TEST REPORT

Tolly.

#216100

January 2016

Commissioned by Ixia

Ixia Network Tool Optimizer (NTO) 5288

Processing Performance Versus the Gigamon GigaVUE-HC2 with One GigaSMART Module

EXECUTIVE SUMMARY

Network visibility is essential to network security and performance management. In practical terms, visibility relies on reliable and intelligent packet management. All traffic generated by switched port analyzer (SPAN) and test access point (TAP) ports must have duplicate packets eliminated and be delivered without loss to network tool ports. Ixia implements per-port, distributed processing to meet these goals.

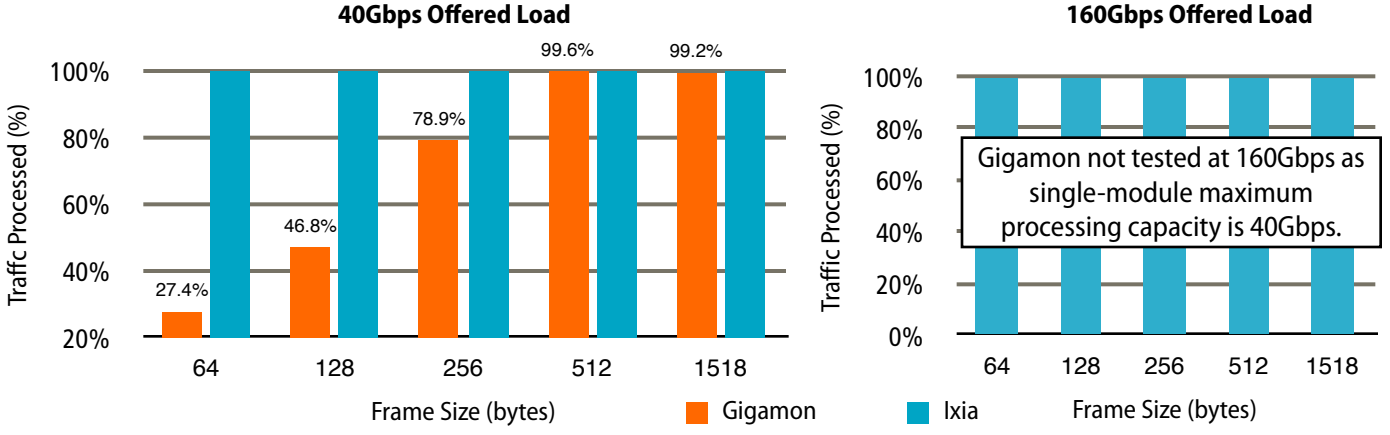
Ixia commissioned Tolly to evaluate the advanced function, packet processing capabilities of its Network Tool Optimizer (NTO) 5288 and compare them with Gigamon GigaVUE-HC2 multi-purpose visibility fabric node outfitted with the GigaSMART module for packet manipulation. Tests used systems outfitted with 16 10GbE port pairs (32 ports total, unidirectional traffic) focusing on the capabilities of a single 16-port processing module.

Tests showed that the Ixia NTO consistently outperformed the Gigamon solution delivering zero-loss, line-rate, 160Gbps throughput with 16 10GbE ports on one IXIA AFM processing module while performing packet deduplication where Gigamon failed to deliver as much as 70% of its stated 40Gbps processing capacity of a single GigaSMART module.

THE BOTTOM LINE

1. The Ixia Network Tool Optimizer 5288 supported line-rate deduplication performance (160Gbps) with one AFM module for all tested frame sizes
2. The Gigamon HC2 with one GigaSMART module lost packets and did not support specified 40Gbps deduplication performance for all frame sizes (e.g. 72.6% frame loss for 64-byte frames)
3. The performance of the Gigamon HC2 with one GigaSMART module was impacted by packet size and features enabled whereas Ixia NTO 5288 delivered steady results
4. In a live network, packet loss creates security blind spots and it is difficult for customers to realize Gigamon's packet loss if any conditions change (network load, frame size, configuration, etc.)

