

A YANG Data Model for Network Inventory

draft-ietf-ivy-network-inventory-yang-03

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Updates Since IETF 119

- Resolved some pyang/yanglint compilation errors/warnings
 - ✓ Fixed the part-number & serial-number & product-name's description
 - ✓ Added software-patch-rev attribute for NE and components
 - ✓ Removed software-specific-info container (out of scope)
- Resolved YANG errors/warnings
- Fixed nits

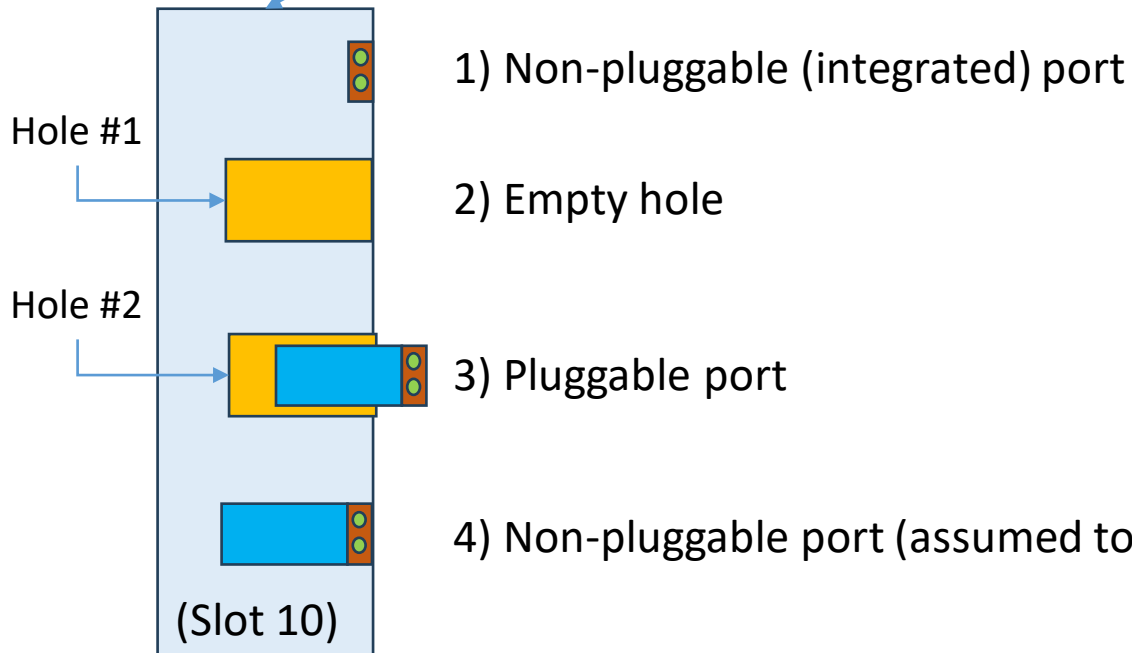
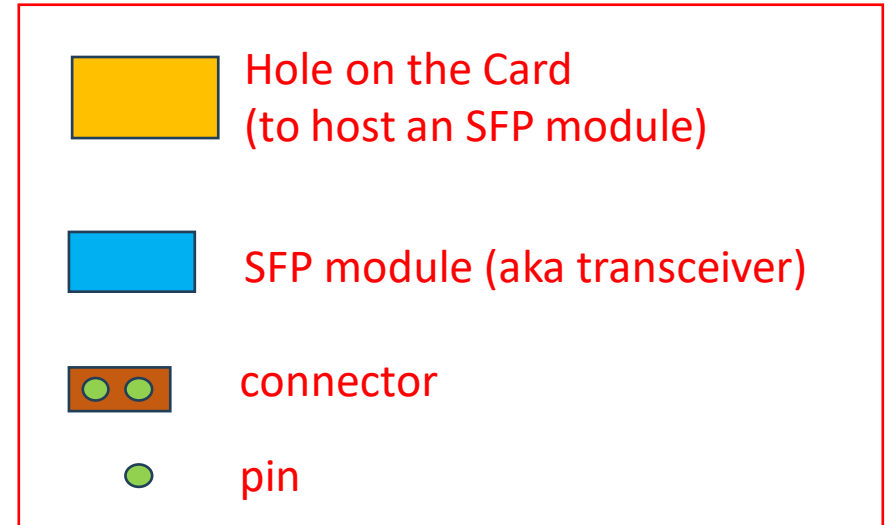
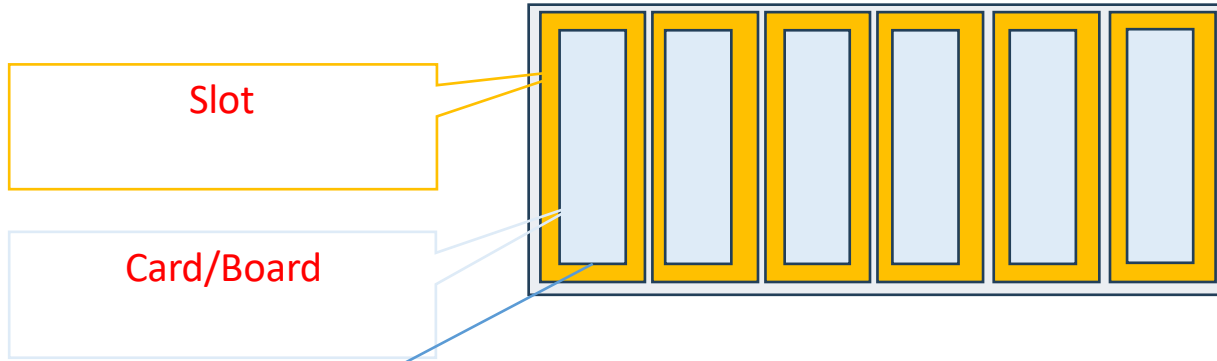
Summary of the Open Issues

- Issues to be addressed before WG LC
 - ✓ Modelling of port/breakout
 - ✓ Terminology and Scope
 - ✓ Ensure that all the requirements for ALMO in the scope of the base inventory model are covered
 - ✓ Editorial clean-up
- Issues not blocking WG LC (could be addressed in other documents or RFC-bis)
 - ✓ Additions (new attributes or inventory elements)
 - ✓ Support write operations
 - ✓ Peer-mount approach
 - Depends from some work in Netmod WG which is at initial stage

Issues faced with modelling of port/breakout

- Different use cases to be considered
 - ✓ Collection of use cases still on-going
 - ✓ Lack of (known) standard references: using pictures taken from the Web
- Alternative modelling options
 - ✓ Three options on the table, based on existing models (RFC8348, OpenConfig and TAPI)
 - ✓ Details of each option still under investigation
- Terminology jargon
 - ✓ Different terminology used when describing different use cases
 - ✓ Different terminology used by existing models
 - ✓ Same terms used with different meanings (e.g., transceiver, channel)

Reference Scenarios of Port Modelling



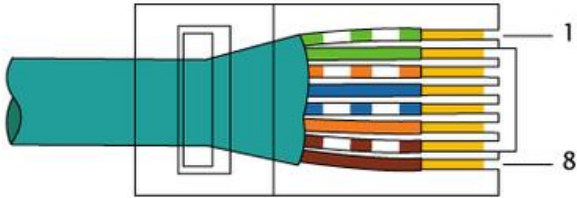
Current focus:

- 1) More commonly used for electrical ports (RJ-45 connectors)
- 2) and 3) more commonly used for optical ports

Target: common model for electrical and optical ports

Need to consider also breakout ports

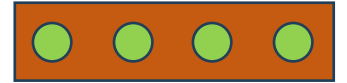
Examples of connectors and pins



EIA/TIA-568A

RJ-45 electrical connector:

- Multiple pins
- Each pin carry electrical signal in Tx or Rx direction



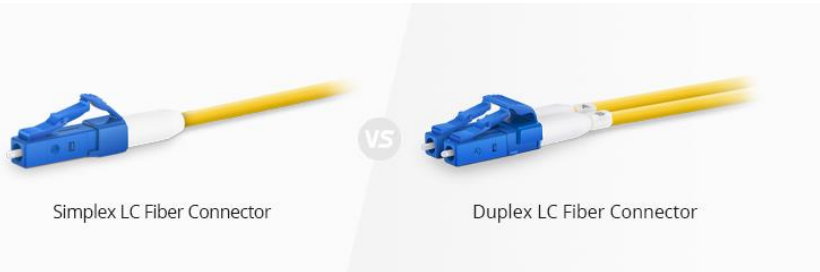
Simplex optical connector (e.g., LC connector):

- One pin
- Can carry optical signal(s) in Tx or Rx or both directions



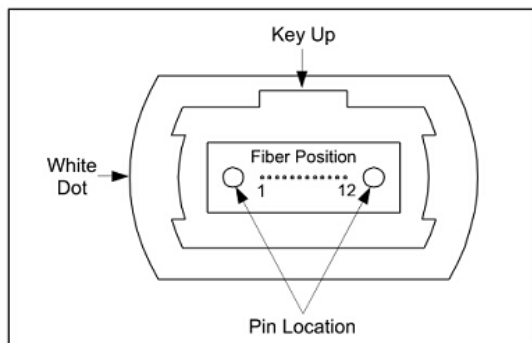
Duplex optical connector (e.g., LC connector):

