INNOVATIVE TARGET AND INITIATOR EMULATION SOLUTIONS

or you could use our solution.

SANBlaze

The Storage Emulation Company

IF YOU NEED TO TEST YOUR SOFTWARE'S ABILITY TO ADDRESS 1000 4TB DRIVES, AT FULL LINE RATE, HOW WOULD YOU SET THAT TEST UP IN THE LAB?

COULD YOU EASILY BUILD A LAB DIVERSE ENOUGH TO TEST YOUR HARDWARE'S ABILITY TO INTEROPERATE WITH 15 DIFFERENT DEVICES FROM 5 DIFFERENT STORAGE VENDORS?

WHEN IS SOMETHING EVEN BETTER THAN THE REAL THING?

In many storage testing and development scenarios the prospect of using actual equipment is daunting – too expensive, too much power required, too much time to set up and administer.

On the other hand, emulation technology provides design, verification and test engineers the ability to simulate a variety of conditions with the flexibility, scalability and speed that would be impossible to attain with actual devices.

Emulation technology is ideal for:

- **Storage developers** conducting first pass testing during a development cycle as a proof of concept
- **Test engineers** who test products for bugs and interoperability, measure performance and conduct compliance tests
- **QA engineers** when conducting final tests to ensure the quality of a production shipment
- **Manufacturing engineers** who need flexible, scalable, automated environments to produce products accurately and cost effectively
- **Marketing engineers** who perform performance and product comparison testing

Emulation decreases the complexity of a lab environment and for many tasks (performance testing, error injection, etc.) provides better functionality than the real thing. Emulation offers a cost and time savings while increasing test functionality.

INTRODUCING THE INDUSTRY'S MOST ADVANCED STORAGE EMULATION SOLUTIONS

SANBlaze manufactures target and initiator emulators for FCoE, Fibre Channel, iSCSI, SAS and other storage protocols. Our highly configurable systems are unique in their ability to emulate actual storage devices. Our target emulators allow you to create read/write drives and tapes, control latency and configure error conditions. Our initiator emulators behave as a real initiator, not just a traffic generator or protocol tester, providing real login and command control.

SANBlaze solutions are used by numerous storage hardware and software vendors, as well as large enterprises to improve test functionality while reducing costs. Our commitment to meet customer requests for new features and product enhancements enables us to stand alone in the storage test systems industry.