10GbE Packet Processing Performance with the Packet Deduplication Feature
Single Processing Module of 16 10GbE Ports
(as reported by Ixia IxNetwork 7.40)



Note: The Ixia NTO 5288 had one 16-port AFM SFP+ module to process data. The Gigamon GigaVUE-HC2 had one SMT-HC0/X16 16-port SFP+ GigaSMART front module to process the data.Unidirectional data was used. All ports on the processing module were egress ports. Each DUT has another 16-port SFP+ module as the input module.

Source: Tolly, December 2015

Figure 1

Visibility Architecture Background

Network visibility solutions provide the critical link between network infrastructure (e.g. LAN switches) and network analysis tools. To be valuable, these devices need to do more than simply provide a pipeline for packets from switch SPAN or TAP ports to network tools.

With multiple switch ports sending traffic, duplicate packets will no doubt exist in the traffic stream. Additionally, with traffic involving larger packets, frequently only a portion of the packet is of interest to the network tool. Intelligence in the fabric visibility device needs to be able to handle both deduplication and packet slicing and do that under load.

Ixia and Gigamon have architected their solutions differently. Ixia provides dedicated processing power at each of its output ports and uses FPGA technology for deterministic packet processing. Thus, a module of 16 10GbE ports has the power needed to provide deduplication/slicing at line rate to all ports. The Ixia 16-port Advanced Feature Module (AFM) implements this capability.

Gigamon, by contrast, centralizes its processing and rates the processing capacity of a single GigaSMART module up to 40Gbps. Thus, in this single-module scenario, the theoretical maximum throughput level is reached at only 25% of the combined port throughput. To achieve improved performance for Gigamon, additional GigaSMART modules would need to be purchased.

Results Summary

Packet Deduplication Performance

This test involved sending a 50/50 mix of unique/duplicate traffic and was run with five packet sizes from 64- through 1518-bytes. The test was first run at a 25% load (40Gbps) as that was the maximum processing rating advertised by Gigamon for a single module.

Ixia NTO processed 100% of the traffic without packet loss. By contrast,Gigamon demonstrated packet loss at every data size. At 256-bytes and below, the loss ranged from 20% to nearly 75%. With these loss levels, critical traffic needed for network analysis is almost guaranteed to be lost before reaching the network tool.

Ixia

Network Tool Optimizer

Packet Processing Performance Evaluation

Tolly. Certified

Tested December 2015

The test was run at 100% load (160Gbps) using Ixia NTO which was able to process all the traffic with zero loss. See Figure 1.

Impact of Features on Performance

As these devices are capable of running multiple functions simultaneously, it is important to understand whether enabling additional features will degrade performance.

To illustrate this, Tolly engineers reran the packed deduplication test referenced above but with the packet slicing feature enabled for each system.

As before, Ixia NTO was able to process 100% of the traffic with zero loss both at a

Packet Processing Performance Degradation
from Deduplication Only Results with the Additional Packet Slicing Feature
(as reported by Ixia IxNetwork 7.40)

Frame Size (bytes)	Performance Drop with the Additional Packet Slicing Feature (lower is better)			Gigamon (40Gbps) Aggregate Loss (dedupe and slicing)
	Ixia (40Gbps)	Ixia (160Gbps)	Gigamon (40Gbps)	
64	0%	0%	1.8%	74.4%
128	0%	0%	2.7%	55.9%
256	0%	0%	2.3%	23.4%
512	0%	0%	0%	0.4%
1518	0%	0%	0%	0.8%

Note: Delta between when the packed deduplication test was run without and then with packet slicing enabled. Aggregate loss column shows the loss with the deduplication feature and the packet slicing feature enabled.

Source: Tolly, December 2015

Table 1

40Gbps load as well as with a line-rate, 160Gbps load.

