数据表

Network Emulator II——以太网

10GbE、1GbE 和 100MbE 以太网损伤模拟

Ixia 的 Network Emulator II 是针对 10GbE、1GbE 和 100MbE 以太网损伤的精密测试设备。该设备使用户能够精确地仿真实际 LAN/WAN 生产网络上发生的真实网络状况。通过在实验室内仿真现实且最坏的网络状况，用户能够验证和测试新硬件、协议和应用的性能，以防止生产网络发生故障。Network Emulator II 提供丰富的特性集，能够在受控的实验室环境进行重复和可预测的损伤测试。Network Emulator II 使用户能够：

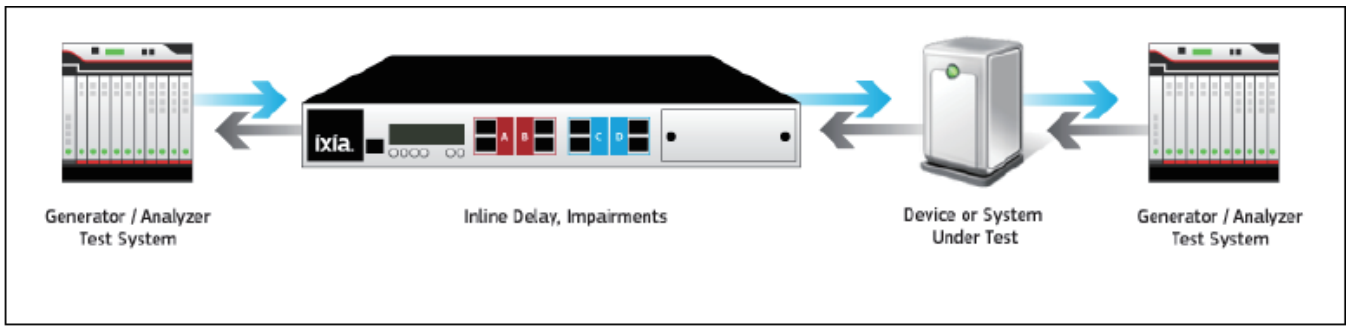
- 测试网络延迟的影响和应用性能；
- 确定应用分布在整个数据中心时的表现；
- 在真实环境中测试数据中心的备份
- 制造停机和性能下降来引发并验证故障转移保护
- 结合 IxNetwork、IxLoad 和 BreakingPoint 测试系统，创造一个包括真实损伤的完整测试环境。

在实验室中仿真真实网络

- 通过再现网络状况和行为而创造真实的测试环境；
- 实现验证、性能和互操作性测试；
- 测试产品和应用来确定真实状况下的终端用户体验；
- 精确再现并快速解决现场发生的问题。

主要特性

- 10GbE / 1GbE / 100MbE 损伤仿真
- 8 端口 FPGA 硬件架构，实现 100%的线速性能
- 适用于以太网和光纤通道的统一硬件平台
- 使用一台设备同时测试多个速度
- 灵活的资源管理



亮点

- 业内最多端口的以太网 FPGA 仿真器，配有 8 个以太网端口；
- 支持 10GbE、1GbE 和 100MbE 以太网损伤；
- FPGA 硬件架构提供最高的精确度和准确度；
- 双排端口，每排 4 个，且每排设有专用 FPGA 处理器，以确保高性能；
- 通过额外的软件许可证也可支持光纤通道 16G、8G、4G 和 2G；
- 灵活的资源管理通过以下方式实现资源按需配置：
  - 自动或手动分配内存
  - 配置文件的分配
  - 灵活的带宽，以线速实现 4 个端口上的 10G，或 8 个端口共享每排 11G 的带宽；
  - 把任何端口配置到以太网或光线通道（借助额外的许可证）以及支持的速度
- 精确仿真以太网络中存在的延迟和损伤
- 通过可控的误码和丢帧对系统进行压力测试
- 动态增加损伤以测试故障恢复机制
- 对任何更高层 2/7 层协议透明
- 光介质物理层时钟透明度，支持 SyncE
- 通过 RESTful Web API 实现测试自动化，允许使用 TCL 以及 Python 等语言进行控制。