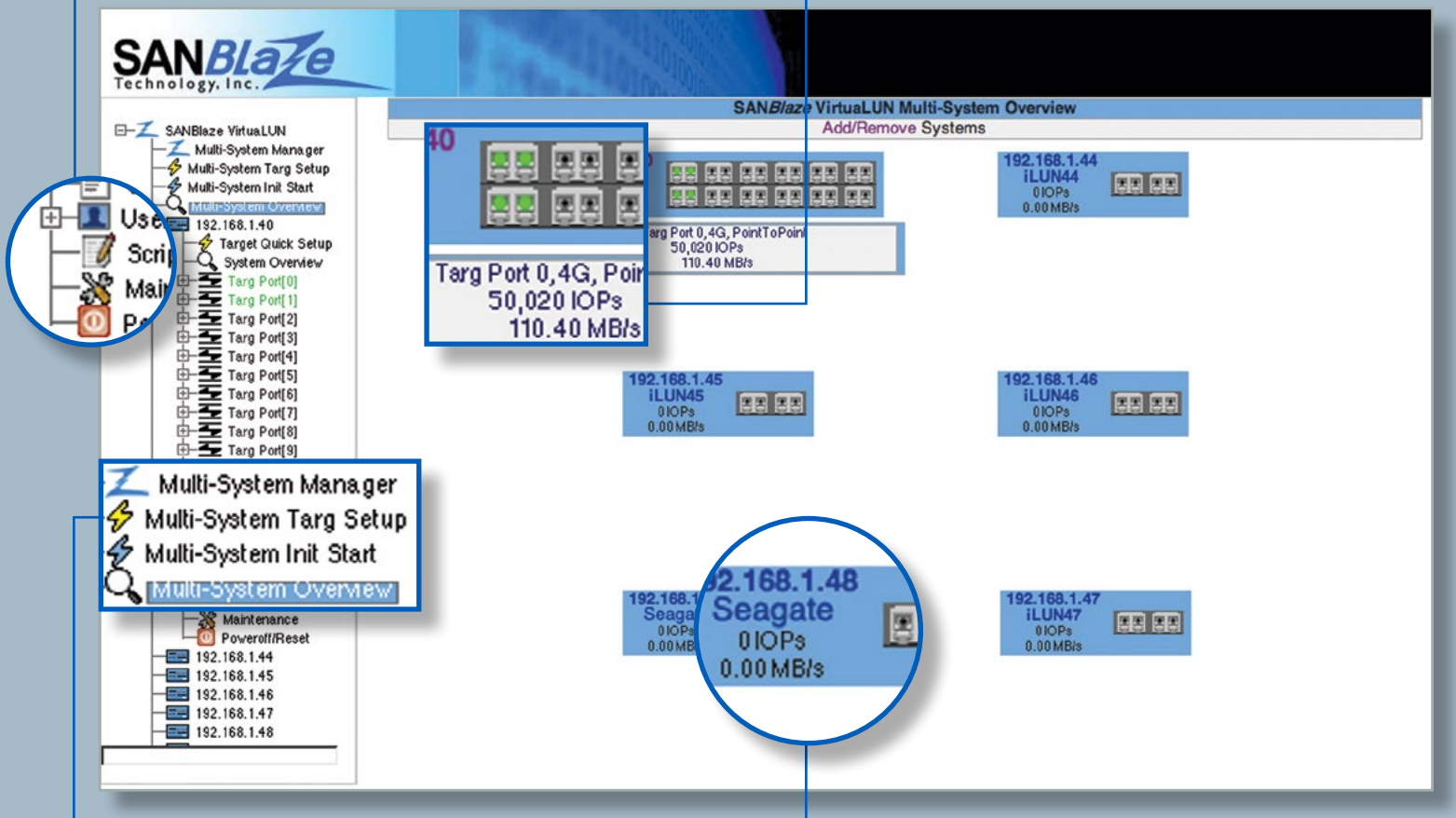
FLEXIBLE AND POWERFUL FEATURE SET

Flexible User Interface

Powerful web-based GUI allows you to quickly create, save and restore configurations. Efficiently build a large number of formatted drives, create a predictable bad drive or generate custom commands to simulate initiator test cases. All functionality found in the GUI is also available from a CLI interface and can be automated using scripting.

Performance

SANBlaze systems can act as a wire speed device. BlazterMode™ allows read/write tests to run at full line rates across all ports, whether it's 8G/16G Fibre Channel, 10G FCoE, iSCSI or 6G/12G SAS. Run tests that eliminate the latency associated with real drives or add latency in millisecond increments in a predictable manner. Track round trip performance statistics between initiator and target.



Configurability

Each port on the system can be configured in target or initiator mode. Specific characteristics can be set to customize your disk drive, tape drive, array or PC test environment. Place a device under test (DUT) between an initiator port and a target port. Generate traffic and inject errors on either side of the DUT.

Vendor Specific Devices

With our profiling functionality you can configure an emulated device to look and behave like a specific vendor disk drive, tape drive or array. Numerous parameters can be changed, such as vendor ID and world wide node name. Define mode, diagnostic and custom inquiry pages to create vendor specific test environments. Generate and import disk, tape or array profiles directly from any connected device.

TARGET EMULATION

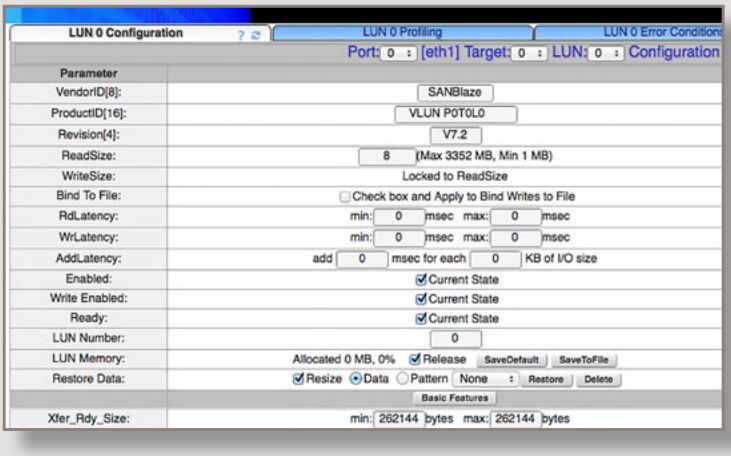
SANBlaze target emulation systems for FCoE, Fibre Channel iSCSI and SAS provide a virtual, extremely cost-efficient configurable environment for SAN and network product development, testing, manufacturing and QA.

The systems reduce the need to deploy large farms of physical "scratch" disks or tapes, providing port density, high performance, non-volatile media at a fraction of the cost of physical disks or tapes.

The ability to add latency, have differing read/write sizes, inject a wide variety of errors and save and restore multiple disk configurations provides a flexible and invaluable tool for development, test and QA labs.

Multiple Disk Configurations

SANBlaze target emulator solutions provide the ability to configure from 1 to 512 disks or "LUNS" per port, allowing a 24 port system the ability to simulate over 12000 drives or tapes. These configurations can be saved and retrieved via a web based interface or script.



