CloudStorm™ 100GE Application and Security Test Load Module

CLOUD-SCALE APPLICATION DELIVERY & NETWORK SECURITY TEST PLATFORM

PROBLEM: AN ALL-ENCRYPTED WORLD AND INCREASING USER EXPERIENCE EXPECTATIONS

Massive concerns around security are driving an increased use of encryption. An all-encrypted world is not far away. At the same time, the scale of traffic continues to grow at an exponential rate and the industry is moving to new cloud-based architectures. Users of services and applications, however, continue to expect their experience to be at or above the current level.

To keep pace, network equipment manufacturers race to build higher-scale, more capable network security and application delivery solutions. In turn, the world's largest cloud data center operators struggle to find the right balance between performance and security in today's hyper-scale, dynamic world. The uncertainty that comes with this change is best mitigated through cloud-scale validation.

SOLUTION: UNIFIED, CLOUD-SCALE, FUTURE-PROOF TESTING

Ixia's CloudStorm™ is an industry-first 2.4 terabit application and security test solution that not only meets today's need, but that of the future. CloudStorm delivers 3X-application and 4X-SSL-emulation scale over any other test system. It helps NEMs shortening their development cycles, and enterprises and data center operators find the right balance between mitigating security risks and delivering high end-user application performance.

Each CloudStorm load module supports two native QSFP28 100GE interfaces with an innovative architecture that allows concurrent emulation of complex applications, unprecedented SSL encrypted applications, and a large volume of DDoS traffic to validate your network infrastructure is high performing and secure. CloudStorm is the industry first solution to break the SSL and DDoS test barriers, achieving

HIGHLIGHTS

- **Massive-scale** under realistic traffic conditions, CloudStorm is the first **multi-terabit** solution—2.5 – 3X application performance

- Hardware-based **SSL acceleration** delivers 4X encryption performance

- Emulate **multi-terabit DDoS** and botnet attacks to future-proof security solutions

- **Unified** application and security test platform, with Layers 2-7 capabilities and support for BreakingPoint and IxLoad software

- **Multi-rate ready**: future-proof your investment with CloudStorm; capable of supporting 100/50/40/25/10GE on a single port

- **Multi-user** environment leverages the per-port user ownership model for all ports on the test modules installed into the chassis

CloudStorm 2 x 100GE (CS100GE2Q28NG) load module

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over 960Gbps of traffic with strong encryption and ciphers or 2.4 terabit DDoS throughput in a single chassis. CloudStorm is driven by Ixia's BreakingPoint and IxLoad applications—industry-leading test solutions for application delivery and security resiliency testing.

PRODUCT CAPABILITIES

CloudStorm provides cloud-grade L4-7 application performance with fully integrated L2/3 stateless traffic support, for exercising the systems under test in real world conditions, helping the customers to easily identify the performance and interoperability issues. The modular architecture of the solution allows linear performance scaling to multi terabit, by populating an Ixia's XGS12-HSL chassis with multiple CloudStorm load modules—up to 12.

XGS12-HSL Chassis with CloudStorm Load Modules

CloudStorm breaks the SSL and IPsec speed test barriers, with its capability to benchmark 960Gbps of encrypted traffic from a single fully populated XGS12 chassis. Powered by encryption hardware offload, CloudStorm enables data center operators to find the right balance between security and end-user quality of experience as traffic is moving toward total encryption, with HTTP/2, 2/4k keys and ECC ciphers are adopted.

The proliferation of IoT poses new security risks, as highjacked IoT devices can easily be used to generate ground-breaking DDoS attacks. Also, network infrastructures need to be able to support billions of concurrent connections to service these IoT devices. CloudStorm allows future-proof validation of cloud data center infrastructure and DDoS mitigation devices by simulating IoT device behavior under a deluge of legitimate IoT and botnet traffic. With the capacity to generate 1.4 billion concurrent sessions and 2.4 Terabits of DDoS traffic from a fully populated chassis, CloudStorm allows organizations to assess their mitigation solutions, as well as people and process.

HARDWARE

Continuing the cutting-edge innovation, CloudStorm's architecture combines powerful multi-core, multi-threaded network processors and inline field programmable gate arrays (FPGAs) to generate realistic, cloud-scale volume of traffic while maintaining 10ns resolution accuracy pertaining to latency measurements.

The CloudStorm 100GE load module is available in two variants:

- CloudStorm Fusion, 2-port 100GE QSFP28 load module
- CloudStorm 2-port 100GE QSFP28 load module

Both variants provide support for native QSFP28 100GE pluggable multi-mode optical transceiver or single-mode optical transceiver.

