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

SCSI Trade Association
August 8th, 2018
Today’s Panel

- 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
The Pillars of SAS

- **Dependability**
  - Reliable
  - Secure
  - Trusted
  - Data Center Ready

- **Flexibility**
  - SAS and SATA
  - SSDs and HDDs
  - Backward Compatibility

- **Scalability**
  - 1000s of End Devices
  - Capacity Storage
  - Enables “Fabric” Solutions

- **Economics**
  - $ / Performance
  - $ / GB
  - $ / Watt
  - Huge Established Ecosystem
  - Development

**SCSI Trade Association, www.scsita.org**

**Flash Memory Summit 2018**

**Santa Clara, CA**
SAS from an Industry Analyst Test Lab View

Dennis Martin
President, Demartek
Independent Test Lab and Analyst

Demartek
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](https://www.demartek.com/Testlab)
Recent Demartek SAS Reports

- **Applications Driving 24G SAS**

- **The Performance of SAS**

- **The Benefits of SAS**
Storage Interface Comparison

- Free reference page on demartek.com
  - [https://www.demartek.com/Storage-Interface-Comparison/](https://www.demartek.com/Storage-Interface-Comparison/)
  - Search for “storage interface comparison” in your favorite search engine
- 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**
Why Should You Transition To SAS4?

Mohamad El-Batal
CTO, Enterprise Data Solutions (EDS)
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
What About The Nearline HDD Storage?

- 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?

- 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
The Shift to Hyper-Converged

SAN

Servers

Storage

Hyper-converged

Then

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
And this is on top of

**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/hotplug 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
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

WW Enterprise Drive Unit Forecast (2017-2022)

WW Enterprise Drive Capacity Forecast (2017-2022)

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**

- **Hybrid SMR**
  - [https://itblog.sandisk.com/dynamic-hybrid-smr/](https://itblog.sandisk.com/dynamic-hybrid-smr/)

- **Next-Gen Technologies for even more capacity growth**
  - **MAMR:** [http://innovation.wdc.com/downloads/WesternDigital-Presentation.pdf](http://innovation.wdc.com/downloads/WesternDigital-Presentation.pdf)
24G SAS Highlights

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
- Performance consistency across large and mixed protocol topologies
- Improves SSD efficiency, latency and QoS
- Prioritizes management-class communications for complex, deep topologies

- Fairness enhancements
- Storage intelligence and persistent connections
- SMP priorities

Double the effective single-lane bandwidth of 12Gb/s SAS
Enhanced 20-bit Forward Error Correction (FEC)
SAS-4 enhanced transmitter training algorithm
The Modern IT Infrastructure

Hyperconvergence

Networking
Storage
Compute

Reliable
Secure
Trusted
Data Center
Ready

SAS and SATA
SSDs and HDDs
Backward Compatibility

Dependability
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Huge Established Infrastructure
Development

Scalability
Economics
The Modern IT Infrastructure

Server-Storage Implementation

Disaggregation

Converged Infrastructure

Disaggregated Infrastructure

LAN

HOT

WARM

COLD

App

OS

Reliable
Secure
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Data Center
Ready

Dependability

SAS and
SATA

SSDs and
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Backward
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Economics
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

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!