

APP NOTES

CloudCO-APPN-004- Activation and Initial Provisioning - Access Devices

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1 Summary/Objective

This application note describes how to activate and initially provision access devices (e.g., OLT, ONU/ONT, DPU) via the Access SDN M&C (Management and Control) and BAA (Broadband Access Abstraction).

2 Assumptions and Preconditions

1. A CloudCO domain is instantiated in a previous bootstrapping stage (see CLOUDCO-APPN-000).
2. The Access PNFs have been installed and are ready to boot.
3. The physical connectivity between Access PNFs, SDN Controllers, and Network I/O has been established.
4. Standard NETCONF/YANG interfaces are used for the management and control between BAA and Access devices either directly or via a device adapter.

3 Description of the System

The only required items are the CCO DO, the Access SDN M&C, the BAA, and one or more access devices (OLT/ONU/ONT/DPU). See Figure 1 System description.VIM to deploy NERG VNF to manage the lifecycle of the future vG VNF.

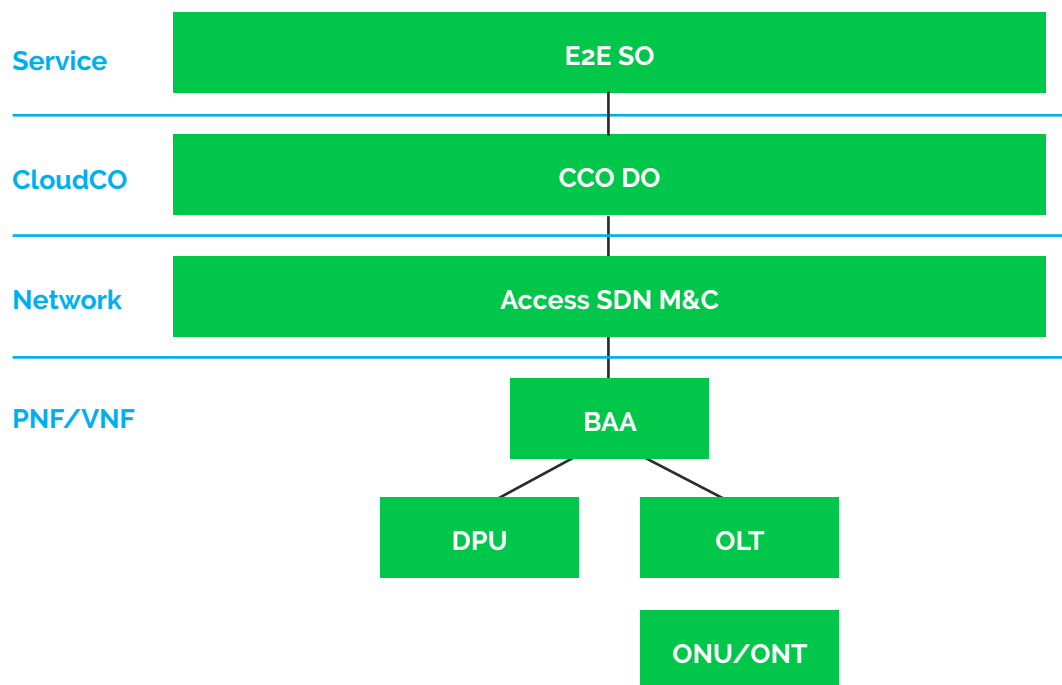


Figure 1 System description

1. For equipment inventory and network topology management function associated with infrastructure, access devices such as OLTs/DPUs and ONUs/ONTs are seen as separated L1-physical nodes via BAA. Although given that they work as part of an overall access function, the applicable YANG Data Models are defined and mounted in a way that correlates the different resources and information at the Access Network topology end Equipment inventory level.

The BAA has the responsibility to perform the equipment management function upon appropriate inputs from the Access SDN M&C.

Section 6 provides interactions when OLTs/DPUs and ONUs/ONTs are installed and initially provisioned to illustrate the ability to separately configure the resources of the access devices.

2. For service provisioning associated with subscriber access management, access device(s) is abstracted as a L2-3 node which is device and technology agnostic via BAA (this is represented by the vAN Data Store, DS) as shown in Figure 2. Following shows some examples of this abstraction:
 - The combination of OLT + TR-156 ONU/ONT is abstracted as a technology-agnostic L2-3 node representation.
 - DPU or TR-167 ONU/ONT is also abstracted as a technology-agnostic L2-3 node representation.

