LX125G GPON Testing Report

Company name：		
Equipment model：	LX125G 1GE GPON	
Fiction：	Tony	2018 年 8 月 26 日
Review：		2018 年 8 月 26 日
Approve：		2018 年 8 月 26 日

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0 version record

Table 1 version record table

Serial number	version number	Generation time	Major modification record	Author	Remarks
1	RA		First edition		

1 Product Overview

1.1 Introduction

Briefly introduce the basic functions of the device and the usage scenarios.

product information

Positive

Negative

Table 2 Product panel light description

Name	status	meaning	Remarks
POWER	Off	The device is not powered on.	conform
	Constantly bright	The device is powered on	conform
LAN	Off	The network port is not connected.	conform
	Constantly bright	The network port is connected.	conform
	flicker	Network port has data transmission	conform
PON	Off	Indicates that the ONU has not started the activation process.	
	flicker	Indicates that the ONU is active	conform
	Constantly bright	Indicates that the ONU has been activated.	
LOS	Off	Indicates that the ONU receives normal optical power.	conform
	flicker	Indicates that the ONU receiving optical power is lower than the optical receiver sensitivity	conform

Test content and purpose

This test report is provided in accordance with the requirements of the device LX125G technical specification. This test report provides test items as well as test procedures and test results.

1.2 Test instruments and auxiliary equipment

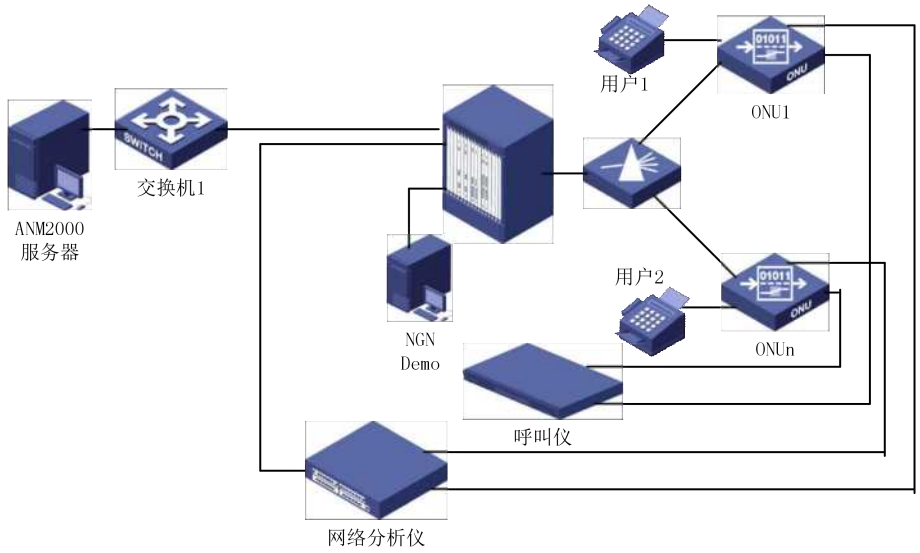
Table 4 Test instrument list

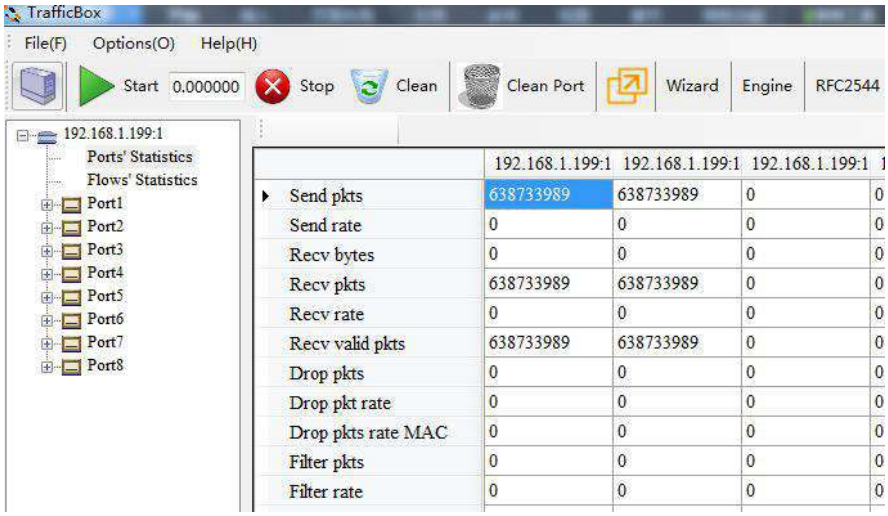
Name	**factory**	**type**
High and low temperature box	Su Rui Electronic Equipment Co., Ltd.	AG-100
OLT	ZTE C300	C300
ONU		LX125G GPON
Optical power meter	Optical technology	PMS-1
Optical attenuator	Optical technology	
Network Analyzer	*Nustrerms*	*Nustrerms-600i*
Network tester		
Fiber		20 km of real fiber

2 test project summary

2.1 Data part and hardware test of PON port

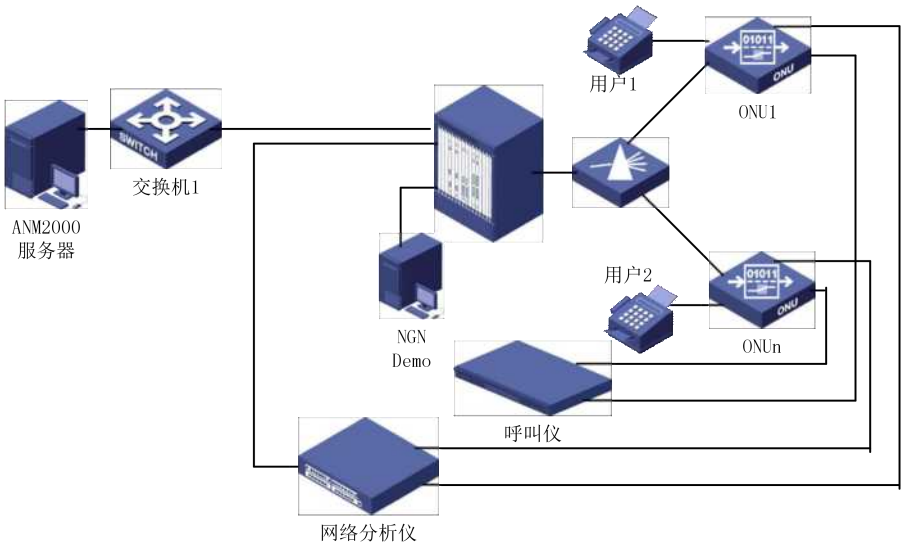
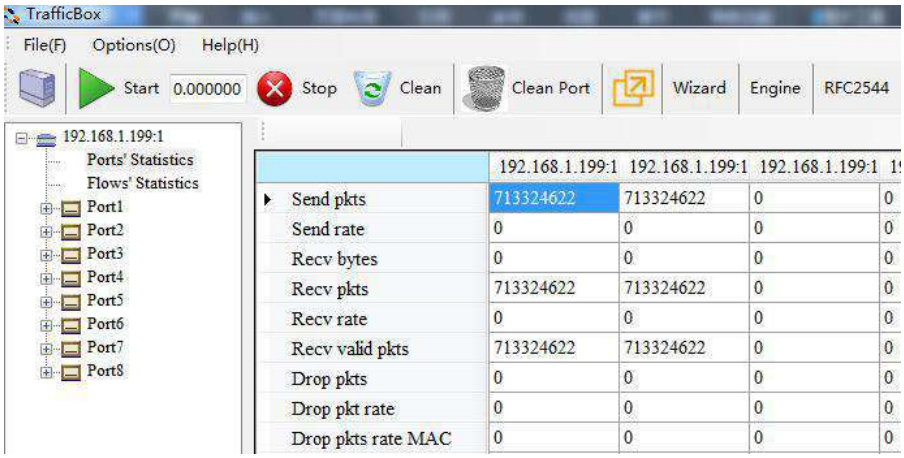
2.1.1 Data exchange and uplink function test

