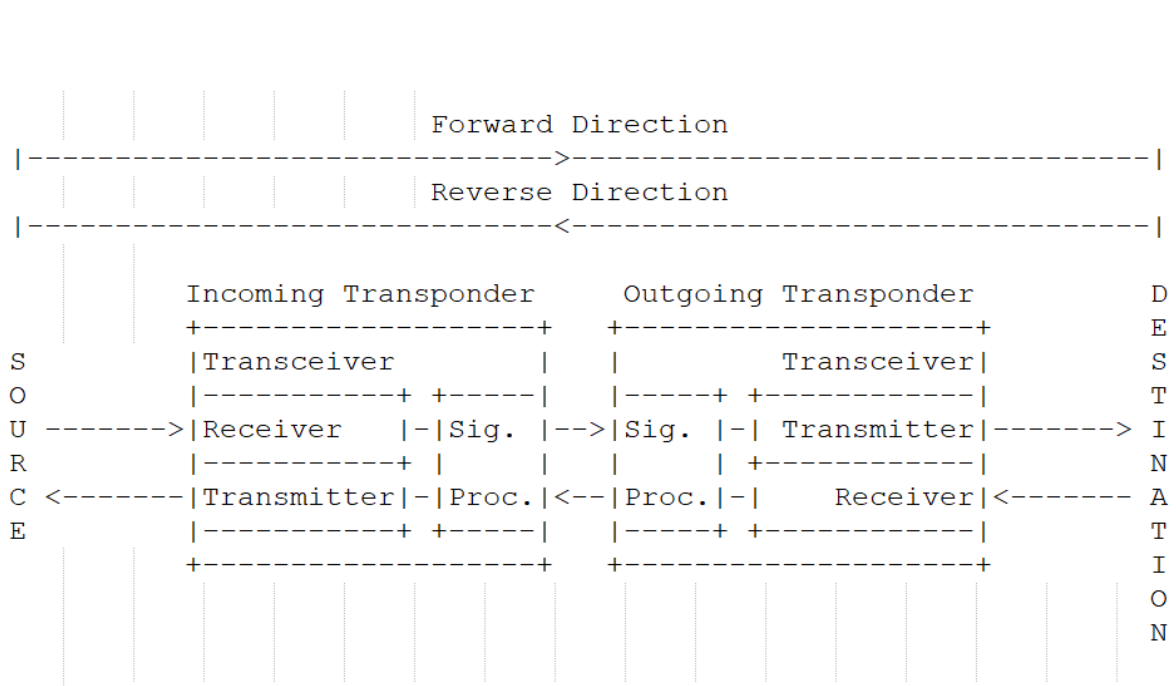


Figure 1: Reference Points in Back-to-back 3R Regeneration

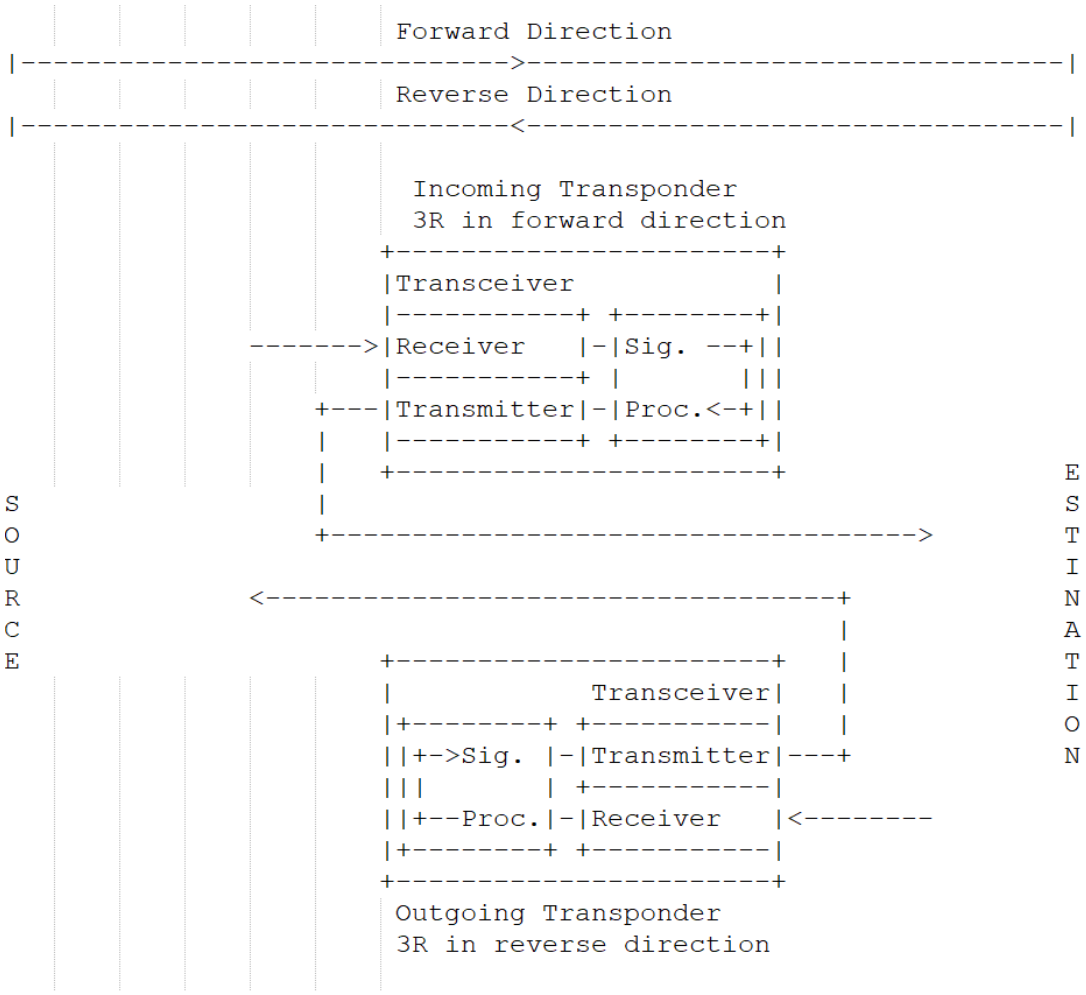


Figure 2: Reference Points in Uni-directional 3R Regeneration

Consistent Transponder Configurations at Source, Destination and Regenerator

```
 +--rw (node-position)?
       +--:(source) or (destination)
       |  +--rw source-transponder (or destination-
transponder)
       |     +--rw transponder-id?         uint32
       |     +--rw digital-terminations
       |     |  +--rw digital-termination* [index]
       |     |     +--rw index               uint8
       |     |     +--rw termination-type?   identityref
       |     |     +--rw mapping-type?       identityref
       |     +--rw transceiver
       |        +--rw transceiver-id?               uint32
       |        +--rw otsi-carrier-id?              uint16
       |        +--rw otsi-carrier-frequency?
       |        |       l0-types:frequency-thz
       |        +--rw tx-channel-power?
       |        |       l0-types:power-dbm
       |        +--rw operational-mode?             string
       |        +--rw line-coding-bitrate?
identityref
       |        +--rw preferred-rx-channel-power?
       |        |       l0-types:power-dbm
       |        +--rw gsnr-extra-margin?            snr
       |        +--rw inverse-multiplexing!
       |           +--rw inverse-mux-type?
identityref
       |           +--rw otsi-lane-termination-type?
identityref
       |           +--rw additional-transceivers
       |              +--rw index?                   uint8
       |              +--rw transceiver-id?          uint32
       |              +--rw otsi-carrier-id?         uint16
       |              +--rw otsi-carrier-frequency?
       |              |       l0-types:frequency-thz
       |              +--rw tx-channel-power?
       |                      l0-types:power-dbm
       |
       +--:(regenerator)
       |  +--rw regenerator
