DASAN NETWORKS
GPON TRAINING

DASAN Networks

CHAPTER 7. GPON MODE CONFIGURATION

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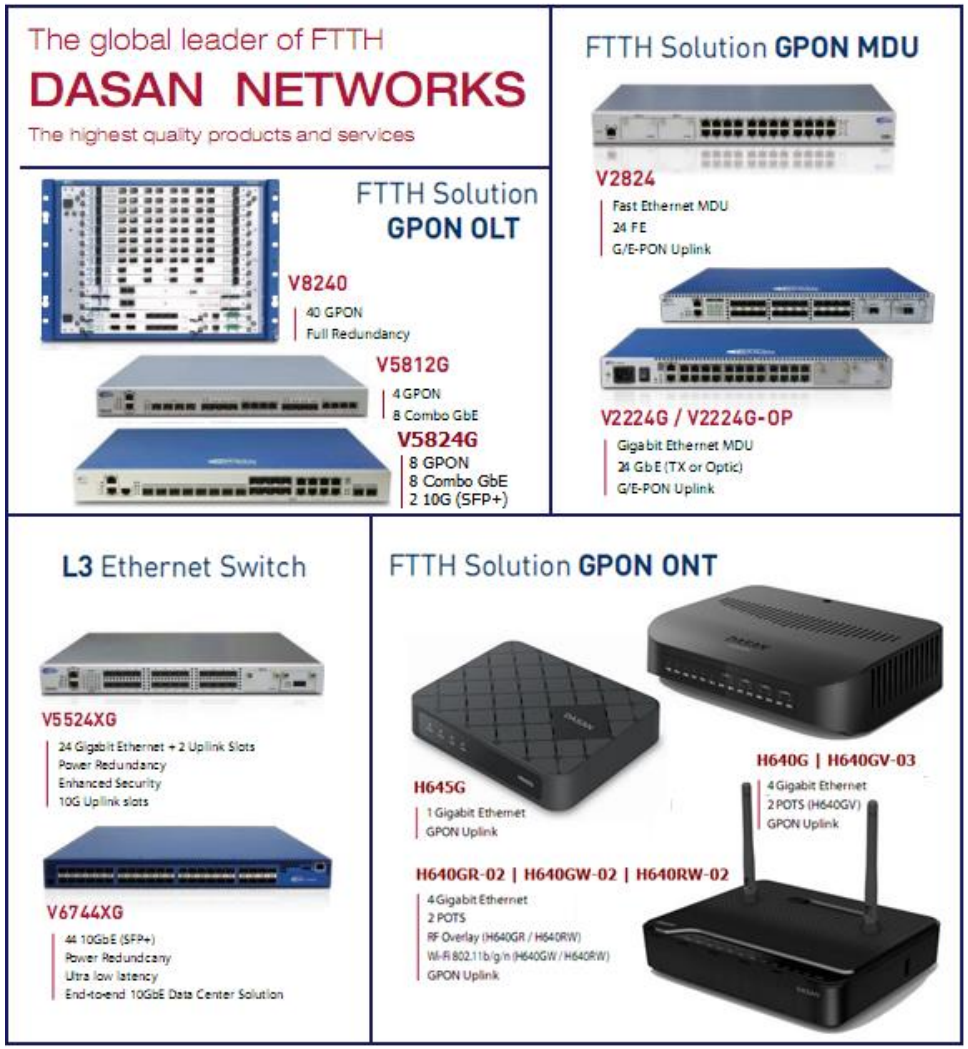


1. GPON Base

GPON Configuration

Gigabit Passive Optical (GPON) technology has the active network elements OLT (Optical Line Termination) at the central office and ONU/ONT (Optical Network Unit / Termination) at the subscriber site. Typical GPON configuration consists of a single PON port at the OLT and a number of ONUs connected to it over a single fiber feeder. Generally, a Time Division Multiplexing (TDM) is used in the downstream data transmission. OLT broadcasts data to every ONUs using TDM approach. Every ONU receives each downstream frame and pinks up only that data addressed to it by the OLT. Optionally, FEC coding and AES encryption are applied to the user data. To deliver data to OLT in upstream direction, the OLT implements a Time Division Multiple Access (TDMA) approach. ONU (ONT) receives data from the user ports and combines them into bursts. Each ONU (ONT) transmits its data in a strict accordance with the Bandwidth Map generated by OLT for the synchronization. Using DBA mechanism OLT can rearrange upstream bandwidth to provide more resources to those ONU tightly loaded with traffic.

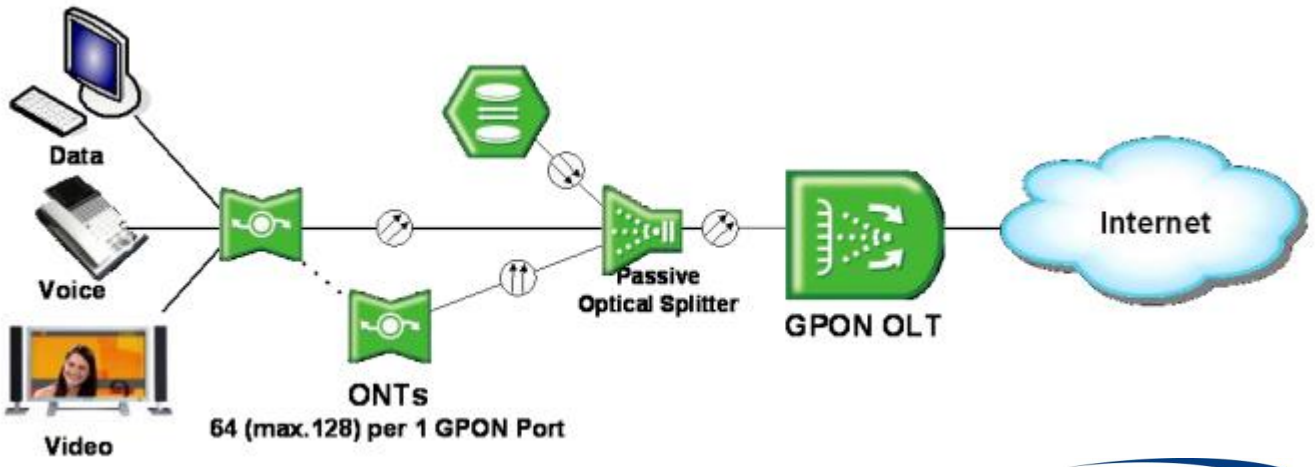
The ONU provides network termination for a Passive Optical Network (PON) in the home or business. The ONU connects via a high speed interface to the PON network and provides subscriber access to data (Ethernet), voice (POTS) and video services. GPON gives edge networks an unparalleled bandwidth advantage in their ability to offer truly high speed triple play service (i.e. voice, video and data) especially when compared with existing cable or DSL services.

Basic Operation

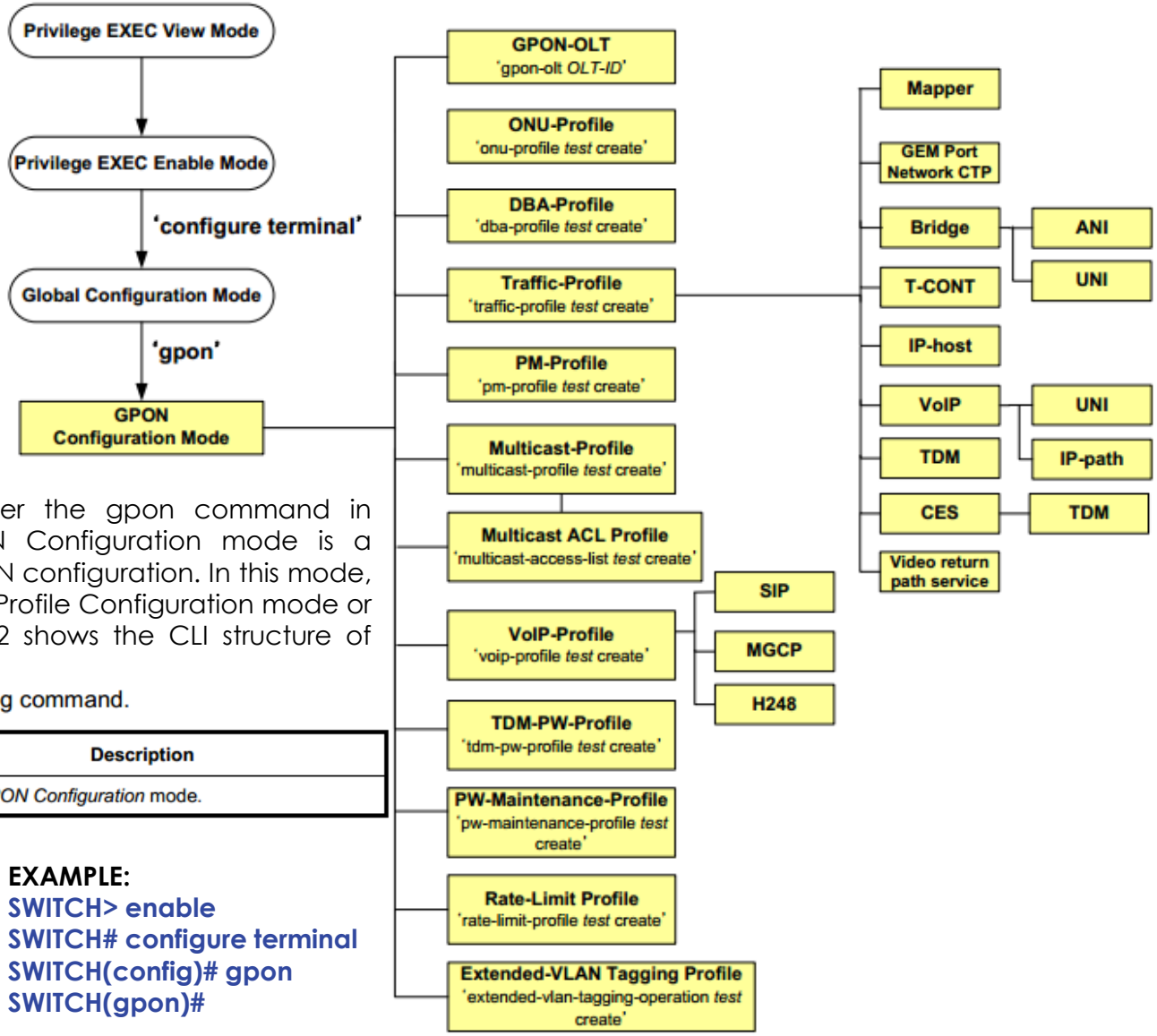
- Configure OLT and ONU (ONT) in GPON-OLT Configuration mode.
- For common ONU (ONT) configuration, create a profile in ONU Profile Configuration mode.
- If the created profile is modified, the profile will be applied to the ONUs (ONTs) automatically.

Specifying OLT and ONU ID

When specifying an OLT ID in the CLI, you can simply put the number in the form of PORT number such as 1, 2, 3, 4. Multiple input is also possible, e.g. 1, 2, 3 or 3-4. When specifying an ONU ID, just remember that the ONU ID is always between 1 and 128 or ONU serial number. Multiple input for the ONU ID is the same as the ONU ID, e.g. 1-3, 8-22, DSNWcb00282d.



2. GPON – CLI structure



CLI Structure

To configure GPON functionalities, enter the gpon command in Global Configuration mode. The GPON Configuration mode is a stage of preparation for the detail PON configuration. In this mode, you can open ONU/PM/Traffic/VoIP/DBA Profile Configuration mode or GPON-OLT Configuration mode. Fig. 11.2 shows the CLI structure of GPON Configuration mode.

To open *GPON Configuration* mode, use the following command.

Command	Mode	Description
gpon	Global	Opens *GPON Configuration* mode.

EXAMPLE:

SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)#

EXAMPLE:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# gpon-olt 1
SWITCH(config-gpon-olt[1])# onu ?
```

activate	Activate ONU
add	Add ONU
auth-control	onu-auth-control
auto-upgrade	Auto upgrade configuration
block	onu block configuration
deactivate	Deactivate ONU
description	ONU Description
encryption	Encryption configuration
firmware	ONU Firmware
fix	change auto learning onus to manual learning onus
inactive	Inactivate ONU
loop-detect	Onu loop-detect configuration
loopback	Loopback configuration
mac-filter	MAC Bridge Filter Table
mgmt-mode	Mamagement mode
multicast-access-list	Multicast Access List
port-admin	Port admin status
port-config	Port configuration
remove	Remove ONU configuration
reset	Reboot ONU
static-ip	Statis IP Configuration
system-account	ONU System Account information
tx-off-optic	Tx power disable of the transceiver
unblock	onu unblock configuration
uni-description	ONU UNI Description
upgrade	ONU Firmware upgrade(Download and Commit)
us-fec-mode	Upstream FEC mode
vlan-gem-mapping	VLAN GEM Port mapping
voip-mgc	VoIP MGC Porotocol Configuration
voip-sip	VoIP SIP Porotocol Configuration

GPON OLT PORT and ONU Management

If You want to configure/check or manage each GPON OLT port and ONUs connected to it, You can go to GPON-OLT mode.

Broader description You can find on Presentation number 8

```
SWITCH(config-gpon-olt[1])# olt ?
```

activate	OLT activation
add-mac	Add mac table data
anti-spoofing	Anti-Spoofing Configuration
auto-to-manual	Automatically changes to manual register
ber	OLT Bit Error Ratio Configuration
bw-scheduler	Bandwidth scheduler configuration
deactivate	OLT deactivation
deactive-monitor	Deactive-monitor
description	OLT Description
ds-gem-mapping	Downstream GEM Port Mapping Method Configuration
ds-qos-mapping	Downstream QoS Mapping mode
fec-mode	FEC mode
key-exchange	Encryption key exchange configuration
mac	Manage MAC Address
max-distance	max distance
max-onu-count	Maximum ONU Count Configuration
optic-param	Optic module parameter
per-flow	Downstream GEM Port Mode Per Flow
signal-check	Optic signal check
specific-ploam	Specific PLOAM Message
srcmac-monitor	srcmac-monitor configuration
static-mac	Static-mac configuration for Multi and Broadcast
threshold	OLT threshold
total	Total configuration
us-flow-mapping	Upstream Flow Mapping Method Configuration

Opening OLT Mode

To open *GPON-OLT Configuration* mode and enable an OLT, use the following command.

Command	Mode	Description
gpon-olt *OLT-ID*	GPON GPON-OLT	Opens *GPON-OLT Configuration* mode. OLT-ID: GPON port number (e.g. 1, 2, 3, 4)

4. OLT link down detection

OLT Link Down Detection

If the power of ONU is turned off by user, this ONU is supposed to send the alarm message of dying-gasp to OLT. When the last ONU is deregistered from DASAN OLT after it generates an alarm by ONU dying-gasp event, we can regard that the link of this GPON port is down and it' s not the cable connection problem.

Command	Mode	Description
olt cable-down enable	GPON	Enables GPON link down detection
olt cable-down disable		Disables GPON link down detection

To set a number of ONUs that are deregistered without dying-gasp alarm message for detecting the PON link of OLT, use the following command.

Command	Mode	Description
olt cable-down reference-count <1-8>	GPON	Sets the number of deregistered ONUs without sending dying-gasp alarms. The numbers indicate the abnormal behavior that the link of GPON port is down. 1-8: count of inactive ONU (default: 3)
no olt cable-down reference-count		Deletes a configured number of deregistered ONUs and returns to the default value.

To display the state of GPON link down detection, use the following command.

Command	Mode	Description
show olt cable-down	Enable Global GPON	Shows the configuration of GPON link down detection.

EXAMPLE:

SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# olt cable-down enable

5. Multicast/Broadcast GEM port separation

Multicast/Broadcast GEM Port Separation

All the downstream multicast and broadcast flows OLT are transmitted through a single GEM port ID. The multicast and broadcast flows need to be separated from each other to properly forward all broadcast/multicast traffic for multiple ONTs.

To configure a multicast GEM port ID, use the following command.

Command	Mode	Description
olt multicast-gem <4094-4095>	GPON	Adds a specific GEM port ID to the multicast stream. 4094-4095: multicast GEM port ID
show olt multicast-gem	GPON GPON-OLT	Shows the specified GEM port ID for multicast stream.

To enable/disable the interworking with IGMP snooping table, use the following command.

Command	Mode	Description
olt interwork igmp-snooping {enable | disable}	GPON	Enables/disables the interworking with IGMP snooping table.

Above two commands must be always configured on OLT – even when You are not using multicast on Your network!

EXAMPLE:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# olt multicast-gem 4094
SWITCH(gpon)# olt interwork igmp-snooping enable
```

ONU RX-Power Update

To configure the interval of ONU rx-power update, use the following command.

