

Lab Testing Summary Report

April 2009
Report 090424

Product Category:

Fibre Channel SAN Switch



Product Tested:

QLogic SANbox 5800V



Value and Management Stackable Solution

Key findings and conclusions:

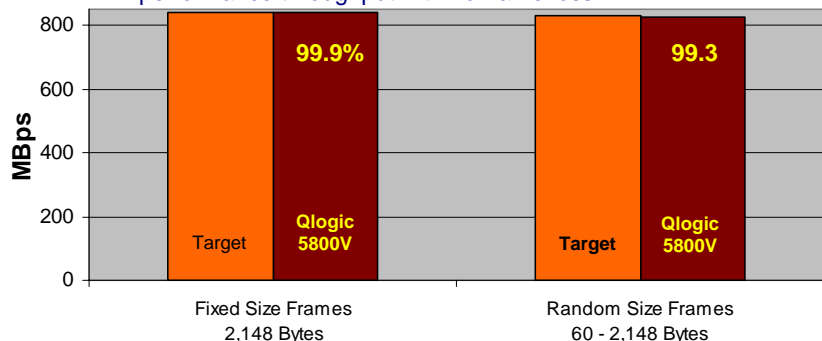
- Stackable design reduces both initial investment and expansion costs with expandable inter-switch backbone (via ISL stacking ports)
- Provides high performance, high port density and affordable 20-Gbps ISL bandwidth “on demand”; ensures reliable wire speed bandwidth at every port
- Adaptive Trunking feature automatically pools bandwidth from multiple inter-switch links into a single high-speed pipeline
- Effective and flexible management tools with advanced switch automated rules and setup configuration wizard; includes “drag and drop”

QLogic’s SANbox 5800V switch was evaluated by Miercom in the 2009 SAN Switch Industry Assessment. Specific areas examined in this review include performance, affordability, scalability and lifecycle management. We analyzed the overall business value and benefits that the SANbox 5800V switch affords enterprise customers.

The 5800V switches have a stackable architecture that easily allows for cost-effective scalability without disruption, offering pay-as-you-grow pricing, and intuitive management toolsets. Inter-switch stacking ports offer more stacking bandwidth without sacrificing device ports and enable the addition of future switches without disrupting the fabric. Each switch supports up to 20 device ports operating at 8-Gbps, 4-Gbps or 2-Gbps with intermix and automatic speed negotiation. Each switch also provides four standard inter-switch stacking ports operating at 10-Gbps with 20-Gbps upgrade available. Up to six 5800V switches (120 ports) can be stacked, and *(continued on page 3)*