Gigamon, tested only at its rated 40Gbps, demonstrated even greater loss levels for 256-byte and smaller sizes losing an additional 1.8% to 2.7% of the offered traffic. See Table 1.

Baseline: Simple Filtering

As a prelude to the packet processing tests, Tolly engineers ran a baseline test to illustrate that both systems would be able to forward a line rate of 160Gbps when not processing traffic with the Ixia AFM module or the Gigamon GigaSMART module. Both systems passed this test by passing 100% of the offered load without any packet processing.

Test Background

Packet Deduplication

Duplicate packets typically exist because SPAN ports can frequently send multiple copies of the same data or because data from multiple taps in a network are forwarded to one tool, with some flows present in multiple taps. This test demonstrates the ability of the intelligent Network Packet Broker (NPB) to eliminate duplicate packets before forwarding them to a security tool. The ideal solution is that one copy of each packet is forwarded to the tool. Under no conditions should there be any loss of original data as that would create a "blind spot" for the security tool.

In a live network, where all counters are moving at variable rates, and some packet loss is expected via normal NPB operations such as filtering, it is practically impossible for a customer to compare input and output counters from the HC2 and realize that extra packets are being lost by Gigamon.

The Impact of Packet Loss on Network Visibility

Network visibility solutions are deployed to serve data to analysis tools so application performance is ensured and security tools can mitigate any threat of network exposure

Packet loss in a network visibility tool should be unacceptable. Visibility is supposed to enable clear insight into network data, not degrade the data that the analytics tools require.

Packet loss in visibility is an insidious problem. It creates blind spots to poor application performance or security threats. A visibility solution that delivers zero-loss is the only acceptable answer.

Source: Tolly, December 2015

Performance Reduction - with One Additional Feature

The intelligent Network Packet Broker (NPB) typically supports multiple features including de-duplication, slicing, masking, etc. This test evaluates whether the configuration (e.g. number of enabled features) impacts the processing performance of the solution under test. With the same test bed setup as the first test, engineers enabled one additional feature (packet slicing) to the existing de-duplication feature.

Test Methodology

Solutions Under Test

The Ixia Network Tool Optimizer 5288 (NTO 5288) under test has one 16-port Advanced Port Module (AFM) SFP+ module which supports line-rate processing with 160Gbps aggregated capability. The Gigamon GigaVUE-HC2 (Gigamon HC2) has one SMT-HC0/X16 16-port SFP+ GigaSMART front module which supports up to 40Gbps processing capability according to its data sheet. (In order to increase aggregate processing throughput for the Gigamon device, additional modules would be required.) See Table 2 for SUT information. See Figures 3 and 4 for Gigamon configurations.

Packet Deduplication

Figure 2 shows the paths for the test. The objective of the test configuration was to provide 40 Gbps of traffic to each device under test, the NTO 5288 and the Gigamon HC2 respectively, by evenly balancing the test traffic over 16 ports at 2.5 Gbps with 50% of the traffic being duplicates. An external test device was used to measure how many packets were removed by each device under test.

An Ixia XGS12 was configured to generate 1.25 Gbps of "original" traffic across 16 ports for a total of 20 Gbps. An NTO 7300 was configured as a 1:2 splitter to duplicate the traffic. The original 20Gbps packets continued to flow through to a second NTO 7300 and the duplicate 20 Gbps packets were sent to an Ixia XGEM Ethernet Network Emulator.

The XGEM creates controlled impairments of test traffic to simulate specific network conditions. In this case, the goal of the test was to recreate the condition where the traffic traversed two taps in the end user

environment with 19ms of latency between each tap. The XGEM device added 19ms of latency to the duplicate packet flow and forwarded the full 20Gbps of duplicate packets to the second NTO 7300.

