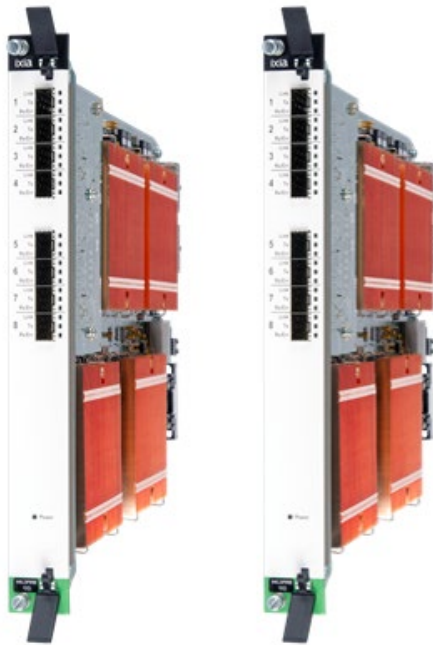


# PerfectStorm® 10/1GE, High-Performance Application and Security Load Modules

Ixia's PerfectStorm family of load modules delivers the industry's most scalable solution for testing converged multi-play services, application delivery, and network security platforms for both wired and wireless networks.

The architectural breakthrough of the PerfectStorm family adopts the technology innovations built around Ixia's Xcellon-Ultra and BreakingPoint Firestorm hardware families, resulting in a revolutionary converged solution with optimal flexibility and performance, to meet the requirements of today's and future next-generation networks.



PerfectStorm 10GE (PS10GE8) and PerfectStorm Fusion 10/1GE (PS10GE8NG / PS1GE8NG) load modules

## Highlights

- Unified applications and security test platform, with support for BreakingPoint and IxLoad software
- Massive scale under realistic traffic conditions
- Hardware-based acceleration for SSL and IPsec
- Multi-user environment leverages the per-port user ownership model for all ports on the test modules installed into the chassis
- 1G/10G dual speed and resource aggregation

## The Ixia PerfectStorm is the essential solution to:

- Evaluate next-generation content-aware security devices
- Benchmark and validate performance of network infrastructures and network devices
- Harden 3G/4G/LTE mobile networks
- Deploy compact cyber ranges and train cyber warriors
- Optimize virtualized data centers
- Tune systems and policies
- Mitigate IT risk
- Rollout converged multiplay services
- Evaluate storage infrastructure and devices

The proliferation of dynamic and evolving applications, along with an increase in advanced malicious attacks, has created a dangerous lack of control and visibility into both the performance and security of IT infrastructures.

The world is becoming an always-connected, mobile environment, with massive volumes of traffic flowing through WANs, LANs, and data centers. The increase in network traffic scale, complexity, and types is causing a huge upswing in data center port counts and technology diversity.

As bandwidth requirements press the limits of networking devices towards the terabit level and users drive 10x more TCP connections per second compared with the last 2-3 years, equipment manufacturers, datacenters, and service providers must keep pace by introducing even higher-density 10GE, 40GE, and 100GE equipment.

Equipped with powerful multi-core, multi-threaded network processors, PerfectStorm is Ixia's next-generation architecture designed to satisfy the testing needs of those manufacturers. As service providers and large enterprises implement this same equipment in their own networks, they must also test and verify performance and functionality prior to deployment.

A single, integrated system equipped with 12 PerfectStorm blades allows control of application traffic to nearly a terabit, up to 720 million concurrent connections, and new TCP connection rates of up to 24 Million. The hardware-based acceleration supports massive encryption levels with up to 240Gbps of SSL traffic and 480Gbps of IPsec traffic per system. The system uses inline field programmable gate arrays (FPGAs) for enhanced accuracy pertaining to latency measurements with a resolution of 10ns.



XGS12-HS chassis and PerfectStorm 10/1GE Load Modules

## Massive-Scale, Easy-To-Use and High-Fidelity Simulations to Battle-Test Today's High-Volume, Dynamic, Converged Networks and Data Center Infrastructures

The modular PerfectStorm platform creates real-world, high-stress conditions and user behavior to provide organizations the insight to battle-test IT infrastructures, train cyber warriors, tune systems and policies, and transform security processes to be proactive and effective.

