

Ethernet QoS Test

Multi-stream Network Quality Evaluation

MT1000A Network Master Pro MT1100A Network Master Flex

MU100010A 10G Multirate Module MU110010A 10G Multirate Module
 MU110011A 100G Multirate Module
 MU110012A 40/100G Module CFP2



The importance of network services is growing with the spread of smartphones and Cloud services. In addition to high-added-value services, networks require high quality levels to ensure provision of even more useful services, and ensuring network Quality of Service (QoS) is becoming a key condition.

Anritsu’s MT1000A Network Master Pro and MT1100A Network Master Flex are all-in-one transport testers for Ethernet QoS tests and evaluations.

Introduction

Provisioning high QoS networks requires both high-level network design technologies and extensive man-hours related to QoS equipment settings. Additionally, although a network in general operational use may not suffer problems, rising traffic levels can soon cause problems and there are many instances where the network configuration must be re-examined after commercial deployment along with making changes to equipment settings. Solving these problems not only requires configuring the network according the switching equipment catalog specifications but also requires evaluation under realistic network loads prior to commercial deployment.

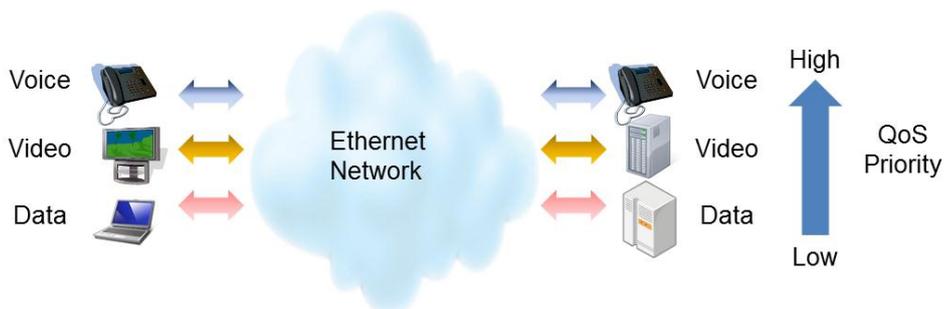


Figure 1. Network and Service Quality (QoS)

Network congestion is the key reason why QoS is required. Problems practically never occur under low traffic loads even without controlling QoS. However, a network soon becomes unstable as congestion occurs when the traffic at each UE increases. Consequently, evaluation of networks ensuring QoS as well as network equipment with QoS control functions requires the creation of high traffic loads (congestion) to confirm that the QoS controls are operating correctly.

Applications

Since a network cannot carry more data packets than the wire capacity, the crowded communications cause congestion and data packets exceeding the wire capacity are discarded (lost). Moreover, since packet transmission wait times increase under congested conditions, transmission delays (latency) become larger, causing more randomness in delay times (Jitter). Networks ensuring QoS prioritize transmission of traffic require high service quality and control the packet loss and transmission delays.

The following diagram shows an example of QoS using VLAN CoS (Class of Service). Normally, services like IP phones are assigned high traffic priority because they require high levels of real-time service quality which is badly affected by packet loss and transmission delays. Conversely, services like PC email and web browsing are assigned low traffic priority because they require low levels of real-time service. Higher CoS value are used for services with higher priority levels.

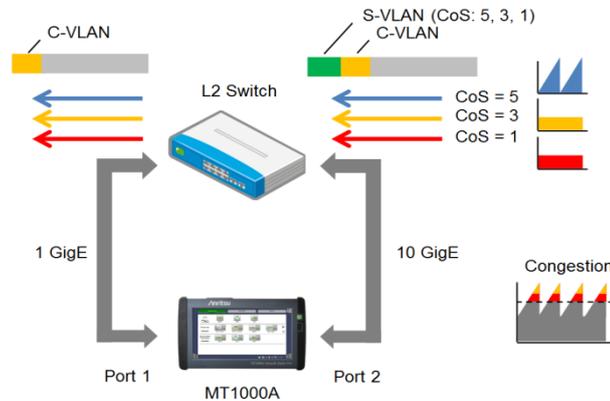


Figure 2. VLAN QoS Test

Traffic Generation and Monitor Functions

The MT1000A and MT1100A emulates high network load conditions and monitors the condition of each traffic type under these high load conditions to support QoS tests allowing evaluation prior to commercial deployment over the network.

Generating high traffic loads up to the full wire rate are easily accomplished on the MT1000A, but are difficult to generate using a live network. Using the MT1000A and MT1100A stream editing function makes it easy to simultaneously generate traffic for up to 16 streams while independently setting any QoS-related parameter such as the CoS value for each stream.

