

MD1230/MP1590 Family

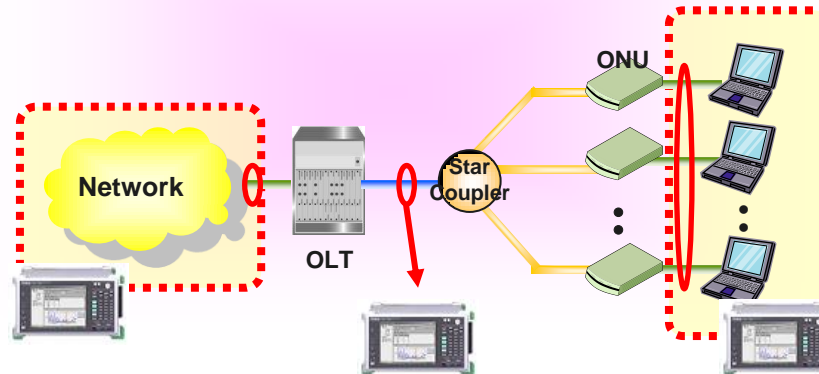
Version 7.1

MD1230/MP1590 Version7.1 Product Introduction

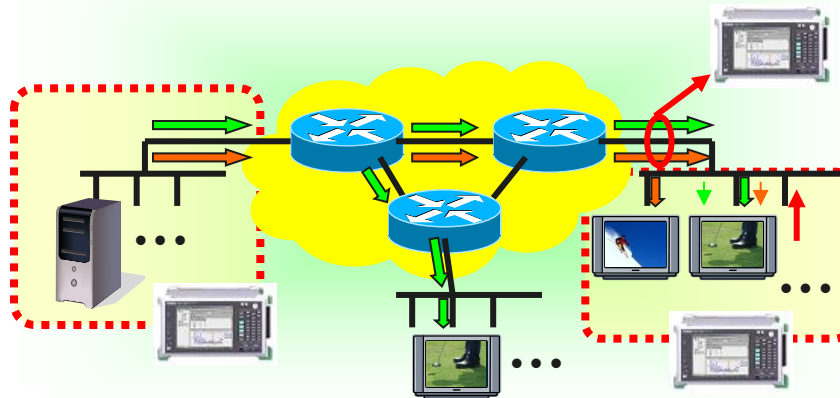
Anritsu Corporation

Overview

PON Solution



IPTV Solution



PON Solution

PON Solution

Application:
E-PON System Analysis/Performance
measurement



E-PON OAM Analysis
LLID Flow Counter

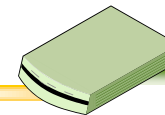
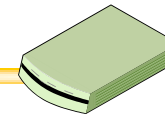
Network



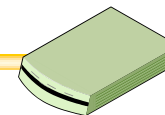
OLT

Star
Coupler

ONU



...



...



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.

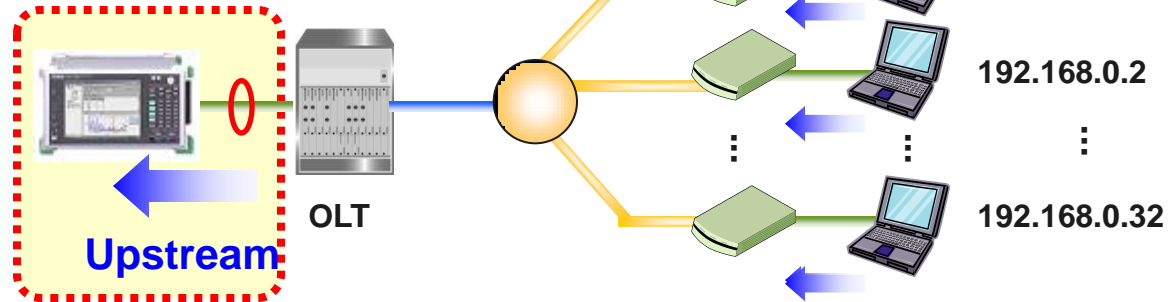


Group Measurement
Low-cost-per-port
Measurement

PON Solution

PON Measurement (OLT Side) (1)

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



Step 2

Check QoS of each ONU for signal from ONU. *Multi Flow Counter*

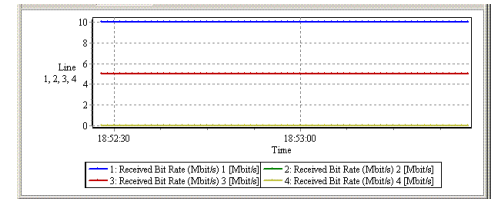
Field Setting

- ☐ Test Frame Flow ID (16bit)
- ☐ MAC DA (48bit)
- ☐ MAC SA (48bit)
- ☐ Ether Type (16bit)
- ☐ VLAN ID #1 (12bit)
- ☐ VLAN ID #2 (12bit)
- ☒ IPv4 Source Address (32bit)
- ☐ IPv4 Destination Address (32bit)
- ☐ IPv4 Protocol (8bit)
- ☐ IPv4 TOS Precedence (6bit)
- ☐ IPv4 DSCP (6bit)
- ☐ IPv4 TTL (8bit)

Flow ID to Monitor

No.	IPv4 Source Address
1	192.168.0.1
2	192.168.0.2
3	192.168.0.3
4	192.168.0.4

Received Bit Rate (Mbit/s) 1	10.000Mbit/s
Received Bit Rate (Mbit/s) 2	5.000Mbit/s
Received Bit Rate (Mbit/s) 3	5.000Mbit/s
Received Bit Rate (Mbit/s) 4	0Mbit/s
Received Bit Rate (Mbit/s) Other	0Mbit/s
Received Rate (%) 1	1.31%
Received Rate (%) 2	0.66%



Check Throughput for each ID as graph.

Step 1

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

Measure

- Throughput
- Latency
- Frame Loss

for each ID (IP Address in this example) and verify QoS for each ID.

