

# GPON HSI Service Troubleshooting

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# Objectives

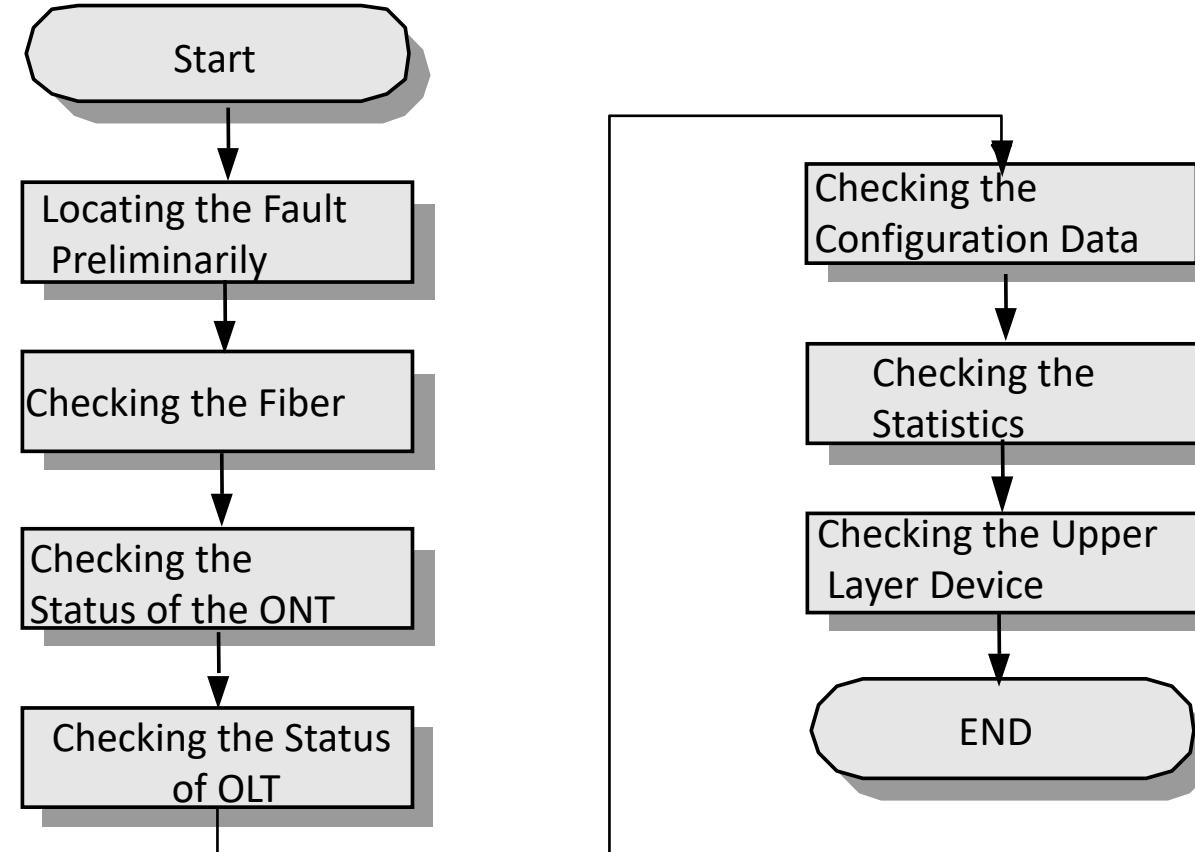
- Upon completion of this course, you will be able to:
  - List the fault analysis methods
  - List HSI service common faults
  - Locate HSI service fault
  - Complete HSI service troubleshooting



# Contents

- 1. HSI Service Fault Processing Procedure**
2. HSI Service Fault Analysis Methods
3. Categorized HSI Service Faults Troubleshooting
4. Case Study

# HSI Service Fault Processing Procedure



# Locating the Fault Preliminarily

Fault Category	Possible Cause(s)
Users of several ports cannot access the Internet.	<ul style="list-style-type: none"><li>•The user terminal or line is faulty.</li><li>•The GPON port is faulty.</li><li>•The configuration data of the MA5800 is incorrect.</li></ul>
Users of a board cannot access the Internet.	The GPON board is faulty.
Users of a shelf cannot access the Internet.	<ul style="list-style-type: none"><li>•The optical path is faulty.</li><li>•The control board or upstream board of the MA5680T is faulty.</li><li>•Users have suffered attacks from the network.</li></ul>
All the users under a BRAS cannot access the Internet.	The upper layer device is faulty.

# Check Optical Path

- Check whether:
  - The fiber is inserted properly.
  - The bending of the fiber is proper.
  - The fiber is intact.
  - The average transmit optical power is normal.
  - The receive optical sensitivity is normal.

Take CLASS B+ optical module for example:  
Transmitting Optical Power Of OLT:1.5~5db  
Transmitting Optical Power Of ONU: 0.5~5db  
Receiving Optical Sensitivity Of OLT: (-28)~(-8)db  
Receiving Optical Sensitivity Of ONU: (-27)~(-8)db

# Check ONU



## LED

- Power
- PON LINK
- PON Register

## VLAN

- VLAN ID
- Uplink port
- service port

## Profile

- DBA profile
- line-profile, traffic table
- service profile, SNMP profile

# Check ONU Status (LED)

LINK and AUTH state	ONT state	Troubleshooting
Both the LINK and AUTH LEDs are off.	Initial-state	<ul style="list-style-type: none"><li>✓ Check whether the laser of the GPON port is disabled.</li><li>✓ Check whether there is any LOS or LOF alarm.</li><li>✓ Check whether the logical reach of the PON port is the same as the actual fiber length.</li></ul>
The LINK LED blinks slowly and the AUTH LED is off.	Standby-state	<ul style="list-style-type: none"><li>✓ Check whether the GMAC version of the ONT is correct.</li><li>✓ Check whether the SN of the ONT is correct</li><li>✓ Check whether the GMAC chip of the ONT is too hot.</li></ul>
The LINK LED blinks fast and the AUTH LED is on.	Ranging-state	The same as above.

# Check ONU Status (LED)

LINK and AUTH State	ONT State	Troubleshooting
The LINK LED blinks fast and the AUTH LED blinks slowly.	Serial-Numberstate	<ul style="list-style-type: none"><li>✓ Check whether the ONT is added to the OLT.</li><li>✓ Check whether the configured SN of the ONT is the same as the actual one of the ONT.</li><li>✓ Check whether the SN of the ONT is correct.</li></ul>
Both the LINK and AUTH LEDs are on.	Operation-state	It indicates that the ONT has been registered successfully. This is a normal state.
The LINK LED blinks fast and the AUTH LED is off.	POPUP-state	Check whether the fiber is connected properly (neither too tight nor too loose).
The LINK LED is on and the AUTH LED is off.	Emergency-Stopstate	It indicates that the ONT has been disabled by the administrator. Contact the administrator for assistance.

# Check ONU Status (Command Line)

Run the command to check the status of ONU in OLT:  
“display ont info” to check the Control Flag/Run State/SN/Config State