The second NTO 7300 performed a process of combining the 20 Gbps of original packets and the 20 Gbps of duplicate packets, dividing the traffic into 16 ports at 2.5 Gbps that was sent to DUT 1, and replicating the traffic to a second set of 16 ports at 2.5 Gbps of traffic that was sent to DUT 2. The traffic going to DUT 1 and DUT 2 was captured and compared to ensure that each was being sent the same traffic.

Each DUT performed the configured operations and then forwarded traffic along 16 ports back to the XGS12 where the packets could be counted.

When performing the 160 Gbps test, the same test configuration was used and the traffic rates were increased by four times. Only the first 20 Gbps of duplicate traffic was delayed in this test configuration while the remaining 60 Gbps of duplicate traffic was not delayed. This simulates a configuration where some of the taps are in the LAN and others are in the WAN. In all other respects, the test configuration was identical.

The received packet counts as measured by the XGS12 were compared with the transmit counts and packet loss was computed as '(sent packets – received packets) / sent packets'.

Performance Reduction - with One Additional Feature

The same test traffic was used as the "Packet Processing Performance - with the Packet De-duplication Feature" test. The Packet Slicing Feature was enabled on both the devices under test. Ixia NTO settings: packet trimming, retain this header information when trimming: MAC, VLAN, MPLS, and L3, plus the next 20 bytes. Gigamon settings: Protocol IPv4/IPv6, offset 20.

Baseline Test with Basic Filtering

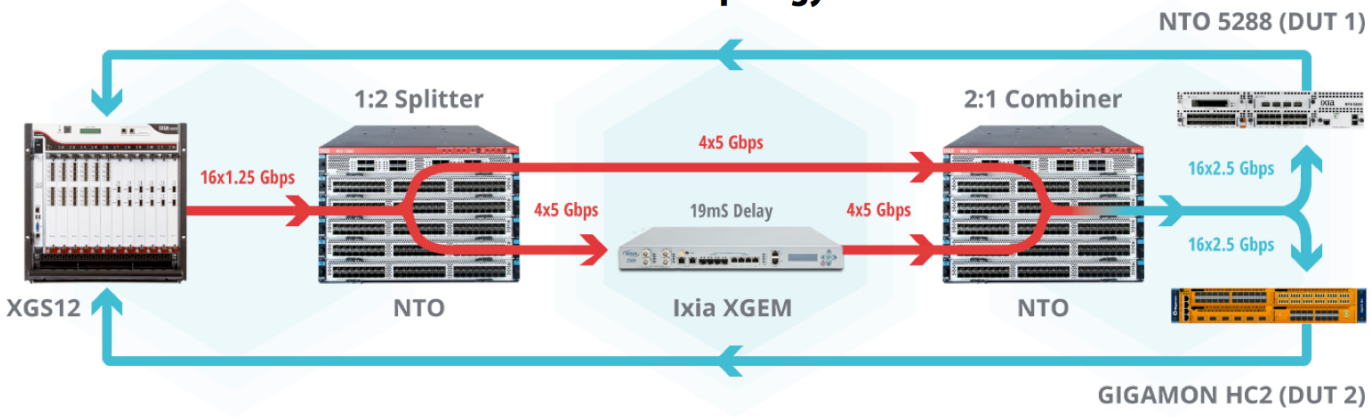
The same 160Gbps unidirectional unique traffic was sent to both the Ixia NTO 5288 and the Gigamon HC2.

Solutions Under Test

Vendor	Ixia	Gigamon
Chassis	Network Tool Optimizer 5288	GigaVUE-HC2
Processing Module	16-port AFM SFP+	SMT-HC0/X16
Input Module	16-port SFP+	BPS-HC0/B4X8/OM3
Software Version	4.3.0.19	4.4.00