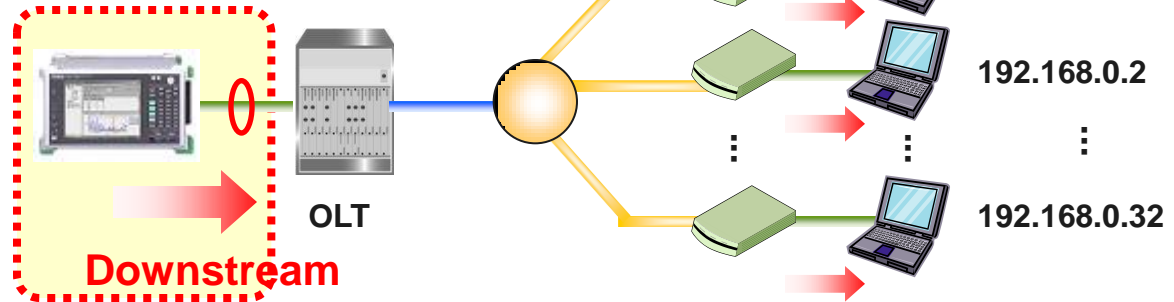
Current Latency (us) 1	0.304us
Current Latency (us) 2	0.304us
Current Latency (us) 3	0.304us
Current Latency (us) 4	-

Check delay 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

ID	Distribution	Length	Protocol	VLAN...	Errors
<input checked="" type="checkbox"/> 1	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 2	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 3	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 4	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 5	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 6	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 7	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 8	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 9	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 10	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 11	Next	Auto	IPv4	None	None
<input checked="" type="checkbox"/> 12	Jump to #1	Auto	IPv4	None	None

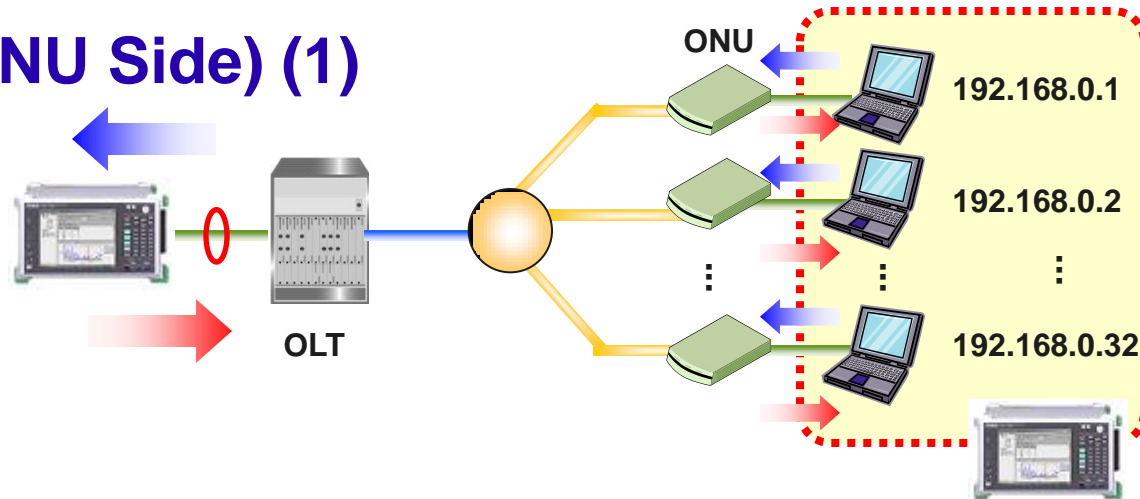
Set any of the following parameters independently for each ONU using Multi Tx Stream method with downstream data flowing to OLT from MD1230.

- 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 Solution

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



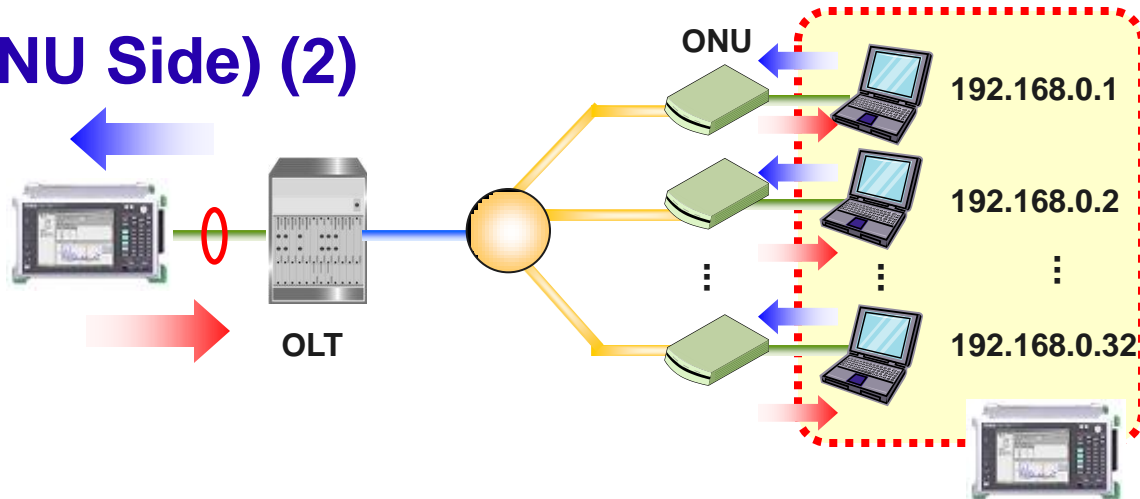
- 1000 BASE-SX/LX/LE/LR
- SFP Transceiver (LC connector)
- **8 ports**

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 Solution

PON Measurement (ONU Side) (2)

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



(1) Throughput Measurement

Name	Unit1:3:1 Current	Unit1:3:2 Current	Unit1:3:3 Current	Unit1:3:5 Current
Transmitted Bit Rate (bit/s)	11,650bit/s	20,609bit/s	8,394bit/s	16,598bit/s
Transmitted Bit Rate (%)	13.00%	69.00%	4.00%	40.00%
Transmitted Byte	31,788	10,607	9,048	8,957
Transmitted Frame	15,132	10,047	1,173	25,402
Received Bit Rate (bit/s)	13,716bit/s	27,928bit/s	2,643bit/s	30,448bit/s
Received Bit Rate (%)	42.00%	93.00%	61.00%	48.00%
Received Byte	30,744	3,278	5,932	31,807
Received Frame	27,358	8,505	3,843	25,411