损伤和分类器

- 主要损伤包括：
  - 高级内存配置（AMA）的延迟
  - 数据包时延变化（PDV）、丢包和重复
  - 误码率（BER）
  - 激光损伤
- 全功能分类器包括：
  - 自定义过滤器库
  - 使用灵活资源管理每排配置 32 个分类器配置文件
  - 灵活资源管理实现每个端口、每一流量方向最多 15 个分类器配置文件。

主要用例

- 在以太网上用真实的网络状况和损伤对关键应用进行性能测试；
- 结合 IxNetwork、IxLoad 和 BreakingPoint 测试系统，创造一个完全真实的测试环境；
- 真实的互操作性和客户概念验证（PoC）测试；
- 公司 LAN/WAN 仿真；
- 业务连续性和灾难恢复测试；
- 服务器整合/迁移；
- 应用云迁移和存储扩展；
- 无线/移动延时和损伤仿真；
- 卫星网络延时仿真
- 借助 Customizable Filter Library 再次使用并创建专有或标准的 2-7 层协议过滤器；

- 模拟损伤进行精确测试和反向测试；
- 制造停机和性能下降，引发故障转移保护。

规格

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 • Flexible Resource Management allows Profiles to be configured from the Profile Pool as needed, allowing for the most efficient use of system resources o 32 Profiles per bank allocated as needed by the user o 1 default profile is allocated to each port o 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 o 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 o Define bandwidth, delay, and impairments per profile o Classify up to any 32 bytes within an Ethernet frame

<table>
<tr><th>Feature</th><th>Details</th></tr>
<tr><td>Delay</td><td>
• 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
<table>
<tr><th></th><th>10GbE</th><th>1GbE</th><th>100MbE</th></tr>
<tr><td>Max Delay at Line Rate</td><td>2 seconds</td><td>20 seconds</td><td>30 seconds</td></tr>
<tr><td>Max Delay at Limited Line Rate</td><td>30 seconds</td><td>30 seconds</td><td>30 seconds</td></tr>
<tr><td>Resolution (Min Delay Increment)</td><td>6.4 ns</td><td>64 ns</td><td>640 ns</td></tr>
</table>
• 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
</td></tr>
<tr><td>Packet Delay Variation</td><td>
• 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
</td></tr>
<tr><td>Packet Drop</td><td>
• Packet Drop impairment allowing single or multiple packets to be dropped
• Variable by Periodic, Poisson, Uniform, and Gaussian distributions
</td></tr>
<tr><td>Packet Duplication</td><td>
• Packet Duplication impairment allows single or multiple packets to be duplicated
• Variable by Periodic, Poisson, Uniform, and Gaussian distributions
</td></tr>
<tr><td>Packet Reorder</td><td>
• Packet Reorder impairment allows the reorder of single or multiple packets as specified by the options
• Variable by Periodic, Poisson, Uniform, and Gaussian distributions
</td></tr>
<tr><td>Packet Accumulate-Burst</td><td>
• 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
</td></tr>
<tr><td>Line BER</td><td>
• 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
</td></tr>
<tr><td>Laser Impair</td><td>
• Emulate loss of signal, loss of frame under user, or program control
</td></tr>
<tr><td>Statistics</td><td>
• Robust statistics support with customizable flow based overview
</td></tr>
<tr><td>Filter Libraries</td><td>
• 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
</td></tr>
</table>

Feature	Details
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
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 o Operating temperature: 0° to 40° C (32 to 104° F) o Operating humidity: 10 to 85% (RH), non-condensing o Storage temperature: –40°C to 70°C (-40 to 158 F) o Storage humidity: 5 to 95% (RH), non-condensing • Input power (internal AC/DC converter) o Input voltage: 100-240VAC o Input frequency: 47-63Hz o 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