XENA™
Test. Improve. Repeat.

APPLICATION NOTE

Stress Testing Switches and Routers

How to perform a simple stress test on a
Layer 2 switch device step-by-step.

Rev 4

APPLICATION NOTE

The Xena testers can verify traffic forwarding performance, protocol scalability and services delivering capabilities of switching and routing devices across the enterprise, metro/edge and core. High traffic loads place demands on the hardware and software components of a Layer-2 or layer-3 networking device. Before deployment, its interfaces, memory, buffering and scheduling mechanisms, switching and routing tables must be thoroughly stressed to ensure the device can switch and route traffic from its input buffers to the appropriate output queues at full line rate.

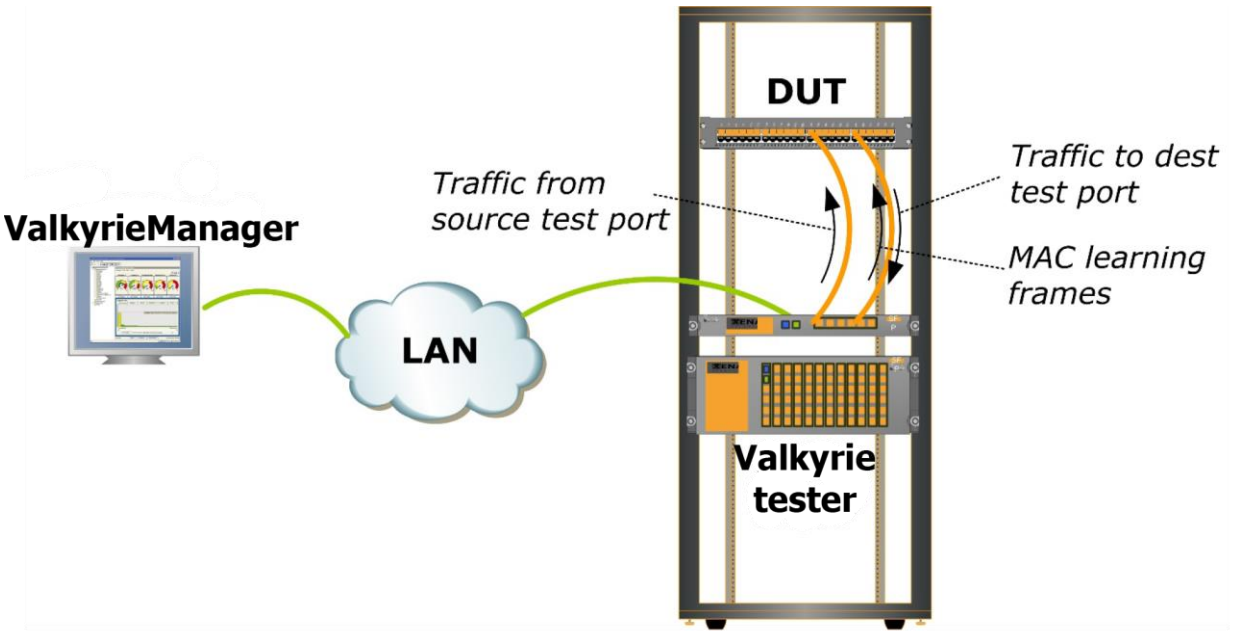
This application note describes how to use a Xena tester to perform a simple stress test on a Layer-2 device's data plane and forwarding capability. You can build many different packet protocols, vary packet sizes, traffic profile, offered loads, and other test parameters, and then view real-time measurements to observe the effect on your router or switch. Because the Xena test platform can generate and measure Layer-2 or Layer-3 traffic with equal facility, you can easily adapt this test for a router forwarding IP traffic.

LAYER-2 FORWARDING PERFORMANCE TEST

This application note describes how to determine a switch's performance when forwarding Ethernet frames with randomly varying lengths to a very large number of MAC addresses.

A powerful and easy to use packet stream configurator makes it easy to build packet streams containing multiple encapsulations. You can define a packet length distribution and header type, and use a field modifier to vary a header field value such as the source and destination MAC address to emulate a very large number of end-host devices.

