vmware®
READY

STORAGE

2ND EDITION

ATTO
Application Guide
The Power Behind the Storage

ATTO

ATTO Technology, Inc.

Corporate Overview

For over 30 years, ATTO has been an innovator in network and storage connectivity, from developing the first solid-state storage device to the latest data center appliances. ATTO creates high-performance products that manage latency in the most demanding real-time environments, resulting in accelerated application performance and enhanced transaction processing. ATTO delivers performance-based solutions to applications, infrastructure, big data, cloud and virtualized environments, including:

- **Enterprise** - Database, Web Servers, Back-Office Operations
- **Departmental** - Business Analytics, Supply Chain, Asset Management
- **Business Continuity** - MetroClusters
- **Workgroup** - CAD/CAE, Video Production/Finishing, Scientific, Energy, Medical

ATTO manufactures the industry's broadest portfolio of high-performance network and storage connectivity products, designed and optimized to work together to help customers better store, manage, analyze and deliver data.

- Fibre Channel, SAS/SATA, iSCSI, Ethernet, Thunderbolt™, NVMe, NVMe over Fabric, Host Bus Adapters, Network Interface Cards, storage controllers, Bridges, Thunderbolt adapters and software

ATTO delivers tested solutions which are qualified and certified with industry-leading workstation, server, storage and application vendors. This ensures:

- Faster access to new technology
- Features that improve your workflow
- Maximized solution performance and productivity

ATTO provides a unique level of partnership with customers, solution providers and OEMs.

ATTO founders Dave Snell, CTO, and Tim Klein, CEO

The Power Behind the Storage

"We would like to thank our valued industry partners and loyal customers for your continued support. ATTO's primary mission is to provide the best possible customer experience while offering the highest performing, industry leading products and technologies available."

-Timothy J. Klein, President and CEO, ATTO Technology, Inc.

ATTO Product Lines

Host Bus Adapters
Celerity™ Fibre Channel HBAs and ExpressSAS® SAS/SATA HBAs provide faster and more efficient data transfers.

Network Interface Cards
FastFrame™ 10/25/40/50/100 Gb Ethernet NICs provide flexible and scalable unified LAN and SAN storage connectivity.

Thunderbolt™ Adapters
ThunderLink® adapters enable high-performance, low latency Thunderbolt connectivity to desktop and mobile workstations for network and storage connectivity.

*i*ntelligent Bridges
XstreamCORE® Ethernet and Fibre Channel intelligent bridges disaggregate storage from compute by enabling remote access and sharing of SAS, JBOD, JBOF, RAID, tape and optical devices.

NVMe Switch Host Adapters
ExpressNVM™ host bus adapters offer a unique option to create shareable NVMe storage pools with unparalleled storage performance—all while delivering enterprise-level management and configuration capabilities.
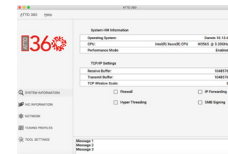
Software
ATTO software and downloadable tools help to maximize the productivity of a number of ATTO products.

ATTO VMware ESXi Certified Products

For well over a decade ATTO has been optimizing storage networking and connectivity products for VMware environments. Working with VMware to ensure interoperability, the list of current ATTO products certified with VMware ESXi® is extensive:

XstreamCORE 7550 16Gb Fibre Channel 4-port to 12Gb SAS 4 (x4) port storage controller
XstreamCORE 7600 32Gb Fibre Channel 2-port to 12Gb SAS 4 (x4) port storage controller