LUNS characteristics can be easily configured, from basic functions like size and latency, to complex settings such as Queue depth, mapping and user definable mode pages.

Performance Testing

SANBlaze target emulation systems perform target reads and writes at full line speed. For example, a 4 port FCoE system will allow for four 10G FCoE ports to execute reads and writes at full line rates each. This full line rate throughput allows for testing to be done against a fast, predictable target with near zero latency.

Trace mode allows a SANBlaze system to trace every I/O generated or received to quickly identify and resolve errors.

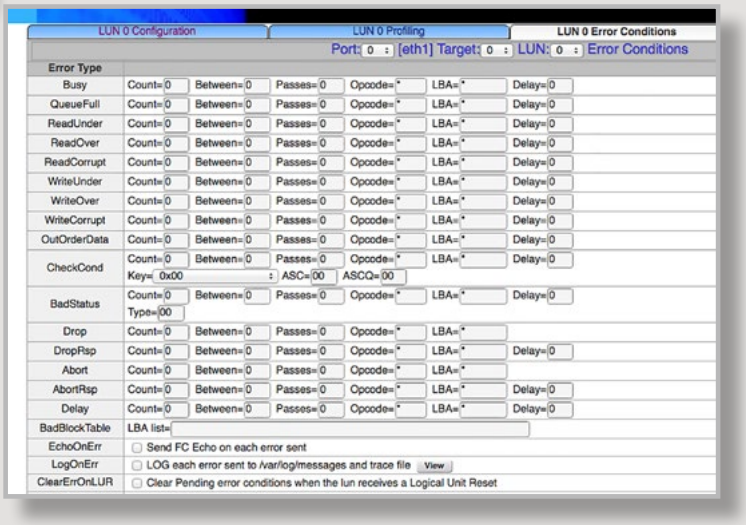
"We have been using SANBlaze products to generate traffic in our lab due to the reliability, flexibility, and their super high quality support. The ability to script traffic and error generation down to a target/LUN is immensely useful. Add to that the ablity to capture FCoE traffic, and the ability to save and restore configurations that include WWNs, make life real easy."

— Gayle Noble, QA Engineer, Virtual Instruments

Error Injection and Bad Drive Testing

DVT and Test Labs are often tasked with testing the error recovery capability of their product in the face of errors that previously have been difficult to create in a predictable manner. SANBlaze target emulation systems can emulate exact conditions, on command, and remain in the error state for a specific number of I/Os or indefinitely, allowing qualification engineering to characterize the ability of its products to deal with specific error cases.

SANBlaze's software can also be scripted to simulate a large number of errors including: queue-full, lost I/Os, long latencies (seconds to minutes), read and write overruns and underruns, and check conditions with any SenseKey/ASQ/ASC combination.



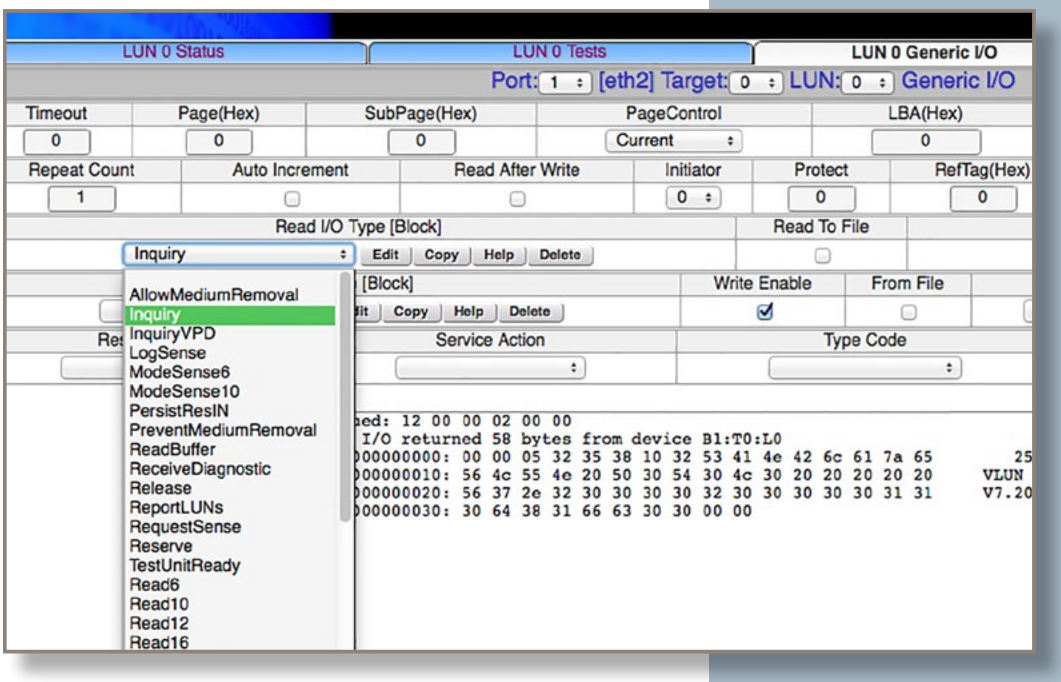
Error conditions can be set to trigger on a number of conditions including time intervals, number of I/Os, specific commands or a range of LBAs. Errors can be combined or scripted to simulate deteriorating drive conditions, in a predictable and repeatable fashion.