Figure 1 SANbox 5800V Performance

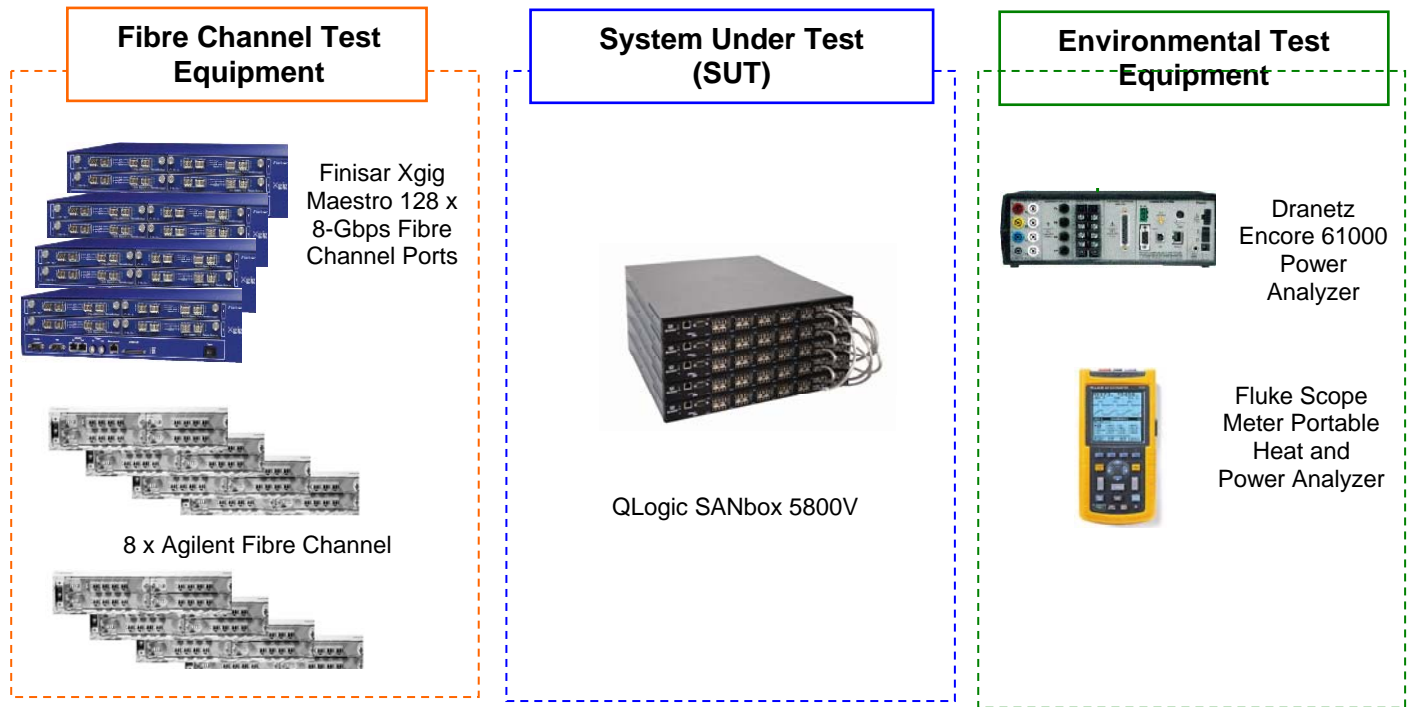
SANbox 5800V with four 20-Gbps ISL full duplex ISL connections performance throughput with no frame loss



	frame size	2,148 bytes	60 – 2,148 bytes
QLogic SANbox 5800V (five switch stack)			
20 ports x 8-Gbps – Target Throughput (Mbps)		840.6	831.9
Achieved Throughput Per Port (Mbps)		839.7	826.4
Total ISL Achieved Throughput (Gbps)		157.7	157.7
Percentage Line Rate		99.9%	99.3%

The QLogic SANbox 5800V switch is Rated Best Value Stackable Solution in the 2009 Miercom Storage Area Networks Switch Industry Assessment. During testing, the SANbox 5800V achieved line rate throughput for 8-Gbps local switching and 99.9 percent of the four link 160-Gbps uplink capacity.

Test Bed Components



How We Did It

The QLogic SANbox 5800V switch was evaluated for performance, scalability and cost benefits compared to industry assessed switch products. The SUT is equipped with 20 8-Gbps device ports, plus four 10/20-Gbps XPAK MSA compliant ports (four 10-Gbps included at no cost upgradeable to 20-Gbps).

The test system used in this evaluation included the Agilent Fibre Channel SANtester and Finisar Xgig Analyzer, 1 and 2 slot, version 4.2.8, and Xgig Maestro, version 4.0.0.78 www.finisar.com for 8-Gbps port and 10/20 Gbps port Fibre Channel traffic load generation and monitoring; the Fluke Scope Meter Portable Heat and Power Analyzer; and the Dranetz Encore 61000 www.dranetz-bmi.com Power Analyzer for environmental analysis testing including power consumption and heat dissipation. Engineers from Finisar provided technical support for this testing.

Tests mentioned in this report are based on 20 8-Gbps device and four 10/20-Gbps XPAK ports, Fibre Channel performance is measured on a per port basis. We verified load performance on the local port to port traffic as well as the traffic routed between switches via the inter-switch link backbone (ISL). We verified load capabilities on a per-port. basis.

We generated traffic that included disk read/write tests from Fibre Channel attached servers while the background traffic load was generated by the Finisar Xgig Load Generators. We also measured power consumption and temperature during different stages of the testing with equipment from Dranetz-bmi.