Use case number	TC-1
Use case name	Packet switching and uplink function
Testing purposes	Detect whether the data port of the tested ONU can exchange data with the OLT through the optical module.
Preconditions	1.The ONU to be tested; 2. Network analyzer; 3.OLT system.
test environment	
Test procedure	1、 1. Connect the hardware device according to the above figure. The network analyzer provides at least two GE ports. 2、 2. Connect the GE port of the ONU to the GE port of the network analyzer. The ONU PON port is connected to the PON port of the OLT through the ODN, and the uplink port of the OLT is connected to the GE port of the network analyzer. 3、 3. Register and authorize the ONU through the graphical network management, and configure unicast transparent transmission vlan 100; 4、 4. Send a data stream to the GE port through the network analyzer, the vlan id is 100, the transmission rate is 900 Mbps, and the word length is 512 bytes. 5、 5. Send the corresponding data stream to the GE port through the network analyzer, and each data stream is sent at a rate of 900 Mbps and a word length of 512 bytes; 6、 6. Check if the data services can communicate with each other; 7、 7. Hang up for 2 hours for a long time to see if there is any packet loss.
Expected	1. Step 6, data services can communicate;

results	2. Step 7, 2 hours packet loss rate is 0.
Testing result	1. The data service can communicate with each other; the GE port is 900 Mbps, the word length is 512 bytes, and the VLAN ID is 100. 2.The 2.2-hour packet loss rate is 0. (as shown below) 
Test conclusion	pass[√] did not pass[ ] Not tested[ ]
remarks	Including all ports of the ONU

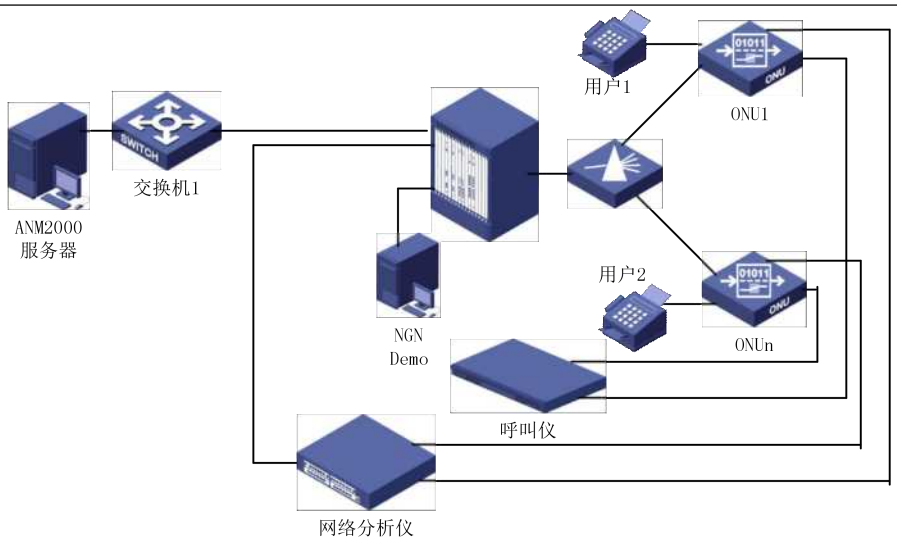
2.1.1 Data port 100 meter network cable test

Use case number	TC-2
Use case name	Data port 100 meter network cable transmission test
Testing purposes	Check whether the data port of the tested ONU can support 100m network transmission.
Preconditions	1. The ONU to be tested; 2. Network analyzer; 3. OLT system.

test environment	
Test procedure	1、 1. Connect the hardware device according to the above figure. The network analyzer provides at least two GE ports. 2、 2. Connect the GE1 port of the ONU to be tested to the GE port of the network analyzer through the 100-meter network cable. The ONU PON port is connected to the PON port of the OLT through the ODN, and the uplink port of the OLT is connected to the GE port of the network analyzer. ; 3、 3. Register and authorize the ONU through the graphical network management, and configure unicast transparent transmission vlan 100; 4、 4. Send a data stream to the two GE ports through the network analyzer, the vlan id is 100, the transmission rate is 900 Mbps, and the word length is 512 bytes. 5、 5. Send the corresponding data stream to the GE port through the network analyzer, and each data stream is sent at a rate of 900 Mbps and a word length of 512 bytes; 6、 6. Check if the data services can communicate with each other; 7、 7. Hang up for 2 hours for a long time to see if there is any packet loss.
expected results	1. 1. Step 6, the data services can communicate; 2. 2. Step 7, 12 hours packet loss rate is 0. 

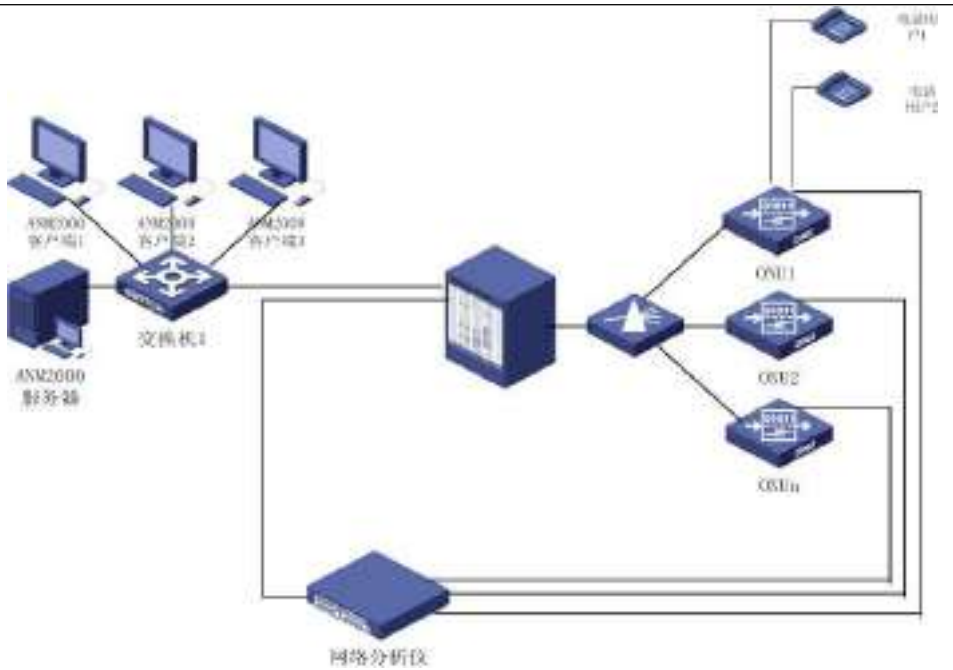
Test conclusion	pass[√] did not pass[ ] Not tested[ ]
remarks	Including all ports of the ONU

2.1.1 Reading the Parameter Information of an ONU Optical Module

Use case number	TC-3
Use case name	Read the ONU optical module parameter information test
Testing purposes	Read the ONU optical module parameter information when the OLT and the ONU work normally.
Preconditions	The ONU is registered normally, the relevant data has been configured, and the relevant test instruments are ready.
test environment	
Test procedure	1. 1. Connect the line as shown above; 2. 2. Fully equipped with 32 ONUs under one OLT PON interface; 3. 3. Enable optical module parameter detection in the performance classification switch of the service card; 4. 4. Read back the parameter information of the optical module of the service board, and record the received optical power value of each ONU; 5. 5. Enable optical module parameter detection in the performance classification switch of each ONU; 6. 6. Read back the parameter information of each ONU optical module, and record the optical power and received optical power value of each ONU. 7. 7. Test the optical power value and the received optical power value of each ONU using a PON optical power meter, and record; 8. 8. Compare the test values obtained in steps 4, 6, and 7.
expected results	In step 8, the error of the test result obtained three times does not exceed ±1 dBm.
Test Results	The test error of 3 times is within ±1 dBm.
Test	pass[√] did not pass[ ] not tested[ ]

