NETWORK EMULATOR II™— ETHERNET

ixia

DATA SHEET

10GBE, 1GBE, AND 100MBE ETHERNET IMPAIRMENT EMULATION

PROBLEM: KNOWING HOW NETWORKS AND DEVICES WILL BEHAVE UNDER WORST-CASE CONDITIONS

Effective testing requires a real-world environment that reproduces realistic network conditions and behavior. All software and hardware should be subjected to a realistic test environment prior to deployment.

SOLUTION: REAL-WORLD NETWORK IMPAIRMENT TESTING

Network Emulator II is a precision test instrument for 10GbE, 1GbE, and 100MbE Ethernet impairment. The device allows users to accurately emulate the real network conditions that occur over live production LAN/WAN networks. By emulating realistic and worst-case network conditions in the lab, users can validate and test performance of new hardware, protocols, and applications to prevent failures in production networks. The Network Emulator II offers a rich feature-set to allow testing in a controlled lab environment with repeatable and predictable impairments. Network Emulator II enables user to:

- Test the effect of delay on the network and application performance
- Determine how applications will perform when distributed across data centers
- Test data center backup in a real-life environment
- Cause outage and degrade scenarios to trigger and validate fail-over protection
- Combine with IxNetwork, IxLoad, and BreakingPoint test systems to create a complete test environment that includes real-world impairments
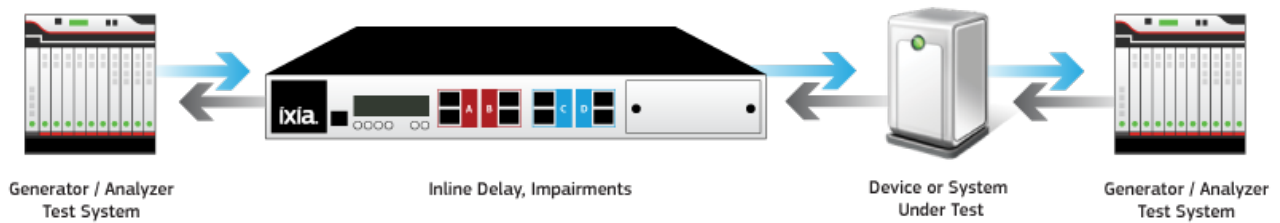
HIGHLIGHTS

Emulate real-world networks in the lab

- Enables validation, performance, and interoperability testing
- Test products and applications to characterize end user experience under real-world conditions
- Precisely reproduce and quickly resolve issues occurring in the field

Key Features

- 10GbE / 1GbE / 100MbE impairment emulation
- 8 Port FPGA hardware architecture allows 100% line-rate performance
- Single hardware platform for both Ethernet and Fibre Channel
- Test mixed speeds at the same time with one device
- Flexible resource management

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Generator / Analyzer Test System   Inline Delay, Impairments   Device or System Under Test   Generator / Analyzer Test System

KEY FEATURES

- Industry's highest port count Ethernet FPGA emulator with 8 Ethernet ports

- Supports 10GbE, 1GbE, and 100MbE Ethernet impairment

- FPGA hardware-based architecture provides maximum precision and accuracy

- Dual banks with 4 ports each and dedicated FPGA processors per bank ensures high performance

- Fibre Channel 16G, 8G, 4G, and 2G also supported with additional software licenses

- Flexible Resource Management enables allocation of resources as needed by allowing:
  - Automatic or manual memory allocation
  - Allocation of profiles
  - Bandwidth flexibility enabling 10G on 4 ports at line rate or 8 ports sharing bandwidth of 11G per bank
  - Configuration of any port to either Ethernet or Fibre Channel (with additional licenses) and speed supported

- Precisely emulates delays and impairment that exist in Ethernet networks

- Stresses systems with controlled bit errors and frame drops

- Dynamically increases impairments to test failure recovery mechanisms

- Transparent to any higher-layer L2/7 protocols

- Optical media physical layer clock transparency for SyncE support

- Test automation via RESTful Web API, allowing control by TCL and languages such as Python

