

# 10 Gigabit Ethernet XM LAN Services Modules

Ixia's 10 Gigabit Ethernet XM LAN Services Modules (LSMs) offer unprecedented scalability, performance, and service testing flexibility as part of the Optixia XM test system. The 10GE XM modules provide the industry's highest density 10 Gigabit Ethernet test solution with up to 36 - 10 Gigabit Ethernet test ports in a single Optixia XM12 test system. A broad portfolio of edge/core testing solutions are supported, including performance, scalability, and conformance testing of Layer 2-3 devices at the control and data planes, and high performance Layer 4-7 testing of content-aware devices and networks.

The Ixia 10GE XM LSM supports a comprehensive portfolio of service testing solutions for next generation service provider networks, including Metro Ethernet E-LAN and E-LINE services; and MPLS VPNs, such as Layer 2 VPNs, Layer 3 RFC 2547 VPNs, and VPLS.



## Key Features

- Industry's highest density 10GE test solution with 36 ports per 10U chassis, resulting in reduced space, power, and cooling requirements
- Traffic generation of millions of unique flows per port, eliminating the need to aggregate multiple 10GE test interfaces to perform high scalability tests
- Tracks and analyzes up to 2 million flows per port for real-time latency, inter-arrival time, packet loss, data integrity, and sequence checking
- Comprehensive Layer 2-7 testing, with integrated data plane and control plane traffic generation and analysis for Layer 2/3 data plane, IPv4/v6 routing protocols, bridging protocols, MPLS VPNs, multicast, and Layer 4-7 testing
- Sophisticated multi-protocol encapsulation and label stacking, including IPv4/v6, VLANs, QinQ, GRE, MPLS, and IP over IP

## Specifications

Load Module	LSM10GXM3-01	LSM10GXMR3-01
Number of Ports	3	3
Number of Slots	1	1
Maximum Ports per Chassis	36	36
Pluggable Interface	XFP	XFP
Functionality	10 Gigabit Ethernet LAN/WAN (SONET/SDH)	10 Gigabit Ethernet LAN/WAN (SONET/SDH)
Layer 2/3 Routing Protocol Emulation	Yes	Yes
Layer 4-7 Application Traffic Testing	Yes	No
Capture Buffer per Port	350 Mbytes	32 Mbytes
Number of Transmit Flows per Port (sequential values)	Billions	Billions
Number of Transmit Flows per Port (arbitrary values)	1 million	32K



## 10 Gigabit Ethernet XM LAN Services Modules

Number of Trackable Receive Flows	2 million	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 and inter-arrival time for each packet group, data integrity, and sequence checking	
User Defined Field Features	Fixed, increment or decrement by user-defined step, value lists, range lists, cascade, random, and chained	
Table UDF Feature	Comprehensive packet editing function for emulating large numbers of sophisticated flows. Up to one million entries (LSM10GXM3) of up to 256 bytes of lists of values can be specified to be placed at designated offsets within a stream. Each list consists of an offset, a size and a list of values in a table format. The LSM10GXMR3 supports 32K entries.	
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 2 million packet flows on	



## 10 Gigabit Ethernet XM LAN Services Modules

	the LSM10GXM3 and up to 64K flows on the LSM10GXMR3.	
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	LSM10GXM3-01	LSM10GXMR3-01
	<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, supporting routing, bridging, MPLS, and multicast protocols.</li> <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>- IxAuthenticate: 802.1x</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 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> </ul>

	<p>authentication performance testing</p> <ul style="list-style-type: none"><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 through management interface (Telnet, FTP, etc.)</li></ul>	
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### Flexible Packet Generation

Each Ixia 10GE XM test port is capable of generating precisely controlled network traffic at up to wire-speed of the network interface. 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 and Jitter Analysis

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, BGP, OSPF, IS-IS, RSVP-TE, and LDP
- 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 10 Gigabit Ethernet XM port is equipped with 350 MB of capture memory (32MB for the LSM10GXMR3). 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 the 10GE XM 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 while running 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 10 Gigabit Ethernet XM 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 10 Gigabit Ethernet XM 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 GXM port can be independently configured to run different protocols and client/server scenarios.

### **In-Line Network Monitoring**

The 10 Gigabit Ethernet XM modules can be configured to be used in-line with the network and can passively monitor at full wire speed. This feature is useful for network troubleshooting and eliminates the need for optical splitters.

### **Tcl API**

Ixia's 10GE XM modules are fully 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 10GE XM ports. Additionally, users can develop their own custom applications and integrate them into the Ixia test environment.

### **Product Ordering Information**

#### **944-0004**

##### **LSM10GXM3-01**

3-port 10 Gigabit Ethernet XFP LAN Services Module for Optixia XM12, 10GE LAN/WAN operation, 512MB processor memory; full-featured - supports routing protocols, Linux SDK, and layer 4-7 test applications. Requires 3 XFP transceivers (not included).

#### **944-0005**

##### **LSM10GXMR3-01**

3-port 10 Gigabit Ethernet XFP LAN Services Module for Optixia XM12, 10GE LAN/WAN operation, 128MB processor memory; reduced performance and scalability – supports routing protocols, Linux SDK. Requires 3 XFP transceivers (not included).

#### **XFP-1550**

XFP 1550nm Transceiver

#### **XFP-1310**

XFP 1310nm Transceiver

#### **948-0003**

##### **XFP-850**

XFP 850 nm Transceiver

**948-0011****XFP-CX4**

XFP Transceiver, CX4 interface (10GBASE-CX4); for 944-0022 (LSM10G1) or 944-0024 (LSM10GL1) with 948-0001 (XFP-ADAP-01) or 948-0002 (XFP-ADAP-02), 944-0034 (LSM10GMS), LSM10GXL6-01, 944-0012 (MSM10G1-02), 944-0003 (LSM10GXL6-02), 944-0004 (LSM10GXM3-01), and 944-0005 (LSM10GXMR3-01)