Traffic flows included both fixed large frame sizes (2,148 Byte frames), as well as randomly distributed frame sizes. We used fixed frame sizes to get benchmark throughput data, similar to that used in benchmark tests for networking switches. Test frames were generated from the Finisar Xgig Load Generator with random and unique Originator Exchange IDs (OX-IDs).

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Contact reviews@miercom.com for additional details on the configurations applied to the system under test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a selection.

(continued from page 1) managed as a single logical entity, reducing errors and increasing productivity. The SANbox 5800V switch does not require proprietary SFPs, including the ability to intermix multiple SFP brands and speeds on the same switch.

The SANbox 5800V stackable switch proved in hands on testing, to handle up to 99.9% of its four 20-Gbps full duplex ISL uplinks per switch, in a stack of five 20-port switches, utilizing automatic load balancing via included Adaptive Trunking. Each ISL uplink actually operates at 25.5-Gbps XAUI - Xilinx 10-Gbps Attachment Unit Interface, which is 20-Gbps half duplex data rate. Local switching for line rate traffic was also verified.

Two 5800V SANbox switches using 10 8-Gbps device ports and four 20-Gbps Inter-switch link ports on each switch were tested. Data flow was set up to drive data into each device port on one switch, through the ISL links to a device port on the other switch to determine device port bandwidth and ISL port bandwidth.

The testing proved that the device ports used 99.7% of throughput capacity at full frame transmission, and used 99.3% of throughput capacity with smaller frames.

Each ISL port is designed to handle the bandwidth of three device ports and automatically balances the workload over the ISL ports with the included Adaptive Trunking feature.

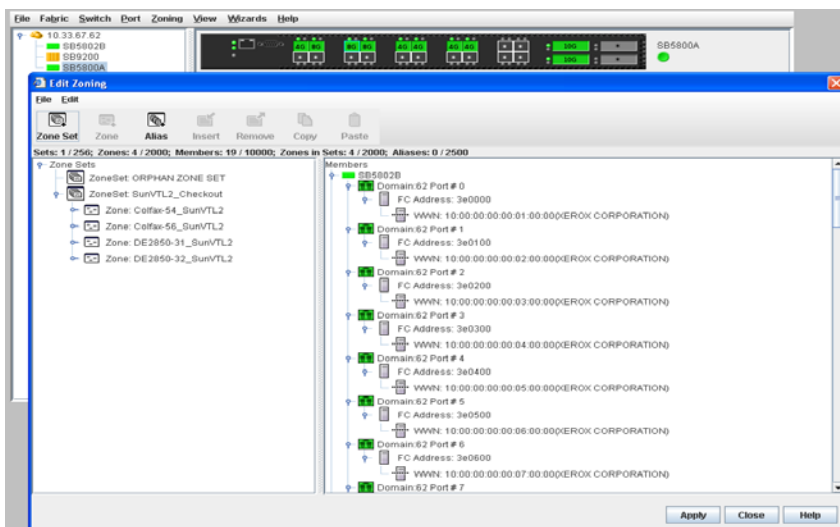
The SANbox 5800V provides a 3 to 1 stacking port ratio. (Each 10-Gbps ISL port bandwidth is equivalent to three 4-Gbps device ports; each 20-Gbps ISL port bandwidth is equivalent to three 8-Gbps device ports.) With this unique design, QLogic provides additional bandwidth equivalent to 12 8-Gbps ports per switch. Since the standard device ports are not used for inter-switch links, multi-switch networks may be built with up to 50% fewer switches.

The ratio and bandwidth available for device ports to inter-switch links is favorable for a five switch stack environment. Tests of inter-switch capacity using 10 fully-loaded device ports per switch and four inter-switch links, resulted in no blocking and utilization of only 77.3% of the capacity of the stacking ports. The graphic shown in Figure 1, on page 1 illustrates the throughput performance for a stack of five SANbox 5800V switches, interconnected with four ISL links. A full mesh topology supplies verified full line rate traffic for local device port switching.

