



4TH EDITION

ATTO
Application Guide

The Power Behind the Storage



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.



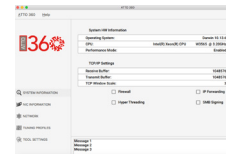
Intelligent Bridges

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.

NetApp ATTO Partnership

In today's era where the flow of data has become the bedrock of enterprise processes and strategies, robust systems and infrastructure are an absolute necessity. As enterprises continue to depend heavily on **seamless connectivity** for **enhanced workflows**, their reliance on **scalable and consistent data delivery** will increase.

"Be it disaster recovery, city-wide data replication, or data transfer across clustered environments, ATTO Technology always focuses on delivering top-notch network and storage connectivity solutions," says Timothy J. Klein, President, and CEO of ATTO Technology.

ATTO is widely recognized for manufacturing Fibre Channel host bus adapters (HBAs), storage controllers, and network interface products. ATTO Advanced Data Streaming (ADS)[™] Technology for latency management and MultiPath Director[™] for high availability Fibre Channel multipathing are among ATTO's core technology stack that powers our diverse product range.

In combination with NetApp's solutions for demanding storage applications, ATTO's technology helped develop unique storage solutions designed explicitly for NetApp processes, such as high-performance virtualized server environments. For instance, **ATTO FibreBridge[®] storage controllers are critical components in NetApp[®] MetroCluster[™]**, which enables site-to-site connectivity up to 300 kilometers apart with redundant low-latency links. ATTO storage controllers work with NetApp ONTAP[®] data management software to provide load balancing, failover, and failback functionality.

Furthermore, ATTO high-performance connectivity products, and NetApp E-Series and fabric-attached storage (FAS) systems provide future-proof solutions that retrieve, analyze, and process data quickly. NetApp all-flash arrays and E-Series platforms with ATTO Celerity[™] HBAs meet the growing market demand for dense, performance-oriented architectures, delivering superior performance, reliability, efficiency, and scale.



The Heart of NetApp MetroCluster[™]

A Complete End-to-End Continuous Availability Solution United by ATTO

Background:

ATTO and NetApp's relationship formed the foundation for the MetroCluster[™]

Solution. NetApp[®] MetroCluster configurations allow site-to-site connectivity up to 300 kilometers apart with redundant low-latency links, commonly used for providing on-site uptime for production sites to maintain schedules. **ATTO storage controllers** included with MetroCluster allow the ability to load balance between data centers while providing failover and failback functionality. These storage controllers also enable the integration of **multiple shelves of flash storage for MetroCluster installations** with a resilient back-end storage architecture.

Problem:

Enterprise-class organizations are seeing significant increases in service demands while being required to manage infrastructure costs and operational efficiency. Data volumes continue to mushroom, applications are moving to shared virtual environments, and the need for continuously available **mission-critical data and applications** has never been higher.

If the applications or data were to suddenly become unavailable, for whatever reason, the result would be lost time and money at best, catastrophic at worst. The infrastructure is critical and it requires **zero data loss** and recovery within minutes rather than hours.

Solution:

NetApp MetroCluster is a solution that combines array-based clustering with synchronous replication to deliver continuous availability and zero data loss at the lowest cost. Administration of the array-based cluster is simpler because the dependencies and complexity normally associated with host-based clustering are eliminated. MetroCluster immediately duplicates all of your mission-critical data on a transaction-by-transaction basis, providing uninterrupted access to your applications and data. MetroCluster works seamlessly with your host environment to provide continuous data availability while eliminating the need to create and maintain complicated failover scripts.

ATTO FibreBridge[®] 7600N storage controller, a high-performance platform, accelerates all reads and writes in hardware. In addition the 7600N adds Enterprise-level 32Gb/16Gb Fibre Channel SAN connectivity and diagnostic, management and monitoring integration with NetApp ONTAP[®] to MetroCluster deployments. By delivering 2.4M 4K IOPS in dual-controller configurations and less than 4 microseconds of latency, the 7600N provides unmatched cost/IOPS value and the lowest access latency in the industry.