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### Modes of operation

The 8 SFP+ interfaces on the PerfectStorm 10G load modules can function as 10G ports (10G mode) or 1G ports (1G mode). The advanced aggregation capabilities of the PerfectStorm allow the blades to operate in two different modes, providing extra flexibility and performance:

**Non-Aggregated, Mode:** In this mode, each 10GE port uses of 1/8th of the network processor and memory resources available on the load module, allowing delivery of application traffic at wire-speeds for each port, with up to 80 Gbps per module.

**10GE Aggregated, Mode:** This mode provides extra flexibility to allocate all available NP resources and memory available on a single module while using a single 10 GE interface to transmit/receive the traffic. Ixia test applications transparently configure the allocation of NP resources to achieve the maximum performance.

### Hardware variants

The PerfectStorm 10GE load module consists of 8-port 1GE/10GE SFP+ interfaces, and is licensed as three variants, each one available in both standard (enables support for IxLoad) and Fusion (enables support for both IxLoad and BreakingPoint) variants:

- 2-port 1GE/10GE SFP+
- 4-port 1GE/10GE SFP+
- 8-port 1GE/10GE SFP+

A flexible licensing model allows customers to easily upgrade their appliance (from any model to any model), simply using an activation code. This flexibility allows customers to preserve their initial investment, optimize their budget, and spread the investment across multiple quarters or when additional performance is required.

Also, a 1G version is available: PerfectStorm 8x1GE ports Fusion; it supports both IxLoad and BreakingPoint:

- 8-port 1GE SFP+

## PerfectStorm Specifications

Specification	PerfectStorm Fusion PS1GE8NG	PerfectStorm Fusion PS10GE8NG	PerfectStorm PS10GE8
<b>Ixia Applications Support</b>			
IxOS	Yes	Yes	Yes
IxExplorer	No	No	No
IxLoad	Yes	Yes	Yes
BreakingPoint	Yes	Yes	No
IxNetwork	No	No	No
TCL API	Yes	Yes	Yes
<b>Hardware, Load Module Specifications</b>			
Physical Interfaces	8-port, 1GE SFP+	8-port, 10/1GE SFP+	8-port, 10/1GE SFP+
1GE Support	Yes	Yes	Yes
Transceiver Support (pluggable transceivers)	SFP+, 10Gb/1Gb SR optical Xcvr, 850nm (cable included) SFP+, 10Gb/1Gb LR optical Xcvr, 1310nm		
Memory	64GB	64GB	64GB
Hardware-Based Traffic Capture (available in BreakingPoint)	256MB per 1GE interface	256MB per 10GE interface	N/A
Software-Based Traffic Capture Buffer (available in IxLoad)	Maximum between 2GB or 2 Million packets, per interface	Maximum between 2GB or 2 Million packets, per interface	Maximum between 2GB or 2 Million packets, per interface
Hardware Encryption Offload	Yes	Yes	Yes
FPGA Offload	Yes	Yes	Yes

Specification	PerfectStorm Fusion PS1GE8NG	PerfectStorm Fusion PS10GE8NG	PerfectStorm PS10GE8
IPv4, IPv6, UDP, TCP	Hardware checksum generation		
Load Module Dimensions	16" (L) x 1.3" (W) x 12.00" (H) 406 mm (L) x 33 mm (W) x 305 mm (H)		
Operating Temperature Range	41°F to 95°F (5°C to 35°C), ambient air		
<b>Chassis Capacity</b>			
Cards per Chassis	12	12	12
Port Density per Chassis	144-port, 1GE	144-port, 1GE/10GE	144-port, 1GE/10GE
Chassis Compatibility	XGS12 & XGS2	XGS12 & XGS2	XGS12 & XGS2
XGS12 Chassis Bundles	XGS12-HS (940-0006) XGS12-HSL (940-0016) XGS2-HS (940-0012) XGS2-HSL (940-0014)	XGS12-HS (940-0006) XGS12-HSL (940-0016) XGS2-HS (940-0012) XGS2-HSL (940-0014)	XGS12-HS (940-0006) XGS12-HSL (940-0016) XGS12-SD (940-0011) XGS2-HS (940-0012) XGS2-HSL (940-0014) XGS2-SD (940-0010)

## PerfectStorm, BreakingPoint performance

Per-blade performance numbers provided in back-to-back using a single blade. Published SSL metrics were measured with 2K key-size in ideal test configurations to maximize performance.