conclusion	
remarks	

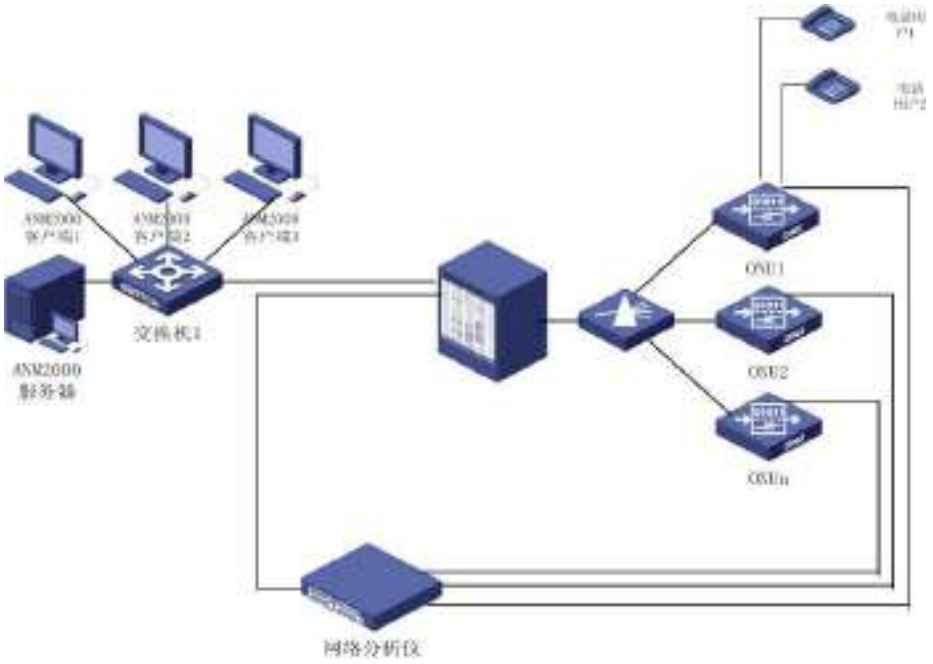
2.1.1 Input voltage range test

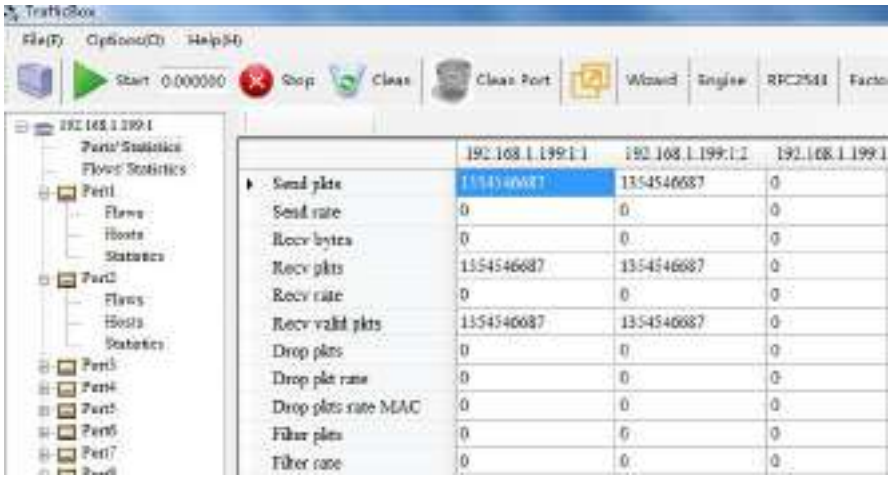
Use case number	TC-4
Use case name	Power pull test (ONU)
Testing purposes	The input voltage range at which the test equipment is operating normally.
Preconditions	1. The test platform should be: ONU is in the network and has normal working status of full service; 2. Test instrument: Variable AC voltage source DC voltage source; multimeter.
Test environment	
Test procedure	1. Connect the test environment according to the above figure, where ONU1 directly adopts adjustable AC or DC power supply, and this use case tests for ONU1; 2. Confirm that the device under test is designed with input voltage overvoltage and undervoltage protection; 3. If the terminal device has input voltage overvoltage and undervoltage protection, test the following method: a) AC power supply:

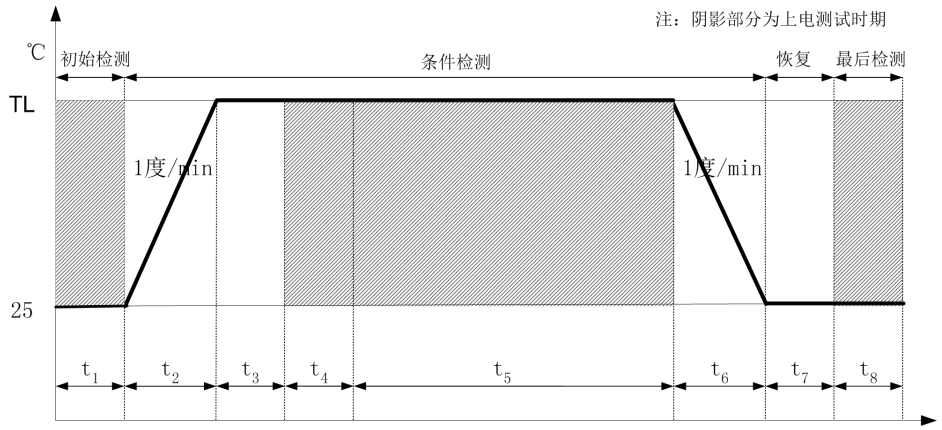
	The AC voltage source directly supplies power to the device. When the device is in full service and in normal working condition, the input voltage range is adjusted by the AC voltage source, and the voltage range in which the device can work normally is tested and recorded; b) DC power supply: The DC voltage source is used to directly supply power to the device. When the device is in full service and in normal working condition, the voltage range of the device can be tested and adjusted by adjusting the input voltage range.
expected results	1. AC mains voltage in the range of 90 ~ 264V, frequency 50Hz ± 5%, voltage waveform distortion rate is less than 5%, the equipment should be able to work normally; 2. DC input requires 12V to allow variable range from 11.5V to 12.5V；
Test Results	The AC mains and DC voltages operate normally within the required deflection range.
Test conclusion	pass[√] did not pass[ ] not tested[ ]
remarks	"China Telecom GPON Equipment Technical Requirements V2.1" 20.2.2.2 ONU power supply adaptability requirements: SFU equipment should be powered by using an external power adapter to convert AC 220V power to DC 12V.

2.1.2 high temperature and high humidity test

Use case number	TC-5
Use case name	High temperature and high humidity environment test
Testing purposes	Start-up and working stability of test equipment in high temperature and high humidity environment
Preconditions	1. 1. OLT and ONU equipment; 2. Data network analyzer, optical power meter, temperature and humidity test chamber, optical splitter, etc.。

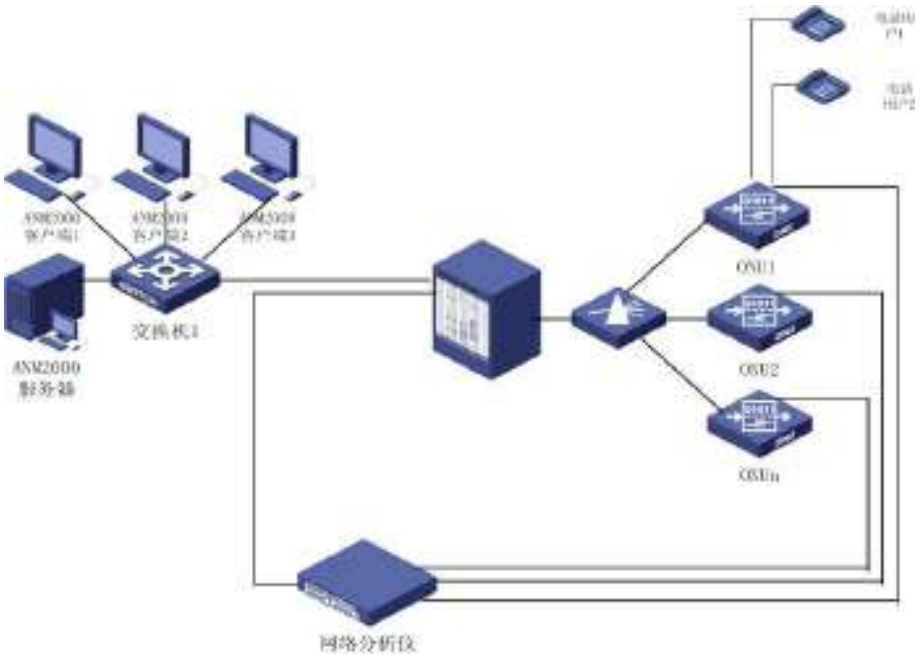
Test environment	
Test procedure	1. Set up a high temperature and high humidity environment test platform; 2. Before the test, test the appearance, mechanical properties and electrical performance of the test sample (OLT/ONU) at room temperature to verify whether the OLT/ONU can start normally, whether the service configuration is normal, whether the two-way service is normal, and test. Transmit optical power of OLT/ONU; (initial detection) 3. Put the test sample at room temperature into the test chamber in the normal position or other regulations without being packaged, energized, or ready for use. At this time, the temperature of the test chamber is also room temperature; 4. The test chamber is heated to 1° C/min to the test temperature TL (the TL value depends on the ambient temperature range category supported by the OLT/ONU); 5. After t3 hours at TL temperature and 90% humidity, power on the test sample to verify whether the OLT/ONU can start normally, whether the service configuration is normal, whether the two-way service is normal, and test the optical power of the OLT/ONU. ; 6. After the test sample has completed the high-temperature and high-humidity start test, the 16-hour long-term high-temperature and high-humidity stability test is carried out under TL temperature and 90% humidity, and two 100 Mbps bidirectional flows are generated for the SFU through the data network analyzer, and the test is long-term stable. For the MDU (LAN), configure a bidirectional traffic for each GE port (the traffic of each GE UNI port is 100 Mbps), and test its long-term stability. For the MDU (DSL) two 16 Mbps/512 Kbps bidirectional traffic, test Long-term stability; 7. The temperature of the test chamber is restored to room temperature (25 ° C), and the cooling rate is 1 ° C/min. After t7 hours, the test sample is powered on to verify whether the OLT/ONU can be started normally, whether