Source: Tolly, December 2015 Table 2

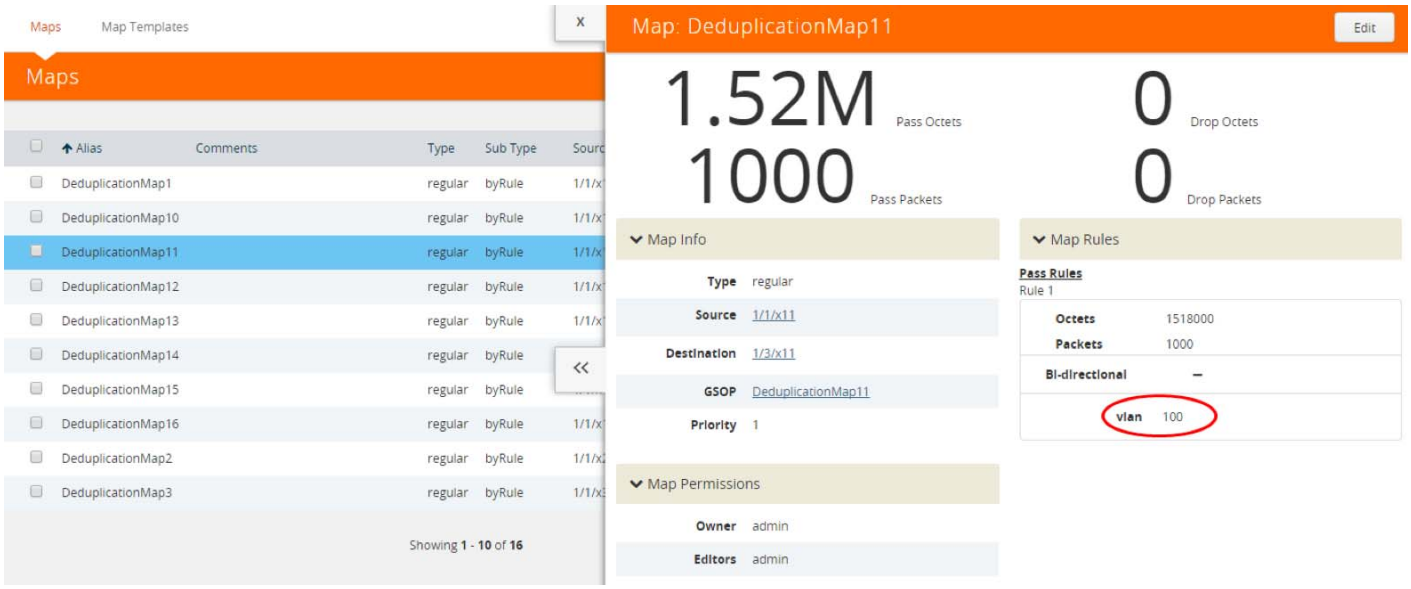
Test Bed Topology



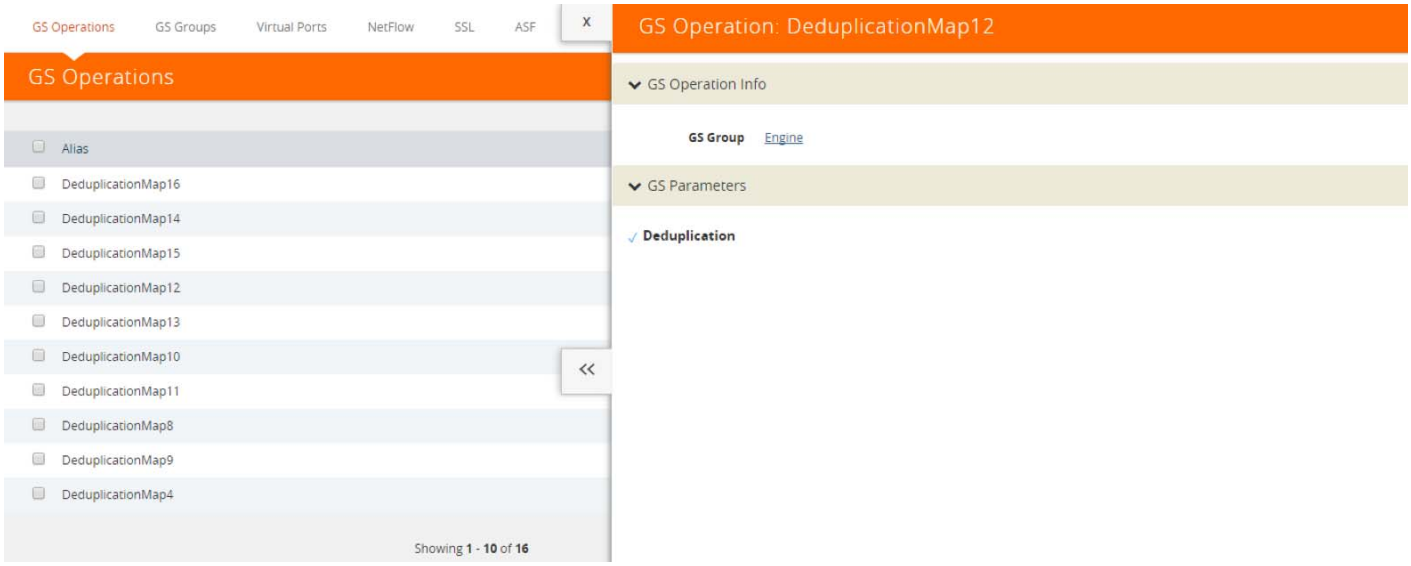
Source: Tolly, December 2015 Figure 2

Gigamon Configuration (Part 1)

Maps and Map Rules used in Tests



GS Operation for Each Map in Test 1 (Deduplication Test)



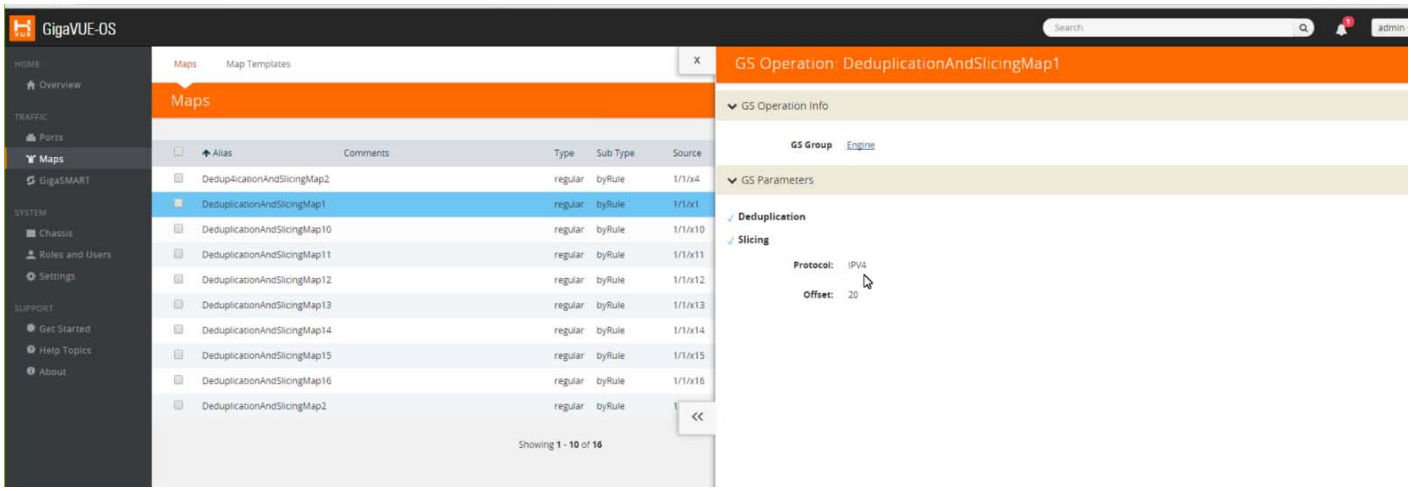
Note: Maps were configured to run the test. Basic filtering on VLAN 100 as a Pass Rule was enabled on Gigamon to meet the minimum filtering requirement for each flow map. No additional filtering was enabled on any of the solution under test (SUT) to make sure that no packets were filtered out on purpose. Test 1 focuses on evaluating the deduplication processing capability of the Ixia AFM module and the Gigamon GigaSMART module. All generated 40Gbps/160Gbps test traffic had the VLAN 100 tag to pass the filter and was sent to the SUT for deduplication processing.

