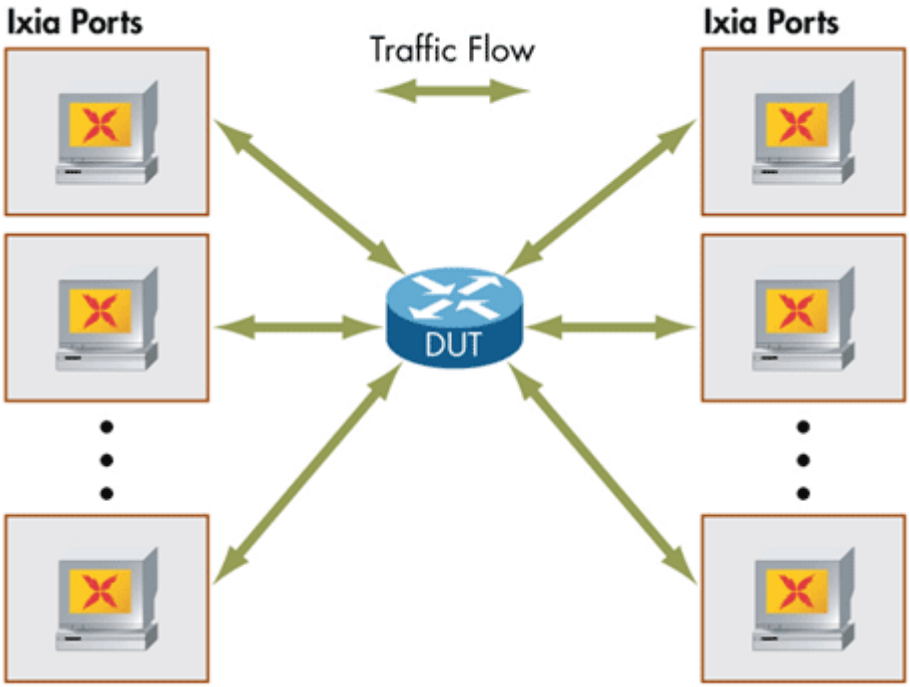
aptixia IxAutomate™

RFC Benchmarking Test Suites

Ixia's IxAutomate Benchmarking test suites provide pre-defined, automated tests for RFC2544-IPv6 Benchmarking and RFC 2889. RFC2544 defines a methodology for benchmarking the data plane performance of networking interconnection devices. The Ixia RFC2544-IPv6 Benchmark suite uses several individual tests to help characterize a networking devices throughput, latency, frame loss, along with several other performance metrics. Support for the IPv6 Benchmarking Methodology IETF draft is integrated into this test suite as well.

While RFC2544 was written as a general methodology for networking devices of all types, RFC2889 was written specifically to benchmark the data plane performance of layer 2 LAN switching devices. The Ixia RFC2889 consists of several tests, each fulfilling individual requirements such as forwarding performance, address handling and filtering, and latency. Ixia has coauthored the IPv6 Benchmarking Methodology draft and we have added this functionality as an extension to the RFC2544 test.

Ixia's RFC Benchmark suites adhere carefully to these specifications, both in test methodology and in results reporting, while adding an easy to use, GUI based, test framework



Example RFC 2889 Full Mesh test topology.

Benchmark Suite Descriptions

RFC2544/IPv6 Benchmarking Test Suite:	
Back to Back Test	The Back to Back test determines the maximum time that the DUT can receive and forward without frame loss. Frames are sent at a user-specified rate, generally the maximum theoretical rate based on the speed of the port. The results of the test show the number of back-to-back frames obtained for each frame size and the average and total back-to-back frames for all the trials. Frames can be MAC only, IPv4 or IPv6. Results include total back to back frames without loss for each frame size.
Frame Loss Test	The Frame Loss test determines how many frames the DUT loses at various frame rates. The number of frames to transmit is specified along with the initial transmit rate, and the percentage decrease in the frame rate (the Granularity parameter) for each iteration. Frames can be MAC only, IPv4, IPv6 (with or without Extension Headers) or IPv4/IPv6 mixture. Results include frame loss at various rates for each

	frame size.
Latency Test	The Latency test determines the latency of the DUT. In the Latency test, frames are transmitted for a fixed duration. Frames are transmitted and tagged with timestamps. Latency is calculated by subtracting the transmit timestamp from the receive timestamp. Frames can be MAC only, IPv4, IPv6 (with or without Extension Headers) or IPv4/IPv6 mixture. Results include latencies for each frame size and the average latencies for all the trials.
Throughput Test	The Throughput test determines the maximum rate at which the DUT receives and forwards frames without any frame loss. Frames are initially sent at a user-specified rate and a binary search algorithm is used to obtain a rate at which the DUT does not lose frames. Frames can be MAC only, IPv4, IPv6 (with or without Extension Headers) or IPv4/IPv6 mixture. Results include: throughput rates in frames per second obtained for each frame size.
RFC2889 Test Suite:	
Address Cache Size Test	The Address Cache Size test uses a binary search to determine the size of the address table for each port or for an entire switch. Beginning at half the size of the initial user-specified table size, frames are transmitted at a user-specified frame rate to see if the DUT has properly learned all of the addresses. If no frame loss and no flooding is detected, the address table size is increased and the test is repeated in a binary fashion until the address table size is determined. Results include maximum number of MAC addresses supported by DUT.
Address Rate Test	The Address Rate test determines the maximum no drop rate by transmitting frames with multiple addresses based on the initial table size at the user-specified frame rate. The number of frames received on each receive port is counted and the receive rate calculated. The rates are compared and a binary search algorithm is used to calculate the address learning rate of the DUT. Results include address learning rate of DUT.
Broadcast Rate Test	The Broadcast Rate test determines the maximum rate at which the DUT receives and forwards broadcast frames without any loss of frames. A binary search algorithm is used to obtain a rate at which the DUT does not lose frames within an acceptable rate window. The