Celerity FC-321P	Gen 7 32Gb Fibre Channel	1-port	PCIe 4.0 x8
Celerity FC-322P	Gen 7 32Gb Fibre Channel	2-port	PCIe 4.0 x8
Celerity FC-324P	Gen 7 32Gb Fibre Channel	4-port	PCIe 3.0 x16
Celerity FC-321E	Gen 6 32Gb Fibre Channel	1-port	PCIe 3.0 x8
Celerity FC-322E	Gen 6 32Gb Fibre Channel	2-port	PCIe 3.0 x8
Celerity FC-324E	Gen 6 32Gb Fibre Channel	4-port	PCIe 3.0 x16
Celerity FC-161P	Gen 6 16Gb Fibre Channel	1-port	PCIe 3.0 x8
Celerity FC-162P	Gen 6 16Gb Fibre Channel	2-port	PCIe 3.0 x8
Celerity FC-164P	Gen 6 16Gb Fibre Channel	4-port	PCIe 3.0 x8
Celerity FC-81EN	8Gb Fibre Channel	1-port	PCIe 2.0 x8
Celerity FC-82EN	8Gb Fibre Channel	2-port	PCIe 2.0 x8
Celerity FC-84EN	8Gb Fibre Channel	4-port	PCIe 2.0 x8
ExpressSAS 1208GT	12Gb SAS/SATA	0 ext / 8 int ports	PCIe 4.0 x8
ExpressSAS 120FGT	12Gb SAS/SATA	0 ext / 16 int ports	PCIe 4.0 x8
ExpressSAS 1244GT	12Gb SAS/SATA	4 ext / 4 int ports	PCIe 4.0 x8
ExpressSAS 1280GT	12Gb SAS/SATA	8 ext / 0 int ports	PCIe 4.0 x8
ExpressSAS 12F0GT	12Gb SAS/SATA	16 ext / 0 int ports	PCIe 4.0 x8

ThunderLink FC 2162 Thunderbolt 2 - to - 16Gb Fibre Channel 2-port
ThunderLink SH 3128 Thunderbolt 3 - to - 12Gb SAS/SATA 2-port
ThunderLink FC 3162 Thunderbolt 3 - to - 16Gb Fibre Channel 2-port
ThunderLink FC 3322 Thunderbolt 3 - to - 32Gb Fibre Channel 2-port

ATTO products will enhance the performance of any VMware ecosystem. This booklet provides use cases common to VMware environments and details how ATTO solves challenges better than any other connectivity solution.

Backup Data Off Site Quickly and Privately

ATTO XstreamCORE® protects critical business data by remotely connecting to SAS tape

Background:
Remote backup is a key operation for businesses that have mission critical data which needs to be preserved in the event of disaster, system outages or corporate sabotage that damages or deletes local data copies. Backups can be located across a metropolitan area or across the world separated from the original data location.
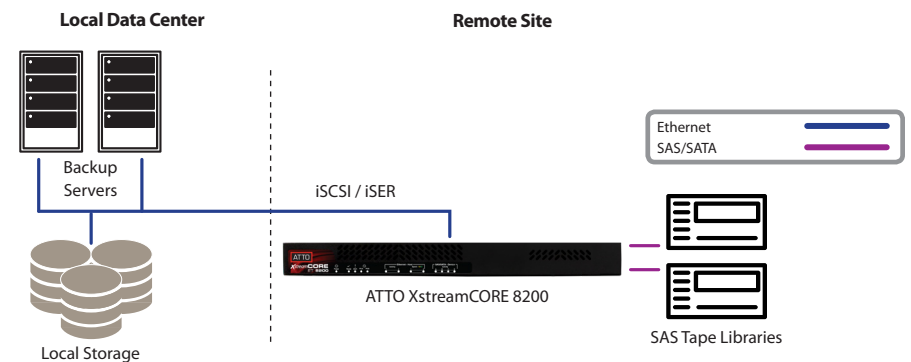
Problem:
SAS tape libraries directly attached to backup servers can limit the feasibility of using these technologies for remote backups. Direct-attached tape devices can not achieve optimum performance behind a backup server and their physical location doesn't support the goal of backing up mission critical data for disaster recovery.

Solution:
ATTO XstreamCORE® ET 8200 connects SAS tape devices to a high-speed Ethernet network using 40GbE with either hardware accelerated iSCSI or iSCSI over RDMA (iSER).

Benefits:
- XstreamCORE features the ATTO xCORE™ processor which accelerates all I/O in hardware ensuring a deterministic latency of less than two microseconds.

- Extremely low latency with simultaneous acceleration for TCP, IP and iSCSI performed in hardware.

- ATTO SpeedWrite™ keeps paths between hosts and XstreamCORE filled with data, eliminating the slow down near the end of writes common to tape drives and, instead, significantly boosting tape write performance.

- Multiple backup servers can share a remote tape library. Patented ATTO Drive Map Director™ feature allows mapping servers to specific tape drives.

