

GPON Broadband Service Provisioning and Configurations

www.huawei.com

Copyright © Huawei Technologies Co., Ltd. All rights reserved.





Objectives

- Upon completion of this course, you will be able to:
 - Understand VLAN principles and applications.
 - Understand the GPON broadband service process.
 - Configure and commission services.
 - Query and modify services.



Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
3. Broadband Service Configuration
4. Broadband Service Maintenance

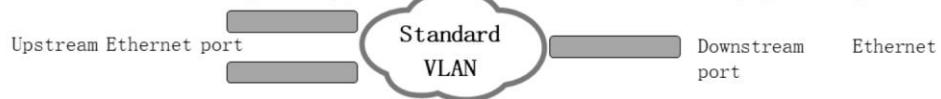
VLAN Type and Attribute

- A PON device supports a maximum of 4096 VLANs. VLAN types and attributes are as follows:
 - VLAN types:
 - Standard
 - Smart
 - MUX
 - VLAN attributes:
 - Common
 - QinQ
 - Stacking

- VLAN Definition
 - A virtual local area network (VLAN) is a technology that virtualizes devices in a LAN into different network segments logically instead of physically. The VLAN technology is a basic technology widely used in various access modes and services, for example, multicast, triple play, wholesale service, and private line services.
- VLAN management enables carriers to flexibly plan services.
 - A standard VLAN is mainly used for cascading. Huawei products support the Ethernet cascading networking. Multi-level access devices can be cascaded through the GE/FE interfaces to effectively extend the network coverage and meet the requirements from a large number of users.
 - A smart VLAN is used to reduce the number of system VLANs and isolate users.
 - A QinQ VLAN is used to transparently transmit private VLAN packets on the public network to implement layer 2 VPN.
 - VLAN stacking is mainly used in wholesale services of carriers.
- The specifications of the VLAN management feature are as follows:
 - Supports smart VLAN, MUX VLAN, and Standard VLAN.
 - Supports 4K VLANs. The value range of VLAN IDs is 2 - 4093.
 - Supports port-based VLANs.
 - Supports QinQ and stacking VLANs.

VLAN Type: Standard VLAN

- The standard VLAN defined in IEEE 802.1Q has the following features:
 - Ports in the same VLAN can communicate with each other at layer 2.
 - Ports in different VLANs are isolated at layer 2.
 - The service port type can only be ETH (Ethernet physical port).



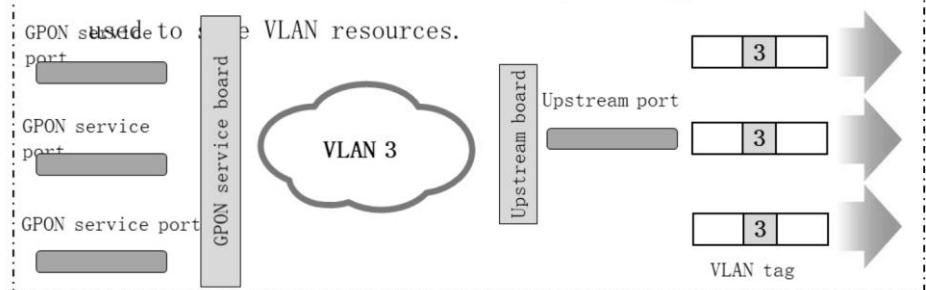
A standard VLAN can contain multiple Ethernet ports for Ethernet cascading or P2P services, but cannot contain GPON service ports.

- Standard VLAN
 - The ports in a standard VLAN are standard Ethernet ports for interworking. Each port is logically equivalent.
 - Ethernet ports in the same standard VLAN can communicate with each other. Ethernet ports in different standard VLANs are isolated from each other.

VLAN Type: Smart VLAN

- A smart VLAN can contain multiple upstream ports and service ports.
 - User groups can be created in different VLANs.
 - Users in the same VLAN are isolated at layer 2.

▫ When the number of VLANs is limited, this type of VLANs can be used to save VLAN resources.

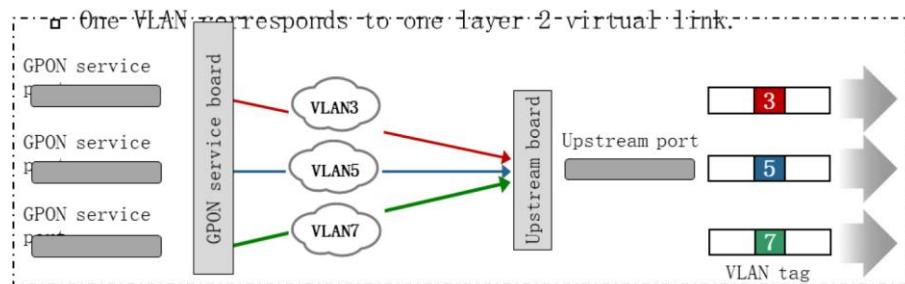


- Smart VLAN

- A smart VLAN is a special VLAN. In addition to the features of a standard VLAN, a smart VLAN also has the following features:
 - In a smart VLAN, ports are not equal and are classified into upstream ports and service ports.
 - Service ports are isolated and cannot communicate with each other.
 - Upstream ports can directly communicate with each other.
 - Service ports can directly communicate with upstream ports.
 - In a standard VLAN, the broadcast domain of each port covers all ports in the VLAN. However, in a smart VLAN, only the broadcast domain of an upstream port covers all ports in the VLAN. The broadcast domain of a service port covers only upstream ports in the VLAN.

VLAN Type: MUX VLAN

- An MUX VLAN can contain multiple upstream ports and only one service port.
 - A one-to-one mapping is set up between users and VLAN IDs.
 - It can be used to isolate users at layer 2 and differentiate users.



- MUX VLAN
 - An MUX VLAN is a VLAN that contains upstream ports and a service port.
 - An MUX VLAN can contain multiple upstream ports but only one service port.
 - Service flows of different MUX VLANs are isolated from each other.
 - Each MUX VLAN maps one access user. Therefore, MUX VLANs can be used to distinguish users.

VLAN Attributes

| Attribute | Description |
|-----------|--|
| Common | An Ethernet frame carries only one VLAN tag, which can be used as a common layer 2 VLAN or a VLAN layer 3 virtual interface when only one VLAN allocated is used for upstream transmission. |
| QinQ | The packet contains the inner VLAN of the user private network and the outer VLAN allocated. The outer VLAN can be used to form a layer 2 VPN tunnel to the user private network to transparently transmit the private network services. You can also use double-tagged VLANs to accurately bind users or differentiate service types. |
| Stacking | The packet contains the inner and outer VLAN tags allocated. An upper-layer device supports double authentication by 2 VLAN tags to increase the number of access users. In the layer 2 working mode, the upper-layer network can directly forward packets through the outer VLAN to provide carriage services. |

Ethernet frame with a single VLAN tag

Ethernet frames with double VLAN tags

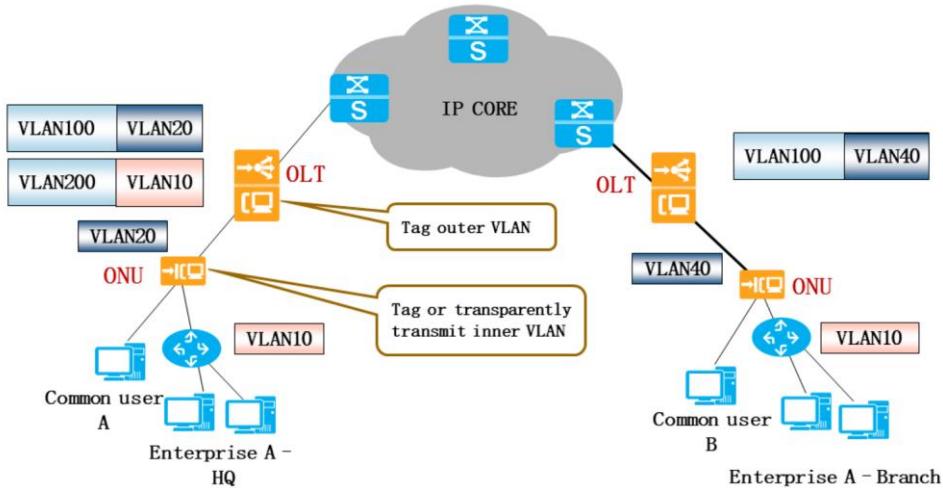
Copyright © Huawei Technologies Co., Ltd. All rights reserved.

