Flash Storage with 24G SAS Leads the Way in Crunching Big Data

SCSI Trade Association
August 8th, 2018

Flash Memory Summit

Today's Panel

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- Dennis Martin – Founder and President Demartek

- Mohamad El-Batal – Sr. Director of Architecture, Seagate

- Kevin Marks – Technologist, Distinguished Engineer, Server Solution Office of the CTO, DellEMC

- Jeremiah Tussey – Product Marketing Manager, Data Center Solutions, Microsemi – a Microchip Company

SAS Technology Roadmap

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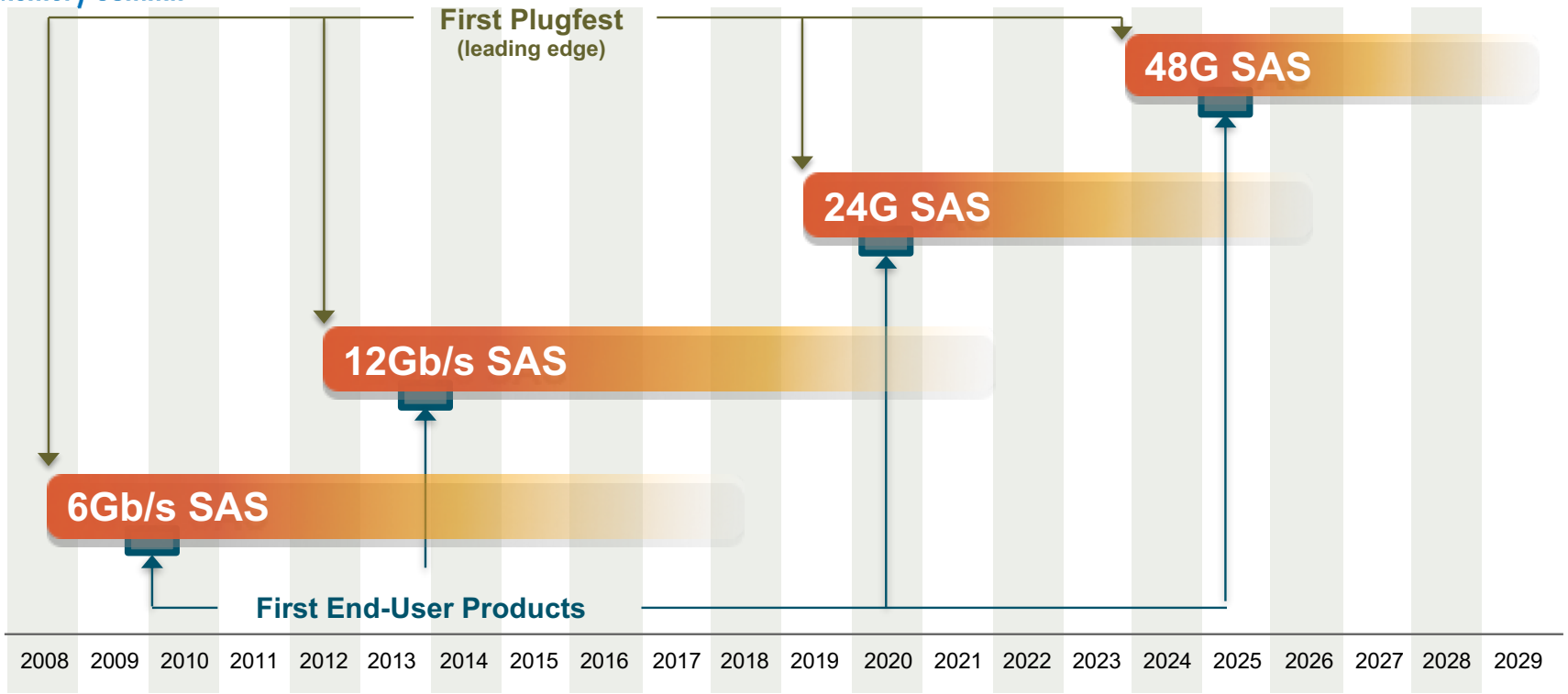

