2023-24 DCIG TOP 5
HIGH-END STORAGE ARRAYS

By DCIG Lead Analyst Storage, Ken Clipperton

Table of Contents

High-End Storage Arrays

SOLUTION
Infinidat InfiniBox Series

COMPANY
Infinidat, Inc.
500 Totten Pond Road
Waltham, MA 02451
+1 (855) 900-4634
infinidat.com

DISTINGUISHING FEATURES OF INFINIDAT INFINIBOX ARRAYS
- InfiniSafe cyber resilience features
- Flexible acquisition options
- AI inside and outside the storage system
- Rapid deployment and instant capacity expansion
- Infinidat white glove service

SOLUTION FEATURES EVALUATED:
- *Acquisition and deployment options*
- *Workload consolidation features*
- *Performance management*
- *Efficiency features*
- *Data protection and security features*
- *Technical support*

The Critical Need for High-End Storage Arrays

Organizations that provide critical infrastructure to the rest of society must provide uninterrupted service availability—even in the event of a disaster. In hospitals, an interruption in service could mean life or death for a patient. In financial institutions, a brief outage could easily have multimillion-dollar ramifications; and an extended outage could affect a nation's economy. Organizations in these and other critical industries—such as telecommunications, energy utilities, and transportation—depend on high-end storage arrays to provide uninterrupted access to the world's most essential data. Many other organizations choose high-end storage arrays for the data that is essential to their own business operations.

Reimagining High-End Storage

If your mental image of a high-end storage array is rack after rack full of blinking lights, you would be right only 30% of the time. Today, half of all high-end storage arrays, including some of the DCIG TOP 5 products in this report, fit into 8RU or less—just fourteen inches of rack space. Thus, huge floor space requirements no longer define high-end storage.

Benefits of an Effective High-End Storage Solution

Performance and availability. An effective high-end storage solution provides consistent high performance and continuous availability for critical business workloads. To obtain this result, high-end storage must provide sufficient performance resources, storage capacity, and protocol support to serve the needs of these applications. High-end storage arrays must also integrate into data center management and automation frameworks as well as integrate with common enterprise software applications to secure and protect the data.

Consolidation. High-end storage arrays provide scalable capacity and storage density that complement the performance resources of the arrays, providing remarkable performance per floor tile and increasing the amount of work any data center can deliver. Broad storage protocol support further enables high-end arrays to provide storage for nearly any workload.

Recent Advances in High-End Storage

This section of the report identifies some of the significant advances in high-end storage that have emerged since the publication of the *2020-21 DCIG TOP 5 High-End Storage Arrays* report.

These advances include new capabilities or enhancements around:

- Cyber resilience
- Advances in using analytics (AIOps)
- Cloud integration
- Provision of object storage
- Storage as a Service (STaaS)
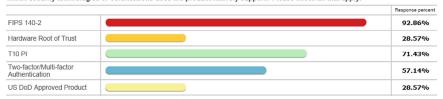- Sustainability enhancements and reporting

Enhanced Cyber Resilience

Every enterprise storage vendor is addressing customer concerns around data security and cyber resilience, especially the threat of ransomware.

High-End Storage Arrays

As the chart below shows, most high-end storage arrays have improved their security posture by implementing multiple technologies, including FIPS 140-2, T10 PI, and multi-factor authentication. Some have also gone through Common Criteria Certification and STIG hardening as part of qualifying for US Department of Defense (DoD) approval.

Some high-end storage arrays have implemented ransomware anomaly detection so they can detect ransomware attacks promptly and then minimize the impact of the attack.

Which security technologies or certifications does the product natively support? Please check all that apply.

	Response percent
FIPS 140-2	92.86%
Hardware Root of Trust	28.57%
T10 PI	71.43%
Two-factor/Multi-factor Authentication	57.14%
US DoD Approved Product	28.57%

N=14

Immutable snapshots. Snapshots are a fundamental part of the backup and recovery process, and as such, these snapshots are a prime target of cybercriminals. In response, almost all high-end storage arrays now provide immutable snapshot capabilities. Most also incorporate backup to the cloud capabilities to provide the "different media" portion of the data protection puzzle.

Secure vault on array for rapid recovery. Some of the arrays now provide a secure vault that is inaccessible to application hosts. The arrays direct snapshots to the secure vault. This approach enhances both security and rapid recovery.