Display measured throughput of **multiple ports on one screen.**

(2) BER Measurement

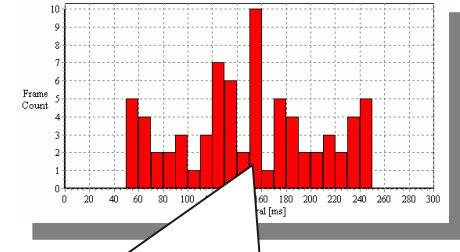
PRBS Frame Error Count	28,703	28,703
PRBS Frame Error Rate	2.7E-03	0
PRBS Bit Error Count	9,894	9,894
PRBS Bit Error Rate	2.7E-03	0

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
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(3) Delay Measurement

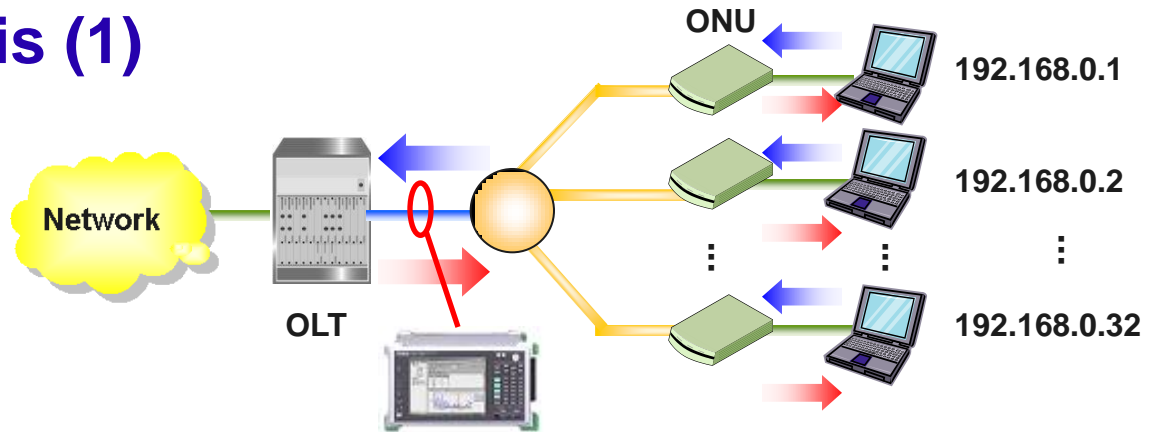


In addition to normal Delay measurement, **measurement of Delay distribution** is also built-in for statistical verification of network randomness.

PON Solution

EPON System Analysis (1)

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



(1) EPON OAM Analysis

Received total 4 Frames (Captured Frames: 4)					
No.	Type	VLAN ID	SA	DA	
1	IPv4	-	127.0.0.1	127.0.0.1	
2	MAC Control Fr...	-	00:00:00:00:00:00	00:00:00:00:00:00	
3	MPCP	-	00:00:00:00:00:00	01:80:C2:00:00:02	
4	IPv4	-	127.0.0.1	127.0.0.1	

Ethernet : --- Ethernet Header ---	
Ethernet : Destination Address	= 01 80 C2 00 00 02
Ethernet : Source Address	= 00 00 00 00 00 00
Ethernet : Type	= 88 09 (Slow Protocols)

SLOW : --- OAM ---	
SLOW : Subtype	= 03 (3: OAM)
SLOW : flags	= 00 00 00
SLOW : XXXXXXXX..... RESERVED	= (0)
SLOW :X..... Remote Stable	= (0: False)
SLOW :X..... Remote Evaluating	= (0: False)
SLOW :XX.... Local Stable/Evaluating	= (0: Local PTE Unsatisfied, Di
SLOW :X.... Critical Event	= (0: Not occurred)
SLOW :X.... Dying Gasp	= (0: Not occurred)
SLOW :X.... Link Fault	= (0: Not detected)
SLOW : Code	= 00 (0: Information)
SLOW : Information Type	= 01 (1: Local Information)
SLOW : Information Length	= 10 (16)
SLOW : OAM Version	= 01 (1)
SLOW : Revision	= 00 00 (0)
SLOW : State	= 02 (2)

Use Capture/Decode function to analyze EPON OAM exchanges.

Supported Analyses
MPCP Frames
IEEE802.3ah Frames

(2) EPON OAM Statistics

Field		Flow ID to Monitor	
MPCP		No.	MPCP
		1	88 08 00 02
		2	88 08 00 03
		3	88 08 00 04
		4	88 08 00 05
		5	88 08 00 06

Add... Delete

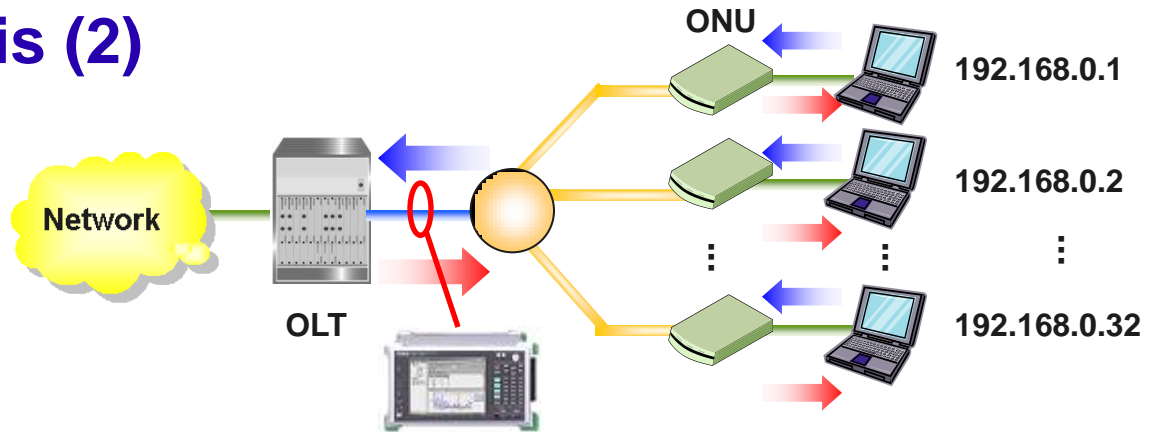
Remains of Field Length: 32bit

Measure MPCP exchanges with Multi Flow Counter to verify OAM statistics.

