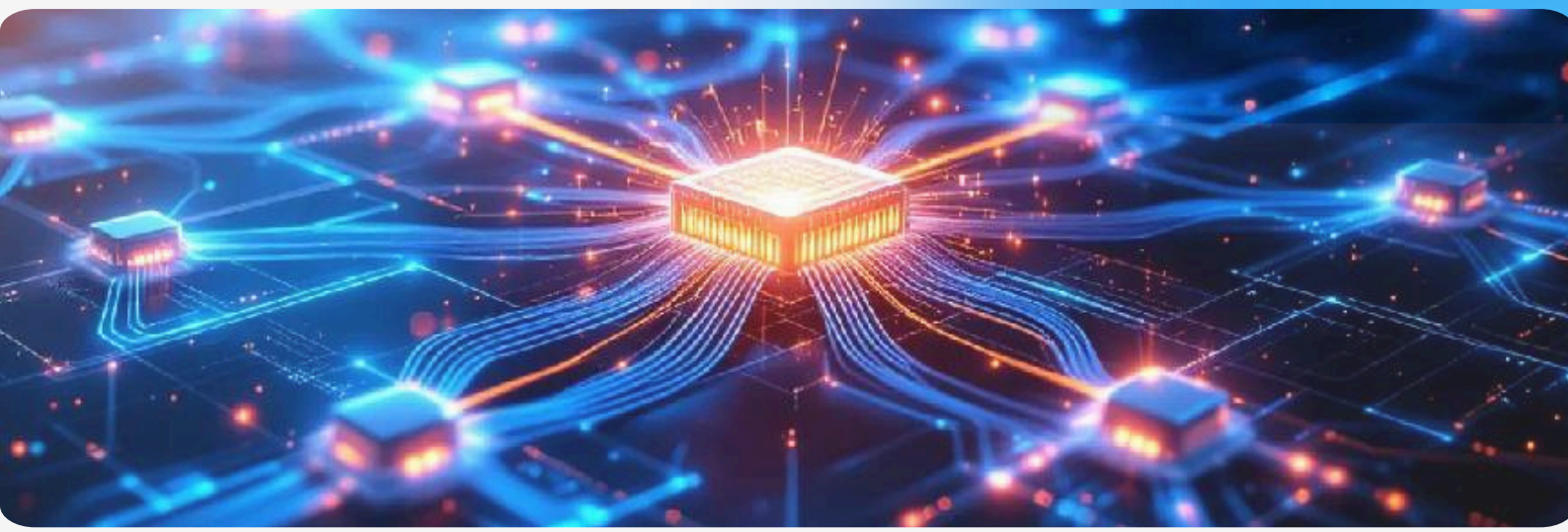
ONF VOLTHA OLT Certification Procedure

Case-study



1. Introduction

ONT stands forOptical Network Terminal. An ONT is the device that serves as the telecommunication chain's endpoint of the PON on your end. Another abbreviation to know is an ONU, which stands for Optical Network Unit. ONU and ONT are often used interchangeably. They are the same. Simply put, an ONT/ONU refer to the user side equipment.

OLT stands for Optical Line Terminal. An OLT is the device that serves as your ISPs endpoint of the passive optical network (PON). The OLT also provides the interface between a PON and your ISP's core network. Simply put, an OLT is ISP equipment.

The PON devices can be mainly classified into GPON, XG-PON, and XGS-PON depending on their transmission rate.

1. The G-PON maximum downstream line-rate transmission is 2.5 Gbit/s, and the maximum upstream line rate is 1.25 Gbit/s.
2. The XG-PON maximum downstream line-rate transmission is 10 Gbit/s, and the maximum upstream line rate is 2.5 Gbit/s.
3. The XGS-PON maximum downstream line-rate transmission is 10 Gbit/s, and the maximum upstream line rate is 10 Gbit/s.

2. Scope of the document

PalC Networks has expertise in Validating customer OLT to be compliant with ONF VOLTHA solution. This document captures information for replicating ONF test procedure.