Local Data Center — Remote Site
Backup Servers — iSCSI / iSER — ATTO XstreamCORE 8200
Local Storage — SAS Tape Libraries
Ethernet / SAS/SATA

Free Your Servers from In-The-Box Storage
Reduce CapEx by adding storage without buying more compute

Background:
In today's datacenters, there are many options for virtualization and high-performance design, specifically hyper-converged infrastructure (HCI). These solution architectures rely on direct-attached storage (DAS) and robust multiport Ethernet infrastructures. These allow a non-shared file system such as VMware vSAN™ or other software HCI packages the ability to provide fast caching and storage while optimizing application performance. A full node, with all of its data, has enough copies and pieces existing on all other hosts so that a host or node failure will not overstress the environment. That is, provided non-shared file systems allow the HCI software to be light and not utilize more space than needed..

Problem:
A core characteristic of a hyper-converged infrastructure is the use of a non-shared file system such that replication occurs across the Ethernet network from node to node (host to host). Although this provides protection against multiple host/node failures it constrains the expansion of storage for a given node/host. If additional storage is required beyond what is available within the storage server an additional node is needed.

Solution:
ATTO has a line of Fibre Channel/SAS bridging products called XstreamCORE®, which can replicate a direct-attach environment while utilizing Fibre Channel (FC) as a transport protocol to allow for the addition of storage into an environment without having to add additional hosts or nodes.

ATTO XstreamCORE XC7550 and 7600 have a unique feature named Host Group Mapping (HGM). HGM allows FC initiators to bind directly with individual SAS drives so that the FC transport protocol is simply the mechanism for transporting the SCSI commands. By allowing this non-shared access to specific drives, or groups of drives, we are adding storage capacity to one or more nodes across a FC fabric without the need to add additional compute nodes.
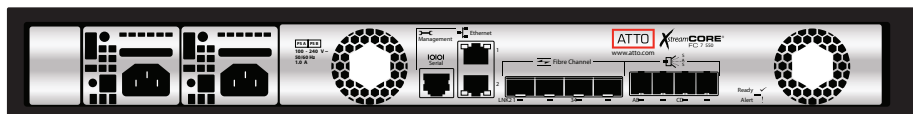

XstreamCORE® FC 7550

ATTO Storage Controller					
Product	4K IOPS	Throughput	Host Ports	x4 SAS Ports	SKU
XstreamCORE FC 7550	1.2M	6,400 MB/s	(4) - 16Gb Fibre Channel	4 (16 PHYs)	XCFC-7550-004
XstreamCORE FC 7600	1.2M	6,400 MB/s	(2) - 32Gb Fibre Channel	4 (16 PHYs)	XCFC-7600-002

Benefits:
- Plug and play appliance that installs in less than 5 minutes

- Works in multiple HCI software packages like vSAN and vFRC

- Allows storage and compute to scale independently of each other and disaggregates storage.

- Typically, additional licensing fees are not required.

- Only buy storage when needed, reducing CAPEX

- Low administrative costs reduce OPEX

- Creates a storage pool that maintains a direct-attached relationship between host and drives where drives can be assigned based on namespace to a specific server

- Reliable and robust fibre connection allows the storage pool to be remotely located

- Attached SAS LUNs are mapped and presented as Fibre Channel LUNs on a Fibre Channel fabric.

Servers

Fibre Channel Fabric

ATTO XstreamCORE

6Gb / 12Gb SAS JBODs / JBOFs

Fibre Channel	
SAS/SATA	
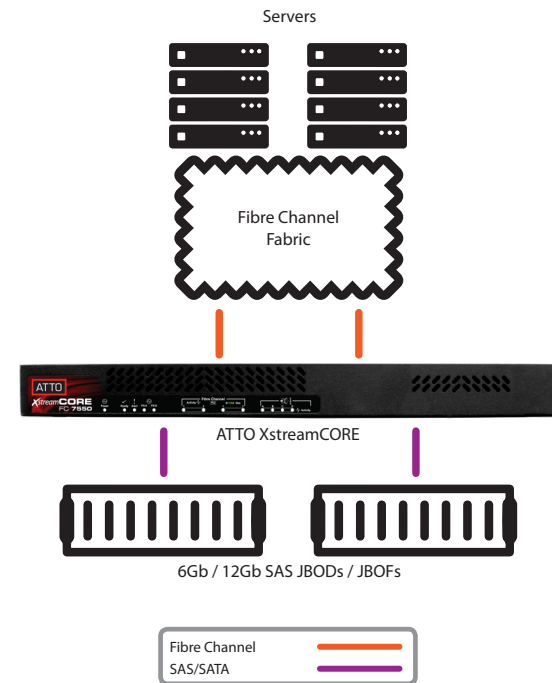
Extend the Life of Your Storage Arrays

