Xgig® Fibre Channel Load Tester

Benefits

- Guarantees line rate traffic in most stressful test environments
- Integrates verification of Fibre Channel functionality with large-scale network performance testing
- Measures high-resolution latency with the utmost accuracy
- Enables automated testing
- Captures control frames and triggers Xgig Analyzer to analyze the root-causes of link issues
- Tests on FCoE to FC topology with Xgig FCoE Load Tester
- Affordable

Key Features

- Full line rate traffic generation and load testing at 1/2/4/8/16G Fibre Channel
- Supports FCoE topology (with FCoE Load Tester ports)
- Up to 255 NPIV
- Up to 64 time-sync ports for high resolution latency measurement 10 ns latency accuracy
- Flexible traffic patterns
- Error generation
- C/C++/Tcl APIs for creating automated test scripts
- Extensive statistical reports with error counters
- Large capture buffer size of 256 MB per load tester port
- F_port emulation
- Ability to emulate fiber-pull and verify high availability feature (failover time measurement)

Applications

- Verify functional switch control planes
- Test switch interoperability
- Test switch performance
- Stress-test the switch
- Bring up ASIC

A key aspect of verifying the reliability of Fibre Channel equipment is to stress-test the network with traffic at and above the maximum legal data rate. The Xgig Fibre Channel Load Tester eliminates having to create complex test setups comprising 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. With effortless comprehensive analysis and statistical capabilities, the Xgig Fibre Channel Load Tester is the ideal tool for testing Fibre Channel fabrics and switches for performance, data integrity, robustness, flexibility, and scalability.

Overview

The Xgig Fibre Channel Load Tester brings essential Fibre Channel traffic generation capabilities to the Xgig Unified Protocol Analysis and Test platform, the industry's only complete protocol testing suite that supports multiple protocols and test functions in one chassis. The Xgig Fibre Channel Load Tester is also the first generation tool with a high speed 14 Gbps Fibre Channel (16 GFC) protocol available on the market.

Eight powerful traffic profile engines assigned to each physical Xgig port enable the load tester to transmit various traffic patterns at and above the maximum legal data rate of as high as 14 Gbps (16 GFC) to simulate extreme traffic conditions. Optimal for testing and verifying switch and fabric scalability, flexibility, robustness, and performance, the Xgig Load Tester offers a cost-effective alternative for high-port-count switch testing scenarios that otherwise require many expensive servers and storage arrays.

By emulating N_Port and/or N_Port ID Virtualization (NPIV) behaviors, with up to 255 NPIV ports for each physical port, the Xgig Load Tester can conduct 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 for complicated traffic topologies, configuring tests are simple and smooth using the intuitive graphical user interface (GUI).

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. Users can view traffic statistics either per port or per stream in intuitive spreadsheet format to identify and resolve network issues. Also, users can automate complex testing processes using application programming interfaces (APIs). The statistics are automatically saved to a .csv file for easy data processing later.

The Xgig Load Tester is compatible with other Xgig functions, such as the analyzer, jammer, and bit error rate test (BERT), and automatically triggers the analyzer to capture problematic traces when it detects any out-of-order, dropped, or missing frame or any sequence error in any of the thousands of data streams being generated. Captures of this type are not easily set up with the analyzer alone because it does not track the frame sequence count. In addition, users can capture the control frames from the load tester directly and view the traces in the .CAP format that they can then view with the Xgig TraceView or Wireshark.

Load Tester Setup Example

The load tester, combined with other JDSU testing tools, offers a complete test solution for simulating a real Fibre 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 Fibre Channel frames into the Fibre Channel fabric while at the same time, the Medusa Lab Test Tools (MLTT) drive real, high input/output operations per second (IOPS) traffic at the host side to the target across the fabric. Xgig Analyzer ports are positioned in line for debugging network problems that the load tester, MLTT, and/or the analyzer itself detect. The Xgig Jammer injects errors into traffic to emulate network "corner behavior" and performs functional tests that complement the load tester's load testing. (For more information about these other protocol test tools, please refer to the individual data sheets for these products.)
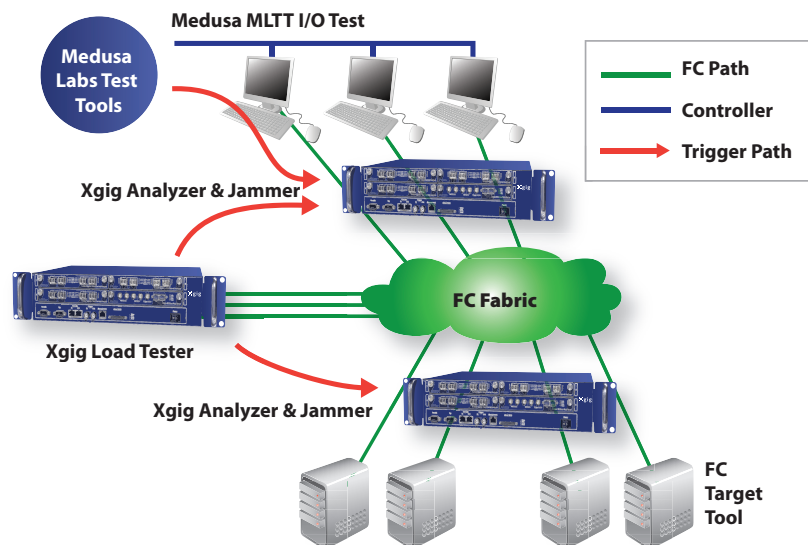

Figure 1: Example setup with the Xgig Load Tester and JDSU Medusa Labs™ Tools for testing Fibre Channel fabric performance.

