Passive ODN modeling:

Leveraging BBF Inventory and Topology NRM

Feb 2025

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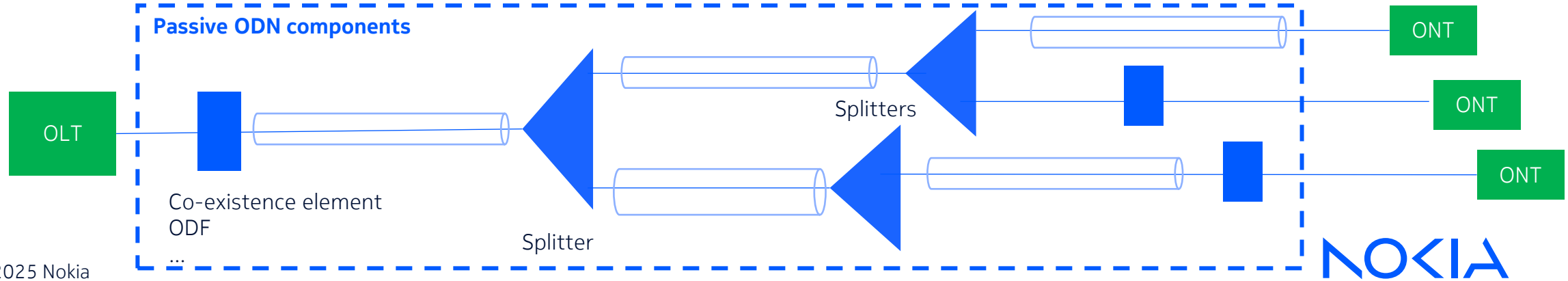
Passive ODN modeling

NRM= Network Resource Model
ODN= Optical Distribution Network
OLT=Optical Line Termination
ONT= Optical NetworkTermination
PON=Passive Optical Network

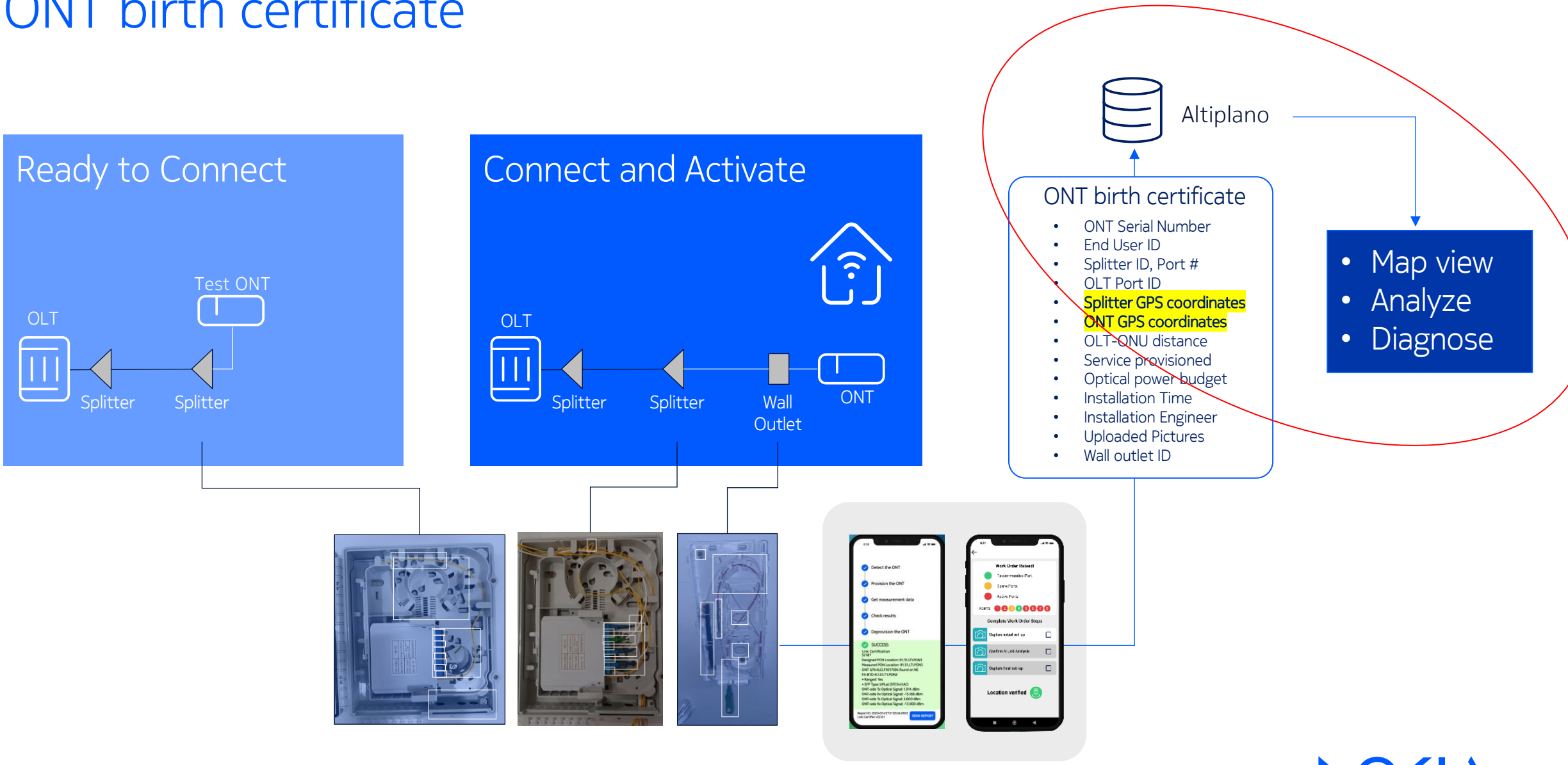
- Target: enable easy trouble shooting and root cause determination when there are ODN incidents or ODN degradations, resulting in alarms generated by OLT and/or ONUs
  - Model passive ODN topology (specifically PON), including individual fiber termination points at each (passive) “interconnect”
- How
  - Include passive modeling in BBF Topology NRM and Inventory NRM
  - Re-use RFC 8345 “Network”, “Node” ,”Termination Point” (TP), and “Link” objects