       |     +--rw regen-group-id?         uint32
       |     +--rw regeneration-layer?     identityref
       |     +--rw incoming-transponder
       |     |  +--rw transponder-id?         uint32
       |     |  +--rw digital-terminations
       |     |  |  +--rw digital-termination* [index]
       |     |  |     +--rw index               uint8
       |     |  |     +--rw termination-type?   identityref
       |     |  |     +--rw mapping-type?       identityref
       |     |  +--rw transceiver
       |     |     +--rw transceiver-id?               uint32
       |     |     +--rw otsi-carrier-id?              uint16
       |     |     +--rw otsi-carrier-frequency?
       |     |     |       l0-types:frequency-thz
       |     |     +--rw tx-channel-power?
       |     |     |       l0-types:power-dbm
       |     |     +--rw operational-mode?             string
       |     |     +--rw line-coding-bitrate?          identityref
       |     |     +--rw preferred-rx-channel-power?
       |     |     |       l0-types:power-dbm
       |     |     +--rw gsnr-extra-margin?            snr
       |     |     +--rw inverse-multiplexing!
       |     |        +--rw inverse-mux-type?
identityref
       |     |        +--rw otsi-lane-termination-type?
identityref
       |     |        +--rw additional-transceivers
       |     |           +--rw index?                   uint8
       |     |           +--rw transceiver-id?          uint32
       |     |           +--rw otsi-carrier-id?         uint16
       |     |           +--rw otsi-carrier-frequency?
       |     |           |       l0-types:frequency-thz
       |     |           +--rw tx-channel-power?
       |     |                   l0-types:power-dbm
       |     +--rw outgoing-transponder
       |           (same structure as incoming-transponder)
       |
       +--:(regenerators)
          +--rw regenerators
             +--rw common-incoming
             |  +--rw operational-mode?             string