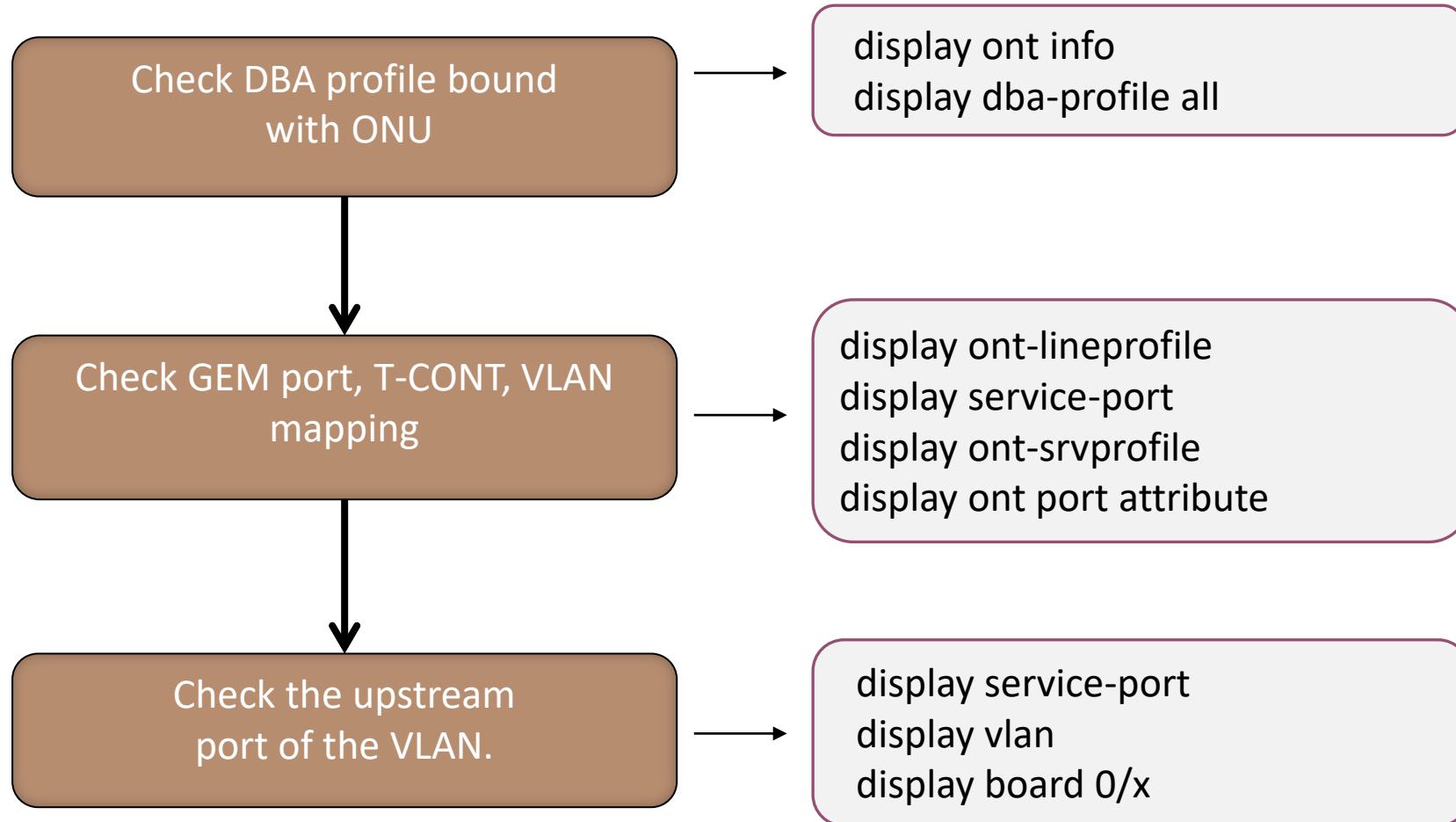
```
MA5800(config-if-gpon-0/3)#display ont info 0 all
-----
ONT-ID      SN          Control   Run       Config    Match   Protect
           flag        state     state     state    side
-----
0 485754436471B642  active    online   normal   match   no
-----
Description : ONT_NO_DESCRIPTION
-----
1 323031312E396A41  active    online   normal   mismatch no
-----
Description : ONT_NO_DESCRIPTION
-----
In port 0, the total of ONTs are: 2
-----
```

# Check OLT Status

	State	board
1	Active -Normal	Control board
2	Standby-Normal	Control board
3	Failed	Service board
4	Prohibited	Service board
5	Config	Service board
6	Auto_find	Service board

- PON interface LED state
- Uplink port state
- “RUN” indicator on control board
- “RUN” indicator on service board

# Check Data Configuration



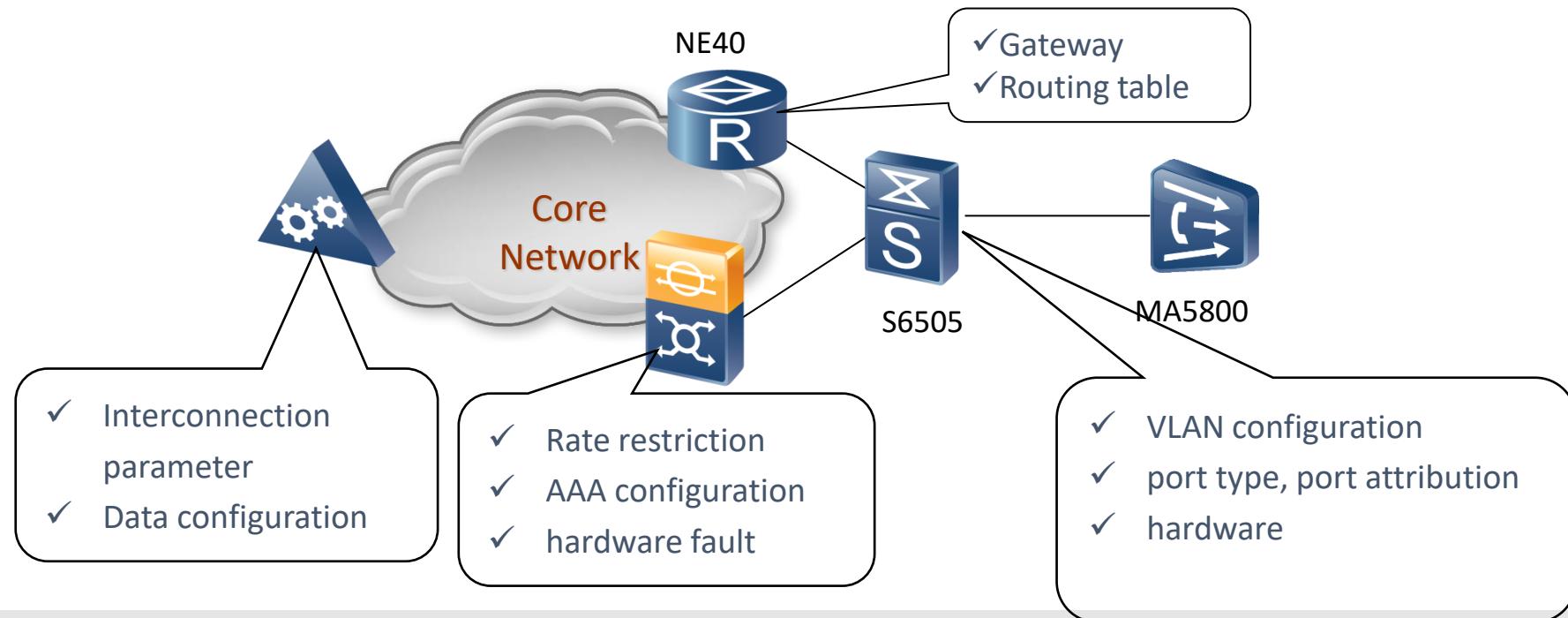
# Checking the Statistics of the OLT

- Check the traffic statistics phase by phase. If the data in a phase contains only Rx data or Tx data, it indicates that the data is lost in this phase. Then, check the configuration of this phase.

- Run command “*display statistics ont-line-quality*” to check the line quality statistics information of ONT.
- Run “*display statistics ont-gem*” command to check the performance statistics information of a specific GEM port
- Run “*display port statistics*” command to check the uplink port traffic statistic information
- Run “*display statistics ont-eth*” command to check the performance statistics information of FE port on ONT.

# Checking the Upper Layer Device

- When all the service failed of the whole OLT, or if after all the steps above you still fail to find any problem, check the upper layer device, such as its running status and data configuration. You must also check whether the port on the upper layer device and the interconnected port on the MA5800 match.





# Q&A

[display ont info](#)

[statistic info](#)

1. How to query the VLAN configuration of the FE port on ONU?
2. If the ONU be bound with incorrect profile, how to resolve?

```
% Too many parameters, the error locates at '^'
Telesur_OLT(config)#display service-port
{ a1<K>|board<K>|connect-oriented<K>|desc<K>|index<U><0,139263>|inner-vlan<K>|next-free-index<K>|number<K>|port<K>|p
Command:
    display service-port
    % Incomplete command, the error locates at '^'
Telesur_OLT(config)#interface gpon 0/1
Telesur_OLT(config-if-gpon-0/1)#display statistics ont-line-quality
{ portid<U><0,15> }: 0
{ <cr>|ontid<U><0,127>||<K> }: 14
{ <cr>||<K> }:
Command:
    display statistics ont-line-quality 0 14
Line quality statistic ONTID      : 14
LOFi alarm count                 : 0
DOWi alarm count                 : 0
Upstream frame delimiter error count : 0
Upstream frame BIP error count   : 0
Downstream frame BIP error count  : 0
Upstream frame FEC corrected blocks : 0
Upstream frame FEC uncorrected blocks : 0
Upstream frame HEC error count   : 0
Upstream FCS error count         : -
Upstream frame bit error rate   : 0
Upstream ETH frame error rate   : -
Upstream GEM frame error rate   : 0
Telesur_OLT(config-if-gpon-0/1)#

```

[int gpon 0/1](#)

[example](#)

[ont modify 0 124 ont-lineprof id 18](#)

[display ont line profile id](#)

[line quality between olt en ont](#)