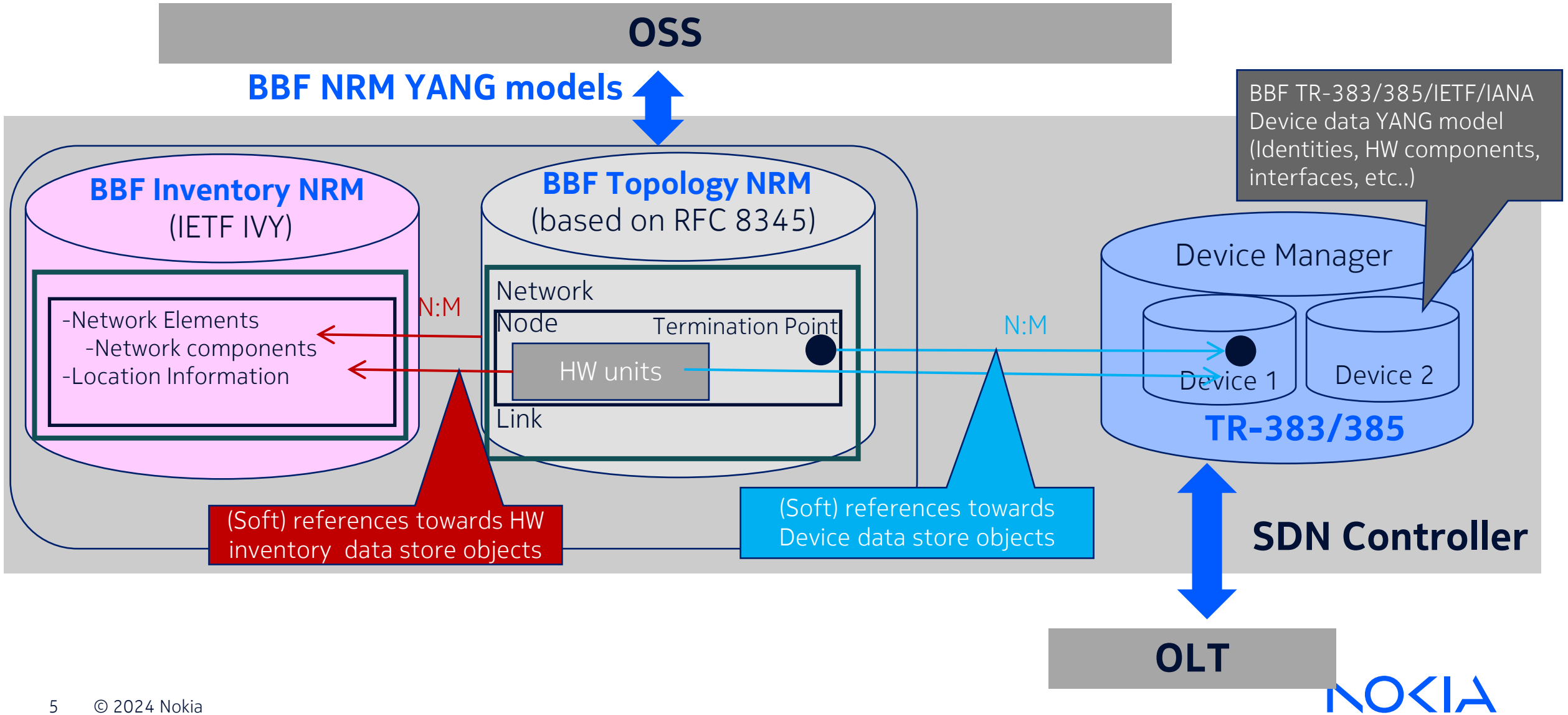
Use cases involving information from (passive) ODN topology