Page 8



- Common VLAN
 - Common is the default attribute of a VLAN. That is, the VLAN does not have the QinQ or stacking attribute. A common VLAN can be used as a common layer 2 VLAN. A layer 3 virtual interface can be created based on a common VLAN for layer 3 forwarding.
- Stacking VLAN
 - If VLAN stacking is used to increase the number of VLANs or identify users, the BRAS is required to implement double-tagged user authentication.
 - If VLAN stacking is used to provide private line wholesale services, the upper-layer network must work in layer 2 mode and forward packets directly based on the VLAN and MAC address.
- QinQ VLAN
 - A QinQ VLAN is used to carry private line services or accurately bind users.

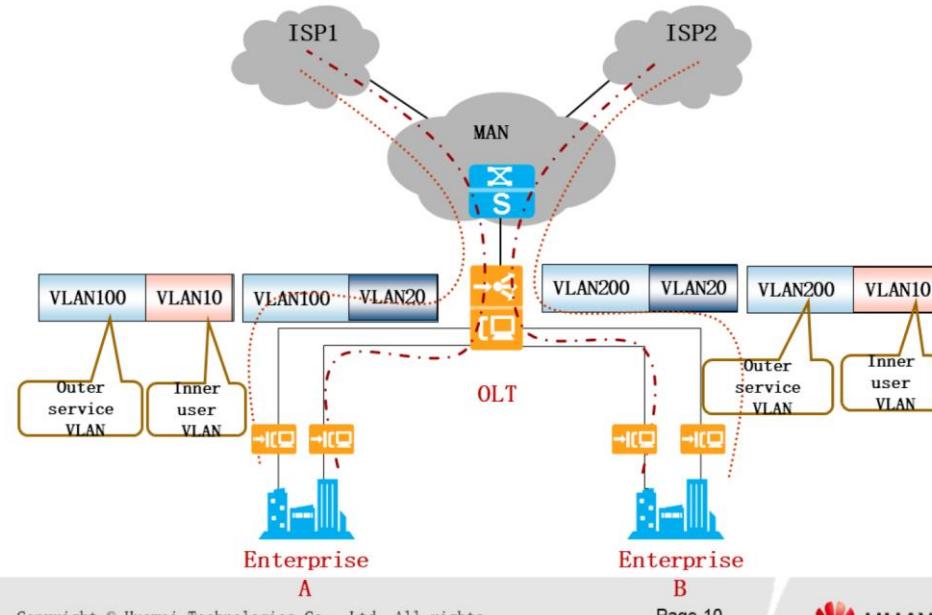
QinQ VLAN Application Example



- Service process of a QinQ VLAN:

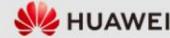
- Users can communicate with each other in the same private network (VLAN 10) in different areas through the QinQ VLAN. User service packets are processed as follows:
 - An HQ user of enterprise A sends an untagged packet upstream.
 - The ONU adds a VLAN tag (VLAN 10) of the private network to the packet (or transparently transmits it) and sends the packet upstream to the OLT.
 - The OLT adds the public VLAN tag (VLAN 200) to the packet and transmits the packet to the upper-layer network.
 - The upper-layer network device transparently transmits the packet according to the public VLAN tag (VLAN 200).
 - After receiving the packet, the peer OLT removes the public VLAN tag (VLAN 200) and transparently transmits the packet to the ONU.
 - The ONU identifies and removes (or transparently transmits) the private VLAN tag (VLAN 10), forwards the untagged packet to the switch of the private network which then forwards the untagged packet to a branch user of enterprise A.
- As mentioned above, the QinQ VLAN can implement the interworking between HQ and branch users of enterprise A in VLAN 10.

Stacking VLAN Application Example



Copyright © Huawei Technologies Co., Ltd. All rights reserved.

Page 10



- Service process of a stacking VLAN:

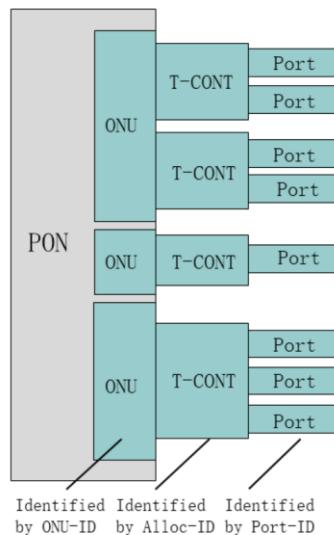
- The OLT uses different stacking VLANs to connect users of enterprise A to ISP1 and users of enterprise B to ISP2. User service packets are processed as follows:
 - A user sends an untagged packet upstream to the OLT through an ONU.
 - The OLT adds two VLAN tags to the untagged packet. Users of different ISPs have different outer VLAN tags.
 - For user packets from enterprise A, the service VLAN 100 is encapsulated in the outer VLAN tag, and the user VLAN 10 or 20 is encapsulated in the inner VLAN tag.
 - For user packets from enterprise B, the service VLAN 200 is encapsulated in the outer VLAN tag, and the user VLAN 10 or 20 is encapsulated in the inner VLAN tag.
- The switching MAN device forwards the packets to different ISPs according to the outer VLAN tags.
- After receiving the packets, the devices of ISP1 and ISP2 remove the outer VLAN tags and differentiate user types in the enterprise according to the inner VLAN tags.



Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
 - Basic Concepts
 - Service Forwarding Principles
 - Data Planning
3. Broadband Service Configuration
4. Broadband Service Maintenance

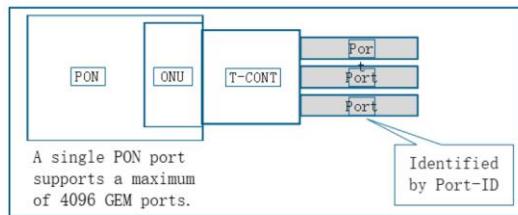
Basic Concepts of GPON - Uplink Multiplex Structure



- A GEM port is used as a service channel. One GEM port can carry one or more types of service flows.
- One ONU can contain multiple T-CONTs.
- The upstream bandwidth is divided based on T-CONTs. Different services use different T-CONTs.

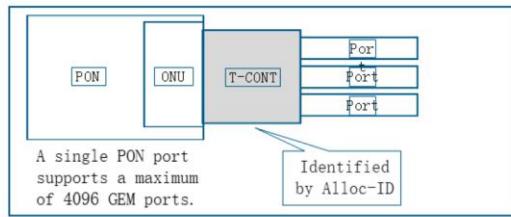
- Basic Concepts of GPON
 - A GPON encapsulation mode (GEM) frame is the smallest service bearing unit in the GPON technology and is the most basic encapsulation structure. All services are encapsulated in GEM frames for transmission on the GPON line and are identified by GEM ports. Each GEM port is identified by a unique Port-ID, which is globally allocated by the OLT. That is, each ONU under the OLT cannot use GEM ports with the same Port-IDs. A GEM port identifies a service virtual channel between the OLT and the ONU, that is, the channel that carries the service flow.
 - A T-CONT is the carrier of services in the GPON upstream direction. Each GEM port is mapped to a T-CONT which transmits data upstream according to DBA scheduling by the OLT. A T-CONT is the basic control unit of the upstream service flow in the GPON system. Each T-CONT is uniquely identified by an Alloc-ID which is globally allocated by the OLT. That is, each ONU under the OLT cannot use T-CONTs with the same Alloc-ID.
- Service multiplexing principles of the GPON system
 - In the upstream direction, services are first mapped to different GEM ports on the ONU, and GEM ports are mapped to different types of T-CONTs for upstream transmission. After receiving a data frame, the OLT decapsulates the GEM port, extracts the user data, and forwards the data to other modules for processing. In the downstream direction, all services are encapsulated into GEM ports and broadcast to all ONUs connected to the GPON port. An ONU filters data according to the GEM port ID, retains only the data intended for it, processes the data, and then forwards the data to the user.