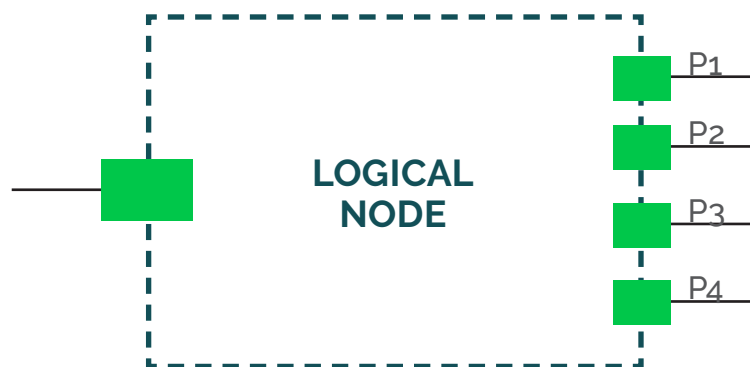


Figure 2 L2-3 node representation of an Access Node

The BAA has the following responsibilities:

- to expose L2-3 management & control of the logical ports of the L2-3 node mapped to the physical node.
- to convert and transfer the configuration between the Access PNF SDN Ctrl and the access device (e.g., converts and transfers the configuration from technology agnostic to GPON specific).

Section 6 provides interactions of service provisioning to illustrate this.

In conclusion, the interface based on L1 physical node is vendor agnostic and device, technology aware, while the interface based on L2-3 node is vendor, device and technology agnostic. These two types of interface can coexist at the same time in NBI of BAA, because they are respectively applied for different functions. For example, the interface based on L1 physical node focuses on the infrastructure management functions(e.g. equipment inventory, topology management, diagnostics, performance monitoring, and fault management), while the interface based on L2-3 node is mainly used in service provision functions associated with subscriber access management(e.g. High Speed Internet Access service, Multicast service, NERG service, etc.).

4 Components

Component Framework Name	Component Description
CCO DO	Cloud CO Domain Orchestrators
Access SDN M&C	Access PNF SDN Management and Control
BAA	Broadband Access Abstraction layer
OLT	Optical Line Termination
ONU/ONT	Optical Network Unit/Termination
DPU	Distribution Point Unit

5 Actors

Actor Name	Actor Description	Actions at CCO Domain
CloudCO Operator	The CloudCO Operator creates the Cloud CO Domain Instance and subtended access devices and networks.	Equipment Provisioning of access devices
Service Provider	The Service provider creates the service, and also creates service users	Service Provisioning of access devices

6 Interactions

6.1 Interaction 1: Initial Provisioning of OLT/DPU

NOTE: A DPU can be provisioned in the same way as an OLT, where the BAA hosts the physical DPU instance (pDPU instance#k) within the PMA as the management agent for the DPU. The following is an example of interactions for the initial provisioning of OLT.

The CloudCO Operator requests the Access SDN M&C to instruct the BAA to create a physical OLT instance (pOLT instance#n) via the Minf (see WT-411/WT-413). The following is an example of the parameters included in this interface (but may not exhaustive to):

- NE-type (OLT, DPU, MSAN, DSLAM, etc.)
- NE-subcategory (shelf, linecard, SFP plug, etc.)
- NE-id
- NE-manufacturer, and serial number
- NE-location/description
- NE-sw/fw
- NE-vendor
- NETCONF-username & password

NOTE: a new YANG module will be needed to define for this procedure

The Access PNF SDN M&C sends the initial configuration of the physical OLT instance to the BAA via the Minf. This configuration is for setting up the infrastructure and is not subscriber related (e.g. channel-group, channel-partition, channel-pair and channel-termination interfaces, see WT-385). The BAA stores the configuration information.

NOTE: this should be supported whether or not the OLT is currently reachable.