Benefits:

Increased Availability and Scalability

- Allows the use of direct-attached storage (DAS) on a shared 8Gb, 16Gb, 32Gb Fibre Channel network.

Fast and Flexible

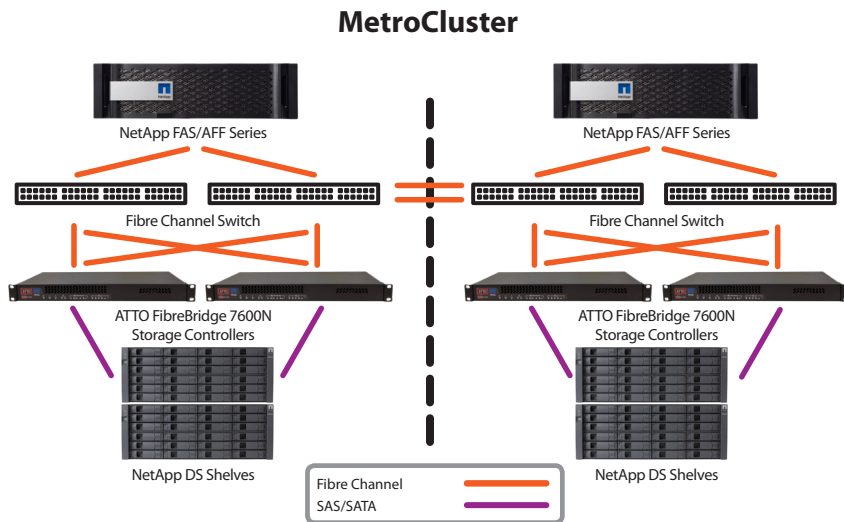
- Connect newer, faster and higher capacity solid-state disk (SSD) drive technology to a storage-area network (SAN).

Industry Leading Software Management

- Integration with NetApp ONTAP for diagnostics and management.

Cutting Edge Capabilities

- FibreBridge® 7600N enables integration of up to eight shelves of SSD storage into the MetroCluster with up to 10x performance improvement compared to the previous generation.



Validated Metro Cluster Configurations

Client OS	E/EF Series Controller	SANtricity OS	ATTO Product
macOS	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 8.40	Celerity FC-8xEN
Windows	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 8.40	Celerity FC-8xEN
Linux	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-16xP
macOS	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-16xP
Windows	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-16xP
Linux	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-32xE
macOS	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-32xE
Windows	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	Celerity FC-32xE
Linux	EF750, EF600, EF300	SANtricity OS 11.70, 8.40	FastFrame N3xx
macOS	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	ThunderLink FC 2082/2162
Windows	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	ThunderLink FC 2082/2162
macOS	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	ThunderLink FC 3162/3322
Windows	E5700, E2800, EF750, EF600, EF300, EF280	SANtricity OS 11.70, 8.40	ThunderLink FC 3162/3322

Unify Your Ecosystem with ATTO MultiPath Director™ and NetApp E-Series

Connect Linux®, Mac® and Windows® to Cost-Effective Enterprise-Class Storage via Fibre Channel

Background:

NetApp E-Series is block-level storage designed to make SANs simple, with dynamic disk pools to eliminate RAID management; robust I/O queuing algorithms optimized for SSDs; proven **high availability**; and out-of-the-box features including mirroring, replication, point-in-time recovery, and thin provisioning..

ATTO MultiPath Director™ is a specialized multipathing driver for ATTO Celerity™ Fibre Channel host bus adapters (HBAs) and Thunderbolt™ adapters that **enable Linux®, Windows®, or Mac® workstations and servers to connect to enterprise-class storage.** Multipath Director implemented across all hosts improves overall Fibre Channel SAN efficiency with consistent uninterrupted access to your data through failover and load balancing protection.