Ransomware anomaly detection. For some time, DCIG has been asserting that it is only a matter of when, not if, an organization experiences a ransomware attack. Every business leader should operate on the assumption that a cyber-attack will make it through the outer defenses and begin to encrypt data on the array. Some high-end storage arrays have implemented ransomware anomaly detection so they can detect ransomware attacks promptly and then minimize the impact of the attack by:

- Intercepting the writes of files infected by known ransomware, preventing the ransomware-encrypted file from being stored
- Analyzing I/O logs for ransomware-like behaviors and creating a secure snapshot
- Using intelligent ransomware detection algorithms to compare each new snapshot with an existing secure snapshot

Any of the above scenarios triggers protective actions and notifies infrastructure administrators of a suspected ransomware infection.

Advances in Using Analytics

Dynamic application performance optimization. In addition to using analytics to enhance cyber resilience, some high-end storage arrays use analytics to dynamically tune application performance in real-time based on quality of service (QoS) settings. This dynamic tuning helps the organization honor its service level agreements (SLAs), keeps application owners and end users happy, reduces IT help desk calls, and enables the infrastructure to deliver the most bang for the buck.

Optimal data placement for performance vs. cost. Some high-end storage arrays use analytics to determine the optimal placement and movement of data to achieve the best possible balance between performance and cost. This benefits businesses by delivering the maximum benefit from their infrastructure investments.

High-End Storage Arrays

Four of the five TOP 5 array families now provide S3-compatible object storage. None of them did so three years ago.

Proactive support. All the high-end storage vendors use analytics to enable some level of proactive support, starting with automated case creation based on fault data. Most have moved beyond that basic use case to include cross-stack analytics for faster root cause analysis, capacity forecasting with an upgrade advisor function, and workload modeling. These benefit businesses by enhancing uptime and agility.

Storage as a Service (STaaS)

Maturing infrastructure automation tools and the application of artificial intelligence and machine learning to the management of storage has created an opportunity for storage vendors to offer their storage solutions as a service.

DCIG defines storage as a service (STaaS) as a storage consumption model where enterprises purchase storage as a subscription with billing based on storage usage, whether deployed on-premises or in the cloud. Storage vendors bill for usage based on various metrics, generally some combination of capacity and performance.

STaaS offers new acquisition and deployment options that give organizations greater agility and flexibility in deploying storage capacity when and where it is needed, without sacrificing the enterprise data services they rely on to store and protect vital corporate data. STaaS solutions offer multiple business benefits, including:

- Align costs more closely with revenue
- Agility and flexibility to support changing business requirements
- Expert management and support
- Reduced staffing risks
- Enhanced sustainability

Object Storage

Four of the five DCIG TOP 5 array families now provide S3-compatible object storage. None did so three years ago. This is a testimony to the rising importance of cloud-native applications to the enterprise. In combination with block and file protocol support, object protocol support means that these high-end storage arrays can provide storage for nearly any application an enterprise may run.

Cloud Integration

Most high-end storage arrays DCIG researched now support AWS S3 as a storage target. In some cases, the S3 storage may be a snapshot destination. In other cases, arrays use S3 as a tier for cold data to free up more expensive primary storage capacity on the array.

Sustainability Enhancements and Reporting

Sustainability is an emerging concern. Many businesses are establishing sustainability goals and beginning to evaluate their operations in light of those goals. The recent spike in energy costs brought additional awareness to sustainability.

Data centers are a significant consumer of electricity, and storage accounts for as much as 30% of a data center's total power consumption. According to analyst Steve McDowell, "The math works out to storage consuming about 1% of total global energy consumption."[1]

---

1. https://www.techtarget.com/searchstorage/feature/Storage-vendors-look-to-make-case-for-sustainability

High-End Storage Arrays

Many providers of high-end storage arrays are beginning to address both the sustainability of their storage systems and the sustainability reporting requirements of their customers. However, much work remains to be done before businesses have sustainability data that can reliably inform acquisition decisions.

Some vendors have adopted the Product Attribute to Impact Algorithm (PAIA) streamlined life cycle assessment (LCA) to assess the carbon footprint of their products. Unfortunately, "The PAIA tools were not developed to support comparisons."[2] And, "Because of the importance of assumptions and the prevalence of correlation, accurate comparisons of LCA results require that all alternatives be simultaneously simulated. Because the PAIA tools are not configured to allow for simultaneous simulation, it is not recommended that PAIA results be used in comparisons."[3]

Providers of high-end storage arrays are beginning to address sustainability. However, much work remains to be done before businesses have sustainability data that can reliably inform acquisition decisions.

Distinguishing Features of the DCIG TOP 5 High-End Storage Arrays

Performance resources. The DCIG TOP 5 High-end Storage Arrays generally feature more performance resources than other arrays, from CPU cores to DRAM caches and storage network connectivity. These performance resources provide the foundation for consolidating many workloads onto the array.

All five arrays, except the InfiniBox, support 12 or more controllers. The InfiniBox has a unique three-controller architecture that also supports non-disruptive workload migrations among InfiniBox storage arrays.