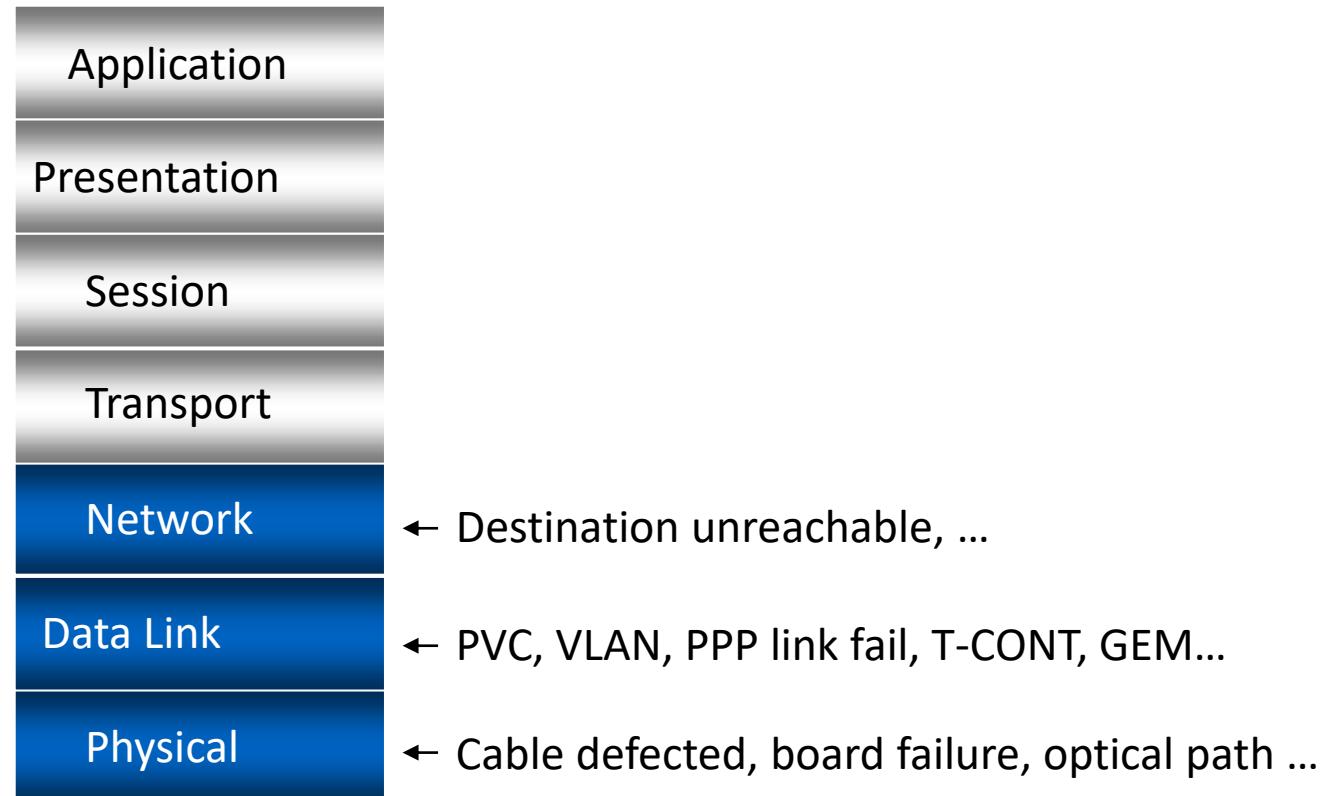


# Contents

1. HSI Service Fault Processing Procedure
2. **HSI Service Fault Analysis Methods**
3. Categorized HSI Service Faults Troubleshooting
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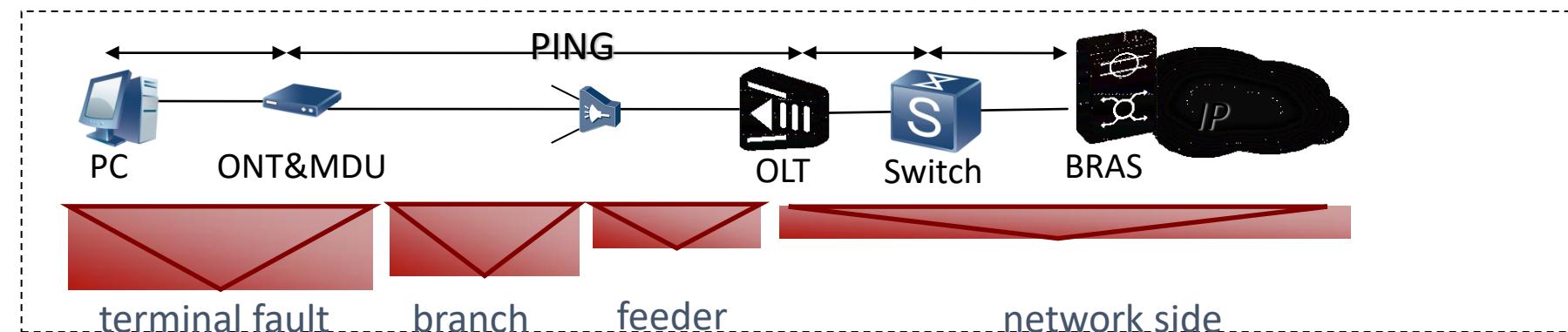
# Layered Analysis

- What're the possible faults in GPON HSI service corresponding to each layer?



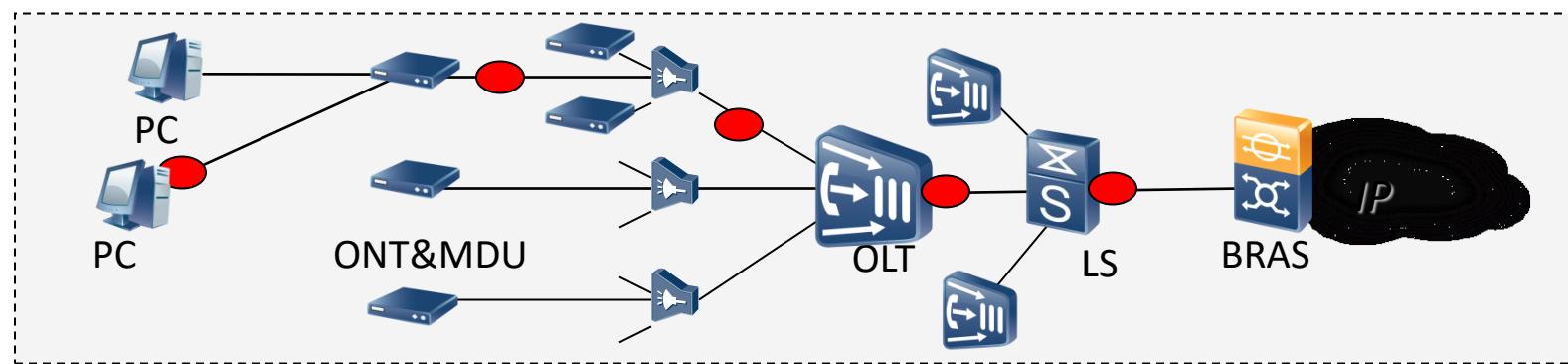
# Segmentation Analysis

- Because different place has different possibility of fault happens, we can adopt segmentation analysis method to locate the fault.
  - Upper layer
    - LAN switch to BRAS
    - Uplink port to LAN switch
  - service board to splitter
  - splitter to ONU
  - ONU to user's CPE



# Comparison Analysis

- Comparison analysis refers to compare the faulty part with the normal part or the neighbors to find the difference and locate the fault range.
  - under the same BRAS or LAN switch
  - different service card of the same frame
  - different PON interface of the same service card
  - different ONU under the same PON interface
  - different interface of the same ONU



# Alarm Analysis

- Alarm message gives the concrete description, possible causes, recovery suggestion of the fault. It covers hardware, link, service, CPU occupation and so on. Alarm message is very important for troubleshooting.
- Ways to obtain alarm message:
  - NMS alarm panel
  - Run “display alarm history” command to query
  - LED indicators on the device

Alarm Classification	Alarm Level	Alarm Causes
communication service quality processing hardware environment	<b>critical</b> <b>major</b> <b>minor</b> warning	multiple service affection level

# Log Analysis

- To find out abnormal configuration through log
- Run “**display log all**” command to query
  - To check whether there is improper operation