The Pillars of SAS

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Dependability	Flexibility	Scalability	Economics
Reliable	SAS and SATA	1000s of End Devices	$ / Performance
Secure	SSDs and HDDs	Capacity Storage	$ / GB
Trusted	Backward Compatibility	Enables "Fabric" Solutions	$ / Watt
Data Center Ready			Huge Established Ecosystem
			Development

SAS from an Industry Analyst Test Lab View

Dennis Martin

President, Demartek

Independent Test Lab and Analyst

About Demartek

- Industry Analysis and ISO 17025 accredited test lab
- Lab includes enterprise servers, networking & storage (6/12Gb SAS, 10/25/40/100GbE, 8/16/32GFC)
- We prefer to run real-world applications to test servers and storage solutions (databases, Hadoop, VMware, etc.)
- Demartek is an EPA-recognized test lab for ENERGY STAR Data Center Storage testing
- Website: https://www.demartek.com/Testlab

Demartek

Full Report

Short Report

Video Report

Infographic

Commentary

Speaking

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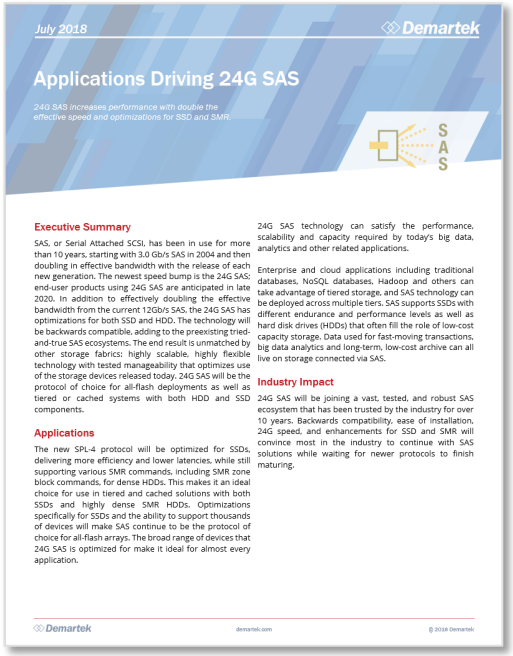
Recent Demartek SAS Reports

- *Applications Driving 24G SAS*
  https://www.demartek.com/Demartek_SAS_Applications_24G_2018-07.html
- *The Performance of SAS*
  https://www.demartek.com/Demartek_SAS_Performance_2018-04.html
- *The Benefits of SAS*
  https://www.demartek.com/Demartek_SAS_Benefits_2017-07.html


July 2018

Demartek

Applications Driving 24G SAS

24G SAS increases performance with double the effective speed and optimizations for SSD and SMR.

SAS

Executive Summary

SAS, or Serial Attached SCSI, has been in use for more than 10 years, starting with 3.0 Gb/s SAS in 2004 and then doubling in effective bandwidth with the release of each new generation. The newest speed bump is the 24G SAS; end-user products using 24G SAS are anticipated in late 2020. In addition to effectively doubling the effective bandwidth from the current 12Gb/s SAS, the 24G SAS has optimizations for both SSD and HDD. The technology will be backwards compatible, adding to the preexisting tried-and-true SAS ecosystems. The end result is unmatched by other storage fabrics: highly scalable, highly flexible technology with tested manageability that optimizes use of the storage devices released today. 24G SAS will be the protocol of choice for all-flash deployments as well as tiered or cached systems with both HDD and SSD components.

Applications

The new SPL-4 protocol will be optimized for SSDs, delivering more efficiency and lower latencies, while still supporting various SMR commands, including SMR zone block commands, for dense HDDs. This makes it an ideal choice for use in tiered and cached solutions with both SSDs and highly dense SMR HDDs. Optimizations specifically for SSDs and the ability to support thousands of devices will make SAS continue to be the protocol of choice for all-flash arrays. The broad range of devices that 24G SAS is optimized for make it ideal for almost every application.

