

SPIRENT ETHERNET NETWORK EMULATORS

GEM/XGEM

Spirent Ethernet Network Emulators enable users to accurately create the delays and impairments that occur over live production 10/100 Mbps, 1Gbps and 10Gbps Ethernet Networks for validating and evaluating new products and technologies. From Proof of Concept to Deployment, our network impairment emulators provide users with total flexibility in terms of features, line speed, and multiprotocol support.

APPLICATIONS

- Multimedia services and applications including: Voice over IP, Video and IPTV Gaming
- Networked/Distributed Application
- Circuit Emulation Services (MEF-18, ITU-T G.8261)
- Timing over Packet (ToP) (IEEE 1588)
- WAN and TCP Acceleration
- Corporate LAN/WAN Emulation
- Metro/Carrier Ethernet
- MPLS
- Mobile Backhaul
- Server Consolidation/Migration
- Storage Extension
- Wireless/Mobile
- Business Continuity
- Disaster Recovery
- Satellite Network Testing
- Performance Testing
- Interoperability Testing
- Customer Proof of Concept
- SLA Planning and Validation

BENEFITS

- Enables validation, performance and interop testing of systems under real world conditions with precise and reproducible results. Provides users with the confidence that network applications, devices and services will perform as expected on production networks.
- Capture real-world network conditions and accurately replay them in the lab environment
- Realistic problem replication for troubleshooting
- Improves Proof of Concept testing
- Less risk and time-to-deploy for new products and services
- Detailed and realistic results provide improved Quality of Experience and user satisfaction with tested products and services
- Simplification and automation of the network testing process
- Field programmable architecture protects investment
- Grow easily as needs change. Multiprotocol support (SONET, SDH, OTN, Fibre Channel, CPRI, and Ethernet) on the same chassis.



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KEY FEATURES

- Hardware-based architecture provides true line rate performance ensuring maximum accuracy and repeatability
- 10GigE, GigE and 10/100Mbps interfaces
- 100% line rate (up to 11.3Gbps) capable even with minimum size frames
- Precisely emulate delays and impairments that occur over Ethernet networks including:
 - Static and Variable Delay (Packet Jitter)
 - Packet Corruption, Drop, Reorder, Duplication, Modification
- Define up to 16 Network Profiles per interface with separate delay, bandwidth and impairments for emulating different classes of service or multiple paths through a network
- Transparent and Layer 3 Router mode with up to 16 Virtual Ports per interface
- Ability to dynamically change impairment profile without data loss or test restart
- Chain multiple impairments simultaneously
- Powerful filtering for selective or focused impairments
- Router Mode to connect up to 16 different IP subnets to a single interface
- IPTV & Multimedia specific test solutions, including selective drop of H.262/H.264 I, B and P frames over IPv4 or IPv6
- Standards-based Network Impairment Models per TIA-921, ITU-T G.1050, MEF-18, IEEE 1588, and G.8261
- Easy GUI and Tcl scripting support for automating tests
- Support for all proprietary and standard L3—L7 protocols including IPv6
- Jumbo frame support—infinite size (12K bytes for reorder and duplication)
- Multiprotocol support (Ethernet, SONET/SDH, OTN, CPRI and Fibre Channel)
- Extensive reporting for review and presentation of graphed test results

FEATURE OVERVIEW

Network Profiles

- Support for up to 16 distinct network profiles emulating 16 “network clouds” per blade
- Define unique bandwidth, delay, and impairments for each profile
- Each profile can be defined by any combination of VLAN tag, MPLS label, MAC or IP address TCP/UDP port or any value up to 2000 bytes deep within the Ethernet frame

TIA-921 and ITU-T G.1050 Network Models

- Standards-based dynamic network configurations
- Test against one or all 1064 dynamic scenarios based on defined models, or create a custom scenario

Delay

- Emulates static or variable delay occurring during transmission of Ethernet data through a network
- Introduce frame or packet delay variation (jitter)
- Optional delay extenders are available for extra delay

Impairment Highlights

- Fixed and random impairment distributions
- Single or bursty
- Random and filtered or targeted impairments
- Chain multiple impairments simultaneously
- Loss of Signal, Loss of Frame Synchronization
- PCS, MAC, and higher layer bit errors, CRC Corruption
- Frame/Packet Drop, Reorder, Duplication Modification
- Bandwidth control or Policing per Metro Ethernet Forum
- Bandwidth Shaping
- Layer 2-4 checksum correction for higher layer impairments
- Extensive Jitter and Bandwidth controls
- DHCP Timeout

Dynamic Search Filter (DSF)

- Search entire TCP/UDP payload for a userdefined string pattern to trigger an impairment event
- Define an impairment counter (to prevent a TCP session from timing out for example)
- Up to 8 strings each up to 8 bytes can be defined within each network profile