Basic Concepts of GPON - GEM Port



- **GEM Port**
 - GPON encapsulation mode (GEM) frames are transmitted between the OLT and an ONU/ONT.
 - Each T-CONT contains one or more GEM ports, and each GEM port carries one type of service flow.
- **GEM Port-ID**
 - Each GEM port is uniquely identified by a port ID. The value range of a port ID is 0 - 4095, which is allocated by the OLT. One GEM port can be used by only one

Basic Concepts of GPON - T-CONT



- T-CONT
 - In a GPON system, a T-CONT is used as a buffer for upstream service flows.
- Alloc-ID
 - Each T-CONT is uniquely identified by an Alloc-ID.
 - The value range of Alloc-ID is 0 - 4095, which is allocated by the OLT.
 - One Alloc-ID can be used by only one ONU/ONT under one PON port.

- Relationship between T-CONT IDs and Alloc-IDs
 - Alloc-IDs are automatically allocated by the system. You can manually define Alloc-IDs by configuring T-CONT IDs.
 - T-CONT ID range: 0 - 127
 - GPBC board: Alloc-ID = T-CONT ID x 256 + ONU ID
 - GPBD board: If T-CONT ID < 8, Alloc-ID = T-CONT ID x 256 + ONU ID. If T-CONT ID ≥ 8, the system automatically allocates the minimum idle Alloc-ID.

Mapping Between GEM Ports and Service Flows

- Mapping modes between GEM ports and services

| Mapping Mode | Mapping Method | Application |
|---------------------|--|---|
| VLAN mapping | Maps a specific VLAN ID to a unique Port-ID. | An ONU/ONT uses VLAN IDs to differentiate service flows. |
| 802.1p mapping | Maps a specific 802.1p priority to a unique Port-ID. | An ONU/ONT uses the 802.1 priority to differentiate service flows. The user priority policy must be Pri-tagged. |
| VLAN 802.1p mapping | Maps a specific VLAN ID+802.1p priority to a unique Port-ID. | An ONU/ONT uses the priority+VLAN ID to differentiate service flows of different users. |

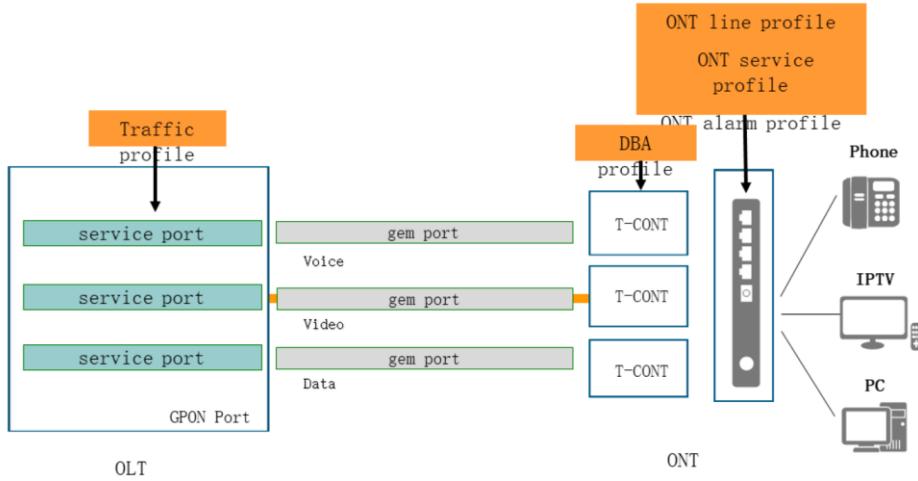
- Upstream data flows from user ports are mapped to specific ONT GEM ports for upstream transmission. Only one mapping mode can be configured for each ONT.



Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
 - Basic Concepts
 - Service Forwarding Principles
 - Data Planning
3. Broadband Service Configuration
4. Broadband Service Maintenance

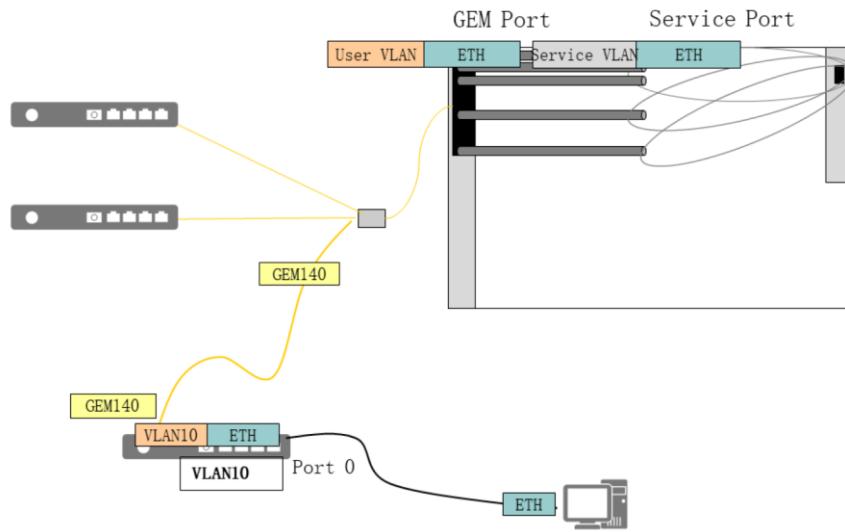
GPON Service Forwarding Principle - ONT



- Introduction to concepts:
 - In a traffic profile, you can configure the rate limit of the traffic and the processing of the packet priority.
 - The dynamic bandwidth allocation (DBA) profile describes the traffic parameters of the xPON. A DBA profile is bound to dynamically allocate the bandwidth and improve the upstream bandwidth utilization.
 - In an ONT line profile, you can configure the attributes related to the ONT line, bind the DBA profile to T-CONTs, configure the mapping priorities between GEM ports and the T-CONTs, and between GEM ports and service flows.
 - An ONT service profile provides a service configuration channel for ONTs managed in OMCI mode. You need to log in to an ONT to configure services if the ONT (such as the MDU) is managed by the SNMP. The number and types of ports configured for the ONT must be consistent with the actual product specifications.
 - (Optional) ONT alarm profile: In an ONT alarm profile, you can configure a series of alarm threshold parameters to monitor the performance of an activated ONT line. If a statistical item reaches the alarm threshold, the system notifies the NE and sends the alarm information to the log NE and the NMS.