	results of the test show the throughput rates obtained for each frame size. Results include broadcast throughput rate per packet size.
Back Pressure Test	The Back Pressure test determines the congestion control back-pressure exerted when multiple ports are transmitting to a single port in order to overload the port. The results of the test show the number of received frames, number of collision frames and the percent loss of frames obtained for each frame size. Results include collision frames, receive frames, percent frame loss.
Head of Line Blocking Test	The Head of Line Blocking test determines the added delay on an non-congested output interface whenever frames are received from an input interface which is also attempting to forward frames to a congested output interface. The results of the test show the number of received frames, number of collision frames and the percent loss of frames obtained for each frame size. Results include collision frames, receive frames, percent frame loss.
Frame Error Filtering Test	The Frame Error Filtering test determines if the DUT correctly filters frames with certain types of errors such as undersized frames, oversize frames, CRC errors, fragments, alignment errors and dribble errors. The results of the test show the type of error transmitted, the number of transmit frames, inter-frame gap and the number of frames in error for each frame size. Results include type of error, IFG, number of frames in error.
Fully Meshed Test	The Fully Meshed test determines the total number of frames that the DUT can handle when it receives frames on all of its ports. The results of the test show the total number of frames transmitted from all the ports and the total number of frames received on all the ports, and the percent loss of frames obtained for each frame size. Dual-mesh capability that supports two separate sets of ports running independently. Results include percent frame loss, average latency, frame loss.
Many to Many Mesh Test	The Many to Many Mesh test determines the frame loss from the total number of frames transmitted from all the ports and the total number of frames received on all the ports. There are two types of many-to-many mesh tests available: round-robin and peak load. Dual-mesh capability that supports two separate sets of ports running

	independently. Results include frame loss, average latency.
Many to One Throughput Test	The Many to One Throughput test determines the maximum rate at which the DUT receives and forwards frames from many interfaces to one interface without any loss of frames. A binary search algorithm is used to obtain a rate at which the DUT does not lose frames within an acceptable rate window. The results of the test show the throughput rates obtained for each frame size. Results include throughput per frame size.
One to Many Throughput Test	The One to Many Throughput test determines the maximum rate at which the DUT receives and forwards frames from one interface to many interfaces without any frame loss. A binary search algorithm is used to obtain a rate at which the DUT does not lose frames within an acceptable rate window. This window is the rate within one inter-frame gap of the initial transmit rate. The results of the test show the throughput rates obtained for each frame size. Results include throughput per frame size.
Partially Meshed Test	The Partially Meshed test determines the maximum throughput of the DUT by sending frames from multiple transmit ports to multiple receive ports in a mesh fashion, where the transmit ports do not receive and the receive ports do not transmit. Results include throughput per frame size.

RFC Benchmark Suite Specifications

						Search			**Test**						**Pass**				
Tests	**Protocol**				**VLAN**	**Type**			**Port Mapping**				**Traffic**		**Criteria**				
	Layer 2-MAC	IP	IPX	IPv6		Binary	Linear	No Search	One-to-One	One-to-Many	Many-to-One	Mesh	BidirectioNal	Unidirectional	Throughut	Latency	Sequence Errors	Frame Loss	Other
RFC 2544																			

Back to Back	✓	✓	✓	✓	✓	✓			✓				✓	✓				
Frame Loss	✓	✓	✓	✓	✓		✓		✓				✓	✓	✓			
Latency	✓	✓	✓	✓	✓			✓	✓				✓	✓		✓		
Throughput	✓	✓	✓	✓	✓	✓			✓				✓	✓	✓			
RFC 2889																		
Address Cache Size	✓				✓	✓				✓				✓				Cache Size
Address Rate	✓				✓	✓				✓				✓				Learning Rate
Broadcast Rate	✓				✓	✓				✓				✓	✓			
Back Pressure	✓	✓	✓	✓	✓						✓			✓			✓	Max Collisions
Head of Line Blocking	✓	✓	✓	✓	✓							✓		✓				Pass/no Pass
Frame Error Filtering	✓							✓		✓				✓				Filtering Errors
Fully Meshed	✓	✓	✓	✓	✓		✓					✓	✓			✓	✓	Dual Mesh
Many to Many Mesh	✓	✓	✓	✓	✓		✓					✓	✓				✓	DualMesh
Many to One Tput	✓	✓	✓	✓	✓	✓					✓			✓	✓			
One to Many	✓	✓	✓	✓	✓	✓				✓				✓	✓			

Tput																			
Partially meshed	✓	✓	✓	✓	✓		✓					✓		✓			✓	✓	

Requirements

- Windows 2000 or XP client PC with a minimum of 512 meg of RAM.
- Linux/Unix support- command line only
- TCL 8.3 or 8.4 support
- XM12, X16, Optixia XL10, IXIA 1600T, IXIA 400T, IXIA 250
- At least one Ixia Load Module: Gigabit TXS Family, LSM1000XMS12/R12, LSM10G Family, LM622ATM/POS, MSM 2.5G (OC-48c), MSM10G, LM10GE700F1, LM10GE700F1-P. LMOC48C3 and SR.
- IxOS 4.0 or higher- not all features listed are supported on older IxOS versions

Product Ordering Information

928-0101
All-In-One Software Bundle

928-0102
RFC Benchmark Software Bundle

928-0103
Data Plane Software Bundle

928-0200
Base Software-GUI

928-0201
RFC2544-IPv6 Benchmarking Suite

928-0202
RFC2889 Suite

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