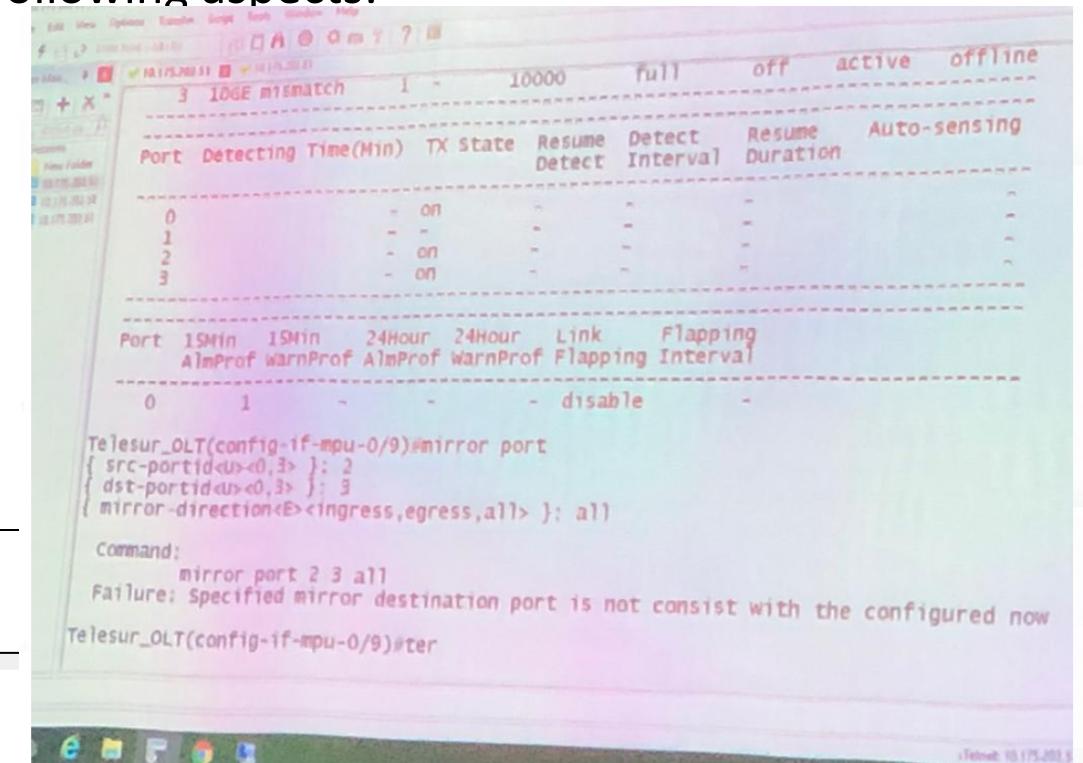
```
▪ MA5800(config)#display log
▪ { all<K>|cli<K>|failure<K>|index<K>|memory<K>|name<K>|security<K>|snmp<K>|tl1<K> }:all
▪ { <cr>|start-date<D><yyyy-mm-dd> }:
▪ Command:
▪     display log all
▪ -----
▪     No. UserName          Domain      IP-Address
▪     180 huawei1           --          192.168.52.2
▪     Time: 2011-01-21 11:09:23+08:00
▪     Cmd: interface gpon 0/3
▪ -----
▪     No. UserName          Domain      IP-Address
▪     179 huawei1           --          192.168.52.2
▪     Time: 2011-01-21 11:09:17+08:00
▪     Cmd: quit
▪ -----
```

# Protocol Analysis

- Protocol Analysis refers to locate the fault by means of signaling tracing and packet capturing.
- Protocol Analysis require the maintenance engineers have in-depth understanding of many protocols.
  - Capture packet on user side
  - Capture packet on uplink port (**interface giu / port mirror**) start capture
  - Capture packet on upper layer device
  - Debug function provided by system (**terminal debugging / debugging xxx / terminal monitor**)  
monitor  
it can be save on wireshark

# Data Analysis

- Incorrect data configuration is an important cause for service fault, especially for those new deployed device. We can check the data configuration from the following aspects:
  - VLAN configuration
  - Uplink port configuration
  - Service port configuration
  - Terminal configuration
- How to check the current configuration of the device?
  - huawei#**display current-configuration**



# Meter Test

- Make use of many types of tools and meters to obtain the practical performance parameters, then compare with the normal value to locate and remove the faults.
- Frequently used tools and meters for FTTx network troubleshooting:
  - Optical Power Meter
  - OTDR
  - Multi-meter
  - Adjustable Power
  - Attenuation Meter



For more details, refer to ODN link detecting

# Interchange Analysis

- Interchange is to interchange the parts that may be faulty with normal parts (such as boards and cables), and then compare the running conditions to locate the faults.
  - board interchange
  - port interchange
  - fiber interchange
  - terminal interchange

Caution Danger: for instance, interchange the short-circuit board to the normal frame may damage it! So, be cautious when executing interchange analysis, make sure not bring more fault.

# Fault Causes and Analysis Methods Summary

ap,pr,ses,tr,netw,dat,phyc

- Layered fault causes:
  - Physical layer (device, fiber, terminal)
  - Data link layer (SN, VLAN) <sup>mac</sup>
  - Network layer (IP address, IP routing)
  - Transportation layer (port number) <sup>tcp udp</sup>
  - Application layer (software)
- Common used fault analysis methods:
  - comparison analysis
  - segmentation analysis
  - interchange analysis
  - alarm analysis
  - performance analysis
  - data analysis
  - tools analysis
  - protocol analysis



# Q&A

config, trouble shoot

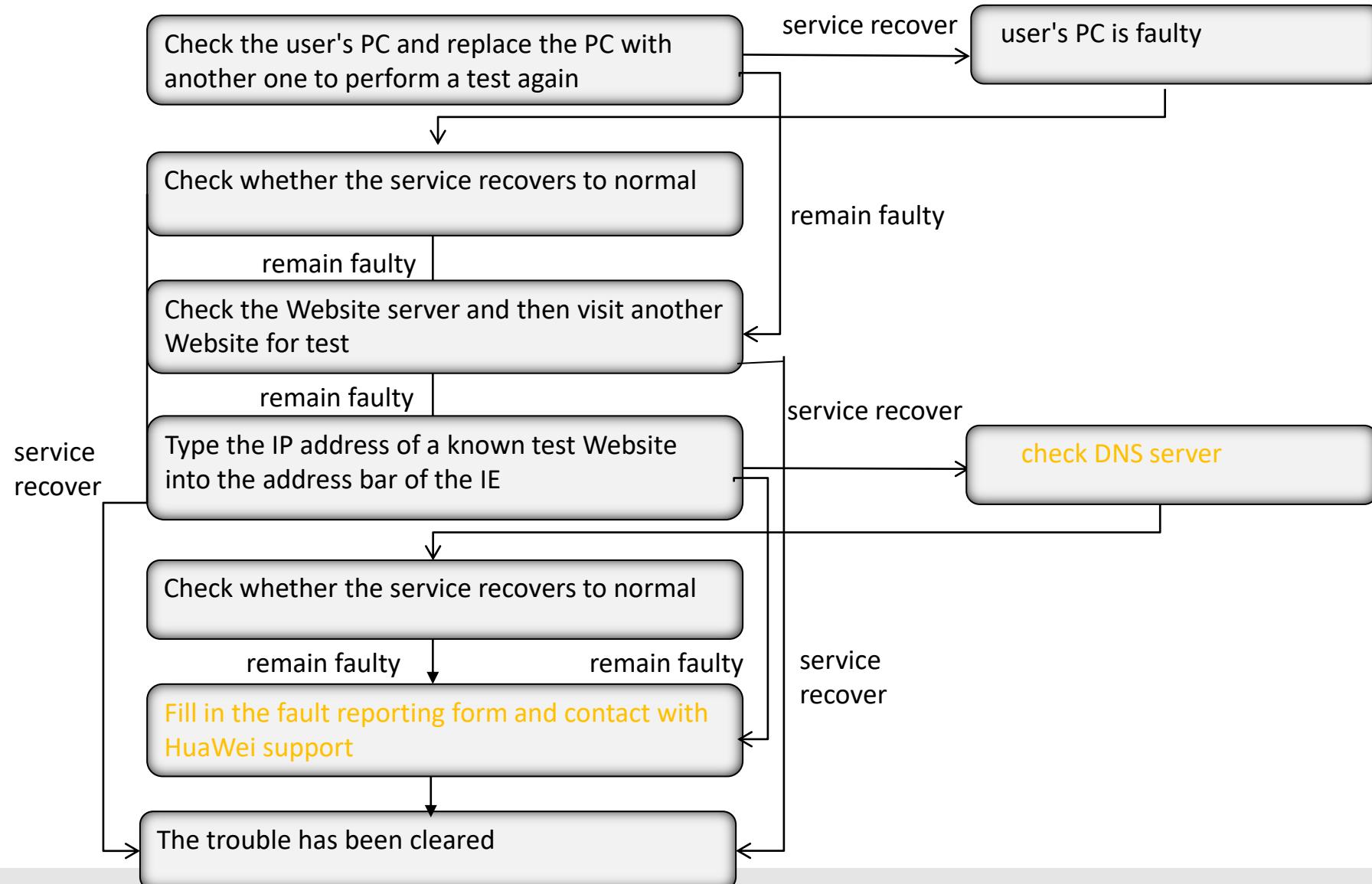
1. Which information we should check for common faults troubleshooting?
2. What're the common used fault analysis methods? [page 25](#)
3. What we have to pay attention when executing interchange analysis?