- Two pins
- One pin carry optical signal(s) in each (Tx/Rx) direction



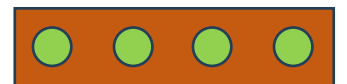
Simplex LC Fiber Connector

Duplex LC Fiber Connector

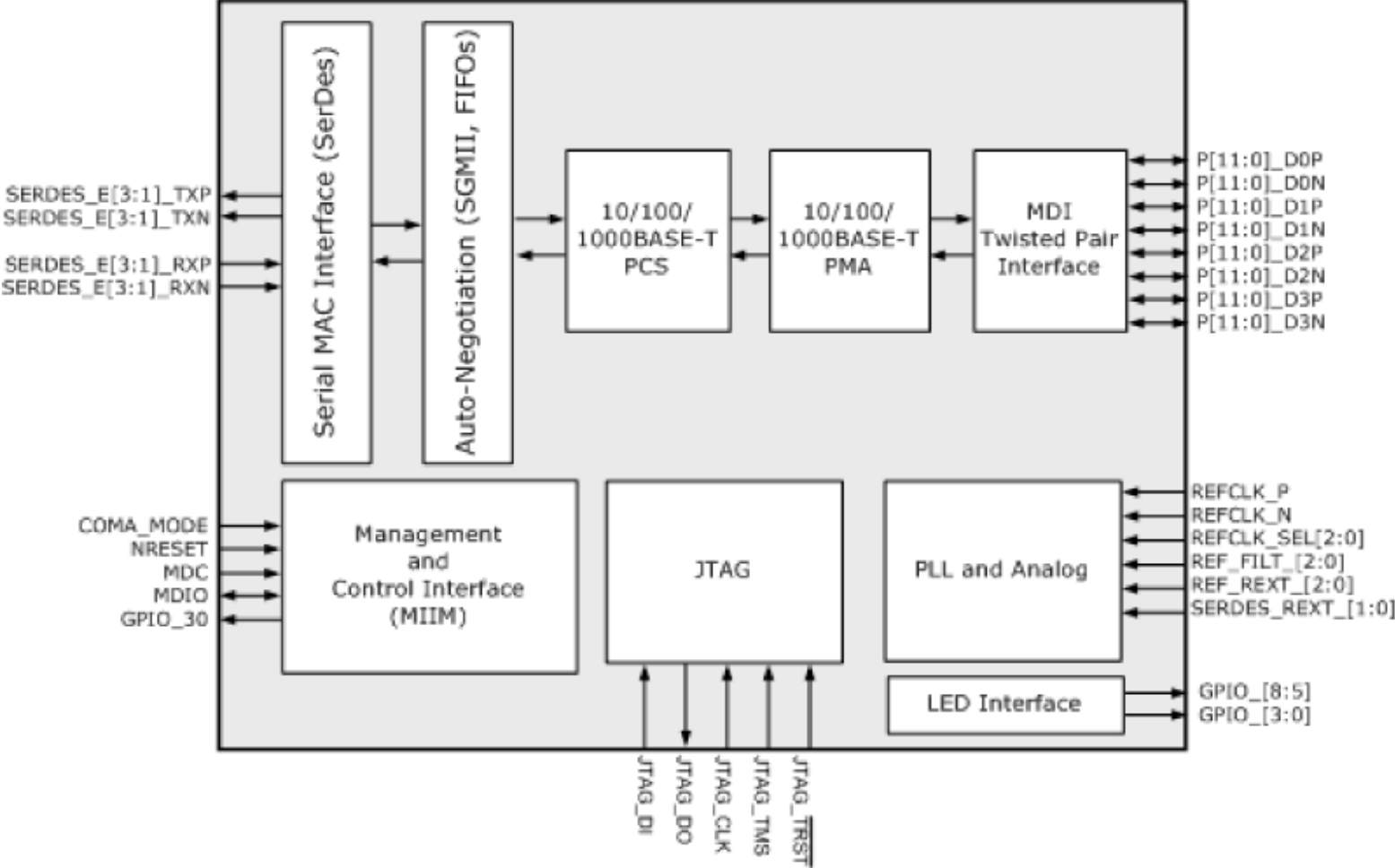


MPO optical connector:

- Multiple pins
- Each pin carry optical signal in Tx or Rx direction



Examples of ports: Electrical (aka RJ-45)



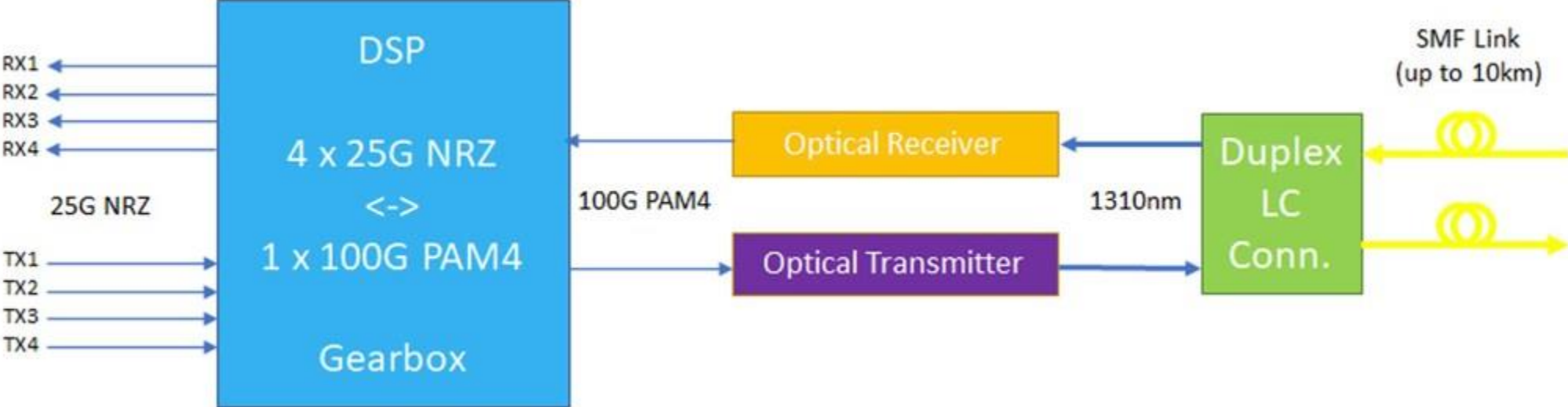
(Integrated)



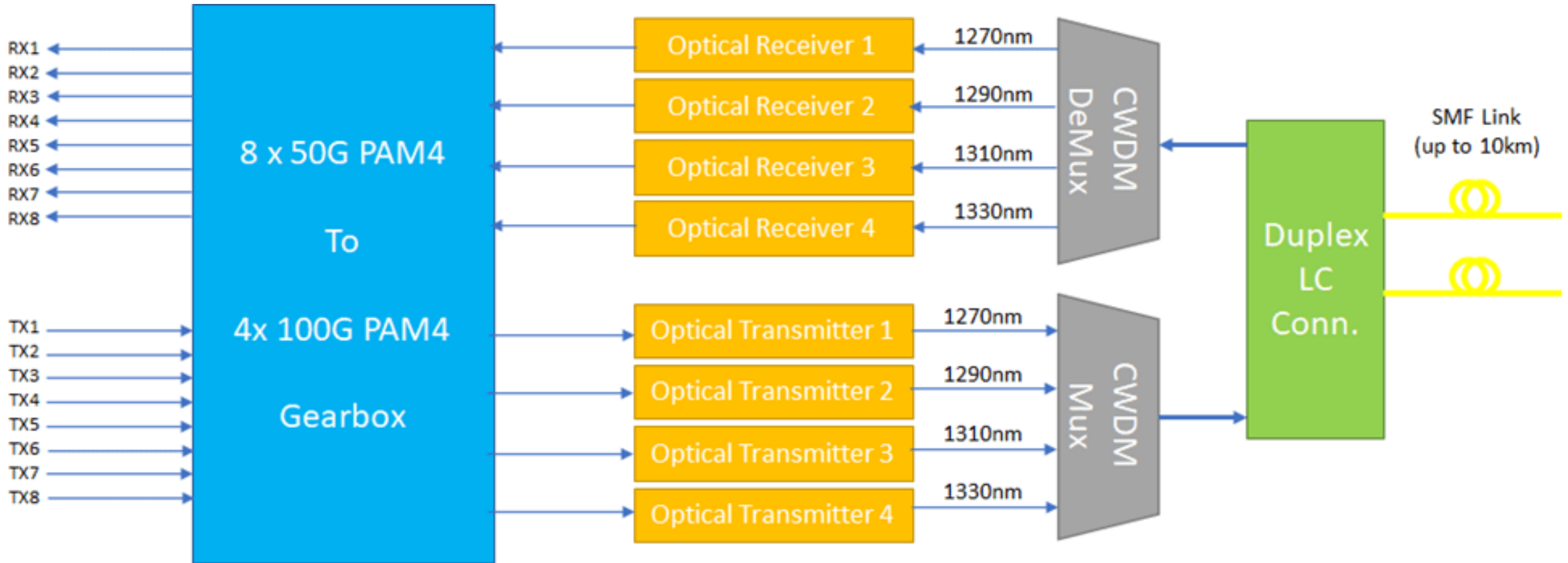
(Pluggable)