24G SAS technology can satisfy the performance, scalability and capacity required by today's big data, analytics and other related applications.

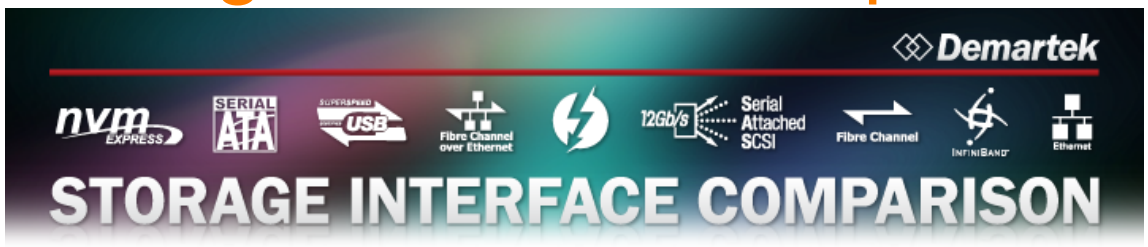
Enterprise and cloud applications including traditional databases, NoSQL databases, Hadoop and others can take advantage of tiered storage, and SAS technology can be deployed across multiple tiers. SAS supports SSDs with different endurance and performance levels as well as hard disk drives (HDDs) that often fill the role of low-cost capacity storage. Data used for fast-moving transactions, big data analytics and long-term, low-cost archive can all live on storage connected via SAS.

Industry Impact

24G SAS will be joining a vast, tested, and robust SAS ecosystem that has been trusted by the industry for over 10 years. Backwards compatibility, ease of installation, 24G speed, and enhancements for SSD and SMR will convince most in the industry to continue with SAS solutions while waiting for newer protocols to finish maturing.

Demartek demartek.com © 2018 Demartek

Storage Interface Comparison



- Free reference page on demartek.com
  - https://www.demartek.com/Storage-Interface-Comparison/
  - Search for "**storage interface comparison**" in your favorite search engin
- Popular page – includes interactive PDF for download
- Provides comparison of storage interfaces
  - FC, FCoE, IB, iSCSI, NVMe, PCIe, SAS, SATA, Thunderbolt, USB
  - Transfer rates, encoding schemes, history, roadmaps, cabling, connectors
- ***We're not a product vendor – we use these technologies in our lab***

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Why Should You Transition To SAS4?

Mohamad El-Batal

CTO, Enterprise Data Solutions(EDS)

SEAGATE

SAS4 All-Flash-Arrays Are a Must

- Most Flash/SCM Based SSDs can already deliver SAS4 throughput levels even today
- SAS4 All-Flash-Arrays will use Wide-Port device connectivity to keep up with PCIe-NVMe

2.2GB/s

What About The Nearline HDD Storage?

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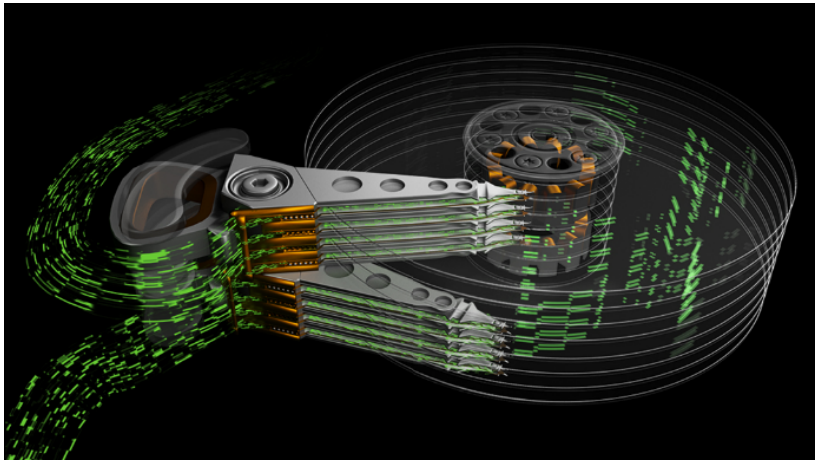
- A new class of Dual, Triple and Multi-Actuator Seagate HDDs will soon hit the market
- Such Multi-Actuator HDDs will deliver >1GB/s Read/Write Throughputs
- Aggregating such HDDs in High-Density storage enclosures will demand SAS4 bandwidth



Mach2 → Mach3 → Mach4

Who Would Benefit From SAS4?

