

# Gigabit Ethernet XMS LAN Services Modules

Ixia's Gigabit Ethernet XMS LAN Services Modules (LSMs) offer complete Layer 2-7 network and application testing functionality in a single Optixia XM test system. Each test port supports wire-speed Layer 2-3 traffic generation and analysis, high performance routing/bridging protocol emulation, and true Layer 4-7 application traffic generation and subscriber emulation. With 12 ports per module, ultra-high density test environments can be created for auto-negotiable 10/100/1000 Mbps Ethernet over copper as well as Gigabit Ethernet over fiber. With 12 slots per Optixia XM12 chassis, up to 144 Gigabit Ethernet test ports are supported in a single test system.

Each port on a GE XMS module contains a powerful RISC processor running Linux and a full, testing-optimized TCP/IP stack. This architecture provides unprecedented performance and flexibility for testing routers, switches, broadband and wireless access devices, web servers, video servers, secure gateways, firewalls, and many other networking and application-aware devices.



**Specifications**

Load Module	LSM1000XMS12-01	LSM1000XMSR12-01
Connector Type	RJ45 or SFP	RJ45 or SFP
Number of Ports	12	12
Maximum Ports per Chassis	144	144
Layer 2-3 Routing Protocol and Emulation	Yes	Yes
Layer 4-7 Application Traffic Testing	Yes	No
Capture Buffer per Port	8MB	8MB
Number of Transmit Flows per Port (sequential values)	Billions	Billions
Number of Transmit Flows per Port (arbitrary values)	98K	32K
Number of Trackable Receive Flows per Port	128K	64K
Number of Stream Definitions per Port	256 in Packet Stream Mode (sequential) or Advanced Stream (interleaved) modes. Each Stream Definition can generate millions of unique traffic flows.	
Transmit Engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity signature, and packet group signatures	
Receive Engine	Wire-speed packet filtering, capturing, real-time latency for each packet group, data integrity, and sequence checking	
User Defined Field (UDF) Features	Fixed, increment or decrement by user-defined step, value lists, range lists, cascade, random, and chained	



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Table UDF Feature	Comprehensive packet editing function for emulating large numbers of sophisticated flows. Up to 98K table UDF entries are supported on the LSM1000XMS12 and 32K on the LSM1000XMSR12.	
Filters	48-bit source/destination address, 2x128-bit user-definable pattern and offset, frame length range, CRC error, data integrity error, sequence checking error (small, big, reverse)	
Data Field (per stream)	Fixed, increment (Byte/Word), decrement (Byte/Word), random, repeating, user-specified up to 13K bytes	
Statistics and Rates: Counter Size: 64-Bits	Link State, Line Speed, Frames Sent, Valid Frames Received, Bytes Sent/Received, Fragments, Undersize, Oversize, CRC Errors, VLAN Tagged Frames, User-Defined Stat 1, User-Defined Stat 2, Capture Trigger (UDS 3), Capture filter (UDS 4), User-Defined Stat 5, User-Defined Stat 6, 8 QoS counters, Data Integrity Frames, Data Integrity Errors, Sequence Checking Frames, Sequence Checking Errors, ARP, and Ping requests and replies	
Error Generation	CRC (Good/Bad/None), Undersize, Oversize	
Packet Flow Statistics	Real-time statistics to track up to 128k packet flows on the LSM1000XMS12 with throughput and latency measurements. The LSM1000XMSR12 supports 64K packet flows.	
Latency Measurements	20 ns resolution	
IPv4, IPV6, UDP, TCP	Hardware checksum generation	
Frame Length Controls	Fixed, random, weighted random, or increment by user-defined step, random, weighted random	
Applications	LSM1000XMS12-01	LSM1000XMSR12-01
	<ul style="list-style-type: none"> <li>- Aptixia IxLoad: Layer 4-7 performance testing of content-aware devices and networks</li> <li>- Aptixia IxNetwork: integrated Layer 2-3 data/control plane performance and functional testing,</li> </ul>	<ul style="list-style-type: none"> <li>- Aptixia IxNetwork: integrated Layer 2-3 data/control plane performance and functional testing, supporting routing, bridging, MPLS, and multicast protocols.</li> <li>- Aptixia IxAutomate: Automation environment</li> </ul>

