Gigabit Ethernet XMVR LAN Services Modules

Ixia's Gigabit Ethernet XMVR LAN Services Modules (LSMs) offer Layer 2-3 network testing functionality in a single test system. Each test port supports wire-speed Layer 2-3 traffic generation and analysis and medium performance routing/bridging protocol emulation. With industry-leading16 Dual-PHY 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/100FX Ethernet over fiber. With 12 slots per XM12 High Performance chassis, up to 192 Gigabit Ethernet test ports are supported in a single test system.

Each port on a GE XMVR module contains a RISC processor running Linux and a full testing-optimized TCP/IP stack. This architecture provides the performance and flexibility required for testing routers, switches, broadband and wireless access devices, and many other networking devices.

Ixia's Gigabit Ethernet XMVR LAN Services Module (LSM) is offered in a 16-port configuration, providing scalability and affordability for many testing requirements.

Highlights

- Complete Layer 2-7 network and application testing functionality in a single test system
- Flexible Packet Generation
- Real-Time Latency
- Transmit Scheduler
- Extensive Statistics
- Data Capture
- Data Integrity
- Sequence and Duplicate Packet Checking
- Routing/Bridging Protocol Emulation
- Application Layer Performance Testing
- Tcl API

Flexible Packet Generation

Each Ixia GE XMVR 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, varied according to a pattern, or 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 time stamps, where each PGID can store the timestamps of first and last received packets

Transmit Scheduler

Two modes of transmission are 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 is 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 XMVR 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 by 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 XMVR modules support performance and functionality testing using routing/bridging protocol emulation via the IxNetwork and IxAutomate applications. Protocols supported include 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). Medium scalable scenarios can be created emulating up to 100 routers advertising thousands of routes per test port. Up to wire-speed Layer 2/3 traffic can be automatically created to target routes and MPLS tunnels.

Tcl API

Ixia's Gigabit Ethernet XMVR 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.

Specifications

Feature	Details
Load Module	LSM1000XMVR16-01
Connector Type	RJ45 or SFP
Connection Speed	Auto-negotiable 10/100/1000 Mbps Ethernet over copper and Gigabit/100FX Ethernet over fiber
Port CPU / Memory	400MHz / 256MB
Number of Ports	16
Maximum Ports per Chassis	192
Layer 2-3 Routing Protocol and Emulation	Yes
Layer 4–7 Application Traffic Testing	No
Capture Buffer per Port	8MB
Number of Transmit Flows per Port (sequential values)	Billions
Number of Transmit Flows per Port (arbitrary values)	32K
Number of Trackable Receive Flows per Port	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.

Feature	Details
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
Table UDF Feature	Comprehensive packet editing function for emulating large numbers of sophisticated flows. Up to 32K table UDF entries are supported on the LSM1000XMVR ports.
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-Bit)	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 64K packet flows with throughput and latency measurements on the LSM1000XMVR16/12/8/4 load modules.
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
Operating Temperature Range	41°F to 86°F (5°C to 30°C), ambient air[i]
Applications	IxNetwork: Integrated Layer 2-3 data/control plane performance and functional testing, supporting routing, bridging, MPLS, and multicast protocols. IxAutomate: Automation environment providing pre-built tests for Layer 2-3 data and control plane testing IxExplorer: Layer 2-3 wire-speed traffic generation and analysis

Product Ordering Information

944-0010 LSM1000XMVR16-01

16-Port Dual-PHY (RJ45 and SFP) 10/100/1000 Mbps Ethernet Load Module for Optixia XM Series Chassis, CPU per port, 256MB processor memory; reduced performance and scalability – supports routing protocols. Does not include SFP transceivers.

SFP-LX

SFP Transceiver - 1310nm LX

SFP-SX

SFP Transceiver - 850nm SX

SFP-CU

SFP Transceiver - RJ-45 Copper converts a 1000Base-X optical Ethernet port into a 1000Base-T copper Ethernet port.

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[i] The maximum operating temperature for these load modules lowers the maximum operating temperature to these limits when used in an XM2 or XM12 chassis

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