Router Mode

- Connect multiple devices from up to 16 different IP subnets directly to a single GEM interface
- Delay and impair data between machines on the same physical GEM interface
- Supports IPv4 unicast and broadcast forwarding
- Generates and accepts ARP requests/replies
- Supports VLAN Tag insertion
- 1 virtual port is standard, 16 virtual ports can be ordered as an optional feature

IPTV

- Selectively drop H.262/H.264 I, B and P frames

Record and Playback Live Network Conditions

- Long term recording of network delay and drop conditions
- In-line Packet Delay Variation (PDV) capture with nanosecond accuracy
- Line rate capture of network traffic packets at 1G and 10G
- Playback recorded traffic or network conditions in the lab
- Build custom impairment tables with delay, drop, reorder and impairments assigned on a per packet or time (nanosecond) basis Upload large tables for multi-day scenarios or low frequency impairment content

Custom Filter Libraries—Save time by building and reusing your own filter library of proprietary protocols. Or, use the pre-built Protocol Filter Suite that contains a growing list of industry standard filters, including: PPP, PTP, RSVP, IP, FCoE, FIP, OSPF, MPEG, and many others

CES and ToP Solutions—Precise and accurate solutions that only a true hardware-based architecture can provide.

- MEF-18 and ITU-T G.8261 Test Suites—Repeatable network models for MEF-18 certification testing
- Record and Playback of Network Delay - Test CES or ToP solutions against delay variation profiles (PDV profiles) captured directly from real world live networks with nanosecond accuracy
- External Timing Reference Module—T1 BITS, E1 MTS, 10MHz

Network Playback

- Create/import and playback custom statistical impairment distributions
- Define an impairment table with packet to packet or nanosecond variations
- Essential feature for CeS/ToP testing scenarios

Statistics/Alarms

- Provides real time stats on the input such as running disparity errors, code group errors, IPG errors, idle errors, bandwidth statistics and more
- Provides stats for impairments introduced at output port
- Indicates alarms for Loss of Signal (LOS), Loss of Lock (LOL), Loss of Frame sync (LOF), Code group errors, running disparity errors
- Detailed logging of blade and Network Profile statistics
- Professional graphical reports can be generated to PDF for review using Reporter

User Interface

- Remote monitoring and control via RJ-45 Fast Ethernet
 - Easy to use GUI (“Drag & Drop Graphical Mode”)
 - Powerful Tcl-based API enables full automated testing
- Front panel status control

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ORDERING INFORMATION

Platform

- **AS-Maui-B** —Rack mountable chassis with 2 x SFP ports and 2 X 10/100/1G Maui blades - up to 2.6Gbps
- **AS-Maui-Q** —Rack-mountable chassis with 4 x SFP ports and 4 x 10/100/1G Maui blades - up to 2.6Gbps
- **AS-Hawaii-B** —Rack-mountable chassis with 2 x SFP and 2 x XFP ports and 2 x 10/100/1G/10G Hawaii blades - up to 11.3 Gbps

Interfaces

- SFP (10/100/1Gig)
- XFP (10Gig)

Software/Emulator Load

- GEM - 10/100/1GigE (up to 16 network profiles per load)
- XGEM - 10GigE (up to 4 network profiles per load)

Maintenance

- First year SW Maintenance included

Also Available

- Standards-based Test Suites
 - TIA-921/ITU-T G.1050 Network Impairment Models
 - MEF-18 Dynamic network scenarios ITU-T G.8261
 - G.8261—Standards based delay variation scenarios as defined in ITU-T G.8261-2008

- **DSF**—Dynamically search through TCP/UDP payload to trigger impairments upon match (GEM only)
- **IPTV Impairments**—Selectively impair I, P and/or B Frames over H.262 or H.264 streams (GEM only)
- **DSX**—Delay SuperExtender provides extended delay at less than full line rate; max delay bank is up to 12sec or 6x the Std Delay (GEM only)
- **VPE-16**—Increases the number of Virtual Ports per physical interface to 16 (GEM only)
- **PROPLAY**—Enables automatic replay of actual network delay and impairment conditions data captured by the Profiler (GEM only)
- **CAPPLAY**—Capture/Replay (1G or 10G Ethernet) at full line rate using filters or triggers. Replay this or other pre-captured traffic on the GEM and apply impairments. Both features can occur before or after impairments are applied
- **NETPLAY**—Network Playback provides the ability to design customized scenarios (PDVs) with per packet and/or nanosecond precision (GEM only)
- **ETR**—External Timing Reference Module provides external timing reference input (T1 BITS, E1 MTS and 10MHz) (GEM only)

SPIRENT GLOBAL SERVICES

Spirent Global Services provides a variety of professional services, support services and education services—all focused on helping customers meet their complex testing and service assurance requirements. For more information, visit the Global Services Web site at www.spirent.com/gs or contact your Spirent sales representative.

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