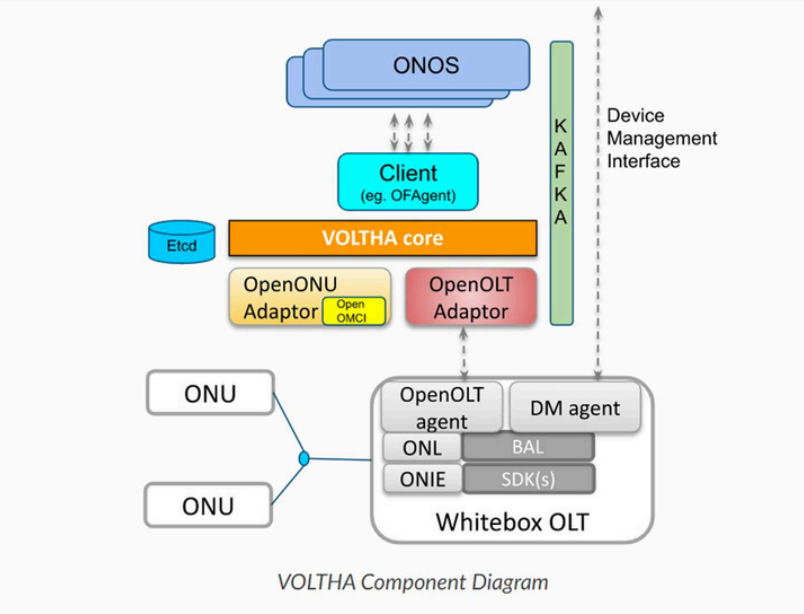
3. Technology Overview

3.1. VOLTHA

VOLTHA is an open-source project to create a hardware abstraction for broadband access equipment. It supports the principle of multi-vendor, disaggregated, “any broadband access as a service” for the Central Office.

VOLTHA currently provides a common, vendor agnostic, GPON control and management system, for a set of white-box and vendor-specific PON hardware devices.

VOLTHA Architecture consists of VOLTHA Stack, voltha core, olt adapter, ont adapter, open flow agent. More details about the voltha architecture and code can be found in https://docs.voltha.org/master/overview/architecture_overview.html



VOLTHA Component Diagram

3.2 VOLTHA Controller bring up procedure

There are predefined helm charts to bring up voltha controller. Reference:
https://docs.voltha.org/master/voltha-helm-charts/README.html
There are two helm charts.

1. voltha- infra (bring up Infra structure components like onos, kafka, etcd)
2. voltha-stack (bring up voltha- core openolt adapter, openont adapters.)

Sample HELM Upgrade Commands:
helm upgrade --install --create-namespace -n infra voltha-infra onf/voltha-infra -f 2.9/voltha-helm-charts/examples/dt-values.yaml -f menlo-certification-pod-radisys-gpon-DT-single.yaml

Use Kubectl get pods to make sure all pods are up and running and enable port forwarding for ports required by each pod. Refer to above doc for exact command. Install voltctl binary to manage voltha controller.

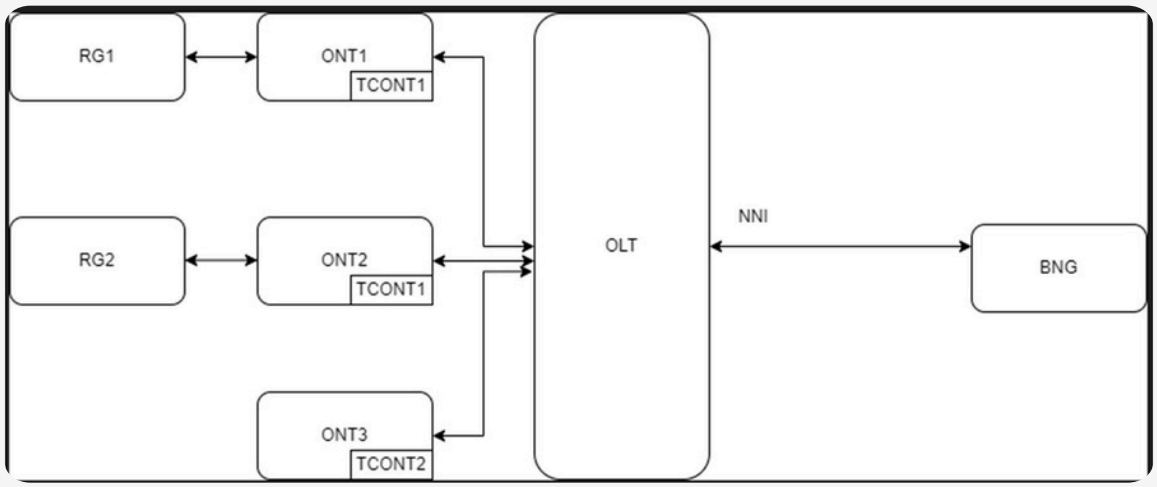
VOLTHA can be managed using onos controller as well. ONOS SADIS module takes care of the configuration and management. VLAN Mapping, Bandwidth profile, TCONT mentioned in SADIS configuration will be consumed by ONOS application. Tech profile has the information about Number of gem ports, services supported by device. ONOS consumes this two information and create the flows and pushes to ONT and OLT using openont and openolt adapters respectively.

3.3 OLT Image build and Install procedures:

Procedure to build openolt software (that runs onOLT) is mentioned in https://docs.voltha.org/master/openolt/BUILDING.html.
As mentioned in the make file, ONL is compiled and then packages required to build opneolt is compiled.