As shown in Figure 1 below, a source test port sends Ethernet frames of different lengths through the device under test (DUT) to a range of addresses on the destination test port while real-time performance statistics are taken. In this test the DUT is a switch or switch-enabled router.



- Figure 1 Test setup

TEST SUMMARY

Step 1: Select test modules and ports. Reserve a destination port and a source port on the Xena tester. See Figure 2.

Step 2: "Teach" DUT the addresses of simulated hosts. On the destination test port, use the modifier function to define an Ethernet stream containing a range of source MAC addresses to simulate hosts behind the port. Then start the traffic generation to send the traffic from the destination test port to the source test port to teach the DUT the addresses. Unlink the traffic Start on the destination port from the global Start button to ensure that traffic will keep running, so that the MAC learning table entries in the DUT do not expire. See Figure 3 and Figure 4.

Step 3: Define traffic on the source test port. On the source test port, define Ethernet streams with randomized packet lengths, IP packet payloads, and use a modifier to generate destination MAC addresses identical to the source addresses simulated behind the destination test port. See Figure 5.

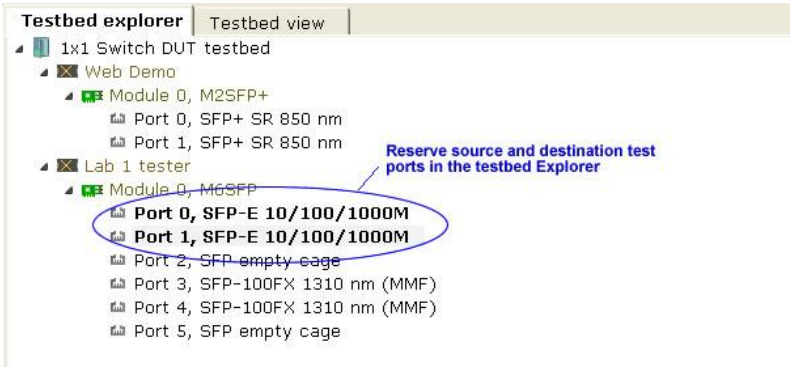
Step 4: Set the traffic properties. Define the traffic profile as constant or bursty, set the offered load, and specify the number of packets to send (e.g., continuous stream, or n packets). See Figure 6.

Step 5: Start traffic and measurements. Send traffic from the source test port to the range of MAC addresses simulated behind the destination test port while you view real-time performance measurements for e.g. packet loss, FCS errors, sequence and misorder errors, latency, and histograms for packet length, IFG, and latency distributions. You can use the global Start button to clear statistics and start traffic in one-click. See Figure 7.