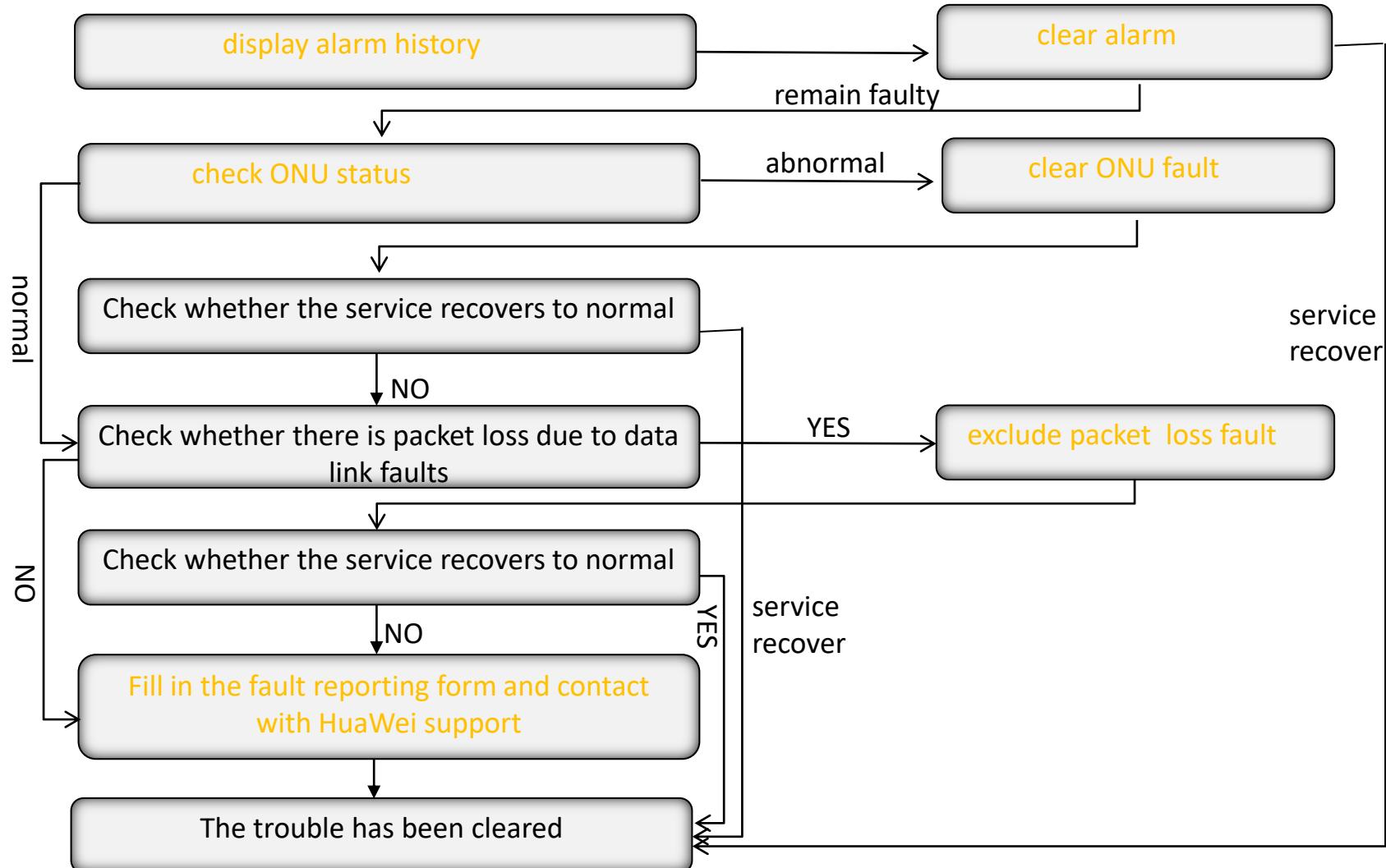
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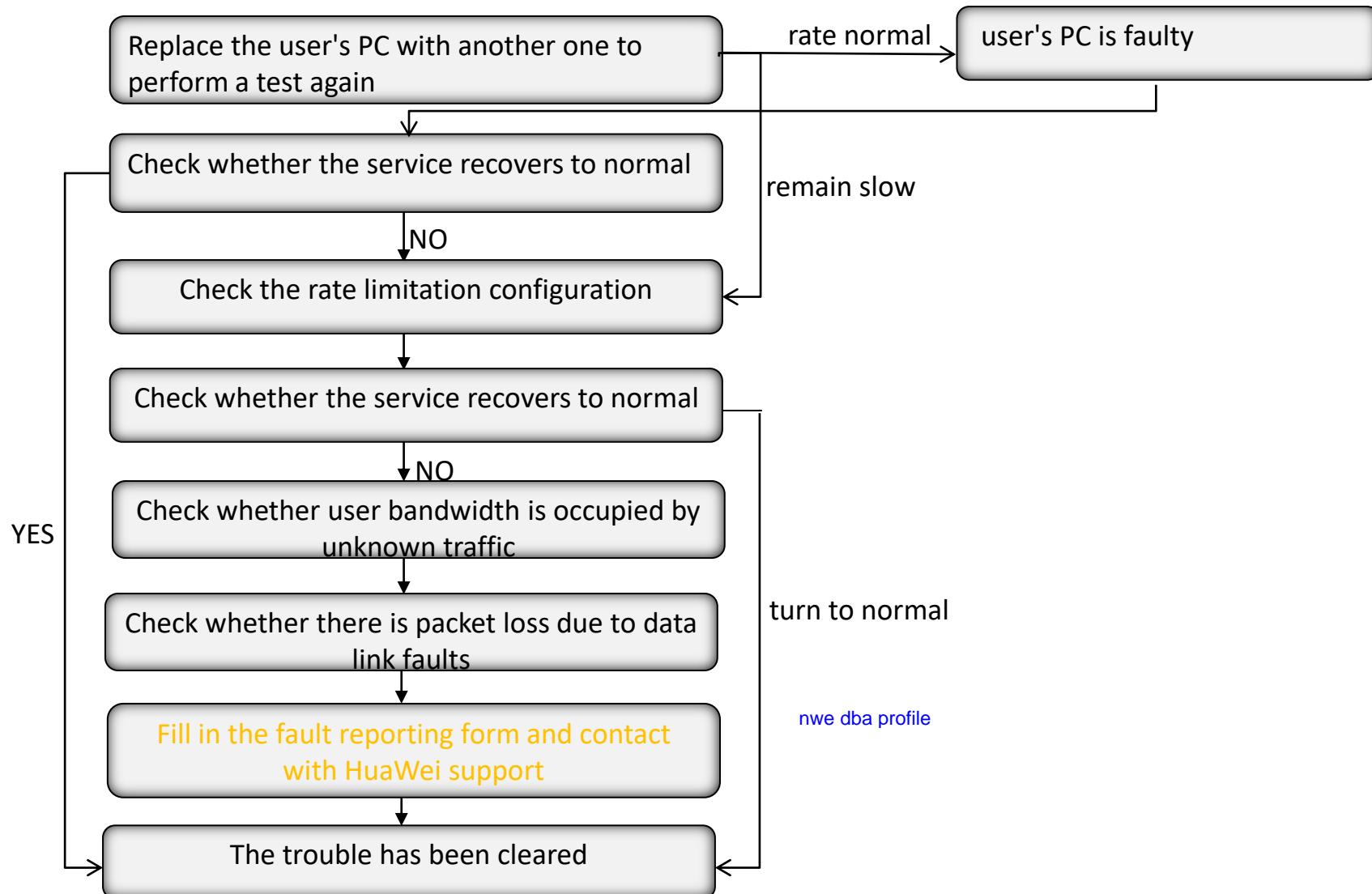
# Failure to Access the Internet