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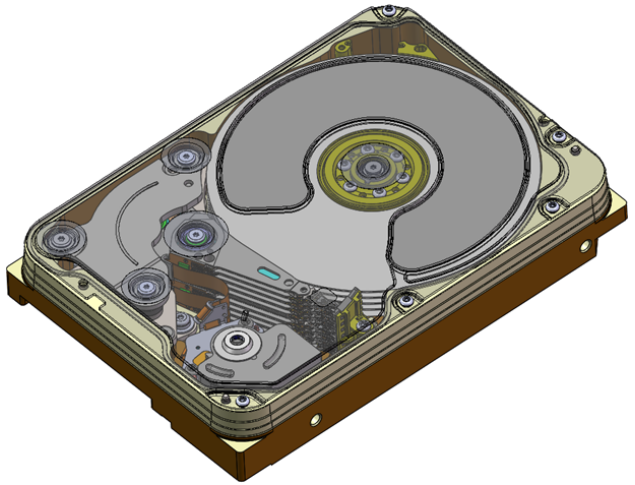
- HPC Streaming Workload Enablement
- Media & Entertainment Applications
- Surveillance & Security Solutions
- Big-Data & Data-Mining Applications
- Enhanced Object-Storage Appliances
- Faster Data-Rebuild Bandwidth
- Enhanced Host Cable Management
- …etc



Designing Your HyperConverged Data Center with 24G SAS and Flash

Kevin Marks

Technologist, Distinguished Engineer

DellEMC | Server & Infrastructure Systems Office of the CTO

SCSI Trade Association, www.scsita.org
Flash Memory Summit 2018
Santa Clara, CA

The Shift to Hyper-Converged

Then

Hyper-converged

Now

Driving the HCI Shift

Rapid Innovation

Rapidly respond to business needs

Reduction in Complexity

Reduce infrastructure overhead to improve efficiency

Resource Optimizations

Shift focus from maintenance to innovation

Cost Efficiency

Reduced OpEx and CapEx

How 24G SAS Enables the HCI Shift

SPEED - Doubles the bandwidth from previous generation and is well matched to Gen4 PCIe

- HCI requires lots of IO bandwidth, HCI has lots of local IO

LATENCY – Add persistent connections and enhances Edge/Buffering for SATA devices

- HCI requires low latency, especially for any type of SSD caching devices

RELIABILITY – Adds active transmitter training and Forward Error Correction (FEC)

- HCI platforms have complex signal channels and need help to maintain cost

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And this is on top of

DELL EMC

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SCALABILITY- Maintains same device type support (SAS/SATA), device counts and reach

- While HCI generally does not have large SAS domains, it allows for JBOD expansion if needed

MANAGEMENT – Maintains the same management layer including enclosure management

- HCI solutions can reuse the years of management/enclosure APIs/code

EXCEPTION HANDLING - Maintains the same exception handling/hotpulg support

- HCI solutions can reuse the years of development in exception handling and hotplug support