Examples of ports: Optical, single-channel

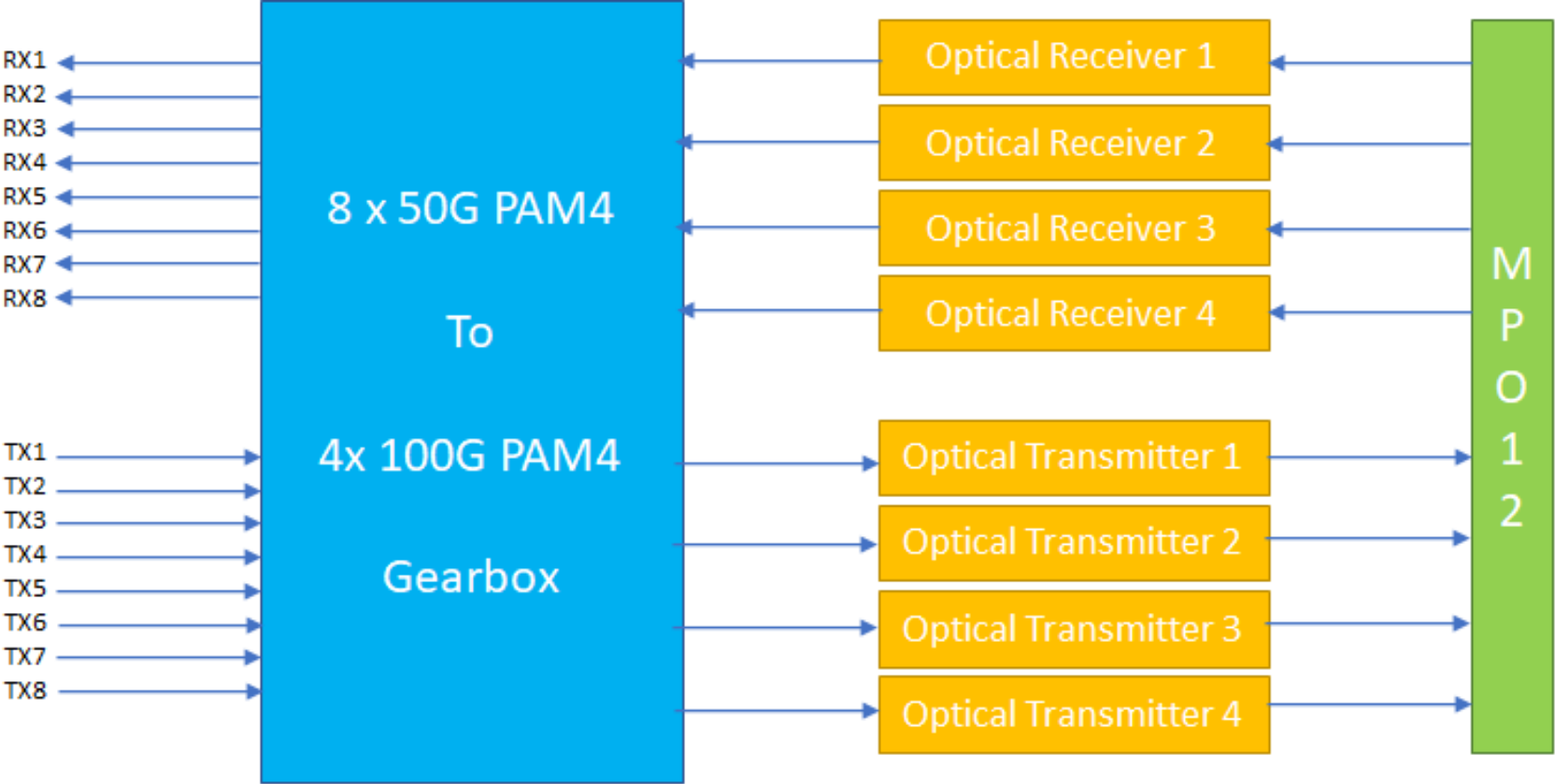


Examples of ports: Optical, WDM multi-channel (e.g., 400G-LR)

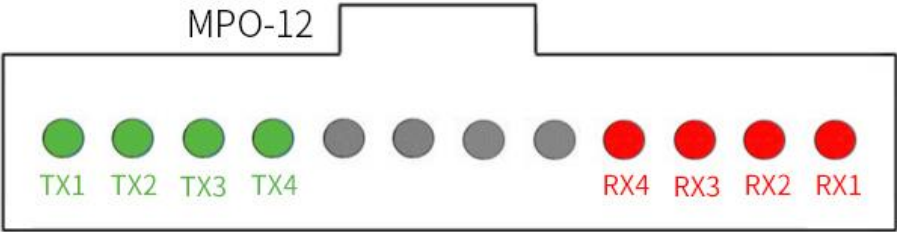


Note: With or without breakout

Examples of ports: Optical, MPO multi-channel (e.g., 400G-DR)



Note: With or without breakout



Additional use cases (not yet discussed)



Active Optical Cables:

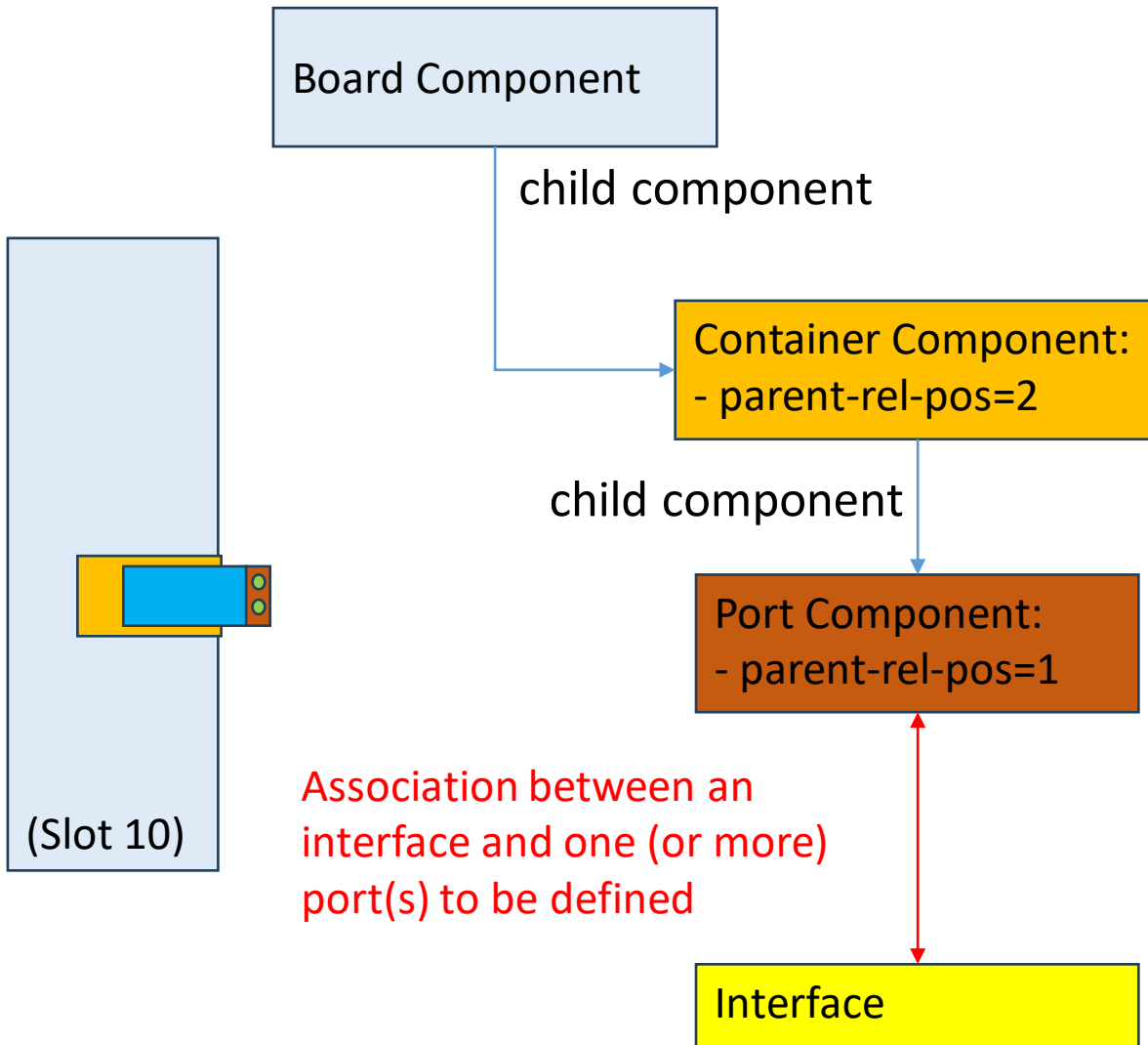
SFP modules and cable bound together (one part number)
SFP modules can be inserted in different network elements



Optical CS connectors:

Multiple CS connectors on the same SFP module
A CS connector has two pins (one Tx and one Rx)

Pluggable port (RFC8348-like approach)



The port can be:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (without breakout)
- Multi-channel MPO port (without breakout)

Modelling of port breakouts to be defined

Modelling of location=`/ne=ne-name/sl=10/p=3` or `/ne=ne-name/sl=10/s_sl=2/p=1` to be clarified

Modelling of the connector type may need to be defined

Modelling of the SFP module attributes may need to be defined

The need to model the SFP module as a module component or as a port to be clarified

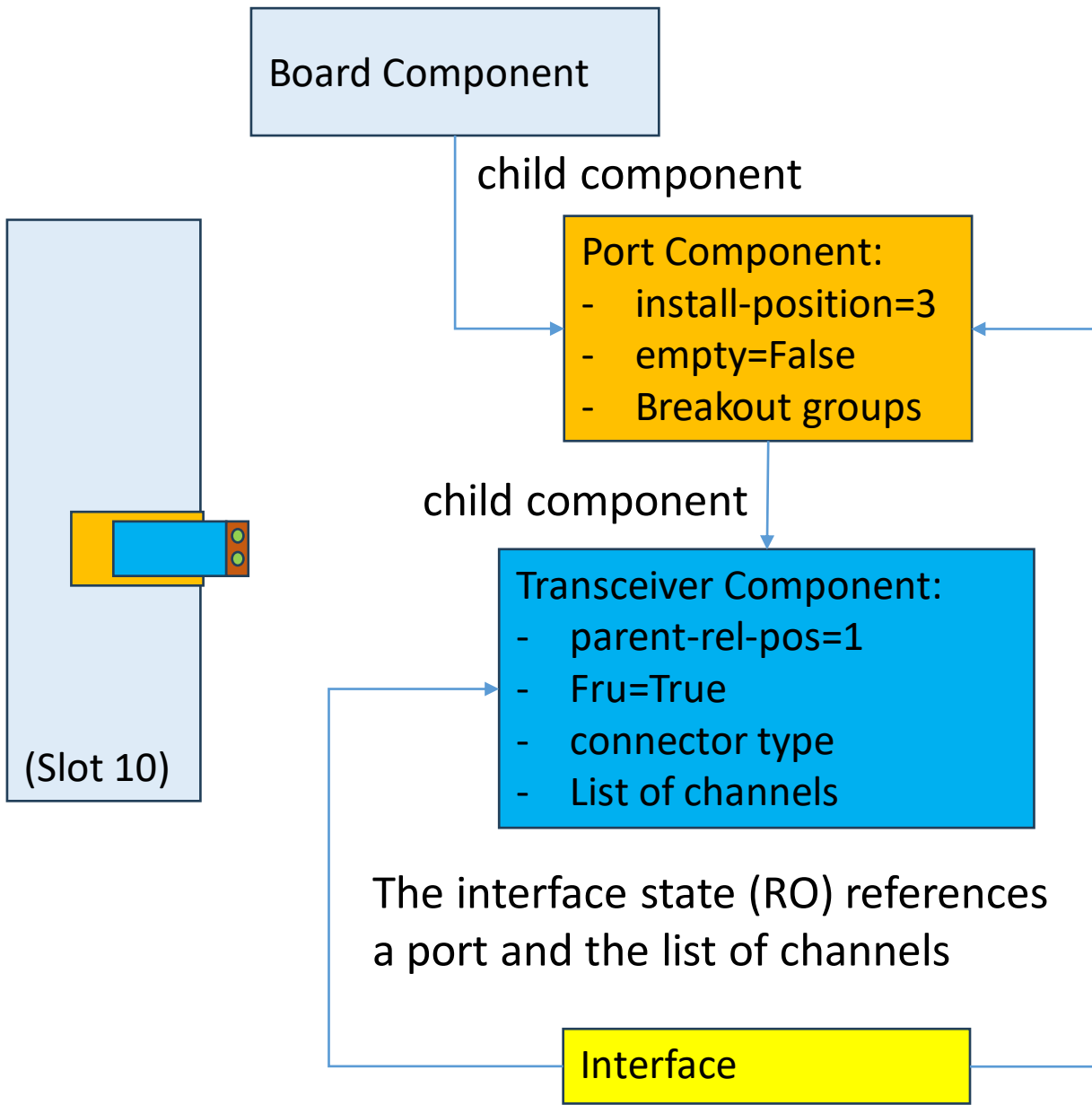
Ambiguity of port definition in RFC8348

```
identity port {  
  base ianahw:hardware-class;  
  description  
    "This identity is applicable if the hardware class is some sort  
    of networking port capable of receiving and/or transmitting  
    networking traffic."  
}
```

```
identity module {  
  base ianahw:hardware-class;  
  description  
    "This identity is applicable if the hardware class is some sort  
    of self-contained sub-system. If a module component is  
    removable, then it should be modeled within a container  
    component; otherwise, it should be modeled directly within  
    another physical component (e.g., a chassis or another  
    module)."  
}
```