ATTO XstreamCORE® connects SAS storage to a Fibre Channel or iSCSI SAN where it can be shared across multiple servers

Background:

Many organizations use direct-attached SAS storage arrays. As infrastructures expand and virtualize, the limitations of direct attached storage silos become evident and SAN technology is preferred. However, conversion of arrays from SAS to Fibre Channel can be costly, time consuming and pose a risk for data loss. ATTO XstreamCORE® is a storage controller designed to connect SAS/SATA RAID arrays, JBODs or JBOFs enclosures to Fibre Channel or Ethernet fabrics.

Problem:

Direct-attached SAS storage can result in underutilized or un-scalable data silos. Operations like vMotion® can take hours to complete moving data from one server/DAS pair to another through the Ethernet network while host resources are often constrained and stressed.
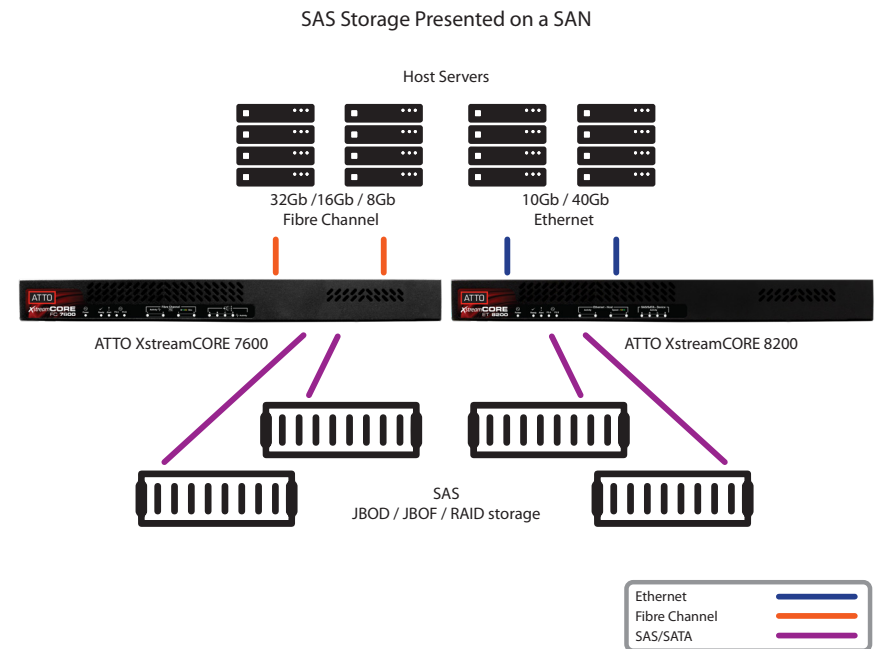
Solution:

ATTO XstreamCORE easily transforms existing direct-attached SAS storage into a pool of scalable, shared Fibre Channel or iSCSI storage that allows the addition of new capacity or hosts with no downtime. All attached hosts can have equal access and visibility to the storage on the fabric. This allows VMs to be migrated between hosts without the need to migrate data from the storage unit. This reduction typically allows for vMotions completing in less than a minute as opposed to potential hours.
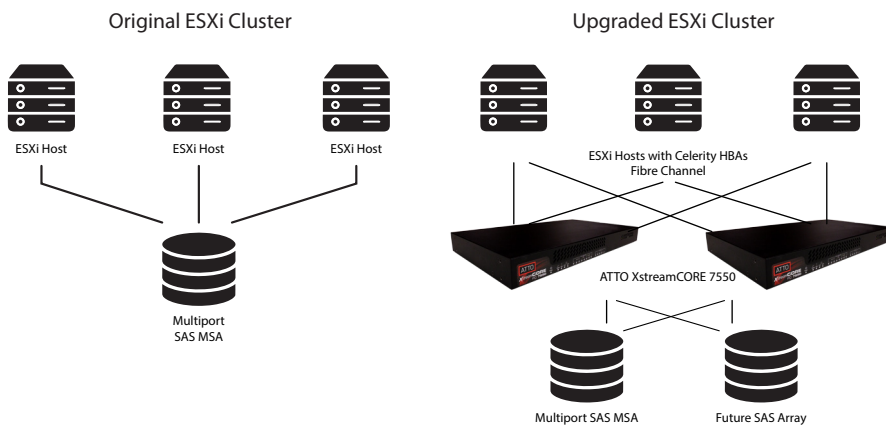
Benefits:

- Increases lifespan and maximizes ROI of existing storage solutions by converting existing SAS devices to Fibre Channel or iSCSI.