SECURITY - Maintains the same security use cases via TCG

- Many HCI platforms have building support for TCG security solutions

Thanks

kevin.marks at dell.com

The Value Proposition of 24G SAS

Jeremiah Tussey

Alliances Product Marketing Manager

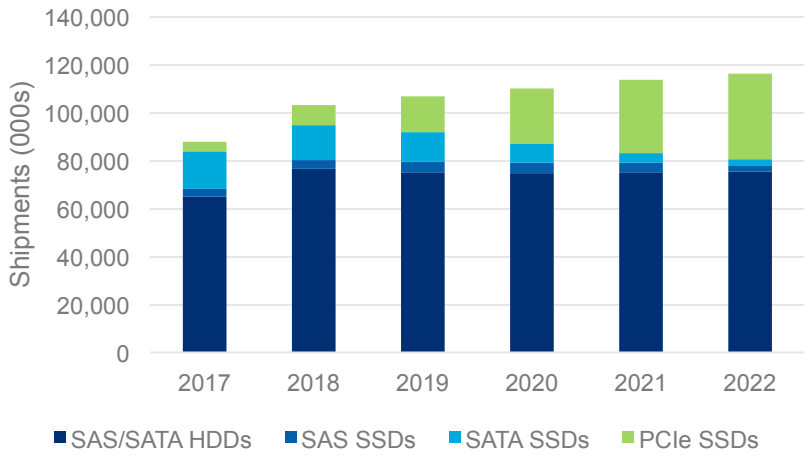
Data Center Solutions

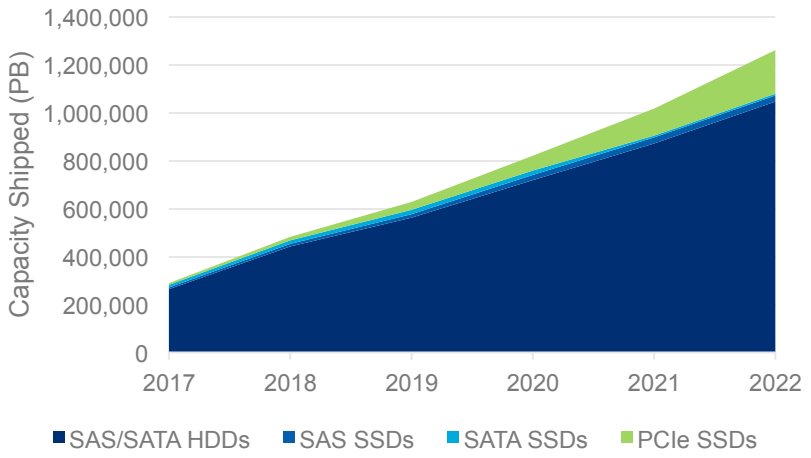
Vice President, SCSI Trade Association

Summary → 24G SAS a Reality in 2019

- SAS continues to be the most widely used storage interconnect for the foreseeable future
- Innovative media technologies driving the “need for speed”
- SAS-4 specification defines “24G SAS”
  - Delivers bandwidth matching to PCIe Gen4 CPU/Platforms
  - Enhanced support for interconnectivity and end points
  - Built for the modern IT infrastructure
- Connectivity & test infrastructure will be ready by 2019
  - Connectors, cables and analyzers available now
  - Expanders and controllers coming in 2019

SAS Remains Primary Enterprise Storage Interface





SAS Infrastructure Enables >70% of Enterprise Storage Drives and >85% of Enterprise Storage Capacity thru 2022