Command	Mode	Description
onu rx-power update {<1-1440> | **disable**}	GPON	Configures the interval of ONU rx-power update. 1-1440: interval (unit: minute) disable: do not update

To display the configuration of ONU rx-power update, use the following command.

Command	Mode	Description
show onu rx-power update	Enable Global GPON GPON-OLT	Shows the configuration of ONU rx-power update.

7. ONT Auto-Upgrade (1)

Auto Upgrade

For efficient system maintenance, OLT provides the auto upgrade functionality for ONU firmware in the operational environment. You can simply upgrade the ONU firmware without an effort for every single ONU.

1. Downloading Firmware to OLT (ENABLE)

To download ONU (ONT) firmware in the system, use the following command:

```
SWITCH# copy ftp onu download
 To exit : press Ctrl+D
-------------------------------------
IP address or name of remote host (FTP): xxx.xxx.xxx.xxx
Download File Name : XXXXXX.x
User Name : user
Password:
```

Command	Mode	Description
copy {ftp | tftp} onu download	Enable	Downloads ONU firmware via FTP or TFTP.

To remove the downloaded ONU (ONT) firmware in OLT, use the following command.

Command	Mode	Description
remove onu firmware *FILE-NAME*	Enable Global GPON	Removes the downloaded ONU (ONT) firmware in OLT.

Command	Mode	Description
show onu firmware-list	Enable Global GPON GPON-OLT	Shows the downloaded ONU (ONT) firmware list in OLT.

2. Auto Upgrade Firmware Configuration (GPON)

To configure the auto upgrade for ONU, use the following command.

The firmware downloaded by copy {ftp | tftp} onu download command is deleted when the OLT system restarts. If you want to perform auto-upgrade even when the firmware does not exist in the OLT, you should specify the TFTP/FTP server from which the firmware can be downloaded.

Command	Mode	Description
onu auto-upgrade firmware *NAME FW_NAME*	GPON	Configures to be auto-upgraded with the specified firmware for the ONU. NAME: ONU model name FW_NAME: ONU firmware name
onu auto-upgrade firmware *NAME FW_NAME* {**ftp** *A.B.C.D USER PASSWD* | **tftp** *A.B.C.D*}		Configures to be auto-upgraded with the specified firmware for the ONU through the TFTP/FTP server. NAME: ONU model name FW_NAME: ONU firmware name A.B.C.D: FTP/TFTP server IP address USER: FTP server user name PASSWD: FTP server password
no onu auto-upgrade firmware *NAME*		Deletes the auto-upgrade configured for the specified ONU. NAME: ONU model name

Command	Mode	Description
show onu auto-upgrade firmware info	Enable Global GPON	Shows the information of TFTP/FTP server specified for auto-upgrade.

```
SWITCH(gpon)# show onu auto-upgrade firmware info
-------------------------------------------------------------------------------
        Firmware Name        | T/FTP |       IP       |    User    | Password
-------------------------------------------------------------------------------
  G_ONU_DALLAS_22_0_8_33.bin | TFTP  |    10.55.2.4   |     XXX    |  XXXX
```

7. ONT Auto-Upgrade (2)

3. Target-version

To specify the execution condition of ONU auto upgrade configuration above, you should specify a target version of ONU firmware with (or without) exclude option. Through the target version and the option, auto upgrade execution condition is determined. If **exclude** option is used, the auto-upgrade is performed only when the ONU' s existing firmware version is different from the specified target version. Otherwise, if exclude option is not used, the auto-upgrade is performed only when the ONU' s existing firmware version is same as the specified target version.

Command	Mode	Description
onu auto-upgrade target-version *NAME VERSION* **[exclude]**	GPON	Sets the target version for ONU. NAME: ONU model name VERSION: target version
no onu auto-upgrade target-version *NAME*		Deletes the configured target version for ONU.

Command	Mode	Description
show onu auto-upgrade target-version	Enable Global GPON	Shows the target version configuration for ONU auto upgrade.

4. Specifying Time for Auto Upgrade

You should set the clock of switch to start auto upgrade of ONU (download to ONU) at specified time. To specify the time to start auto upgrade of ONU, use the following command:

Command	Mode	Description
onu auto-upgrade model-name *NAME* **start-time** <0-23> **end-time** <0-23>	GPON	Specifies the time to start auto upgrade of ONU. NAME: ONU model name 0-23: start/end time (unit: o'clock)
onu auto-upgrade model-name *NAME* **start-time disable**		Deletes the specified time.
no onu auto-upgrade model-name *NAME* **start-time**		

5. Retry Count for Auto Upgrade

The retry count argument specifies how many times to retry the auto upgrading of ONU if the first attempt fails. To specify the retry count of auto upgrade, use the following command:

Command	Mode	Description
onu auto-upgrade retry-count <3-10>	GPON	Specifies the retry count of auto upgrade. 3-10 : retry count (default: 3)
no onu auto-upgrade retry-count		Deletes the configured retry count.

7. ONT Auto-Upgrade (3)

6. Configuration of ONU Restart

To use the upgraded ONU firmware, the ONU must restart. You can configure the upgrade-completed ONU to restart at specified time. T o specify the time that the upgrade-completed ONU restarts, use the following command:

Command	Mode	Description
onu auto-upgrade reboot-time [*NAME*] {<0-23> | **immediately**}	GPON	Specifies the time that the upgrade-completed ONU restarts. NAME: ONU model name 0-23: restart time (unit: o'clock)
onu auto-upgrade reboot-time [*NAME*] **disable**		Deletes the specified time.

7. Enabling Auto Upgrade (GPON-OLT)

To enable/disable ONU auto upgrade on the specific OLT port, use the following command. In order to apply the auto upgrade for ONU, you should enable the configured auto upgrade on the specific OLT port by onu auto-upgrade enable command on GPON-OLT Configuration mode

Command	Mode	Description
onu auto-upgrade {**enable** | **disable**}	GPON-OLT	Enables/disables ONU auto upgrade configuration on the OLT port.

8. Displaying Auto-upgrade Configuration

To display the ONU auto upgrade configuration, use the following command.

Command	Mode	Description
show onu auto-upgrade info	Enable Global GPON GPON-OLT	Shows a progress of ONU auto-upgrade.
show onu auto-upgrade model-list [*NAME*]		Shows a list of ONU model names configured to be auto-upgraded. NAME: ONU model name

To display the firmware for ONU auto-upgrade, use the following command.

Command	Mode	Description
show onu auto-upgrade firmware	Enable Global GPON	Shows the firmware information of auto-upgraded ONU.
show onu auto-upgrade current-fw [*OLT-ID*]		Shows the firmware to be auto-upgraded currently.
show onu auto-upgrade current-fw	GPON-OLT	Shows the firmware to be auto-upgraded currently.

To display the status of ONU firmware, use the following command.

Command	Mode	Description
show onu firmware version *OLT-ID* [*ONU-IDs*]	Enable Global GPON	Shows the status of ONU firmware. OLT-ID: GPON port number ONU-ID: ONU ID (1-128) or ONU serial number
show onu firmware version [*ONU-IDs*]	GPON-OLT	Shows the status of ONU firmware. ONU-ID: ONU ID (1-128) or ONU serial number

- **Changing Active Firmware**

If an ONU supports the dual OS, you can change the active firmware using the following command. To change the active firmware, use the following command.

Command	Mode	Description
onu firmware active-change *ONU-ID*	GPON-OLT	Changes the active OS of ONU (with ONU reboot). ONU-ID: ONU ID (1 to 128) or ONU serial number

7. ONT Auto-Upgrade (4)

```
SWITCH> enable
SWITCH# copy ftp onu download
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# onu auto-upgrade model-name H640GW-02 start-time 0 end-time 7
SWITCH(gpon)# onu auto-upgrade reboot-time immediately
SWITCH(gpon)# onu auto-upgrade firmware H640GW-02 G_ONU_N_2.58-1060.02.H640GW.x ftp 10.20.30.40 LOGIN PASSWORD
SWITCH(gpon)# onu auto-upgrade target-version H640GW-02 2.58-1060 exclude
SWITCH(gpon)# gpon-olt 1
SWITCH(config-gpon-olt[1])# onu auto-upgrade enable
SWITCH(config-gpon-olt[1])# gpon-olt 2
SWITCH(config-gpon-olt[2])# onu auto-upgrade enable
SWITCH(config-gpon-olt[2])# gpon-olt 3
SWITCH(config-gpon-olt[3])# onu auto-upgrade enable
SWITCH(config-gpon-olt[3])# gpon-olt 4
SWITCH(config-gpon-olt[4])# onu auto-upgrade enable
```

With above configuration, all ONTs which will not be running from version 2.58-1060 (defined in target version):

```
SWITCH(config-gpon-olt[1])# sh onu firmware version
                                                    (D):Default-OS  (R):Running-OS
-------------------------------------------------------------------------------------
 OLT | ONU |        Upgrade Status       |          OS1          |          OS2
-------------------------------------------------------------------------------------
   1 |   1 |                             |            2.25-1025  |  (D)(R)2.25-1025
```

1. At time 0 ~ 7 AM will automatically download new firmware file G_ONU_N_2.58-1060.02.H640GW.x to the STAND BY OS:

```
SWITCH(config-gpon-olt[1])# sh onu firmware version
                                                    (D):Default-OS  (R):Running-OS
-------------------------------------------------------------------------------------
 OLT | ONU |        Upgrade Status       |          OS1          |          OS2
-------------------------------------------------------------------------------------
   1 |   1 |          Download Progress  |            2.25-1025  |  (D)(R)2.25-1025
```

2. Set DEFAULT to this STAND BY OS:

```
SWITCH(config-gpon-olt[1])# sh onu firmware version
                                                    (D):Default-OS  (R):Running-OS
-------------------------------------------------------------------------------------
 OLT | ONU |        Upgrade Status       |          OS1          |          OS2
-------------------------------------------------------------------------------------
   1 |   1 |           Commit Complete   |       (R) 2.58-1060  |  (D) 2.25-1025
```

3. Automatically reload ONT from this OS

8. ONT Manual-Upgrade

Manual Upgrade

1. Downloading Firmware to OLT (ENABLE)

To download ONU (ONT) firmware in the system, use the following command:

```
SWITCH# copy ftp onu download
 To exit : press Ctrl+D
-------------------------------------
IP address or name of remote host (FTP): xxx.xxx.xxx.xxx
Download File Name : XXXXXX.x
User Name : user
Password:
```

2. Upgrading Firmware

To upgrade an ONU (ONT) with the downloaded ONU (ONT) firmware, use the following command. If you execute the onu upgrade command, the firmware stored in OLT is downloaded to the standby (not running) OS of the specified ONU (ONT), and the standby OS is specified as default one. For example, if OS1 is running, the firmware is downloaded to OS2, and the OS2 is specified as the default. It may take about 10 minutes to upgrade the firmware of ONU (ONT). When completing the firmware upgrade, the related Syslog message is reported.

Manual upgrade during enabled auto-upgrade is possible from OLT versions:

- **V5812G – 6.02**
- **V5824G – 1.04-0028**
- **V8240 – 6.04**

Command	Mode	Description
copy {ftp | tftp} onu download	Enable	Downloads ONU firmware via FTP or TFTP.

To remove the downloaded ONU (ONT) firmware in OLT, use the following command.

Command	Mode	Description
remove onu firmware *FILE-NAME*	Enable Global GPON	Removes the downloaded ONU (ONT) firmware in OLT.

Command	Mode	Description
show onu firmware-list	Enable Global GPON GPON-OLT	Shows the downloaded ONU (ONT) firmware list in OLT.

To upgrade an ONU (ONT) with the downloaded ONU (ONT) firmware, use the following command.

Command	Mode	Description
onu upgrade *ONU-ID FILENAME*	GPON-OLT	Upgrades an ONU (ONT) with a specified firmware. ONU-ID: ONU ID (1-128) or ONU serial number FILENAME: firmware file name

3. Restarting ONU

In order to use the new upgraded firmware, you should restart the ONU (ONT).

ONU Reset

Command	Mode	Description
onu reset *ONU-IDs*	GPON-OLT	Resets a specified ONU. ONU-ID: ONU ID (1 to128) or ONU serial number

9. DBA Profile

DBA (Dynamic Bandwidth Allocation) is responsible for allocating upstream bandwidth to ONT devices.

Command	Mode	Description
mode fixed [cbr]	DBA Profile	Configure a fixed-UBR bandwidth allocation mode. fixed: fixed-ubr bandwidth (fixed-ubr BW: minimum 512 kbps) cbr: fixed-cbr bandwidth
mode { nsr | sr }		Configure an ONU status reporting mode of DBA profile. nsr: non status reporting dynamic bandwidth allocation sr: status reporting dynamic bandwidth allocation (fixed-cbr BW: minimum 512 kbps)
sla fixed <128-1031616>		Sets a bandwidth. 128-1031616: fixed bandwidth (unit: 64Kbps) 0-1031616: assured bandwidth (unit: 64Kbps) 128-1031616: maximum bandwidth (unit: 64Kbps) (default option: best-effort (=do not use **non-assured** option))
sla assured <0-1031616>		
sla maximum <128-1031616> **[non-assured]**		

Creating DBA Profile

To create/delete/modify a DBA profile, use the following command.

Command	Mode	Description
dba-profile *PROFILE* **create**	GPON	Creates a DBA profile. PROFILE: DBA profile name
no dba-profile {*PROFILE* | **all**}		Deletes a DBA profile.
dba-profile *PROFILE* **modify**		Modifies the configured DBA profile.