Steps:
Build Base image using "make OPENOLTDEVICE=<Device_name>
"Build Debian package using "make OPENOLTDEVICE=<DEVICE_NAME> deb
PORT_QSFP_SPEED=10g
PORT_SFP_SPEED=10g"
Copy the debian package to the device and restart openolt and dev_mgmt_daemon service.
Image
Upgrade process is successful if openolt services comes up properly.

4. Certification Validation Procedure



RG - Residential Gateway.
ONT - Optical network Terminal.
OLT - Optical Line Terminal.
BNG - Broadband network Gateway.
Above topology can be used to run DT workflow cases of ONF Validation scripts. RG is used to simulate a subscriber by using a linux machine. Iperf was used to send traffic. BNG acts a DHCP server and allocates IP address to subscribers.

4.1. Setting up a client (RG)

If you want to setup the container for the DT workflow, please add a tagged interface to be used to send out traffic.

4.2. Setting up an emulated BNG on Linux

Create Q-in-Qinterfaces On the interface that connects to the Agg Switch (upstream) you are going to receive double tagged traffic, so you'll need to create interfaces to received it.

Supposing that your subscriber is using s_tag=111, c_tag=222 and the upstream interface name is eth2 you can use these commands to create it:

```
ip link set eth2 up
ip link add link eth2 name eth2.111 type vlan id 111
ip link set eth2.111 up
ip link add link eth2.111 name eth2.111.222 type vlan id 222
ip link set eth2.111.222 up
ip addr add 10.11.2.254/24 dev eth2.111.222
```

Then you'll need to tell the dhcp server to listen on that interface, you can do that by editing the file /etc/default/isc-dhcp-server so that it looks like:

```
INTERFACES="eth2.111.222"
```

NOTE: that you can list multiple interfaces, separated by spaces, in case you have multiple subscribers in your setup in the /etc/dhcp/dhcpd.conf config file, configure the IP address range to assign to the double

```
tagged interface:
subnet 10.11.2.0 netmask 255.255.255.0 {
range 10.11.2.1 10.11.2.100;
option routers 10.11.2.254;
option domain-name-servers 8.8.8.8;}
```

For more information, please refer below link:
https://docs.voltha.org/master/overview/lab_setup.h

4.3. Pre-requisite manual validation

1. Basic validation for subscriber to be active is to successfully ping BNG from RG and vice versa. Based on SADIS and Tech profiles, VOLTHA will programs flows in OLT and ONT.
2. Once Subscriber comes up, DHClient in RG will send out a DHCP Request.
3. ONT will forward it to OLT.
4. OLT will push the DHCP packets towards BNG.
5. BNG will assign an IP for Subscriber and respond to RG. DHCP response will be forwarded to RG via OLT/ONT.
6. RG will assign the ip address and use it for data traffic.
7. Ping from RG to BNG also takes the same flow. ONT receives the packet from RG and sends to OLT. OLT forwards it to BNG and reply packet comes via BNG --> OLT --> ONT --> RG

4.4. Validation through ONF Automated scripts

ONF Automation scripts are implemented using ROBOT Framework. As ROBOT Scripts makes use of Voltctl command to program and validated subscribers, automation scripts can be run on the server where voltha controller is spawned. More details on test cases can be found in https://github.com/opencord/voltha-system-tests
The command used to run Dt-workflow:
robot -V <YAML file > <options> tests/dt-workflow/Voltha_DT_PODTests.robot
No differentiation of services. Used Wildcard vlan(4096) on UNI Side. ONT and OLT accepts all packets and forwards to BNG

For TT-Workflow:
robot -V <YAML><Options >tests/tt-workflow/Voltha_TT_PODTests.robot

Different VLAN foreach service(HSIA, VOIP, VOD, MCAST)

4.5. Report Analysis

The default output directory is the directory where the execution is started from, but it can be altered with the--output dir (-d) option.

For Example, in run command we can see -d option which contains the path where log is stored, it contains 3 files

1. Output file
2. Log file
3. Report file

Output file:
Output files contain all the test execution results in machine readable XML format.

Log file:
Log files contain details about the executed test cases in HTML format. They have a hierarchical structure showing test suite, test case and keyword details. Log files are needed nearly every time when test results are to be investigated in detail. Even though log files also have statistics, reports are better for getting a higher-level overview.

Report file:
Report files contain an overview of the test execution results in HTML format. They have statistics based on tags and executed test suites, as well as a list of all executed test cases. When both reports and logs are generated, the report has links to the log file for easy navigation to more detailed information.

4.6. Conclusion

After validating the test cases locally, we can request ONF VOLTHA team to get certified.