Source: Tolly, December 2015

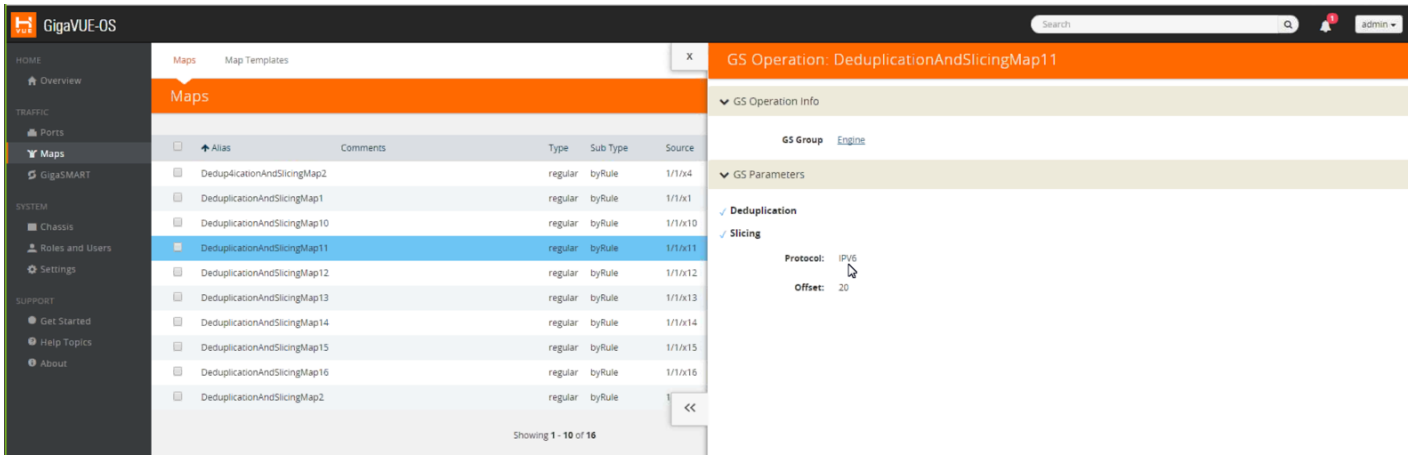
Figure 3

Gigamon Configuration (Part 2)

GS Operation for the IPv4 Map in Test 2 (Deduplication and Packet Slicing Test)



GS Operation for the IPv6 Map in Test 2 (Deduplication and Packet Slicing Test)



Note: Maps were configured to run the test. Basic filtering on VLAN 100 as a Pass Rule was enabled on Gigamon to meet the minimum filtering requirement for each flow map. No additional filtering was enabled on any of the solution under test (SUT) to make sure that no packets were filtered out on purpose. Test 1 focuses on evaluating the deduplication and packet slicing processing capability of the Ixia AFM module and the Gigamon GigaSMART module. All generated 40Gbps/160Gbps test traffic had the VLAN 100 tag to pass the filter and was sent to the SUT for deduplication and packet slicing processing.

Source: Tolly, December 2015 Figure 4

About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 25 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

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Interaction with Competitors

In accordance with Tolly's Fair Testing Charter, Tolly personnel invited representatives from Gigamon, Inc. to participate in the testing. Gigamon did not respond to this invitation.

For more information on the Tolly Fair Testing Charter, visit:

http://www.tolly.com/FTC.aspx

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