The CloudStorm load module also includes a mission control center CPU (MCC) equipped with dedicated memory and a solid-state drive (SSD) to accelerate boot time and reduce test configuration time.

The dual-port capabilities enable 100GE inline devices like firewalls can be tested with a single card; this reduces CAPEX, simplifies the management of the test system, while allowing higher density. The load module is capable of supporting 100/50/40/25/10GE[i] on the same port, saving CAPEX by eliminating the need to buy different hardware for each speed and increasing the efficiency of the test platform.

SPECIFICATIONS

SPECIFICATION	CLOUDSTORM FUSION CS100GE2Q28NG	CLOUDSTORM CS100GE2Q28
Ixia Applications Support		
IxOS	Yes	
IxLoad	Yes	
BreakingPoint	Yes	No
TCL API	Yes	
Hardware, Load Module Specifications		
Physical Interfaces	2-port, 100GE QSFP28	
Transceiver Support	QSFP28 SR4 and LR4 (pluggable transceivers)	
Memory	128GB	
Hardware Encryption Offload	Yes	
Hardware-Based Traffic Capture (for BreakingPoint)	2GB per 100GE interface	N/A
Capture Memory (for IxLoad)	Maximum between 2GB or 2 Million packets, per interface	
FPGA Offload	Yes	
IPv4, IPv6, UDP, TCP	Hardware checksum generation	

SPECIFICATION	CLOUDSTORM FUSION CS100GE2Q28NG	CLOUDSTORM CS100GE2Q28
Load Module Dimensions	16.4" (L) x 12.0" (W) x 1.3" (H) 417mm (L) x 305mm (W) x 33mm (H)	
Operating Temperature	41°F to 95°F (5°C to 35°C), ambient air	
Chassis Capacity		
Cards per Chassis	• 12 on XGS12-HSL • 2 on XGS2-HSL	
Port Density	• XGS12-HSL: 24-ports, 100GE QSFP28 • XGS2-HSL: 4-ports, 100GE QSFP28	
XGS12 Chassis Bundles	• XGS12-HSL (940-0016) • XGS2-HSL (940-0014)	

CLOUDSTORM, BREAKINGPOINT PERFORMANCE

Performance numbers are provided in back-to-back scenario using a single CloudStorm load module (a pair of ports). Published SSL metrics were measured with 2K key-size in ideal test configurations to maximize performance.

PERFORMANCE METRIC	CLOUDSTORM FUSION CS100GE2Q28NG	XGS12 CHASSIS WITH 12 BLADES
Application Throughput	200 Gbps	2.4 Tbps
HTTP Connection Rate (CPS)	3.5 Million	42 Million
HTTP Concurrent Connections (CC)	120 Million	1.44 Billion
SSL Throughput	65 Gbps	780 Gbps
SSL Connection Rate (CPS)	320 K	3.8 Million
SSL Concurrent Connections (CC)	2 Million	24 Million
IPsec Throughput	65 Gbps	780 Gbps
Application Throughput over GTP	170 Gbps	2 Tbps

CLOUDSTORM, BREAKINGPOINT TEST COMPONENTS

BREAKINGPOINT	CLOUDSTORM FUSION (CS100GE2Q28NG)
Test Components	- Bit Blaster - Routing Robot - Application Simulator - Session Sender - Security - Security NP - Recreate - Live AppSim - Stack Scrambler - Hardware-based Packet Capture, 2GB per port
Labs	- RFC 2544 Lab - DDoS Lab - Multicast Lab - Lawful Intercept Lab - Session Sender Lab - LTE Lab - Device Validation Lab - MultiBox testing - Resiliency Score - Data Center Resiliency

CLOUDSTORM, IXLOAD PERFORMANCE

Performance numbers are provided in back-to-back scenario using a single CloudStorm load module (a pair of ports). Published SSL metrics were measured with 2K key-size in ideal test configurations to maximize performance.