If the OLT bandwidth allocation method for ONU upstream transmission is dynamic (DBA), there are two methods of DBA are defined for GPON: status -reporting (SR) DBA, which is based on ONU reports via the dynamic bandwidth report upstream (DBRu) field, and non-status-reporting (NSR) DBA, which is based on OLT monitoring per T –CONT utilization. To set the bandwidth allocation and ONU status reporting mode of DBA profile, use the following command

Example (SR) for Internet traffic:

```
SWITCH(gpon)# dba-profile DBA create
SWITCH(config-dba-profile[DBA])# mode sr
SWITCH(config-dba-profile[DBA])# sla fixed 128
SWITCH(config-dba-profile[DBA])# sla maximum 1031616 - without UPSTERAM limitation
SWITCH(config-dba-profile[DBA])# apply
SWITCH(config-dba-profile[DBA])# exit
```

Example (SR) for VoIP:

```
SWITCH(gpon)# dba-profile VOIP create
SWITCH(config-dba-profile[VOIP])# mode fixed
SWITCH(config-dba-profile[VOIP])# sla fixed 1024
SWITCH(config-dba-profile[VOIP])# apply
SWITCH(config-dba-profile[VOIP])# exit
```

Whenever you modify a DBA profile, you should apply the changes again using the **apply** command. If you do not, it will not be saved with new changes. After apply, all modifications will be automatically applied to ONTs which are using this profile.

Saving DBA Profile

After configuring a DBA profile, you need to save the profile using the following command.

Command	Mode	Description
apply	DBA-Profile	Saves a DBA profile configuration.

10. Extended VLAN Tagging Operation Profile (1)

Extended VLAN Tagging Operation Profile

You can configure the ONU's extended VLAN tagging operation. In order to configure the operation, you need to create an extended VLAN tagging operation profile. To create the profile, use the following command

Command	Mode	Description
extended-vlan-tagging-operation *NAME* **create**	GPON	Creates an extended VLAN tagging operation profile. NAME: profile name
no extended-vlan-tagging-operation {*NAME* | **all**}		Deletes an extended VLAN tagging operation profile.
extended-vlan-tagging-operation *NAME* **modify**		Modifies the configured extended VLAN tagging operation profile.

Received Frame VLAN Tagging Operation Table Configuration

This configuration specifies a table that filters and tags upstream frames. Each entry represents a tagging rule, comprising a filtering part and a treatment part. Each incoming upstream packet is matched against each rule in list order. The first rule that matches the packet is selected as the active rule, and the packet is then treated according to that rule. There are three categories of rules: untag, single-tag, and double-tag rules.

Logically, these categories are separate, and apply to their respective incoming frame types. In other words, a single-tag rule should not apply to a double-tagged frame, even though the single-tag rule might match the outer tag of the double-tagged frame.

Single-tag rules have a filter outer priority field = 15 (indicating no external tag), untag rules have both filter priority fields = 15 (indicating no tags), and double -tag rules have both filter priority fields set to a value that is different from 15 (indicating two tags).

Each tagging rule is based on 'remove' and 'add' operation, where up to two tags can be removed or added. A modify operation is applied by the combination of 'remove' and 'add'.

Note that when a single tag is added, the treatments use the 'inner tag' data-fields for definiteness – this is true even for treatments where a single tag is added to a frame that already has a tag, i.e., added as a second tag. The 'outer tag' data-fields are used only when two tags are added by the same rule.

The terms 'inner' and 'outer' only have meaning with respect to the tags that are being filtered or added. One set operation can add, modify or delete one entry. The first 8 bytes of each entry are guaranteed to be unique, and are used to identify table entries. The OLT deletes a table entry by setting its last eight bytes to all 0xFF.

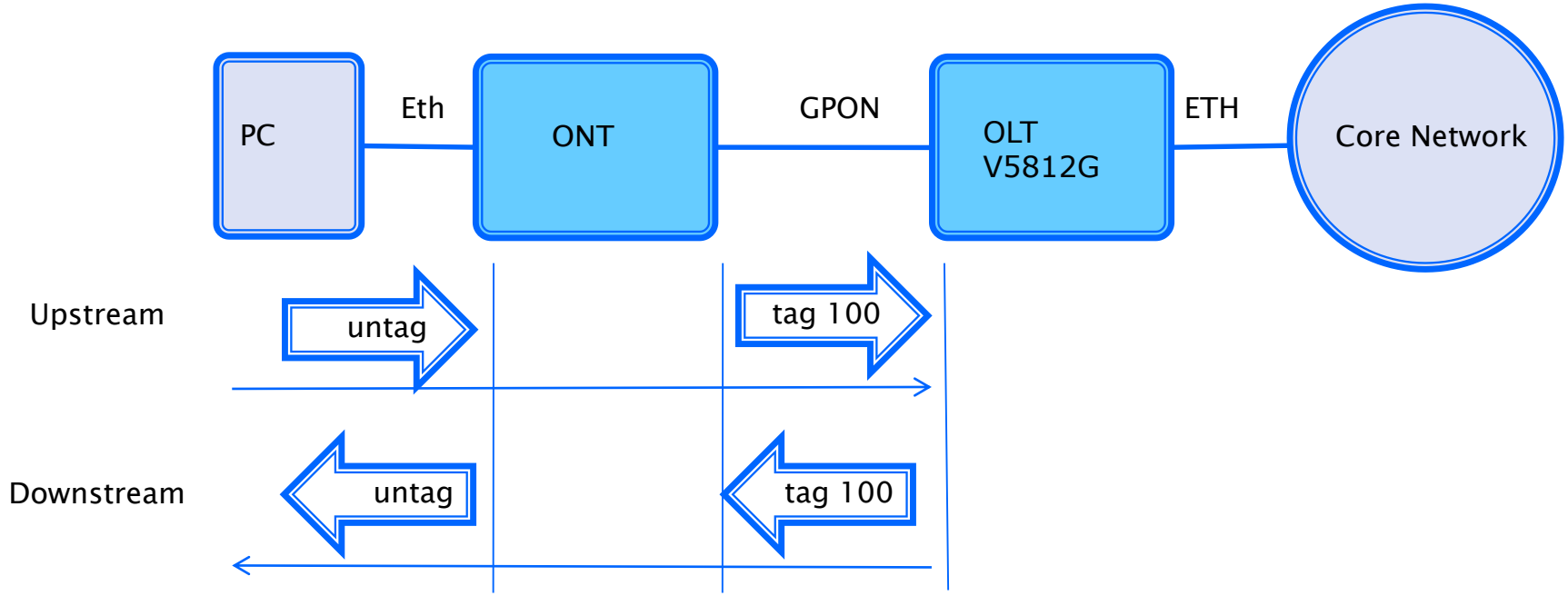
When the table is created, the ONT should predefine three entries that list the default treatment (of normal forwarding) for untagged, single-tagged, and double-tagged frames. As an exception to the rule on ordered processing, these default rules are always considered as a last resort for frames that do not match any other applicable rule. Best practice dictates that these entries not be deleted; however, they can be modified to produce the desired default behaviour.

10. Extended VLAN Tagging Operation Profile (2)

Downstream Mode Configuration

Although the extended VLAN tagging operation pertains to upstream traffic, this configuration specifies the mode for downstreaming mapping. The operation performed in the downstream direction is the inverse of that performed in the upstream direction. For one-to-one VLAN mappings, the inverse is trivially defined. Many-to-one mappings are possible, however, and these are treated as follows. If the many-to-one mapping results from multiple operation rules producing the same ANI-side tag configuration, then the first rule in the list defines the inverse operation. If the many to-one mapping results from "do not care" fields in the filter being replaced with provisioned fields in the ANI-side tags, then the inverse is defined to set the corresponding fields on the ANI-side with their lowest value.

Command	Mode	Description
downstream-mode {enable | disable}	GPON-ext-vlan-oper	Enables/disables the extended VLAN tagging operation for the downstream mode.



10. Extended VLAN Tagging Operation Profile (3) – untagged-frame

Configuration for Untagged Frame Treatment

To create the mapping table to configure the untagged frame treatment, use the following command.

Command	Mode	Description
untagged-frame *TABLE*	GPON-ext-vlan-oper	Creates the mapping table to configure the untagged frame treatment. TABLE: table number
no untagged-frame *TABLE*		Deletes the specified table.

To configure the treatment of filtered untagged frames, use the following command.

Command	Mode	Description
treat inner vid <0-4094 **cos** {<0-7> | **dscp-to-pbit**} **tpid** {**output dei** {**0** | **1**} | **0x8100**}	Untagged-Frame	Configures the inner tag treatment for filtered untagged frames. 0-4094: uses this value as the VID in the inner VLAN tag. 0-7: uses this value as the priority in the inner VLAN tag.
treat outer vid <0-4094> **cos** {<0-7> | **dscp-to-pbit**} **tpid** {**output dei** {**0** | **1**} | **0x8100**}		Configures the outer tag treatment for filtered untagged frames.
treat discard-frame		Drops the filtered untagged frames.
no treat {**remove-discard** | **outer** | **inner**}		Deletes the treatment-related configuration above.

If You want to use ONT Ethernet port as CISCO Access port, then You should configure untagged frame treatment.

On the right You can find example of configuring three extended-vlan profiles for three services:

INTERNET – VLAN 100
IPTV – VLAN 200
VOIP – VLAN 300

Which will be used later by ONT.

```
SWITCH> enable
SWITCH# configure termina
SWITCH(config)# gpon
SWITCH(gpon)#
```

Extended Vlan Profile for INTERNET:

```
SWITCH(gpon)# extended-vlan-tagging-operation NET create
SWITCH(config-ext-vlan-oper[NET])# downstream-mode enable
SWITCH(config-ext-vlan-oper[NET])# untagged-frame 1
SWITCH(config-ext-vlan-oper[NET]-untagged-frame[1])# treat inner vid 100 cos 0 tpid 0x8100
SWITCH(config-ext-vlan-oper[NET]-untagged-frame[1])# apply
SWITCH(config-ext-vlan-oper[NET])# exit
```

Extended Vlan Profile for IPTV:

```
SWITCH(gpon)# extended-vlan-tagging-operation IPTV create
SWITCH(config-ext-vlan-oper[IPTV])# downstream-mode enable
SWITCH(config-ext-vlan-oper[IPTV])# untagged-frame 1
SWITCH(config-ext-vlan-oper[IPTV]-untagged-frame[1])# treat inner vid 200 cos 0 tpid 0x8100
SWITCH(config-ext-vlan-oper[IPTV]-untagged-frame[1])# apply
SWITCH(config-ext-vlan-oper[IPTV])# exit
```

Extended Vlan Profile for VOIP:

```
SWITCH(gpon)# extended-vlan-tagging-operation VOIP create
SWITCH(config-ext-vlan-oper[VOIP])# downstream-mode enable
SWITCH(config-ext-vlan-oper[VOIP])# untagged-frame 1
SWITCH(config-ext-vlan-oper[VOIP]-untagged-frame[1])# treat inner vid 300 cos 0 tpid 0x8100
SWITCH(config-ext-vlan-oper[VOIP]-untagged-frame[1])# apply
SWITCH(config-ext-vlan-oper[VOIP])# exit
```

11. VOIP Profile (1)

OMCI Management Configuration

The GPON system enables multi-vendor interoperability between OLT and ONT. The OMCI specification addresses the ONT configuration management, fault management and performance management for GPON system operation and for several services including voice services. The OMCI and the configuration server based architecture are the standard alternatives to convey the operation of the ONT for VoIP. In addition, the VoIP user agent at the ONT needs to work in conjunction with a softswitch for voice service features. You need to open VoIP Profile Configuration mode to configure VoIP based on OMCI management. To implement the configurations of VoIP between OLT and ONU, an ONU profile should be included by the configured VoIP profile. You can easily manage the VoIP network parameters of ONUs using the VoIP profile. The ONT must be applied by VoIP profile defined in V5812G if the ONT has POTS terminations and if OL T is to be used to remotely manage and provide the VoIP service.

VoIP Media Configuration

To specify fax mode, use the following command.

Command	Mode	Description
fax-mode {passthru | t-38}	VoIP-Profile	Specifies fax mode.

Command	Mode	Description
codec-nego <1-4> **codec {pcmu | gsm | g723 | dvi4-8k | dvi4-16k | lpc | pcma | g722 | l16-2ch | l16-1ch | qcelp | cn | mpa | g728 | dvi4-11k | dvi4-22k | g729} packet-period** *VALUE* **silence-suppression** *VALUE*	VoIP-Profile	Configures codec negotiation by specifying codec, packet period and silence suppression. 1-4: codec negotiation number pcmu ~ g729: codecs as defined by IETF RFC 3551 (default: pcmu) VALUE: 10~30, packet period (unit: ms, default: 10) VALUE: 0~1, whether silence suppression is on or off (0 = off, 1 = on)

Command	Mode	Description
oob-dtmf {enable | disable}	VoIP-Profile	Specifies out-of-band DTMF carriage. When enabled, DTMF signals are carried out of band via RTP or the associated signalling protocol. When disabled, DTMF tones are carried in the PCM stream.

Creating VoIP Profile

To create a VoIP profile, use the following command.

Command	Mode	Description
voip-profile *NAME* **create**	GPON	Creates a VoIP profile. NAME: VoIP profile name

Command	Mode	Description
no voip-profile *NAME*	GPON	Deletes n VoIP profile. NAME: VoIP profile name

Command	Mode	Description
voip-profile *NAME* **modify**	GPON	Modifies the exisitng VoIP profile. NAME: VoIP profile name

Command	Mode	Description
echo-cancel {true | false}	VoIP-Profile	Specifies whether echo cancellation is on or off. (true = on, false = off)

Command	Mode	Description
pstn-protocol-variant *E164_COUNTRY_CODE*	VoIP-Profile	Controls which variant of POTS signalling is used on the associated UNIs. Its value is equal to the E.164 country code. E164_COUNTRY_CODE: 0-65535
no pstn-protocol-variant		Deletes the configured E.164 country code.

Saving VoIP Profile

After configuring a VoIP profile, you need to save the profile with the following command.

Command	Mode	Description
apply	VoIP-Profile	Saves a VoIP profile configuration.

11. VOIP Profile (2) – Protocol SIP

OMCI-based SIP Configuration

If the ONUs are fully provisioned and managed from the V5812G using OMCI, you can configure POTS interface, call features and SIP agents of these ONUs. You need to enter SIP mode to perform the SIP-related detail configuration such as VoIP application service, SIP agent, etc. To enter the SIP mode, use the following command.

Command	Mode	Description
protocol sip	VoIP-Profile	Enters the SIP mode.

Command	Mode	Description
soft-switch *NAME*	VoIP-SIP	Identifies the SIP gateway softswitch vendor. NAME: vendor name
no soft-switch		Deletes the configured SIP gateway softswitch vendor name.

Command	Mode	Description
proxy-server *ADDRESS*	VoIP-SIP	Configures IP address or URI of SIP proxy server for SIP signalling messages.

Command	Mode	Description
reg-exp-time <0-65535>	VoIP-SIP	Specifies the SIP registration expiration time. If the value is 0, the SIP agent does not add an expiration time to the registration requests and does not perform re-registration. 0-65535: SIP registration expiration time (unit: second, default: 3600)

Command	Mode	Description
outbound-proxy-server *ADDRESS*	VoIP-SIP	Configures IP address or URI of outbound SIP proxy server for SIP signalling messages. ADDRESS: outbound SIP proxy server IP address or URI
no outbound-proxy-server		Deletes the configured address of outbound SIP proxy server.

Command	Mode	Description
host-part-server *URI*	VoIP-SIP	Specifies the host or domain part of the SIP address of record for users connected to the ONT. URI: host part URI
no host-part-server		Deletes the configured host part URI.

