SILICONDISK™

RAM-based Storage Appliance

Ultra Low-Latency Storage for 100Gb Ethernet

Enterprise Fabric Architectures

ATTO

The Power Behind the Storage

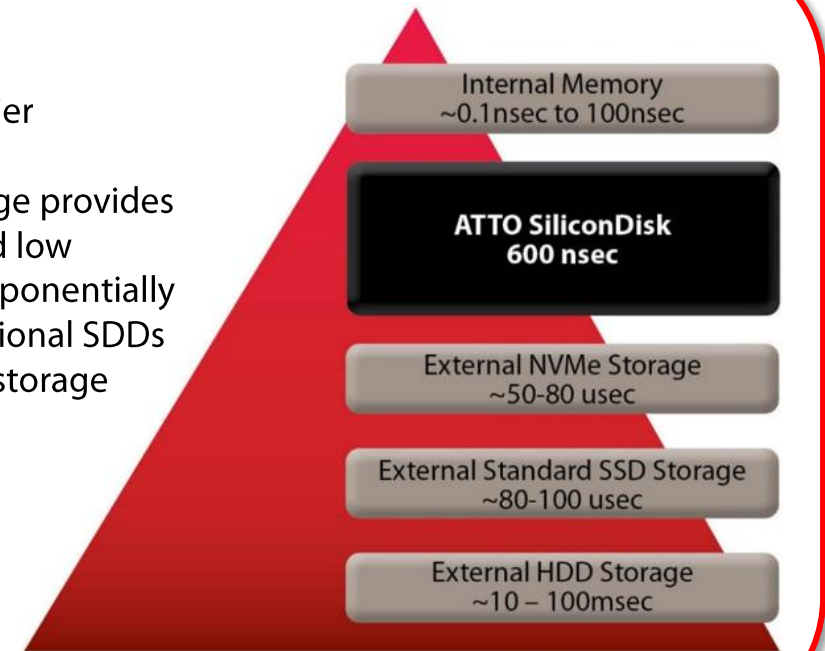# SiliconDisk™ Storage Appliance

RAM-based Storage Appliance

- Extremely-low latency storage for 100GbE fabric architectures
- 6.4M 4k IOPS
- 35GB/sec sustained throughput
- Predictable latency of <600 nanoseconds

A New Storage Tier

SiliconDisk storage provides performance and low latency that is exponentially faster than traditional SDDs and even NVME storage solutions

Internal Memory
~0.1nsec to 100nsec

ATTO SiliconDisk
600 nsec

External NVMe Storage
~50-80 usec

External Standard SSD Storage
~80-100 usec

External HDD Storage
~10 – 100msec

High-performance storage for latency-sensitive applications

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Rethink your Storage Architecture

Application Targets

- Workgroup & cloud architectures
- AI/ML
- Imaging and rendering
- Database indexes
- Shared memory mailbox
- Server clusters
- Composable infrastructures

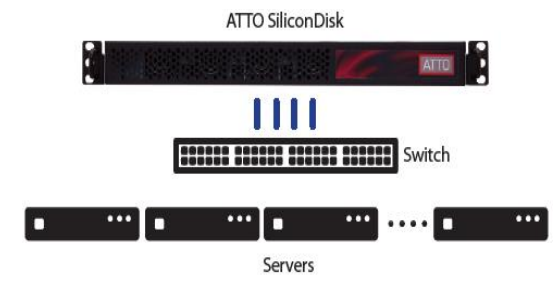- *Wherever ultra-low, deterministic latency is critical to application performance*

- Direct-attached & fabric-attached configurations

- Provides *scalable, shareable, low-latency* storage anywhere on the network fabric

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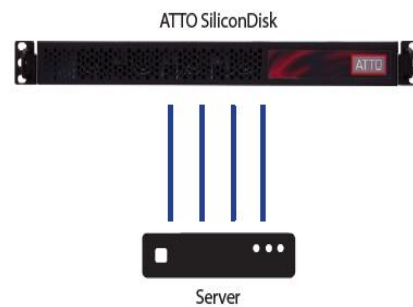
Server

Direct-attached for 400 GbE performance.

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Servers   Servers
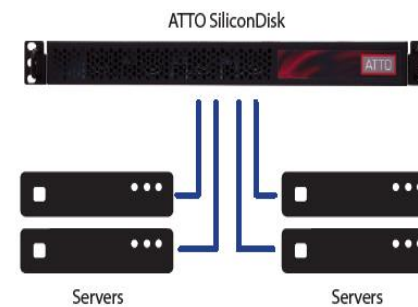
Switch-less direct-connect server configuration.