PON Solution

EPON System Analysis (2)

Verify QoS of signal in E-PON for each LLID using Multi Flow Counter.



Step 2

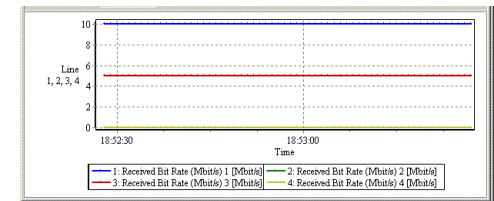
Check QoS of each ONU for signal from ONU. *Multi Flow Counter*

Field		Flow ID to Monitor	
No.	LLID	No.	LLID
1	00 00	1	00 00
2	00 00	2	00 00
3	00 01	3	00 01
4	00 02	4	00 02
5	00 03	5	00 03
6	00 04	6	00 04

Remains of Field Length: 48bit

Add... Delete

ID1 →	Received Bit Rate (Mbit/s) 1	10.000Mbit/s
ID2 →	Received Bit Rate (Mbit/s) 2	5.000Mbit/s
ID3 →	Received Bit Rate (Mbit/s) 3	5.000Mbit/s
ID4 →	Received Bit Rate (Mbit/s) 4	0Mbit/s
	Received Bit Rate (Mbit/s) Other	0Mbit/s
	Received Rate (%) 1	1.31%
	Received Rate (%) 2	0.66%



Check Throughput for each ID as graph.

Step 1

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

Measure

- **Throughput**
- **Latency**
- **Frame Loss**

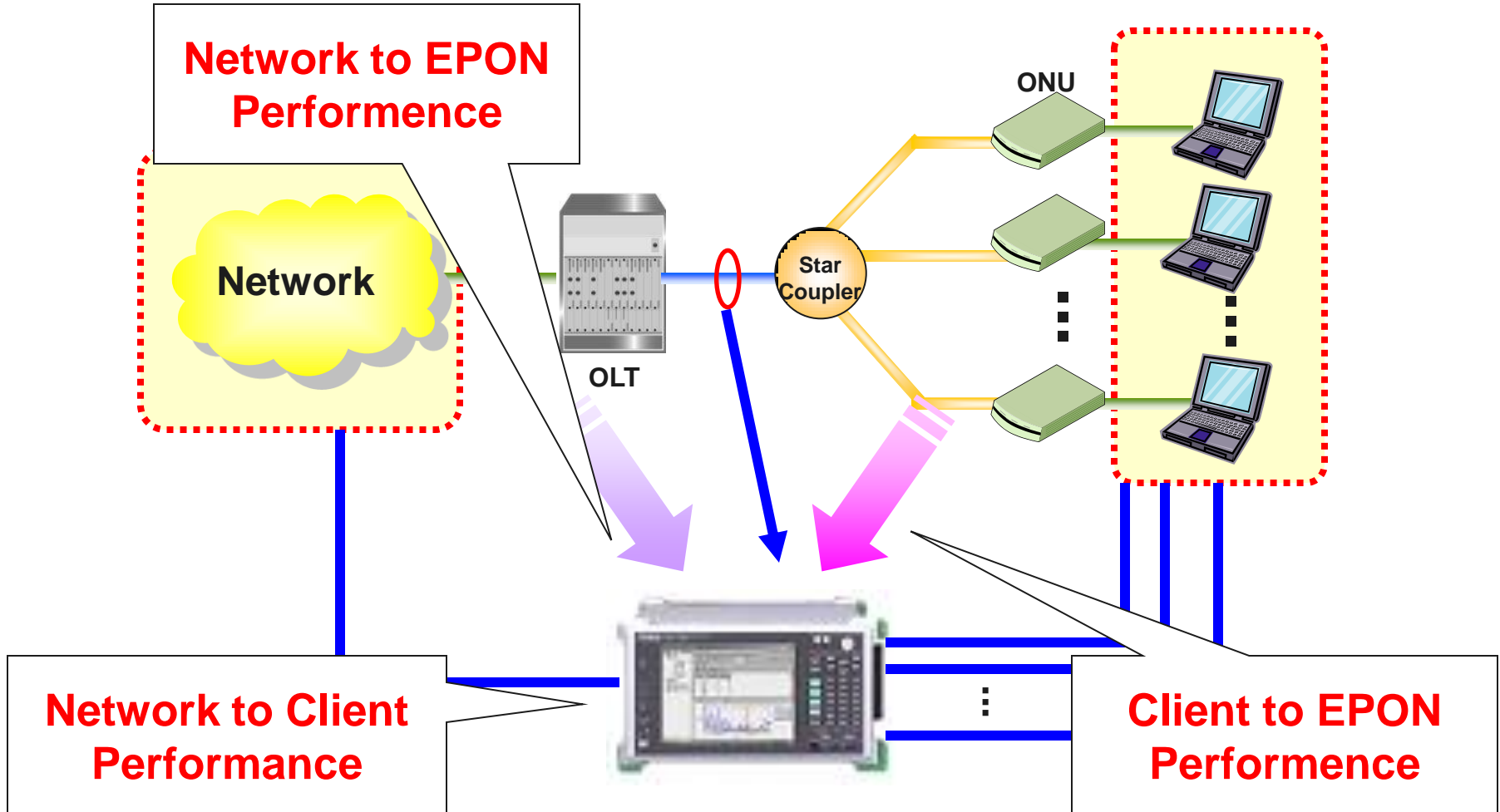
for each ID (LLID Address in this example) and verify QoS for each ID.

Current Latency (us) 1	0.304us
Current Latency (us) 2	0.304us
Current Latency (us) 3	0.304us
Current Latency (us) 4	-

Check delay for each ID.

