VirtualNet™ GE / XG Emulators
Ethernet & FCoE Validation

Applications

- Application or Equipment Performance Validation & Optimization
- Corporate WAN Planning
- IPTV, VoIP, Video Conf.
- Storage Extension
- Data Center Migration
- Disaster Recovery Testing
- Capacity Planning
- WAN Acceleration Testing
- OAM Implementation Validation
- Redundant Path/Fail-over System Testing
- Interoperability Testing
- Security Protocol Testing
- FCoE System Testing
- QoS Testing

Benefits

- Increased system performance and robustness with complete testing of usage and error scenarios
- Reduced time-to-market with faster test case creation and repeatable testing
- Increased productivity with automated generation of specific error scenarios
- Eliminate costly post-deployment operational and performance issues
- Faster root-cause analysis of problems in deployed systems

Frame Impairments

- Delay / Delay Jitter
- Drop
- Reorder
- Duplicate
- Corrupt, Modify
- Checksum errors
- Bandwidth control
- Layer2 FCS, FCoE, and IP/UDP/TCP CRCs can be optionally corrected for modified frames

PHY Layer Impairments

- Bit Errors
- Bit Rotation
- Advanced LOS

Overview

VirtualNet™ GE and XG are high-performance in-line (pass-thru) 1G/10G Ethernet test systems that enable development and verification engineers to validate proper system response to error conditions that can occur in deployed systems. VirtualNet Ethernet emulators modify/impair live bi-directional traffic according to user-specified parameters and duration as traffic passes through.

With VirtualNet in their test and verification setups, engineers can introduce bit-errors, delay, bandwidth controls, frame drop, corrupt frame data, modify specific protocol fields in selected frames and observe the resulting system response. This testing enables validation of system performance and robustness under any desired scenario. Thorough testing for these corner cases is essential for optimizing performance and avoiding costly post-deployment operational issues.

Unlike other emulators, VirtualNet Emulators are hardware-based network emulators (using dedicated FPGAs), delivering full line-rate performance for 1G and 10G Ethernet traffic at **ALL** frame sizes **AND** regardless of the impairment settings applied. With the ability to replicate real-world network conditions in a 100% controlled manner, users are ensured that no other variable has been introduced into testing and results are precise and, most importantly, repeatable.

Overview

- **Performance:** Full line-rate regardless of the incoming frame sizes, number of impairments, or the specified parameters for impairments
- **Targeted Impairments:** Unique ability to select a particular frame for specific impairments based on user-specified frame protocol field values
- **Protocol/Field Parsing:** Frames are parsed in hardware to recognize specific protocol fields irrespective of the protocol hierarchy
- **Impairment Duration:** Impairments can be specified as having infinite as well as finite duration in units of Time, Frames, and Bytes
- **QoS:** 8 queues with user-specified bandwidth, buffer space, and output scheduling (priority or round-robin)
- **Transparent Installation:** Only specified traffic is impaired (other non-test traffic is bypassed without delay or impairments) to enable in-line installation with co-mingled production and DUT network traffic
- **Dynamic Impairment Parameters**: Impairment parameters can be changed during testing without disrupting the traffic stream or creating unintended intermediate impairment conditions
- **Analysis:** Detailed real-time statistics for bi-directional Ingress/Egress traffic as well as statistics related to impairments created by the VirtualNet. All statistics may be recorded to a CSV file for post-analysis.
- **Multiple ports:** Up to Eight (8) 1G ports or Two (2) 10G ports + Four (4) 1G ports with simultaneous operation on all ports
- **Usability:** Intuitive GUI and powerful TCL based CLI for testing automation.

Better Testing → Better Reliability → Better Products

Functional Specifications

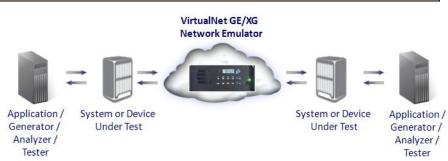|	VirtualNet GE (1G)	VirtualNet XG (10G)
Throughput	Full line-rate = 2 Gbps – at all frame sizes – all impairment settings	Full line-rate = 20 Gbps – at all frame sizes – all impairment settings
Transparent Installation	Yes	
Protocol Stack Parser	Included Protocols – VLAN, MPLS, IPv4, IPv6, TCP, UDP, FCoE, **Custom**	
Targeted Impairments	Field Comparisons =, ≠, ≥, ≤, Range, Out-of-Range Multiple comparisons can be combined with AND / OR conditions	
QoS Emulation	8 Queues – Queue assignment based on VLAN Priority, DSCP/TOS, or User Specification Bandwidth, Buffer size, and Output Scheduling (Priority or Round Robin) controls	
Bandwidth Control	1Kb/s to 1Gb/s, ± 0.5 Kb/s	1Kb/s to 10Gb/s, ± 0.5 Kb/s
	Buffer size and Pause frames controls, Background traffic emulation	
Frame Drop	Rate – 1E-7% (1E-9) to 100%. Distributions – Uniform, Periodic, "Bursty"	
Reorder	Block reorder, up to 16 KB, Reorder Delay – Frame/Time-based	
Duplication	Block Duplication – up to 16 KB – Duplication count – 1 to 255 Duplication Delay – Frame/Time based	
Data Corruption	Rate – 1E-2 to 1E-12, User specified corruption envelope to protect or corrupt headers Checksum Correction Options: L2, FCoE, IPV4/6, TCP, UDP	
Data Modification	4 Engines, 32 bytes each	2 Engines, 256 bytes each
	Checksum Correction Options: L2, FCoE, IPV4/6, TCP, UDP	
CRC Errors	L2, FCoE, IPV4/6, TCP, UDP	
Delay	50us to 10Sec – 8ns resolution	8us to 10Sec – 6.4ns resolution
	Max. 250ms at Full Line Rate, Fixed/Variable Distributions	
Layer 1 Bit Errors	Rate – 1E-2 to 1E-12, Burst Length – 1 to 32767 bits (Optical interfaces only)	
Output (Laser) Disable	25ms minimum, Fixed/Random Cycle Times (200us resolution) **(Optical interfaces only)**	
Real-Time Statistics	L1/L2 Errors, Interface Traffic, Impairments, Logging for all stats	

Physical Specifications

Data Interfaces	Eight (8) 1G Ports – 850 or 1310nm Optical; 10M/100M/1G Copper (1000-Base-T) Two (2) 10G Ports – 850, 1310, or 1550nm Optical
Management Interface	1 x Gigabit Ethernet, GUI and Tcl-based CLI
Input Power	100VAC to 240VAC, 50-60Hz, 225 Watts (Max.)
Dimensions / Weight	19" Rack-mountable, 4U (7" (H) x 16 7/8" (W) x 17 11/16" (D) 40 lbs.

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VirtualNet GE/XG
Network Emulator

Application / Generator / Analyzer / Tester → System or Device Under Test → System or Device Under Test → Application / Generator / Analyzer / Tester

Typical testbed setup using Ethernet network emulator

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