- Fiber Cable Cut/Damage
  - (probably) all fiber cores in this cable are cut/damaged
  - Required Capability:
    - Determine from impacted OLT ports/ONTs whether they share the same (impacted) fiber cable(s) and provide fiber cable segment identifier(s)
- Passive Node Damage
  - Potentially impacting all fiber cores terminated in this passive node
  - Required Capability:
    - Determine from impacted OLT ports/ONTs whether they share the same passive node and provide the passive node identifier
- New ONU connected
  - Compare optical perform. (ONU birth certificate) with FTTH-passed optical test

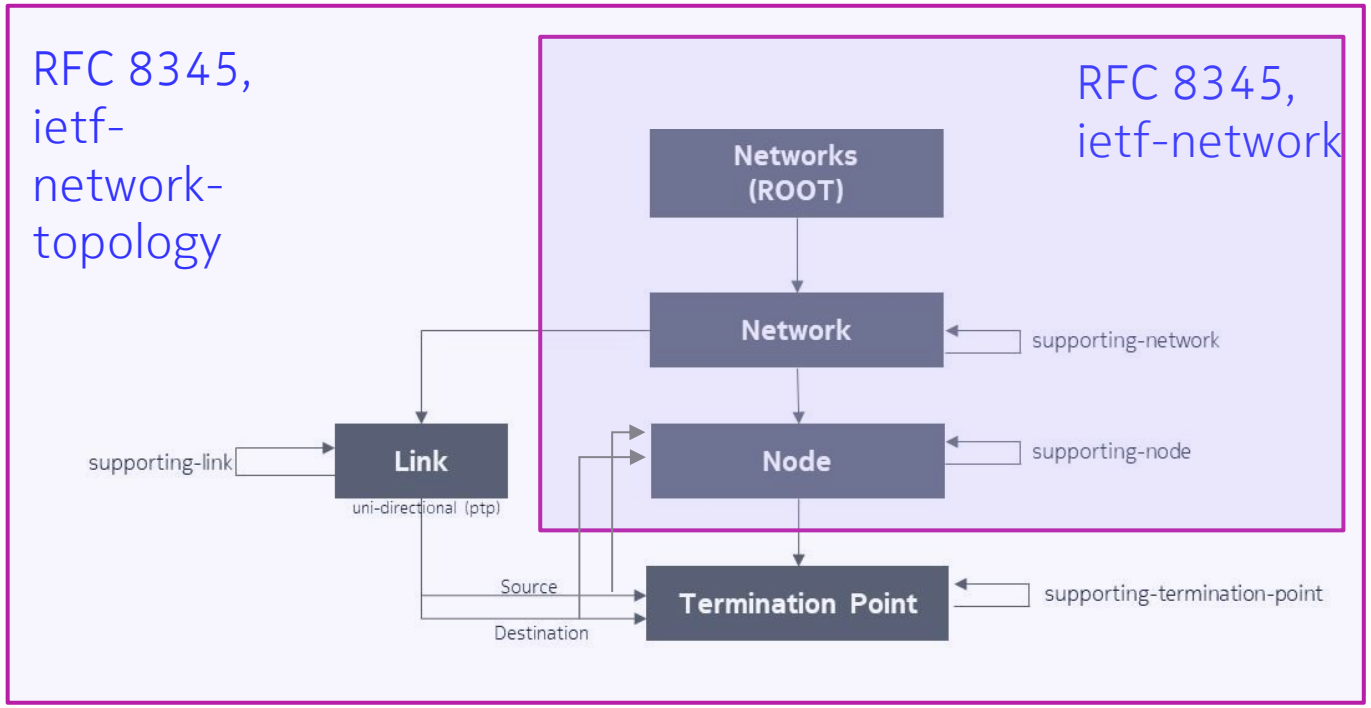
ONT birth certificate

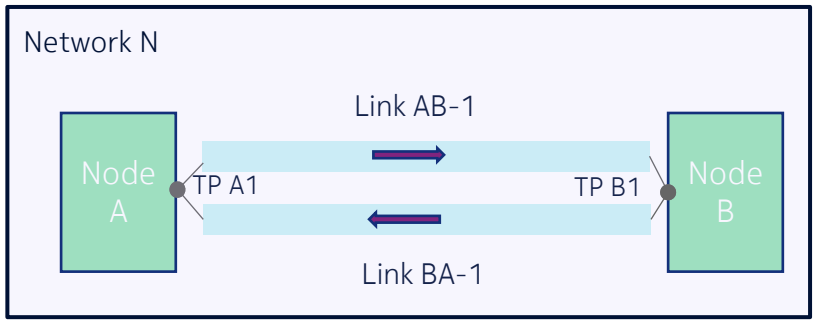


BBF Inventory and Topology Network Resource Model (NRM)



Topology NRM builds on RFC 8345





The NRM that is exposed on the NB of an Access SDN M&C is based on RFC 8345, enabling to define

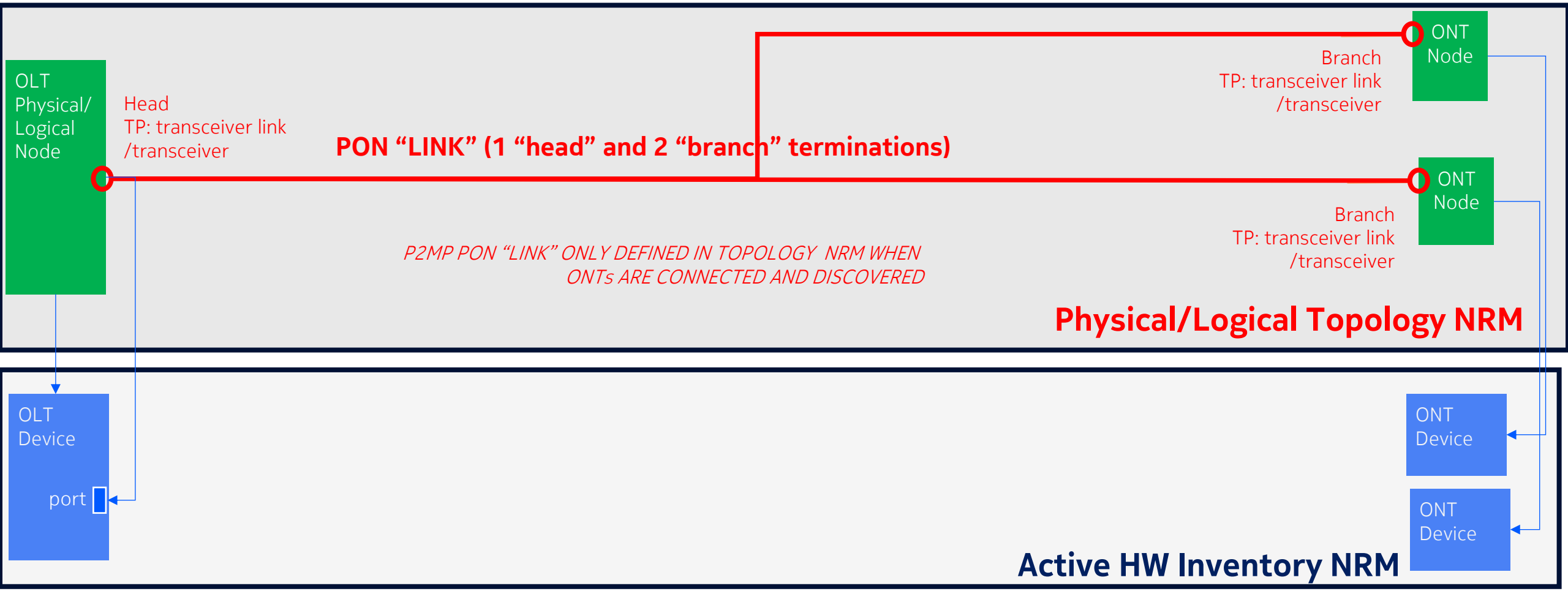
- Multiple networks
- Multiple layers / network types within a network
- Nodes representing access equipment
- TPs and links (topology or inter-device connectivity)