             |  +--rw line-coding-bitrate?
identityref
             |  +--rw preferred-rx-channel-power?
             |  |       l0-types:power-dbm
             |  +--rw gsnr-extra-margin?            snr
             +--rw common-outgoing
             |  +--rw operational-mode?             string
             |  +--rw line-coding-bitrate?
identityref
             |  +--rw preferred-rx-channel-power?
             |  |       l0-types:power-dbm
             |  +--rw gsnr-extra-margin?            snr
             +--rw regenerator* [index]
                +--rw index                   uint8
                +--rw regen-group-id?         uint32
                +--rw regeneration-layer?     identityref
                +--rw incoming-transponder
                |  +--rw transponder-id?   uint32
                |  +--rw transceiver
                |     +--rw transceiver-id?           uint32
                |     +--rw otsi-carrier-id?          uint16
                |     +--rw otsi-carrier-frequency?
                |     |       l0-types:frequency-thz
                |     +--rw tx-channel-power?
                |             l0-types:power-dbm
                +--rw outgoing-transponder
                   +--rw transponder-id?   uint32
                   +--rw transceiver
                      +--rw transceiver-id?           uint32
                      +--rw otsi-carrier-id?          uint16
                      +--rw otsi-carrier-frequency?
                      |       l0-types:frequency-thz
                      +--rw tx-channel-power?
                              l0-types:power-dbm
```

Next Steps

- Consolidate the basic reference scenarios out of our complete package
- Address the open issues & WG comments

Weekly team meeting:

Thursday, 14:00 (CET)

CCAMP WebEx Details

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

Join by meeting number

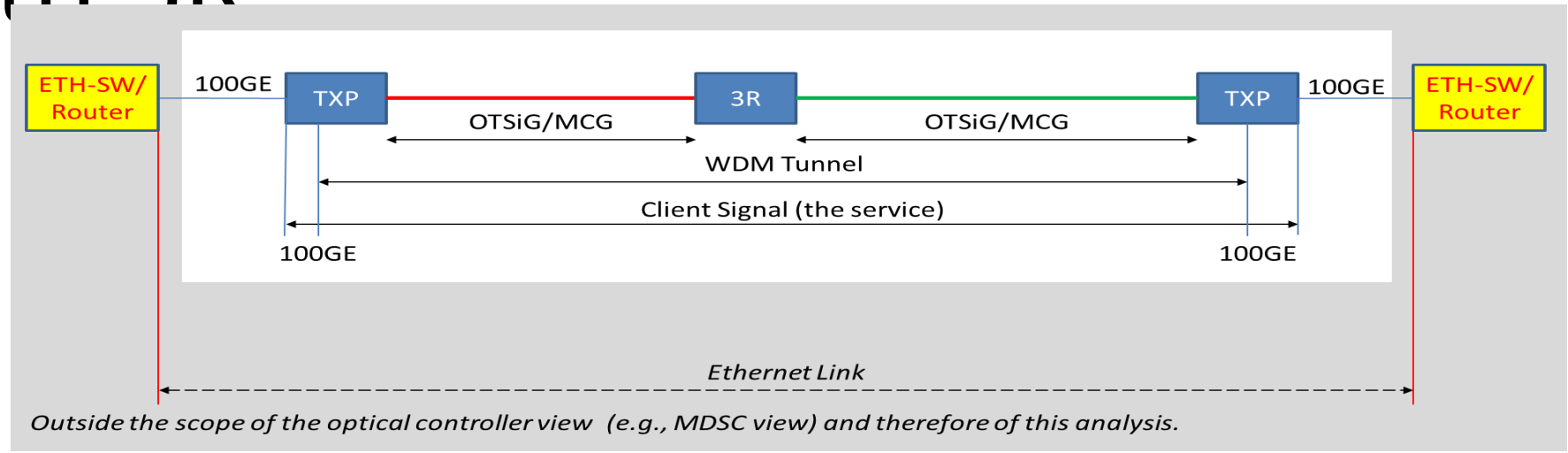
Meeting number (access code): 2422 698 1495