PON Solution

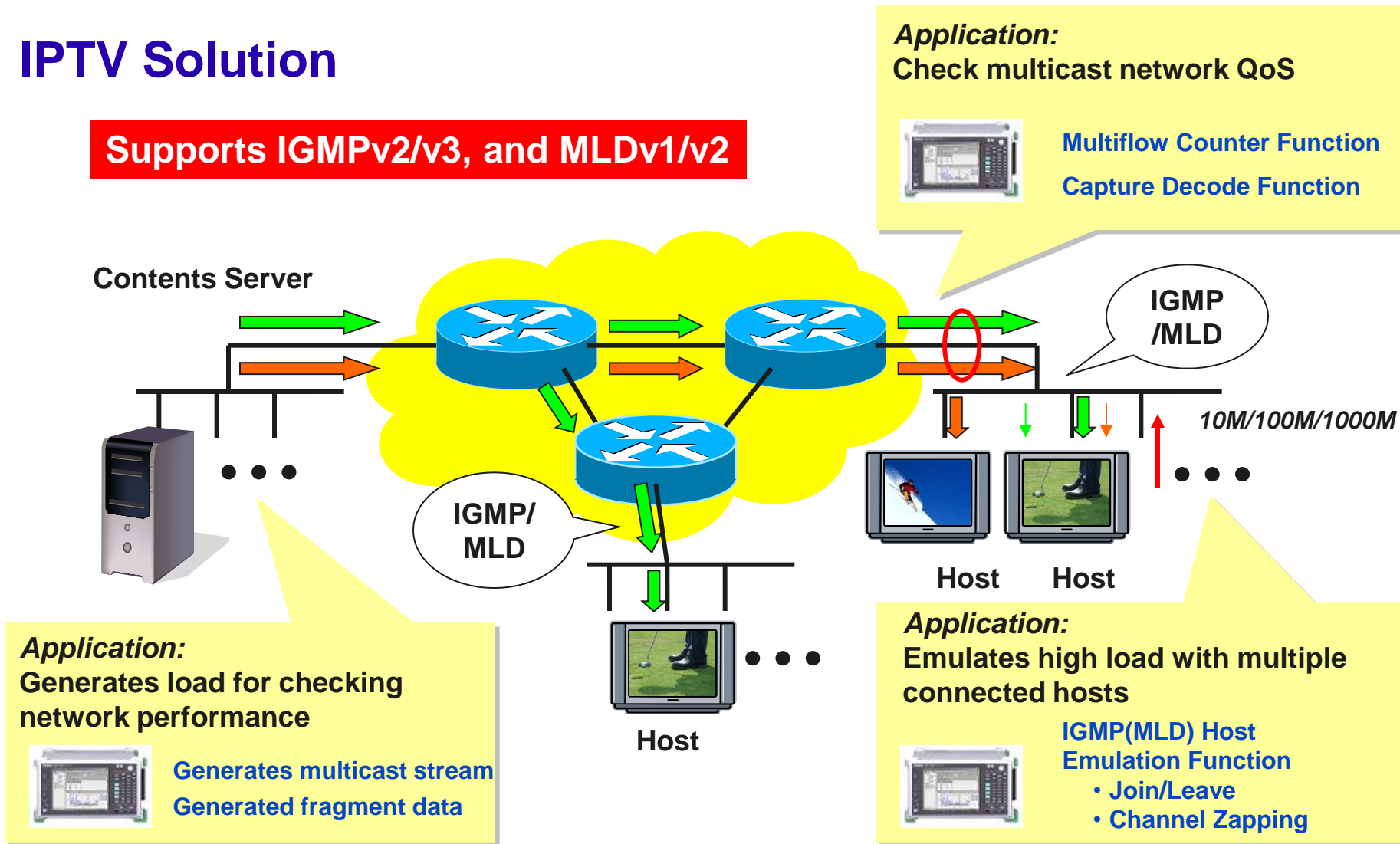
PON Measurement (Total Performance)



IPTV Solution

IPTV Solution

Supports IGMPv2/v3, and MLDv1/v2

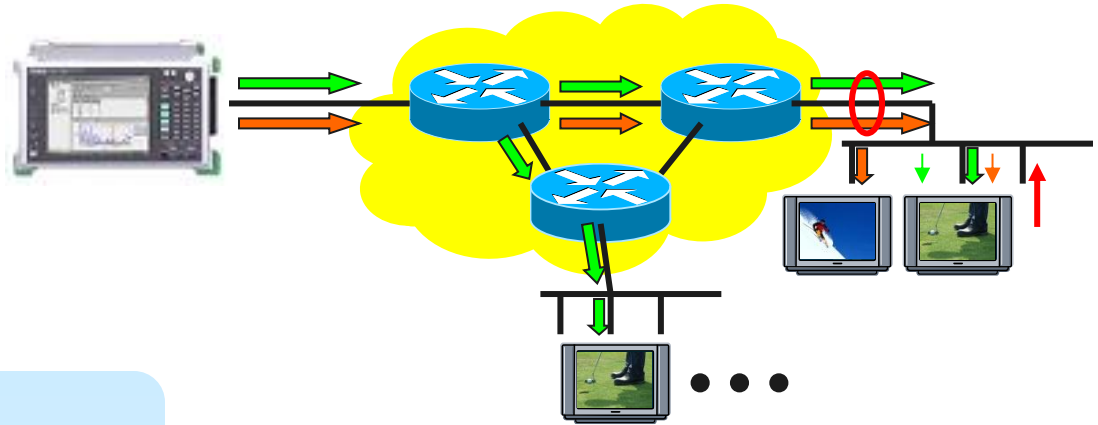


➡ **Multicast stream A**
➡ **Multicast stream B**

IPTV Solution

Stream Generation

Generate load for checking network performance.



Fragment Test Stream

ID	Distribution	Length	Protocol	VLAN...	Errors
<input checked="" type="checkbox"/> 1	Cont	Fixed 9000	IPv4	None	None

ID	Distribution	Length	Protocol	VLAN...	Errors
<input checked="" type="checkbox"/> 1	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 2	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 3	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 4	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 5	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 6	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 7	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 8	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 9	Next	Fixed 1014	IPv4	None	None
<input checked="" type="checkbox"/> 10	Jump to #1	Fixed 216	IPv4	None	None

Automatically create **fragmented test data** from any test data.

