XCELLON-ULTRA™ NP – 10GE HIGH-PERFORMANCE APPLICATION LOAD MODULES

DATA SHEET

Ixia's Xcellon™ load modules are the highest performing and most scalable application traffic generation solution available in the industry. The Xcellon-Ultra™ NP offers complete layer 2-7 packet generation, routing, and application testing functionality in a single load module.

The Xcellon-Ultra NP load module combines the processing power and resources of up to twelve per-port CPUs into one physical port, providing the highest layer 4-7 line-rate performance -- unmatched by any other layer 4-7 test solution. Any of the twelve Gigabit Ethernet (GbE) ports can be used individually or aggregated through the single 10GbE port. 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 subscriber emulation and traffic generation. The twelve GbE ports can be used to build an ultra-high-density test environment for auto-negotiable 10/100/1000 Mbps Ethernet over copper and fiber. With twelve slots per XGS12 chassis, up to 144 GbE and twelve 10GbE test ports are available in a single test system.

Xcellon-Ultra NP 10GbE Load Module

HIGHLIGHTS

- Real-time 64-bit frame counts and rates
- Spreadsheet presentation format for convenient manipulation of statistics counters
- Eight QoS counters (supporting 802.1p, DSCP, and IPv4 TOS measurements)
- Six user-defined statistics that have 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

Xcellon-Ultra NP can meet the challenge of next-generation advanced networking and security platforms. Each GbE port contains a powerful RISC processor running Linux, and a complete testing-optimized TCP/IP stack. The Xcellon-Ultra NP ports incorporate a technology unique to the test and measurement industry – network processors. Each Xcellon-Ultra NP GbE port uses multiple network processors that are optimized for layer 4-7 testing.

Xcellon-Ultra NP's CPU count and NP architecture create a powerful application traffic generation platform that emulates millions of real-world application flows, including voice, video and massive amounts of data.

APPLICATION LAYER PERFORMANCE TESTING

The Xcellon-Ultra NP load module, in conjunction with Ixia testing software such as IxLoad, allow for scalable solutions for converged multiplay services and application delivery platforms. They emulate data, voice, and video subscribers and the associated protocols for performance testing. Unique and advanced subscriber modeling capabilities create realistic scenarios to validate subscriber quality of experience (QoE).

The Xcellon-Ultra NP load module executes high performance testing of content-aware devices and networks. It can create real-world traffic scenarios at layer 4 (TCP/UDP) and layer 7 (application layer), emulating clients and servers for Web (HTTP, SSL), FTP, e-mail (SMTP, POP3, IMAP), streaming (RTP, RTSP), video (MPEG2, MPEG4, IGMP), voice (SIP, MGCP) and infrastructure services such as DNS, DHCP, LDAP and Telnet.

APPLICATION TRAFFIC CAPABILITIES

APPLICATION FEATURE	DETAILS
Network Protocols	Extensive support for layer protocols including DHCPv4, DHCPv6-PD, PPPoE, IPSEC, unique MAC addresses, VLANs, 802.1q, 802.1p. Flexible IP and VLAN mapping, traffic to network associations for complex scenarios
Dynamic Subscriber Behavior	True user emulation with multiple applications per subscriber. Realistically simulates dynamic network interface setup and tear-down behavior linked with subscriber emulation. Advanced network attachment support to test with any network topology
Layer 2-3 Authentication and Access Control	Sets up 802.1x and EAPoUDP sessions and carries out authentication and access control. Transmits high-performance multiplay traffic over authenticated sessions for performance benchmarking, while performing web-based HTTP session authentication and running HTTP performance scalability tests.
Data Protocol Emulation	HTTP, SSL, FTP, Peer-to-Peer, RTSP, RTP, SMTP, POP3, IMAP, CIFS, Radius, SSH, Radius, Telnet, DNS, DHCP, LDAP, DDoS, vulnerability attacks and application replay for true replay of application flows
Voice Protocol Testing	VoIP, SIP, SCCP (Skinny), H.248, SIP, MGCP
Video Protocol Testing	IPTV, video-on-demand, streaming video, RTSP, RTP, IGMP, MLD
Wireless Protocol Testing	GGSN testing

APPLICATION PERFORMANCE[i]

The Xcellon-Ultra NP load module provides high performance real-world application emulation.

METRIC	PERFORMANCE
Simulated Users	4,700,000
Throughput	10Gbps
Connections/sec	750,000
Concurrent Connections	10,000,000
SSL Throughput	2.7Gbps
SSL Connections/sec	62,500
Voice Simulated SIP Endpoints	180,000
Voice Full duplex RTP streams	96,000
Voice Full duplex RTP Throughput	9.5Gbps
Video Simulated Users	24,000
Video RTSP Connections/sec	180,000
Video RTP Concurrent streams	720,000
Video IPTV Throughput	**10Gbps**

MODES OF OPERATION

The Xcellon-Ultra NP load module operates in three different modes, providing for flexible, scalable and powerful layer 4-7 performance.