The Fibre Channel stacking design with included automatic Adaptive Trunking, provides a stable, cost-effective, highly-expandable transport for ISL traffic. The SANbox 5800V is a 1U stackable switch, designed with a modular, fixed port configuration. The chassis features 20 8-Gbps ready device ports that auto-negotiate to support 4-Gbps and 2-Gbps (deployed as 8-Gbps, 4-Gbps or 2-Gbps devices), plus four 10-Gbps ISL

Figure 2 Enterprise Fabric Suite

Enterprise Fabric Suite from QLogic greatly facilitates Storage Area Management with an intuitive interface



Enterprise Fabric Suite shown on the left offers drop and drag zone editing, fabric change tracking functionality, and single point switch stack management. The switches are managed and function as a single stack.

stacking ports, which are upgradeable to 20-Gbps stacking ports. In addition, the SANbox 5802V has hot-swappable dual power supply/fans that provides redundant power and cooling.

Performance

The QLogic SANbox 5800V switch proved to handle line rate 8-Gbps Fibre Channel traffic utilizing local switching per switch. Although device port specifications indicate 8-Gbps and ISL ports indicate 10/20-Gbps, each device port on the 5800V operates at industry standard 8.5-Gbps and each ISO stacking port operates at 12.75-Gbps or 25.5-Gbps. A stack of five switches proved to handle 99.9% of the traffic passing over the 160 Gbps uplink per switch inter-switch capacity.

Fibre Channel performance for the SANbox 5800V switch was verified at 2/4/8-Gbps port speeds and 10/20-Gbps full duplex for ISL uplinks. All ports could auto-negotiate the speed for each device or port. The SANbox 5800V switch offers cut-through routing, with fabric bandwidth of 1700-MBps full-duplex on 8-Gbps ports and 5100-MBps full-duplex on 20-Gbps ports, with aggregate bandwidth of 544-Gbps per switch.

The SANbox 5800V switch architecture provides ASIC-embedded memory and guarantees 16 credit multi-read port buffer for full performance.

Management

QLogic Fibre Channel switches can be managed with either the built-in web GUI interface Quick Tools or premium management tool, Enterprise Fabric Suite. Both tools have similar look and feel and are very intuitive. [Figure 2](#) on page 3 shows a screen shot from the Enterprise Fabric Suite while conducting a drag and drop zone edit. Using the QuickTools interface, we felt the QLogic SANbox 5800V was one of the simplest SAN switches to configure and deploy. Ongoing management of the product is very straightforward using these tools.

We were particularly impressed in how quickly the management tool could identify an unexpected faulty third party SFP module when we were conducting testing.

Installation is a three step process utilizing automated routines to handle tasks from basic

switch setup to advanced zoning, and extended distance configuration. Self configuring switch ports and the capability to automatically adjust to 8-Gbps, 4-Gbps or 2-Gbps device speeds, simplifies installation.

The SANbox 5800V switch is configurable with a built in Graphical User Interface (QuickTools), that performs many of the same capabilities of Enterprise Fabric Suite with the exception of multi-fabric management, credit buffer extensions, and advanced license reallocation. The built-in QuickTools capabilities include management of switches in a single fabric (including multiple switches in a stack) from any local or remote location via a web access, and a centralized view of system activity. Administration, troubleshooting and the configuration of a basic fabric network is made simple, through the web based QuickTools interface, resulting in optimizing storage resources and maximizing performance of the system.

QLogic offers the optional Enterprise Fabric Suite software that extends the QuickTools functions to multiple fabrics and provides additional advanced features. The Fabric Suite allows users to manage a stack of up to six 5000 series products as a single device, thereby reducing complexity and errors for system administrators. With the Enterprise Fabric Suite application, the administrator can also perform the basic QuickTools functions such as loading firmware, provisioning security and performing SNMP administration. These functions are performed with an advanced level of granular control, which provides an easy to use and comprehensive management tool for a multi-fabric environment.