- Improves VM live migration completion time from hours down to minutes with no data migration required.

- XstreamCORE features ATTO xCORE processor which accelerates all I/O in hardware driving total performance up to 1.2M 4K IOPS & 6.4GB/s throughput per controller.

- Installs quickly without data risk and is VMware vSphere® 6.x certified.

SAS Storage Presented on a SAN

Host Servers

32Gb /16Gb / 8Gb
Fibre Channel

10Gb / 40Gb
Ethernet

ATTO XstreamCORE 7600

ATTO XstreamCORE 8200

SAS
JBOD / JBOF / RAID storage

Ethernet
Fibre Channel
SAS/SATA

Original ESXi Cluster

Upgraded ESXi Cluster

ESXi Host

ESXi Host

ESXi Host

ESXi Hosts with Celerity HBAs
Fibre Channel

ATTO XstreamCORE 7550

Multiport
SAS MSA

Multiport SAS MSA

Future SAS Array

"XstreamCORE FC 7550 has allowed (us) the flexibility to expand our storage without having to completely re-architect the current setup. It has provided a seamless migration path to newer all-flash vendor agnostic solutions and gave new life to hardware we would otherwise replace."

Shawn Winters
Torcon director of technology

Fastest Block Data Over Ethernet
iSCSI or iSER storage networks without a target server

Background:

Creating an iSCSI SAN allows multiple hosts to share a pool of storage over an Ethernet network. iSCSI block-based storage can be considerably faster than Network Attached Storage (NAS).
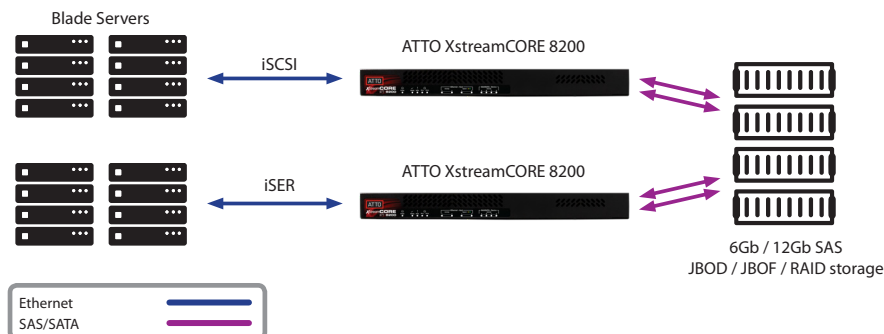
Problem:

Server nodes using iSCSI to connect to SAS storage can be complex to setup and manage. It requires multiple hardware and software components and licenses. It also introduces considerable latency.

Solution:

ATTO XstreamCORE® presents SAS storage as iSCSI or iSER targets allowing servers to connect to highly efficient block storage. It provides shared connectivity for up to 64 individual iSCSI servers to up to 960 total SAS/SATA SSDs or HDDs housed in commodity JBODs. These drives can be totally isolated from select servers or shared across many.

Benefits:

• Eliminate the need for iSCSI server controller nodes.

• XstreamCORE features ATTO xCORE™ processor which accelerates all I/O in hardware ensuring a deterministic, consistent protocol conversion latency of less than four microseconds.

• Total performance of up to 1.2M 4K IOPS & 6.4GB/s throughput per controller.

• ATTO *i*ntelligent Bridging Architecture™ is designed with powerful hardware and advanced conversion algorithms to enable efficient, consistent protocol conversion adding under four microseconds of latency.

• SSDs/HDDs presented as iSCSI LUNs.