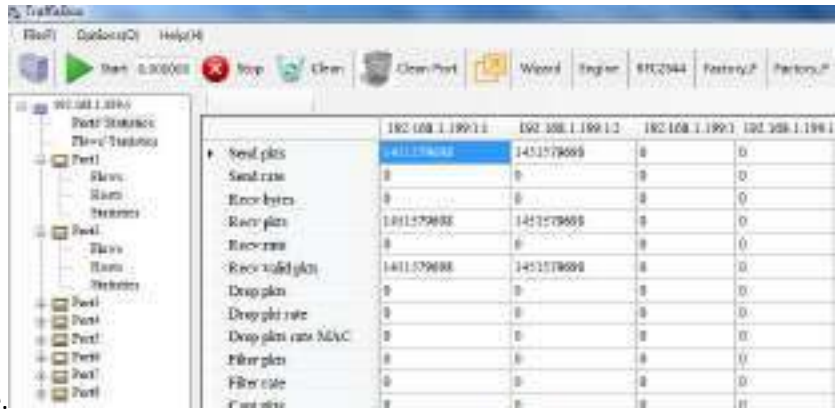
	the service configuration is normal, and whether the two-way service is normal. And test the OLT/ONU to send optical power. Also test the appearance, mechanical properties, electrical properties, etc. of the test sample; (final test)
expected results	1. 1. Step 5: The OLT/ONU can start normally and complete the automatic service configuration. The two-way service is normal; there is no obvious change before the optical power and temperature rise. 2. 2. Step 6: The OLT bidirectional packet loss rate is less than 10-11 in long-term high temperature and high humidity environment; SFU bidirectional packet loss rate is less than 10-11; MDU (LAN) bidirectional packet loss rate is less than 10-11; MDU (DSL) The two-way packet loss rate is less than 10-11; 3. 3. Step 7: After returning to room temperature, the OLT/ONU can start normally and complete the automatic service configuration, the two-way service is normal; there is no obvious change before the optical power and the temperature drop; the appearance, mechanical properties and electrical performance of the test sample have no obvious change;
Test result	The service configuration can be completed automatically, and no packet loss is found in the high temperature and high humidity environment; after returning to room temperature (25 ° C), everything is normal and there is no obvious change. 
Test conclusion	pass[√] did not pass[ ] not tested[ ]
remarks	1. Adopt ETSI 300019 Class 3.2 standard test to meet TL9000 requirements; 2. During the test, equipment damage may occur. It is recommended to perform this test after other functional tests are completed; 3. The temperature control box for testing shall have a temperature rise and fall capability of 1.0 ° C/min, and the temperature range is -31 to 56 ° C;

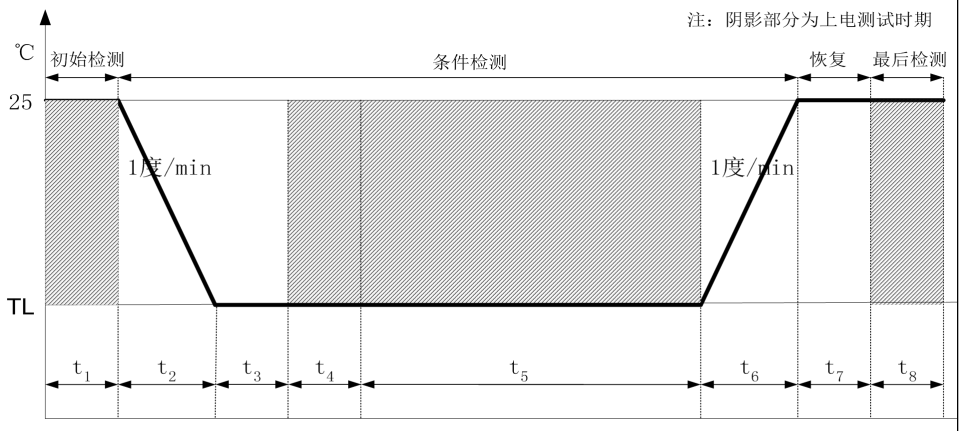
	4. The lower and upper temperature limits selected in the OLT environmental test are: low temperature TL=-1° C, high temperature TL=51° C; the lower and upper temperature limits selected in the SFU environmental test are: low temperature TL=-6° C, high temperature TL =46° C; the lower and upper temperature limits selected in the MDU environmental test are: low temperature TL=-31° C, high temperature TL=56° C; (actual test temperature requirement is greater than the manual declared value ±1° C) 5. The test uses a randomly selected MDU (LAN) device and randomly selects two GE ports. During the test, two ADSL2+ ports are randomly selected from one ADSL2+ interface board of the MDU (DLS) device. For a multi-GE port modem, each modem uses only one GE interface for testing. 6. The temperature control curve is shown in the figure below;  TL（试验温度值）：40℃ t_1 （室温初始检测时间）：0.5h t_2 （温度上升时间）：(TL-25)/60h t_3 （样品温度稳定时间）：0.5h t_4 （样品在高温下启动和业务检测时间）：0.5h t_5 （样品高温长期稳定性测试时间）：16h t_6 （温度下降时间）：(TL-25)/60h t_7 （样品恢复时间时间）：0.5h t_8 （室温重新检测时间）：0.5h

2.1.3 Low temperature test

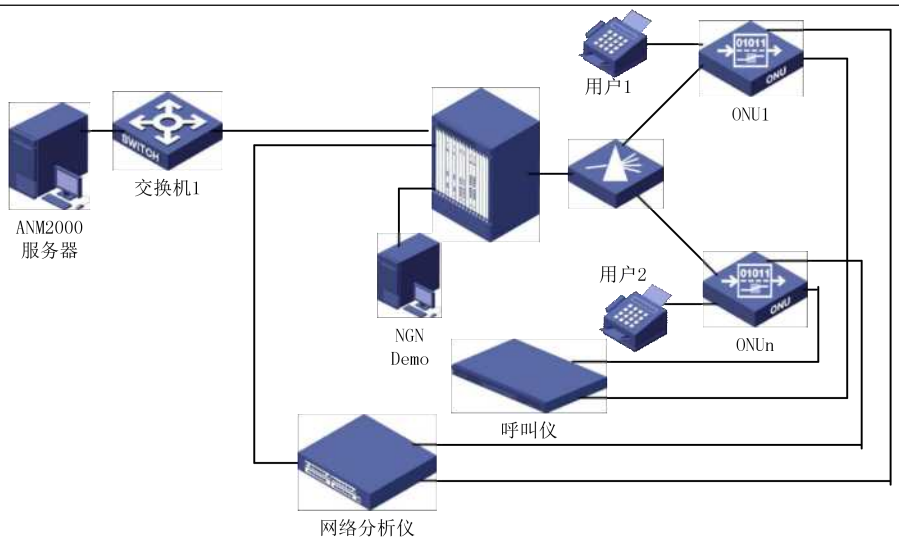
Use case number	TC-6
Use case name	Low temperature environment test
Testing purposes	Start-up and working stability of test equipment in low temperature environments
Preconditions	1. 1. OLT and ONU equipment; 2. Data network analyzer, optical power meter, temperature and humidity test chamber, optical splitter, etc.

test environment	
Test procedure	1. Set up a low temperature environment test platform; 2. Before the test, test the appearance, mechanical properties and electrical performance of the test sample (OLT/ONU) at room temperature to verify whether the OLT/ONU can start normally, whether the service configuration is normal, whether the two-way service is normal, and test. Transmit optical power of OLT/ONU; (initial detection) 3. Put the test sample at room temperature into the test chamber in the normal position or other regulations without being packaged, energized, or ready for use. At this time, the temperature of the test chamber is also room temperature; 4. The test chamber is cooled to 1 ° C/min to the test temperature TL (the TL value depends on the ambient temperature range category supported by the OLT/ONU); 5. At TL temperature, after t3 hours, power on the test sample to verify whether the OLT/ONU can be started normally, whether the service configuration is normal, whether the two-way service is normal, and test the optical power of the OLT/ONU. 6. After the test sample has completed the low temperature start test, perform 16 hours long-term low temperature stability test at TL temperature, and generate a 900 Mbps bidirectional flow rate for the SFU through the data network analyzer to test long-term stability; 7. The temperature of the test chamber is restored to room temperature (25 ° C), and the heating rate is 1 ° C / min. After t7 hours, the test sample is powered on to verify whether the OLT / ONU can be started normally, whether the service configuration is normal, and whether the two-way service is normal. And test the OLT/ONU to send optical power. Also perform performance checks on the appearance, mechanical properties, electrical properties, etc. of the test samples; (final test)