Multichannel Stream

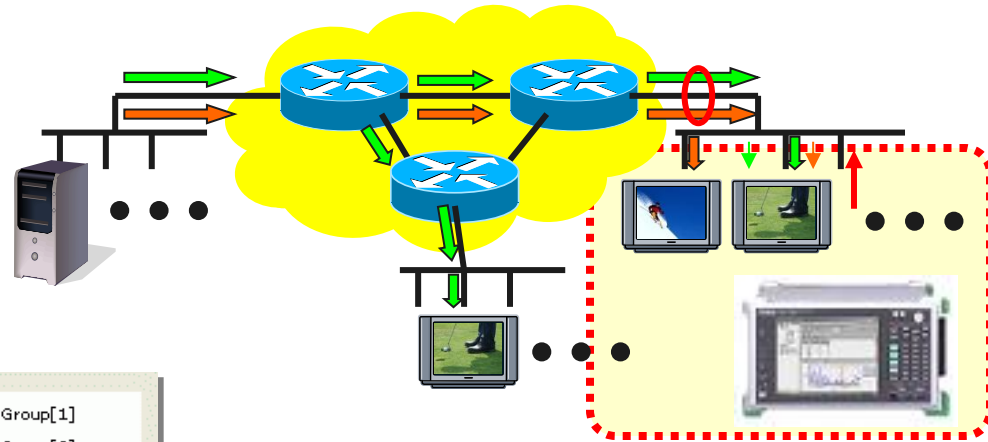
ID	Distribution	Length	Protocol	VLAN...	Errors
<input type="checkbox"/> 1	Next	Fixed 1518	IPv4	None	None
<input type="checkbox"/> 2	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 3	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 4	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 5	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 6	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 7	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 8	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 9	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 10	Next	Fixed 1518	IPv4	None	None
<input checked="" type="checkbox"/> 11	Jump to #1	Fixed 1518	IPv4	None	None

Create stream for multiple channels (multiple multicast addresses).
Address, Tx rate, etc., are set separately for each channel.

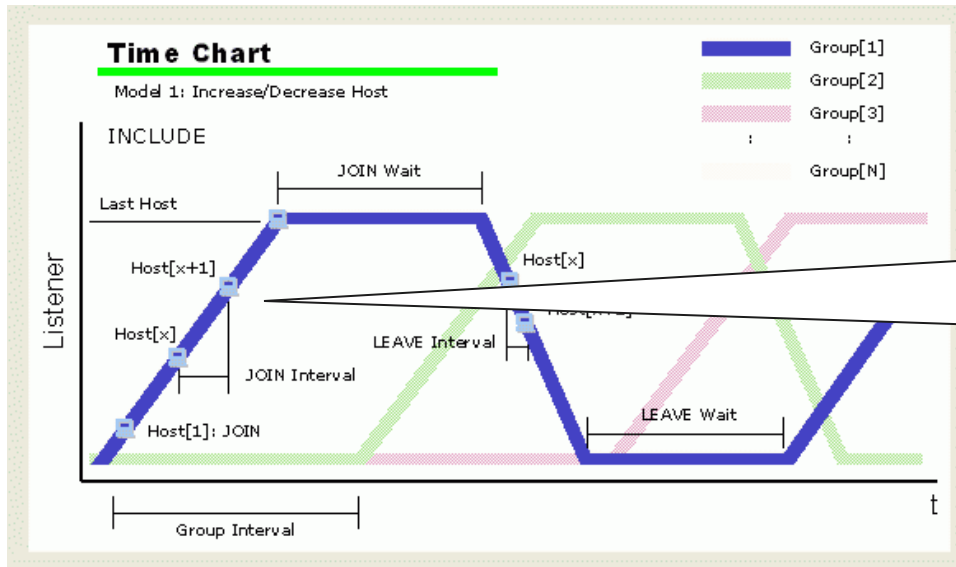
IPTV Solution

Multicast Host Emulation – Leave/Join

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



IGMPv2/v3, MLDv1/v2 Emulation

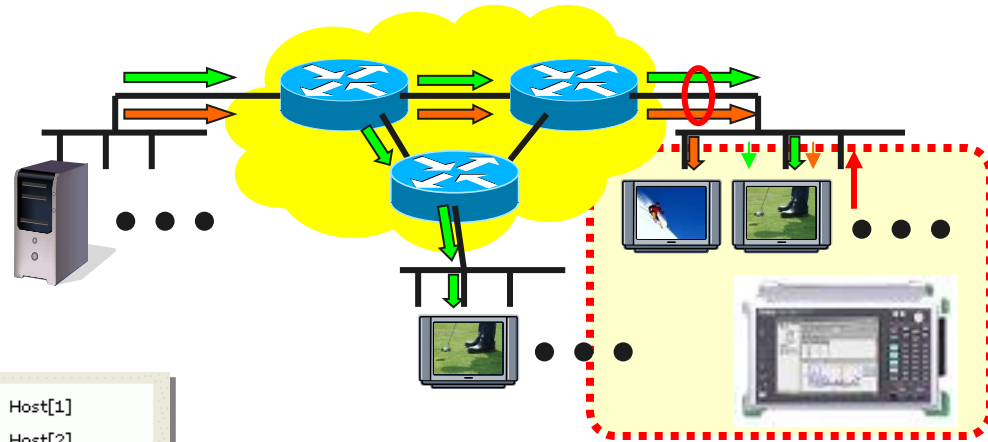


To emulate a number of groups, hosts perform repeated Join operations at fixed intervals. After the specified number of hosts has joined, Leave operations are performed repeatedly.