Should the SFP module be modelled as a port or as a module component?

Pluggable port (OpenConfig-like approach) – 1/2



The port can be associated with:

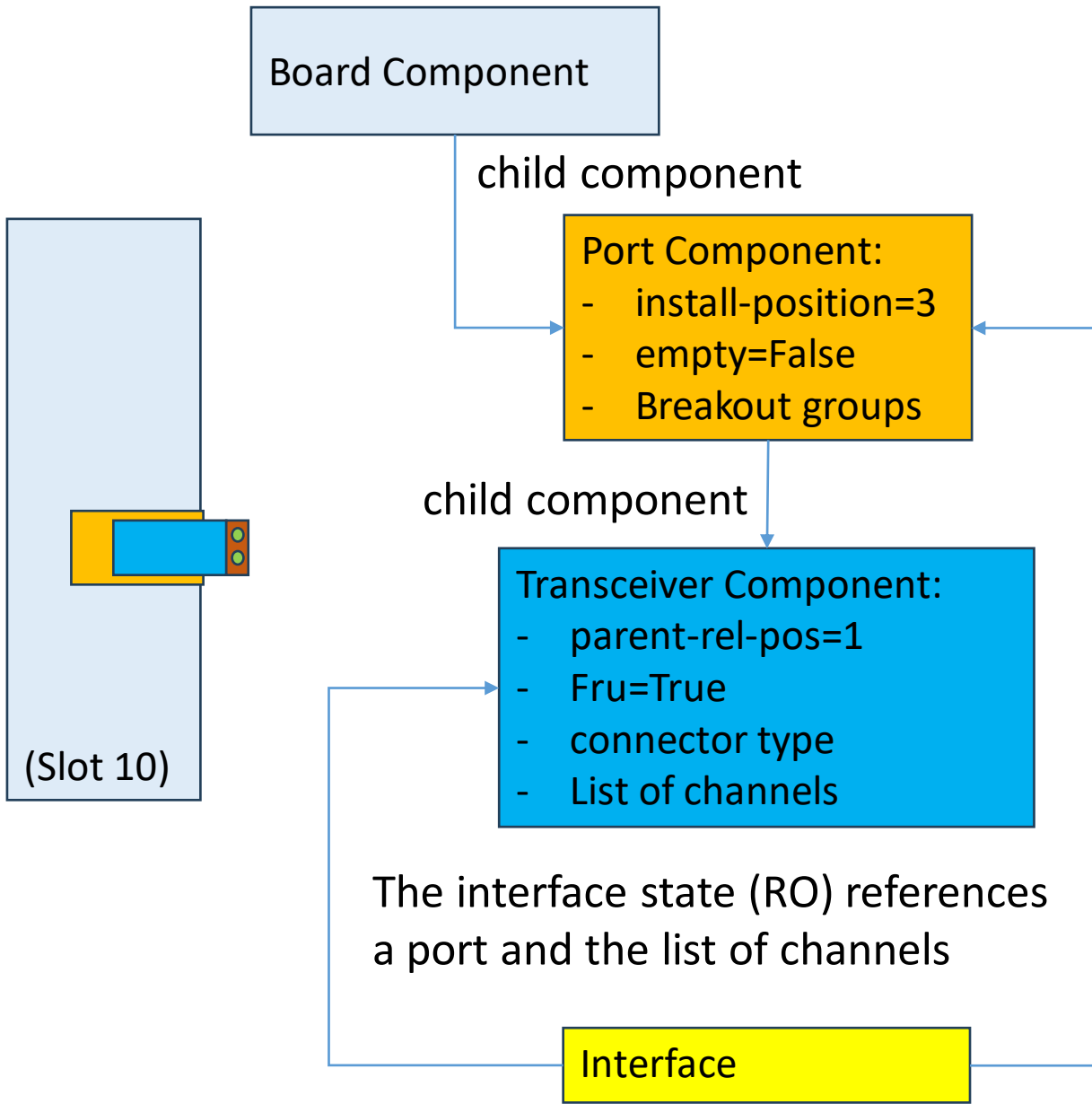
- Single-channel optical port
- Multi-channel WDM port (with or without breakout)
- Multi-channel MPO port (with or without breakout)

location=/ne=ne-name/sl=10/p=3

The list of *line-side* channels (and references from the interface) is defined only for multi-channel ports

The breakout group configuration drives the creation of the interfaces associated with a multi-channel port, by configuring the interface rate, the number of interfaces in the group and the number of *host-side* channels assigned to each interface

Pluggable port (OpenConfig-like approach) – 2/2

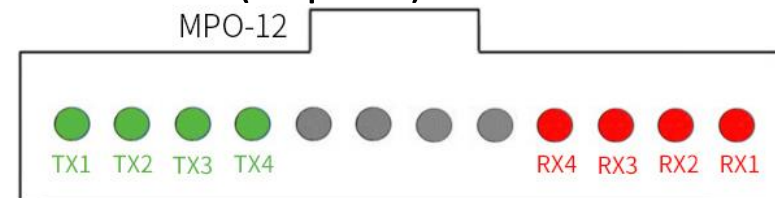


The list of (line side) channels on the transceiver is reported for any multi-channel port (with or without breakout): the reference from the interface to a port by default assumes all the channels are used by the port (no breakout) unless the list of (line-side) channels is also reported

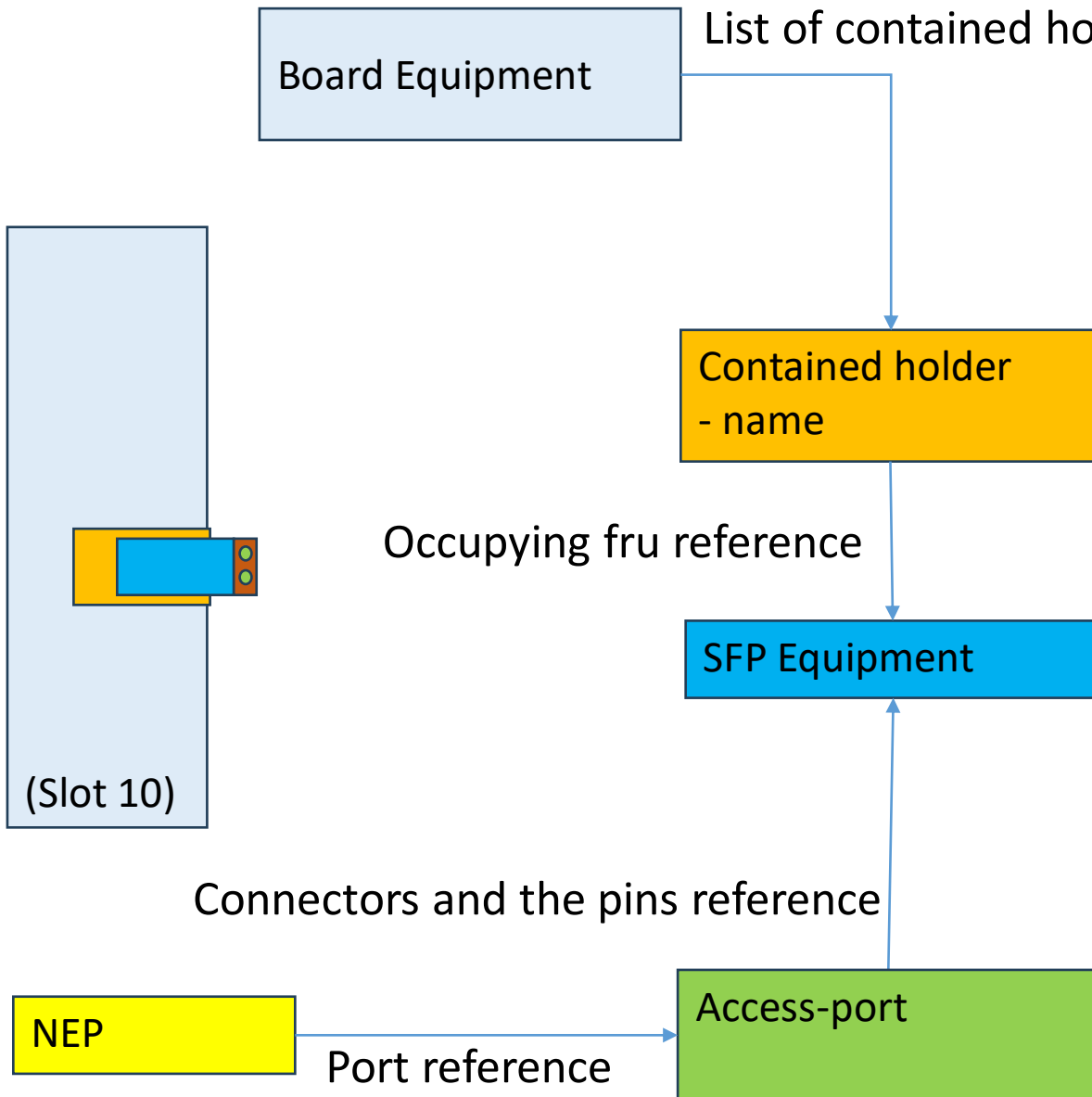
Modelling of pluggable electrical ports to be clarified