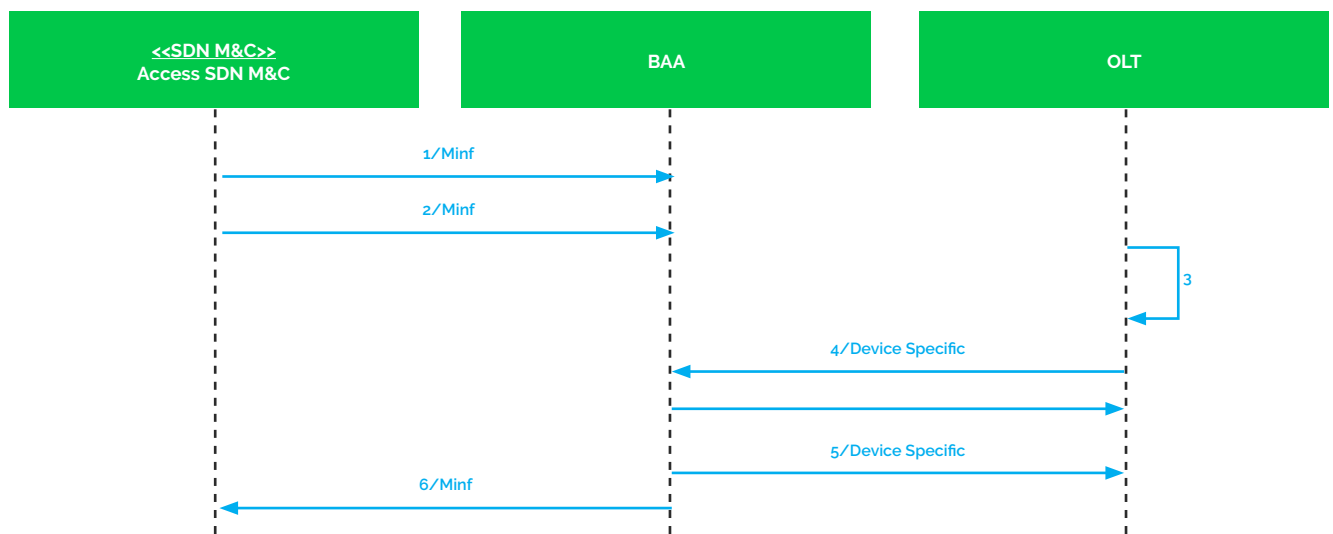
5. The physical OLT is powered on and starts to boot.
6. The OLT connects to the BAA to establish a NETCONF link to the BAA. The OLT authenticates the BAA via an appropriate mechanism (e.g., username/password, SN, etc.) among those specified in SD-417 (NETCONF reqs for OLT management).

NOTE: OLT may get an IP address by a craft terminal interface because OLT typically is located in centralized CO. If OLT is remote, it may get IP address from a DHCP server and establish the NETCONF connection with the BAA via the SZTP solution described in draft-ietf-NETCONF-zero-touch-21

7. The BAA sends the initial configuration information to the OLT.

NOTE: the OLT is not reachable due to some fault, the BAA must align the OLTs configuration with any modifications made to the pOLT instance#n (actually to the pOLT#n DS) in the BAA as soon as communication to the OLT is restored.

8. The BAA notifies the Access SDN M&C with a message indicating that the OLT is online and properly configured.



6.2 Interaction 2: Initial Provisioning of ONU/ONT

NOTE: An ONT can be initially provisioned in the same way as a TR-156 ONU. The following is an example of interactions for the initial provisioning of a TR-156 ONU.

1. The CloudCO Operator requests the Access SDN M&C to instruct the BAA to create an ONU via the Minf (see WT-411/WT-413). The following is an example of the parameters included in this interface (but may not exhaustive to):
 - ONU-ID
 - ONU-authentication information(SN or Password, etc.).
 - Access line information (e.g., PON port ID).
 - The hardware model of ONU (e.g., the type and number of the interfaces in the ONU).
 - ONU description.
2. The BAA creates the necessary PON resources and attributes corresponding to the physical interfaces of the ONU in the corresponding pOLT#n DS , and stores this information.