Blade Servers

iSCSI — ATTO XstreamCORE 8200

iSER — ATTO XstreamCORE 8200

6Gb / 12Gb SAS
JBOD / JBOF / RAID storage

Ethernet
SAS/SATA

Break Free From Blade Server Storage Limitations
Scale out to massive amounts of inexpensive commodity storage

Background:

A blade server is a stripped-down server computer with a modular design optimized to minimize the use of physical space and energy and often dedicated to a single application. Blade servers allow more processing power in less rack space, simplifying cabling and reducing power consumption.
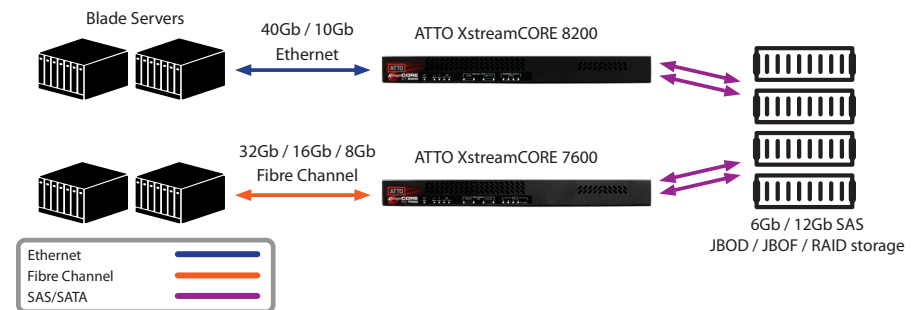
Problem:

Although blade servers provide dense compute power in a small footprint there are very limited options to expand outside the box. Each blade typically comes with only one or two local SSD or HDD drives. If more storage is necessary either an additional blade needs to be deployed or a PCIe or mezzanine card is required to connect to external storage most often dedicated to that server.

Solution:

ATTO XstreamCORE® presents SAS storage on iSCSI or Fibre Channel networks allowing blade servers to connect to highly efficient block storage. It provides shared connectivity for up to 64 individual blades to up to 960 total SAS/SATA SSDs or HDDs housed in commodity JBODs/JBOFs. These drives can be totally isolated from other servers or shared across many using ATTO Host Group Mapping or CHAP and ACLs. The drives can also be easily remapped in case of a server failure or scheduled maintenance.

Benefits:

• Easily connect efficient shared block SSD storage to blade servers.

• Eliminate the need for proprietary, expensive storage and licensing fees by using commodity storage and Software Defined Storage solutions to manage data.

• XstreamCORE features ATTO xCORE™ processor which accelerates all I/O in hardware driving total performance up to 1.2M 4K IOPS & 6.4GB/s throughput per controller.

Blade Servers

40Gb / 10Gb Ethernet — ATTO XstreamCORE 8200

32Gb / 16Gb / 8Gb Fibre Channel — ATTO XstreamCORE 7600

6Gb / 12Gb SAS
JBOD / JBOF / RAID storage

Ethernet
Fibre Channel
SAS/SATA

Reduce the Complexity of Managing and Monitoring All of Your Storage Connectivity
ATTO vConfig Tool™ management plug-in tool for VMware vCenter®

Background:

ATTO vConfigTool™ for VMware vCenter Server® is a software plug-in that integrates simplified, centralized management and monitoring of ATTO Celerity™ Fibre Channel HBAs and ATTO ExpressSAS® 12Gb HBAs into VMware virtual environments. With vConfigTool, IT administrators using vSphere® 5.5 and later web clients optimize configurations, improve system availability and reduce the cost of VMware host infrastructures.

Benefits:

• Manage multiple ATTO products from one convenient location.

• Customize the settings to maximize the performance of your storage connection.

Uncover Hidden Storage Performance Problems
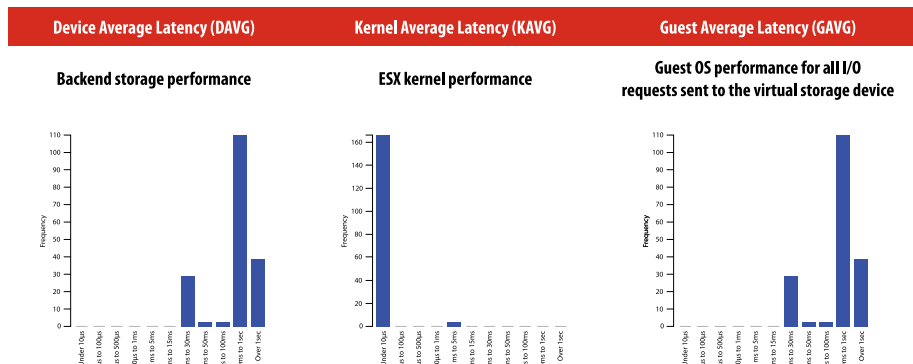ATTO Latency Scout™ shines a light on your storage bottlenecks

Background:

vConfigTool includes ATTO Latency Scout™ an exclusive dianostic tool that enables IT administrators to quickly make adjustments to maximize performance. Real-time histograms allow administrators to monitor storage I/O latency and isolate bottlenecks.