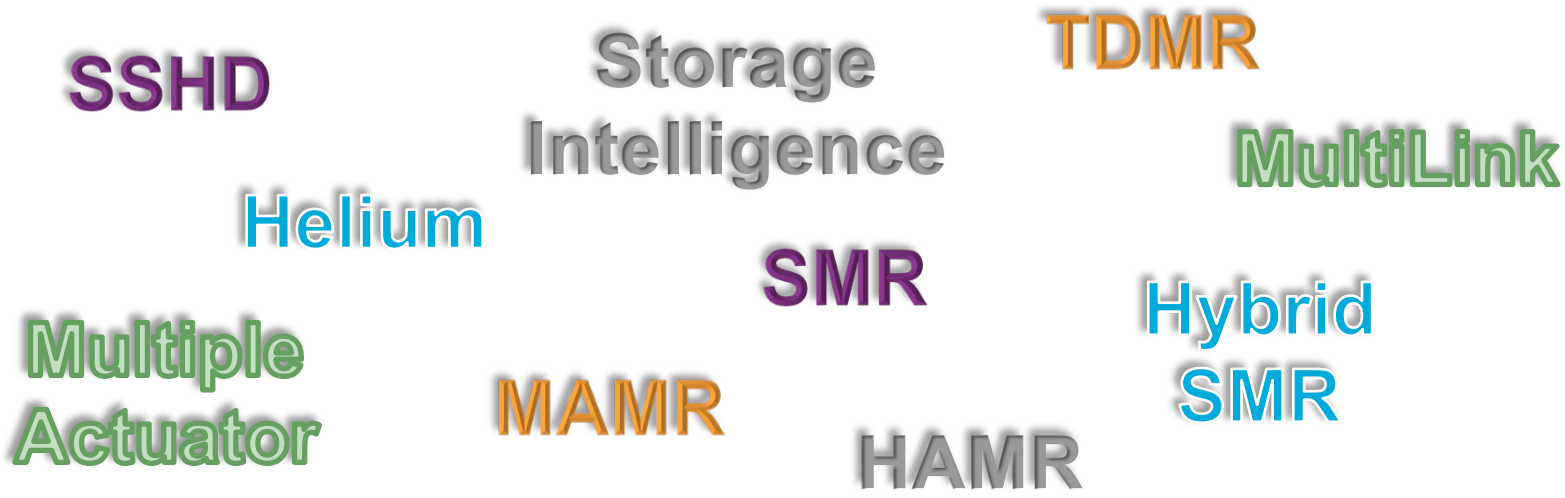
Source: IDC, May 2018

Market Summary

- Through 2022, >70% of all drives will be SAS/SATA
- HDDs are here to stay
  - HDDs forecasted to store 85% of all newly deployed capacity through 2022
  - Drive vendor roadmaps for Enterprise HDDs continue to be SAS/SATA
  - New technology emerging to maintain the $/TB advantage for HDDs
- Near-term SSD investments are focused on NVMe
  - It's hot and in-demand; current storage system resources refocused to cover all bases
  - 24G SAS drive production will follow after initial ecosystem launch

SAS Innovations in HDD and SSD Technologies

Storage media is ever-changing to increase IOPS and capacity



New SAS infrastructure is needed to support new drive technologies!

Increasing Capacities = Growing SAS Performance Needs

- Multiple Actuator
  - https://blog.seagate.com/enterprises/multi-actuator-technology-a-new-performance-breakthrough/
- Hybrid SMR
  - https://blog.seagate.com/intelligent/new-flex-dynamic-recording-method-redefines-data-center-hard-drive/
  - https://itblog.sandisk.com/dynamic-hybrid-smr/
- Next-Gen Technologies for even more capacity growth
  - MAMR: http://innovation.wdc.com/downloads/WesternDigital-Presentation.pdf
  - HAMR: https://www.storagenewsletter.com/2017/10/25/seagate-hamr-next-leap-forward-now/

24G SAS Highlights

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Physical Layer Enhancements

Double the effective single-lane bandwidth of 12Gb/s SAS	Enhanced 20-bit Forward Error Correction (FEC)	SAS-4 enhanced transmitter training algorithm
Higher throughput and IOPs performance	More robust data reliability and connectivity	Continuous optimal signal tuning

Protocol & Block Level Enhancements

Fairness enhancements	Storage intelligence and persistent connections	SMP priorities
Performance consistency across large and mixed protocol topologies	Improves SSD efficiency, latency and QoS	Prioritizes management-class communications for complex, deep topologies