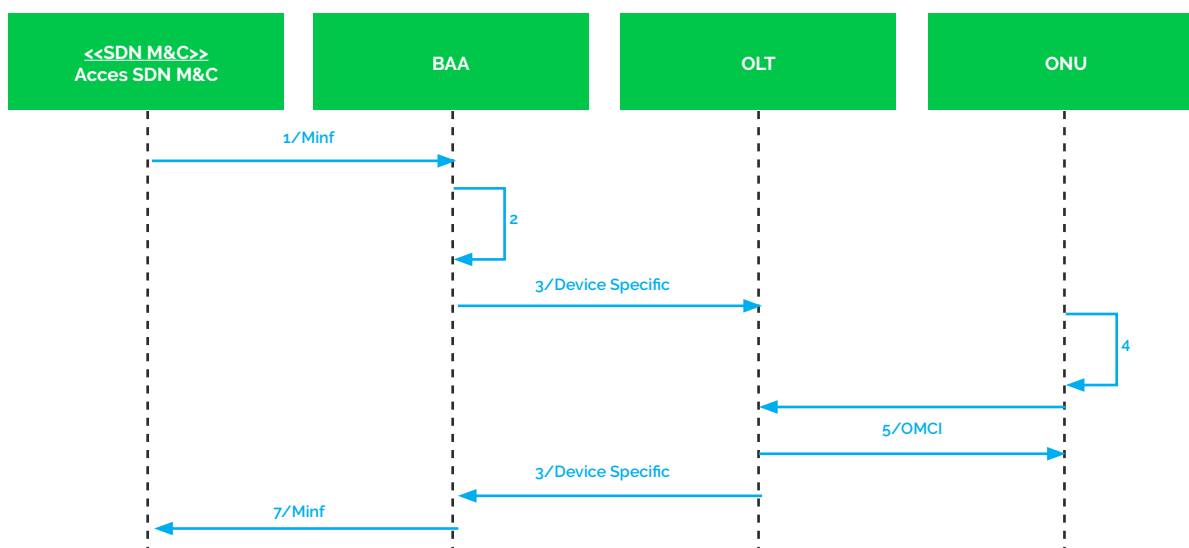
The BAA configures the pOLT#n DS with the necessary technology specific format (e.g., GPON v-ontani, ont-ani; see WT-385) and sends to the hosting physical OLT.

NOTE: this should be supported whether or not the ONU has been installed.

3. The ONU is connected, starts to boot and registers at the OLT which authenticates the ONU (e.g., via SN, Password, etc.).

NOTE: There may be many methods to authenticate ONU. For example, when the subscribers own the ONUs and ONUs are installed by subscribers themselves, there may be some differences in the above step 1&4. The BAA and OLT need not be pre-configured with ONU-authentication information, and the authentication is performed via the Access SDN M&C (or some authentication VNFs). In this case the BAA has the responsibility of passing ONU authentication requests towards the Access SDN M&C and response message to the OLT.

4. The OLT sends the configuration information to the ONU via the appropriate communications link (e.g., OMCI, EOAM, etc).
5. The OLT notifies the BAA that the ONU is configured (or not in the event of a failure) using the appropriate message.
6. The BAA notifies the Access SDN M&C of the ONUs status via the Minf.



6.3 Interaction 3: User side Service Provisioning

It should be noted that the interfaces for service provisioning will not change whether the physical network elements are "OLT+ ONU/ONT", DPU, DSLAM, or some other technology because via BAA these devices are abstracted as L2-3 node which are device and technology agnostic.

The details of service provisioning is referred to:

- APPN-007 "Interaction 3: VNO ONT L2 Service Creation" for provisioning of L2 connectivity over a PON (this Interaction also relies on Interaction 2 for the V ref. point configuration).
- APPN-001 "Interaction 2: Create HSIA Service" for the generical establishment of a C-VLAN to a user (this Interaction also relies on Interaction 1 for the V ref. point configuration).

7 Success Criteria

Interaction 1:

1. The OLT/DPU can be managed through the Access SDN M&C.
2. The BAA supports the provisioning of the OLT/DPU that has not yet been installed.
3. When the OLT/DPU comes online from some fault, the BAA synchronizes its provisioned configuration with the OLT/DPU configuration

Interaction 2:

1. The ONU/ONT can be managed through the Access SDN M&C.
2. The provisioning of the ONU/ONT is supported whether or not the ONU/ONT is currently reachable.
3. When the ONU/ONT comes online from some fault, the OLT synchronizes its provisioned configuration with the ONU/ONT configuration.

Interaction 3:

N/A. Addressed in other Application Notes.

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