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Xgig 8G Fiber Channel Load Tester

A key aspect of verifying the reliability of Fiber Channel equipment is to stress-test the network with traffic at and above the maximum legal data rate. The Xgig® Fiber Channel Load Tester eliminates the need for creating complex test setups comprised of multiple servers and storage arrays by enabling users to construct fully-meshed data communication topologies, generate traffic loads, and monitor both transmitted and received data streams. Offering easy-to-use comprehensive analysis and statistical capabilities, Xgig Fiber Channel Load Tester is the ideal tool for testing Fiber Channel fabrics and switches for performance, data integrity, robustness, flexibility, and scalability.

Key Features

- Dynamically adjustable to greater than 100% of the maximum legal data rate with an inter-packet gap 3~64k
- Supports FCoE topology (with FCoE Load Tester ports available soon)
- Up to 255 NPIV (N_Port ID Virtualization)
- Flexible traffic patterns
- Error generation
- C/C++/Tcl APIs for creating automated test scripts
- Extensive statistical reports with error counters
- Ability to trigger Xgig Analyzer for root-cause analysis of error events

Application

- Subsystem design and debug
    - ASIC physical layer test
    - Hardware robustness test
- Functionality
    - Switch performance test
    - Switch regression test
    - Switch stress test
- Interoperability
- Network data integrity test
    - Fabric stress test
    - Fabric scalability test
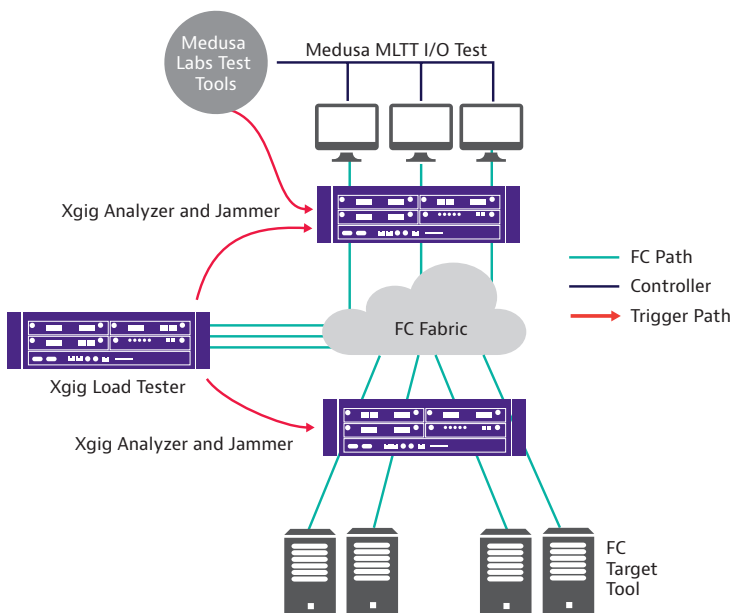- Manufacturing
    - Hardware verification

Figure 1: Example setup with the Xgig Load Tester and Medusa Lab Tools for testing Fiber Channel Fabric performance.

Overview

The Xgig Fiber Channel Load Tester brings essential Fiber Channel traffic generation capabilities to the Xgig Unified Protocol Analysis and Test platform, the industry's only complete protocol testing suite supporting multiple protocols and analysis functions in a single chassis.

With eight powerful traffic profile engines assigned to each physical Xgig port, the Load Tester is capable of transmitting various traffic patterns at and above the maximum legal data rate to simulate extreme traffic conditions. Optimal for testing and verifying switch and fabric scalability, flexibility, robustness and performance, the Xgig Load Tester is also a cost-effective alternative for high port count switch testing scenarios which otherwise require many expensive servers and storage arrays.

By emulating N_Port and/or NPIV behaviors—with up to 255 NPIV ports for each physical port—the Xgig Load Tester conducts fabric and port login processes and can configure a variety of port topologies among ports in the same zone to also test fabric and switch virtualization features. While the Load Tester offers dramatic flexibility that allows for complicated traffic topologies, configuring a test is simple and smooth using the intuitive GUI interface.

The Xgig Load Tester monitors both transmitted and received traffic, provides comprehensive throughput statistics for each physical or virtual port, and alerts users to data stream errors. Traffic statistics can be viewed either per port or per stream in an intuitive spreadsheet format that facilitates identification and resolution of network issues. In addition, users can automate complex testing processes by using Application Programming Interfaces (APIs).

