

# CloudStorm™ 25GE 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 shorten their development cycles, and enterprises and data center operators find the right balance between mitigating security risks and delivering high end-user application performance.

## 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 8 x 25GE  
(CS25GE8Q28NG) load module

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 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. CloudStorm 2 x QSFP28 ports is available in several speed options; the 25GE options are:

- CloudStorm Fusion, 8-port 25GE QSFP28 load module
- CloudStorm 8-port 25GE QSFP28 load module

Both variants provide support for native QSFP28 100GE pluggable multi-mode optical transceiver or single-mode optical transceiver. The 25GE interfaces are provided through fan-out cables.

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 load module is capable of supporting 100/50/40/25/10GE 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 CS25GE8Q28NG	CloudStorm CS25GE8Q28
<b>Ixia Applications Support</b>		
IxOS	Yes	
IxLoad	Yes	
BreakingPoint	Yes	No
TCL API	Yes	
<b>Hardware, Load Module Specifications</b>		
Physical Interfaces	2-port, 100GE QSFP28 Fan-out to a total of 8x25GE ports	
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 100GE interface	

Specification	CloudStorm Fusion CS25GE8Q28NG	CloudStorm CS25GE8Q28
FPGA Offload	Yes	
IPv4, IPv6, UDP, TCP	Hardware checksum generation	
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	
<b>Chassis Capacity</b>		
Cards per Chassis	<ul style="list-style-type: none"> <li>• 12 on XGS12-HSL</li> <li>• 2 on XGS2-HSL</li> </ul>	
Port Density	<ul style="list-style-type: none"> <li>• XGS12-HSL: 96-ports, 25GE</li> <li>• XGS2-HSL: 16-ports, 25GE</li> </ul>	
XGS12 Chassis Bundles	<ul style="list-style-type: none"> <li>• XGS12-HSL (940-0016)</li> <li>• XGS2-HSL (940-0014)</li> </ul>	

## CloudStorm, BreakingPoint performance

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

Performance Metric	CloudStorm Fusion CS25GE8Q28NG	XGS12 Chassis w/ 12 Blades
<b>Application Throughput</b>	200 Gbps	2.4 Tbps
<b>HTTP Connection Rate (CPS)</b>	3.5 Million	42 Million
<b>HTTP Concurrent Connections (CC)</b>	120 Million	1.44 Billion
<b>SSL Throughput</b>	92 Gbps	1.1 Tbps
<b>SSL Connection Rate (CPS)</b>	320 K	3.8 Million
<b>SSL Concurrent Connections (CC)</b>	2 Million	24 Million
<b>IPsec Throughput</b>	65 Gbps	780 Gbps
<b>Application Throughput over GTP</b>	170 Gbps	2 Tbps

## CloudStorm, BreakingPoint test components

BreakingPoint	CloudStorm Fusion (CS25GE8Q28NG)
<b>Test Components</b>	<ul style="list-style-type: none"> <li>• Bit Blaster</li> <li>• Routing Robot</li> <li>• Application Simulator</li> <li>• Session Sender</li> <li>• Security</li> <li>• Security NP</li> <li>• Recreate</li> <li>• Live AppSim</li> <li>• Stack Scrambler</li> <li>• Hardware-based Packet Capture, 2GB per 100GE interface</li> </ul>
<b>Labs</b>	<ul style="list-style-type: none"> <li>• RFC 2544 Lab</li> <li>• DDoS Lab</li> <li>• Multicast Lab</li> <li>• Lawful Intercept Lab</li> <li>• Session Sender Lab</li> <li>• Device Validation Lab</li> <li>• MultiBox testing</li> <li>• Resiliency Score</li> <li>• Data Center Resiliency</li> </ul>

## CloudStorm, IxLoad performance

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

Performance Metric	CloudStorm Fusion & Non-Fusion CS25GE8Q28NG, CS25GE8Q28	XGS12 Chassis w/ 12 Blades
<b>HTTP Throughput</b>	200 Gbps	2.4 Tbps
<b>HTTP Connection Rate (CPS)</b>	4.5 Million	54 Million
<b>HTTP Concurrent Connections (CC)</b>	60 Million	720 Million
<b>SSL Throughput</b>	100 Gbps	1.2 Tbps
<b>SSL Connection Rate (CPS)</b>	520 K	6.2 Million
<b>SSL Concurrent Flows</b>	3 Million	36 Million
<b>DNS Queries per Second (QPS)</b>	8 Million	96 Million

Performance Metric	CloudStorm Fusion & Non-Fusion CS25GE8Q28NG, CS25GE8Q28	XGS12 Chassis w/ 12 Blades
<b>IPsec, Concurrent Tunnels</b>	1 Million	12 Million
<b>IPsec, Tunnel Setup Rates</b>	20 K	240 K
<b>SIP, Emulated Endpoints w/ Media</b>	400 K	4.8 Million
<b>Video (OTT) Throughput</b>	50 Gbps	600 Gbps