Problem:

Your enterprise relies on core applications that are critical to business success. To be competitive today, you need data storage systems that can deliver exceptional application performance with nonstop data availability. **Consistent performance** and cost-effective delivery are imperative. Yet managing data is increasingly more complex and costly, especially with limited resources, space, and power.

However, nonstop data availability is not solely reliant upon the storage hardware. Storage networks are complex, involving many components that can fail for myriad reasons. A disrupted path can prevent critical data from reaching its destination and losing the connection to storage can quickly turn into a significant problem.

Additionally, today's data volume along with server virtualization increases the potential for bottlenecks. If a bottleneck occurs anywhere along the SAN it can affect the entire ecosystem by slowing down the flow of data.

Solution:

The combination of ATTO Fibre Channel HBAs and NetApp E-Series storage arrays provides a high-performance collaborative workflow solution that keeps data available in real time for many users. This allows for significant gains in productivity, minimal downtime and uninterrupted access to data resources.

ATTO's feature-rich driver for Celerity Fibre Channel HBAs provides multiple, redundant paths to storage with load balancing and failover capabilities. ATTO MultiPath Director is the only storage connectivity solution that allows users to manage multiple paths between Windows, Linux and Mac workstations, servers and high-end storage systems.

Benefits:

Superior Performance

- Load balancing increases overall system performance by using more than one Fibre Channel path to transfer data.

Flexible Connectivity

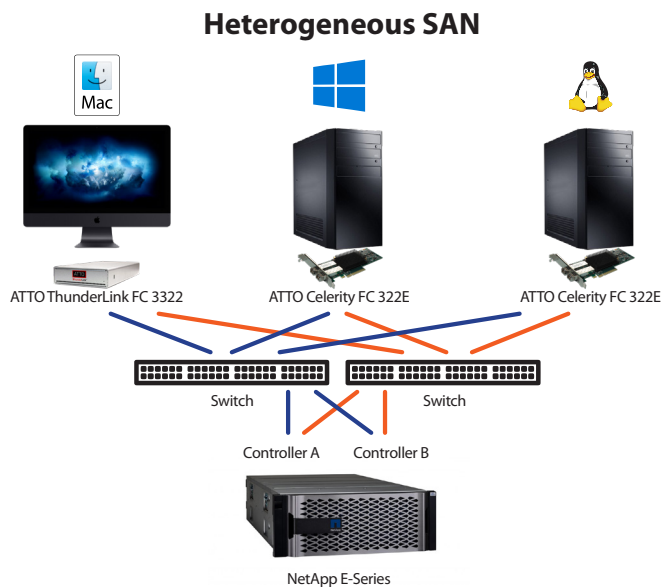
- Ability to mix Windows, Linux and Mac workstations and servers in a heterogeneous environment sharing consistent failover/failback policies.

Simplified Storage Management

- ATTO ConfigTool™ simplifies administration, troubleshooting and management of multiple paths to storage. Visually identify preferred, alternate and failed paths, monitoring how much data moves across each path.

Unmatched Value

- Address always changing business requirements with the industry's most flexible, enterprise-grade storage system.



Accelerate the Most Demanding Workflow

NetApp FAS Storage & ATTO Connectivity Solutions

Background:

NetApp FAS Hybrid Flash arrays are the **next generation** systems for MSB and enterprise customers. They offer the best price, performance and flexibility as well as a powerful range of technologies to help reduce complexity and increase efficiency.

ATTO Fibre Channel, Ethernet and Thunderbolt™ adapters are designed to connect Linux®, Windows®, and macOS® workstations, servers and mobile workstations to **high-performance storage solutions**. ATTO has been tested across NetApp FAS storage product lines and are the prevailing connectivity provider in the content creation and streaming media markets.