INITIATOR EMULATION

SANBlaze Initiator Emulation provides simulation of a single to hundreds of Initiator ports. In many development and test instances, the software eliminates the need for multiple physical devices, such as a rack of PCs, providing a stress and performance testing solution in a compact and easily manageable footprint. Initiator emulation runs standalone or in conjunction with SANBlaze Target Emulation software for an end-to-end solution.

As with all SANBlaze products, the Initiator Emulator provides unparalleled advantages over the real thing: smaller footprint, lower power consumption, centralized management and control and lower cost of ownership.

Features such as read/write/compare testing, error injection and a custom command builder provide the ideal environment in which to simulate Initiator test cases via script or an easy to use web interface.



Generate a wide variety of conditions, from basic read/write testing or individual SCSI commands to custom writes of specific size, byte offset and address.

Director Class Switch Testing

The SANBlaze Initiator Emulation solution running in a SANBlaze GargantuLUN system can provide up to 24 Fibre Channel or 48 SAS Initiator ports in a 3U chassis. Multiple 3U systems can be combined to provide a very high density solution in a compact form factor, enabling you to replace racks upon racks of 1U PCs needed to provide the same test functionality. Coordinated events such as simulating hundreds of simultaneous logins via script or a single mouse click provide a level of automation unavailable in existing solutions.

SANBlaze Initiator Emulator Key Features

- Web-based interface for convenient set-up
- High density, easily managed Initiator ports in a small footprint
- Multiple systems, centrally managed, can emulate 100s of devices
- Quickly run and save multiple test configurations
- View statistics and performance in real time
- Error injection capabilities
- View error counters and statistics
- Measure throughput and latency
- Custom command builder
- Interface with industry standard tools such as IOmeter
- Full featured Command line and scripting support

"SANBlaze provides a configurable and scalable environment, making it an invaluable lab tool. By varying configuration and error conditions in a virtual Fibre Channel environment instead of a physical one, we complete far more comprehensive testing in less time, and ultimately shorten our time-to-market."

— Charlie Kraus, LSI Logic

SANBLAZE EMULATION SYSTEM PLATFORMS

SANBlaze target and initiator emulation solutions are delivered in high performance, optimized system platforms. Options for port density and memory provide a range of configurations to address varying requirements and budgets. In addition to performance optimized systems, the products are available as a software only version for specific requirements and feature sets.

SANBlaze VirtuaLUN™ Value

The Value Edition delivers the basic SANBlaze emulation functionality in a flexible software only configuration allowing end users to deploy on recommended hardware platforms and configurations. The Value Edition includes most of the functions of the full featured emulation product, but excludes some advanced features such as error injection and performance enhancements.

SANBlaze VirtuaLUN™ Enterprise

The Enterprise Edition delivers the complete SANBlaze emulation funtionality in a flexible software only configuration allowing end users to deploy on recommended hardware platforms and configurations.

VirtuaLUN 2 Slot, 1U system

SANBlaze optimized hardware platforms

SANBlaze emulation solutions are delivered in high performance, optimized systems that provide flexibility and maximum performance. Features include:

- Dual Multi-core, high-speed Intel Xeon processors
- Large optimized memory configurations
- 2 slot (VLF) or 6 slot (GLF) options

Chassis	Memory	Slots
VLF	64G or 128G or 256G	2
GLF	64G or 128G or 256G	6

Protocol	Ports per Slot
10G FCoE	2
10G iSCSI	2
8G Fibre Channel	2 or 4
16G Fibre Channel	2
6G or 12G SAS	8
40G iSCSI	2

Protocols can be mixed and matched in any system.

For example, A VLF system has two slots, so it could support 2 ports of FCoE and 2 ports of 16G Fibre Channel. Any variation of the Protocols can be integrated within a system.

GargantuLUN 6 Slot, 3U system

For additional technical information please visit our website or send an email to info@sanblaze.com.

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SANBlaze Technology, Inc. is a pioneer in SAN Emulation technologies and a leading provider of solutions for embedded systems. SANBlaze emulation products provide storage engineers, test and QA teams with scalable, high performance and configurable emulated environments for Fibre Channel, iSCSI, SAS and FCoE targets and initiators.