

Annual AFA Update

Key Technology Trends, Marketplace Drivers, & AFA Rankings

By

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Flash Memory Summit



Key Drivers in the AFA Marketplace

What Businesses Want From Their Technology Investments

- Create more revenue
- Reduce expenses

... with an “Easy” button



Key Drivers in the AFA Marketplace

HARDWARE

- Increasing density
- Power consumption
- Increasing bandwidth
- Lower latency



Technology Advancements

3D NAND

CPU & GPU

TLC & QLC

FC & Ethernet

Storage Class
Memories

PCIe Gen4/5

NVMe

NVMe-oF



PCIe Advances

	RAW BIT RATE	LINK BW	BW/ LANE/WAY	TOTAL BW X16
PCIe 1.x	2.5GT/s	2Gb/s	250MB/s	8GB/s
PCIe 2.x	5.0GT/s	4Gb/s	500MB/s	16GB/s
PCIe 3.x	8.0GT/s	8Gb/s	~1GB/s	~32GB/s
PCIe 4.0	16GT/s	16Gb/s	~2GB/s	~64GB/s
PCIe 5.0	32GT/s	32Gb/s	~4GB/s	~128GB/s



Key Drivers in the AFA Marketplace

SOFTWARE

- Software-defined Storage
- Automation frameworks
- Proactive support
- Predictive analytics



Key Drivers in the AFA Marketplace

NON-TECHNICAL

- Usage-based costing
- Evergreen support agreements / refreshes
- All-inclusive licensing



AFA Architectures

Mainstream Enterprise

- Dual-controller scale-up
- Scale-out
- Scale-up and scale-out



Key Drivers in the AFA Marketplace

- **“The right tool for the right job.”**
... but a multiprotocol AFA with good QoS and data management features is a very versatile tool
- **It’s a big world out there**
... with room for many solutions
... and many paths to market



AFA Architectures

Other Approaches

- All-flash Appliance
- Converged Infrastructure
- Hyper-converged
- JBoF / NVMe JBoF



AFA Architectures

Market Opportunities

- AI, IoT, Edge
- ISV vertical integration
- Government/Military



AFA Architectures

Scale-up



VS

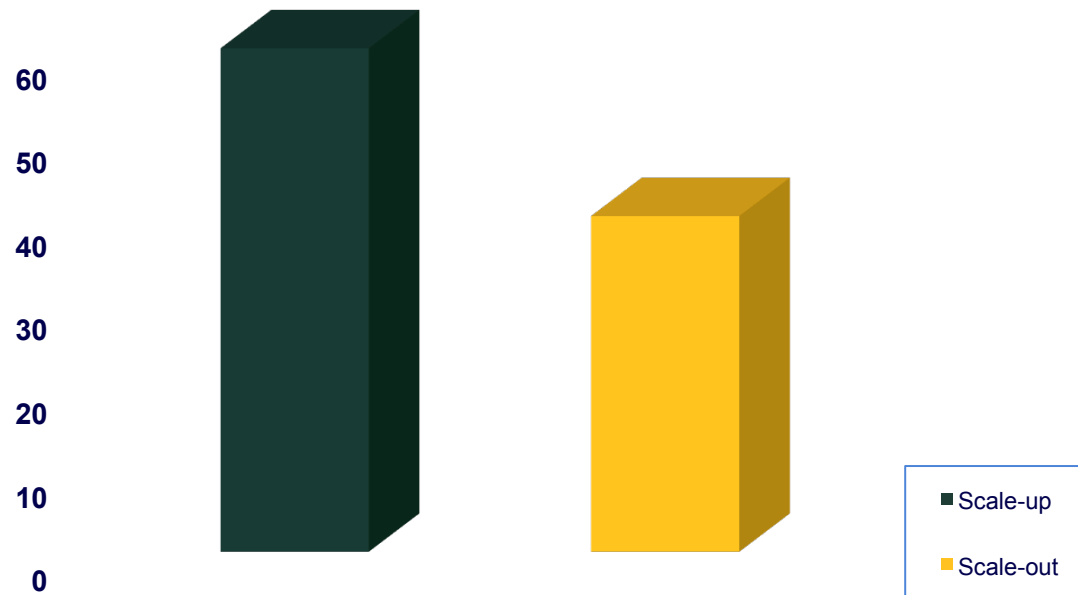
Scale-out



AFA Architectures

Scale-up Remains Predominant

AFA Architectures



*60 percent of
enterprise AFA
models are
scale-up.*

Source: DCIG; N=109



AFA Architectures

Scale-up Remains Predominant

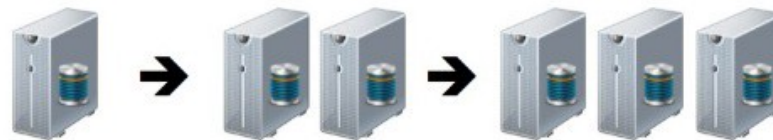
- ✓ Apps cannot yet push performance capabilities of flash
- ✓ Corporate IT staff consolidation
- ✓ NVMe accelerates reads/writes w/o CPU overhead
- ✓ Simplified data migrations
- ✓ Companies still deploy relatively small amounts of flash



AFA Architectures

Scale-out Remains Promising

- Facilitates non-disruptive:
 - Array-based data migrations
 - Firmware updates
- Predominantly found on high end AFAs
- More desirable in physical environments



AFA Architectures

Scale-out Challenges

- Cable management
- Still complexity in scaling out – just different
- Stability of scale-out technology
- Increased performance of NVMe technologies



Optimization Focus



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Optimization Focus

Focus Areas

- Capacity
- Data Management
- Performance



Optimization Focus

Capacity

- High Capacity SSDs
 - 15+ TBs
 - Purpose-built
 - SSDs with TLC/QLC Technology
- SAS connectivity
- Read Use Case



Optimization Focus

Data Management

- Enterprise Data Services
- Mature software
 - 10+ years
 - Multi-protocol support
- Origins in HDD Arrays
- Predictive analytics



Optimization Focus

Performance

- Designed for flash/SSDs
- NVMe/NVMe-OF support
- 10M IOPS
- Sub-millisecond response



DCIG General Observations

Emerging Trends

- Feature gaps narrowing
- Hybrid cloud – multiple approaches
- Containerized apps on the array
- Composable infrastructure



DCIG AFA Rankings



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DCIG Buyer's Guide Rankings

Enterprise General Purpose



Inclusion Criteria

- All-flash configuration
- Dual Controller Arrays
 - FC Connectivity
- Scale-up architecture



DCIG Buyer's Guide Rankings

Enterprise General Purpose Characteristics

- Concurrent FC/iSCSI connectivity
 - Data reduction
- Persistent storage for containers
- Upload telemetry data automatically



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DCIG Buyer's Guide Rankings

Enterprise General Purpose Recommended



Dell EMC VMAX

Hitachi Vantara VSP F-Series

HPE 3PAR StoreServ

Huawei OceanStor Dorado / V5

NetApp AFF A-Series

Pure Storage FlashArray //M, //X



DCIG Buyer's Guide Rankings



Overall



Inclusion Criteria

- All-flash configuration
 - 2+ controllers
- 100+ products evaluated



DCIG Buyer's Guide Rankings



Overall



Characteristics

- Enterprise General Purpose Features++
 - Multiple PBs of capacity
 - Scale-out architecture
- 100+ storage networking ports



DCIG Buyer's Guide Rankings



Overall Recommended



HPE 3PAR StoreServ

Hitachi Vantara VSP F-Series

Huawei OceanStor Dorado

NetApp AFF A-Series



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Questions??

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