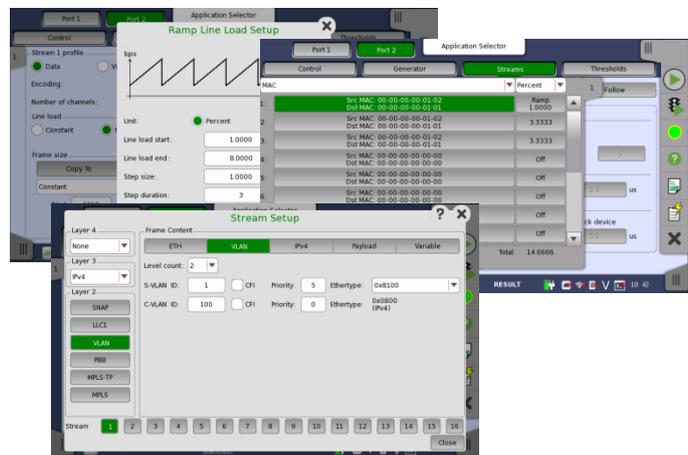


Figure 3. Traffic Generation

Simultaneously monitoring of each traffic condition (Frame Loss/Delay/Jitter (delay randomness)) for up to 16 streams supports the confirmation of the QoS control functions as well as measuring the effectiveness of the network QoS configuration.



Figure 4. Traffic Monitor

Measurement Examples

The number and proportion (%) of lost frames for each stream with different priorities can be measured. The example showing in figure 5 is confirming no high-priority-traffic packets have been lost.

Frame Loss	Port 1		Port 2	
	Frames	%	Frames	%
Stream 1	0	0.00 %	0	0.00 %
Stream 2	7.816 k	4.39 %	0	0.00 %
Stream 3	67.279 k	37.87 %	0	0.00 %
Stream 4	N/A	N/A	N/A	N/A

Figure 5. Measurement Results (Frame Loss)

The delay (Max., Min., Ave.) can be measured for each of the 16 streams with different priorities. The example in figure 6 confirms the high-priority traffic delay (latency) is maintained at low levels.

Latency(us)	Port 1			Port 2		
	Min.	Max.	Avg.	Min.	Max.	Avg.
Stream 1	6.7 us	179.2 us	95.7 us	138.4 us	139.1 us	138.7 us
Stream 2	6.7 us	26.146 ms	4.2267 ms	138.7 us	139.4 us	139.0 us
Stream 3	117.1 us	6.10558 s	29.113 ms	138.7 us	139.4 us	139.0 us
Stream 4	N/A	N/A	N/A	N/A	N/A	N/A

Figure 6. Measurement Results (Delay)

The Jitter (delay randomness) (Max., Min., Ave.) can be measured for each of the 16 streams with different priorities. The example in figure 7 confirms the high-priority traffic Jitter is maintained at low levels.

Jitter(us)	Port 1			Port 2		
	Min.	Max.	Avg.	Min.	Max.	Avg.
Stream 1	0.0 us	171.9 us	51.8 us	0.0 us	0.5 us	0.2 us
Stream 2	0.0 us	615.6 us	66.2 us	0.0 us	0.5 us	0.2 us
Stream 3	0.0 us	6.03099 s	545.4 us	0.0 us	0.5 us	0.2 us
Stream 4	N/A	N/A	N/A	N/A	N/A	N/A

Figure 7. Measurement Results (Jitter)

Irrespective of whether the traffic priority is high, if packet lost, delay and jitter are high, countermeasures are required, these include the review of QoS-related settings of network equipment and might even require the replacement of network equipment itself.

Product Features

- Generates high traffic loads up to full wire rate
- Generates and monitors traffic for up to 16 streams simultaneously
- Measures Frame Loss, Delay, and Jitter of each stream
- Supports up to 10 GigE (MT1000A) and up to 100 GigE (MT1100A)
- Supports QoS tests with all-in-one configuration and two ports at all line rates

Summary

The MT1000A and MT1100A can generate the high traffic loads needed for QoS tests and evaluation prior to commercial network deployment. It is the ideal tester for improving the quality of continuously evolving and expanding high-level networks.

Ordering Information MT1000A

Mainframe	
MT1000A	Network Master Pro
Test Module	
MU100010A	10G Multirate Module
Options	
MU100010A-001	Up to 2.7G Dual Channel
MU100010A-012	Ethernet 10G Dual Channel

Ordering Information MT1100A

Mainframe	
MT1100A	Network Master Flex
Test Modules	
MU110010A	10G Multirate Module
MU110011A	100G Multirate Module
MU110012A	40/100G Module CFP2
Power Supply Module	
MU110001A	Power Supply Module AC/DC
MU110002A	High Power Supply Module AC
Options	
MU110010A-001	Up to 2.7G Dual Channel
MU110010A-012	Ethernet 10G Dual Channel
MU110011A/12A-013	Ethernet 40G Single Channel
MU110011A/12A-014	Ethernet 40G Dual Channel
MU110011A/12A-015	Ethernet 100G Single Channel
MU110012A-016	Ethernet 100G Dual Channel

Note: Screen shots in this application note are made using the MT1000A. You can make similar screen shots with the MT1100A

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