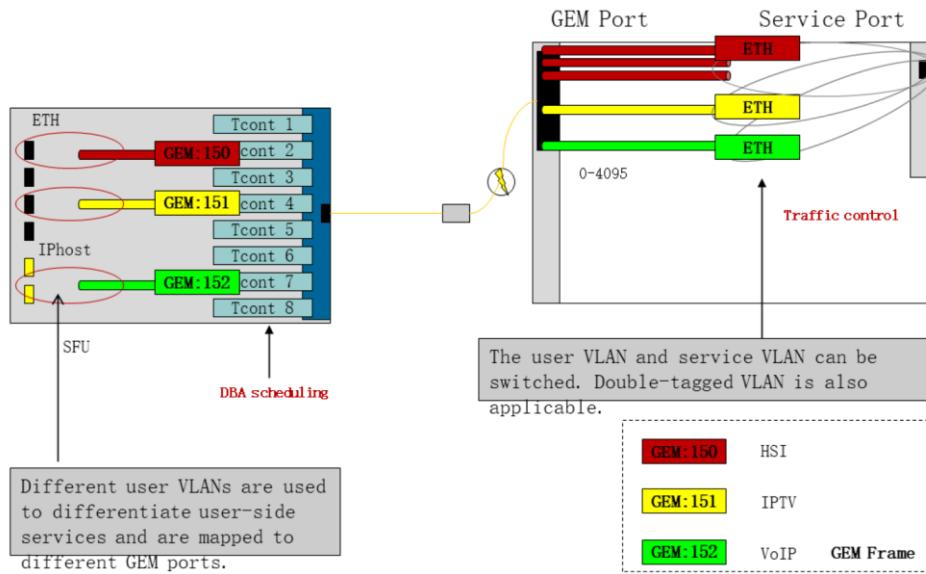
- Service port: Specifies the encapsulation relationships and modes of the service flows, physical ports, and virtual ports.

Service Forwarding Process

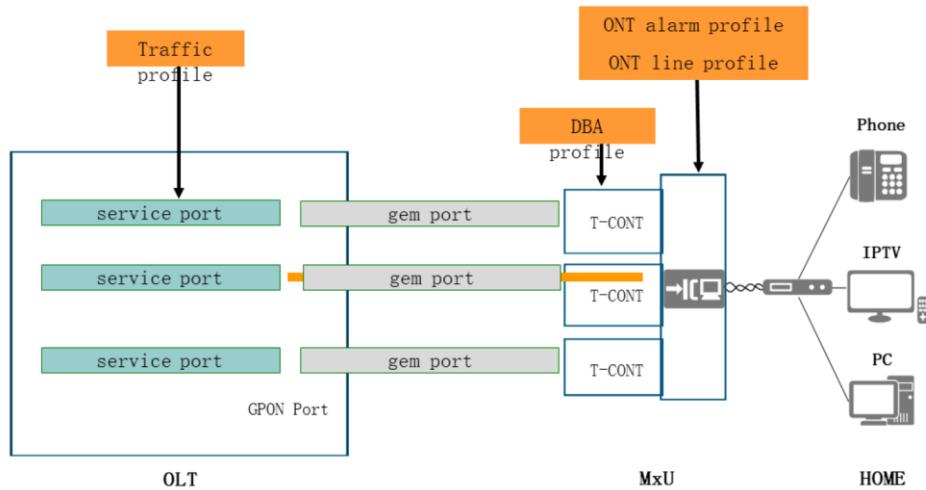


- Service forwarding example
 - A user-side terminal sends an encapsulated ETH data frame to the Ethernet port of the ONT.
 - The ONT port processes the user data by priority and adds the user-side VLAN tag.
 - The GPON chip of the ONT encapsulates the VLAN data into a GEM frame and sends the GEM frame to the OLT through the PON port of the ONT.
 - The OLT decapsulates the GEM data frame and extracts the VLAN data frame.
 - The OLT switches the user VLAN tag to a service VLAN tag, and then forwards the user data to the upstream port.

Forwarding Process of the Triple Play Service



GPON Service Forwarding Principle - MxU





Contents

1. Introduction to VLANs
2. **Introduction to Broadband Services**
 - Basic Concepts
 - Service Forwarding Principles
 - Data Planning
3. Broadband Service Configuration
4. Broadband Service Maintenance

Guidelines for Planning T-CONTs and GEM Ports

- Bind T-CONTs to the GEM ports in an ONT line profile.
 - One GEM port maps to one service flow.
 - One GEM port is bound to one T-CONT.
 - Different service flows are carried in different T-CONTs.
 - Different T-CONTs are bound to different types of DBA profiles.

One T-CONT can be bound to one or multiple GEM ports. To apply different traffic policies to different types of services, you are advised to use the one-to-one mapping mode.

Principles for Planning Broadband Services VLANs

- A broadband user is accurately bound and uniquely identified by a QinQ VLAN.
 - Different outer tags are added for various services on the same PON port.
 - If the outer tags of different PON ports are the same, the inner tags must be different.
 - If the outer tags of different PON ports are different, the inner tags can be the same.
 - The NMS application does not use the QinQ VLAN.

VLAN data planning is flexible. Here is a typical planning mode. You can select a common VLAN, QinQ VLAN, or Stacking VLAN according to the actual situation.

Outer VLAN Planning

| Subrack | Slot | Port | Service | Inner Tag | Outer Tag |
|---------|------|------|---------|-----------|-----------|
| 0 | 2 | 0 | PPPOE | 11-1500 | 1000 |
| 0 | 2 | 1 | PPPOE | 11-1500 | 2024 |
| 0 | 2 | 2 | PPPOE | 11-1500 | 1006 |
| 0 | 2 | 3 | PPPOE | 11-1500 | 1009 |

- Principles:
 - Implement flexible QinQ on the OLT.
 - Add different outer tags for services. That is, services of the same type on the same port use the same outer tag. For example, for PON port 0/2/0, the outer tag of PPPoE is 1000, the outer tag of VoIP is 2000, and the outer tag of IPTV is 2012.
 - The outer tags of different PON ports must be different.
 - The NMS VLAN is not added with an outer tag.

Inner VLAN Planning (1)

| Preset MDU Device Type | ONT ID | PPPoE Service | | DBA Bandwidth Profile | Equipment Installation Location | Device SN |
|------------------------|--------|---------------|----------|-----------------------|---------------------------------|-----------|
| | | Start VLAN | End VLAN | | | |
| MA562X | 8 | 523 | 546 | Assured 50 Mbps | | |
| MA562X | 9 | 547 | 570 | Assured 50 Mbps | | |
| MA562X | 10 | 571 | 594 | Assured 50 Mbps | | |
| MA562X | 11 | 595 | 618 | Assured 50 Mbps | | |
| MA562X | 12 | 619 | 642 | Assured 50 Mbps | | |
| MA562X | 13 | 643 | 666 | Assured 50 Mbps | | |
| MA562X | 14 | 667 | 690 | Assured 50 Mbps | | |
| MA562X | 15 | 691 | 714 | Assured 50 Mbps | | |
| MA562X | 16 | 715 | 738 | Assured 50 Mbps | | |
| MA562X | 17 | 739 | 762 | Assured 50 Mbps | | |
| MA562X | 18 | 763 | 786 | Assured 50 Mbps | | |
| MA562X | 19 | 787 | 810 | Assured 50 Mbps | | |
| MA562X | 20 | 811 | 834 | Assured 50 Mbps | | |

Inner VLAN Planning (2)

| Preset MDU Device Type | ONT ID | PPPoE Service | | DBA Bandwidth Profile | Equipment Installation Location | Device MAC Address |
|------------------------|--------|---------------|----------|-----------------------|---------------------------------|--------------------|
| | | Start VLAN | End VLAN | | | |
| HG terminal | 32 | 1200 | | Assured 10 Mbps | | |
| HG terminal | 33 | 1201 | | Assured 10 Mbps | | |
| HG terminal | 34 | 1202 | | Assured 10 Mbps | | |
| HG terminal | 35 | 1203 | | Assured 10 Mbps | | |
| HG terminal | 36 | 1204 | | Assured 10 Mbps | | |
| HG terminal | 37 | 1205 | | Assured 10 Mbps | | |
| HG terminal | 38 | 1206 | | Assured 10 Mbps | | |
| HG terminal | 39 | 1207 | | Assured 10 Mbps | | |
| HG terminal | 40 | 1208 | | Assured 10 Mbps | | |
| HG terminal | 41 | 1209 | | Assured 10 Mbps | | |
| HG terminal | 42 | 1210 | | Assured 10 Mbps | | |
| HG terminal | 43 | 1211 | | Assured 10 Mbps | | |
| HG terminal | 44 | 1212 | | Assured 10 Mbps | | |