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Switch

Servers

Fabric-attached for greater scalability.

Shared, high-performance storage where it's needed most

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Technical Specifications

- Faster than flash – consistent low latency and high performance

- Key features drive performance:
  - Latency *<600ns*
  - Up to *6.4M* 4K IOPS
  - Up to *35GB/sec*
  - (4) *100GbE* ports
  - Full NVME-oF RoCE v2 support
  - Direct attach or Fabric connectivity
  - 1U rackmount - Enterprise ready!

- Storage capacity starting at 512GB
  - For higher capacities, contact ATTO

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A convergence of fast and sharable ... storage without compromises

Fast   Sharable
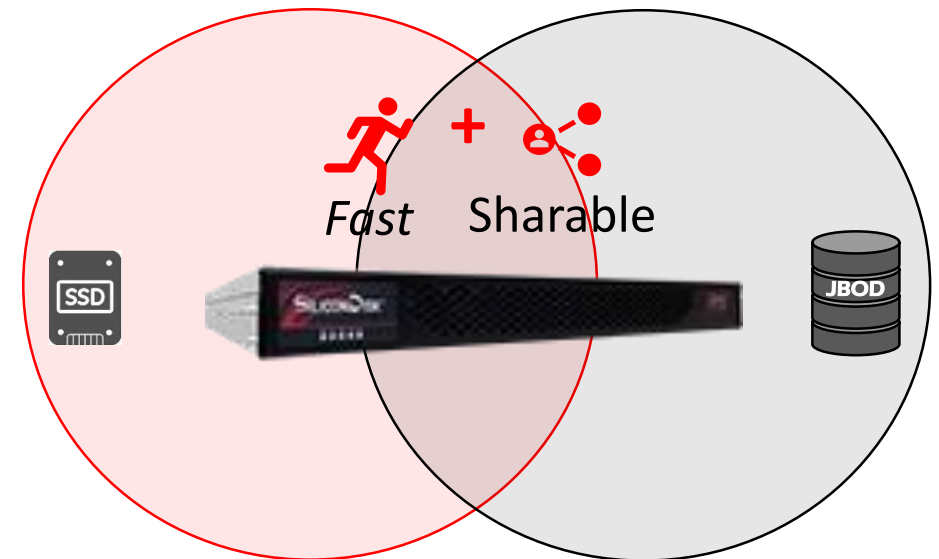
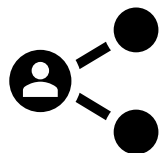Sharable storage that doesn't compromise on performance
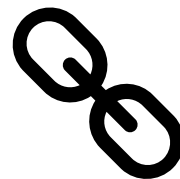
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Benefits of SiliconDisk™

High performance

Unlimited shareability

Direct/Fabric-attached

Scalable

Better application performance + More flexible network configuration = Better ROI

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Industry-lowest Latency

- Flash-based arrays introduce too much latency

- Why worry about latency?
  - Lost revenue
  - Increased direct costs
  - Opportunity costs
  - Inefficient networks
  - Competitive risks

- SiliconDisk eliminates latency

- SiliconDisk
  - Industry-leading data transfer speeds
  - Lowest storage latency
  - More configuration options

- Storage solution for all latency dependent applications
  - Don't settle for good enough when your business depends on being the best

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The Essentials

- Performance & latency that's *100x faster than flash-based SSD* storage

- Takes your storage *networks to the next level* with standard Ethernet protocols

- Scale *without performance penalties*

- Virtually *service free* – unlike traditional storage

- It's the storage that *latency-dependent applications* have been waiting for:
  - Capture more data instances for AI/ML
  - Manipulate more data sets quicker
  - Provides incredible performance to index look-ups
  - Edit more streams of video

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Under the Hood

What Makes SiliconDisk™ Better

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What ATTO did differently

- ATTO delivers the industry's 1st DRAM-based storage
- We started with the basics – make it *Fast*, make it *Shareable*, make it *Easy*
- Multiple 100GbE ports for shareability and flexibility
- Patented process moves data directly via high-speed hardware
- Fully integrated into a single chip – delivering the ultimate in consistent, low latency
- Developed ATTO Insight Analytics™ embedded analytics that provide granular performance and configuration data without impacting performance
- Adding multiple high speed Ethernet connectivity to DRAM based storage with negligible added latency isn't easy- but we did it.

What's in it for your customers?