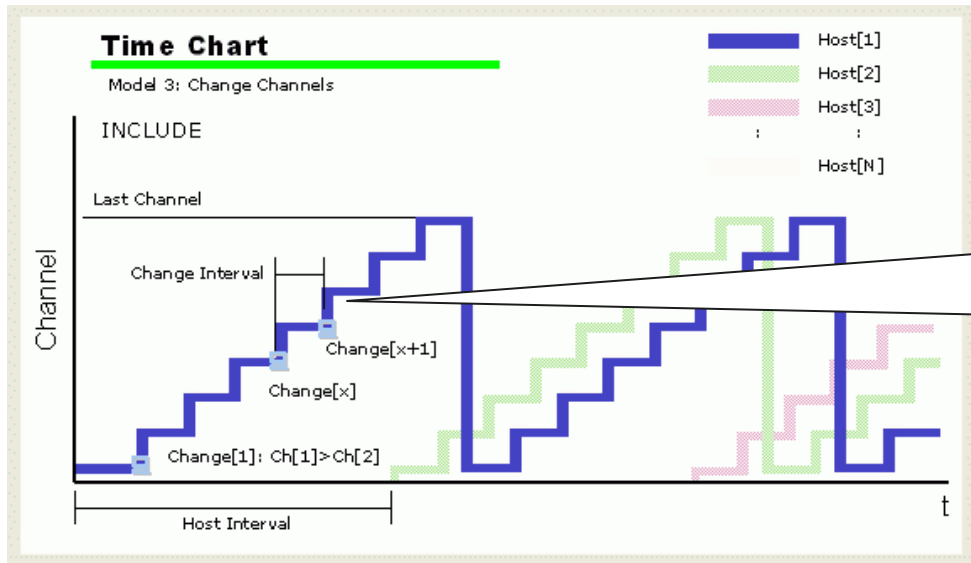
IPTV Solution

Multicast Host Emulation – Channel Zapping

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



IGMPv2/v3, MLDv1/v2 Emulation

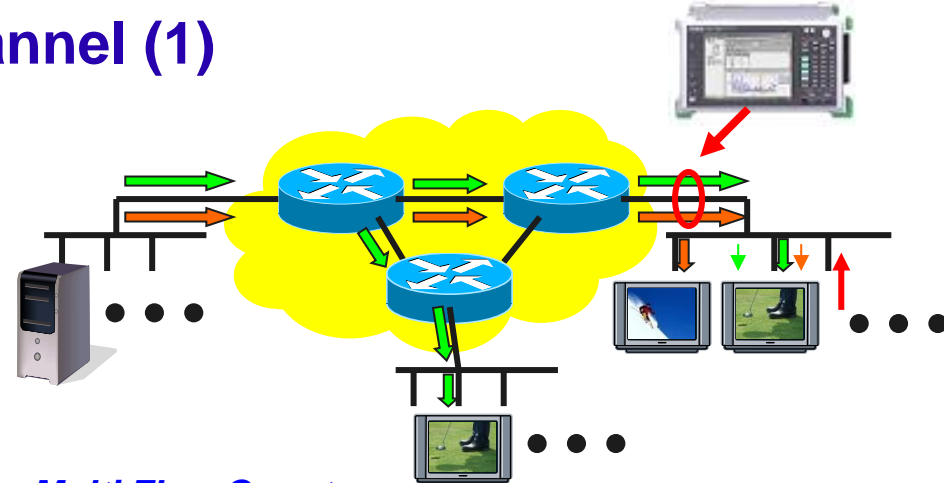


To emulate a number of groups, viewing-channel switching requests are made at fixed intervals to create a continuous Channel Zapping condition.

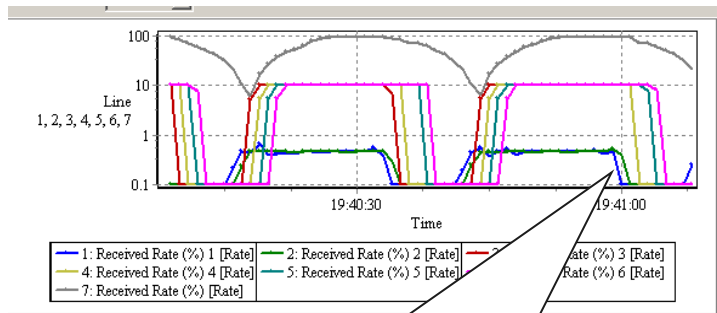
IPTV Solution

QoS Measurement of Each Channel (1)

Verify QoS of each channel or each host.