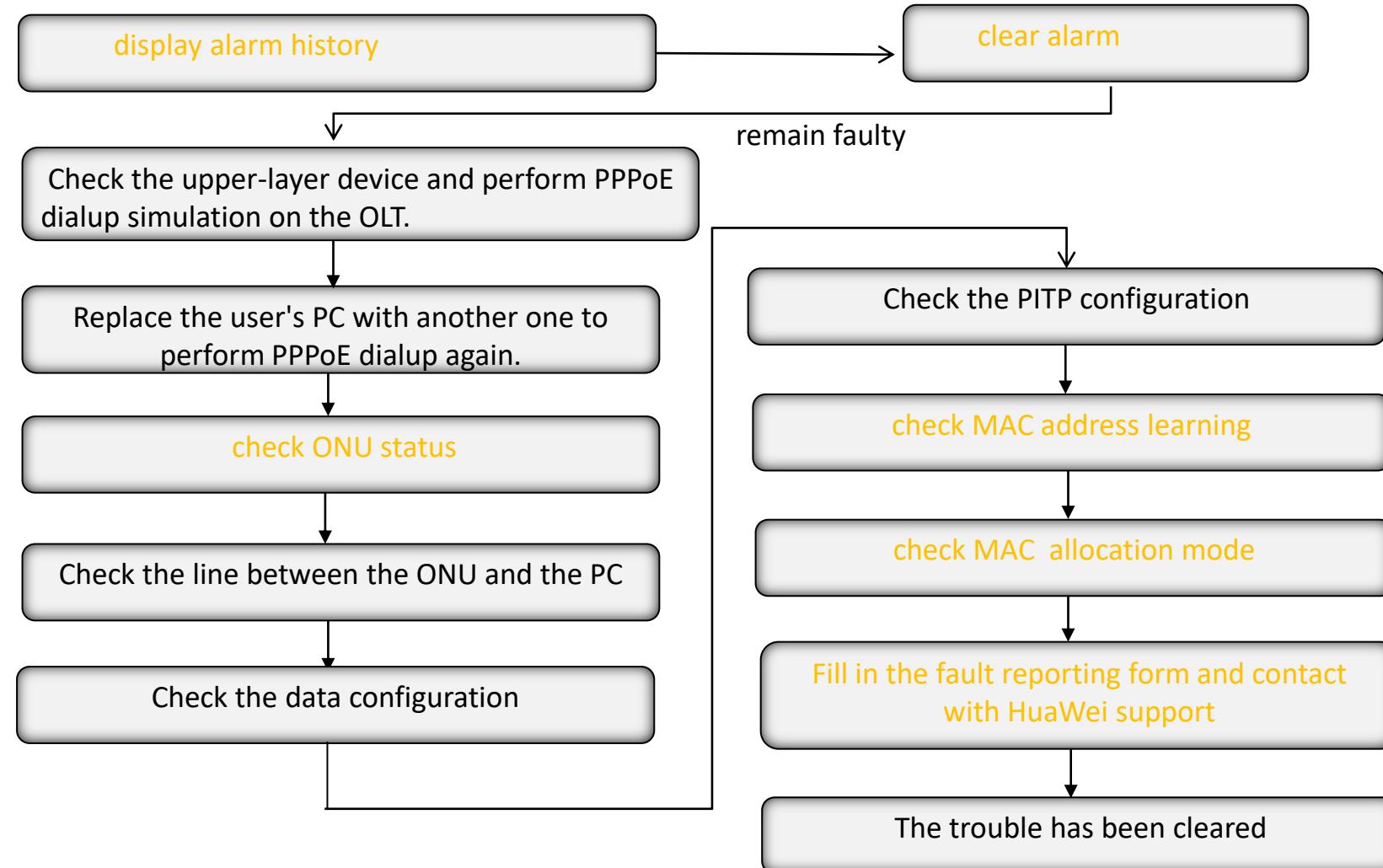
# Internet Access Service Interruption



# Low Internet Access Rate



# Failure to Obtain the IP Address in PPPoE Dialup



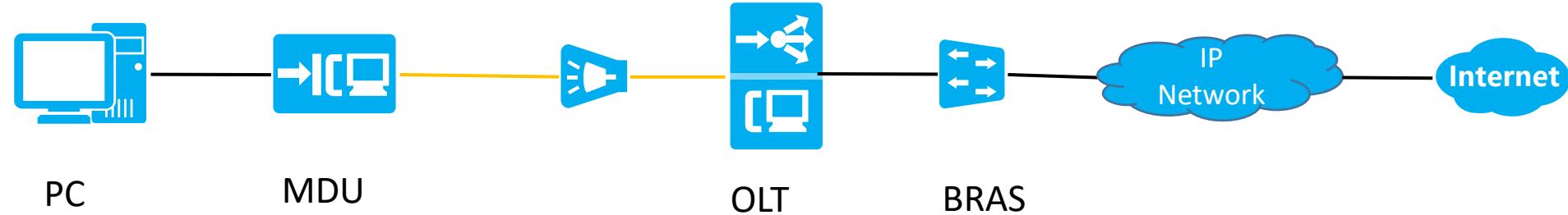


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# Case1 Error 676 Occasionally Occurs in PPPoE Dialup

- Description
  - An ONU user occasionally encounters error 676 in PPPoE dialup. In addition, the fault duration varies.



# Case1 Error 676 Occasionally Occurs in PPPoE Dialup

- Possible Causes
  - An ONU user forges the MAC address of the BRAS.
  - An OLT user forges the MAC address of the BRAS.
  - The configuration of the BRAS or remote authentication dial in user service (RADIUS) is incorrect.
  - A VLAN conflict occurs.

# Case1 Error 676 Occasionally Occurs in PPPoE Dialup

- Procedure

1. Run the **security mac-filter** command to configure MAC address filtering on the ONU, which prevents the MAC address of the BRAS from being forged. The fault persists.
2. Run the **security mac-filter** command to configure MAC address filtering on the OLT. The fault persists.
3. Check the configurations of the BRAS and RADIUS. The configurations are correct. Check the VLAN configurations on the upper-layer aggregation switch and OLT. The VLAN configurations are correct.

# Case1 Error 676 Occasionally Occurs in PPPoE Dialup

- Procedure

4. When an ONU user in VLAN A encounters error 676, another user in the same VLAN is already online on the BRAS. Therefore, it is determined that a VLAN conflict occurs on the BRAS. The maximum number of concurrent online users configured on the BRAS is 1 in PPPoE dialup. Therefore, if a user is online in the VLAN with conflicts, error 676 occurs with other users of the same VLAN in PPPoE dialup.
5. Query the configurations of all ONUs connected to the OLT. It is found that VLANs have the same outer VLAN tags and the same inner VLAN tags. Modify the VLAN settings so that they have different outer tags and different inner tags. Then, the fault is rectified.

# Case1 Error 676 Occasionally Occurs in PPPoE Dialup

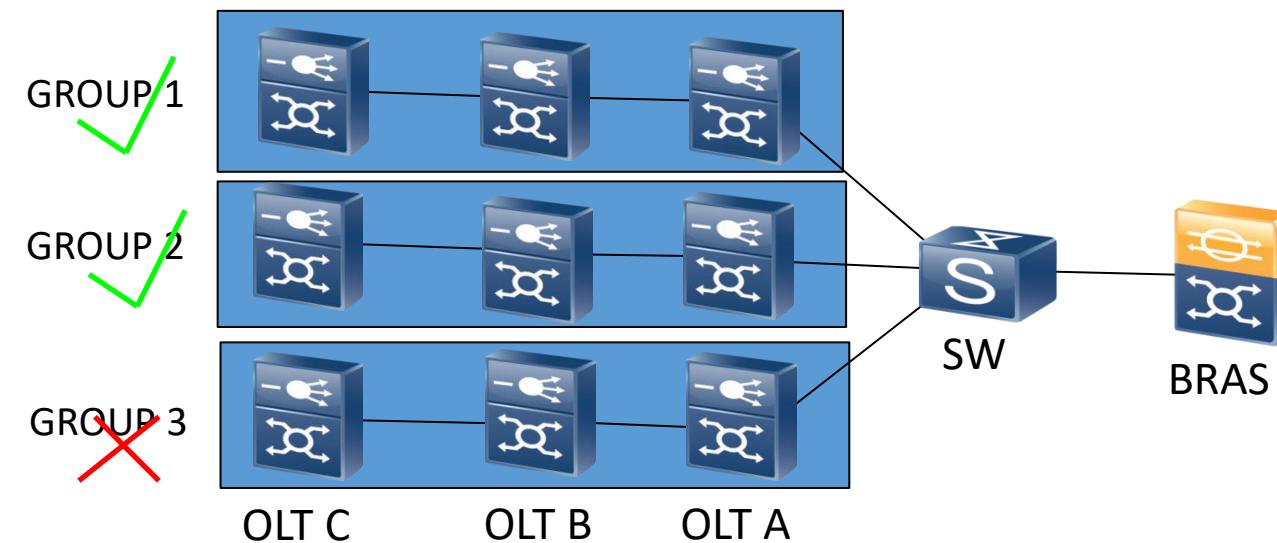
- Suggestions and Summary
  - Properly plan VLANs for the PON ports on an OLT. It is suggested to configure an outer VLAN tag for each PON port. In such a manner, the fault location scope is minimized even when an inner VLAN conflict occurs.