- A storage solution that is 100X faster than Flash-based SSDs

- Sophisticated timing analytics to measure down to nanosecond time-slices in order to give visibility to a level never before seen

- Easy to configure for sharing the SiliconDisk resources between multiple servers to optimize utilization

- SiliconDisk allows for infinite number of writes a day making it perfect for databases or applications with large work loads

- Built in tools allow for troubleshooting without downtime

Latency

MILLISECONDS

6
5
4
3
2
1
0

0.0006
SiliconDisk

5
Flash-based array
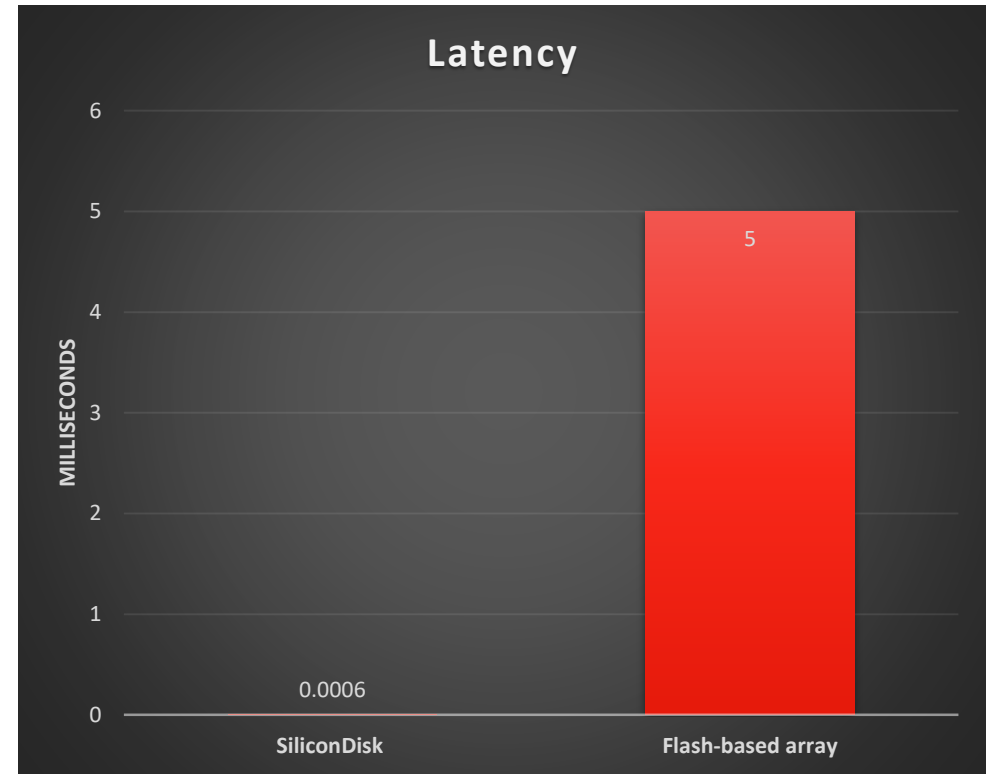
SiliconDisk – Better By Design
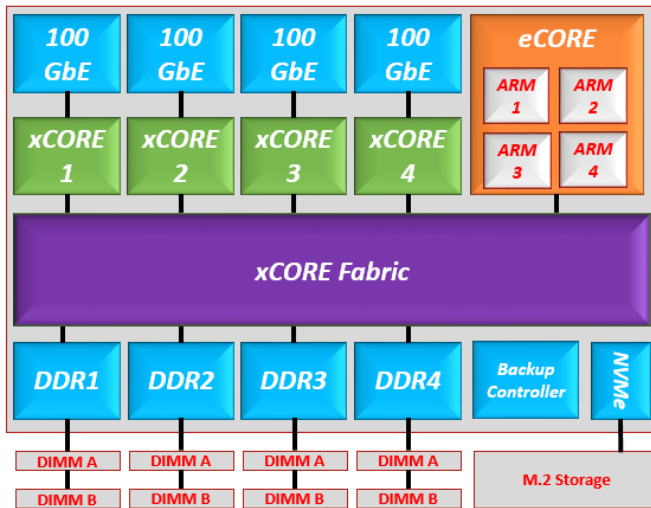
- ATTO Custom ASIC w (4) integrated 100Gb Ethernet Ports
  - *No separate 100GbE NIC ICs used for speed*
  - *Independent ports can also be configured as (16) 25GbE ports*

- Four independent, low-latency xCORE™ I/O Acceleration Engines
  - *xCORE engines provide full bandwidth thru HW data-movers*
  - *Each host port leverages an independent xCORE engine*
  - *xCORE engines share an internal fabric for access to all RAM*