Performance Metric	PerfectStorm Fusion PS1GE8NG	PerfectStorm Fusion PS10GE8NG	XGS12 Chassis with 12 x PS10GE8NG Blades
Applications Throughput	8Gbps	80Gbps	960Gbps
TCP Connections per Second	2M	2M	24M
Applications Concurrent Flows	60 Million	60 Million	720 Million
SSL Bandwidth	8Gbps	20Gbps	240Gbps
SSL Handshakes Rates	200,000	200,000	2.4 Million
SSL Concurrent Flows	1 Million	1 Million	12 Million

Performance Metric	PerfectStorm Fusion PS1GE8NG	PerfectStorm Fusion PS10GE8NG	XGS12 Chassis with 12 x PS10GE8NG Blades
Applications Throughput over SCTP	5Gbps	5Gbps	60Gbps
Applications Throughput over IPsec	8Gbps	25Gbps	300Gbps
IPsec, Concurrent Tunnels	500,000	500,000	6 Million
IPsec, Tunnel Setup Rates	2,000	2,000	12,000
Applications Throughput over GTP	8Gbps	40Gbps	480Gbps
GTP, UE Attachment Rate	450K	450K	5.4M
GTP, Tunnels	3M	3M	36M

### PerfectStorm, BreakingPoint test components

BreakingPoint	PerfectStorm Fusion (PS10GE8NG & PS1GE8NG)
Test Components	<ul style="list-style-type: none"> <li>• Application Simulator</li> <li>• Session Sender</li> <li>• Security</li> <li>• Security NP</li> <li>• Recreate</li> <li>• Stack Scrambler</li> </ul>

### PerfectStorm, BreakingPoint mobility

BreakingPoint	PerfectStorm Fusion (PS10GE8NG & PS1GE8NG)
Mobility (3G/4G)	<p><b>Interfaces Supported</b></p> <ul style="list-style-type: none"> <li>• S1-U (eNodeB and SGW sides)</li> <li>• S1-MME (eNodeB side)</li> <li>• SGi (PDN side)</li> <li>• S5/8 (SGW and PGW sides)</li> <li>• S11 (MME and SGW sides)</li> <li>• Gn (SSGN and GGSN sides)</li> </ul> <p><b>Wireless Protocols Supported</b></p> <ul style="list-style-type: none"> <li>• S1AP</li> <li>• GTP-C v1, GTP-C v2, GTP-U v1</li> <li>• SCTP (over UDP or IP)</li> </ul>

BreakingPoint	PerfectStorm Fusion (PS10GE8NG & PS1GE8NG)
	<b>3G/4G Operational Modes</b> <ul style="list-style-type: none"> <li>• eNodeBs + UEs</li> <li>• PDN</li> <li>• MME</li> <li>• SGW + PGW + PDN</li> <li>• eNodeBs + UEs + MME, SGW + PGW + PDN</li> <li>• SGSN + UEs</li> <li>• GGSN + PDN</li> <li>• UE/eNB/MME/SGW</li> <li>• PGW/PDN</li> <li>• UE/eNB vs. MME/SGW/PGW/PDN</li> </ul>

### PerfectStorm performance with IxLoad

Per-blade performance numbers provided in back-to-back using a single blade. Published SSL metrics were measured with 2K key-size in ideal test configurations to maximize performance.

Performance Metric	PerfectStorm PS1GE8NG	PerfectStorm PS10GE8 & PS10GE8NG	XGS12 Chassis with 12 x PS10GE8NG Blades
Applications Throughput	8Gbps	64Gbps	768Gbps
HTTP Throughput	8Gbps / 8Gbps	40Gbps / 72Gbps	480Gbps / 864Gbps
HTTP Connections per Second	1.5M	1.5M	18M
HTTP Concurrent Connections	30M	30M	360M
SSL Throughput	8Gbps	20Gbps	240Gbps
SSL Connection Rates	200,000	200,000	2.4 Million
SSL Concurrent Flows	1 Million	1 Million	12 Million
IPsec, Concurrent Tunnels	500,000	500,000	6 Million
IPsec, Tunnel Setup Rates	10,000	10,000	120,000

IxLoad, application support

IxLoad Application Support	PerfectStorm (PS10GE8 and PS10GE8NG)
<p><b>Application Delivery</b></p>	<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>
<p><b>Video Delivery</b></p>	<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>• Quality of Video</li> </ul>
<p><b>VoIP</b></p>	<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>• Audio, Voice, Video</li> <li>• Video Telepresence</li> <li>• MSRP</li> <li>• Quality of Voice / Quality of Video</li> </ul>
<p><b>IPsec</b></p>	<ul style="list-style-type: none"> <li>• IKEv1, IKEv2, IPsec Suites B</li> <li>• IPsec Quick Tests</li> </ul>
<p><b>Storage</b></p>	<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>