Command	Mode	Description
dns primary *A.B.C.D* [**secondary** *A.B.C.D*]	VoIP-SIP	Specifies the primary/secondary SIP DNS IP address. A.B.C.D: primary/secondary DNS server address (default: 0 (= no primary/secondary SIP DNS is defined))
no dns		Deletes the configured address of SIP DNS server.

Command	Mode	Description
register-server *ADDRESS*	VoIP-SIP	Specifies the register server IP address or resolved name. ADDRESS: register server address
no register-server		Deletes the configured address of register server.

Command	Mode	Description
call-waiting {**call-wait** | **cid-announce**}	VoIP-SIP	Enables each feature for call waiting. (default: disabled) call-wait: call waiting cid-announce: caller ID announcement
no call-waiting		Disables the call waiting feature.

Command	Mode	Description
caller-id {**call-number** | **call-name** | **cid-blocking** | **cid-number** | **cid-name** | **acr**}	VoIP-SIP	Enables each feature for caller ID. (default: disabled) call-number: calling number call-name: calling name cid-blocking: CID blocking (both number and name) cid-number: permanent presentation status for number cid-name: permanent presentation status for name acr: anonymous CID blocking. It may not be possible to support this feature in the ONT.
no caller-id		Disables all the features for caller ID.

Command	Mode	Description
dial-plan table *TABLE_ID TABLE_TOKEN*	VoIP-SIP	Adds a dial plan with the configured token. TABLE_ID: A unique identifier of a dial plan within the dial plan table TABLE_TOKEN: the token used by the VoIP service to process dial plans (This ASCII string is typically delimited by ":".)
no dial-plan table *TABLE_ID*		Deletes the created dial plan table.

Dial Plan implementation is based on standard RFC3435 (2.1.5 Digit Maps)

11. VOIP Profile (3) – Protocol SIP

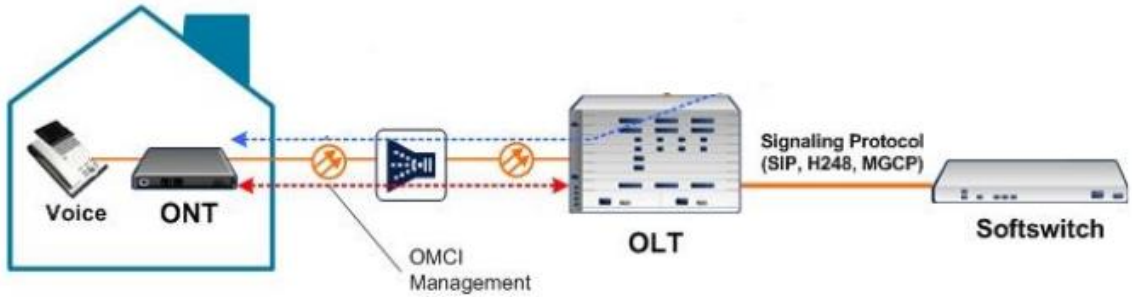
Voip-profile configuration (required):

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# voip-profile VOIP create
SWITCH(config-voip-profile[VOIP])# codec-nego 1 codec pcmu packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[VOIP])# codec-nego 2 codec pcma packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[VOIP])# codec-nego 3 codec g729 packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[VOIP])# codec-nego 4 codec g723 packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[VOIP])# protocol sip
SWITCH(config-voip-profile[VOIP sip)# proxy-server 11.1.1.253
SWITCH(config-voip-profile[VOIP]-sip)# outbound-proxy-server 11.1.1.253
SWITCH(config-voip-profile[VOIP]-sip)# register-server 11.1.1.253
SWITCH(config-voip-profile[VOIP]-sip)# host-part-server 11.1.1.253
SWITCH(config-voip-profile[VOIP]-sip)# dns primary 11.1.1.1
SWITCH(config-voip-profile[VOIP]-sip)# reg-exp-time 60
SWITCH(config-voip-profile[VOIP]-sip)# caller-id call-number
SWITCH(config-voip-profile[VOIP]-sip)# dial-plan table 1 x.  -  required
```

Examples:

```
dial-plan table 1 *xx**|
dial-plan table 2 *x.T|
dial-plan table 3 **xx|
dial-plan table 4 1xx|
dial-plan table 5 6xxxxxxx|
dial-plan table 6 [2-5]xxxxxx|
dial-plan table 7 0xx[2-9]xxxxxx|
dial-plan table 8 [7-9]xxxxxx|
dial-plan table 9 0xx001xxxxxxxxxx|
dial-plan table 10 001xxxxxxxxxx|
dial-plan table 11 0xx00x.T|
dial-plan table 12 00x.T|
```

or dial-plan table 1 x.(any number of digits 0-9)



Dial Plan implementation is based on standard RFC3435 (2.1.5 Digit Maps)

```
SWITCH(config-voip-profile[VOIP]-sip)# exit
SWITCH(config-voip-profile[VOIP])# apply
```

Additionally:

```
SWITCH(config-voip-profile[VOIP])# fax-mode {passthru | t-38}  - fax mode
SWITCH(config-voip-profile[VOIP])# oob-dtmf {enable | disable}
SWITCH(config-voip-profile[VOIP])# echo-cancel {true | false}
SWITCH(config-voip-profile[VOIP])# codec-nego 1 codec pcma packet-period 10 silence-suppression 1
```

11. VOIP Profile (4) – Protocol MGCP

OMCI-based MGC Configuration

MGCP (Media Gateway Control Protocol) is a signaling and call control protocol used within VoIP systems that typically interoperate with the public switched telephone network (PSTN). If the ONUs are fully provisioned and managed from the V5812G using OMCI, you can configure the MGC-related settings of these ONUs. The MGC entity defines the media gateway controller configuration associated with an MG subscriber. It is conditionally required for ONUs (ONTs) that support MGCP (H.248, Megaco) VoIP service. You need to enter MGC mode to perform the MGC-related detail configuration. To enter the MGC mode, use the followina command.

Command	Mode	Description
protocol {mgcp | h248}	VoIP-Profile	Enters the MGC mode.

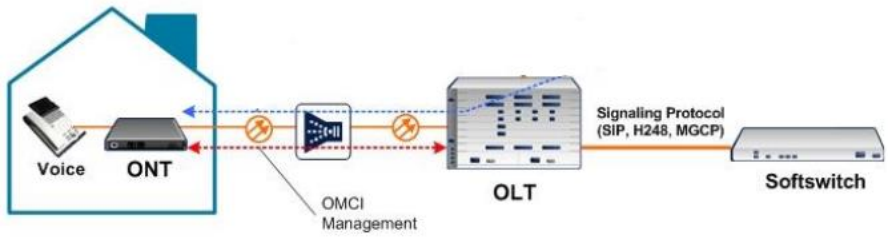
Command	Mode	Description
mgc {primary | secondary} *A.B.C.D*	VoIP-MGC	Configures the IP address of primary and secondary MGC server.
no mgc {primary | secondary}		Deletes the configured IP address.

Command	Mode	Description
mgc version *VALUE*	VoIP-MGC	Configures the version of MGCP.

Command	Mode	Description
mgc soft-switch *NAME*	VoIP-MGC	Specifies the gateway softswitch name. NAME: gateway softswitch (format: four ASCII coded alphabetic characters [A-Z])
no mgc soft-switch		Deletes the gateway softswitch name configuration.

Command	Mode	Description
mgc max-retry-time <0-65534>	VoIP-MGC	Configures the maximum retry time for MGC transactions. 0-65534: maximum retry time (unit: second)
no mgc max-retry-time		Deletes the configured maximum retry time.

```
SWITCH(gpon)# voip-profile MGCP create
SWITCH(config-voip-profile[MGCP])# codec-nego 1 codec pcmu packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[MGCP])# codec-nego 2 codec pcma packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[MGCP])# codec-nego 3 codec g729 packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[MGCP])# codec-nego 4 codec g723 packet-period 20 silence-suppression 0
SWITCH(config-voip-profile[MGCP])# protocol mgcp
SWITCH(config-voip-profile[MGCP]-mgc)# mgc primary 1.1.1.1:2427
SWITCH(config-voip-profile[MGCP]-mgc)# mgc secondary 1.1.1.1:2427
SWITCH(config-voip-profile[MGCP]-mgc)# mgc max-retry-time 60
SWITCH(config-voip-profile[MGCP]-mgc)# mgc soft-switch 1
SWITCH(config-voip-profile[MGCP]-mgc)# apply
SWITCH(config-voip-profile[MGCP])# exit
```



Traffic-profile:

```
SWITCH(gpon)# traffic-profile MGCP create
……
SWITCH(config-traffic-pf[MGCP])# voip-service 1
SWITCH(config-traffic-pf[MGCP]-voip[1])# protocol udp port 2427 tos 46
SWITCH(config-traffic-pf[MGCP]-voip[1])# manage-method omci
SWITCH(config-traffic-pf[MGCP]-voip[1])# voip-profile MGCP
SWITCH(config-traffic-pf[MGCP]-voip[1])# uni pots 1
SWITCH(config-traffic-pf[MGCP]-voip[1]-uni[1])# uni pots 2
SWITCH(config-traffic-pf[MGCP]-voip[1]-uni[2])# apply
…
SWITCH(gpon)# gpon-olt 1
SWITCH(config-gpon-olt[1])# onu voip-mgc 3 message-id service 1 domain.voip.net
SWITCH(config-gpon-olt[1])# onu voip-mgc 3 termination-id pots 1 aaln/1
```

12. Multicast Profile

Multicast Profile

The multicast profile is used for ONU (ONT) to handle the multicast traffic using a IGMP related commands. Multicast profile managed entity organizes data associated with multicast management at subscriber ports of 802.1 bridges, including 802.1p mappers when the provisioning model is mapper-based rather than bridge-based. Instances of this managed entity are created and deleted by the OLT. It is the responsibility of the OLT to manage the members of a multicast group and control the multicast connection in ONTs

Recommend configuration:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# multicast-profile MULTI create
SWITCH(config-mcast-profile[MULTI])# igmp robustness-variable 7
SWITCH(config-mcast-profile[MULTI])# igmp tag-control add vid 200 cos 0
SWITCH(config-mcast-profile[MULTI])# igmp access-list vid 200 dst-ip start
                    224.0.0.1 end 239.255.255.255 bw 4294952 gem 4094
SWITCH(config-mcast-profile[MULTI])# apply
```

Creating Multicast Profile

To create a multicast profile, use the following command.

Command	Mode	Description
multicast-profile *NAME* **create**	GPON	Creates a multicast profile. NAME: multicast profile name

Command	Mode	Description
no multicast-profile {*NAME* | **all**}	GPON	Deletes a created multicast profile. NAME: multicast profile name

Command	Mode	Description
multicast-profile *NAME* **modify**	GPON	Modifies the existing multicast profile. NAME: multicast profile name

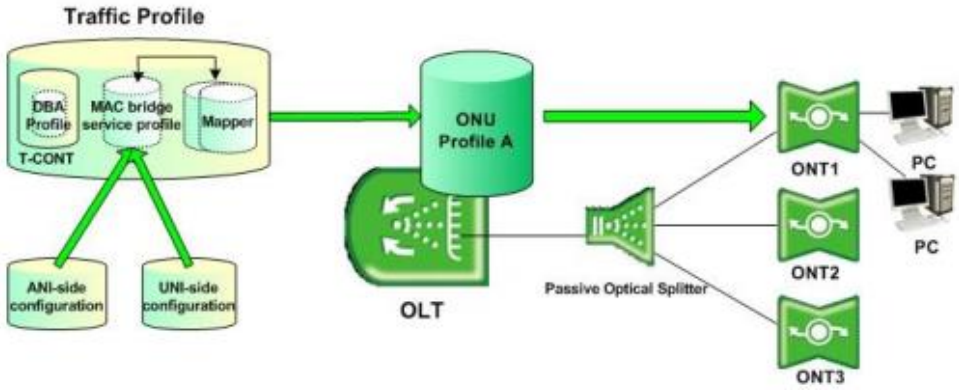
Saving Multicast Profile

Command	Mode	Description
apply	Multicast-Profile	Saves a multicast profile configuration.

Command	Mode	Description
igmp version <1-3>	Multicast-Profile	Sets an IGMP version on a current interface. 1-3: IGMP version (default: 2)
igmp function snooping		Enables the IGMP snooping.
igmp function suppression		Enables the IGMP snooping with proxy reporting (SRP).
igmp function proxy		Enables the IGMP proxy.
igmp immediate-leave enable		Enables the IGMP immediate leave. (Default: enable)
igmp querier address *A.B.C.D*		Specifies a querier address. A.B.C.D: querier address
igmp querier query-interval <0-3600>		Specifies a general query interval. 0-3600: query interval (default: 125 seconds)
igmp querier max-response-time <0-25>		Specifies a maximum query response time. 0-25: maximum response time (default: 10 seconds)
igmp robustness-variable <1-7>		Configures the Querier's Robustness Variable (QRV) value on an interface. (default: 2)
igmp access-list vid {**untagged** | *VLAN*} **dst-ip start** *A.B.C.D* **end** *A.B.C.D* [**bw** *VALUE* | **src-ip** *A.B.C.D* | **gem** *PORT* | **cos** <0-7>]		Configures the dynamic/static access control list table. It discards the IGMP join message from ONTs based on the access list. VLAN: 1 to 4095, VLAN ID for specific tagged downstream flow dst-ip: destination IP address A.B.C.D: start/end IP address of the multicast group range VALUE: imputed group bandwidth (unit: bytes/sec) src-ip: source IP address PORT: multicast GEM port ID
igmp static-access-list vid {**untagged** | *VLAN*} **dst-ip start** *A.B.C.D* **end** *A.B.C.D* [**bw** *VALUE* | **src-ip** *A.B.C.D* | **gem** *PORT* | **cos** <0-7>]		
igmp tag-control {**bypass** | **add vid** *VLANS* **cos** *VALUE* | **replace vid** *VLANS* [**cos** *VALUE*]}		Configures IGMP tag control attribute and the policy to define a VLAN ID and P-bits to add to upstream IGMP messages. bypass: pass upstream IGMP traffic transparently add: adds a VLAN tag (including P-bits) to upstream IGMP traffic replace: replaces the TCI (VLAN ID + P-bits or VLAN ID) VLANS: VLAN ID(s) (1-4095) VALUE: CoS (0-7)
igmp upstream rate-limit <1-65535>		Configures the rate limit of upstream IGMP traffic 1-65535: IGMP message count (message/second)

13. Traffic Profile (1)

OLT provides the easy and efficient management solution for various service models that are comprised of MAC bridging and 802.1p mapping functionality using the traffic profile. There are two major layer 2 functions available: MAC bridging and 802.1p mapping. MAC bridging is described in IEEE 802.1D. The bridge has many features, and can be used to direct traffic based on MAC address or on VLAN characteristics (using the VLAN filter feature). The mapping function describes the steering of traffic from one UNI-side entity to ANI-side port-IDs. The mapper is equivalent to a MAC bridge with VLAN filters that only operate on the priority bits of the VLAN tags.