- **Non-Aggregated Mode.** This mode is used for high-density layer 2-7 GbE testing. In this mode, the twelve 10/100/1000 Mbps ports each provide layer 2-7 functionality. Each port is capable of providing high performance packet generation and application layer testing by employing its own port CPU resources as well as the dedicated hardware stream engine. In this mode the 10GE aggregation port is disabled.
- **GbE Aggregated Mode.** This mode is used for high-performance layer 4-7 GbE testing. In this mode the twelve port CPUs can be assigned to any of twelve GbE test ports through the switch fabric. Aggregation of the processing power from multiple CPUs allows application layer testing at line rate. A cluster of port CPUs can be assigned to any of the physical ports. Ixia test applications transparently configure the available port CPU resources and assign them to a physical port to

achieve the test objectives. This mode does not support the hardware stream engine. The 10GbE aggregation port and unused GbE ports are disabled in GbE aggregated mode.

- **10 GbE Aggregated Mode.** This mode is used for high-performance layer 4-7 10 GbE testing, producing 10 GbE, line-rate application traffic. In this mode, all twelve port CPUs are assigned to the 10 GbE aggregation port through the switch fabric. Ixia test applications transparently configure the port CPU resources to achieve the test objectives. This mode does not support the hardware stream engine. The twelve GbE ports are also disabled when in 10 GbE aggregated mode.

FLEXIBLE PACKET GENERATION

Each Ixia GbE test port is capable of generating precisely controlled network traffic at wire speed using Ixia's IxExplorer test application. Millions of packet flows, with fully customizable packet header fields, can be configured on each port. 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 the packets belonging to different groups. Measurable latencies include:

- Instantaneous latency and inter-arrival time where each packet is associated with one PGID
- 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

There are 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 4000 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 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 QoS counters (supporting 802.1p, DSCP, and IPv4 TOS measurements)
- Six user-defined statistics that have a trigger condition
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DATA CAPTURE

Each port is equipped with 64 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 GbE ports 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.

TCL API

Ixia's GbE ports 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

LOAD MODULE	XCELLON-ULTRA NP
Connector Type	RJ45 or SFP for GbE ports; XFP for 10GbE port
Number of Ports	12 GbE (10/100/1000) + 10GbE
Maximum Ports per Chassis: **- XGS12-HS or XGS12-SD or XM12** **- XM2 Desktop**	 144 GbE + 12 10GbE 24 GbE + 2 10GbE
Layer 2-3 Routing Protocol and Emulation	Yes
Layer 4–7 Application Traffic Testing	Yes
Capture Buffer per Port	64 MB
Number of Transmit Flows per Port (sequential values)	Billions
Number of Transmit Flows per Port (arbitrary values)	98K
Number of Trackable Receive Flows per Port	128K
Number of Stream Definitions per Port	4000 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

LOAD MODULE	XCELLON-ULTRA NP
Table UDF Feature	Comprehensive packet editing function for emulating large numbers of sophisticated flows. Up to 750K table UDF entries are supported on the Xcellon-Ultra™ NP.
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 128K packet flows on the Xcellon-Ultra™ NP with throughput and latency measurements.
Latency Measurements	20ns 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)

PRODUCT ORDERING INFORMATION

944-0083
Xcellon-Ultra NP-01, Application Network Processor Load Module, 1-10G or 12-Port Dual-PHY (RJ45 and SFP) 10/100/1000 Mbps; On-Board Port Aggregation. The load module is compatible with the XGS12-SD 12-slot, standard performance rack mount chassis bundle (940-0011), XGS12-HS 12-slot, high-speed performance rack mount chassis bundle (940-0006), XG12 12-slot, rackmount chassis (940-0005), XGS2-SD 2-slot, 3RU standard performance chassis bundle (940-0010), XGS2-HS 2-slot, 3RU high-speed performance chassis bundle (940-0012) and the XM2 desktop chassis (941-0003). 1GbE Fiber Ports REQUIRE SFP transceivers, options include SFP-LX or SFP-SX; and 10GbE port requires a XFP transceiver, options are either 948-0003 (XFP-850), XFP-1310, or XFP-1550.

GIGABIT ETHERNET TRANSCEIVERS

SFP-LX
SFP transceiver - 1310nm LX

SFP-SX
SFP transceiver - 850nm SX

10-GIGABIT ETHERNET TRANSCEIVERS

948-0003
XFP 850nm transceiver

XFP-1550
XFP 1550nm transceiver

XFP-1310
XFP 1310nm transceiver

IXIA WORLDWIDE
26601 W. AGOURA ROAD
CALABASAS, CA 91302

(TOLL FREE NORTH AMERICA)
1.877.367.4942
(OUTSIDE NORTH AMERICA)
+1.818.871.1800
(FAX) 818.871.1805
www.ixiacom.com

IXIA EUROPE
CLARION HOUSE, NORREYS DRIVE
MAIDENHEAD SL6 4FL
UNITED KINGDOM

SALES +44.1628.408750
(FAX) +44.1628.639916

IXIA ASIA PACIFIC
101 THOMSON ROAD,
#29-04/05 UNITED SQUARE,
SINGAPORE 307591

SALES +65.6332.0125
(FAX) +65.6332.0127

[i] Numbers in the table represent the performance of two connected, Xcellon-Ultra NP modules