Scalability

The architecture of the SANbox 5800V switch responds to the SAN lifestyle cycle management framework by designing an effective stackable switch solution. Taking advantage of full mesh and redundancy of inter-connectivity, the SANbox 5800V switch maximizes performance and capability with XPAK uplinks. With the efficient "stackable" design, users can benefit from a "full mesh" redundant switch network, maximizing device ports usage and performance throughout the fabric. Internal port-to-port transfers are 100% non-blocking. The four XPAK inter-switch links

on each SANbox 5000 series switch interconnect other switches within the fabric. With 24 ports per switch, 20 8-Gbps/4-Gbps/2-Gbps auto-detecting device ports, and four dedicated 10-Gbps stacking ports (upgradeable to 20-Gbps), the SANbox 5800V switch offers a proven SAN switch solution. Each stacking port provides three times the speed of a FC device port which eliminates allocation of device ports for inter-switch links. Fewer device ports are required initially and during upgrades.

Additional port density can be added to the stack of 5000 series switches (up to six switches) to scale beyond 100 ports (with a recommended five stacked switch configuration). The Enterprise Fabric Suite application can manage six stacked switches as a single device (single fabric) and is capable of scaling and managing an unlimited number of stacks or fabrics.

The Adaptive Trunking feature automatically pools bandwidth from multiple inter-switch links into a single high-speed pipeline, without incurring licensing costs, providing a proven cost effective switch load balancing solution, enabling full use of the 100-Gbps of interconnection bandwidth. Our testing validated the automatic load balancing at both 10 and 20-Gbps.

The SANbox 5800 switch is fully compatible with other QLogic SANbox 5000/9000 series and also compatible with vendor FC-SW-2 compliant switches. The switch is also inter-operable with server applications and infra-structure vendors.

Reliability

In applying our standard set of criteria for evaluating reliability, the 5800V switch proved to have very effective high availability capabilities.

QLogic products offer a number of hardware components to ensure reliability. These include full bandwidth architecture, providing wire-speed bandwidth at every port; and a dedicated 10/20-Gbps ISL transport to create stable non-blocking multi-switch configurations. Additionally, the Adaptive Trunking feature optimizes ISL use and performance by pooling the capacity of the ISL port links into a single high-speed pipeline. This high-speed pipeline is automatically invoked, thereby eliminating manual configuration.

Other features that enhance the reliability and performance of the SANbox 5800V switch include I/O StreamGuard RSCN suppression, which guarantees bandwidth for applications such as video-streaming; exclusive Hardware-enforced zoning, provides the ability to move ports to specific zones; Non-Disruptive Code Load and Activation (NDCLA); and the optional hot-swappable power supply/fan device, provides redundant power each switch.

For the most effective inter-connectivity and performance, Miercom recommends stacking five SANbox 5800V switches, utilizing the XPAK uplinks for maximum performance. With four inter-connecting switches, the SANbox inter-switch backbone allows for a full mesh inter-connection of fabric, providing 100-Gbps of inter-connectivity per switch, ensuring maximum reliability and continuous connectivity, in the event a switch should fail.

Advanced Features

The SANbox 5800V switch provides 8-Gbps ready performance; the switch is backward compatible and auto-negotiates to 4-Gbps and 2-Gbps devices, and supplies 20-Gbps of ISL bandwidth on demand. The SANbox 5800V switch utilizes the same ISL cables and XPAK transceivers for either 10-Gbps or 20-Gbps, and the switch is capable of increasing bandwidth without manual reconfiguration. Each stacking port has the capacity to handle full line rate of three device ports. There are four stacking ports offering 160-Gbps (4 at 20-Gbps full duplex) of inter-switch data bandwidth per switch, which is provided by the 10-Gbps stacking ports (upgradeable to 20-Gbps).

For fast management of the entire SAN, the intuitive QuickTools implements device discovery and management, zoning (with Drag-and-Drop zoning) and fabric management.

QLogic's Data Center Fabric Manager provides an easy to use, comprehensive management tool for SANbox network devices. The optional Enterprise Fabric Suite bundles enterprise features into a single site-licensed package, reduces costs, and supports high level control of the fabric.

When troubleshooting the SANbox 5800V switch, QLogic offers the optional SANdoctor application, which we also evaluated that provides diagnostic tools to trouble-shoot problems in the switching fabric. In addition, QLogic offers an optional free Fabric Security tool which establishes user, connection and device security protection.