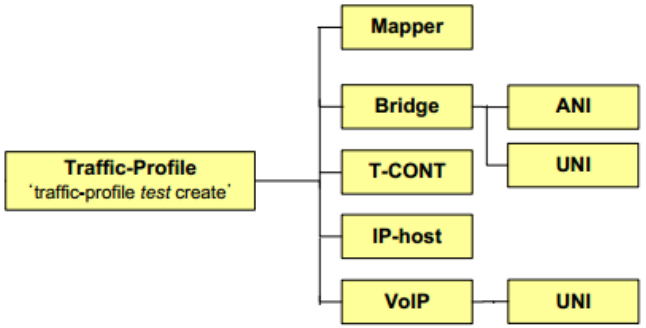


Creating Traffic Profile

Command	Mode	Description
traffic-profile *NAME* **create**	GPON	Creates a traffic profile. NAME: traffic profile name

Command	Mode	Description
no traffic-profile {*NAME* | **all**}	GPON	Deletes the traffic profile with its all configurations.

Command	Mode	Description
traffic-profile *NAME* **modify**	GPON	Modifies the existing traffic profile. NAME: traffic profile name



On next three presentation files, You can find different traffic-profiles for different ONT model and service scenario!

T-CONT – Transmission containers (T-CONTs) are used for the management of upstream bandwidth in PON section of the TC layer. T-CONTs dynamically receive grants, identified by AllocID, from the OLT. A single T-CONT can carry GEM traffic with various service classes. It also accommodates one or more physical queues and aggregates them into a single logical buffer so that this feature can be used for enhanced QoS implementation in upstream direction.

MAPPER – is responsible for mapping Ethernet frames to the GPON frames (GEM)

BRIDGE – management of ethernet (LAN) side of ONT (ethernet ports)

IP-HOST – configuration of IP interfaces of ONT. On ONT we can use up to two IP interfaces:

- **IP-HOST-1** - which can be used for VOIP Gateway or remote management
- **IP-HOST-2** - ONT WAN interface for Router/NAT or for Router/NAT and VOIP Gateway

VOIP – VoIP gateway configuration

ANI – Access Network Interface – ONT uplink interface (GPON)

UNI – User Network interface – ETHERNET or POTS ports

Saving Traffic Profile

Command	Mode	Description
apply	Traffic-Profile	Saves a traffic profile configuration.

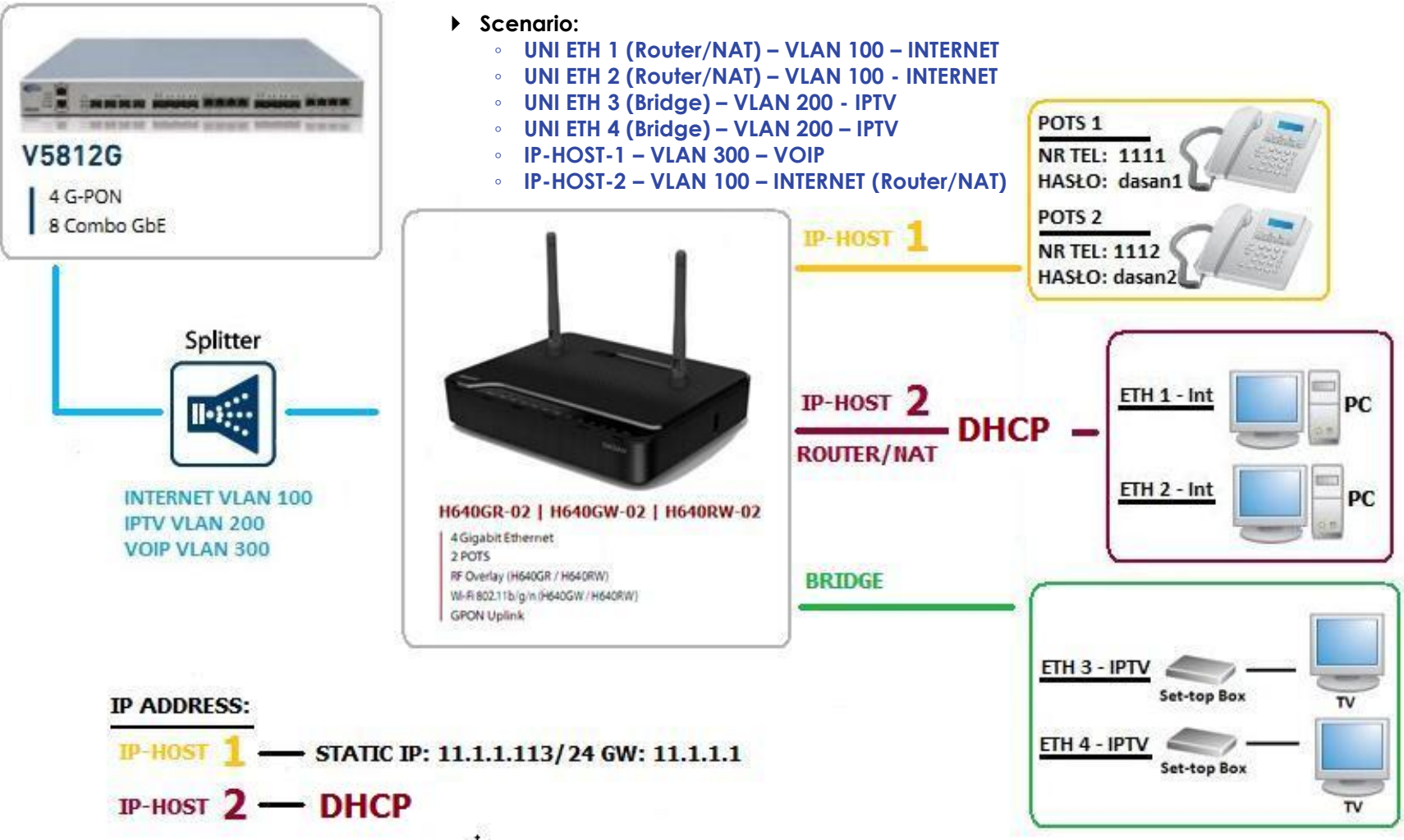
13. Traffic Profile (2)

For better understanding configuration of traffic-profile please check below topology for three services: INTERNET, IPTV and VOIP. What You need to know:

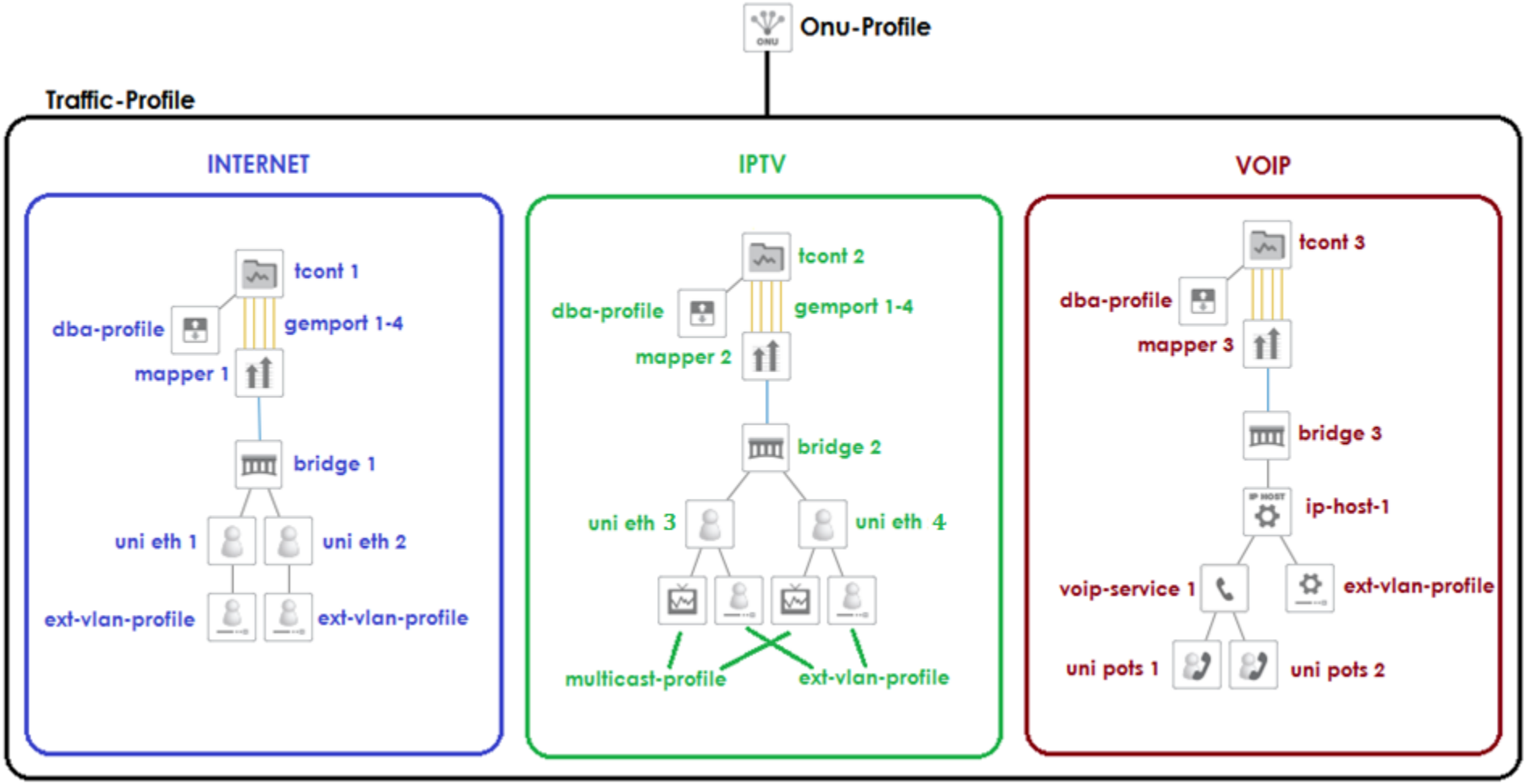
- **Every services/VLAN/port-mode(bridge/router) should be in different T-CONT/MAPPER/BRIDGE, so:**
  - INTERNET: T-CONT 1 | MAPPER 1 | BRIDGE 1
  - IPTV: T-CONT 2 | MAPPER 2 | BRIDGE 2
  - VOIP: T-CONT 3 | MAPPER 3 | BRIDGE 3

- **You can not assign the same VLAN or the same IP address to both interfaces: IP-HOST 1 and IP-HOST 2**

- **Scenario:**
  - **UNI ETH 1 (Router/NAT) – VLAN 100 – INTERNET**
  - **UNI ETH 2 (Router/NAT) – VLAN 100 - INTERNET**
  - **UNI ETH 3 (Bridge) – VLAN 200 - IPTV**
  - **UNI ETH 4 (Bridge) – VLAN 200 – IPTV**
  - **IP-HOST-1 – VLAN 300 – VOIP**
  - **IP-HOST-2 – VLAN 100 – INTERNET (Router/NAT)**



13. Traffic Profile (3)



- **Scenario:**
  - UNI ETH 1 (Router/NAT) – VLAN 100 – INTERNET
  - UNI ETH 2 (Router/NAT) – VLAN 100 - INTERNET
  - UNI ETH 3 (Bridge) – VLAN 200 - IPTV
  - UNI ETH 4 (Bridge) – VLAN 200 – IPTV
  - IP-HOST-1 – VLAN 300 – VOIP
  - IP-HOST-2 – VLAN 100 – INTERNET (Router/NAT)

13. Traffic Profile (4) – Port Mode

Management Mode

The OLT manages the ONU through an ONU management and control interface (OMCI) path. An OMCI is a configuration transmission path defined in the GPON standard. If the OLT manages the ONU through a non-OMCI path, this ONU' s UNI port is connected as a Virtual Eth and is controlled by its web/TR-69/SNMP management system. To specify the management mode of ONU' s UNI port, use the following command.

Command	Mode	Description
mgmt-mode uni { **eth** | **pots** | **ces** | **video** } *UNI_PORT* { **omci** | **non-omci link virtual-eth** *NUMBER*}	Traffic-Profile	Specifies the management mode of ONU's UNI port using OMCI or non-OMCI path. UNI_PORT: UNI port number (1-32)
no mgmt-mode uni { **eth** | **pots** | **ces** | **video** } *UNI_PORT*		Deletes the specified UNI port's management mode.

To display the configured management mode of ONU, use the following command.

Command	Mode	Description
show onu uni-mgmt *OLT-ID ONU-ID*	Enable Global GPON	Shows the management mode of ONU ID.
show onu uni-mgmt *ONU-ID*	GPON-OLT	

SWITCH(gpon)# traffic-profile TRAFFIC create
SWITCH(config-traffic-pf[TRAFFIC])# mgmt-mode uni eth 1 non-omci link virtual-eth 1 – Router/NAT
SWITCH(config-traffic-pf[TRAFFIC])# mgmt-mode uni eth 2 non-omci link virtual-eth 1 – Router/NAT
SWITCH(config-traffic-pf[TRAFFIC])# mgmt-mode uni eth 3 omci - Bridge
SWITCH(config-traffic-pf[TRAFFIC])# mgmt-mode uni eth 4 omci - Bridge

13. Traffic Profile (5) – T-CONT

T -CONT Mode

Transmission containers (T-CONTs) are used for the management of upstream bandwidth in PON section of the TC layer. T-CONTs dynamically receive grants, identified by AllocID, from the OLT. A single T-CONT can carry GEM traffic with various service classes. It also accommodates one or more physical queues and aggregates them into a single logical buffer so that this feature can be used for enhanced QoS implementation in upstream direction.

OLT provides the easy and efficient management solution using T-CONT concept with the Traffic profile. A GPON port is connected with multiple ONUs/ONTs via splitter. The GPON encapsulation mode (GEM) frames are transmitted between the OLT and the ONUs (ONTs). A GEM frame is identified by a GEM port ID. In the upstream direction, the TCONTs carry the data stream. The Traffic profile is a collection of configurations about dynamic bandwidth allocation and GEM port according to the service priority levels. You can configure each T-CONT to have a priority value using GEM port number. You need to open Traffic Profile Configuration mode to configure a T-CONT. A T-CONT ID can include multiple T-CONTs and supports up to 8 priority queues per T-CONT.

Command	Mode	Description
tcont *TCONT-ID*	Traffic-Profile	Creates a T-CONT ID. TCONT-ID: T-CONT ID (1 to 32)

GEM Port Configuration

To specify the GEM ports (priority queue) per T-CONT by mapping between T-CONT and GEM port, use the following command.

Command	Mode	Description
gemport *GEM-PORTS* [**queue** <0-7>]	Traffic-TCONT	Specifies the priority queues of a GEM port. GEM-PORTS: mapper ID/GEM port ID (ex: 1/1= mapper #1:gem port 1, 1/2= mapper#1:gem port 2, 2/1-4=mapper #2:all gem ports)
no gemport *GEM-PORTS*		Deletes the configured mapping between T-CONT and the list of GEM ports.

DBA Profile Association

You can associate a configured DBA profile with T-CONT by using the following command.