Meeting password: 6UbM2tEJJd6

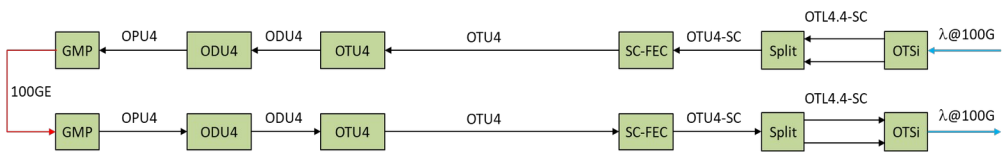
Thank you!

Backup

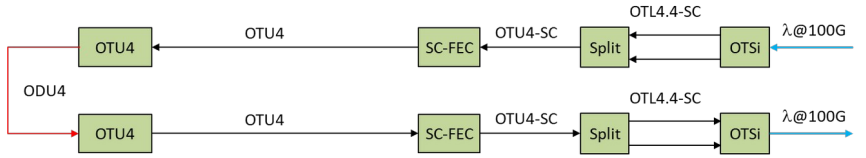
Reference Scenario (1) - 100GE Service with 3R



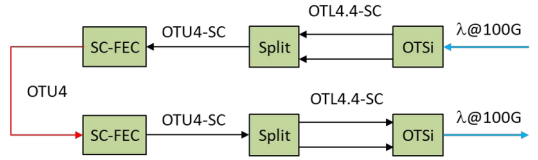
Source Transponder
Destination Transponder (in reverse signal direction)