Standard Compliance

QLogic's Fibre Channel switching products meet Class A emissions and immunity requirements for USA, Canada, Europe, Australia, New Zealand, Korea and Japan. The SANbox 5800V switch has agency approvals for US/Canada, UL/cUL, 60950-1, Europe, EN60950, CB Scheme-IEC 60950-1, CE, TUV, Low Voltage Directive.

Business Case

The flexibility and design of the SANbox 5800V switch provides 8-Gbps Fibre Channel device ports, with connectivity to 8-Gbps, 4-Gbps or 2-Gbps Fibre Channel ports, for about the same cost as competing 4-Gbps products, supplying incremental bandwidth within the ISL fabric. The switch is backward compatible, allowing customers to deploy and upgrade to full 8-Gbps, meeting future expansion needs without additional cost for future expansion of the SAN network. This protects customers' infrastructure investment, and offers advanced management functionality.

The SANbox 5800V switch provides 10-Gbps of standard inter-switch bandwidth on demand, (at no additional cost) and the ability to upgrade these ISL ports to 20-Gbps on one or more switches, without disruption of service. The configuration is performed via one click of the mouse; extending stability, cost savings and performance benefits of a backbone SAN architecture.

The 10-Gbps stacking ISL ports provide more than 40-Gbps of additional data bandwidth per switch, with no additional expansion costs of the SAN network; protecting the infrastructure investment and extending product lifespan. Customers can upgrade to the 20-Gbps

bandwidth option on demand, and double the inter-switch speed without manual re-configuration. The SANbox networks require 50% fewer switches since each stacking port matches throughput of three device ports, thus reducing expansion costs.

For example, contrasting a two-stack 40 8-Gbps device port configuration with the SANBox 5800V stackable switch to a comparable switch which utilizes device ports for interconnection shows the 5800 with 66% more inter-switch bandwidth (68-Gbps vs. 102-Gbps for QLogic). The non-stacking configuration requires dedicating four device ports on each switch for inter-switch links resulting in the loss of eight device ports.

The process of adding additional ports to the QLogic stack is non-disruptive to the switch network, though installing additional ports to a non-QLogic configuration require re-cabling disruptions and may add complexity to the device port and inter-switch link configuration.

The architecture of QLogic's ISL port provides a 3 to 1 stacking port ratio, with enterprises gaining up to 12 device ports per switch, realizing a 50% cost reduction of their switch device purchases.

Additionally, the optional Enterprise Fabric Suite application manages an unlimited number of fabrics. Through the Adaptive Trunking functionality, the capacity of multiple ISL ports is automatically pooled into a single-load pipeline, providing full bandwidth optimization. The administration of the network does not require IT staff, and additional licensing fees are not required, thereby QLogic customers realize a substantial cost savings.

QLogic understands that most companies operate in a mixed environment, with the ability to intermix 2-Gbps, 4-Gbps or 8-Gbps device ports. The QLogic SANbox 5800V Stackable Fibre Channel plays well, and allows more value than standard switch products. The flexible design of the SANbox 5800V switch allows customers to select the capacity required, offering port capacity at 2-Gbps, 4-Gbps or 8-Gbps with best value and low initial cost to the customer.

Miercom Rated Best

Based on hands-on testing and validation of capabilities, operation and features, *The QLogic SANbox 5800V switch is Rated Best Value and Management Stackable Solution in the 2009 Miercom Storage Area Networks Switch Industry Assessment.* This rating is based on the specific testing in those areas described in this report as well as other tests that were conducted.

The award is in accordance with the Rated Best Testing Program of Miercom, effective for one year from test certification. The Rated Best program recognizes products that exhibit exceptional qualities in specific test criteria when analyzed in a competitive test review or Miercom Industry Assessment.

The QLogic SANbox 5800V switch is clearly designed for high density scalability and high aggregate switching capacity. It is well designed and exceeds expectations for the data center storage market.



Value and Management Stackable Solution



SANbox 5800V Switch



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