Command	Mode	Description
dba-profile *NAME*	Traffic-TCONT	Associates a configured DBA profile with T-CONT. NAME: DBA profile name

```
SWITCH(gpon)# traffic-profile TRAFFIC create
SWITCH(config-traffic-pf[TRAFFIC])# tcont 1
SWITCH(config-traffic-pf[TRAFFIC]-tcont[1])# gemport 1/1
SWITCH(config-traffic-pf[TRAFFIC]-tcont[1])# dba-profile NET
SWITCH(config-traffic-pf[TRAFFIC]-tcont[1])# exit
SWITCH(config-traffic-pf[TRAFFIC])#
SWITCH(config-traffic-pf[TRAFFIC])# tcont 2
SWITCH(config-traffic-pf[TRAFFIC]-tcont[2])# gemport 2/1
SWITCH(config-traffic-pf[TRAFFIC]-tcont[2])# dba-profile IPTV
SWITCH(config-traffic-pf[TRAFFIC]-tcont[2])# exit
SWITCH(config-traffic-pf[TRAFFIC])#
SWITCH(config-traffic-pf[TRAFFIC])# tcont 3
SWITCH(config-traffic-pf[TRAFFIC]-tcont[3])# gemport 3/1
SWITCH(config-traffic-pf[TRAFFIC]-tcont[3])# dba-profile VOIP
```

13. Traffic Profile (6) - Mapper

Creating a Mapper

A mapper provides support for upstream flow routing based on 802.1p priority bits. It is responsible for mapping Ethernet frames to the GPON frames (GEM)

Command	Mode	Description
mapper *MAPPER_ID*	Traffic-Profile	Creates a 802.1p mapper for a specified traffic profile. MAPPER_ID: 1 to 32, 802.1p mapper ID
no mapper *MAPPER_ID*		Removes the created mapper from the traffic profile

Command	Mode	Description
gemport count {**1** | **2** | **4** | **8**}	Traffic-Mapper	Sets the GEM port count of mapper. The GEM port count corresponds to a total number of priority queues.
dscp-to-pbit {**enable** | **disable**}		Enables/disables the DSCP to P-bit marking for untagged frame forwarding.
default-cos <0-7>		Specifies CoS value for untagged frame forwarding.
cos-mapping cos *RANGE* **gemport** *GEM-PORT-VALUE*		Specifies the range of CoS values for mapping with GEM port. RANGE: CoS range GEM-PORT-VALUE: corresponds to the gemport count

Command	Mode	Description
gemport *GEM-PORT-RANGE* **rate-limit** { **upstream** | **downstream** } *PIR_BANDWIDTH* [*SIR_ BANDWIDTH*]	Traffic-Mapper	Sets the downstream/upstream traffic bandwidth for GEM port ID. RANGE: GEM port range SIR_VALUE: SIR bandwidth range of 0 to 2147483584 (in steps of 64Kbps) PIR_VALUE: PIR bandwidth range of 0 to 2147483584
no gemport *GEM-PORT-RANGE* **rate-limit** { **upstream** | **downstream** }		Deletes the configured rate limit of GEM port ID.

Using option **gemport 1-4 rate-limit downstream**, You can limit the traffic for all UNI ETH PORTs which are assigned to each TCON/MAPPER/BRIDGE, so if on BRIDGE-1 You have defined two UNI ETH ports (uni eth 1 and uni eth 2) than limitation will be summary for them.

What is more, if ports which are on the bridge 1, are working in router mode (non-omci) then limitation will be summary per NAT interface (uni eth and WIFI)

For UPSTERAM RATE-LIMIT please use DBA-PROFILE – not gemport rate-limit upstream

```
SWITCH(config-traffic-pf[TRAFFIC])# mapper 1
SWITCH(config-traffic-pf[TRAFFIC]-mapper[1])# gemport count 1
SWITCH(config-traffic-pf[TRAFFIC]-mapper[1])# gemport 1 rate-limit downstream 102400 102400
SWITCH(config-traffic-pf[TRAFFIC]-mapper[1])# exit
SWITCH(config-traffic-pf[TRAFFIC])# mapper 2
SWITCH(config-traffic-pf[TRAFFIC]-mapper[2])# gemport count 1
SWITCH(config-traffic-pf[TRAFFIC]-mapper[2])# gemport 1 rate-limit downstream 40960 40960
SWITCH(config-traffic-pf[TRAFFIC]-mapper[2])# exit
SWITCH(config-traffic-pf[TRAFFIC])# mapper 3
SWITCH(config-traffic-pf[TRAFFIC]-mapper[3])# gemport count 1
SWITCH(config-traffic-pf[TRAFFIC]-mapper[3])# exit
```

13. Traffic Profile (7) - Bridge

MAC Bridge Service Profile

A MAC bridge service profile can be configured per each UNI-side port or it can be configured for the multiple UNI-side ports. The MAC bridge service profile is comprised of ANI-side port for the upstream traffic management and UNI-side port for the downstream traffic management. The system creates both ANI-side and UNI-side MAC bridge port config data ME.

Command	Mode	Description
bridge *BRIDGE_ID*	Traffic-Profile	Creates a bridge ID in traffic profile. BRIDGE_ID: 1 to 32, MAC Bridge ID

Command	Mode	Description
no bridge *BRIDGE_ID*	Traffic-Profile	Removes the configured bridge ID from a traffic profile

ANI Port Configuration

To enable/disable a connection between MAC bridge service profile and a mapper ID, use the following command.

Command	Mode	Description
ani mapper *MAPPER_ID*	Traffic-Bridge	Connects a MAC bridge service profile with a mapper ID. MAPPER_ID: 1 to 32, IEEE802.1p mapper ID
no ani mapper *MAPPER_ID*		Disconnects a mapper ID from the MAC bridge service profile.

Command	Mode	Description
vlan-filter [**vid** <1-4094>] **untagged** {**allow** | **discard**}	Traffic Bridge-ANI	Enables a VLAN tagging filtering function of ANI-side port. allow: forwards the untagged frames to the ANI-side port discard: blocks the untagged frames to the ANI-side port 1-4094: VLAN ID(s)
vlan-filter vid {**add** | **del**} *VID*		Adds or deletes the VLAN ID on the VLAN list configured by **vlan-filter vid** command above.
no vlan-filter		Disables the VLAN tagging filtering function.

UNI Port Configuration

A UNI-side port is an ONU device port connected to a subscriber. To enable/disable a connection between a MAC bridge service profile and UNI-side port for the downstream traffic, use the following command.

Command	Mode	Description
uni {**eth** | **virtual-eth**} *UNI-PORT*	Traffic Bridge	Connects an UNI port of ONT to a specified MAC bridge service profile. UNI-PORT: UNI port number
no uni {**eth** | **virtual-eth**} *UNI-PORT*		Removes the UNI port of ONT from the MAC bridge service profile.

Maximum Frame Size

Command	Mode	Description
max-frame <64-2036>	Traffic Bridge-UNI	Sets the maximum frame size for an UNI port.
no max-frame		Deletes the configured maximum frame size.

Rate Limit

Command	Mode	Description
rate-limit {**upstream** | **downstream**} *PIR_BANDWIDTH SIR_BANDWIDTH*	Traffic Bridge-UNI	Sets the downstream/upstream traffic bandwidth for UNI port. SIR_BANDWIDTH: 0 to 2147483584 (in steps of 64Kbps) PIR_BANDWIDTH: 0 to 2147483584
no rate-limit {**upstream** | **downstream**}		Deletes the configured rate limit.

Mapping between Multicast Profile and UNI port

Command	Mode	Description
multicast-profile *PROFILE*	Traffic Bridge-UNI	Applies the existing multicast profile to a specified UNI port. PROFILE: Multicast profile name
no multicast-profile		Deletes the mapping between a multicast profile and this UNI port.

13. Traffic Profile (8) - Bridge

Extended VLAN Tagging Operation Profile Association

Command	Mode	Description
extended-vlan-tagging-operation *NAME*	Traffic Bridge-UNI	Associates the extended VLAN tagging operation profile. NAME: profile name
no extended-vlan-tagging-operation		Disassociates the extended VLAN tagging operation profile.

Mapping between Multicast Profile and UNI port

Command	Mode	Description
multicast-profile *PROFILE*	Traffic Bridge-UNI	Applies the existing multicast profile to a specified UNI port. PROFILE: Multicast profile name
no multicast-profile		Deletes the mapping between a multicast profile and this UNI port.

```
SWITCH(config-traffic-pf[TRAFFIC])# bridge 1
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1])# ani mapper 1
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1]-ani[mapper:1])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1])# uni eth 1
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1]-uni[eth:1])# extended-vlan-tagging-operation NET
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1]-uni[eth:1])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1])# uni eth 2
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1]-uni[eth:2])# extended-vlan-tagging-operation NET
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1]-uni[eth:2])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[1])# exit
SWITCH(config-traffic-pf[TRAFFIC])# bridge 2
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2])# ani mapper 2
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-ani[mapper:2])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2])# uni eth 3
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:3])# multicast-profile MULTI
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:3])# extended-vlan-tagging-operation IPTV
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:3])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2])# uni eth 4
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:4])# multicast-profile MULTI
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:4])# extended-vlan-tagging-operation IPTV
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2]-uni[eth:4])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[2])# exit
SWITCH(config-traffic-pf[TRAFFIC])# bridge 3
SWITCH(config-traffic-pf[TRAFFIC]-bridge[3])# ani mapper 3
SWITCH(config-traffic-pf[TRAFFIC]-bridge[3]-ani[mapper:3])# exit
SWITCH(config-traffic-pf[TRAFFIC]-bridge[3])# link ip-host-config 1
SWITCH(config-traffic-pf[TRAFFIC]-bridge[3])# exit
```

IP-host Service Link

Command	Mode	Description
link ip-host-config *SERVICE-ID*	Traffic-Bridge	Links an IP-host service to MAC bridge service profile. SERVICE-ID: IP-host service ID (1 to 32)
no link ip-host-config *SERVICE-ID*		Disconnects the linked IP-host service.

IGMP Group

Command	Mode	Description
igmp max-group <0-255>	Traffic Bridge-UNI	Sets the maximum number of IGMP groups for an UNI port.

Maximum Frame Size

Command	Mode	Description
max-frame <64-2036>	Traffic Bridge-UNI	Sets the maximum frame size for an UNI port.
no max-frame		Deletes the configured maximum frame size.

Activating Administration for UNI

Command	Mode	Description
port-admin {enable | disable}	Traffic Bridge-UNI	Enables/disables the administration of UNI port.

13. Traffic Profile (9) – IP-HOST

IP-HOST – configuration of IP interfaces of ONT. On ONT we can use up to two IP interfaces:

- **IP-HOST-1** - which can be used for VOIP Gateway or remote management
- **IP-HOST-2** - ONT WAN interface for Router/NAT or for Router/NAT and VOIP Gateway

IP Host Service Configuration

In order to configure an IP host, you need to create an IP host service ID. To create the IP host service ID and enter the configuration mode for the host, use the following command.

Command	Mode	Description
ip-host-config *SERVICE-ID*	Traffic-Profile	Creates the IP host service ID and enters the configuration mode for the host. SERVICE-ID : IP host number (1 to 32)
no ip-host-config *SERVICE-ID*		Deletes the created IP host service ID.

Extended VLAN Tagging Operation Profile Association

Command	Mode	Description
extended-vlan-tagging-operation *NAME*	Traffic-IP-host	Associates the extended VLAN tagging operation profile. NAME: profile name
no extended-vlan-tagging-operation		Disassociates the extended VLAN tagging operation profile.

IP Address

To specify the IP address assignment on the host, use the following command.

Command	Mode	Description
ip address {static | dhcp}	Traffic-IP-host	Specifies the IP address assignment on the host.

DNS

Command	Mode	Description
dns primary *A.B.C.D* **[secondary** *A.B.C.D*]	Traffic-IP-host	Specifies the primary/secondary DNS IP address on the host.
no dns		Deletes the configured DNS IP address.

VoIP Service Link

Command	Mode	Description
link voip-service *SERVICE_ID*	Traffic-IP-host	Links the VoIP service to the host. SERVICE_ID: VoIP service ID (1 to 32)
no link voip-service *SERVICE_ID*		Disconnects the linked VoIP service.

```
SWITCH(config-traffic-pf[TRAFFIC])# ip-host-config 1
SWITCH(config-traffic-pf[TRAFFIC]-iphost[1])# ip address static
SWITCH(config-traffic-pf[TRAFFIC]-iphost[1])# dns primary 8.8.8.8 secondary 8.8.4.4
SWITCH(config-traffic-pf[TRAFFIC]-iphost[1])# extended-vlan-tagging-operation VOIP
SWITCH(config-traffic-pf[TRAFFIC]-iphost[1])# link voip-service 1
SWITCH(config-traffic-pf[TRAFFIC]-iphost[1])# exit
SWITCH(config-traffic-pf[TRAFFIC])# ip-host-config 2
SWITCH(config-traffic-pf[TRAFFIC]-iphost[2])# ip address dhcp
SWITCH(config-traffic-pf[TRAFFIC]-iphost[2])# extended-vlan-tagging-operation NET
SWITCH(config-traffic-pf[TRAFFIC]-iphost[2])# exit
```

13. Traffic Profile (10) – VOIP-Service

VoIP Service Management Mode

OLT provides VoIP management function for the subtended ONUs. OMCI Managed Model The full OMCI is used to control the VoIP configurations and OLT can handle these configurations for VoIP clients integrated in the ONT (OLT is using VOIP-Profile and accounts defined on OLT CLI).

Command	Mode	Description
manage-method {omci | ip-path}	Traffic-VoIP	Sets VoIP service management mode. omci: ONT Management and Control Interface ip-path: IP-path managed
no manage-method		Deletes the configured VoIP service management mode.

OMCI Managed VoIP

If you configure the VoIP service management mode as OMCI managed by using voip-profile omci command, you need to connect VoIP profile with which OLT can handle the configurations for VoIP clients. To connect VoIP profile to the current VoIP service, use the following command.

Command	Mode	Description
voip-profile *NAME*	Traffic-VoIP	Connects VoIP profile to the current VoIP service. NAME: VoIP profile name
no voip-profile		Disconnects the specified VoIP profile.

POTS UNI Configuration

Command	Mode	Description
uni {pots | isdn} *POTS_NUMBER*	Traffic-VoIP	Configures the VoIP user network interface. pots: POTS (Plain Old Telephone Service) isdn: ISDN (Integrated Services Digital Network) (future release) POTS_NUMBER: POTS port number
no uni {pots | isdn} *POTS_NUMBER*		Deletes the configuration of UNI.