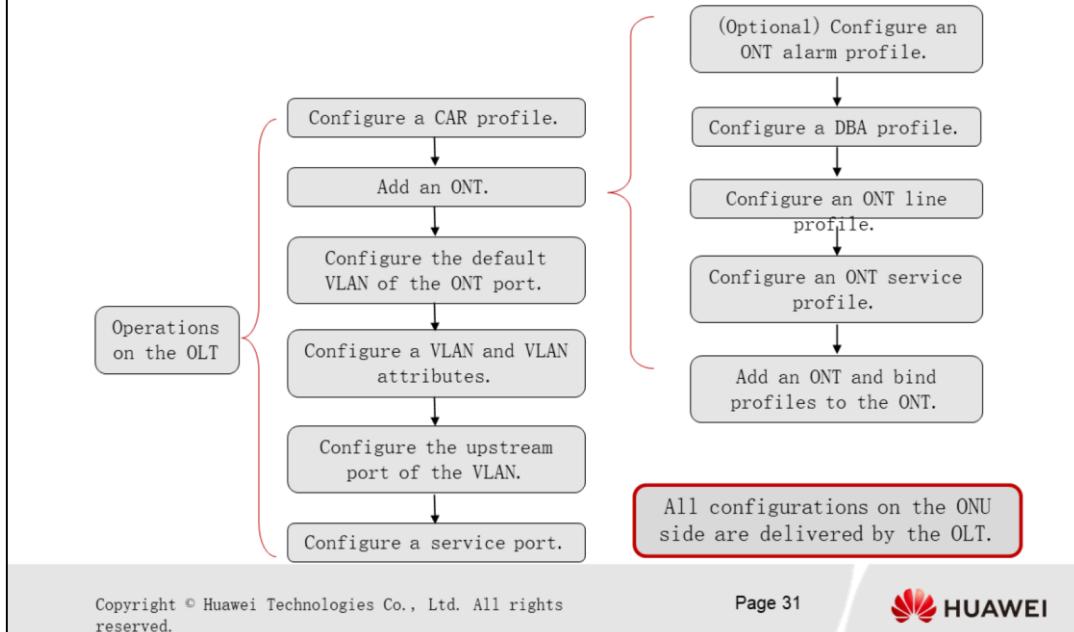
Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
3. **Broadband Service Configuration**
 - Configuration of Class A ONUs
 - Configuration of Class B/C ONUs
4. Broadband Service Maintenance

Data Planning

| Parameter Type | Parameter Value | Parameter Type | Parameter Value |
|-----------------------|--|------------------------|-----------------|
| OLT PON port | 0/8/0 | CAR profile ID | 10 |
| ONT ID | 0 | ONT alarm profile ID | 20 |
| ONT SN | 32303131D659FD40 | DBA profile ID | 30 |
| Outer VLAN ID | 2012 | ONT line profile ID | 40 |
| Inner VLAN ID | 35 | ONT service profile ID | 50 |
| User ETH port | 1 | T-CONT No | 2 |
| User VLAN | 35 | GEM port index | 0 |
| DBA bandwidth type | Type 2 | Bandwidth | 4096 kbps |
| CAR profile Bandwidth | Assured: 4096 kbps; maximum: 8192 kbps | | |

Flowchart for Configuring the Broadband Access Service for ONT



Configuring a CAR Profile

```
huawei(config)#traffic table ip index 10
{cir<K>|name<K>}:cir
{cir<U><64,10240000>|off<K>}:4096
{cbs<K>|pbs<K>|pir<K>|priority<K>}:pir
{pir<U><64,10240000>}:8096
{pbs<K>|priority<K>}:priority
{prival<U><0,7>|user-cos<K>|user-inner-cos<K>|user-tos<K>}:user-cos
{defaultval<U><0,7>|mapping-profile<K>}:5
{inner-priority<K>|priority-policy<K>}:priority-policy
{priority-policy<E><Local-Setting,Tag-In-Package>}:Tag-In-Package
```

- Parameter description
 - Committed information rate (CIR): Indicates the assured information rate. This parameter is mandatory. The value must be an integer multiple of 64. If the input is not a multiple of 64, the value is rounded down to a value which is an integer multiple of 64 and no less than 64.
 - Committed burst size (CBS): Indicates burst rate. This parameter is optional. If this parameter is not specified, the value is obtained based on the formula min (2000 + CIR x 32, 1024000).
 - Peak information rate (PIR): Indicates the peak rate. This parameter is optional.
 - Peak burst size (PBS): Indicates the peak burst rate. This parameter is optional. If this parameter is not specified, the value is obtained based on the formula min (2000 + 32 x PIR, 10240000).
 - Priority: Sets the priority keyword.
 - User-cos: Indicates the outer 802.1p priority of incoming packets. This parameter is optional. If the outgoing packet priority needs to be mapped according to the outer 802.1p priority of an incoming packet, this parameter needs to be configured.
 - User-tos: Indicates the IP priority of packets. This parameter is optional. If the upstream packet priority needs to be mapped according to the Type of Service (ToS) field priority in a user packet, this parameter needs to be configured.
- Priority-policy: Indicates the priority scheduling policy of packets. This parameter is mandatory. The options include **Local-Setting** which indicates

that packets are scheduled according to the priorities specified in the traffic profile, and **Tag-In-Package** which indicates that packets are scheduled according to the priorities carried in the packets.

(Optional) Configuring an ONT Alarm Profile

- Configuration example:
 - Add an ONT alarm profile whose ID is 20.

```
huawei(config)#gpon alarm-profile add profile-id 20 ...
```

You can run the following command to query the information about the ONT alarm profile in the system memory:

```
huawei(config)#display gpon alarm-profile all
```

- In an ONT alarm profile, you can configure a series of alarm threshold parameters to monitor the performance of an activated ONT line. If a statistical item reaches the alarm threshold, the system notifies the NE and sends the alarm information to the log NE and the NMS.
- The Huawei product supports 50 alarm threshold profiles.
- The system has a default alarm threshold profile whose ID is 1. This profile cannot be deleted but can be modified.

Configuring a DBA Profile

- Configuration example:
 - Add a DBA profile whose ID is 30.

```
huawei(config)# dba-profile add profile-id 30 type2 assure  
4096
```

You can run the following command to query all DBA profiles in the system memory:

```
huawei(config)#display dba-profile all
```

- Run the **dba-profile add** command to add a DBA profile. By default, the system has DBA profiles 0 - 9, which provides typical traffic parameter values. Default profiles cannot be added or deleted.
- Note:
 - By default, a T-CONT is not bound to any DBA profile and must be configured. By default, LLIDs are bound to DBA profile 9.
 - When you add a DBA profile, the bandwidth must be an integral multiple of 64. If the input bandwidth is not an integer multiple of 64, it is rounded down to an integer multiple of 64.

Configuring an ONT Line Profile

- Configuration example:

- Enter the GPON ONT line profile config mode, set the profile ID to 40, and set the profile parameters.

```
huawei(config)#ont-lineprofile gpon profile-id 40
huawei(config-gpon-lineprofile-40)#tcont 2 dba-profile-id
30
huawei(config-gpon-lineprofile-40)#gem add 0 eth tcont 2
huawei(config-gpon-lineprofile-40)#mapping-mode vlan
huawei(config-gpon-lineprofile-40)#gem mapping 0 0 vlan 35
huawei(config-gpon-lineprofile-40)#commit
```

You can run the following command to query all ONT line profiles in the system memory:

```
huawei(config)# display ont-lineprofile gpon all
```

- If the EPON ONT line profile whose ID is 40 already exists, the GPON ONT line profile cannot be added.