	<p>supporting routing, bridging, MPLS, and multicast protocols.</p> <ul style="list-style-type: none"><li>- Aptixia IxAutomate: Automation environment providing pre-built tests for Layer 2-7 data and control plane testing</li><li>- IxExplorer: Layer 2-3 wire-speed traffic generation and analysis</li><li>- IxChariot®: Emulated application performance testing over Layer 4</li><li>- IxAccess: Broadband access performance testing, including PPPoX and L2TPv2/v3</li><li>- IxVPN: Performance verification of IPSec devices and networks</li><li>- IxAuthenticate: 802.1x authentication performance testing</li><li>- Tcl API: Custom user script development for Layer 2-7 testing</li><li>- Linux Software Development Kit (SDK): Custom user application development. Full TCP/IP connectivity</li></ul>	<p>providing pre-built tests for Layer 2-7 data and control plane testing</p> <ul style="list-style-type: none"><li>- IxExplorer: Layer 2-3 wire-speed traffic generation and analysis</li></ul>
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	through management interface (Telnet, FTP, etc.)	
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### Flexible Packet Generation

Each Ixia GE XMS test port is capable of generating precisely controlled network traffic at up to wire-speed of the network interface using Ixia's IxExplorer test application. Up to millions of packet flows can be configured on each port with fully customizable packet header fields. Flexible header control is available for Ethernet, IPv4/v6, IPX, ARP, TCP, UDP, VLANs, QinQ, MPLS, GRE, and many others. Payload contents can also be customized with incrementing/decrementing, fixed, random, or user-defined information. Frame sizes can be fixed, vary according to a pattern, or be randomly assigned across a weighted range. Rate control can be flexibly defined in frames per second, bits per second, percentage of line rate, or inter-packet gap time.

### Real-Time Latency

Packets representing different traffic profiles can be associated with Packet Group Identifiers (PGIDs). The receiving port measures the minimum, maximum, and average latency in real-time for each packet belonging to different groups. Measurable latencies include:

- Instantaneous latency and inter-arrival time where each packet is associated with one group ID
- Latency bins, where PGIDs can be associated with a latency range
- Latency over time, where multiple PGIDs can be placed in "time buckets" with fixed durations
- First and last timestamps, where each PGID can store the timestamps of first and last received packets

### Transmit Scheduler

There are two modes of transmission available - Packet Stream and Advanced Stream Scheduler:

### Packet Stream Scheduler

In Packet Stream Scheduler mode, the transmit engine allows configuration of up to 256 unique sequential stream groupings on each port. Multiple streams can be defined in sequence each containing multiple packet flows defined by unique characteristics. After transmission of all packets in the first stream, control is passed to the next defined stream in the sequence. After reaching the last stream in the sequence, transmission may either cease or control may be passed on to any other stream in the sequence. Therefore, multiple streams are cycled through, representing different traffic profiles to simulate real network traffic.

### **Advanced Stream Scheduler**

In Advanced Stream Scheduler mode, the transmission of stream groupings are interleaved per port. For example, assume a port is configured with three streams. If Stream 1 is defined with IP packets at 20% of line rate, Stream 2 is defined with TCP packets at 50% of line rate, and Stream 3 is defined with MPLS packets at 30% of line rate, data on the port will be transmitted at an aggregate utilization of 100% with interleaved IP, TCP, and MPLS packets.