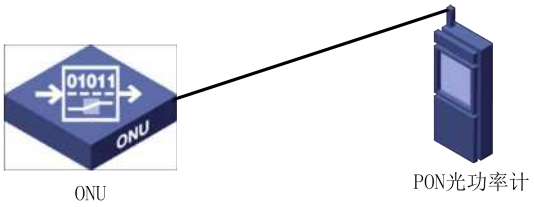
expected results	1. 1. Step 5: The OLT/ONU can start normally and complete the automatic service configuration. The two-way service is normal; there is no obvious change before the optical power and cooling. 2. 2. Step 6: The OLT two-way packet loss rate is less than 10-11 in the long-term low temperature environment; the SFU two-way packet loss rate is less than 10-11; the MDU (LAN) bidirectional packet loss rate is less than 10-11; MDU (DSL) two-way The packet loss rate is less than 10-11; 3. 3. Step 7: After returning to room temperature, the OLT/ONU can start normally and complete the automatic service configuration. The two-way service is normal; there is no obvious change before the optical power and the temperature rise; the appearance, mechanical properties and electrical performance of the test sample have no obvious change;
Test result	The appearance is intact, the service configuration can be completed automatically, and no packet loss is found in the low temperature and high humidity environment; after returning to room temperature (25 ° C), everything is normal and there is no obvious change. 
Test conclusion	Pass [√] fail [ ] not tested [ ]

Remarks	1. Adopt ETSI 300019 Class 3.2 standard test to meet TL9000 requirements; 2. During the test, equipment damage may occur. It is recommended to perform this test after other functional tests are completed; 3. The temperature control box for testing shall have a temperature rise and fall capability of 1.0 ° C/min, and the temperature range is -31 to 56 ° C; 4. The lower and upper temperature limits selected in the OLT environmental test are: low temperature TL=-1° C, high temperature TL=51° C; the lower and upper temperature limits selected in the SFU environmental test are: low temperature TL=-6° C, high temperature TL =46° C; the lower and upper temperature limits selected in the MDU environmental test are: low temperature TL=-31° C, high temperature TL=56° C; (actual test temperature requirement is greater than the manual declared value ±1° C) 5. When testing at low temperature, if necessary, the heating plate can be used to assist the MDU to achieve low temperature start-up (preferably MDU support can be started normally without the aid of the heating plate); 6. The test uses a randomly selected MDU (LAN) device and randomly selects two GE ports. During the test, two ADSL2+ ports are randomly selected from one ADSL2+ interface board of the MDU (DLS) device. For a multi-GE port modem, each modem uses only one GE interface for testing. 7. The temperature control curve is shown below  t_1 （室温初始检测时间）：0.5h t_2 （温度下降时间）：(25-TL)/60h t_3 （样品温度稳定时间）：0.5h t_4 （样品在低温下启动和业务检测时间）：0.5h t_5 （样品低温长期稳定性测试时间）：16h t_6 （温度上升时间）：(25-TL)/60h t_7 （样品恢复时间时间）：0.5h t_8 （室温重新检测时间）：0.5h

2.1.7 Maximum transmission distance test

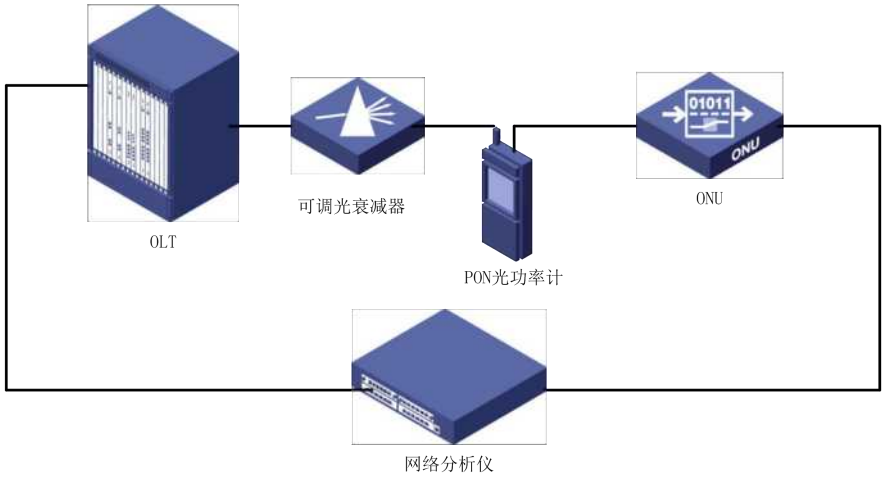
Use case number	TC-8
Use case name	Maximum transmission distance test
Testing purposes	The maximum distance that can be reached between the PON interface of the OLT and the ONU under normal working conditions of the OLT and the ONU (20km)
Preconditions	The ONU is registered normally, the relevant data has been configured, and the relevant test instruments are ready.
test environment	
Test procedure	1. Connect the line as shown above; 2. Fully equipped with 32 ONUs under one OLT PON interface; 3. The trunk road uses 20KM fiber and is equipped with ONU, OLT and network analyzer; 4. Start the OLT and turn on all ONU power supplies; Record whether all ONUs are successfully registered to the OLT and the time to verify whether the service is normal.
expected results	Step 5: All ONUs are successfully registered to the OLT, and the uplink and downlink services are normal.
Test Results	The distance between the ONU and the OLT is 20Km. The ONU can be successfully registered to the OLT, and the uplink and downlink services are normal.
Test conclusion	Pass [√] fail [ ] not tested [ ]
Remarks	

2.1.7 Average emitted optical power

Use case number	TC-9
Use case name	ONU optical port average transmission optical power
Testing purposes	The average optical power of the transmitter is measured.
Preconditions	1. 1. The ONU to be tested;
test environment	
Test procedure	2. Connect to the test environment as shown above;
expected results	3. Set the ONU optical module to be in a long-light working state;
Test Results	4. Measure the TX optical power and record.
Test conclusion	EPON ONU
Remarks	

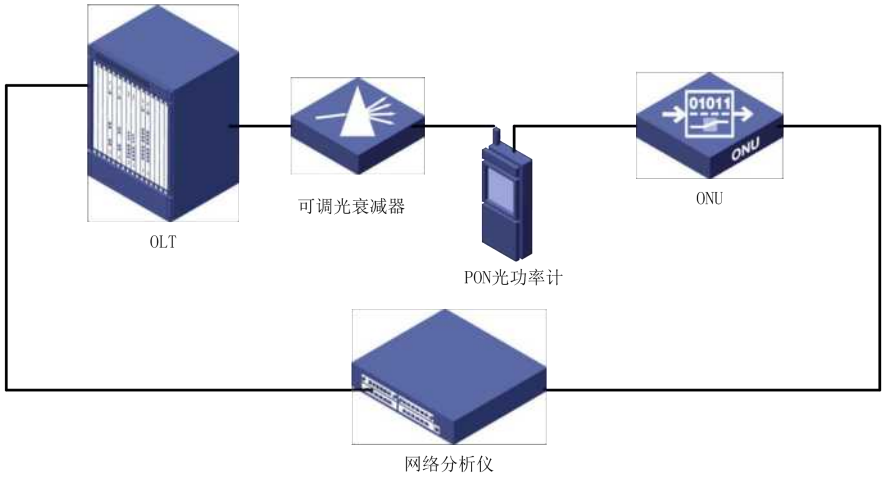
2.1.7 Receive sensitivity

Use case number	TC-10
Use case name	Receive sensitivity of ONU optical port
Testing purposes	The minimum value of the average received power required by the receiver to reach a BER value of 1 x 10-12 at the receiver.
Preconditions	2. 1. The ONU to be tested;

test environment	
Test procedure	1. Connect to the test environment as shown above; 2. Adjust the dimming attenuator to increase the attenuation, make the optical module work normally, and verify that there is no packet loss with the network analyzer; Read the optical power value and record it.
expected results	EPON ONU The receiving sensitivity of the ONU optical module is ≤-27dBm; GPON ONU GPON PON-R interface receiver sensitivity (downstream rate is 2488 Mbit/s, Class B+): -30 dBm.
Test Results	The acceptance sensitivity of the ONU optical port is -29.2dBm
Test conclusion	Pass [√] fail [ ] not tested [ ]
Remarks	