Configuring an ONT Service Profile

- Configuration example:
 - Enter the GPON ONT service profile config mode, set the profile ID to 50, and configure the profile parameters.

```
huawei(config)#ont-srvprofile gpon profile-id 50
huawei(config-gpon-srvprofile-50)#ont-port eth 4 pots 2
huawei(config-gpon-srvprofile-50)#port vlan eth 1 35
huawei(config-gpon-srvprofile-50)#commit
```

You can run the following command to query all ONT service profiles in the system memory:

```
huawei(config)#display ont-srvprofile gpon all
```

- If the EPON ONT service profile whose ID is 50 already exists, the GPON ONT service profile cannot be added.
- You can also set the capability set of the ETH and POTS ports to adaptive by running the **ont-port eth adaptive pots adaptive** command. The system will then automatically adapt to the actual capability of the online ONT.

Registering an ONT

- Add an ONT Offline.

```
huawei(config)#interface gpon 0/8
huawei(config-if-gpon-0/8)#ont add 0 0 sn-auth
32303131D659FD40 omci ont-lineprofile-id 40 ont-
srvprofile-id 50
```

- Manually confirm an ONT.

```
huawei(config-if-gpon-0/8)#port 0 ont-auto-find enable
huawei(config-if-gpon-0/8)#ont confirm 0 ontid 0 sn-auth
32303131D659FD40 omci ontl-ineprofile-id 40 ont-
srvprofile-id 50
```

- When pre-configuration is required, you can add an ONT offline.
- After the ONT goes online, you can manually confirm the ONT.

Querying the ONT Status

- Query the list of ONTs automatically discovered by the OLT

```
huawei(config)#interface gpon 0/8  
huawei(config-if-gpon-0/8)#display ont autofind 0
```

- Query the list of ONT terminals in the OLT system

```
huawei(config)#interface gpon 0/8  
huawei(config-if-gpon-0/8)#display ont info 0 all
```

After an automatically discovered ONT is confirmed, the terminal information is transferred from the list of automatically discovered ONTs to the list of existing ONTs in the OLT system.

(Optional) Binding an Alarm Profile to an ONT

- Configuration example:
 - Bind the alarm profile whose ID is 20 to ONT 0 on port 0/8/0.

```
huawei(config)#interface gpon 0/8
huawei(config-if-gpon-0/8)#ont alarm-profile 0 0 profile-
id 20
```

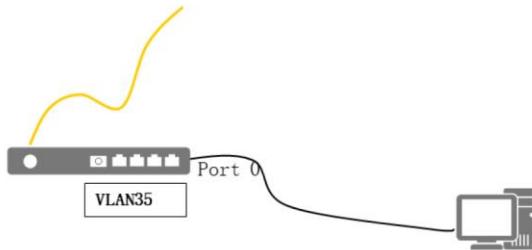
You can run the following command to query the information about the alarm profile bound to an ONT:

```
huawei(config-if-gpon-0/8)#display ont alarm-profile
0 0
```

Configuring the Default VLAN of an ONT Port

- Specify the VLAN ID of an ONT port.

```
huawei(config) interface gpon 0/8
huawei(config-if-gpon-0/8)#ont port native-vlan 0 0 eth 1
vlan 35
```



Configuring VLANs and Adding Ports in QinQ Scenario

- Add a service VLAN and set its type to Smart and attribute to QinQ.

```
huawei(config)#vlan 2012 smart  
huawei(config)#vlan attrib 2012 q-in-q
```

- Allow the upstream port to use the service VLAN.

```
huawei(config)#port vlan 2012 0/19 0
```

- Add a GPON service port to the VLAN.

```
huawei(config)#service-port vlan 2012 gpon 0/8/0 ont 0  
gemport 0 multi-service user-vlan 35 rx-cttr 10 tx-cttr 10
```

Note that the priorities of the upstream and downstream traffic profiles of a service port must be the same.

- This is a typical double-tagged VLAN configuration for broadband services of carriers.

Configuring a VLAN and Adding Ports in the Single-Tagged VLAN Scenario

- Set the service VLAN type to Smart and attribute to

```
( huawei(config)#vlan 35 smart  
 huawei(config)#vlan attrib 35 common
```

- Allow the upstream port to map to the service VLAN

```
( huawei(config)#port vlan 35 0/19 0
```

- Add a GPON service port to the VLAN

```
( huawei(config)#service-port vlan 35 gpon 0/8/0 ont 0  
      gempport 0 multi-service user-vlan 35 rx-cttr 10 tx-cttr 10
```

Note that the priorities of the upstream and downstream traffic profiles of a service port must be the same.

- This is a typical single-tagged VLAN configuration for the enterprise network scenario.
- The default attribute of a VLAN is Common.



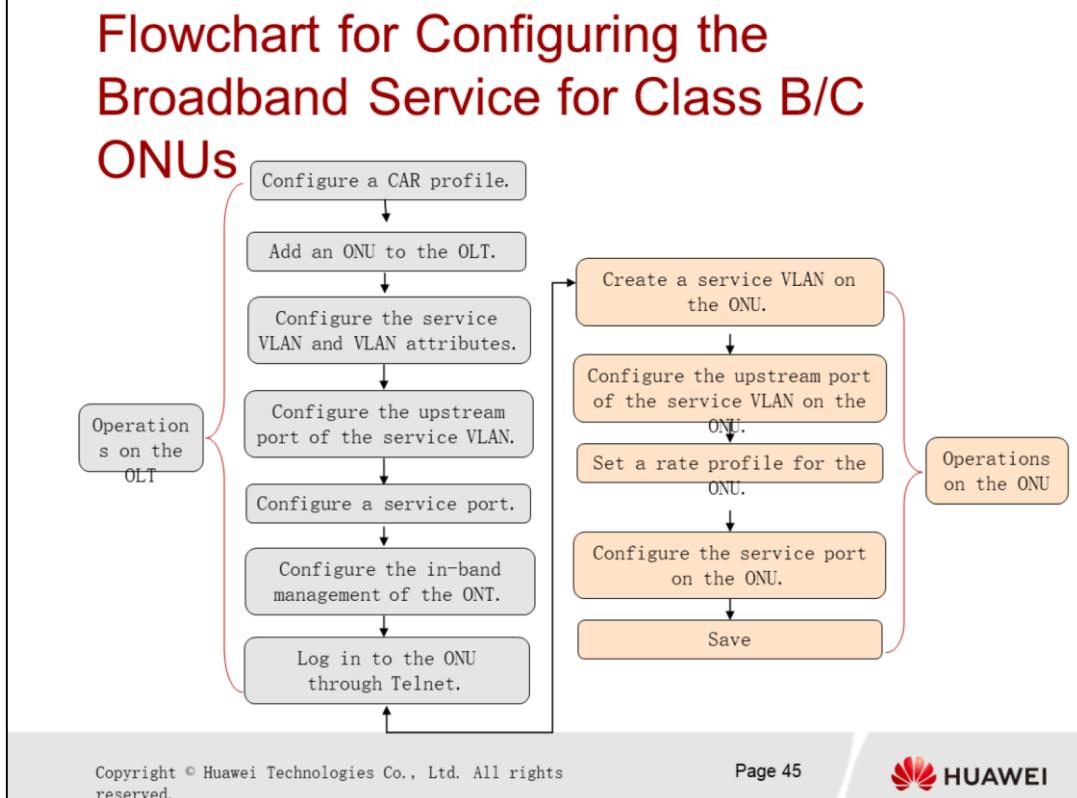
Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
3. **Broadband Service Configuration**
 - Configuration of Class A ONUs
 - Configuration of Class B/C ONUs
4. Broadband Service Maintenance