# Case2 Low Downloading Speed

- Description
  - Every three of nine OLTs are subtended as a group. Then, the three groups are connected to the convergence switch. Two groups work in the normal state but the three OLTs in the third group suffer a low network rate. Pinging the gateway from the three OLTs with a low network rate shows that the delay is 2 ms, and loss of packets does not occur.

- Alarm

- No



# Case2 Low Downloading Speed

- Cause Analysis
  - OLT data configuration
  - Upper layer configuration
- Troubleshooting
  - Another 6 OLTs service normal, exclude the problem of upper layer
  - Reboot OLT A, fault disappear in several days, locate the fault point at OLT A
  - Log in OLT A, check the port negotiation status and packet statistics information, find that the “discard frame” increase quickly.

Command: display port statistics 0	
Number of transmitted frames	: 1888940
Number of received frames	: 27092203
Total number of frames	: 28981143
Number of transmitted multicast frames	: 82
Number of received multicast frames	: 482029
Total number of multicast frames	: 482111
Number of transmitted broadcast frames	: 43544
Number of received broadcast frames	: 23720294
Total number of broadcast frames	: 23763838
Number of transmitted unicast frames	: 1845314
Number of received unicast frames	: 2889880
Total number of unicast frames	: 4735194
Number of transmitted pause frames	: 0
Number of received pause frames	: 0
Number of transmitted octets	: 162701665
Number of received octets	: 2180129970
Total number of octets	: 2342831635
Number of alignment error frames	: 0
Number of discarded frames in the Tx direction	: 0
Number of discarded frames in the Rx direction	: 8864965
Total number of discarded frames	: 8864965
Number of CRC error frames	: 0
Number of collision frames	: 0
Number of undersized frames	: 0
Number of oversized frames	: 3

## Case2 Low Downloading Speed

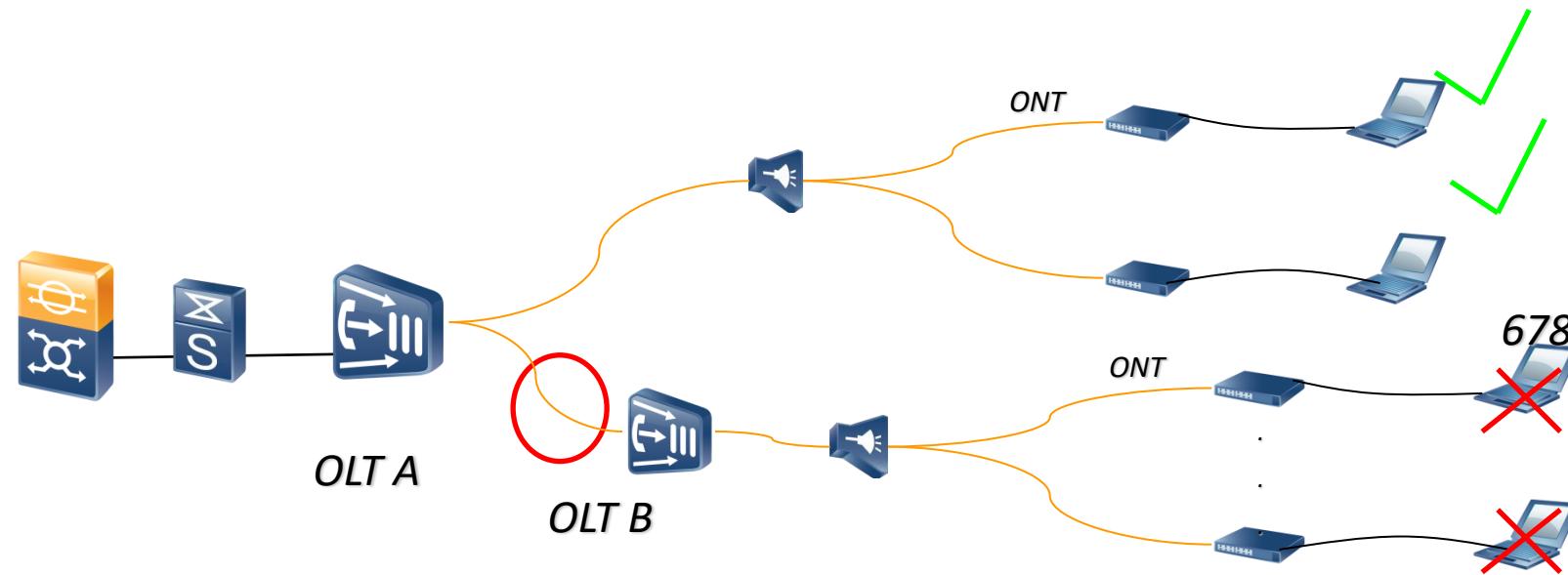
- Check the MAC address table, find the aging time was set to “No aging”, the MAC of BRAS was learned by multiple service port. Modify the aging time to be 300s (by default), 10 minutes later check the service again, the downloading speed turned to normal.

### Experience & Conclusion :

The fault caused because the operator set the MAC aging time to “No aging”. As to the basic function configuration of MAC address, it is suggested to use default setting except special requirement.

# Case3 PPPoE User Sometime Failure to Dialup

- Description
  - As the upper layer convergence switch port no enough, on one site two MA5800 adopt cascading uplink. Users of the upper OLT service normal all the time, but users of the cascaded OLT complain that difficult to dialup during busy time.
- Alarm
  - No



# Case3 PPPoE User Sometime Failure to Dialup

- Fault Analysis:
  - The fault occurs only for the users belong to the cascaded OLT, exclude the problem of upper layer device.  
[interface mpu 0/9 mode](#)
- Troubleshooting:
  - Exclude the problem of upper layer device and the uplink board of OLT  
[display port state](#)  
[display mac-adres](#)  
[display port statistics](#)
  - Check whether there are too much virus or broadcast message cause the PPPoE packet can not pass. Capture packet at the cascaded OLT uplink port, contains PPPoE packet. So the PPPoE must be discarded at the upper OLT.
  - Check the upper OLT configuration, find the cascading slot enable the broadcast suppression function, decrease the suppression threshold, fault cleared.

## Experience & Conclusion :

In the cascading network, pay attention to the broadcast suppression setting, if the threshold is too high, the PPPoE broadcast message may be discarded, users failure to dialup to the BRAS during busy time.

# Case4 Both HSI and VoIP Service Unstable

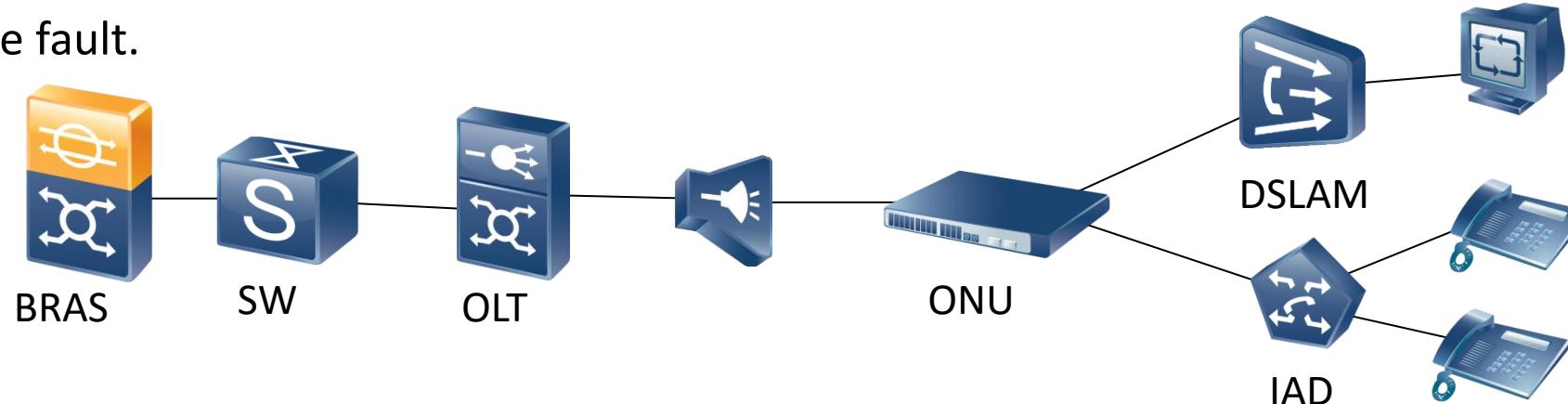
- Description
  - Two FE port of ONU provide HSI and VoIP service respectively, sometime both the services interrupted, the time last for about 30 seconds.

to filter mc adres that are causing problem

- Fault Analysis
  - Check the network, BRAS act as the gateway for both the HSI and voice services. Due to the interruption duration not too long, it's difficult to locate the fault. It need to use protocol analysis to locate the fault.