Protocol Type Configuration

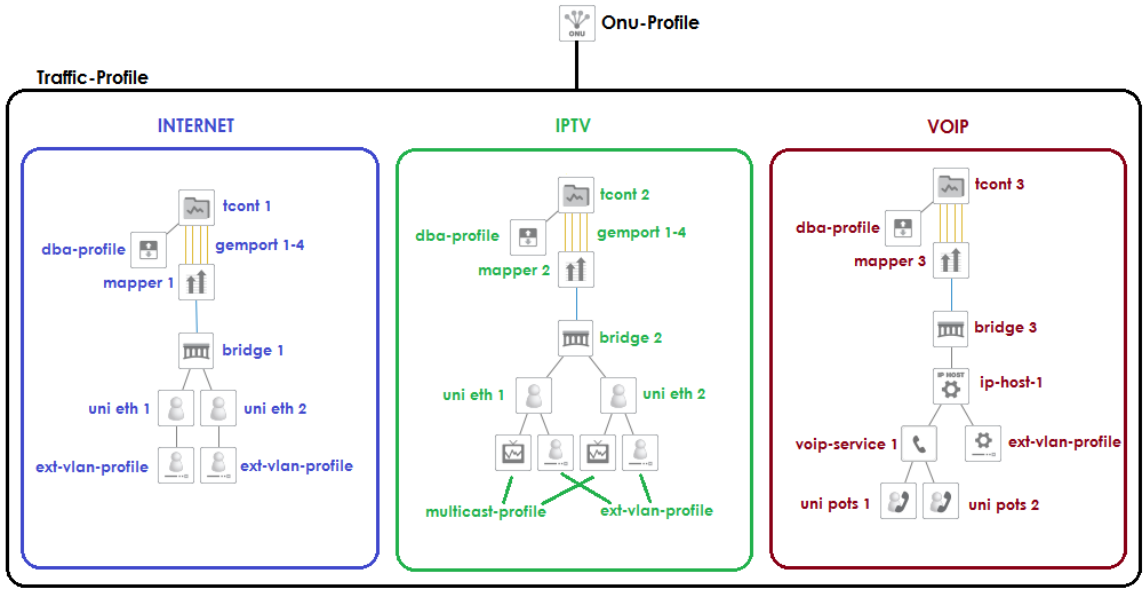
Command	Mode	Description
udp port *PORT* **tos** *TOS*	Traffic-VoIP	Specifies the port number that offers the UDP/TCP/TLSP/protocol-type service and the value of the TOS field of the IPv4 header. PORT: port number TOS: type of service per IETF RFC 1349 or a differentiated services code point (DSCP) defined by IANA (default: 0)
protocol { **udp** | **tcp** | **tlsp** | *TYPE*} **port** *PORT* **tos** *TOS*		

```
SWITCH(config-traffic-pf[TRAFFIC])# voip-service 1
SWITCH(config-traffic-pf[TRAFFIC]-voip[1])# manage-method omci
SWITCH(config-traffic-pf[TRAFFIC]-voip[1])# voip-profile VOIP
SWITCH(config-traffic-pf[TRAFFIC]-voip[1])# uni pots 1
SWITCH(config-traffic-pf[TRAFFIC]-voip[1]-uni[1])# exit
SWITCH(config-traffic-pf[TRAFFIC]-voip[1])# uni pots 2
SWITCH(config-traffic-pf[TRAFFIC]-voip[1]-uni[2])# exi
SWITCH(config-traffic-pf[TRAFFIC]-voip[1])#
```

13. Traffic Profile (11) – Total

```
traffic-profile TRAFFIC create
 mgmt-mode uni eth 1 non-omci link virtual-eth 1
 mgmt-mode uni eth 2 non-omci link virtual-eth 1
 mgmt-mode uni eth 3 omci
 mgmt-mode uni eth 4 omci
 tcont 1
  gemport 1/1
  dba-profile DBA
 tcont 2
  gemport 2/1
  dba-profile DBA
 tcont 3
  gemport 3/1
  dba-profile TEL
 mapper 1
  gemport count 1
  gemport 1 rate-limit downstream 102400 102400
 mapper 2
  gemport count 1
  gemport 1 rate-limit downstream 40960 40960
 mapper 3
  gemport count 1
 bridge 1
  ani mapper 1
  uni eth 1
   extended-vlan-tagging-operation NET
  uni eth 2
   extended-vlan-tagging-operation NET
 bridge 2
  ani mapper 2
  uni eth 3
   multicast-profile MULTI
   extended-vlan-tagging-operation IPTV
  uni eth 4
   multicast-profile MULTI
   extended-vlan-tagging-operation IPTV
```

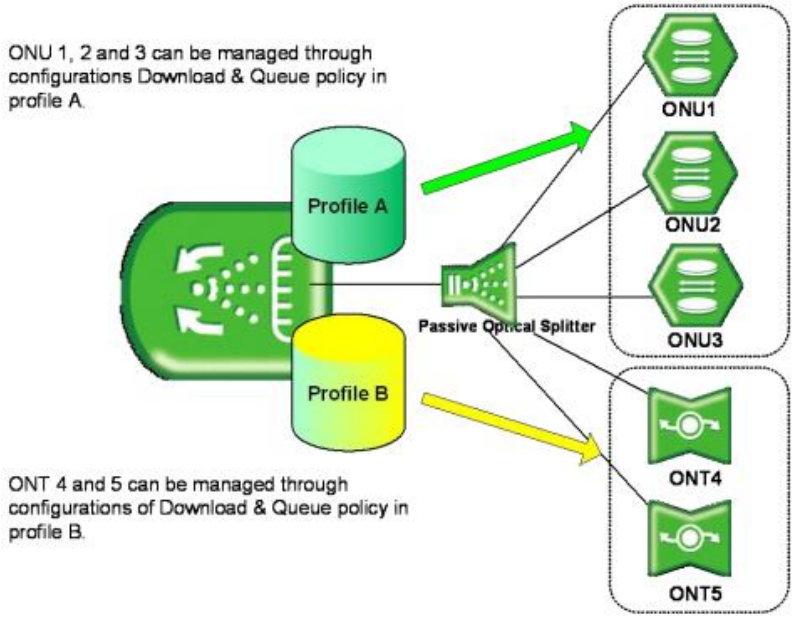
```
 bridge 3
  ani mapper 3
  link ip-host-config 1
 ip-host-config 1
  ip address static
  dns primary 8.8.8.8 secondary 8.8.4.4
  link voip-service 1
  extended-vlan-tagging-operation VOIP
 ip-host-config 2
  ip address dhcp
  extended-vlan-tagging-operation NET
 voip-service 1
  manage-method omci
  voip-profile VOIP
  uni pots 1
  uni pots 2
 apply
!
```



You can easily create new profiles on OLT, because You can modify profiles on some text editor and paste to the OLT CLI.

14. ONU Profile (1)

OLT provides the easy and efficient management solution for various service environments with the ONU profile. The ONU profile is a collection of configurations for the operation of an ONU (ONT). You can manage all ONUs connected to an OLT by simply applying the configured profile to ONUs without any local configuration. In case of a modification of a profile, the modified configurations will be automatically applied to ONUs, which are managed by the profile. This will prevent unnecessary resources to configure every single ONU (ONT), allowing the maintenance efficiency to dramatically increase. One ONU profile can be applied to several ONUs (ONTs), but one ONU cannot be managed by several ONU profiles.



Creating ONU Profile

You need to open *ONU Profile Configuration* mode to configure an ONU profile. To create an ONU profile, use the following command.

Command	Mode	Description
onu-profile *NAME* **create**	GPON	Creates an ONU profile. NAME: ONU profile name

To modify an existing ONU profile, use the following command.

Command	Mode	Description
onu-profile *NAME* **modify**	GPON	Modifies an ONU profile. NAME: ONU profile name

To delete a created ONU profile, use the following command.

Command	Mode	Description
no onu-profile {*NAME* | **all**}	GPON	Deletes an ONU profile. NAME: ONU profile name

Saving Profile

After configuring an ONU profile, you need to save the profile with the following command.

Command	Mode	Description
apply	ONU-Profile	Saves an ONU profile configuration.

Applying ONU Profile

If you want to apply a created ONU profile to connected ONUs (ONTs), open *GPON-OLT Configuration* mode where you want to apply the profile.

```
SWITCH(config-gpon-profile[AAA])# exit
SWITCH(gpon)# gpon-olt 1
SWITCH(config-gpon-olt[1])#
```

To apply/release an ONU profile to/from connected ONUs (ONTs), use the following command.

Command	Mode	Description
onu-profile *ONU-IDs NAME*	GPON-OLT	Applies an ONU profile to specified ONUs. ONU-IDs: ONU ID (1 to 128) or ONU serial number NAME: ONU profile name
no onu-profile *ONU-IDs*		Releases an ONU profile from connected ONUs. ONU-ID: ONU ID (1 to 128) or ONU serial number

14. ONU Profile (2)

RX Optical Power Threshold

The ONUs periodically monitor the RX optical power and send the alarm message to their OLT when the RX optical power exceeds the user-defined threshold. To set the transmit rate of an UNI port, use the following command

Command	Mode	Description
rx-power threshold {**low** *VALUE* [**high** *VALUE*] | **high** *VALUE* [**low** *VALUE*] }	ONU-Profile	Sets the RX optical power threshold and sends RX power high/low alarm to OLT when the RX power exceeds the threshold or it is below the threshold. VALUE: -127 to 0 dBm
no rx-power threshold [**low** | **high**]		Deletes the configured RX optical power threshold.

Rogue ONU

The first method is that after detecting the existence of a rogue ONT, the rouge ONT is identified and isolated from the service by the OLT. GPON OLT allocates the time slot for each ONU to transmit upstream traffic similarly to the TDM method. The allocated time is announced by the bandwidth map that is contained in the downstream GEM frame and the ONT only transmits the traffic based on the allocated bandwidth map. Due to this nature of GPON technology, the wrong transmit time of the ONT makes collision in upstream direction. This can be resulted from continuous transmitting data of the malfunctioned ONT which is called "Rogue ONT". The polling interval attribute represents the interval of polling optical transceiver at the ONT. And the polling count for rogue ONT attribute represents the number of consecutive polling, which results in abnormality, for declaring the optical transceiver as abnormal.

Command	Mode	Description
rogue onu polling [<10-60000> <1-250>]	ONU-Profile	Specifies a polling interval and count for rogue ONT. 10-60000: polling interval value (unit: millisecond) 1-250: polling count
rogue onu polling disable		Deletes the specified polling interval and count.

Command	Mode	Description
rogue onu alarm enable <1-5>	ONU-Profile	Enables the alarm after detecting a rogue ONU. 1-5: alarming count
rogue onu alarm disable		Disables the alarm after detecting a rogue ONU.

Command	Mode	Description
rogue onu waiting-time <100-50000>	ONU-Profile	Sets the waiting time for OLT's response 100-50000: waiting time (unit: millisecond)
rogue onu waiting-time disable		Deletes the specified waiting time for OLT's response.

14. ONU Profile (3)

Overwriting Traffic Profile Configuration

Basically, one traffic profile can be applied to the ONU profile. So, if a number of cases for traffic profile configuration are required on the ONU profile, the user should create the corresponding traffic profiles and apply them to the ONU profile. The overwriting traffic profile configuration can help reducing the count of creating and applying the traffic profile. This configuration overwrites the corresponding setting of the applied traffic profile.

IGMP Group List

You can configure the maximum number of multicast groups that a host on a port can join. To specify the maximum number of IGMP groups per UNI-side port, use the following command.

Activating Administration for Ethernet UNI

To enable/disable the administration of the Ethernet UNI port, use the following command.

Mapping between T -CONT ID and DBA profile

To specify the GEM ports (priority queue) per T-CONT and the bandwidth of GEM port by mapping between T-CONT ID and DBA profile, use the following command.

Applying Traffic

To add/delete the user-defined Traffic profile to a specified ONU profile, use the following command.

Command	Mode	Description
traffic-profile *NAME*	ONU-Profile	Adds the existing Traffic profile to ONU profile. NAME: Traffic profile name
no traffic-profile *NAME*		Removes the Traffic profile from ONU profile.

Command	Mode	Description
uni eth *UNI-PORT* **igmp max-groups** <0-255>	ONU-Profile	Specifies the maximum number of IGMP groups for a port. UNI-PORT: UNI port number 0-255: number of IGMP groups (default: 16)
no uni eth *UNI-PORT* **igmp max-groups**		Deletes a specified maximum number of IGMP groups.

Command	Mode	Description
uni eth *UNI-PORT* **port-admin** {**enable** | **disable**}	ONU-Profile	Enables/disables the administration of Ethernet UNI port on the specified ONU.

Command	Mode	Description
tcont *TCONT-ID* **dba-profile** *DBA-PROFILE*	ONU-Profile	Specifies the priority queues of T-CONT by mapping between the DBA profile and T-CONT ID. Sets T-CONT's bandwidth by specifying the DBA profile DBA-PROFILE: DBA profile name
no tcont *TCONT-ID* **dba-profile**		Disables the mapping between T-CONT ID and DBA profile.

Onu-profile configuration:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)#
SWITCH(gpon)# onu-profile NAME create
SWITCH(config-onu-profile[NAME])# traffic-profile NAME
SWITCH(config-onu-profile[NAME])# apply
SWITCH(config-onu-profile[NAME])# exit
```

14. ONU Profile (4)

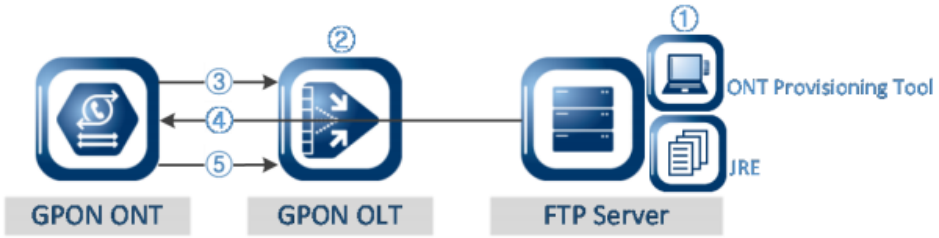
ONT Auto-configuration and Service Provisioning

Automated provisioning and remote management of ONTs are vital service delivery activities of ISPs and operators - helping to reduce costs, lead times and complexity as well as to deploy new subscriber services. ONT provisioning method simplifies network operations by eliminating the need to configure every network element interface between the OLT ingress and subscriber ports of our ONTs (H64x series) for diverse GPON service applications. If the ONT service provisioning settings in XML file are saved in a FTP server prior to installation/activation of ONTs, the OLT can relay the configured XML file from the FTP server to the activated ONTs using the commands.

Command	Mode	Description
onu mgmt-mode ip-path *ONU_ID* **ftp id** *ID* **password** [*PASSWORD*]	GPON-OLT	Sets an user name and password to access FTP server for GPON ONT provisioning. ONU-ID: 1-128 or ONU serial number ID: user name PASSWD: password
onu mgmt-mode ip-path *ONU_ID* **uri** *URI* **file** *FILE_NAME*		Specifies a FTP server and ONT provisioning file (XML file) name. URI: FTP server address FILE_NAME: ONT provisioning file name
no onu mgmt-mode ip-path *ONU_ID*		Deletes the configurations of GPON provisioning.

Command	Mode	Description
mgmt-mode mode ip-path	ONU-Profile	Selects the MGMT IP-Path mode for ONT provisioning.
mgmt-mode ip-path ftp id *ID* **password** [*PASSWORD*]		Sets an user name and password to access FTP server for GPON ONT provisioning. ID: user name PASSWD: password
mgmt-mode ip-path uri *URI* **file** *FILE_NAME*		Specifies a FTP server and ONT provisioning file (XML file) name. URI: FTP server address FILE_NAME: ONT provisioning file name
no mgmt-mode mode		Deletes the configured GPON provisioning mode.
no mgmt-mode ip-path		Deletes the configurations of GPON provisioning per ONT.

ONT Provisioning Process



① ONT Provisioning Tool & JRE Installation:
Install JRE (version 1.6) and provisioning tool (ONTProvisionTool.exe) to FTP server. Create a new XML configuration file and modify the ONT settings for ONT provisioning. The ONT configuration parameters can be changed or saved in XML.

② File Transfer from FTP server to ONT:
For the ONT configuration file (XML file) transfer, the ONT provisioning-related commands should be executed on the OLT.
The OLT is capable to relay the user-defined XML file from the FTP server to the activated ONTs.

③ ONT Activation

④ Receive XML configuration file from FTP server:
The ONT receives the ONT service configuration file in XML from FTP server. The new service settings are assigned to this ONT.

⑤ Send File Transfer Message:
On the OLT side, the OLT can monitor a file transfer status by receiving the messages ("File transfer in progress", "File transfer complete", "Remote failure", "Local failure") from ONT.

Broader description You can find on presentation file:
15_ONT - gpon provisioning.pptx.

With this configuration, all ONTs which are using this profile, will download the same configuration file. You can also configure config file individually.

15. OLT service-profile

OLT Service Profile

OLT provides numerous functions to customize a GPON network with many CLI commands and parameters. Each ONU profile can be designed with several profiles such as T-CONT, DBA and VoIP to meet the requirement of data bandwidth, VoIP access and the advanced security issues. OLT also provides the service ONU profile for customer convenience. You can apply one of ONU profiles as the default profile to all ONUs or apply an ONU profile to specified ONUs with a given model name.

To apply a default ONU profile to all ONUs(ONTs), use the following command.

Command	Mode	Description
olt service-profile default *PROFILE*	GPON	Applies a default ONU profile to all ONUs. PROFILE: existing ONU profile name

If you try to configure a default profile for all ONUs when a specified service ONU profile is already applied to ONUs with a given model name, the default ONU profile will be applied only to the ONUs that do not have specific profiles.

To apply an ONU profile to specified ONUs(ONTs) with a given model name, use the following command.

Command	Mode	Description
olt service-profile model-name *NAME PROFILE*	GPON	Applies an ONU profile to specified ONUs with a given model name. NAME: ONU model name PROFILE: existing ONU profile name

To release the default ONU profile from all ONUs(ONTs), use the following command.

Command	Mode	Description
no olt service-profile	GPON	Releases a default/service ONU profile from all ONUs.
no olt service-profile default		
no olt service-profile model-name *NAME*		

EXAMPLE:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# olt service-profile default DEFAULT-PROFILE
SWITCH(gpon)# olt service-profile model-name H640G H640G-PROFILE
SWITCH(gpon)# olt service-profile model-name H640GR-02 H640GR-02-PROFILE
SWITCH(gpon)# olt service-profile model-name H640GV-03 H640GV-03-PROFILE
SWITCH(gpon)# olt service-profile model-name H640RW-02 H640RW-02-PROFILE
SWITCH(gpon)# olt service-profile model-name H640GW-02 H640GW-02-PROFILE
SWITCH(gpon)# olt service-profile model-name H645G H645G-PROFILE
```