NRM defines MP2MP and Bidirectional Links

Possible passive modeling in Inventory and Topology NRM

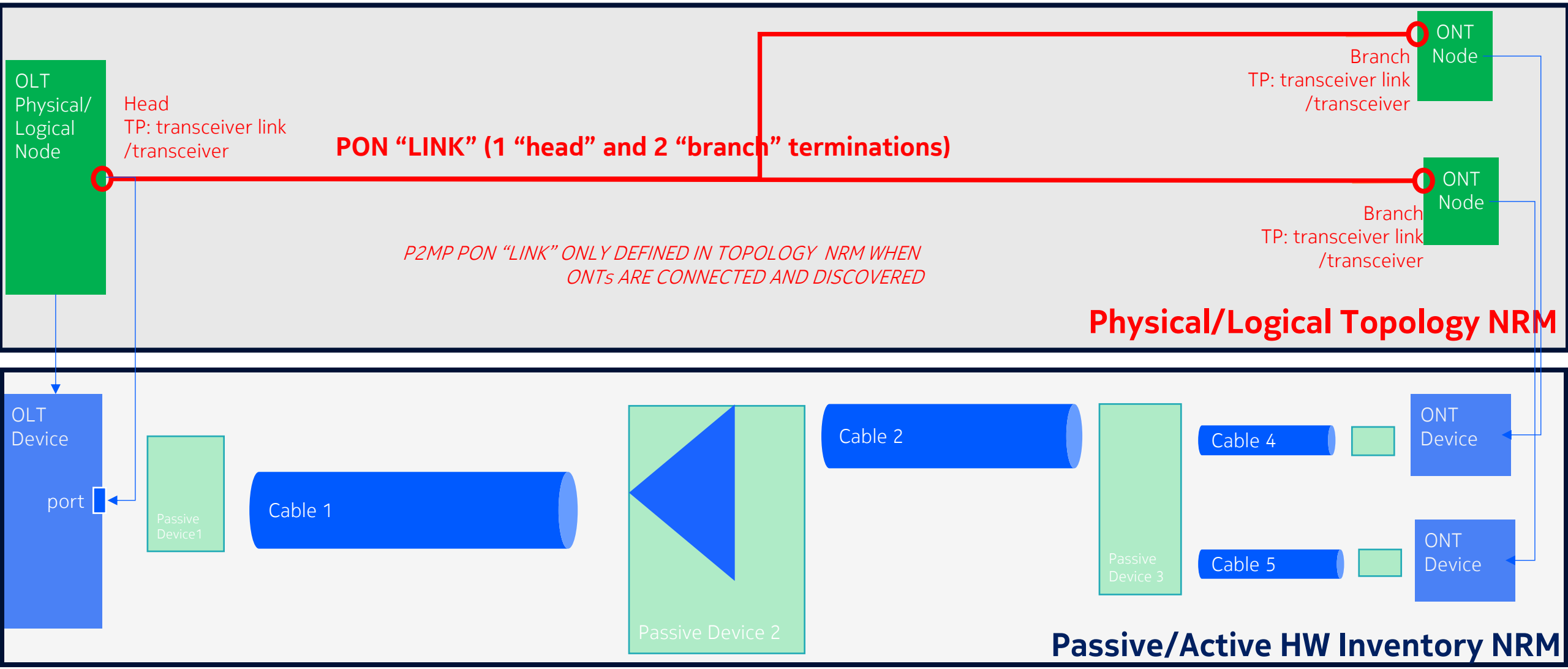
- (Passive) Inventory NRM lists passive devices and fiber cables present in the OSP
  - Passive node model may include internals (eg splitters, etc)
  - Fiber cables: id, number of fiber cores, cable type, fiber core type etc..
- Inventory NRM also has location information
  - For (passive) nodes: address/ geo-location
  - For fiber cables
    - Information needed is based on GIS, fiber routes mapped eg via Google maps
- Inventory NRM may/should NOT include which fiber cores of which fiber cables are interconnected and how…. => Topology view
- As such the passive ODN inventory information /view is static and represents the initial install view…Once realized, the fiber core inter-connectivity is imported in the topology NRM

