Product Introduction

MD1230/MP1590 Family
Version 7.1
Overview

PON Solution

IPTV Solution
PON Solution

Application:
E-PON System Analysis/Performance measurement

Network

Application:
Verify QoS of each ONU in Upstream, and measure general transmission performance.

Multi Flow Counter
Multi Stream Generation

Application:
Measure some ONUs performance and QoS simultaneously.

Group Measurement
Low-cost-per-port Measurement

E-PON OAM Analysis
LLID Flow Counter
PON Solution

PON Measurement (OLT Side) (1)

Verify QoS of each ONU signal from upstream signal sent from OLT.

Step 1
Extract each ONU signal from received upstream signal using IP address as ID.

Step 2
Check QoS of each ONU for signal from ONU.

Multi Flow Counter

Check Throughput for each ID as graph.

Check delay for each ID.

Measure
• Throughput
• Latency
• Frame Loss
for each ID (IP Address in this example) and verify QoS for each ID.
PON Solution

PON Measurement (OLT Side) (2)

Generate signal sent to each ONU from MD1230 to verify throughput of entire network.

Multi Tx Stream

Set any of the following parameters independently for each ONU using Multi Tx Stream method with downstream data flowing to OLT from MD1230.

- Address: MAC, IP
- Client Data Format: TCP, UDP, IPv6, User-defined, etc.
- VLAN: Supports Q-in-Q
- Frame Length: 48 to 10,000 Bytes
- And others
PON Measurement (ONU Side) (1)

Configure low-cost test environment for multiple ONUs (clients) connected to PON.

MU120131A 10M/100M/1000M Ethernet Module
- 10/100/1000 BASE-T
- RJ-45 Auto MDI-X
- 12 ports

MU120132A Gigabit Ethernet Module
- 1000 BASE-SX/LX/LE/LR
- SFP Transceiver (LC connector)
- 8 ports

Full range of multi-port modules for measuring multiple ONU (clients), supporting measurement of all ports in a 32-branch PON system using one MD1230B.
PON Measurement (ONU Side) (2)

Verify QoS of multiple ONUs using throughput, delay, BER, etc.

(1) Throughput Measurement

<table>
<thead>
<tr>
<th>Name</th>
<th>Unit 1.1 Current</th>
<th>Unit 1.2 Current</th>
<th>Unit 1.3 Current</th>
<th>Unit 1.4 Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitted Bit Rate</td>
<td>11.500Gbps</td>
<td>20.600Gbps</td>
<td>8.399Gbps</td>
<td>16.590Gbps</td>
</tr>
<tr>
<td>Transmitted Bit Rate (%)</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Transmitted Byte</td>
<td>31.700</td>
<td>10.007</td>
<td>9.043</td>
<td>9.057</td>
</tr>
<tr>
<td>Transmitted Frame</td>
<td>15.122</td>
<td>10.047</td>
<td>1.773</td>
<td>25.402</td>
</tr>
<tr>
<td>Received Bit Rate [b/s]</td>
<td>13.716Gbps</td>
<td>27.502Gbps</td>
<td>2.743Gbps</td>
<td>30.480Gbps</td>
</tr>
<tr>
<td>Received Bit Rate (%)</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Received Byte</td>
<td>30.744</td>
<td>3.278</td>
<td>5.932</td>
<td>31.807</td>
</tr>
<tr>
<td>Received Frame</td>
<td>8.708</td>
<td>8.506</td>
<td>2.843</td>
<td>25.411</td>
</tr>
</tbody>
</table>

(2) BER Measurement

Verify Tx QoS of each ONU at 1-bit resolution using BER measurement.

Pattern for BER Measurement

- Preamble 8 bytes
- Header
- Data
  - Single PRBS9
  - Cross PRBS23, 31
- FCS 4 bytes
- IFG 12 bytes

(3) Delay Measurement

In addition to normal Delay measurement, measurement of Delay distribution is also built-in for statistical verification of network randomness.
EPON System Analysis (1)

Monitor signals between E-PON OLT and ONU to analyze OAM exchange.

(1) EPON OAM Analysis

Use Capture/Decode function to analyze EPON OAM exchanges.

Supported Analyses
- MPCP Frames
- IEEE802.3ah Frames

(2) EPON OAM Statistics

Measure MPCP exchanges with Multi Flow Counter to verify OAM statistics.
Verify QoS of signal in E-PON for each LLID using Multi Flow Counter.

Step 1
Extract each ONU signal from received signal in EPON using LLID as ID.

Step 2
Check QoS of each ONU for signal from ONU.

Measure
• Throughput
• Latency
• Frame Loss
for each ID (LLID Address in this example) and verify QoS for each ID.
PON Solution

PON Measurement (Total Performance)

Network to EPON Performance

Network to Client Performance

Client to EPON Performance
IPTV Solution

Supports IGMPv2/v3, and MLDv1/v2

Contents Server

Multicast stream A

Multicast stream B

IPv4: IGMP
IPv6: MLD

Application:
Generates load for checking network performance
Generates multicast stream
Generated fragment data

Application:
Emulates high load with multiple connected hosts

Application:
Check multicast network QoS
Multiflow Counter Function
Capture Decode Function

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IPTV Solution

Stream Generation

Generate load for checking network performance.

Fragment Test Stream

Automatically create fragmented test data from any test data.

Multichannel Stream

Create stream for multiple channels (multiple multicast addresses). Address, Tx rate, etc., are set separately for each channel.
Multicast Host Emulation – Leave/Join

Reproduce conditions as each host repeatedly performs Leave/Join requests to server to generate high server load.

To emulate a number of groups, hosts perform repeated Join operations at fixed intervals. After the specified number of hosts has joined, Leave operations are performed repeatedly.
Multicast Host Emulation – Channel Zapping

Multiple groups make continuous channel switching requests to server (Channel Zapping) to create high network load.

To emulate a number of groups, viewing-channel switching requests are made at fixed intervals to create a continuous Channel Zapping condition.
QoS Measurement of Each Channel (1)

Verify QoS of each channel or each host.

Multi Flow Counter

Measure throughput (traffic) of each channel (each multicast address).

Confirm packet loss conditions.
QoS Measurement of Each Channel (2)

Verify network delay by emulating multiple hosts simultaneously and creating high-load Channel Zapping conditions.

By measuring time-delay distribution, confirm the network degree of delay (variation) under high-load conditions.

Verify amount of delay of each channel and host in chronological sequence.
QoS Measurement – Confirming Channel Switching Time

Capturing and analyzing the exchanges between the host and supports verification of channel switching time.

- IGMP (Membership Report)
- Multicast Stream
- Multicast Stream
- Host
- Router (Network Side)

Ethereal/Wireshark

Capture

Switching Time