The Modern IT Infrastructure

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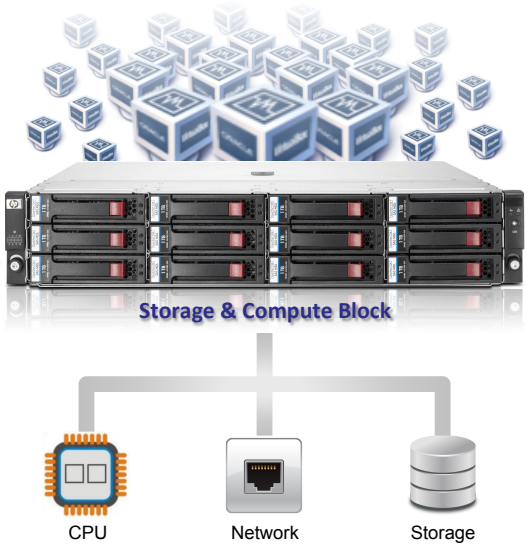
Hyperconvergence

Networking

Storage

Compute



Dependability	Flexibility
Reliable	SAS and SATA
Secure	SSDs and HDDs
Trusted	Backward Compatibility
Data Center Ready	

Scalability	Economics
1000s of End Devices	$ / Performance
Capacity Storage	$ / GB
Enables "Fabric" Solutions	$ / Watt
	Huge Established Infrastructure
	Development

The Modern IT Infrastructure

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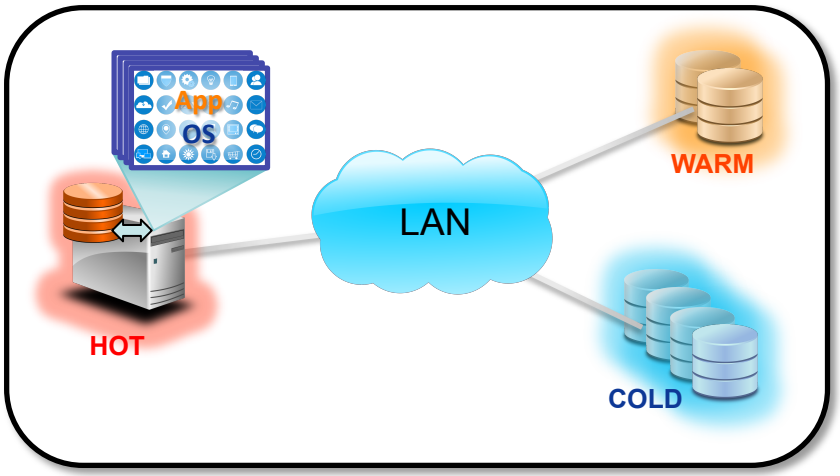
Server-Storage Implementation

Disaggregation

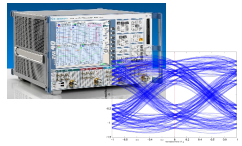
Converged Infrastructure



Disaggregated Infrastructure

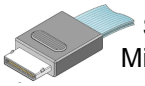
Reliable Secure Trusted Data Center Ready	SAS and SATA SSDs and HDDs Backward Compatibility
Dependability	**Flexibility**
1000s of End Devices Capacity Storage Enables "Fabric" Solutions	$ / Performance $ / GB $ / Watt Huge Established Infrastructure Development
Scalability	**Economics**

24G SAS Ecosystem Readiness for 2019

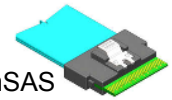


- Ecosystem is on track for SAS-4 production readiness in 2019
  - SAS-4 analyzers have been sampling since last year
  - Cables and connectors: both existing and new form-factors ready for 24G SAS
  - SAS-4 controllers & expanders aligned with upcoming Gen4 platform launches
  - New 12G SAS and 6G SATA HDD/SSD capabilities to intersect with 24G SAS ecosystem
    - MultiLink SSDs → **Increased IOPs/Bandwidth**
    - Dual-actuator → **Increased IOPs/Bandwidth**
    - Hybrid SMR → **Flexible and Increased Capacity**
    - HAMR / MAMR → **Increased Capacity**

Mini SAS HD



SAS MiniLink



SlimSAS

- **Call to action:** 24G SAS ecosystem on track for 2019 launch readiness; Start your designs now, and don't forget to participate in SAS plugfests!

Thank You!