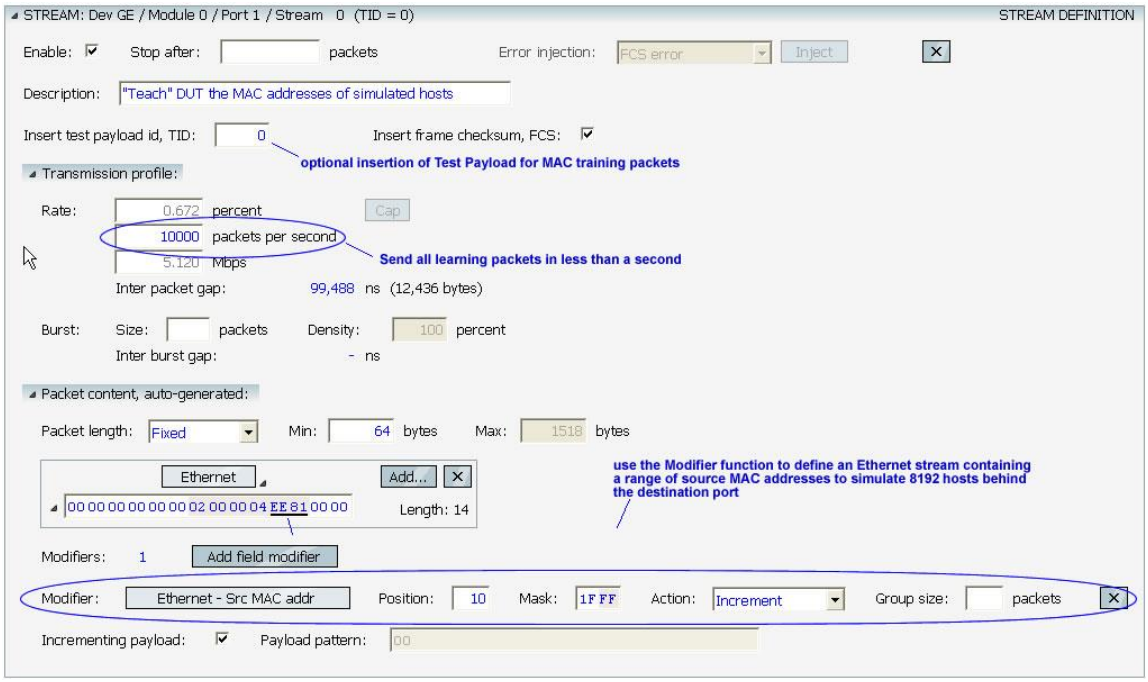
Step 6: Increase the offered load and observe the switching performance. Monitor the effect on the DUT's switching performance. If you are sending traffic in continuous mode, you must manually stop the test. Stop and re-start the test with a new load. See Figure 8 and Figure 9.

Step 7: Save the test configuration. You can save the port configurations, including any streams you have defined. See Figure 10.

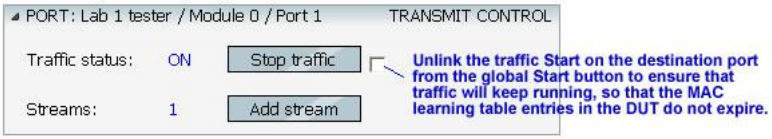
VALKYRIEMANAGER SCREENSHOTS FOR TEST STEPS 1 TO 7



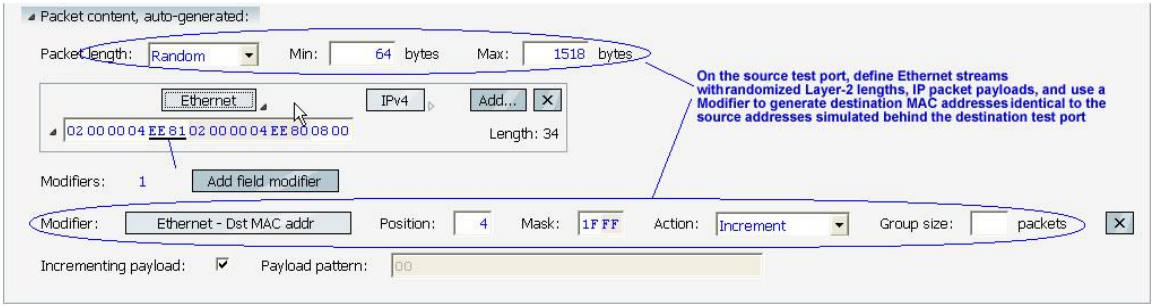
- Figure 2 Select test modules and ports (step 1)



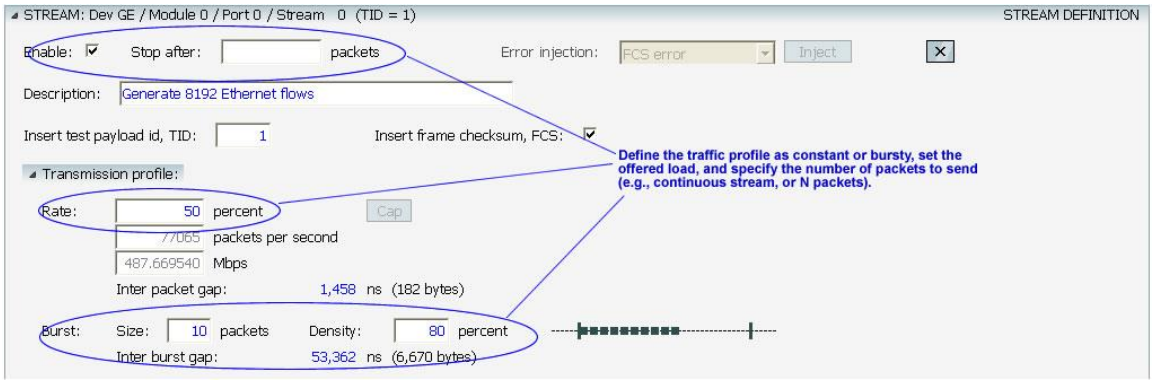
- Figure 3 “Teach” DUT the MAC addresses of 8192 simulated hosts (step 2)