PRIMARY USE CASES

- Performance testing of critical applications over Ethernet with realistic network conditions and impairments

- Combine with IxNetwork, IxLoad, and BreakingPoint test systems to create a complete real world test environment

- Real-world interoperability and customer proof-of-concept (PoC) testing

- Corporate LAN/WAN emulation

- Business continuity and disaster recovery testing
- Server consolidation/migration
- Application cloud migration and storage extension
- Wireless/mobile delay and impairment simulation
- Satellite network delay emulation
- Reuse and build proprietary or standard-based Layer 2-7 protocol filter with the Customizable Filter Library
- Use corruption for precise functional and negative testing
- Cause outage and degrade scenarios triggering fail-over protection

NETWORK EMULATOR II SPECIFICATIONS

FEATURE	DETAILS

Ports	- 8 FPGA ports, divided into two banks of 4 ports each
	- All ports support 10GbE, 1GbE, and 100MbE
	- All ports support Fibre Channel with additional licensing
	- Each bank may run a different speed and choice of Ethernet or Fibre Channel protocol
	- License only what is needed, allowing for efficient cost
	- Flexible Resource Management provides performance when you need it
	  o Full 100% line rate support for 8 ports of 1G
	  o Full 100% line rate support for 4 ports of 10G (2 ports per bank)
	  o Full 100% line rate support for 4 ports of 10G and 4 ports of 1G (each bank must run 2 ports of each speed)
	  o 8 ports of 10GbE can be used when sharing bandwidth of 11G per bank
	Note: Each line to be impaired requires 2 ports

Traffic Selection	- Classifier pattern matching allows selection of specific traffic
	  o Standard filters available such as MAC, IP, and VLAN
	  o Custom Byte Offset
	  o Up to 32 bytes for matching

32 Classifier Profiles Per Bank with Flexible Allocation	- Flexible Resource Management provides ability to allocate resources in the required manner - Each line to be impaired requires a port pair - Ports 1&2, 3&4, 5&6, 7&8 are paired and traffic flow is between port pairs

FEATURE	DETAILS
	• Flexible Resource Management allows Profiles to be configured from the Profile Pool as needed, allowing for the most efficient use of system resources ○ 32 Profiles per bank allocated as needed by the user ○ 1 default profile is allocated to each port ○ Flexible Resource Management allows allocation from the Profile Pool enabling up to 15 profile per port, per traffic direction allowing 30 profiles per bidirectional traffic flow • FPGA hardware-driven implementation ensures accuracy and repeatable testing • Network Profiles support emulating multiple "network clouds" per interface: emulate different paths through a network or different classes of service ○ Each profile is defined by any combination of VLAN tag, MPLS label, MAC/IP address (IPv4, IPv6), TCP/UDP port, or any data within Ethernet frame ○ Define bandwidth, delay, and impairments per profile • Classify up to any 32 bytes within an Ethernet frame
Delay	• Emulate delay occurring during transmission through an Ethernet network • Fully transparent pass-through operation for fiber where delayed output is logically identical to input signal • Delay at 100% line rate

	10GBE	1GBE	100MBE
Max Delay at Line Rate	2 seconds	20 seconds	30 seconds
Max Delay at Limited Line Rate	30 seconds	30 seconds	30 seconds
Resolution (Min Delay Increment)	6.4 ns	64 ns	640 ns

Note: When line rate is less than 100%, delay can be increased to a maximum 30 seconds dependent on the actual line rate and memory allocation