Data Planning

| Parameter Type | Parameter Value | Parameter Type | Parameter Value |
|-----------------------|---|---------------------|-----------------|
| OLT PON port | 0/8/0 | CAR profile ID | 10 |
| ONT_ID | 0 | DBA profile ID | 30 |
| ONT SN | 3230313192E95441 | ONT line profile ID | 40 |
| Outer VLAN ID | 2012 | T-CONT (NMS) | 0 |
| Inner VLAN ID | 35 | T-CONT (service) | 2 |
| User FE port | ONU 0/1/1 | GEM (NMS) | 0 |
| User VLAN | 35 | GEM (service) | 1 |
| DBA bandwidth type | Type 2 | Bandwidth | 4096 |
| CAR bandwidth profile | Greater than 4096 kbps and smaller than 8192 kbps | | |

Flowchart for Configuring the Broadband Service for Class B/C ONUs



Configuring Various Profiles (on the OLT)

- Profiles to be configured:
 - Car profile
 - DBA profile
 - (Optional) ONT alarm profile
 - ONT line profile: The in-band NMS parameters and service flow parameters must be configured at the same time.



For details about how to configure various profiles, see the HSI service configuration of class A terminals.

Class B/C terminals support the SNMP protocol. Therefore, no ONT service profile needs to be configured.

The HSI service configurations of class B/C terminals are similar. The following uses the configurations of class B terminals as an example.

- A service profile is used for issuing OMCI protocol parameters. For class B/C ONUs, the OMCI only needs to issue IP addresses, and does not need to issue other parameters.

Configuring an ONT Line Profile (on the OLT)

- Configuration example:

- Enter the GPON ONT line profile config mode, set the profile ID to 40, and set the profile parameters.

```
huawei(config)# ont-lineprofile gpon profile-id 40
Huawei (config-gpon-lineprofile-40) #tcont 0 dba-profile-id 30 //in-band NMS
Huawei (config-gpon-lineprofile-40) #tcont 2 dba-profile-id 30 //service
Huawei (config-gpon-lineprofile-40) #gem add 0 eth tcont 0 //in-band NMS
Huawei (config-gpon-lineprofile-40) #gem add 1 eth tcont 2 //service
huawei(config-gpon-lineprofile-40)#mapping-mode vlan
Huawei (config-gpon-lineprofile-40) #gem mapping 0 0 vlan 4000 //in-band NMS
Huawei (config-gpon-lineprofile-40) #gem mapping 1 1 vlan 35 //service
huawei(config-gpon-lineprofile-40)#commit
```

- If the EPON ONT line profile whose ID is 40 already exists, the GPON ONT line profile cannot be added.

Manually Adding or Confirming an ONU (on the OLT)

- Add an ONU manually.

```
huawei(config)#interface gpon 0/8
huawei(config-if-gpon-0/8)#ont add 0 0 sn-auth
3230313192E95441 snmp ont-lineprofile-id 40
```

- Confirm an ONU after automatic discovery.

```
huawei(config-if-gpon-0/8)#port 0 ont-auto-find enable
huawei(config-if-gpon-0/8)#ont confirm 0 ontid 0 sn-auth
3230313192E95441 snmp ont-lineprofile-id 40
```

Configure a Service VLAN and adding Ports (on the OLT)

- Add a service VLAN and set its type to Smart and attribute to QinQ.

```
huawei(config)#vlan 2012 smart  
huawei(config)#vlan attrib 2012 q-in-q
```

- Allow the upstream port to use the service VLAN.

```
huawei(config)#port vlan 2012 0/19 0
```

- Add a GPON service port to the VLAN.

```
huawei(config)#service-port vlan 2012 gpon 0/8/0 ont 0  
gemport 1 multi-service user-vlan 35 rx-cttr 10 tx-cttr 10
```

Configuring the NMS VLAN and Adding Ports (on the OLT)

- Add an NMS VLAN and set its type to Smart and attribute to

```
C huawei(config)#vlan 4000 smart
```

- / huawei(config)#port vlan 4000 0/19 0

- (huawei(config)#interface vlanif 4000
huawei(config-if-vlanif4000)#ip address 172.16.200.1 16

- / huawei(config)#service-port vlan 4000 gpon 0/8/0 ont 0
gemport 0 multi-service user-vlan 4000 rx-cttr 10 tx-cttr
10

Configuring ONU NMS Parameters (on the OLT)

- Configure the management address of the ONU.

```
huawei(config-if-gpon-0/8)#ont ipconfig 0 1 static ip-
address 172.16.200.2 mask 255.255.0.0 gateway 172.16.0.1
vlan 4000
```

- Log in to a class B/C ONT through Telnet.

```
huawei(config)#telnet 172.16.200.2
>>User name:root
>>User password:mduadmin
```

ONU Data Configuration (on the ONU)

- Create a user VLAN.

```
MA5620G(config)#vlan 35
```

- Configure the upstream port of the user VLAN.

```
MA5620G(config)#port vlan 35 0/0 1
```

- Configure the traffic profile of the ONU.

```
MA5620G(config)#traffic table ip index 10 cir 4096 pir  
8192 cbs 2048 pbs 4096 priority user-cos 5 priority-policy  
Tag-In-Package
```

You can run the following command to query information about CAR profiles in the ONU system memory:

```
MA5620G(config)#display traffic table ip from-  
index 0
```

ONU Data Configuration (on the ONU)

- Configure a service port.

```
MA5620G(config)#service-port vlan 35
{eth<K>} The ONU of the :eth // C type is xDSL.
{ frameid/slotid/portid<S><1,15> }:0/1/1
{ other-all<K>|user-encap<K>|user-vlan<K> }:user-vlan
{ untagged<K>|user-vlanid<U><1,4094> }:untagged
{ rx-cttr<K> }:rx-cttr
{ rx-index<U><0,63> }:10
{ tx-cttr<K> }:tx-cttr
{ tx-index<U><0,63> }:10
// Add the service flow of port FE 1 on the ONU, specify
the user VLAN, and limit the rate.
```



Contents

1. Introduction to VLANs
2. Introduction to Broadband Services
3. Broadband Service Configuration
4. Broadband Service Maintenance

Operations on the GPON Port

- Set the maximum and minimum logical distances.

```
huawei(config-if-gpon-0/8)#port 0 range min-distance  
10 max-distance 15
```



- Turn on the laser.

```
huawei(config-if-gpon-0/8)#port 0 laser-switch on
```

- Query the status of a PON port.

```
huawei(config-if-gpon-0/8)#display port info 0
```

- The **port range** command is used to configure the maximum and minimum logical distances of a GPON port. During the ranging process, proper logical distance values can avoid affecting normal services of other online ONTs for too long.
- The **undo port range** command is used to restore the ranging compensation distance of a GPON port to the default value.
- Configuration notes:
 - GPON board: Maximum distance - Minimum distance <= 20 km
 - XG-PON board: Maximum distance - Minimum distance <= 40 km
 - The actual physical distance between the OLT and an ONT should be as close to (Maximum distance + Minimum distance)/2 as possible.