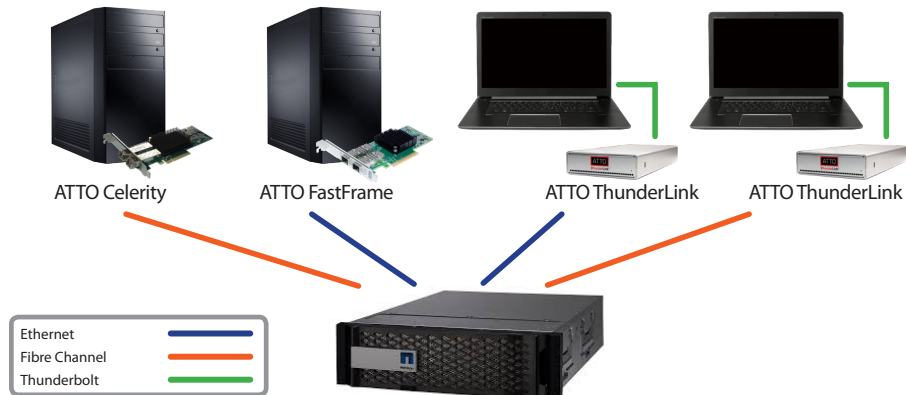
Problem:

Legacy storage and data architectures can hold back entire IT ecosystems with data divided into multiple silos and the application demands being too great for the infrastructure to handle. Older generation network hardware can quickly become a bottleneck when attempting to accomplish current and future generation workloads.

With data volume growing at a phenomenal rate and the need to accelerate enterprise applications, **AI and data analytics**, customers are looking for storage solutions that with guaranteed interoperability while meeting their **demanding performance requirements**.

As storage technology and performance expectations evolve, the traditional requirements such as storage uptime, scalability, and cost efficiency are still critical. However, **flash acceleration, cloud integration, unified support for SAN and NAS, and data mining** are essential factors in choosing storage solutions for today and tomorrow.

Unified Workflow



Solution:

NetApp FAS Hybrid storage systems provide a combination of high-performance hardware and adaptive, scalable storage software, while supporting existing workloads with the ability to scale quickly and address new applications and evolving IT models. Powered by NetApp ONTAP® data management software, NetApp FAS Hybrid systems unify your SAN and NAS storage infrastructure.

ATTO Celerity™ Fibre Channel HBAs and FastFrame™ NICs provide an economical yet high-performance solution to leveraging the power of NetApp FAS storage systems. ATTO exclusive technologies reduce latency, smooth data streams, and increase reliability maximizing performance and ROI.

Benefits:

Simple to Deploy, Limitless Flexibility

- Ability to connect servers, workstations, all-in-one systems, laptops and integrated computers to NetApp storage systems.

Engineered to be Scalable and Adaptable

- Supports existing workloads and storage needs while preparing for future expansion.

Reliable and Powerful

- ATTO's industry leading support and interoperability minimizes installation and maintenance time. NetApp FAS intelligent modular design enhances reliability, availability, and serviceability.

Always Available and No Bottlenecks

- Advanced Data Streaming (ADS™) Technology and DriveAssure™ technology ensures efficient I/O performance.

ATTO Products	
Celerity FC 32XE	32Gb Fibre Channel HBAs
Celerity FC 16XP	16Gb Fibre Channel HBAs
Celerity FC 8XEN	8Gb Fibre Channel HBAs
ThunderLink TLFC	Thunderbolt 3 to 32Gb Fibre Channel
ThunderLink TLFC	Thunderbolt 2 to 16Gb Fibre Channel

ATTO Differentiators

Adaptive Path Optimization

Intelligently senses multiple paths to drives and increases I/O performance up to 70%. Eliminates single points of failure in storage connections.

Data Mover

Patented technology that pre-processes data to allow for accelerated movement of data between storage devices while freeing up server CPU, memory and storage interfaces.

Drive Map Director™

Provides a logical, static topology enabling login parameters, access management and security for SAS/SATA storage, reducing administration costs and resources.

intelligent Controller Architecture™

Combines powerful hardware with an efficient data engine to create a platform that delivers performance with a rapid IO ramp and extremely low latency.

Latency Scout™

Enables IT administrators to quickly isolate datacenter bottlenecks with real-time latency histograms, ensuring maximum infrastructure uptime and optimal performance.