PERFORMANCE METRIC	CLOUDSTORM FUSION AND NON-FUSION CS100GE2Q28NG CS100GE2Q28	XGS12 CHASSIS WITH 12 BLADES
HTTP Throughput	200 Gbps	2.4 Tbps
HTTP Connection Rate (CPS)	4.5 Million	54 Million
HTTP Concurrent Connections (CC)	60 Million	720 Million
SSL Throughput	80 Gbps	960 Gbps
SSL Connection Rate (CPS)	500 K	6 Million
SSL Concurrent Flows	3 Million	36 Million

PERFORMANCE METRIC	CLOUDSTORM FUSION AND NON-FUSION CS100GE2Q28NG CS100GE2Q28	XGS12 CHASSIS WITH 12 BLADES
DNS Queries per Second (QPS)	8 Million	96 Million
IPsec, Concurrent Tunnels	1 Million	12 Million
IPsec, Tunnel Setup Rates	20 K	240 K
SIP, Emulated Endpoints w/ Media	400 K	4.8 Million
Video (OTT) Throughput	50 Gbps	600 Gbps

IXLOAD, APPLICATION SUPPORT

IxLoad Application Support	CloudStorm (CS100GE2Q28NG & CS100GE2Q28)
Application Delivery	- AppLibrary - TCP Plugin - Application Replay - HTTP - HTTPS - FTP - SMTP - POP3 - DNS - TFTP - IMAP - Stateless Peer
Video Delivery	- VoD (RTSP, QoE) - RTSP (RTP/TCP) - IPTV Multicast IPv4 - Silverlight - Adobe HDS - Apple HLS - Flash Player - MPEG DASH - Video Quality

IxLoad Application Support	CloudStorm (CS100GE2Q28NG & CS100GE2Q28)
VoIP	- Advanced SIP - SIP Cloud/SIP Proxy - RTP/RTCP - SRTP & TLS - WebRTC, DTLS, STUN - Audio, Voice, Video - Video Telepresence - MSRP - Voice Quality / Video Quality
IPsec	- IKEv1, IKEv2, IPsec Suites B - IPsec Quick Tests
Storage	- CIFSv1 - SMB 2.1 - SMB 3.0 - iSCSI - NFSv3, NFSv4, NFSv4.1
Stack Manager	- Static ARP - GratARP - IPv4 / IPv6 - PPP - DNS - DHCPv4 - DHCPv6 - IPv6 SLAAC

ORDERING INFORMATION

944-1231

CloudStorm 100GE 2-port QSFP28 Fusion Load Module (CS100GE2Q28NG).

Requires BreakingPoint Application & Threat Intelligence (ATI) (909-0856), sold separately, at time of purchase. Requires 2 optional QSFP28 transceivers/cable assemblies (QSFP28LR4-XCVR or QSFP28-SR4-XCVR or 942-0087 or 942-0088 or 942-0092) to be ordered separately. The load module is compatible ONLY with XGS12-HSL and XGS2-HSL chassis.

944-1232

CloudStorm 100GE 2-port QSFP28 Load Module (CS100GE2Q28).

Requires 2 optional QSFP28 transceivers/cable assemblies (QSFP28LR4-XCVR or QSFP28-SR4-XCVR or 942-0087 or 942-0088 or 942-0092) to be ordered separately. The load module is compatible ONLY with XGS12-HSL and XGS2-HSL chassis.

SPEED OPTIONS

905-1014

CloudStorm 25GE FAN-OUT FACTORY INSTALLED Option of the 25GE fan-out option for new purchases of the CloudStorm Fusion CS100GE2Q28NG (944-1231) or the CloudStorm CS100GE2Q28 (944-1232), 100GE 2-port QSFP28 load modules. Note: This option is REQUIRED ON NEW PURCHASES to enable the 25GE speed on the CloudStorm CS100GE2Q28NG and CS100GE2Q28 load modules.

905-1015

CloudStorm 25GE FAN-OUT-UPG UPGRADE Option purchase of the 25GE fan-out option for the CloudStorm Fusion CS100GE2Q28NG (944-1231) or the CloudStorm CS100GE2Q28(944-1232), 100GE 2-port QSFP28 load modules. Note: This option is REQUIRED ON UPGRADE PURCHASES to enable the 25GE speed on the CloudStorm CS100GE2Q28NG and CS100GE2Q28 load modules. Note: For the 25GE upgrade purchase please provide the serial number of the desired load module to install the option on at the time of order placement.

905-1018

CloudStorm 10/40GE FAN-OUT FACTORY INSTALLED Option of the 10/40GE fan-out option for new purchases of the CloudStorm Fusion CS100GE2Q28NG (944-1231) or the CloudStorm CS100GE2Q28(944-1232), 100GE 2-port QSFP28 load modules. Note: This option is REQUIRED ON NEW PURCHASES to enable the 10/40GE speeds on the CloudStorm CS100GE2Q28NG and CS100GE2Q28 load modules.