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Configuration

A simple, three-step process (shown in Figure 2) configures the Xgig Load Tester, even for the most complex topologies and traffic patterns.
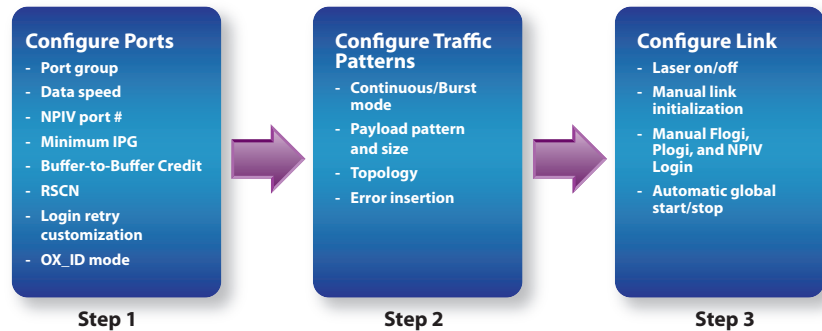
Configure Ports
- Port group
- Data speed
- NPIV port #
- Minimum IPG
- Buffer-to-Buffer Credit
- RSCN
- Login retry customization
- OX_ID mode

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: Configuring Xgig Load Tester with a simple three-step process

Figure 3: External trigger for connecting the Xgig Analyzer

Figure 4: RX Traffic View

Figure 5: TX Traffic View

Using the Load Tester to Trigger Xgig Functions

The Xgig Load Tester shares the same hardware, therefore, it is fully compatible with other Xgig functions—analyzer, jammer, and BERT. The Xgig Load Tester can trigger analyzer ports that are connected to the load tester through the trigger port on the Xgig chassis, as shown in Figure 3, which is extremely useful to users because even when the analyzer is positioned in line to monitor and capture traffic, it does not know what sequences to expect and cannot detect mismatches. The load tester generates the traffic; therefore, it can accurately detect missing frames and trigger the analyzer to begin or to stop filling the trace buffer.

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

To facilitate user debugging of error events in the captured trace, the 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 set up the search/filter in the analyzer TraceView to quickly locate trigger events, such as out-of-order, dropped, and misdirected frame errors, as well as CRC (cyclic redundancy check) errors.

Traffic Statistics

The Xgig Load Tester monitors received (RX) (see Figure 4) and transmitted (TX) traffic (see Figure 5) 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 (MBps), 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, and dropped, out-of-order, and misdirected frames, as well as sequencing errors.

Automating Testing

All load tester functions and configurations can be configured through APIs 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 Software

Users can configure the Xgig Load Tester with JDSU Maestro Software using the same GUI they use to manage other Xgig functions, thus eliminating having to switch between different GUIs when using multiple tools. Other Xgig functions that Maestro supports include the protocol-based Fibre Channel and Gigabit Ethernet BERT, the Fibre Channel and 10G Ethernet Load Tester, the 10G Ethernet Delay Emulator, the SAS/SATA Jammer (error injection), and the SAS/SATA Generator. Xgig Maestro operates under Windows 2000, Windows XP, Windows Server 2003, Windows Vista (Business and Ultimate version), and Windows 7 (Business and Ultimate version).

Specifications

Features	Specification
Line rate	1.0625, 2.125, 4.25 Gbps Fibre Channel on the 4G Fibre Channel blade; 1.0625, 2.125, 4.25 or 8.50 Gbps Fibre Channel on the 8G Fibre Channel blade; 14.025 Gbps Fibre Channel on the 16G Fibre Channel blade
Class of services	Class 3
Port type	N_Port; NPIV port (Up to 255 virtual ports with each physical port) F_Port;
Inter-packet-gap (IPG)	Adjustable from 3 to 65535 (64K) Adjustable from 4 to 65535 (64K) for 16G speed
Data rate adjustment	Adjustable from 0 to over 100% of theoretical line rate (IPG=6) 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 per load tester port 8 different traffic patterns per load tester 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
Flow control	Configurable buffer-to-buffer credits from 0 to 256
OX_ID (Single/Multi-Exchange)	Fixed and unique per stream on each port (ISL Test Mode) Random within definable range Incrementing within definable range
Error injection	CRC errors; SOF/EOF errors; zero payload; oversized payload
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
Capture buffer	256 MB per load tester port
Automation	C/C++, TCL

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