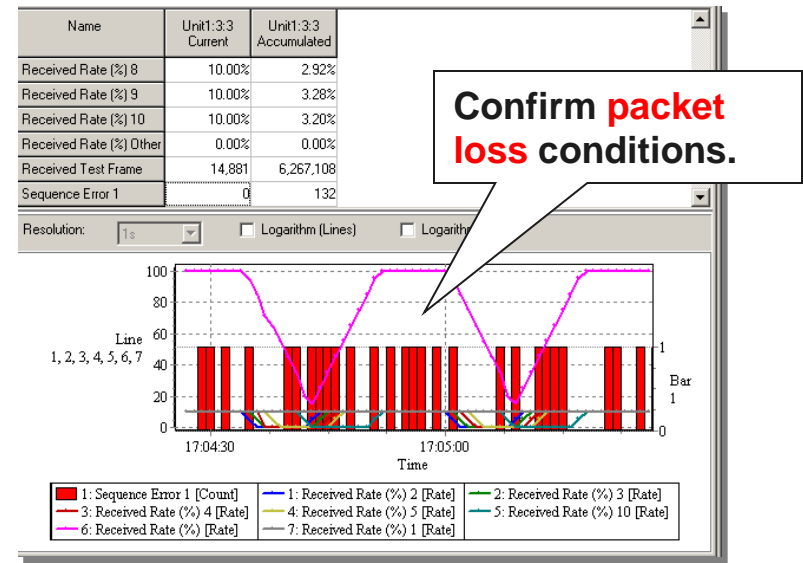
Multi Flow Counter



Multi Flow Counter

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

Multi Flow Counter

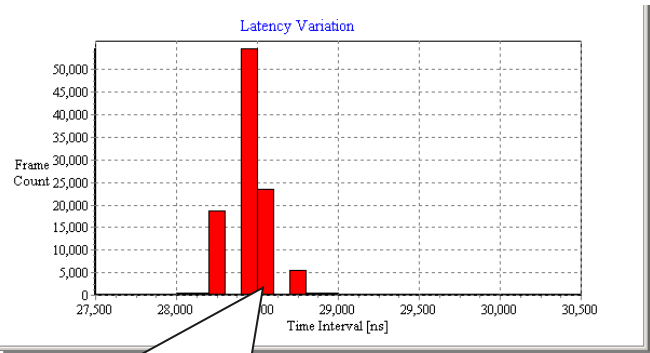


IPTV Solution

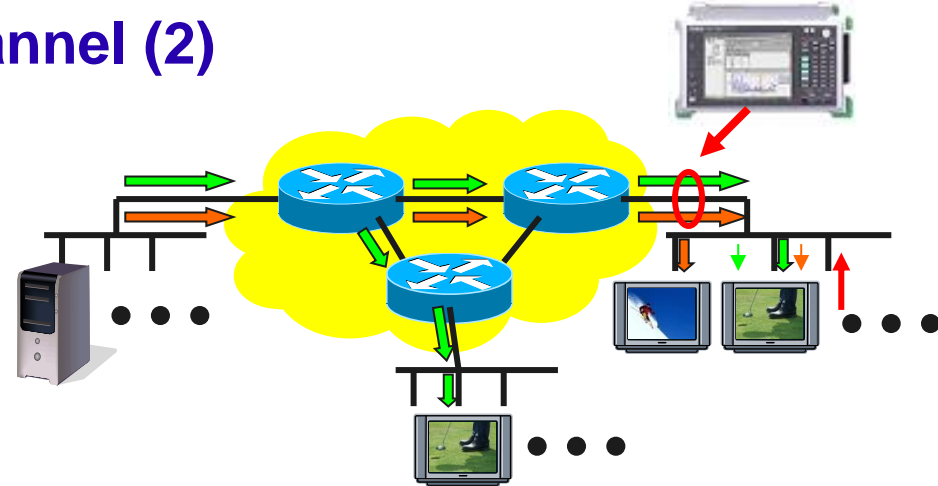
QoS Measurement of Each Channel (2)

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

Variation

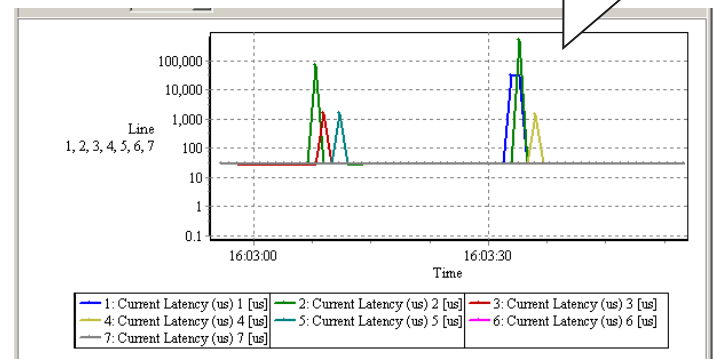


By measuring time-delay distribution, confirm the network degree of delay (variation) under high-load conditions.



Verify amount of delay of each channel and host in chronological sequence.

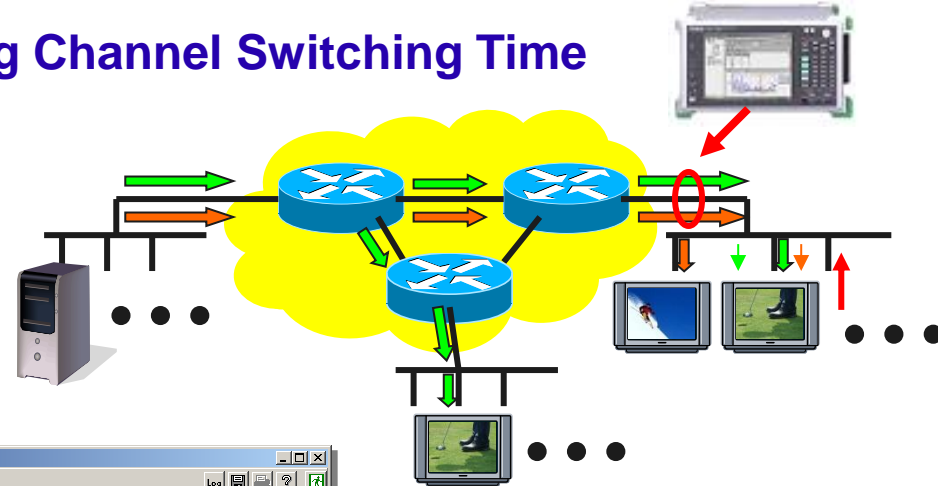
Multi Flow Counter



IPTV Solution

QoS Measurement – Confirming Channel Switching Time

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



Ethereal/
Wireshark

Counter Capture Latency

Received total 13 Frames (Captured Frames: 578)

Port	No.	Type	SA	DA	Len	Status	Captured Time	Latency
Unit1:3.4	1	IGMP	192.168.1.10	224.1.1.1	64	Good	14/05/01 15:01:32.034	
Unit1:3.3	2	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	3	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	4	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	5	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	6	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	7	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	8	UDP	192.168.3.10	224.1.1.1				
Unit1:3.3	9	UDP	192.168.3.10	224.1.1.1				
Unit1:3.4	2	IGMP	192.168.1.11	224.1.1.1				
Unit1:3.4	3	IGMP	192.168.1.10	224.1.1.1				

Capture

(Untitled) - Ethereal

Filter:

No.	Time	Source	Destination	Protocol	Info
11	0.018303	192.168.1.10	224.1.1.1	IGMP	V2 Membership Report
1	0.000000	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
2	0.018565	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
3	0.048276	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
4	0.068251	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
5	0.088284	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
6	0.118416	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
7	0.138382	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
8	0.168417	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr
9	0.188502	192.168.3.10	224.1.1.1	RTP	Payload type=MPEG-II tr

Frame 11 (64 bytes on wire (8 bytes captured) on interface 0)

Ethernet II, Src: 00:0d:59:14:89:a2, Dst: 01:00:5e:01:01:01

Internet Protocol, Src Addr: 192.168.1.10 (192.168.1.10), Dst Addr: 224.1.1.1 (224.1.1.1)

Internet Group Management Protocol

0000 01 00 5e 01 01 01 00 d0 59 14 89 a2 08 00 46 00 ..A.....Y.....F.
0010 00 20 00 83 00 00 01 02 81 a0 c0 a8 01 0a e0 01
0020 01 01 94 04 00 00 16 00 08 fd e0 01 01 01 00 00

IGMP
(Membership Report)

Multicast Stream

Multicast Stream

Host

Router (Network Side)

Switching Time

Note

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