- Figure 4 Send the training packet forever, to avoid MAC learning table timeout (step 2)

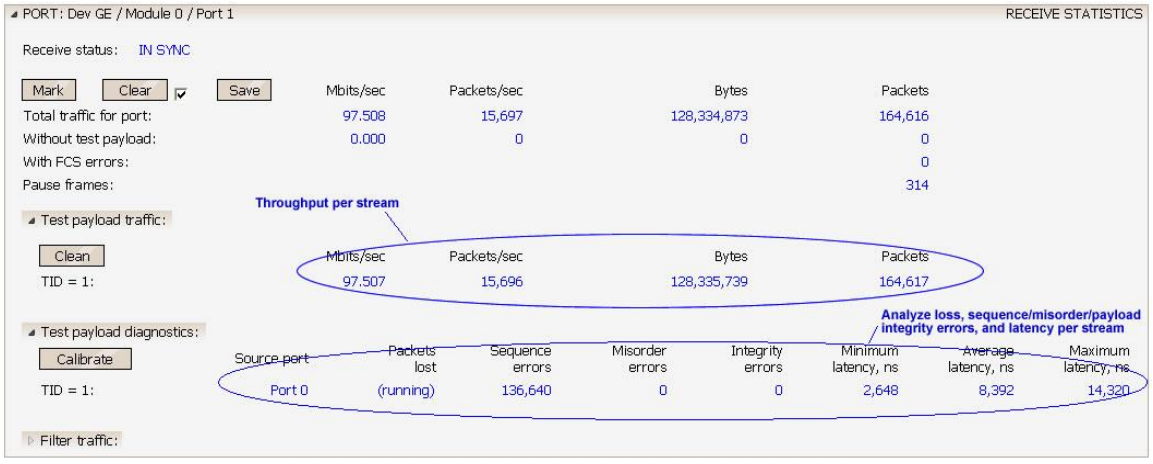


- Figure 5 setup traffic on the source test port (step 3)