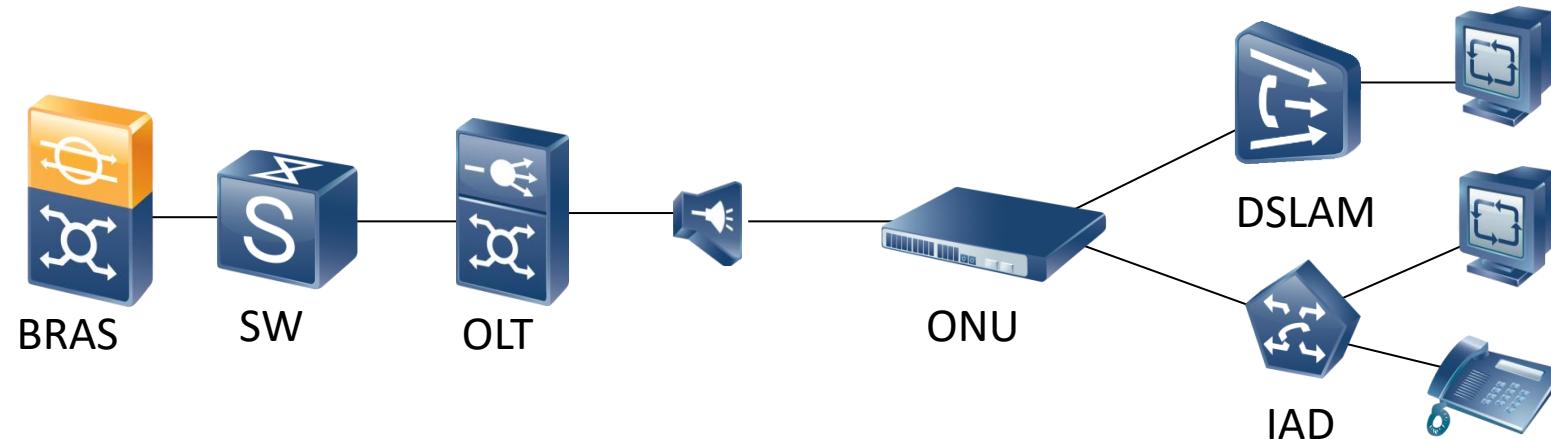
display mac-adres port  
display mac-adres serviceport

display security mac-filter  
security mac-filter-source



# Case4 Both HSI and VoIP Service Unstable

- Troubleshooting:
  - Capture packet at the downstream port of SW, it contains PADI message but no PADR message. Note that PADR is unicast message and PADI is broadcast message. Unicast message is discarded by the device. We doubt gateway MAC drift in the PON network.



# Case4 Both HSI and VoIP Service Unstable

- ❑ Capture packet on the FE port which connect to the DSLAM. Analyze the captured packet and find that there are packets send by the user with the same source MAC address as gateway.
- ❑ Enable the MAC filtering function in DSLAM, clear the fault.

Experience & Conclusion :

1. This networking is not standard and not recommended, it is suggested to adopt the MDU which integrate voice service.
2. Enable MAC filtering and loop detecting function in DSLAM.

# Case5 The Web Pages Sometimes Cannot Be Opened

- Description:
  - Subscribers connected to the OLT (MA5800) fail to open the web pages sometimes. The voice services and the NMS are normal.
- Cause Analysis:
  - The traffic configuration on the device is incorrect.
  - The network connection is abnormal.
  - The OLT configuration is incorrect.
- Procedure:
  - Query the configuration of MDU, all correct.
  - Ping the domain name of a website. The ping operation sometimes fails.
  - Query the OLT configuration. It is found that the aging time of the MAC address is set to 10s, change the aging time to 300s. The fault, however, persists.

nce

```
Command: interface mpu 0/9
Telesur_OLT(config-if-mpu-0/9)#display traffic-suppress
{ all<*>|portid<0..3> }: all
{ <cr>||<K> }:

Command: display traffic-suppress all
Traffic suppression ID definition:
NO. Min bandwidth(kbps) Max bandwidth(kbps) Package number(pps)
1 6 145 12
2 12 291 24
3 24 582 48
4 48 1153 95
5 97 2319 191
6 195 4639 382
7 390 9265 763
8 781 18531 1526
9 1562 37063 3052
10 3125 74126 6104
11 6249 148241 12207
12 12499 296483 24414
13 0 0 0

MIN MAX

PortID Broadcast_index Multicast_index unicast_index
0 1 7 7
1 7 7 7
2 7 7 7
3 7 7 7

Telesur_OLT(config-if-mpu-0/9)#

```

# Case5 The Web Pages Sometimes Cannot Be Opened

- Ping the gateway address of the upper-layer device connected to the OLT from a PC. The ping operation is not always successful. It can be preliminarily determined that the upper-layer device connected to the OLT is abnormal.
- Check the OLT. It is found that two ports on the OLT are used for upstream transmission. One port, however, is not configured with any data, and it is just online. Later, it is found that the link aggregation is configured on the upper-layer device connected to the OLT. The link aggregation, however, is not configured on the OLT. Remove the optical fiber connected to the port with no data configured. The fault then is rectified.

**Experience & Conclusion :**

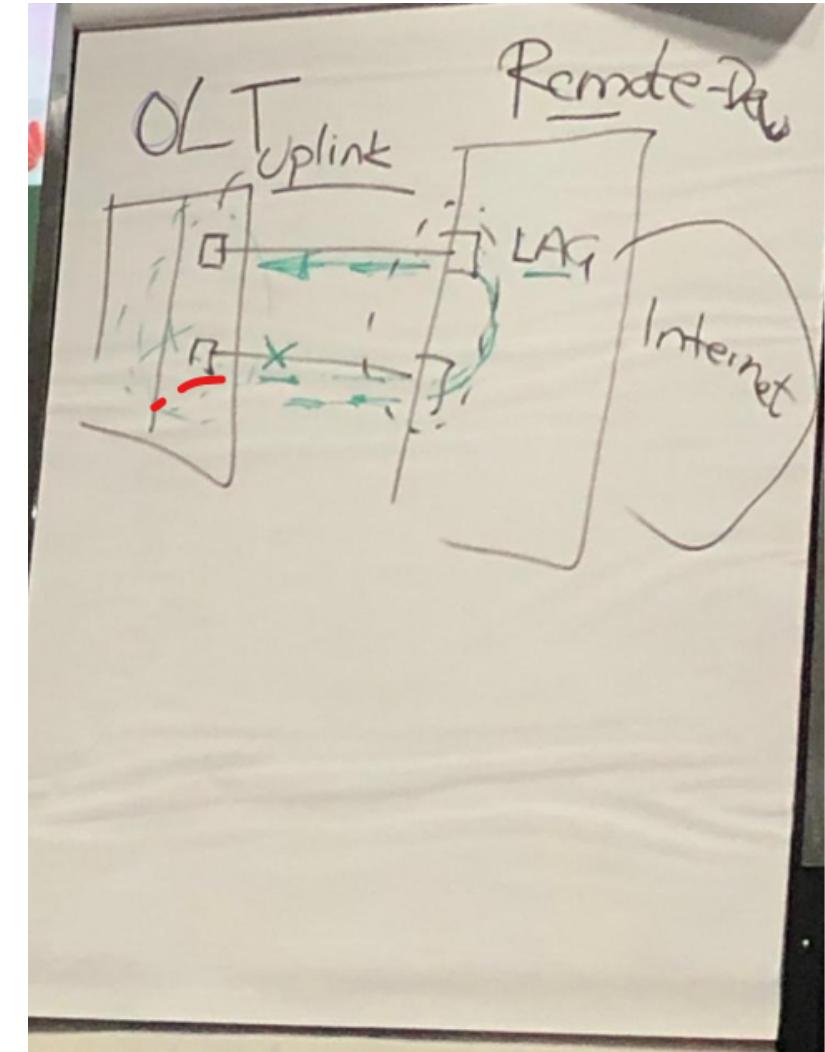
The gateway address of the upper-layer device can be pinged successfully, but why the website domain name cannot be pinged from time to time? It is related to the load sharing mechanism of the upper-layer device.



# Summary

- GPON HSI service faults troubleshooting procedure
- Categorized HSI service faults

soultion case 5  
group uplinks in 1 vlan  
or disconnect link that is not configured





# Acronyms and Abbreviations

- BRAS: Broadband Remote Access Server
- SNMP: Simple Network Management Protocol
- AAA: Authorization Authentication Accounting
- SW: Service Switch
- PPPoE: PPP over Ethernet
- DSLAM: Digital Subscriber Line Access Multiplexer
- IAD: Integrated Access Device

# Thank You

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