### **Extensive Statistics**

- Real-time 64-bit frame counts and rates
- Spreadsheet presentation format for convenient manipulation of statistics counters
- Eight Quality of Service counters (supporting 802.1p, DSCP, and IPv4 TOS measurements)
- Six user-defined statistics that use a trigger condition
- Extended statistics for ARP, ICMP, and DHCP
- Transmit stream statistics for frame counts and rate
- External logging to file for statistics and alerts
- Audible and visual alerts with user-definable thresholds

### **Data Capture**

Each port is equipped with 8 MB of capture memory, capable of storing tens of thousands of packets in real-time. The capture buffer can be configured to store packets based on user-defined trigger and filter conditions. Decodes for IPv4, IPv6, UDP, ARP, BGP-4, IS-IS, OSPF, TCP, DHCP, IPX, RIP, IGMP, CISCO ISL, VLAN, and MPLS are provided.

### **Data Integrity**

As packets traverse through networks, IP header contents may change resulting in the recalculation of packet CRC values. To validate device performance, the data integrity function of Gigabit Ethernet XMS modules allows packet payload contents to be verified with a unique

CRC that is independent of the packet CRC. This ensures that the payload is not disturbed as the device changes header fields.

### **Sequence and Duplicate Packet Checking**

Sequence numbers can be inserted at a user-defined offset in the payload of each transmitted packet. Upon receipt of the packets through the Device Under Test (DUT), out-of sequence errors or duplicated packets are reported in real time at wire-speed rates. The user can define a sequence error threshold to distinguish between small versus big errors, and the receive port can measure the amount of small, big, reversed, and total errors. Alternatively, the user can use the duplicate packet detection mode to observe that multiple packets with the same sequence number are received and analyzed.

### **Routing/Bridging Protocol Emulation**

Ixia's Gigabit Ethernet XMS modules support performance and functionality testing using routing/bridging protocol emulation via the Aptixia IxNetwork and Aptixia IxAutomate applications. Protocol support includes IPv4/IPv6 routing (BGP-4, OSPF, IS-IS, and RIP), MPLS (RSVP-TE, LDP, L2 MPLS VPNs, L3 MPLS VPNs, and VPLS), multicast (IGMP, MLD, and PIM-SM), and bridging (STP, RSTP, MSTP). Highly scalable scenarios can be created emulating up to thousands of routers advertising millions of routes per test port. Up to wire speed Layer 2/3 traffic can be automatically created to target routes and MPLS tunnels.

### **Application Layer Performance Testing**

Ixia's Gigabit Ethernet XMS modules support high performance testing of content-aware devices and networks via the Aptixia IxLoad application. IxLoad creates real world traffic scenarios at the TCP/UDP (Layer 4) and Application (Layer 7) layers, emulating clients and servers for Web (HTTP, SSL), FTP, Email (SMTP, POP3, IMAP), Streaming (RTP, RTSP), Video (MPEG2, MPEG4, IGMP), Voice (SIP, MGCP), and services such as DNS, DHCP, LDAP and Telnet. Each GE XMS port can be independently configured to run different protocols and client/server scenarios.

### **Tcl API**

Ixia's Gigabit Ethernet XMS modules are supported by a comprehensive Tcl Application Programming Interface (API). This API allows users to develop custom scripts, and integrate the modules into automated test environments.

**Custom Applications**

The Linux Software Development Kit (SDK) allows existing Linux applications to be compiled and run on GE XMS ports. Additionally, users can develop their own custom applications and integrate them into the Ixia test environment.

## Product Ordering Information

944-0001

## LSM1000XMS12-01

12-Port Dual-PHY (RJ45 and SFP) 10/100/1000 Mbps Ethernet Load Module for Optixia XM12, CPU per port, 256MB processor memory; full featured - supports routing protocols, Linux SDK, and Layer 4-7 test applications. Does not include SFP transceivers.

944-0002

## LSM1000XMSR12-01

12-Port Dual-PHY (RJ45 and SFP) 10/100/1000 Mbps Ethernet Load Module for Optixia XM12, CPU per port, 128MB processor memory; reduced performance and scalability – supports routing protocols, Linux SDK. Does not include SFP transceivers.

SFP-LX

SFP Transceiver - 1310nm LX

SFP-SX

SFP Transceiver - 850nm SX