Benefits:

• Customize utility settings to optimize performance.

• Integrates with VMware vCenter Server®.

• Provides advanced monitoring and troubleshooting.

Latency Scout measures three levels of latency:

Device Average Latency (DAVG)	Kernel Average Latency (KAVG)	Guest Average Latency (GAVG)
Backend storage performance	ESX kernel performance	Guest OS performance for all I/O requests sent to the virtual storage device

A Latency Scout histogram display indicating backend storage performance challenges ocurring within the datacenter.

Technology Leadership
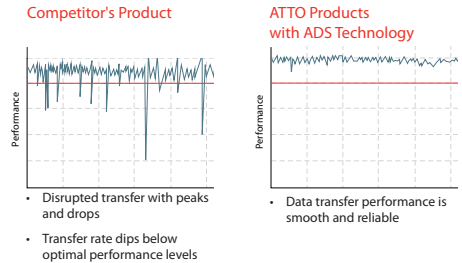Technology at it's fastest

ATTO Advanced Data Streaming (ADS™) Technology

ATTO ADS™ is proprietary latency management technology built into all ATTO network and storage connectivity solutions. ADS works transparently to smooth data transfers through controlled acceleration. Data moves more efficiently giving ATTO users an unmistakable edge in total system performance.

From high I/O transactions to large bandwidth real-time streaming, ADS reduces interruptions and maximizes the amount of data processed per CPU cycle.

Featured Products:

• ATTO Celerity™ Fibre Channel host bus adapaters (HBAs)

• ATTO ExpressSAS® SAS/SATA HBAs

• ATTO FastFrame™ Ethernet adapters

• ATTO ThunderLink ® Thunderbolt™ adapters

Competitor's Product
• Disrupted transfer with peaks and drops
• Transfer rate dips below optimal performance levels

ATTO Products with ADS Technology
• Data transfer performance is smooth and reliable

ATTO xCORE Hardware Acceleration Processor / eCORE Offload Processor

xCORE is hardware-based data acceleration technology that manages the data path and assures that all reads and writes are processed software-free with minimal overhead. Latency is limited to a consistent two to four microseconds.

eCORE provides software-based virtualization and management services. ATTO eCORE supplements xCORE to maintain deterministic latency by enabling software functionality only where and when needed.

Working together, xCORE and eCORE unleash the full potential of software defined storage, making it possible to add common, open storage services and industry standard API integration and maximize the gains of all-flash storage architectures.

Featured Products:

• ATTO XstreamCORE® *i*ntelligent Bridge

ATTO PowerCenter Pro™

A software interface built into ATTO 12 Gb/s ExpressSAS® SAS/SATA HBAs and ATTO ThunderLink® Thunderbolt™ adapters. ATTO PowerCenter Pro adds RAID functionality, protection and performance without the need or cost of additional hardware RAID components.

Supports RAID 0, 1, 1e or 10 via integrated software and features a simple, fully scriptable "set it and forget it" CLI and EFI interface for RAID group creation, monitoring and management. Provides full boot support as well as support for hot spares.

Easy-to-use, powerful, yet lightweight, ATTO PowerCenter Pro software provides the protection, capacity expansion and performance improvements needed for today's SSD storage platforms.

Featured Products:
*   ATTO ExpressSAS® SAS/SATA host bus adapter

ATTO SpeedWrite™

Exclusive performance-enhancing capability that significantly boosts tape performance by efficiently managing read and write commands between host and tape, resulting in continuous operation, shorter back-up times and higher overall throughput.

SpeedWrite is a mode of operation in which SCSI LC Write commands are processed using 'Write-Behind' and 'Deferred Error' handling to return completion status back to the host prior to actual command completion.

Featured Products:
*   ATTO XstreamCORE® *i*ntelligent Bridge

ATTO

The Power Behind the Storage

How to Buy

On the web:
www.atto.com/howtobuy

+1.716.691.1999

VARs and System Integrators can also purchase ATTO products from the "How To Buy" page

Be sure to follow us on social media

www.atto.com