Querying Service Configuration on Class A ONTs

```
huawei(config-if-gpon-0/15)#display ont info 0 0
-----
subrack/slot/port: 0/15/0
ONT ID: 0
Control flag: Activated
Running flag: Online
Configuration status: Normal
Match status: Match
DBA mode: SR
ONT ranging distance (m): 213
ONT battery status: -
Authentication mode: SN authentication
Serial number: 323031312E396A41 (2011-2E396A41)
Management mode: OMCI
Isolation status: Normal
-----
Line profile ID: 11
Line profile name: hg850
-----
```

- There are 3 types of ONT status: ONT running status (Run state), ONT configuration status (Config state), and ONT matching status (Match state). The Run state of an ONT indicates the current running status of the ONT.
- Offline: An ONT in the offline state has not passed the authentication. In this case, the ONT version and ONT FEC statistics cannot be queried, and the ONT cannot carry services.
- Online: An ONT in the online state has passed the authentication. In this case, 3 yellow indicators on the ONT are steady on, and whether the ONT can normally forward services depends on the ONT configuration status.
- The configuration status of an ONT refers to the configuration restoration of an ONT. There are 4 states: Initial, Config, Normal, and Failed. After an ONT goes online, the OLT issues the configuration data to the ONT to restore its configurations.
- The Initial state is short and followed by the Config state.
- In the Config phase, the OLT issues the ONT configuration data to the ONT to restore the ONT configurations. The duration of the Config state depends on the amount of data to be configured on the ONT.
- If the ONT configuration is restored successfully, the ONT status changes to Normal, and the ONT can forward services normally.
- If the ONT configuration fails to be restored, the ONT status changes to Failed, and the ONT cannot forward services.
- The ONT matching status indicates whether the service profile bound to the ONT matches the actual capability of the ONT. The options include Initial, Mismatch, and Match.
- At the beginning, the status is Initial.
- If the configuration status is normal and the service profile bound to the ONT matches the actual hardware capability of the ONT, the matching status

changes to Match; otherwise, the matching status changes to Mismatch.

Querying Service Configurations on Class B ONUs

```
MA5626G (config) #display vlan all // Query all VLANs.
```

```
MA5626G (config) #display vlan 31 // Query a specific VLAN.
```

```
-----  
Subrack/slot/port status
```

```
-----  
0/0/ 1 Normal
```

```
-----  
Number of standard ports: 1
```

```
-----  
Index Type Status Subrack/Slot/Port Service Type Parameter
```

```
-----  
0 eth Fault 0/1/ 2 vlan untag
```

```
-----  
Number of service ports: 1
```

```
MA5620G (config) #display service-port all // Query  
service ports.
```

Querying the OLT Broadband Service

- Query the service VLAN.

```
huawei(config)#display vlan 2012
huawei(config)#display service-port vlan 2012
-----
Index VLAN VLAN port subrack/slot/port VPI VCI service parameter
RX TX status
ID Attribute Type
-----
0 2012 QinQ gpon 0/8/0 10 10 vlan 10 --Normal
1 2012 QinQ gpon 0/8/1 20 20 vlan 20 --Faulty
6 2012 QinQ gpon 0/8/2 30 30 vlan 30 --Normal
-----
Total: 3 (normal/faulty: 2/1)
```

- After services are deployed, you can run the **display statistics service-port** command to query service flow statistics or run the **display traffic service-port** command to query the real-time receiving and transmitting rates of service flows, thereby determining whether services are normal and locating faults.

Querying the Broadband Service Traffic

- Query the ONT traffic.

```
huawei(config-if-gpon-0/8)#display ont traffic 0 2
-----
Traffic query result
-----
Upstream Traffic (kbps): 96
Downstream Traffic (kbps): 1024
-----
Query the traffic of a PON port on a class B/C ONU.
```

- Query the traffic of a PON port on a class B/C ONU.

```
MA5620G(config-if-epu-0/0)#display port traffic 1
Received traffic (packets/second): 1408
Received Traffic (bytes/Second): 123980
```

- Query the traffic of an FE port on a class B/C ONU.

```
MA5626G (config-if-epf-0/1)#display port traffic 1
```

Querying MAC Addresses Related to the Broadband Service

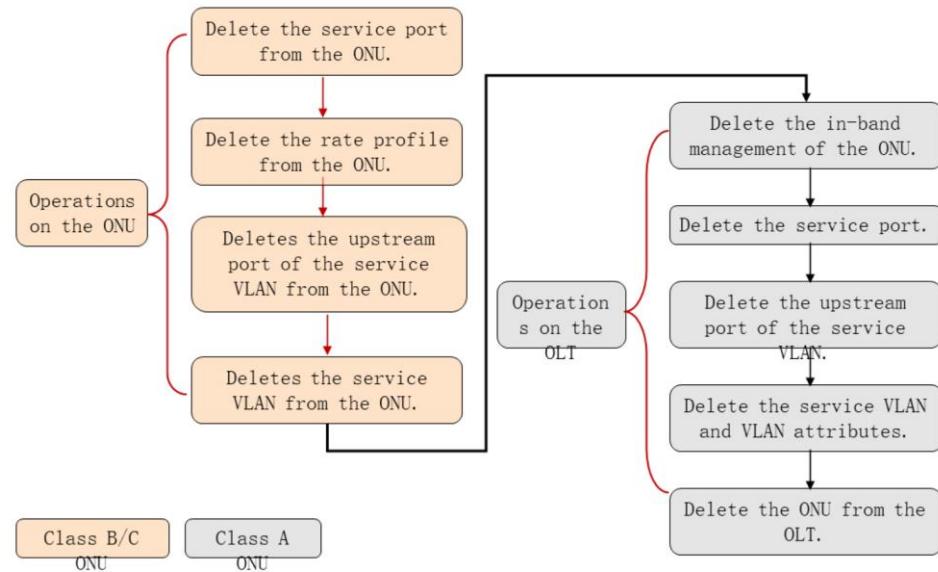
- Query the MAC address in a VLAN.

```
huawei(config)#display mac-address vlan 2012
-----
Service port BUNDLE type MAC address subrack/slot/port VPI VCI
VLANID
    Index   Index          Type
-----
--eth 000f-e25e-0670 Dynamic 0/19/0 --2012
--eth 00e0-fc41-3df9 Dynamic 0/19/0 --2012
-----
Total: 2
```

- Query the MAC address of a user.

```
huawei(config)#display mac-address board 0/8
MA5620G(config)#display mac-address port 0/1/1
```

Deleting a Broadband Service (1)



Deleting a Broadband Service (2)

- Commands on the MDU

```
undo service-port { all | vlan vlanid | index }

undo traffic table ip row-index

undo port vlan vlanid [ to end-vlanid ] frameid/slotid portlist

undo vlan vlanid [ to end-vlanid ]
```

Deleting a Broadband Service (3)

- Commands on the OLT

```
undo ont ipconfig port ontid  
undo service-port { all | vlan vlanid | index }  
undo port vlan vlanid [ to end-vlanid ] frameid/slotid portlist  
undo vlan attrib vlanid [ to end-vlanid [ q-in-q | stacking ] ]  
undo vlan vlanid [ to end-vlanid ]  
ont delete portid { all | ontid }
```

Quiz

1. What are the differences between VLAN types and VLAN attributes?
2. Describe the mapping between user service flows, GEM ports, and T-CONTs.
3. What are the functions of a T-CONT?
4. How to replace an ONU and restore services?

- Reference answer:
 1. The VLAN types include Standard, Smart, and Mux, which describe the service port capability of a VLAN. VLAN attributes include Common, QinQ, and Stacking, which describe the VLAN tag processing feature for packets.
 2. A user service flow is mapped to a GEM port for transmission between the OLT and the ONU. A GEM frame is mapped to a T-CONT in the upstream direction for buffering and bandwidth scheduling.
 3. Scheduling of upstream GEM buffer and bandwidth
 4. To replace a class A ONU, you only need to change the SN on the OLT or ONU side. To replace a class B/C ONU, you need to pre-deploy it on the NMS or manually reconfigured it.



Summary

- VLAN types and differences
- Broadband service flow
- Broadband service configuration methods
- Common maintenance commands and methods

Thank You

www.huawei.com