Regen layer:
100GE

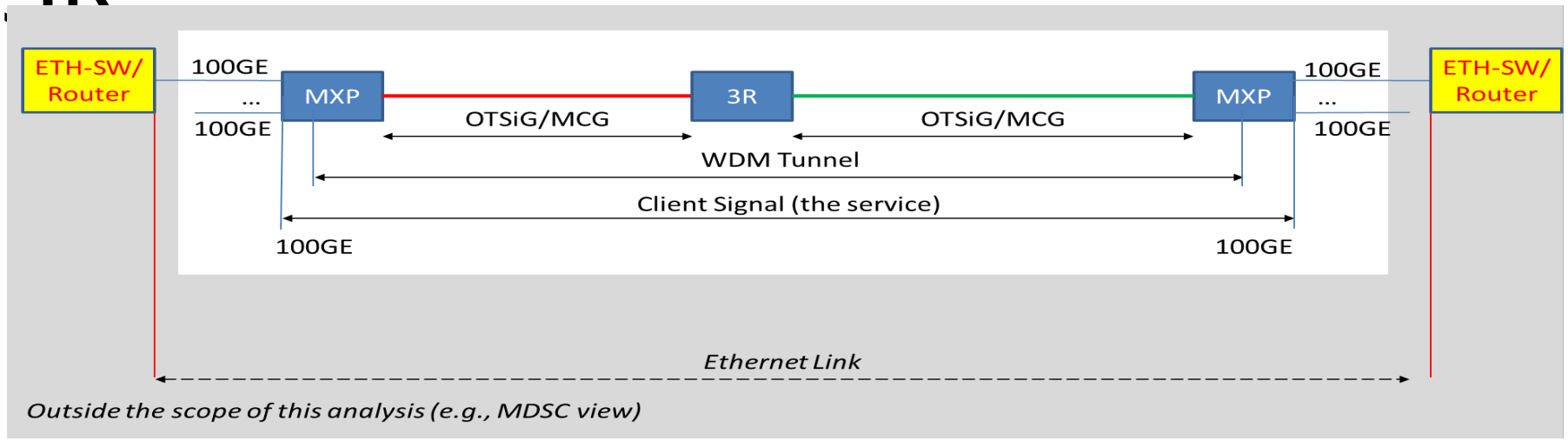


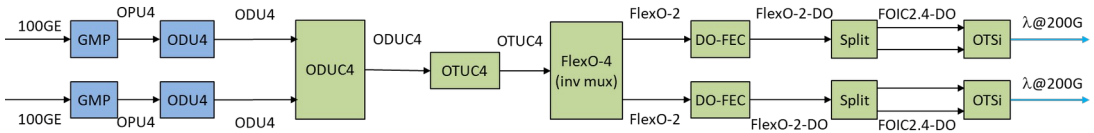
Regen layer:
ODU4



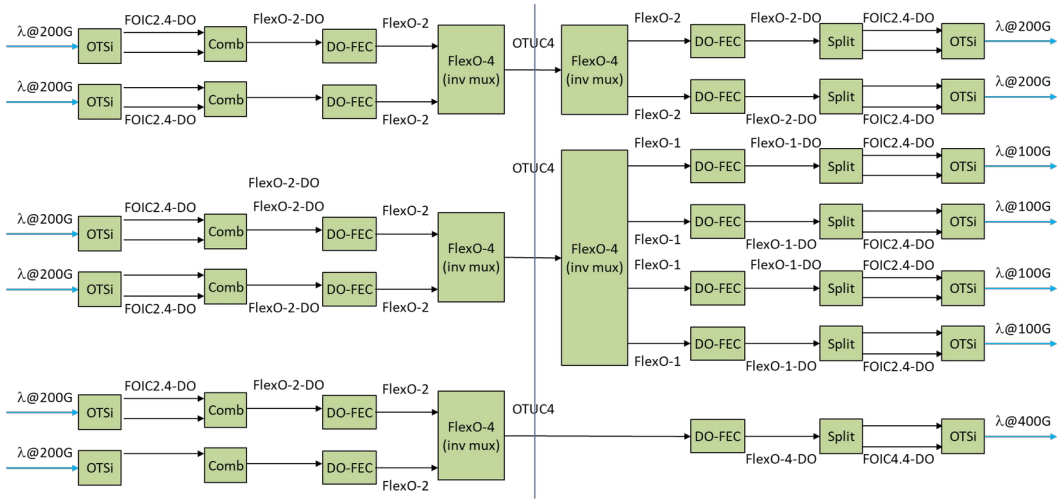
Regen layer:
OTU4

Reference Scenario (2) – 4 x 100GE Service with 3R





Source Muxponder
Destination Muxponder (in reverse signal direction, can have different digital mapping than the source muxponder)



Regen layer:
OTUC4

Regen layer:
FlexOnM/FlexO xR

YANG modules impacts (1)

To align and merge with previous

draft-ietf-ccamp-client-signal-yang (client information)	draft-ietf-ccamp-wdm-tunnel-yang (configuration)	Optical Impai (capabilities)
Client Payload	Multiplexing schema type (e.g. LO-ODU,VLAN etc.))	Inverse Multiplexing types
Digital Mapping (inferred ?) GMP, GFP-F	Digital-termination-type (ordered list)	3R regeneration layer supported
Multiplexing label value(s) (e.g. tsg/tpn in case of OTN))	3R regeneration layer (list in the tunnel, single value for an hop in the ERO) (1)	List of multiplexing schema types supported
LEGENDA	Inverse Multiplexing types (single value)	Digital-termination-types supported

Client Signal YANG

WDM Tunnel YANG model + OI topology

- Multiplexing schema type: identifies the type of multiplexing technology used (e.g ODUj,K)
- Digital Mapping: identifies the mapping technology used to map the client ETH signal (e.g. OTN, VLAN) (GMP, GFP-F)
- Client Payload: identifies the client signal that will be carried by WDM tunnel (e.g. 100GE, 400GE, etc.)
- Multiplexing label value(s): identifies which multiplexing slot(s) are used by the client (if OTN tributary slot/tributary port numb
- Digital termination type: identifies the type of the multiplexing container (e.g. ODUC4)

(1) 3R reg list as constraints for tunnel, single value for transceiver configuration in the ERO