905-1019

CloudStorm 10/40GE FAN-OUT-UPG UPGRADE Option purchase of the 10/40GE fan-out option for the CloudStorm Fusion CS100GE2Q28NG (944-1231) or the CloudStorm CS100GE2Q28(944-1232), 100GE 2-port QSFP28 load modules. Note: This option is REQUIRED ON UPGRADE PURCHASES to enable the 10/40GE speeds on the CloudStorm CS100GE2Q28NG and CS100GE2Q28 load modules. Note: For the 10/40GE upgrade purchase please provide the serial number of the desired load module to install the option on at the time of order placement.

TRANSCEIVERS AND CABLES

QSFP28-SR4-XCVR

QSFP28 100GBASE-SR4 100GE pluggable optical transceiver, MMF (multimode), 850nm, 100m reach.

QSFP28-LR4-XCVR

QSFP28 100GBASE-LR4 100GE pluggable optical transceiver, SMF (single mode fiber), 1310nm, 10km reach.

942-0088

QSFP28 passive, copper, Direct Attach Cable (DAC), 3-meter length

942-0092

QSFP28 Active Optical Cable (AOC), multimode fiber, 850nm, 3-meter length

BREAKINGPOINT ORDERING INFORMATION

909-0856

BreakingPoint - Application & Threat Intelligence Program

IXLOAD ORDERING INFORMATION

925-3366

IxLoad PLUS-2016 Software Bundle, Layer 4-7 Performance Test Application. Enables support for HTTP, HTTPS, TCP Session, FTP, Application-Replay, Stateless Peer, Stream Blaster, DNS, DHCP, LDAP and Telnet emulations. Includes: support for ADVNET-DHCP to emulate DHCP enabled clients, and Software Impairment. Note: some of the features are available only on specific load modules.

925-3371

IxLoad Multiplay-Security-2016, Software Bundle, Layer 4-7 Performance Test Application Data-Video-Voice-Security package. Includes:

- Data: Enables support for HTTP, HTTPS, TCP Session, FTP, DNS, Mail (SMTP, POP3 and IMAP), Database, SSH, RADIUS, TFTP, Application-Replay, DHCP, LDAP, Telnet, Stateless-Peer and StreamBlaster emulations.
- Video: Enables support for basic RTSP, IPTV (Multicast), Video-ADVANCED (VoD), Adobe Flash Client, Apple HLS Client, Microsoft Silverlight Client, Adobe HDS Client and DASH Client emulations. Includes Video Quality VQMON engine for up to 10Gbps and TCP VQ Video quality for TCP video traffic for up to 10 Gbps.
- Voice: Advanced VoIP SIP & RTP, Audio Codecs, VoLTE extensions, and Bulk SIP & MGCP. Includes: Voice Quality engine for up to 10Gbps, Video Quality engine for up to 10Gbps conversational video traffic.
- ADVNET: Enables support for Advanced Access networking protocols such as DHCP for IP address acquisition, DHCP Server, PPP, L2TP and IPsec.
- Storage: iSCSI, CIFSv1, CIFSv2 (SMB2), SMB3, NFSv3 Client, NFSv4 Client, NFS4.1 Client, Cloud Storage Client, DCBX, FCoE and FC; Note the FCoE and FC emulation is only supported on selected load modules.
- Access: DHCP, PPP, L2TP, L2TP, IPsec, IPsec Performance Benchmarking QuickTest & SuiteB Cryptographic, 6RD, DSLITE and IPv6 SLAAC, 8021X, NAC and WEBAUTH.

Note: some of the features are available only on specific load modules

IXIA WORLDWIDE	**IXIA EUROPE**	**IXIA ASIA PACIFIC**
26601 W. AGOURA ROAD	CLARION HOUSE, NORREYS DRIVE	101 THOMSON ROAD,
CALABASAS, CA 91302	MAIDENHEAD SL6 4FL	#29-04/05 UNITED SQUARE,
	UNITED KINGDOM	SINGAPORE 307591
(TOLL FREE NORTH AMERICA)		
1.877.367.4942	SALES +44.1628.408750	SALES +65.6332.0125
(OUTSIDE NORTH AMERICA)	(FAX) +44.1628.639916	(FAX) +65.6332.0127
+1.818.871.1800		
(FAX) 818.871.1805		
www.ixiacom.com		

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[i] 50GE speed mode is subject to additional software license purchase, and will be available at a later time.