MultiPath Director™

Proprietary technology that provides Linux®, macOS® and Windows® workstations and servers multiple paths to enterprise-class storage with redundant controllers, providing failover and load balancing capabilities.

xCORE™ Acceleration Platform

Features multiple parallel I/O acceleration engines with end-to-end I/O processing, hardware buffer allocation management and real-time performance and latency analytics.

eCORE™ Control Engine

Adds common, open storage and management services, integrates with industry standard APIs, handles reservations, storage routing and host and LUN mapping functions.

Power Center Pro

Easy-to-use, integrated software RAID solution that brings the performance and protection of RAID 0, 1, 1e and 10 to storage devices connected to ATTO host adapters.

Virtual Device Manager™

Creates a virtual link between initiators and targets on a per-command basis.

WriteStop™

Ensures data security in digital forensics applications by blocking writes to hard disks, while providing read-only protection at the system level.

SpeedWrite™

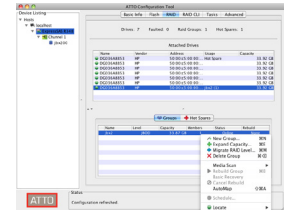
Keeps path between host and ATTO XstreamCORE® filled with data to significantly boost tape write performance.

Management Tools

ATTO ConfigTool™

ConfigTool helps customize the settings of your ATTO host bus adapter (HBA) to maximize the performance of your storage connection. ConfigTool comes standard with all ATTO HBAs and Thunderbolt™ adapters. While the factory settings on your host adapter provide excellent performance for a wide range of applications, some specialized applications may benefit from adjustment of the adapter settings to tune for a specific performance range.

- Custom utility settings to optimize performance
- Available on macOS® Windows® and Linux®
- Advanced troubleshooting and monitoring



ATTO vConfigTool™

vConfigTool for VMware® vCenter Server is a software plug-in that integrates centralized management and monitoring of ATTO Celerity™ and ATTO ExpressSAS® host adapters into VMware virtual environments. This accelerates adapter deployments, optimizes configurations, improves system availability and reduces infrastructure costs. vConfigTool includes Latency Scout™, an I/O latency statistic feature that enables IT administrators to quickly make adjustments within the data center to maximize performance. Real-time histograms allow administrators to monitor storage I/O latency and isolate bottlenecks.

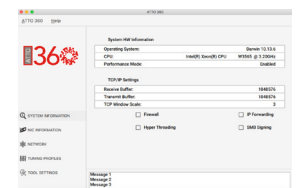
- Custom utility settings to optimize performance
- Available on VMware vCenter Server
- Advanced troubleshooting and monitoring

ATTO 360™

An all-purpose tool for Ethernet network optimization designed for creative professionals who want to unlock the true potential of ATTO FastFrame and Thunderlink® adapters.

ATTO 360 features a simple, easy-to-use management interface. A one-click setup provides nine pre-configured performance tuning profiles for macOS®, Windows®, and Linux® which include preset tuning profiles for media and entertainment workflows.

- Tune for both files level (NAS) and block level (Fabrics) storage
- Analyze data from several different tools in one convenient location
- Perform nmap security scans



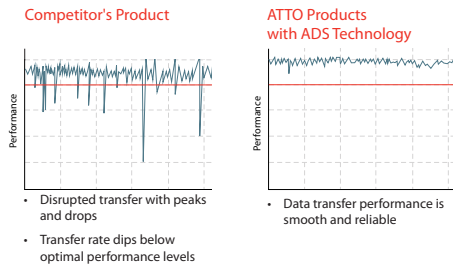
Technology Leadership

Technology at it's fastest

ATTO Advanced Data Streaming (ADS™) Technology

ATTO ADS™ is proprietary latency management technology works transparently to smooth data transfers through controlled acceleration. Data moves 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.



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.

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 Write commands are processed using 'Write-Behind' and 'Deferred Error' handling to return completion status back to the host prior to actual command completion.



The Power Behind the Storage

How to Buy

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+1.716.691.1999

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

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