Modelling the association between an interface and multiple ports may need to be added

Association of Tx/Rx pins to line-side channels not modelled (implicit)



Pluggable port (TAPI-like approach) – 1/2



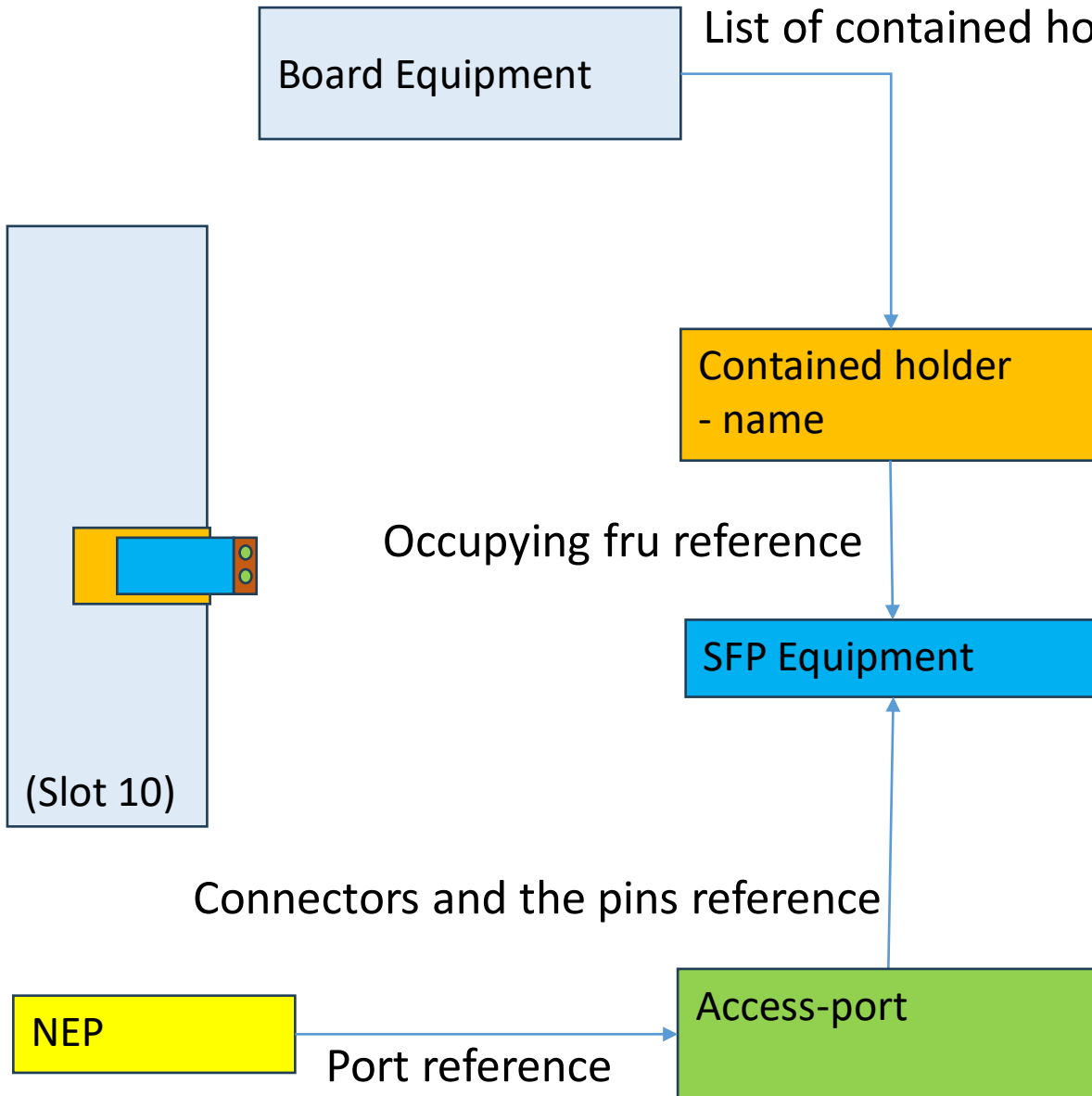
The port can be associated with:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (**without breakout**)
- Multi-channel MPO port (with or without breakout)

holder-name=/ne=ne-name/sl=10/p=3

Connectors and pins on the SFP module are not explicitly reported in the model (no information about the connector type is provided)

Pluggable port (TAPI-like approach) – 2/2

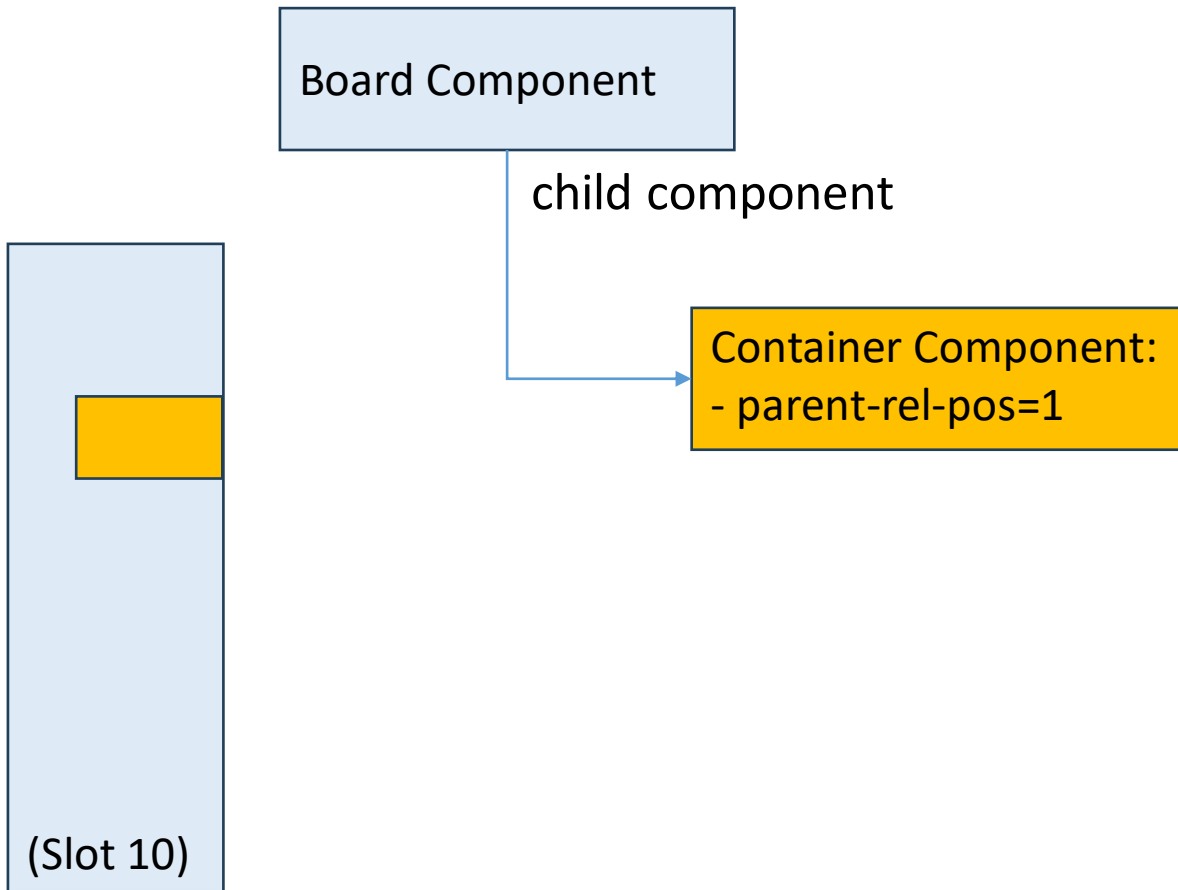


References from the access port to the pins in the connector required only in case of breakout ports

A NEP can be mapped to an access port which is using multiple connectors (e.g., 10G-Base-SR4 without MPO)