IxLoad Application Support	PerfectStorm (PS10GE8 and PS10GE8NG)
<b>Stack Manager</b>	<ul style="list-style-type: none"> <li>• Static ARP</li> <li>• GratARP</li> <li>• IPv4 / IPv6</li> <li>• PPP</li> <li>• L2TP</li> <li>• DNS</li> <li>• DHCPv4</li> <li>• DHCPv6</li> <li>• IPv6 SLAAC</li> <li>• 6rd</li> <li>• DSLite</li> <li>• 802.1x</li> <li>• WebAuth</li> <li>• EAPoUDP</li> </ul>

## Hardware Ordering Information

Part Number	Description
940-0006	XGS12-HS 12-slot chassis bundle with High Performance Controller
940-0016	XGS12-HSL 12-slot chassis bundle with High Performance Controller
940-0011	XGS12-SD 12-slot chassis bundle with Standard Controller
940-0012	XGS2-HS 2-slot chassis bundle with High Performance Controller
940-0014	XGS2-HSL 2-slot chassis bundle with High Performance Controller
940-0010	XGS2-SD 2-slot chassis bundle with Standard Controller
<b>Fusion Load Modules</b>	
944-1200	PerfectStorm 10GE Fusion 8-port (PS10GE8NG)
944-1203	PerfectStorm 1GE Fusion 8-port (PS1GE8NG)
944-1209	PerfectStorm 10GE Fusion 4-port (PS10GE4NG)
944-1210	PerfectStorm 10GE Fusion 2-port (PS10GE2NG)

Part Number	Description
<b>Standard Load Modules</b>	
944-1204	PerfectStorm 10GE 8-port (PS10GE8)
944-1207	PerfectStorm 10GE 4-port (PS10GE4)
944-1208	PerfectStorm 10GE 2-port (PS10GE2)

### Transceivers and cables

Part Number	Description
988-0011	SFP+, 10Gb/1Gb SR optical Xcvr, 850nm (cable included)
988-0012	SFP+, 10Gb/1Gb LR optical Xcvr, 1310nm

### BreakingPoint Ordering Information

Part Number	Description
909-0856	BreakingPoint - Application & Threat Intelligence Program

### IxLoad Ordering Information

Part Number	Description
925-3371	<p><b>IxLoad Multiplay-2016</b>, Software Bundle, Layer 4-7 Performance Test Application Data-Video-Voice-Security package. Includes:</p> <ul style="list-style-type: none"> <li>• <b>Data:</b> 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.</li> <li>• <b>Video:</b> 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.</li> <li>• <b>Voice:</b> Advanced VoIP SIP &amp; RTP, Audio Codecs, VoLTE extensions, and Bulk SIP &amp; MGCP. Includes: Voice Quality engine for up to 10Gbps, Video Quality engine for up to 10Gbps conversational video traffic.</li> <li>• <b>ADVNET:</b> Enables support for Advanced Access networking protocols such as DHCP for IP address acquisition, DHCP Server, PPP, L2TP and IPsec.</li> </ul>

Part Number	Description
	<ul style="list-style-type: none"> <li>• <b>Storage:</b> 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.</li> <li>• <b>Access:</b> DHCP, PPP, L2TP, L2TP, IPsec, IPsec Performance Benchmarking QuickTest &amp; SuiteB Cryptographic, 6RD, DSLITE and IPv6 SLAAC, 8021X, NAC and WEBAUTH.</li> <li>• <b>Security:</b> Enables support for a collection of vulnerabilities and malware attacks with 1-year subscription service and DDoSv2.</li> <li>• Software Impairment.</li> </ul> <p>Note: some of the features are available only on specific load modules</p>
925-3461	<p><b>IxLoad AppLibrary Slot Bundle</b>, Software Bundle, Layer 4-7 Performance Test Application; Enables support for AppLibrary on a single load module. It includes <b>AppLibrary Slot Feature</b> (925-3462) and <b>Slot Subscription</b> service (925-3460) to access new application flows for one year; Requires previous purchase of 925-3040 (IXLOAD Base) or higher bundle.</p>
<p><b>IxLoad Bundles per technology</b> (Data, Video, Voice, Access and VPN, Storage, Security) are also available.</p>	

For more information, see [www.ixiacom.com/products/perfectstorm](http://www.ixiacom.com/products/perfectstorm)

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

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