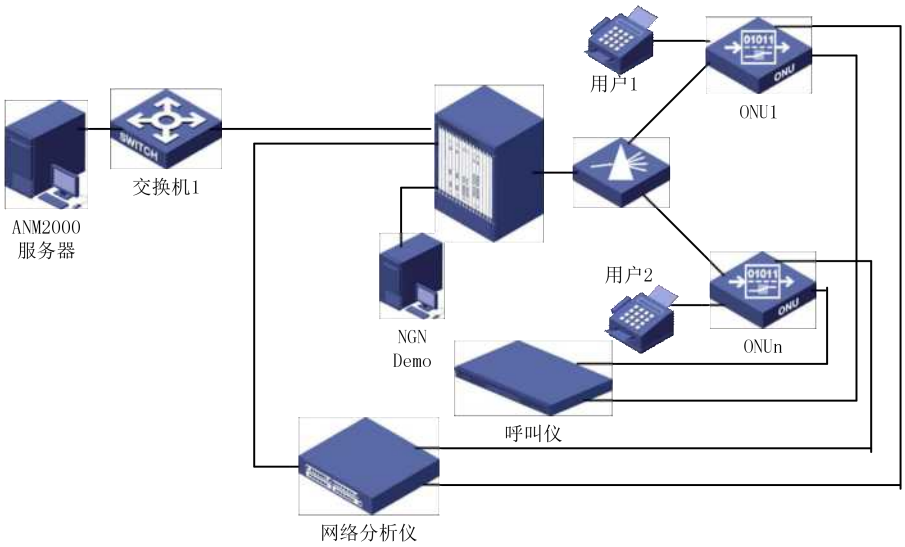
2.1.4 Maximum received optical power

Use case number	TC-11
Use case name	ONU optical module average maximum received optical power
Testing purposes	Measure the maximum average received power required by the ONU optical module to reach a BER value of 1 × 10 -12
Preconditions	1. 1. The ONU to be tested and the corresponding OLT system;

test environment	
Test procedure	1. 1. Connect to the test environment as shown above;
expected results	2. Adjust the optical attenuator to make the optical module work normally, and use the network analyzer to verify that there is no packet loss;
Test Results	The average maximum received optical power of the ONU optical module is -3dBm.
Test conclusion	Pass [√] fail [ ] not tested [ ]
Remarks	

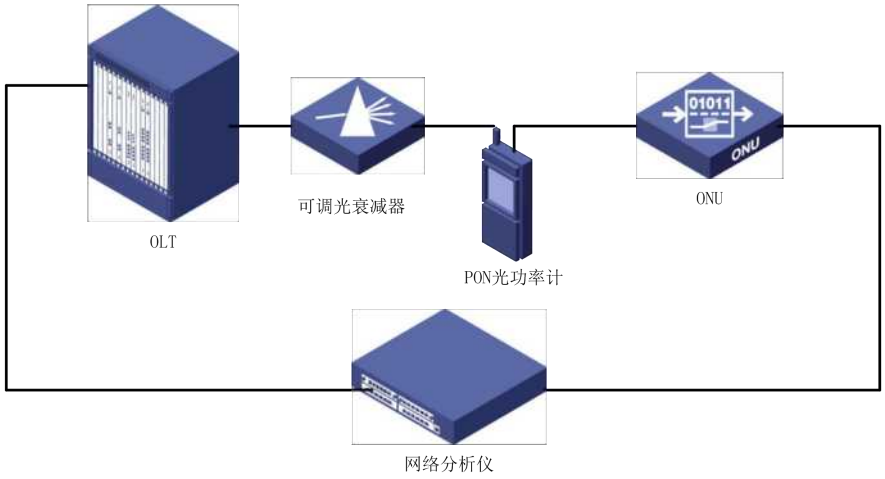
2.1.8 Optical Module Shutdown Test

Use case number	TC-12
Use case name	ONU optical module shutdown test
Testing purposes	The ONU optical module can be shut down through the network management.
Preconditions	1. 1. The ONU to be tested;

test environment	
Test procedure	1. 1. When the ONU is working normally, the ONU remote optical module is turned off by the NMS.
expected results	2. Check if the corresponding ONU is down.
Test Results	After the ONU optical module is turned off, the ONU is registered.
Test conclusion	After the ONU optical module is turned off, the ONU is registered.
Remarks	

2.1.8 Maximum turn-off optical power

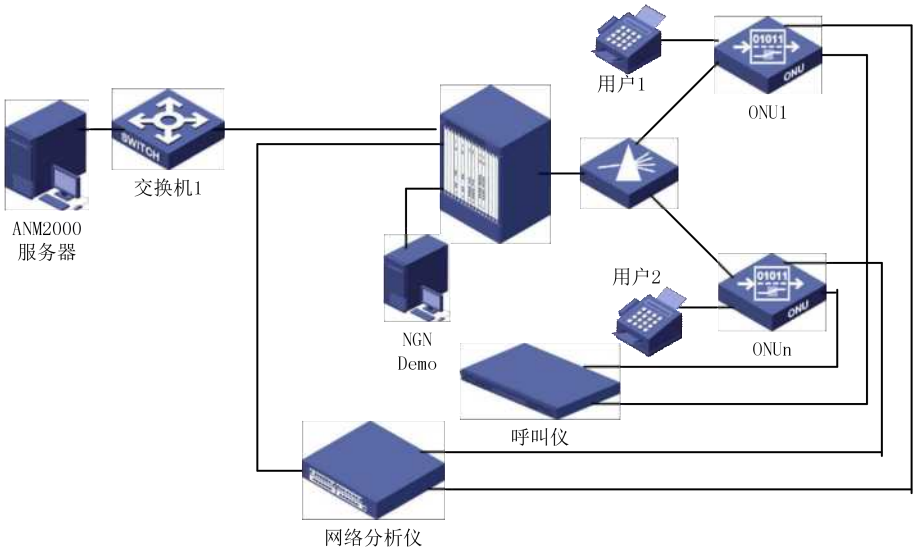
Use case number	TC-13
Use case name	ONU optical module maximum off optical power
Testing purposes	The ONU optical module emits power without the transmitter transmitting data.
Preconditions	1. 1. The ONU to be tested;

test environment	
Test procedure	1. 1. When the ONU is working normally, disconnect the OLT from the ONU to break the laser of the ONU.
expected results	2. The optical power meter is set at the wavelength of the measured light, and the output power is stable. The optical power value read from the optical power meter is the average transmitting power when the transmitter is turned off.
Test Results	EPON ONU
Test conclusion	Maximum off optical power ≤ -45dBm
Remarks	

2.2 performance test

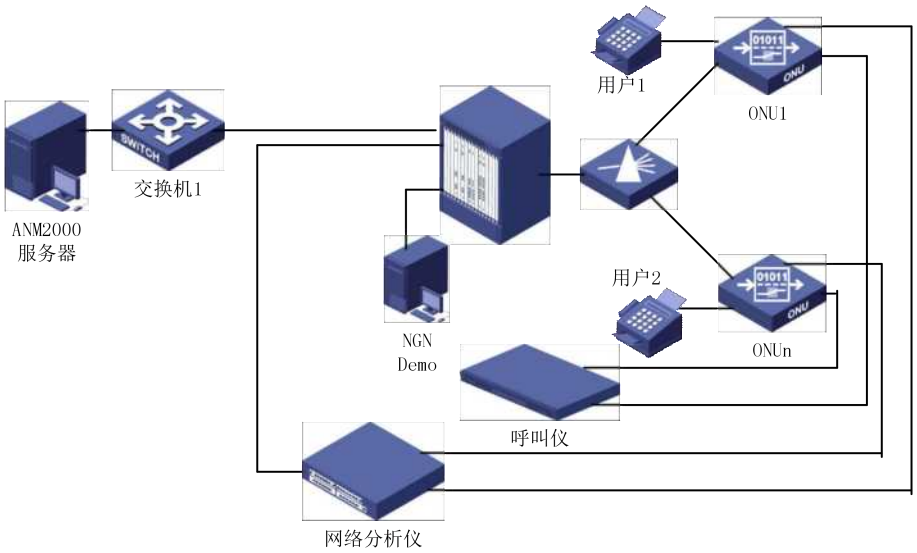
Throughput

Use case number	TC-14
Use case name	ONU throughput test
Testing purposes	Detecting the data port bidirectional throughput of the tested ONU
Preconditions	1. 1. The ONU to be tested;

<table>
<tr><td>test environment</td><td> 
</td></tr>
<tr><td>Test procedure</td><td>1. 1. Connect as shown in the test configuration diagram. All user ports of one ONU are connected to the data network analyzer port. Connect 20km disk between the OLT and the optical splitter [optional].
2. 2. Turn on the encryption function [optional].
3. 3. In the uplink direction, the meter sends an untag Ethernet service flow to the GE port of the ONU. The ONU marks the CVLAN of the service flow of the port, and the OLT adds an SVLAN to each CVLAN.
4. 4. In the downstream direction, the meter sends a double-tagged Ethernet service flow to the uplink port of the OLT. SVLAN=CVLAN, the OLT and ONU respectively mark the SVLAN and CVLAN of the service flow.
5. 5. The test uses the standard RFC2544 test method to perform the uplink and downlink two-way test.
6. 6. The test uses 7 typical packet lengths: 64 bytes (downstream direction is 72 bytes), 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 1280 bytes, 1514 bytes (downstream direction is 1522) byte).
7. The test time is set to 30 seconds, each package length is tested and the detailed result is recorded.</td></tr>
<tr><td>expected results</td><td>Record the detailed test results, and the result value is as large as possible.</td></tr>
<tr><td>Test Results</td><td>detailed data：
<table>
<tr><th>Test items</th><th>Guideline</th><th>Packet length</th><th>Upstream（Mbps）</th><th>Down（Mbps）</th></tr>
<tr><td rowspan="5">Throughput (Mbps)</td><td rowspan="5">1000Mbps</td><td>64</td><td>999.6</td><td>1000</td></tr>
<tr><td>128</td><td>999.6</td><td>1000</td></tr>
<tr><td>256</td><td>999.9</td><td>1000</td></tr>
<tr><td>512</td><td>999.7</td><td>1000</td></tr>
<tr><td>1024</td><td>999.1</td><td>1000</td></tr>
</table></td></tr>
</table>