Modelling of multi-channel WDM port breakouts to be clarified

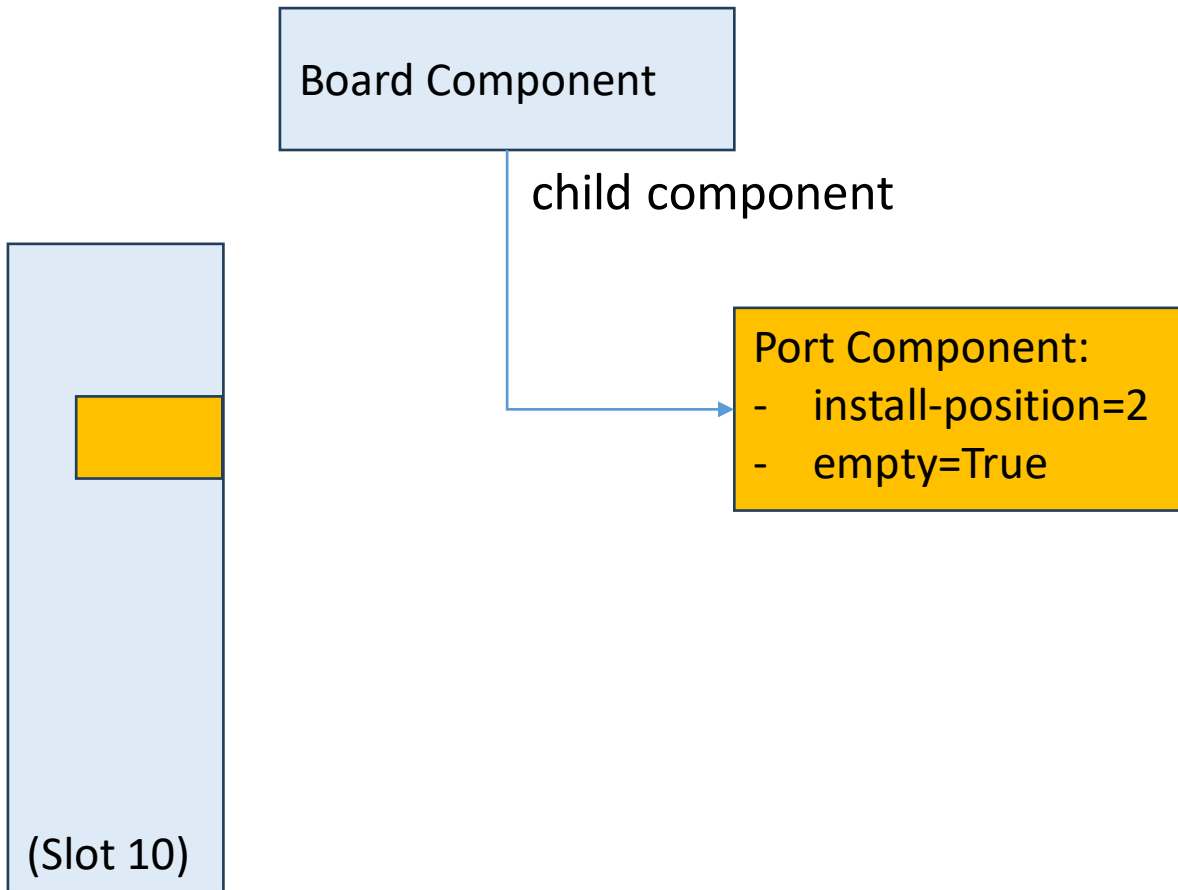
Empty Hole (RFC8348-like approach)



It can be used to plug:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (with or without breakout)
- Multi-channel MPO port (with or without breakout)

Empty Hole (OpenConfig-like approach)

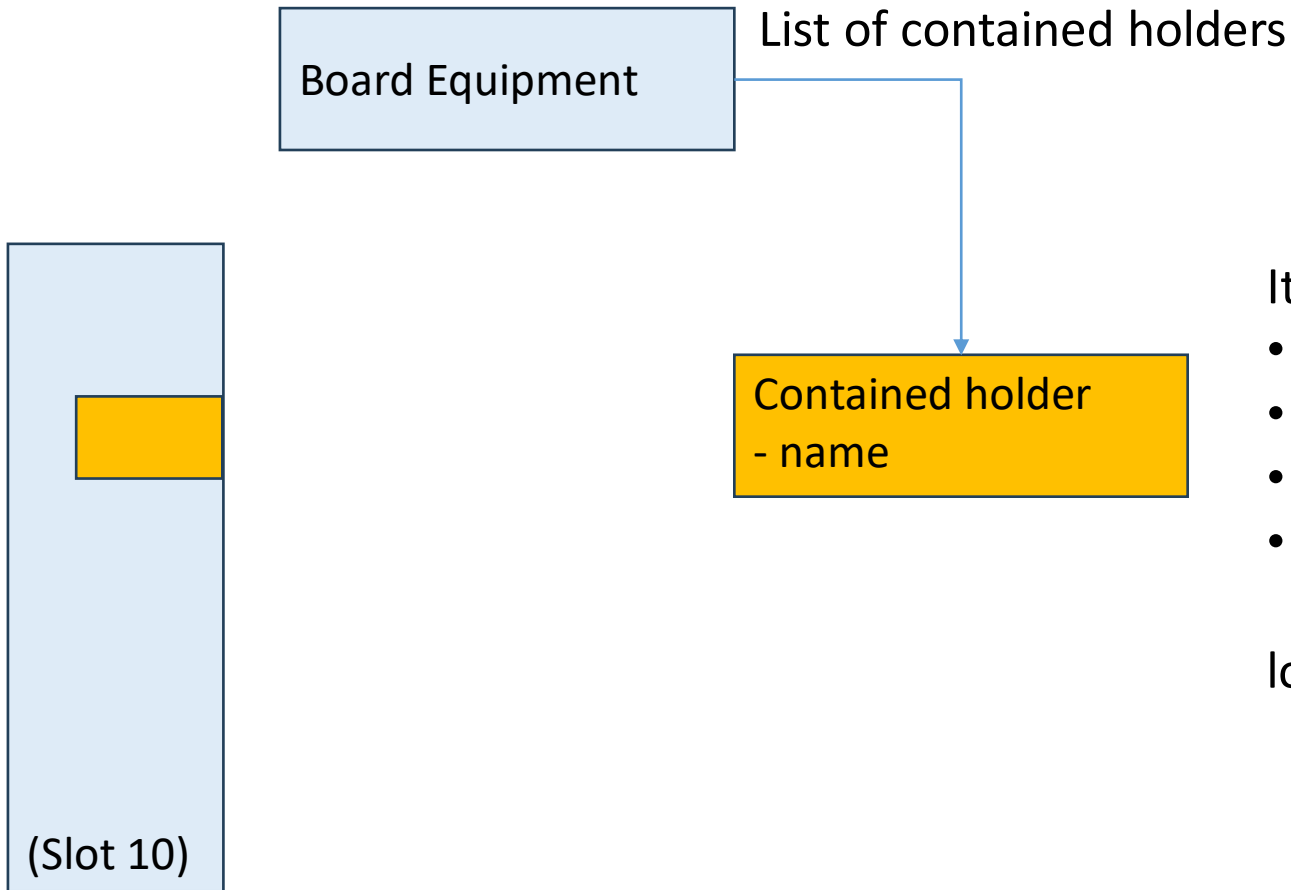


It can be used to plug :

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (with or without breakout)
- Multi-channel MPO port (with or without breakout)

location=/ne=ne-name/sl=10/p=2

Empty Hole (TAPI-like approach)

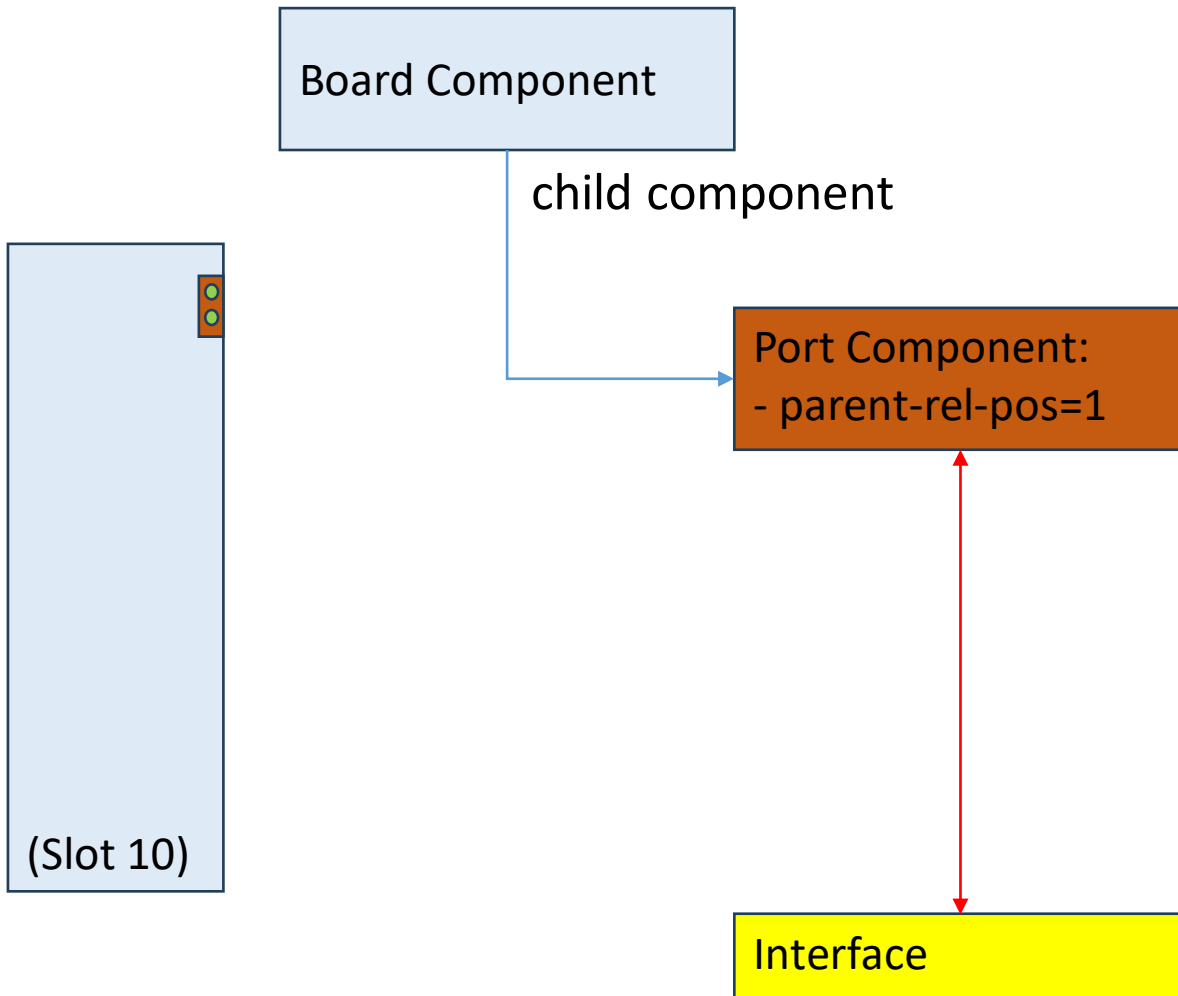


It can be used to plug :