- eCORE™ engine with four ARM processors for commands
  - *Capable of running future custom or third party applications*

- BU controller w M.2 SSD interface for future non-volatility feature

- ATTO Insight Analytics™ performance monitoring, analytics & optimization
  - *Measures real-time performance at 100ns thru embedded hardware*
  - *No impact on data performance for perfect analytics*

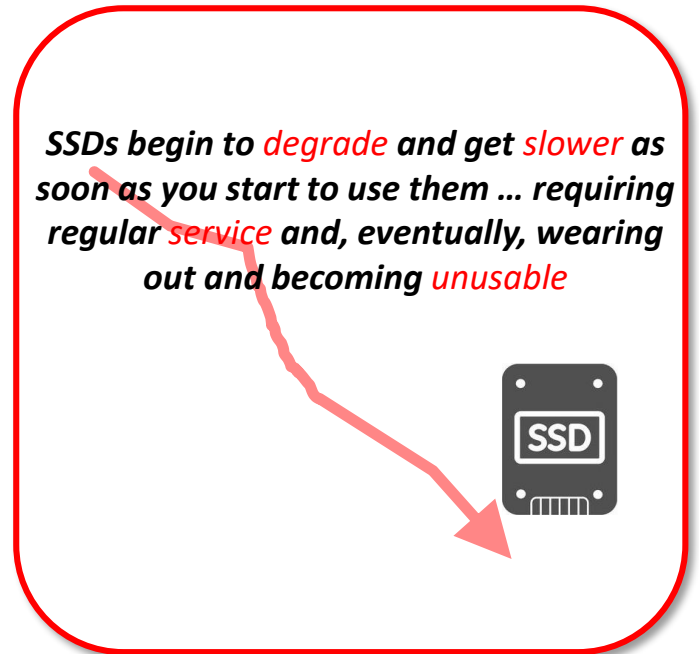- Memory fully protected with ATTO patent pending technology

xCORE Data Acceleration Delivers <600 Nanosecond Latency – Even at Peak I/O Load

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Infinite Write Endurance™

- SiliconDisk™
  - Infinite Write Endurance™ allows *unlimited* device writes per day
  - Storage *never wears out*
  - Consistently high performance – doesn't slow down over time, or require performance-draining garbage collection operations
  - Service costs are minimal
  - Data is *persistent and protected* by multiple layers of error-correction

SSDs begin to degrade and get slower as soon as you start to use them ... requiring regular service and, eventually, wearing out and becoming unusable

SSD

Reliable storage for your most important data

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Advanced Data Streaming (ADS™)

Controlled *acceleration* of data ensures *smooth* streaming and the most *consistent performance* in real-time, managed latency environments

- Higher application performance = better productivity
- Ability for larger workloads & client counts = more sharing
- Faster transaction processing = Improved time to revenue
- Optimized multi-stream data flows eliminates bottlenecks
- Shared memory optimization minimizes bus traffic
- Guarantees Data is delivered on-time, every time!

ATTO Products with ADS Technology

Performance

Optimal application performance
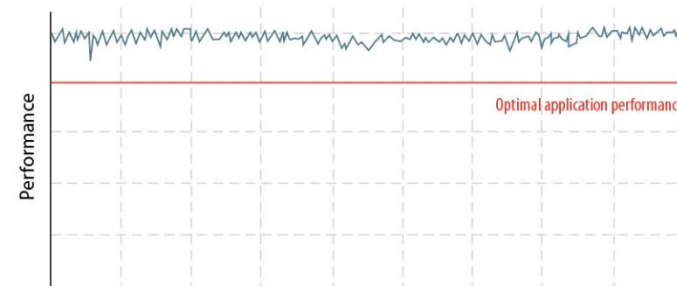
Data transfer performance is smooth and reliable

Competitor's Product

Performance

Optimal application performance

Disrupted transfer with peaks and drops

Transfer rate dips below optimal performance levels

Better application performance, Better reliability – Built-in to every ATTO product

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ATTO Insight Analytics™

- Analyze performance of the storage – storage insights

- Application specific analysis

- Find performance bottlenecks with drives, controllers and up through the host fabric
  - A complete & unique view of true overall system performance

- Easily show real-time information as well as collected information over time.