			1280	999. 6	1000
			1518	999. 7	1000
Test conclusion	Pass [√] fail [ ] not tested [ ]				
Remarks					

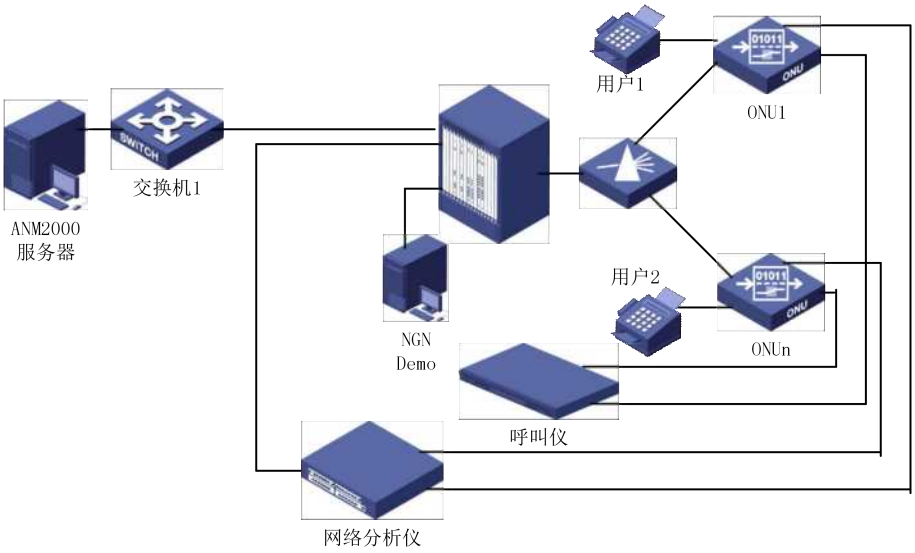
Delay

Use case number	TC-15
Use case name	ONU delay test
Testing purposes	Detecting the data port forwarding delay of the measured ONU
Preconditions	1. 1. The ONU to be tested;
test environment	
Test procedure	1. 1. Connect as shown in the test configuration diagram. All user ports of one ONU are connected to the data network analyzer port. Connect 20km disk between the OLT and the optical splitter [optional]. 2. Enable encryption function [optional]。 3. In the uplink direction, the meter sends an untagged Ethernet service flow to the GE port of the ONU. The ONU marks the CVLAN of the service flow of each port. The OLT adds an SVLAN to each CVLAN, and CVLAN=SVLAN. 4. 4. In the downstream direction, the meter sends a double-tagged Ethernet service flow to the uplink port of the OLT. SVLAN=CVLAN, the OLT and ONU respectively mark the SVLAN and CVLAN of the service flow. 5. 5. The test uses the standard RFC2544 test method to perform the uplink and downlink two-way test. 6. 6. The test uses 7 typical packet lengths: 64 bytes (downstream direction is 72 bytes), 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 1280 bytes, 1514 bytes (downstream direction is 1522) byte).

<table>
<tr><td></td><td>7. The test time is set to 30 seconds, each package length is tested and the detailed result is recorded.</td></tr>
<tr><td>expected results</td><td>3. 3. Record detailed test results.
4. 4. GPON standard: When the traffic volume does not exceed 90% of the system throughput, the transmission delay in the uplink direction (UNI to SNI) should be less than 1.5ms (any Ethernet packet length between 64Byte and 1518Byte) The transmission delay in the downlink direction (SNI to UNI) should be less than 1ms (any Ethernet packet length)
5. EPON standard: When carrying only Ethernet/IP services, if the traffic volume does not exceed 90% of the system throughput, the uplink (UNI to SNI) transmission delay should be less than 1.5ms (64Byte to 1518Byte). Any Ethernet packet length), the transmission delay in the downstream direction (SNI to UNI) should be less than 1ms (any Ethernet packet length)</td></tr>
<tr><td>Test Results</td><td>detailed data：
<table>
<tr><td>Test items</td><td>Packet length</td><td>Upstream（μs）</td><td>Down（μs）</td></tr>
<tr><td rowspan="7">Delay（μs）</td><td>64</td><td>56.30</td><td>30.76</td></tr>
<tr><td>128</td><td>60.34</td><td>32.76</td></tr>
<tr><td>256</td><td>66.19</td><td>34.93</td></tr>
<tr><td>512</td><td>63.24</td><td>40.68</td></tr>
<tr><td>1024</td><td>89.26</td><td>53.30</td></tr>
<tr><td>1280</td><td>80.24</td><td>59.52</td></tr>
<tr><td>1518</td><td>87.98</td><td>65.49</td></tr>
</table></td></tr>
<tr><td>Test conclusion</td><td>Pass [√] fail [ ] not tested [ ]</td></tr>
<tr><td>Remarks</td><td>Including all ports of the ONU</td></tr>
</table>

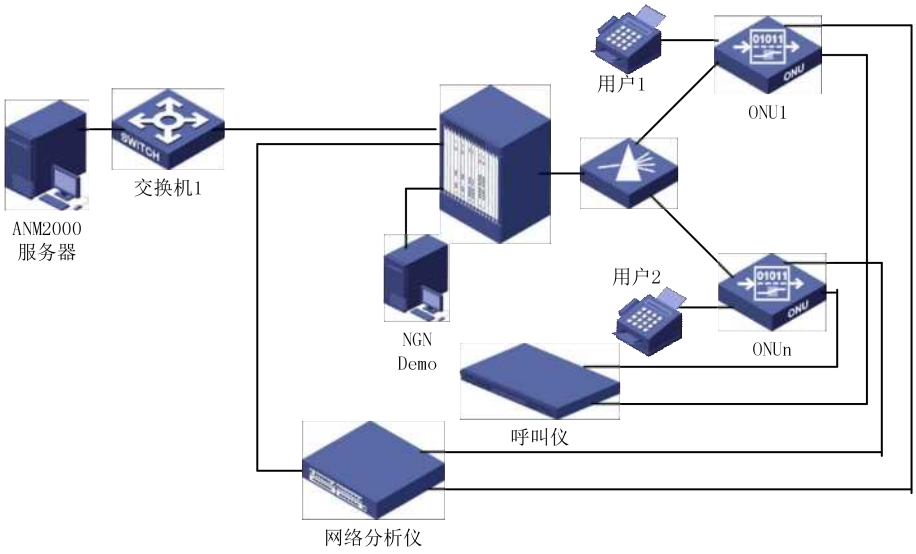
Packet loss rate

Use case number	TC-16
Use case name	ONU packet loss rate test
Testing purposes	Detecting the data port overload loss rate of the tested ONU
Preconditions	1. 1. The ONU to be tested;

<table>
<tr><td>test environment</td><td> 
</td></tr>
<tr><td>Test procedure</td><td>1. 1. Connect as shown in the test configuration diagram. All user ports of one ONU are connected to the data network analyzer port. Connect 20km disk between the OLT and the optical splitter [optional].
2. 2. Turn on the encryption function [optional].
3. In the uplink direction, the meter sends an untagged Ethernet service flow to the GE port of the ONU. The ONU marks the CVLAN of the service flow of each port, ranging from 1001 to 1001+N. The OLT adds an SVLAN to each CVLAN, and CVLAN= SVLAN.
4. 4. In the downstream direction, the meter sends a double-tagged Ethernet service flow to the uplink port of the OLT, SVLAN=CVLAN, and the SVLAN range is: 1001~1001+N, and the OLT and ONU respectively mark the SVLAN and CVLAN of the service flow. .
5. 5. The test uses the standard RFC2544 test method to perform the uplink and downlink two-way test.
6. 6. The test uses 7 typical packet lengths: 64 bytes (downstream direction is 72 bytes), 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 1280 bytes, 1514 bytes (downstream direction is 1522) byte).
7. The test time is set to 30 seconds, each package length is tested and the detailed result is recorded.</td></tr>
<tr><td>expected results</td><td>6. Record detailed test results.</td></tr>
<tr><td>Test Results</td><td>detailed data：
<table>
<tr><th>Test items</th><th>Packet length</th><th>Test rate</th><th>Average packet</th></tr>
<tr><td rowspan="4">Packet loss rate</td><td>64</td><td>900</td><td>0</td></tr>
<tr><td>128</td><td>900</td><td>0</td></tr>
<tr><td>256</td><td>900</td><td>0</td></tr>
<tr><td>512</td><td>900</td><td>0</td></tr>
</table></td></tr>
</table>