FEATURE	DETAILS
Packet Delay Variation	• Introduce frame or packet delay variation (jitter) • Impairment distribution: Gaussian, Periodic, Uniform, or Custom • Timing transparent pass-through operation: Physical medium clock is maintained between ingress and egress port
Packet Drop	• Packet Drop impairment allowing single or multiple packets to be dropped • Variable by Periodic, Poisson, Uniform, and Gaussian distributions
Packet Duplication	• Packet Duplication impairment allows single or multiple packets to be duplicated • Variable by Periodic, Poisson, Uniform, and Gaussian distributions
Packet Reorder	• Packet Reorder impairment allows the reorder of single or multiple packets as specified by the options • Variable by Periodic, Poisson, Uniform, and Gaussian distributions
Packet Accumulate-Burst	• Packet Accumulate-Burst allows the accumulation of packets until the time and/or accumulation amount has been reached after which all accumulated packets will be sent
Line BER	• Capable of injecting bit-errors at rates 5x10-4 to 5x10-17, which allow errors from one in every 1000 bits to once every several years • Error distributions of Periodic, Uniform, Gaussian, and Poisson • 1-bit to 64K-bit error burst – invert, PRBS, all ones, or all zeros
Laser Impair	• Emulate loss of signal, loss of frame under user, or program control
Statistics	• Robust statistics support with customizable flow based overview
Filter Libraries	• Filter Libraries allow you to customize the emulator for your specific protocol requirements o Advanced Protocol Filter Suite provides a growing list of filters including PPP, PTP, RSVP, IP, FCoE, FIP, OSPF, MPEG, and many others o Customer Byte Offset functionality allows
User Interface	• Remote monitoring and control via 10/100/1000 RJ45 Ethernet port • Intuitive and interactive web GUI interface • RESTful API allows test automation and complete control of all functionality • The following browsers and versions are supported o Internet Explorer version 9 or higher o Mozilla Firefox version 24 or higher

NETWORK EMULATOR II SYSTEM SPECIFICATIONS

FEATURE	DETAILS
Chassis	• Rack mount and desktop mounting hardware included • 1U rack-mountable • Dimensions: 1U - 1.73 x 17.3 x 10" (4.6 x 43.9 x 25.4 cm) • Weight: 9 lb. (4.08 kg) • Thermal ○ Operating temperature: 0° to 40° C (32 to 104° F) ○ Operating humidity: 10 to 85% (RH), non-condensing ○ Storage temperature: –40°C to 70°C (-40 to 158 F) ○ Storage humidity: 5 to 95% (RH), non-condensing • Input power (internal AC/DC converter) ○ Input voltage: 100-240VAC ○ Input frequency: 47-63Hz • Max. power consumption: 100W (typical), 175 (max)
Regulatory Approvals	• CE • UL 60950-1, 2nd Edition • FCC Class A • ROHS compliant • UL File #: E255262
Transceivers supported	• SFP and SFP+ form factors • Copper SFP

PRODUCT ORDERING INFORMATION

PART NUMBER	DESCRIPTION
946-0070	Network Emulator II: Rack mountable 1U 8 port emulator (requires 1 license below)
930-2700	Network Emulator II: Ethernet 10GbE, 1GbE & 100MbE Network Emulator Software and 8 Port License Bundle
930-2701	Network Emulator II: Ethernet 10GbE, 1GbE & 100MbE Network Emulator

PART NUMBER	DESCRIPTION
	Software and 2 Port License
930-2702	Network Emulator II: Ethernet 1GbE & 100MbE Network Emulator Software and 2 Port License
930-2703	Network Emulator II Upgrade: Ethernet 10GbE, 1GbE & 100MbE Network Emulator Software and 2 Port License Upgrade
930-2704	Network Emulator II Upgrade: Ethernet 1GbE & 100MbE Network Emulator Software and 2 Port License Upgrade
930-2705	Network Emulator II: Ethernet 1GbE & 100MbE Network Emulator Software and 8 Port License Bundle

SUPPORTED TRANSCEIVERS

ETHERNET TRANSCEIVERS	10G	1G	COPPER	MODE/NM
958-0053	✔			Multi/850
958-0054	✔			Single/1310
958-0030		✔		Multi/850
958-0031		✔		Single/1310
958-0036			✔	RJ45