### IxLoad, application support

IxLoad Application Support	CloudStorm (CS25GE8Q28NG & CS25GE8Q28)
Application Delivery	<ul style="list-style-type: none"> <li>• AppLibrary</li> <li>• TCP Plugin</li> <li>• Application Replay</li> <li>• HTTP</li> <li>• HTTPS</li> <li>• FTP</li> <li>• SMTP</li> <li>• POP3</li> <li>• DNS</li> <li>• TFTP</li> <li>• IMAP</li> <li>• Stateless Peer</li> </ul>
Video Delivery	<ul style="list-style-type: none"> <li>• VoD (RTSP, QoE)</li> <li>• RTSP (RTP/TCP)</li> <li>• IPTV Multicast IPv4</li> <li>• Silverlight</li> <li>• Adobe HDS</li> <li>• Apple HLS</li> <li>• Flash Player</li> <li>• MPEG DASH</li> <li>• Video Quality</li> </ul>
VoIP	<ul style="list-style-type: none"> <li>• Advanced SIP</li> <li>• SIP Cloud/SIP Proxy</li> <li>• RTP/RTCP</li> <li>• SRTP &amp; TLS</li> <li>• WebRTC, DTLS, STUN</li> <li>• Audio, Voice, Video</li> <li>• Video Telepresence</li> </ul>

IxLoad Application Support	CloudStorm (CS25GE8Q28NG & CS25GE8Q28)
	<ul style="list-style-type: none"> <li>• MSRP</li> <li>• Voice Quality / Video Quality</li> </ul>
IPsec	<ul style="list-style-type: none"> <li>• IKEv1, IKEv2, IPsec Suites B</li> <li>• IPsec Quick Tests</li> </ul>
Storage	<ul style="list-style-type: none"> <li>• CIFSv1</li> <li>• SMB 2.1</li> <li>• SMB 3.0</li> <li>• iSCSI</li> <li>• NFSv3, NFSv4, NFSv4.1</li> </ul>
Stack Manager	<ul style="list-style-type: none"> <li>• Static ARP</li> <li>• GratARP</li> <li>• IPv4 / IPv6</li> <li>• PPP</li> <li>• DNS</li> <li>• DHCPv4</li> <li>• DHCPv6</li> <li>• IPv6 SLAAC</li> </ul>

## Ordering Information

### CloudStorm bundles

#### 947-5102

Bundle, CloudStorm 25 GigE 8-port SFP28 Fusion Load Module (CS25GE8Q28NG) with enabled support for 25GigE, 40GigE and 10GigE.

Requires BreakingPoint Application & Threat Intelligence (ATI) (909-0856), sold separately, at time of purchase.

Includes Qty 1 each CloudStorm 25GigE 8-port SFP28 Fusion Load Module (944-1235), Qty 2 each QSFP28 100GBASE-SR4 pluggable optical transceivers (QSFP28-SR4-XCVR) and Qty 2 MT-to-4x10GE LC fan-out, MMF, 3-meter cable for 10GE and 25GE fan-out cables (942-0067). Transceivers and fan-out cables for other modes are available to be ordered separately. The bundle is compatible ONLY with XGS12-HSL (940-0016) and XGS2-HSL (940-0014) chassis.

## 947-5106

Bundle, CloudStorm 25 GigE 8-port SFP28 Load Module (CS25GE8Q28) with enabled support for 25GigE, 40GigE and 10GigE.

Includes Qty 1 each CloudStorm 25GigE 8-port SFP28 Load Module (944-1236), Qty 2 each QSFP28 100GBASE-SR4 pluggable optical transceivers (QSFP28-SR4-XCVR) and Qty 2 MT-to-4x10GE LC fan-out, MMF, 3-meter cable for 10GE and 25GE fan-out cables (942-0067). Transceivers and fan-out cables for other modes are available to be ordered separately. The bundle is compatible ONLY with XGS12-HSL (940-0016) and XGS2-HSL (940-0014) 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.

### 905-1029

Field Hardware Upgrade from 944-1235 (CS25GE8Q28NP - CloudStorm Fusion 8-port 25GigE) to 944-1233 (CS100GE2Q28NGALL - CloudStorm Fusion 2-port 100GigE) or from 944-1236 (CS25GE8Q28 - CloudStorm 8-port 25GigE) to 944-1234 (CS100GE2Q28ALL - CloudStorm 2-port 100GigE); enables the 100GE and 50GE speed options on CloudStorm 25GE load module. The upgrade option increases the hardware value of the original base hardware. The upgraded system is covered by the original warranty of the base hardware until the initial contract term lapses. The upgrade option DOES NOT require ATI purchase until original ATI contract is terminated. Renewal of ATI for the fusion variant, and the renewal of warranty to be calculated based on the upgraded system price (base system + upgrade option). This purchase requires the 6-digit serial number of the original hardware to install the upgrade option, at the time of order placement.



## 905-1034

Field Hardware Upgrade from CloudStorm Non-fusion to CloudStorm Fusion. From 944-1232 (CS100GE2Q28) to 944-1231 (CS100GE2Q28NG), or from 944-1234 (CS100GE2Q28ALL) to 944-1233 (CS100GE2Q28NGALL), or from 944-1236 (CS25GE8Q28) to 944-1235 (CS25GE8Q28NG), or from 944-1238 (CS40GE2Q28) to 944-1237 (CS40GE2Q28NG), or from 944-1240 (CS10GE8Q28) to 944-1239 (CS10GE8Q28NG). The upgrade option increases the hardware value of the original base hardware. Requires: 1 year of BreakingPoint Application & Threat Intelligence (ATI) (909-0856), sold separately, at time of purchase (calculated as 18% of the end-user price of the upgraded system - base system + upgrade option). The upgrade option is covered by the warranty of the original base hardware until the original contract lapses. Renewal of warranty and ATI to be calculated based on the upgraded system price (base system + upgrade option). This purchase requires the 6-digit serial number of the original hardware to install the upgrade option, 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*

Other IxLoad technology-specific bundles (data, voice, video) are available for ordering.

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