All five arrays extend NVMe to application hosts via NVMe/FC, NVMe/TCP, or NVMe-oF (RDMA.) The reduced protocol overhead of NVMe frees up CPU cycles on the application host while reducing storage latency.

Broader protocol support. All DCIG TOP 5 arrays offer unified storage through Fibre Channel and iSCSI block protocol support as well as NFS and SMB file access. Several also offer mainframe connectivity through FICON protocol support. Among the more recent developments, four provide S3 object storage.

The combination of these capabilities means that storage for nearly any application can be supplied by, and consolidated onto, these high-end storage arrays.

TOP 5 High-End Storage Array Solution Profiles

The following solution profile identifies some of the outstanding or distinctive features that helped the Infinidat InfiniBox Series earn a spot in the *2023-24 DCIG TOP 5 High-End Storage Arrays* report.

---

2. https://p1-ofp.static.pub/ShareResource/social_responsibility/PAIA_Intended_Use/PAIA_Intended_Use.pdf
3. https://p1-ofp.static.pub/ShareResource/social_responsibility/PAIA_Intended_Use/PAIA_Intended_Use.pdf

High-End Storage Arrays

> *"The all-flash InfiniBox® SSA II and hybrid InfiniBox arrays showcase Infinidat's thorough understanding of enterprise high-end storage requirements, including guaranteed recoveries in less than 1 minute."*

Infinidat InfiniBox® Series (InfiniBox SSA II/InfiniBox)

The all-flash InfiniBox® SSA II and hybrid InfiniBox arrays showcase Infinidat's thorough understanding of enterprise high-end storage requirements. Some of the features that helped Infinidat's InfiniBox® SSA II/InfiniBox® earn a spot in the *2023-24 DCIG TOP 5 High-End Storage Arrays* report include:

InfiniSafe cyber resilience (no additional cost) features.

- Guaranteed recovery from the InfiniSafe repository in less than 1 minute
- Immutable Snapshots
- Remote Logical Air Gap
- Fenced Forensic Network Environment

Flexible acquisition options. Infinidat offers two STaaS consumption and deployment models for its InfiniBox®, InfiniBox™ SSA, and InfiniGuard® enterprise storage platforms with a 100% availability guarantee. Infinidat also earned DCIG TOP 5 honors in the Enterprise STaaS report in July 2022.

- *Elastic Pricing* is a hybrid CAPEX/OPEX approach where the enterprise purchases a percentage of the storage capacity up-front. Expansion can either be purchased or burst month-to-month. Businesses only pay for purchased capacity but benefit from all the devices in the system from day one.
- *Infinidat FLX* is a true cloud-like OPEX-based all-inclusive enterprise STaaS subscription. FLX provides pay-as-you-go scalability (up or down), with support and hardware included for the life of the agreement.

AI inside and outside the storage system. InfiniOps AIOps includes Infinidat's patented Neural Cache data distribution and placement engine. It uses machine learning to optimize data placement without tuning, ensuring maximum performance and reducing operational costs.

Infinidat's InfiniVerse leverages InfiniMetrics telemetry for cloud-based monitoring, AI-based predictive analytics, and AIOps support software, enabling Infinidat support engineers to take preventative actions before the customer is impacted.

Infinidat also leverages its comprehensive API to integrate with other enterprise AIOps vendors, such as ServiceNow and VMware. Its Host Power Tools automate many configuration tasks.

Rapid deployment and instant capacity expansion. Infinidat's fully configured, rack-based approach facilitates rapid deployment at a customer location and instant capacity expansion. Businesses simply turn on new capacity when needed, without the risks or efforts associated with conventional upgrades.

InfiniBox SSA II	Usable/Raw	Effective
Capacity	1.3PB	3.25PB
Density	50.5TB/RU	126TB/RU
Power Efficiency*	3.65W/TB	1.46W/TB

*These numbers include storage, processors, and networking.

High-End Storage Arrays

For organizations requiring more high-end storage than a single InfiniBox provides, Infini-Box Online Data Mobility (ODM) enables non-disruptive workload movement between InfiniBox systems.

Infinidat white glove service. Infinidat assigns a named engineer to each customer for the duration of the storage as a service agreement, as a Technical Advisor. The Technical Advisor is an experienced Storage Systems Engineer who provides a full spectrum of services, including non-disruptive in-family data migrations, and acts as a customer advisor. Infinidat's comprehensive service and support include its AIOps-based support software, 24x7x365 technical support with rapid SLA response times, and its Technical Advisor program. ■

DCIG, LLC // 7511 MADISON STREET // OMAHA NE 68127 // 844.324.4552   **dcig.com**