The Xgig Load Tester is compatible with other Xgig functions such as Analyzer, Jammer, and BERT, and automatically triggers the Analyzer to capture problematic traces when any out of order, dropped, missing frame, or sequence error is detected in any of the thousands of data streams being generated. Captures of this type are not easily setup with the Analyzer alone because the Analyzer does not track the frame sequence count.

Load Tester Setup Example

The Load Tester, combined with other VIAVI testing tools, offers a complete test solution for simulating a real Fiber Channel network without requiring expensive servers and storage arrays, thus providing significant savings in terms of rack space, power, cabling, and equipment cost.

Figure 1 shows an example setup with the Xgig Load Tester blasting layer-2 Fiber Channel frames into the Fiber Channel fabric while at the same time, the Medusa Lab Test Tools (MLTT) drive real, high IOPS traffic at the host side to the target across the fabric. Xgig Analyzer ports are positioned inline for debugging network problems detected by the Load Tester, MLTT, and/or the Analyzer itself. The Xgig Jammer injects errors into traffic to emulate network "corner behavior" and perform functional tests that complement the Load Tester's load testing. (For more information about these other protocol test tools, please refer to the individual datasheets.)
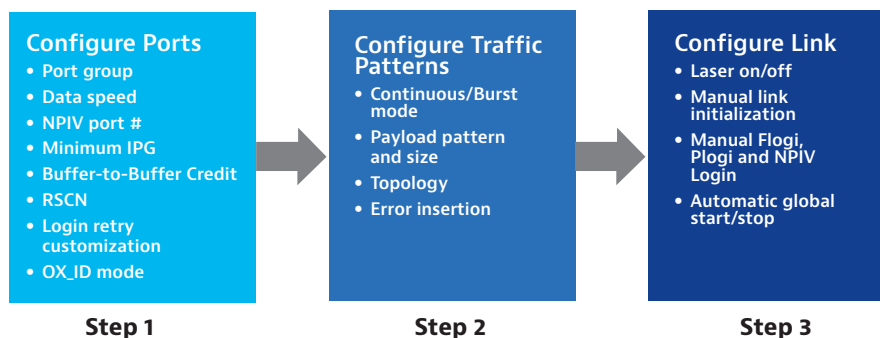
Configure Ports
- Port group
- Data speed
- NPIV port #
- Minimum IPG
- Buffer-to-Buffer Credit
- RSCN
- Login retry customization
- OX_ID mode

Step 1

Configure Traffic Patterns
- Continuous/Burst mode
- Payload pattern and size
- Topology
- Error insertion

Step 2

Configure Link
- Laser on/off
- Manual link initialization
- Manual Flogi, Plogi and NPIV Login
- Automatic global start/stop

Step 3

Figure 2: Configure Xgig Load Tester with a simple three-step process

Configuration

Configuring the Xgig Load Tester, even with the most complex topologies and traffic patterns, is a simple three-step process (see Figure 2).

Using the Load Tester to Trigger Xgig Functions

The Xgig Load Tester shares the same hardware and so is fully compatible with Xgig's other functions—Analyzer, Jammer, and BERT. The Xgig Load Tester is also capable of triggering Analyzer ports that are connected to the Load Tester through the trigger port on the Xgig chassis. This is extremely useful to users since even when the Analyzer is positioned inline to monitor and capture traffic, it does not know what sequences to expect and cannot detect mismatches. Since the Load Tester generates the traffic, it can accurately detect missing frames and trigger the Analyzer to begin or stop filling the trace buffer.

This distinctive feature also enables the Load Tester ports to further separate the events of dropped frames, out of order frames, and misdirected frames, providing more thorough and accurate measurements of switch performance.

To facilitate user debugging of error events in the captured trace, Xgig Load Tester lists key information such as the S_ID, D_ID, SEQ_CNT, and OX_ID. Additionally, any information in the trigger frame can be used to setup the search/filter in TraceView of the Analyzer to quickly locate trigger events. Trigger events include: out of order frame errors, dropped frame errors, misdirected frame errors, and CRC errors.

Traffic Statistics

The Xgig Load Tester monitors transmitted (TX) (see Figure 5) and received (RX) traffic (see Figure 4) to provide comprehensive statistical information through a variety of spreadsheet pane views. On the TX side, port-based and traffic pattern-based views show statistics such as TX data frames (byte, frame), actual/average bandwidth (MB/s), actual/average data rate, and login frame count. On the RX side, port-based and stream-based views show statistics such as min/average/max latency, RX data frames (byte, frame), max/actual data rate, S_ID/D_ID, OX_ID, and error counters for code violations, CRCs, disparity errors, dropped frames, out of order frames, misdirected frames and sequence errors.