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (with or without breakout)
- Multi-channel MPO port (with or without breakout)

location=holder-name=/ne=ne-name/sl=10/p=2

Non-pluggable integrated port (RFC8348-like approach)

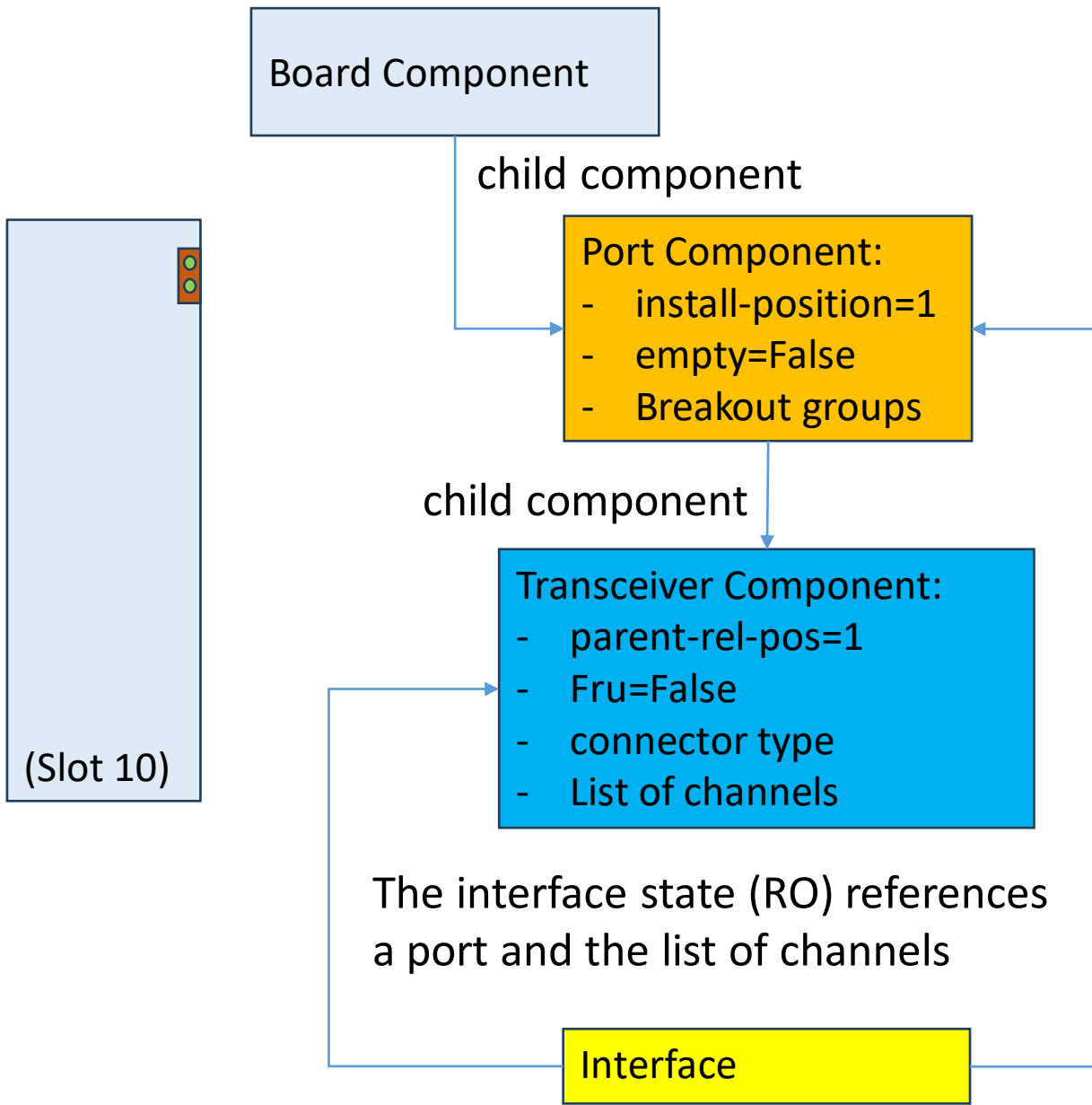


The port can be:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (*without breakout*)
- Multi-channel MPO port (*without breakout*)

location=/ne=ne-name/sl=10/p=1

Non-pluggable integrated port (OpenConfig-like approach)

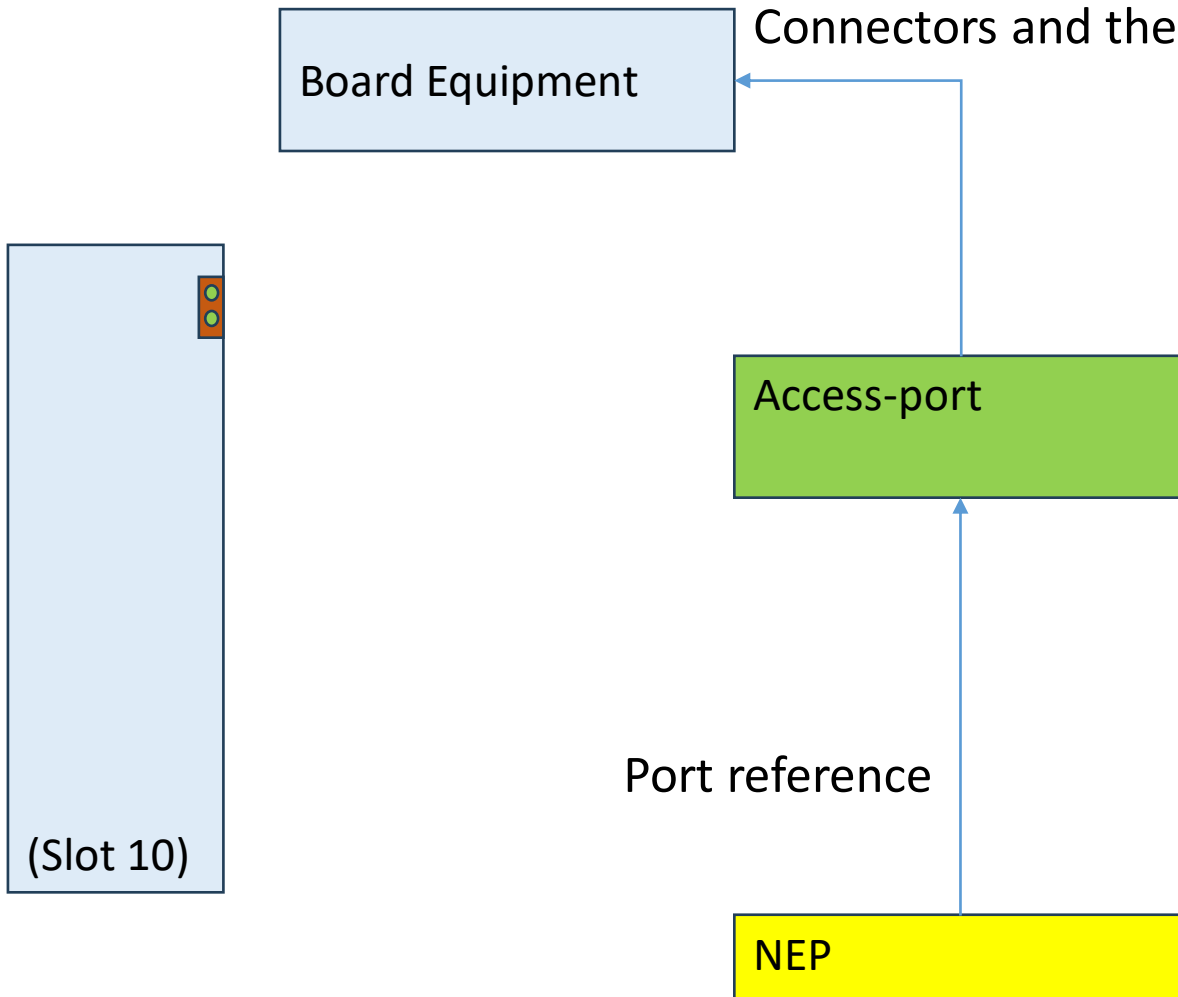


The port can be:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (without breakout)
- Multi-channel MPO port (without breakout)

location=/ne=ne-name/sl=10/p=1

Non-pluggable integrated port (TAPI-like approach)



Connectors and pins on the board are not explicitly reported in the model

The port can be associated with:

- Electrical port
- Single-channel optical port
- Multi-channel WDM port (**without breakout**)
- Multi-channel MPO port (with or without breakout)

Terminology and Scope: input from mailing list (1/2)

- Hardware component as generalization of:
 - ✓ From RFC8348: chassis, backplane, container (slot, ...), power supply, fan, sensor, module (board, ...), cpu, battery, storage device
 - ✓ New components can be added to the list based on requirements
 - ✓ Definitions from RFC8348 that require some further discussion/clarifications: port, energy object, stack
 - ✓ In general operators have expressed the interest to retrieve any component which has a part number
- Software component: more input needed
 - ✓ One option is to indicate that other type of components (non-hardware component) are in the scope of IVY but outside the scope of the base inventory model
 - ✓ Further terminology enhancements (outside the scope of the base inventory model) can be defined in the SW inventory model I-D

Terminology and Scope: input from mailing list (2/2)

- (Physical) network element: implementation or application specific grouping of components (e.g., hardware component)
- Virtual network element: more input needed
 - One option is to indicate the other type of network elements are in the scope of IVY but outside the scope of the base inventory model
 - Further terminology enhancements (outside the scope of the base inventory model) can be defined in the SW inventory model I-D