Topology and Inventory NRM

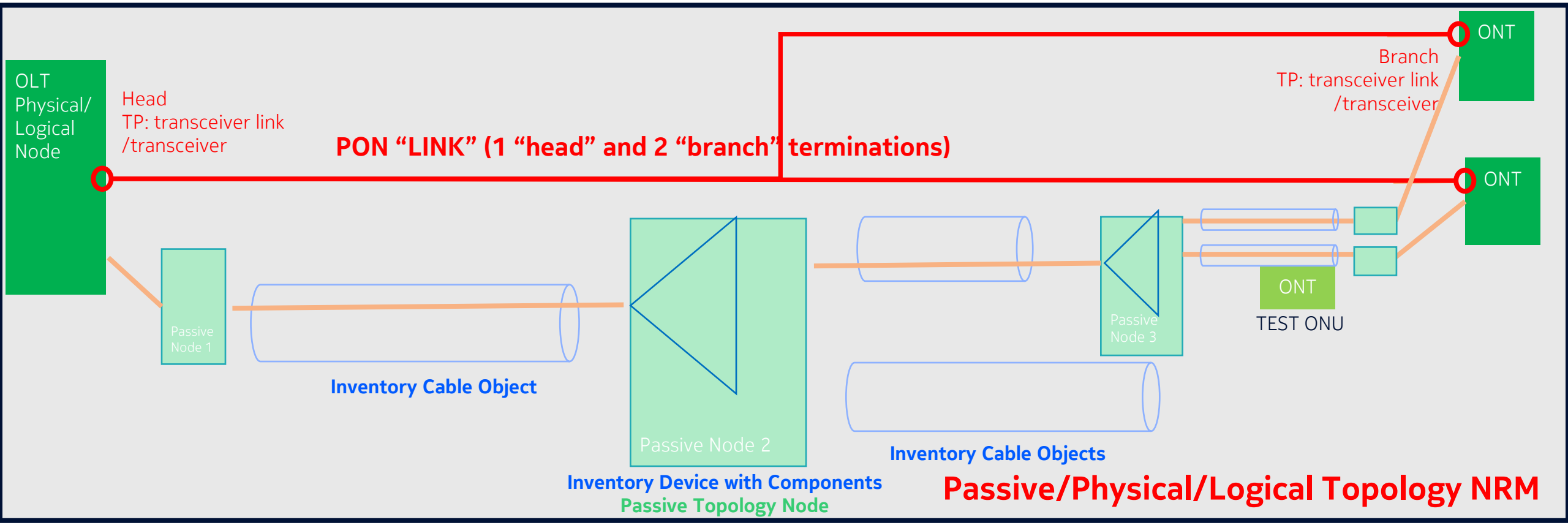


(PON) link is defined in the Topology NRM Physical/Logical network layer and is terminated by OLT node transceiver (head termination) and ONT node transceivers (branch terminations). It informs which ONTs are connected to which OLT port using which (PON) technolog It represents not just a physical E2E connection, its presence indicates operational transceivers at either side (an active PON) as its presence in the topology NRM is based on (automated) network discovery!