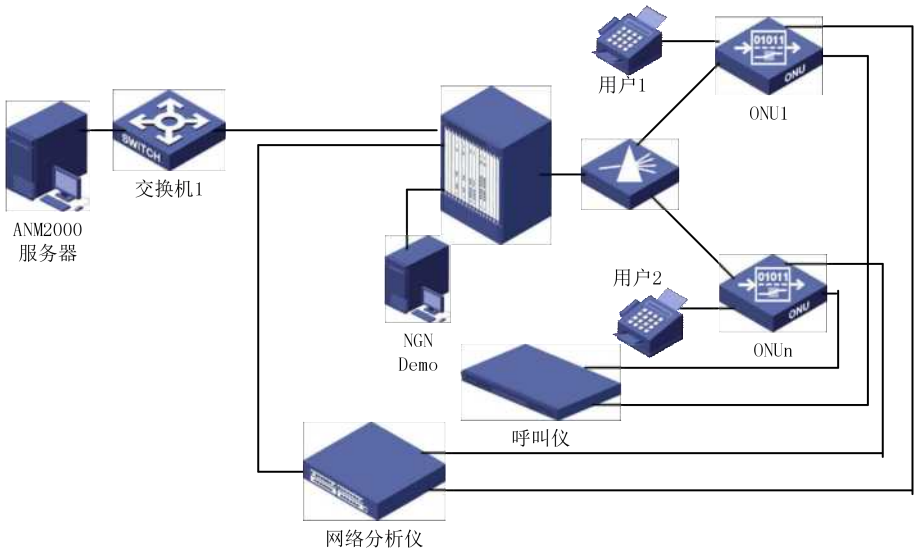
			1024	900	0
			1280	900	0
			1518	900	0
Test conclusion	Pass [√] fail [ ] not tested [ ]				
Remarks	Including all ports of the ONU				

Multicast service forwarding delay

Use case number	TC-17
Use case name	Multicast service forwarding delay test
Testing purposes	Test multicast service forwarding delay
Preconditions	1. 1. If the ONU data port is 4 (or less than 4), connect one OLT and 10 tested ONUs as shown in the following figure. Each ONU uses a GE/GE interface. 2. 2. If there are 8 ONU data ports, connect 2 tested ONUs, one of which connects all 8 ports to the data network analyzer port, and the other ONU selects 2 ports to connect to the data network analyzer. 3. 3. If there are more than 10 ONU data ports (including 10), connect one ONU to be tested, and select 10 ports to connect to the data network analyzer. 4. 4. Connect the 20km disk between the OLT and the optical splitter. 5. The test was conducted using an automated script.
test environment	
Test procedure	7. 7. Connect to the network according to the above figure and complete the system multicast service configuration. 8. The data network analyzer is used to test the multicast service forwarding delay. The test uses three typical packet lengths: 64 bytes, 512 bytes, and 1518 bytes. The test time is set to 30 seconds. Each packet length is tested once for each ONU port. Join 16 groups, the total traffic of the 16 groups is 95M, all the ONU ports are added to

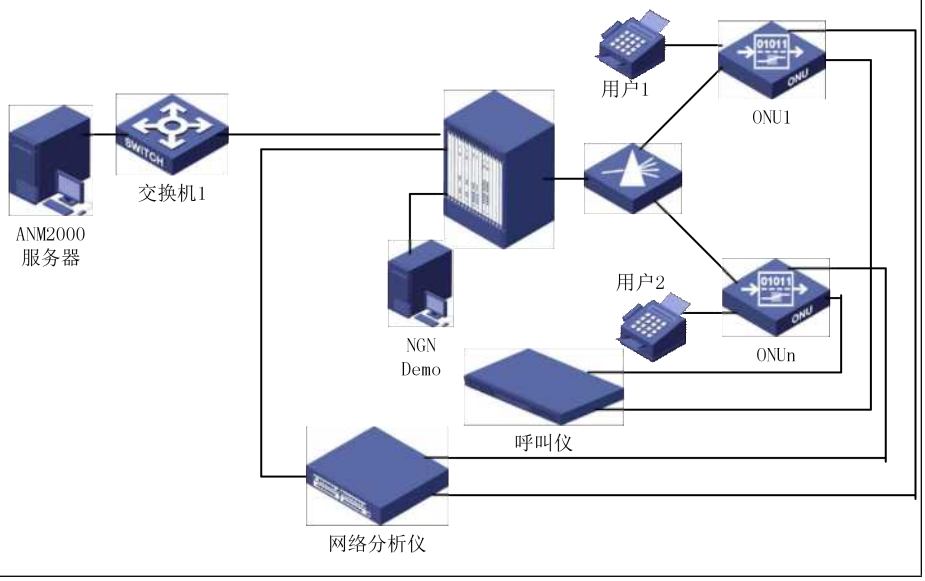
	the same 16 groups, and the join mode is Accumulate. Record minimum forwarding delay, average forwarding delay, maximum forwarding delay.
expected results	The multicast forwarding delay should be less than 100ms.
Test Results	Forwarding delay is 4.9ms
Test conclusion	Pass [√] fail [ ] not tested [ ]
Remarks	

Multicast join/leave delay

Use case number	TC-18
Use case name	Group join/leave delay test
Testing purposes	Test group join/leave delay
Preconditions	1. 1. If the ONU data port is 4 (or less than 4), connect one OLT and 10 tested ONUs as shown in the following figure. Each ONU uses a GE/GE interface. 2. 2. If there are 8 ONU data ports, connect 2 tested ONUs, one of which connects all 8 ports to the data network analyzer port, and the other ONU selects 2 ports to connect to the data network analyzer. 3. 3. If there are more than 10 ONU data ports (including 10), connect one ONU to be tested, and select 10 ports to connect to the data network analyzer. 4. 4. Connect the 20km disk between the OLT and the optical splitter. 5. Enable the IGMP proxy function of the OLT and enable IGMP Snooping on the ONU. The test is performed using an automated script.
test environment	
Test procedure	1. 1. Connect to the network according to the above figure and complete the system multicast service configuration. 2. Use the data network analyzer to test the multicast service forwarding delay. The test uses a 64-byte packet length. The test time is set to 30 seconds. The test is performed

	once. Each ONU port is added to 4 groups. The total traffic of the four groups is 20M. All ONUs. The ports are all added to the same 16 groups, and the join mode is Accumulate. Record the join/leave delay of the 16th group.
expected results	
Test Results	Group join and leave delay should be less than 30ms
Test conclusion	Pass [√] fail [ ] not tested [ ]
Remarks	

2.2 indicator test

Use case number	TC-20
Use case name	Indicator test
Testing purposes	Test the ONU hardware indicator
Preconditions	1. The ONU to be tested; 2. Network analyzer; 3. Caller OLT system.
test environment	

<table>
<tr><td>Test procedure</td><td>1. 1. Power on the ONU and connect the PON port fiber, network cable and telephone line respectively.
2. Compare the status of the actual indicator and record the status of each hardware port indicator.</td></tr>
<tr><td>expected results</td><td>
<table>
<tr><th>name</th><th>status</th><th>meaning</th></tr>
<tr><td rowspan="2">power supply</td><td>Off</td><td>The device is not powered on.</td></tr>
<tr><td>Constantly bright</td><td>The device is powered on</td></tr>
<tr><td rowspan="2">Network port</td><td>Off</td><td>The network port is not connected.</td></tr>
<tr><td>Constantly bright</td><td>Network port connection</td></tr>
<tr><td rowspan="3">Network G/optical signal</td><td>Off</td><td>Indicates that the ONU has not started the activation process.</td></tr>
<tr><td>flicker</td><td>Indicates that the ONU is active</td></tr>
<tr><td>Constantly bright</td><td>Indicates that the ONU has been activated.</td></tr>
</table>
</td></tr>
<tr><td>Test Results</td><td>All indicators are lit and the status is normal.</td></tr>
<tr><td>Test conclusion</td><td>Pass [√] fail [ ] not tested [ ]</td></tr>
<tr><td>Remarks</td><td></td></tr>
</table>

3 test conclusions

The test lasted for 5 days and tested 20 items, of which 20 items were passed, 0 items were not passed, and 0 items were not tested.

1. The panel indicator of the device is functioning normally.
2. The full indicator of the Ethernet service of the device is tested normally.
3. The indicator test of the optical port of the device passes;
4. The high temperature test of the equipment passed.

Tester: Tony

Date: 2018-8-26