- Measurements don't impact performance

- Embedded in xCORE™ engine means no performance penalties or special "debug" code to collect metrics

- Provides a ground-breaking level of detail by measuring in 100ns time-slices

- Quickly diagnose what is actually happening

- Readily available for integration with OEM software
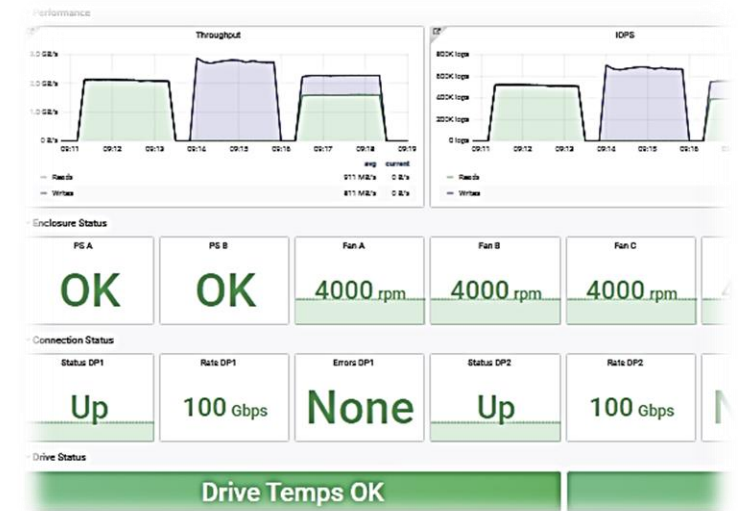
ATTO Insight™ Embedded Analytics

Intelligently optimize your systems and reduce expensive support calls

State of the Market

- Flash-based SSDs have changed architecture thinking on storage architecture for performance vs HDD, but some applications are looking for more.

- Disaggregated scalable clusters and scalable shared storage is the new model for expansion

- Scalable shared component disaggregation trend continues to expand.

- Performance fabric connected storage is quickly moving to Ethernet -based NVMe-oF

- Many applications use disk block storage (with now with SSDs) to expand when system memory is full.

- Storage and networking connectivity has greatly increased in performance through tighter latency and faster throughput.

- High performance systems are always looking for more performance.

Market Problem

- Flash-based SSD drives are the fastest external component (10's of uS) but still not fast enough

- Sharing Flash-based SSDs JBOFs in a fabric adds painful latency (100's of uS) that make them un-usable in many applications

- Server memory is dedicated to that single server. It is fast but it is not sharable between systems

- Server memory capacity can be limited in capacity

- For many environments, all servers must maintain the same amount of memory in each machine.

- Sometimes it is all about performance!

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Current Solutions

- Architects make various decisions about the best components to add to achieve desired performance, capacity, cost, flexibility, expandability, etc

- With the introduction of Flash-based SSDs and associated JBOFs - System engineers have been able to re-architect their system to take advantage of the new performance paradigm.

- You can get a boost in performance by sharing Flash-based SSD drives or JBOFs but still not fast enough

- Existing SSD controllers and JBOFs have wide variations on latency delays can create unpredictability in system performance.

- Flash-based SSDs have dramatic differences in read and write performance due to the nature of Flash-based design.

- Flash-based arrays have a certain life span on data writes, once this life span has been exhausted the array will fail

- The more you store on flash-based arrays the slower performance you will receive

What's in it for You?

- Delivers the industries first and only 1U DRAM based Solid-State with multiple 100GbE port connectivity

- A scalable, state-of-the-art NVMe storage product that also helps effectively manage associated data center infrastructure costs

- Storage solution that is easily configurable to implement in fabric architecture design that is considerably faster than Flash-based SSDs

- Leverages ATTO's proven 5th generation xCORE data acceleration engine

- ATTO Insight analytics™ engine provides end-to-end disc performance data, reducing support and troubleshooting costs

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Competitive Comparison

	SiliconDisk™	NVMe SSD JBOF	System Memory	Local NVMe SSD
Performance	●	◔	◑	◔
Capacity	◔	●	◔	◔
Cost	◑	●	◑	◔
Shareability	●	◑	○	○
Manageability	●	◑	○	○
Expandability	●	◑	◔	○
Analytics	●	○	○	○

SiliconDisk™ overcomes the challenges other storage solutions can't achieve.

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About ATTO

Why ATTO?

ATTO was founded over 30 years ago building high performance RAM-Based SSDs before today's products wee even conceived.

We know what it takes to get the full performance from these type devices

We have delivered millions of similar low latency products to top brand OEMs through the history of the company

Nobody knows low latency storage and data movement better than ATTO

We engineer, manufacture and support our products made in USA for the best of quality.

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