Topology and Inventory NRM, with passive devices and cables



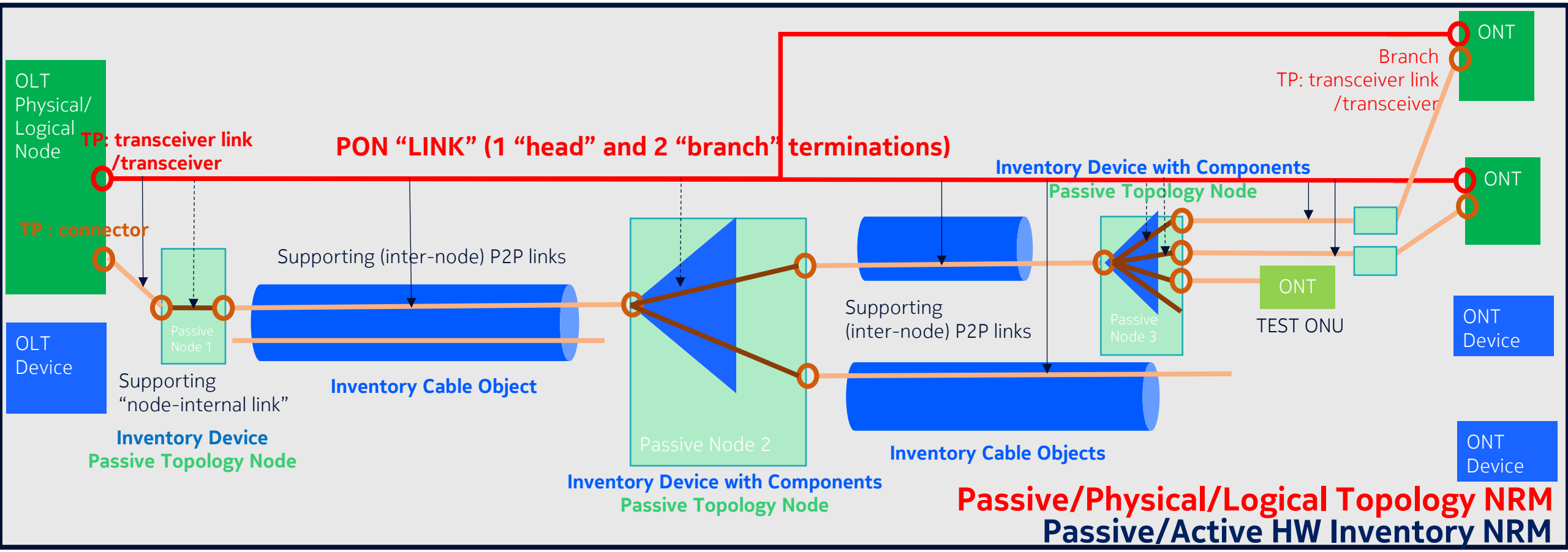
Possible “passive modeling” Topology/Inventory NRM



Single network layer where **“network-types”** presence container has values **“passive” + “physical” + “logical”**
-**OLT, ONT** = (active) nodes where **“node-types”** presence container has values **“physical” + “logical”**
-**Passive Nodes** = nodes where **“node-types”** presence container has value **“passive”**

Allows to define (passive) links between active and passive nodes, as both nodes belong to same network layer

Possible “passive modeling” Topology/Inventory NRM



The links defined in the Physical/Logical Network Layer between active nodes (eg PON link for OLT-ONT) are supported by a set of passive P2P links. In the general case a passive P2P link is the equivalent of a fiber strand –in case of an optical technology- where the termination points (TPs) are the connectors at either end. TBD: model the connector of the fiber strand that is plugged into the PON OLT/ONT transceiver as the supporting TP of the PON link

Inventory

Active

- ....

Passive

- **Passive Devices**
  - UID, node-type, mark/model/vendor, location, # input ports, # output ports , ports-in-use ??
    - Device components
      - Splitters,..
- **Fiber Cables**
  - UID, # fiber cores, cable type, mark/model/vendor, GIS-reference)

To be discussed if also fiber paths representing the concatenation of multiple concatenated fiber link segments (including passive node-internal optical links) are to be defined

Topology (nodes, TPs and links)

Logical/Physical/Passive Network Layer

- (Logical/Physical) Nodes
  - OLT and its TPs
  - ONTs and its TPs
- PON (M)P2MP Link
  - OLT/ TP
  - ONT-1/TP; ONT-2/TP;...
  - **Supporting Links**
- **(Passive) Nodes**
  - TPs
  - Reference to “passive device” and “device components
- **P2P Fiber link segment 1**
  - Passive or Logical/physical Node X/ TP
  - Passive or Logical/physical Y/ TP
  - Reference to Fiber Cable
- **P2P Fiber link segment 2**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