To display the service ONU profile from all ONUs(ONTs), use the following command.

Command	Mode	Description
show olt service-profile	Enable Global GPON	Shows the configured service ONU profiles.

16. EXAMPLE GPON Level Configuration (1)

```
gpon
  olt cable-down enable
  onu auto-upgrade model-name H640GW-02 start-time 0 end-time 0
  onu auto-upgrade model-name H645G start-time 0 end-time 0
  onu auto-upgrade model-name H640G start-time 0 end-time 0
  onu auto-upgrade model-name H640GR-02 start-time 0 end-time 0
  onu auto-upgrade model-name H640GV-03 start-time 0 end-time 0
  onu auto-upgrade model-name H640RW-02 start-time 0 end-time 0
  onu auto-upgrade reboot-time immediately
  onu auto-upgrade firmware H640GW-02 H640GW-02/G_ONU_N_2.45-1045.01.H640GW.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640GW-02 2.45-1045 exclude
  onu auto-upgrade firmware H640G H640G/G_ONU_N_2.45-1045.01.H640G.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640G 2.45-1045 exclude
  onu auto-upgrade firmware H640GR-02 H640GR-02/G_ONU_N_2.45-1045.01.H640GR.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640GR-02 2.45-1045 exclude
  onu auto-upgrade firmware H645G H645G/G_ONU_N_2.45-1045.01.H645G.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H645G 2.45-1045 exclude
  onu auto-upgrade firmware H640RW-02 H640RW-02/G_ONU_N_2.45-1045.01.H640RW.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640RW-02 2.45-1045 exclude
  onu auto-upgrade firmware H640RW-02 H640RW-02/G_ONU_N_2.45-1045.01.H640RW.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640RW-02 2.45-1045 exclude
  onu auto-upgrade firmware H640GV-03 H640GV-03/G_ONU_N_2.32-1032.01.H640GV.x ftp 195.88.30.175 publicro iLOVEdasan
  onu auto-upgrade target-version H640GV-03 2.32-1032 exclude
  olt multicast-gem 4094
  olt interwork igmp-snooping enable
  !
  !
  dba-profile DBA create
   mode sr
   sla fixed 128
   sla maximum 1031616
   apply
  !
  dba-profile TEL create
   mode fixed
   sla fixed 1024
   apply
  !
  multicast-profile MULTI create
   igmp tag-control add vid 200 cos 0
   igmp robustness-variable 7
   igmp access-list vid 200 dst-ip start 224.0.0.1 end 239.255.255.255 bw 4294952 gem 4094
   apply
  !
```

16. EXAMPLE GPON Level Configuration (2)

```
!
extended-vlan-tagging-operation IPTV create
 downstream-mode enable
 untagged-frame 1
  treat inner vid 200 cos 0 tpid 0x8100
 apply
!
extended-vlan-tagging-operation NET create
 downstream-mode enable
 untagged-frame 1
  treat inner vid 100 cos 0 tpid 0x8100
 apply
!
extended-vlan-tagging-operation VOIP create
 downstream-mode enable
 untagged-frame 1
  treat inner vid 300 cos 0 tpid 0x8100
 apply
!
voip-profile VOIP create
 codec-nego 1 codec pcmu packet-period 10 silence-suppression 0
 codec-nego 2 codec pcma packet-period 10 silence-suppression 0
 codec-nego 3 codec g729 packet-period 10 silence-suppression 0
 codec-nego 4 codec g723 packet-period 10 silence-suppression 0
 protocol sip
  proxy-server 11.1.1.253
  outbound-proxy-server 11.1.1.253
  register-server 11.1.1.253
  host-part-server 11.1.1.253
  dns primary 11.1.1.1
  reg-exp-time 60
  caller-id call-number
  dial-plan table 1 x.
 apply
!
```

16. EXAMPLE GPON Level Configuration (3)

```
traffic-profile TRAFFIC create
 mgmt-mode uni eth 1 non-omci link virtual-eth 1
 mgmt-mode uni eth 2 non-omci link virtual-eth 1
 mgmt-mode uni eth 3 omci
 mgmt-mode uni eth 4 omci
 tcont 1
  gemport 1/1
  dba-profile DBA
 tcont 2
  gemport 2/1
  dba-profile DBA
 tcont 3
  gemport 3/1
  dba-profile TEL
 mapper 1
  gemport count 1
  gemport 1 rate-limit downstream 102400 102400
 mapper 2
  gemport count 1
  gemport 1 rate-limit downstream 40960 40960
 mapper 3
  gemport count 1
 bridge 1
  ani mapper 1
  uni eth 1
   extended-vlan-tagging-operation NET
  uni eth 2
   extended-vlan-tagging-operation NET
 bridge 2
  ani mapper 2
  uni eth 3
   multicast-profile MULTI
   extended-vlan-tagging-operation IPTV
  uni eth 4
   multicast-profile MULTI
   extended-vlan-tagging-operation IPTV
 bridge 3
   ani mapper 3
   link ip-host-config 1
  ip-host-config 1
   ip address static
   dns primary 8.8.8.8 secondary 8.8.4.4
   link voip-service 1
   extended-vlan-tagging-operation VOIP
  ip-host-config 2
   ip address dhcp
   extended-vlan-tagging-operation NET
  voip-service 1
   manage-method omci
   voip-profile VOIP
   uni pots 1
   uni pots 2
  apply
 !

onu-profile NAME create
 traffic-profile TRAFFIC
apply
!

olt service-profile model-name H640GW-02 TRAFFIC
```

17. ONT authentication from FreeRadius server (1)

ONU Authentication from RADIUS Server

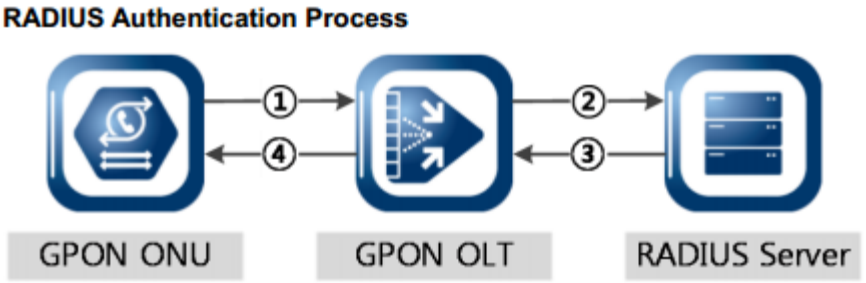
You can use the RADIUS authentication process when an ONU (ONT) is activated and it attempts to access an OLT. The RADIUS Access-Request message is sent from the OLT to the RADIUS server. If the ONU is valid, the RADIUS server consults a database of ONUs to find the ONU which matches the authentication attributes in the connection request. If the RADIUS server has the valid ONU-related information, it sends the configuration settings placed into a RADIUS Access-Accept message to the OLT for the ONU registration. The OLT receives the service profile settings from the RADIUS server and it assigns a new service profile to ONU.

① **Upload MIB Info:** During the initial connection between OLT and ONU, the ONU uploads the MIB information. On the OLT side, the OLT checks the ONU validation using ONU model name, firmware version and serial number.

② **Sends RADIUS message:** If the RADIUS authentication is required when the OLT and ONU are connected each other, the OLT sends Access-Request message with the authentication attributes (user name, user password, OLT-ID, ONU-ID, ONT model name, serial number, firmware version) to the RADIUS server.

③ **Receive Response message:** If the RADIUS message is sent by a valid ONU, and if the authentication attributes contain the correct values, the Access-Accept message of ONU configuration settings is sent by the RADIUS server.

④ **Set the configuration:** The OLT receives the service profile information from the RADIUS server. The new service profile settings are assigned to ONU.



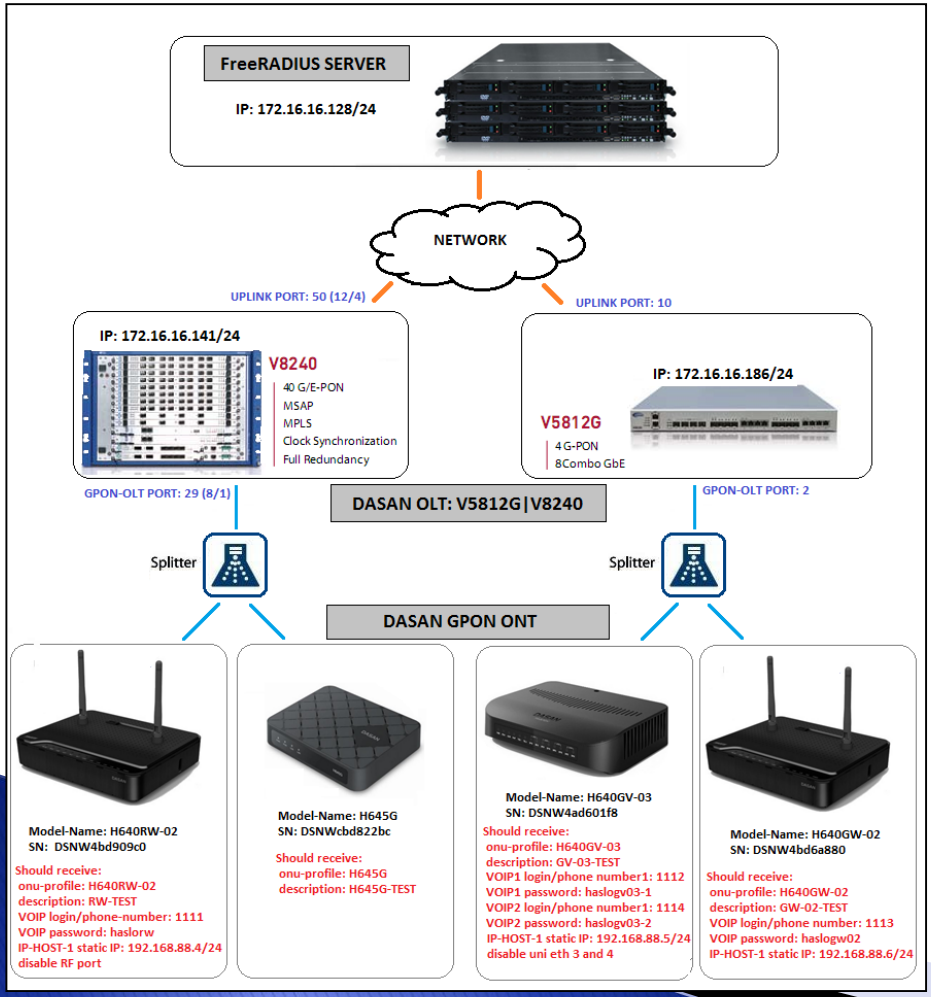
The RADIUS server sends Disconnect messages (DM) request in order to terminate a user session on a network access server, whereas it sends Change-of-Authorization (CoA) request messages to modify session authorization attributes of ONU. The OLT checks that the key of DM message from the RADIUS server is valid. If the key value is invalid, the packets are silently discarded.

17. ONT authentication from FreeRadius server (2)

To configure IP address and key value of RADIUS server for ONU authentication, use the configuration on the right:

To display the information of RADIUS server for ONU authentication, use the following command:

Command	Mode	Description
show onu auth radius-server	GPON	Shows the information of RADIUS server for ONU authentication



Command	Mode	Description
onu auth radius-server host *A.B.C.D* **key** *WORD* **[auth-port** <0-65535>]	GPON	Specifies an IP address with key value and UDP port of RADIUS server. A.B.C.D: RADIUS server IP address WORD: RADIUS authorization key value 0-65535: UDP port (default: 1812)
onu auth radius-username { **serial-number** | **model-name**}		Sends the ONU's serial number-based or its model name-based ID key value on the authentication message to RADIUS server. serial-number: uses GPON serial number of ONU (default) model-name: uses model name of ONU
no onu auth radius-server host *A.B.C.D*		Deletes the configured RADIUS server address.

You can see the status of ONU authentication via RADIUS server by the debug gpon **rauth** command.

To enable/disable the ONU authentication for ONU profile, use the following command.

Command	Mode	Description
onu auth-control {**enable** | **disable** }	GPON-OLT	Enables/disables the authentication control function for the specified OLT port.
onu auth-control reauthenticate		Performs re-authentication processing for ONU.

To display the information of ONU authentication status and profile, use the following command.

Command	Mode	Description
show onu auth-status [*OLT-ID*]	GPON	Shows the current authentication status of ONU.
show onu auth-status [*ONU-ID*]	GPON-OLT	

EXAMPLE:

```
SWITCH> enable
SWITCH# configure terminal
SWITCH(config)# gpon
SWITCH(gpon)# onu auth radius-server host 172.16.16.128 key testing123
SWITCH(gpon)# gpon-olt 1
SWITCH(config-gpon-olt[1])# onu auth-control enable
```

Broader description You can find on Presentation number 13

THANK YOU

DASAN Networks

If You need help please contact: support@dasannetworks.eu