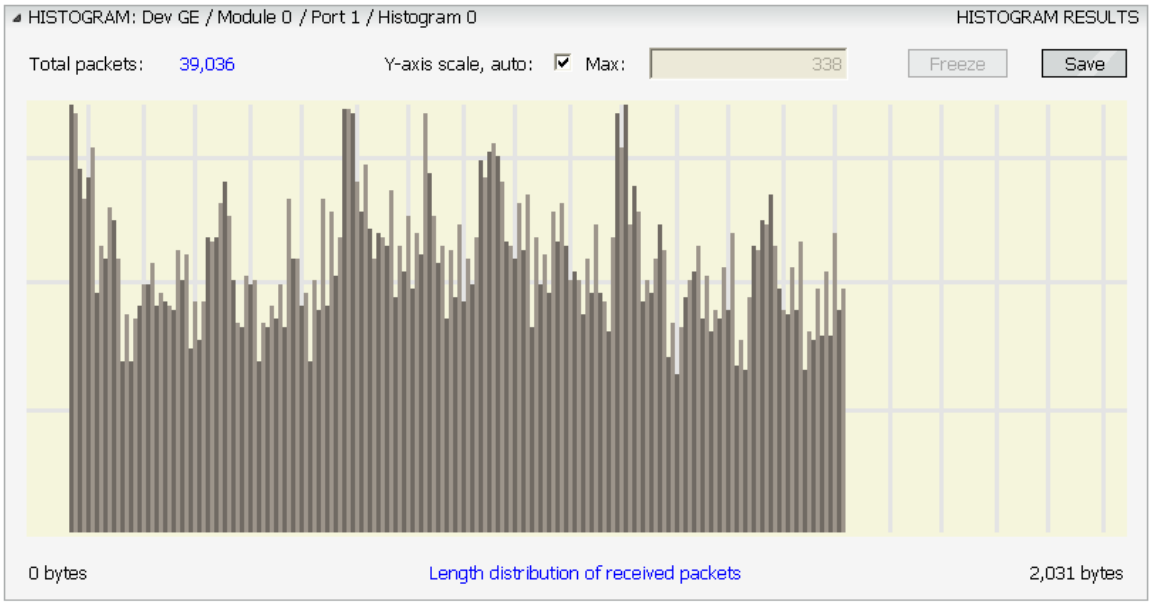


- Figure 6 setup Set the traffic properties (step 4)

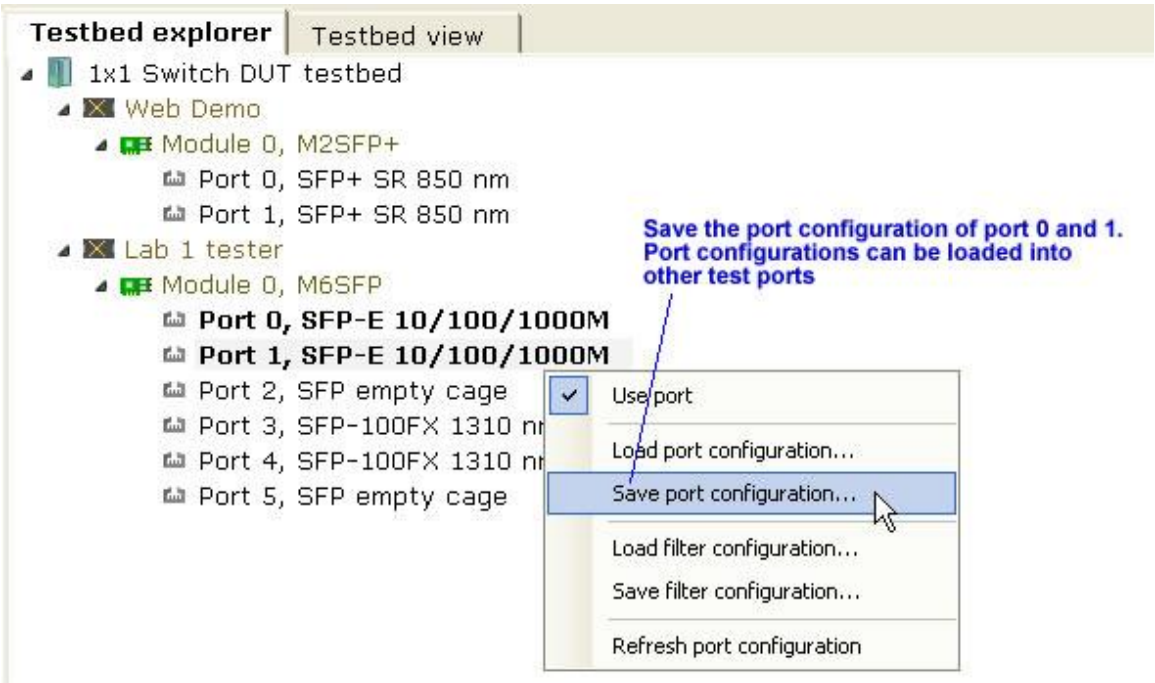
- Figure 7 Start traffic and clear statistics in one clock (step 5)



- Figure 8 Monitor the packet loss and throughput, and Increase the offered load (step 6)



- Figure 9 Analyze histograms for frame length distribution, IFG, and latency of received packets (step 6)



- Figure 10 Save the test configuration (step 7)