Additions

- Proposed additions that required further discussion
 - ✓ Attributes proposed by China Unicom (issue #11)
 - ✓ Timestamp information (issue #17)
 - ✓ Attributes from RFC 7317 (issue #2)
 - ✓ *Modelling of fibers and cables (issue #32) → new draft*
 - ✓ Asset-id attribute for network-element (issue #36)
 - ✓ Support for SW upgrades (issue #41)
 - ✓ Component location (issue #42)
 - ✓ Inventory of passive components (issue #46)
- Need to prioritize and evaluate which issue to address before WG LC
 - ✓ Which issue to postpone to a future revision (RFC-bis)
 - ✓ Which issue to address in an augmentation model

Next Step

- Resolve the terminology and scope issue
- Resolve the port and breakout modelling issue
- Discuss the scope of the initial revision of the base inventory
 - ✓ Consider multiple revisions of the base inventory model
 - ✓ Consider other models augmenting the base inventory model

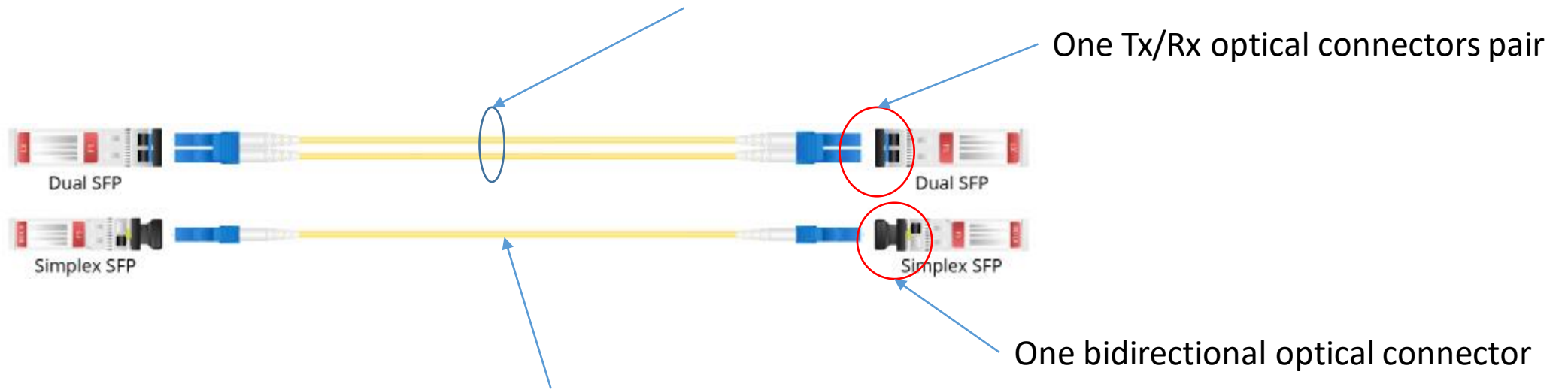
Backup

References

- 1) [Dual Fiber SFP and Simplex SFP Fiber Modules: What are Differences? | FS Community](#)
- 2) [Cavo Ethernet Cat6 \(F/UTP\) RS PRO, guaina in PVC col. Grigio, L. 3m, Con terminazione | RS \(rs-online.com\)](#)
- 3) [Category 5 cable – Wikipedia](#)
- 4) [10GBASE-T Ultimate Guide: Introduction, Cable, Pros and Cons \(qsfp tek.com\)](#)
- 5) [What Are MTP[®]/MPO Cables and How to Choose Them? | FS Community](#)
- 6) [How to Choose MTP/MPO Cable for 10G/40G/100G Connections? \(fiber-optic-solutions.com\)](#)
- 7) [Everything You Need to Know About Ethernet Ports and Their Uses – Infinity Cable Products \(infinity-cable-products.com\)](#)
- 8) [Deep Dive: 400GBASE-LR4 QSFP-DD Optical Transceiver \(fluxlight.com\)](#)
- 9) [Single Lambda 100GBASE-LR1 - FluxLight Blog](#)
- 10) [VSC8522 | Microsemi](#)

Optical Fibers and Connectors

One fiber pair, one (unidirectional) fiber carrying one optical signal for each direction (aka dual-fiber patch cable)



One (bidirectional) fiber carrying two optical signals, one for each direction

Note: There are also cases where there is a single fiber used to carry signal in a single direction: to be analyzed in a later step

Electrical Cables and Connectors

One twisted-pair cable carrying electrical signals in both directions



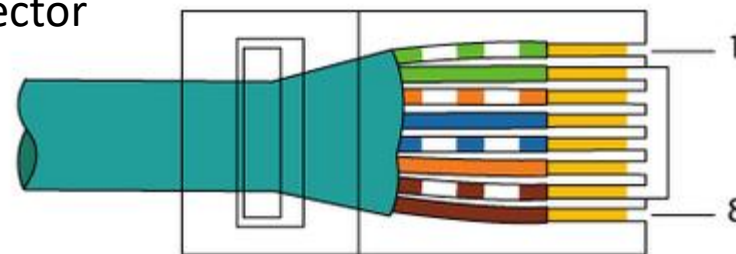
One bidirectional RJ45 connector

More than one twisted-pair wires in one cable



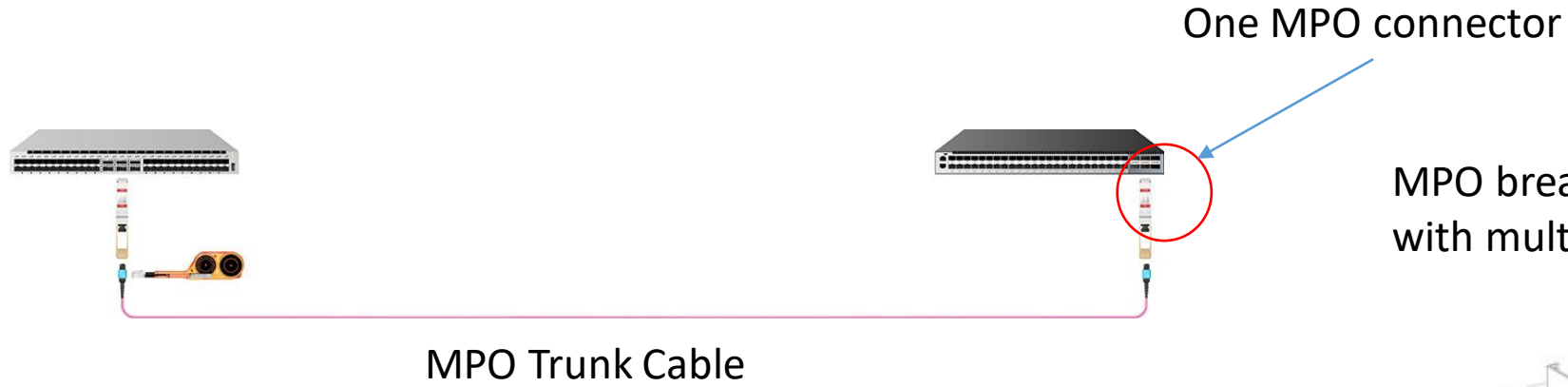
An SPF module can have an RJ-45 connector

More than pin in one RJ-45 connector

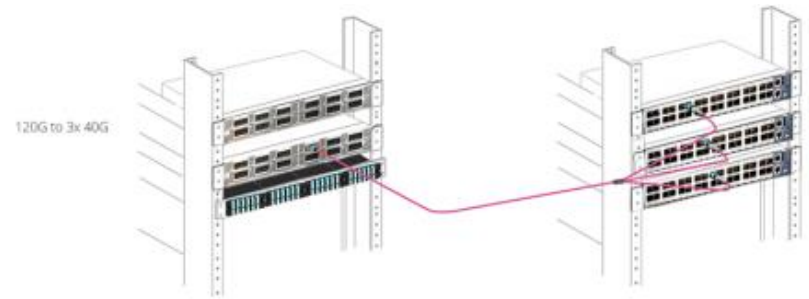
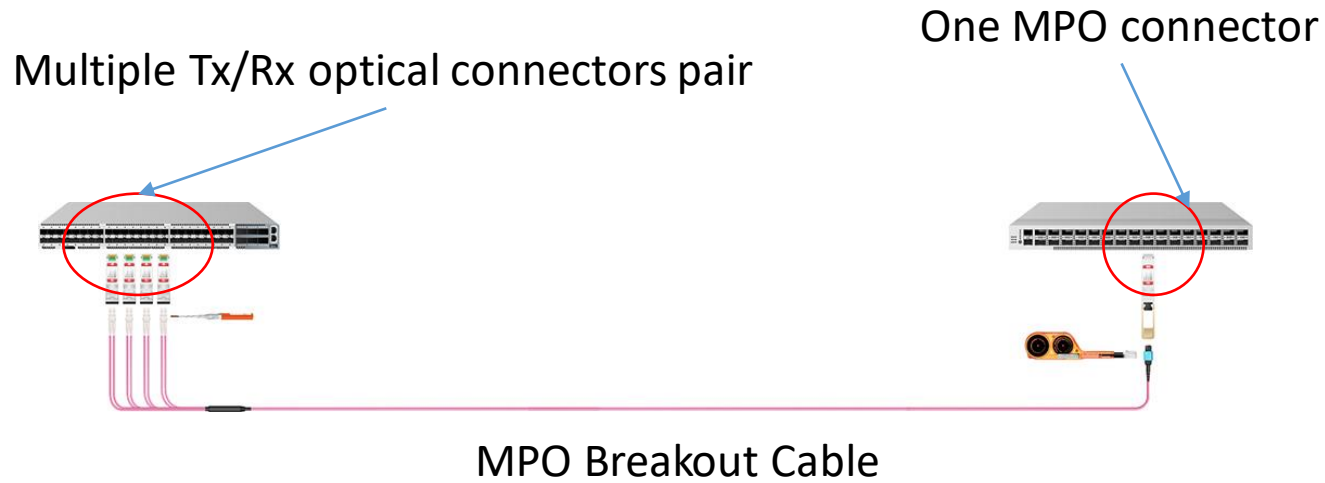


EIA/TIA-568A

MPO Cables and Connectors



MPO breakout cables can connect one NE with multiple NEs



More than pin in one MPO connector