TTL Trigger Out

Figure 3: External trigger for connecting with Xgig Analyzer.
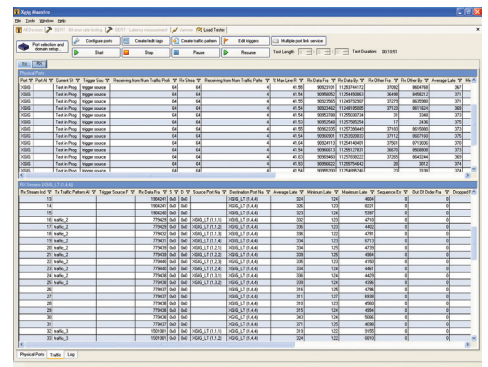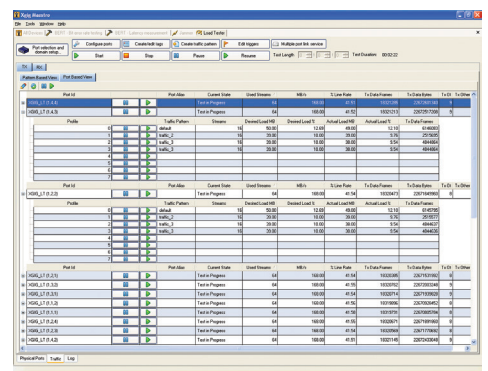

Figure 4: RX Traffic View

Figure 5: TX Traffic View

Automating Testing

All Load Tester functions and configurations can be configured through Application Programming Interfaces (API) to customize and automate testing using scripts written in C/C++ and TCL/TK. Automated testing eliminates time-consuming configuration and management of tests, enabling users to easily repeat tests or perform regression testing, an especially critical capability for manufacturing test setups.

Maestro

Users configure the Xgig Load Tester using Maestro. Maestro uniquely allows users to utilize the same GUI to manage other Xgig functions, thus eliminating the need to switch between different GUIs when using multiple tools. Other Xgig functions supported by Maestro include protocol-based Fiber Channel and Gigabit Ethernet BERT (Bit Error Rate Test), SAS/SATA Jammer (error injection) and SAS/SATA Generator. Xgig Maestro operates under Windows 2000,Windows XP, Windows Server 2003, and Window Vista (Business and Ultimate version).

Specifications

Features	Specification
Line Rate	1.0625, 2.125, 4.25 or 8.50 Gb/s Fiber Channel
Class of Services	Class 3
Port Type	N_Port
	NPIV port (Up to 255 virtual ports with each physical port)
Inter-Packet-Gap (IPG)	Adjustable from 3 to 65535 (64K)
Data Rate Adjustment	Adjustable from 0 to over 100% of theoretical line rate (IPG=
	Data rate dynamically adjustable per each traffic configuration
Link Service Configuration	Automatic login process
	Customized login re-try count/frequency
FCP Session	Name Server Registration RFT_ID
	Discovery GID_PT
	LISM – automatic and user control (OLS, LR)
	Error recovery procedure
	RSCN
Stream Mode	Continuous
	Burst
Stream Capacity	1024 TX streams with S_ID and D_ID variations
	8 different traffic patterns per physical port
Data Frame Payload	8+ fixed payload patterns (e.g. CJTPAT, CRPAT)
	FLOGI frame blasting (Error mode)
	Fixed/Random payload size within definable range
Port Topology per Traffic Pattern)	Point-to-Point
	Partially meshed
	Fully meshed

Specifications continued

Features	Specification
Flow Control	Configurable Buffer-to-Buffer Credits up to 256
OX_ID	Fixed and unique per stream on each port (ISL Test Mode)
	Random within definable range
	Incrementing within definable range
Error Injection	CRC errors
Measurement	TX frames, MBytes, data rate, utilization
	RX frames, MBytes, data rate, min/max/average latency
Error Counters	Sequence errors
	Out of order frame errors
	Dropped frame errors
	Misdirected frame errors
	Code violations
	CRC errors
	Running disparity errors
Trigger	TTL trigger output on detected errors
Automation	C/C++, TCL

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