Enterprise Strategy Group™

TECHNICAL VALIDATION

Infinidat InfiniBox SSA G4

Fulfilling Continuing Demands for High Performance Storage and Cyber Resiliency in Modern IT Environments

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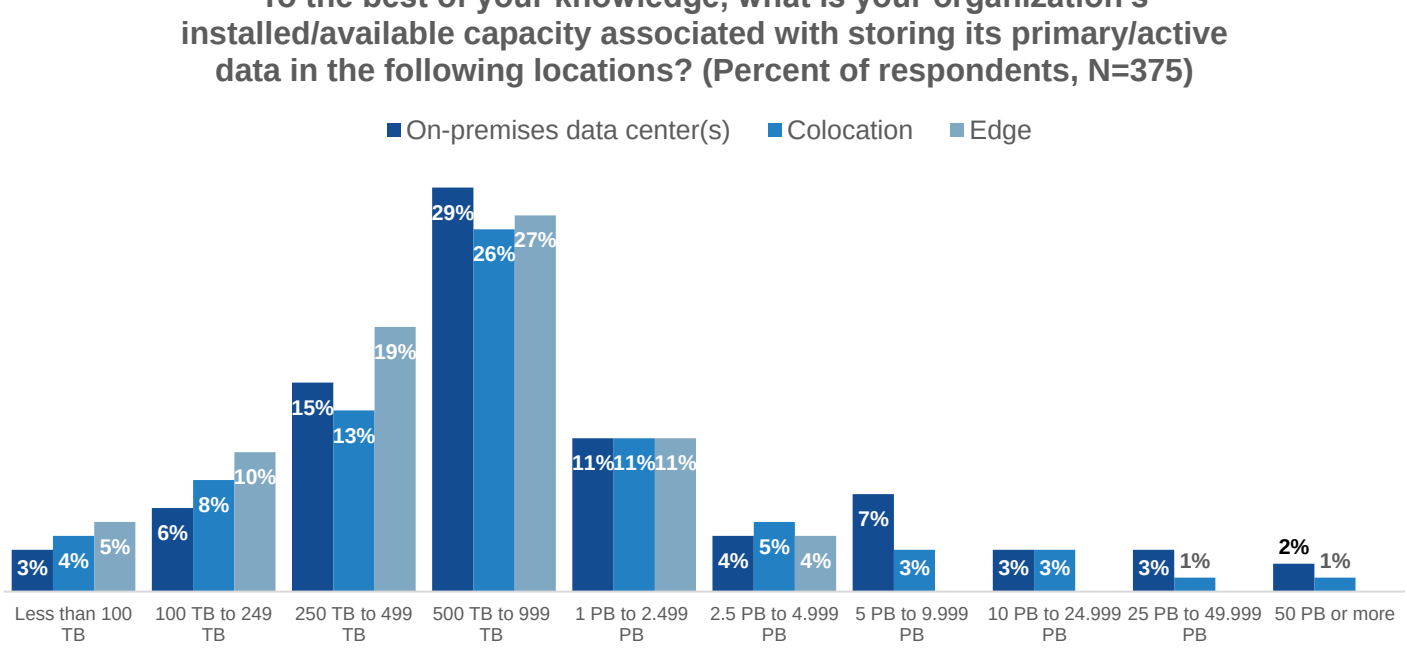
Introduction

This Technical Validation from Enterprise Strategy Group evaluates the Infinidat InfiniBox SSA G4. As part of our analysis, we evaluated how this iteration of the InfiniBox SSA will help organizations support the high-performance application and workload requirements demanded by their end users, while significantly reducing their data security risk via the solution's cyber-resiliency features.

Background

Primary data—data used every day for business operations—continues to be stored not only on premises but also in colocation environments and at the edge. Enterprise Strategy Group research has found that 51% of organizations currently have between 500 TB and 9.999 PB of available capacity for primary data on premises, 45% have similar quantities of available capacity in colocation facilities, and 42% reported having similar quantities at the edge (see Figure 1).[1]

Figure 1. Amount of Installed/Available Capacity for Storing Primary/Active Data



Source: Enterprise Strategy Group, now part of Omdia

And these same organizations anticipate that data will continue to grow. 63% of respondents cited that their capacity for primary/active data will grow between 11% and 50% on premises over the next three years, while 59% cited similar growth in colocation centers and at the edge.[2]

As organizations consider their storage options, two requirements continue to be top of mind:

- **Business- and mission-critical application performance.** Workload consolidation remains a key objective to lower overall costs related to data center footprint, power, cooling, and IT resources (for ongoing

[1] Source: Source: Enterprise Strategy Group Research Report, *Navigating the Cloud and AI Revolution: The State of Enterprise Storage and HCI*, March 2024.
[2] Ibid.

management). Yet, maintaining a high level of performance is key; existing storage must continue to deliver the experience end users expect. Performance becomes more critical as organizations ramp up their deployment of AI-enabled applications. Given the tremendous amounts of data consumed for training, inferencing, and operating such applications, storage performance cannot be the bottleneck.

- **Security.** Data breaches and ransomware continue to plague businesses, prompting organizations to seek solutions to protect their data assets. According to Enterprise Strategy Group research, improving cybersecurity and resiliency against cyberattacks was the most cited consideration for justifying new IT investments.[3] Ultimately, organizations want to ensure that data is protected, such that if normal operations are disrupted, compromised data can be restored with a clean copy as quickly as possible.

Infinidat InfiniBox SSA G4

The Infinidat InfiniBox SSA G4 is an all-flash storage array designed to help organizations store the ever-increasing amount of data they must store and manage, supporting a diverse mix of applications and workloads requiring file- or block-based storage. With the InfiniBox SSA G4, organizations can further consolidate workloads supported by both enterprise and mid-tier storage arrays without sacrificing application performance. Workload consolidation leads to less IT environment complexity and cost. Simultaneously, InfiniBox SSA G4 has been designed to bolster cyber resiliency, as ransomware threats continue to proliferate throughout organizations.

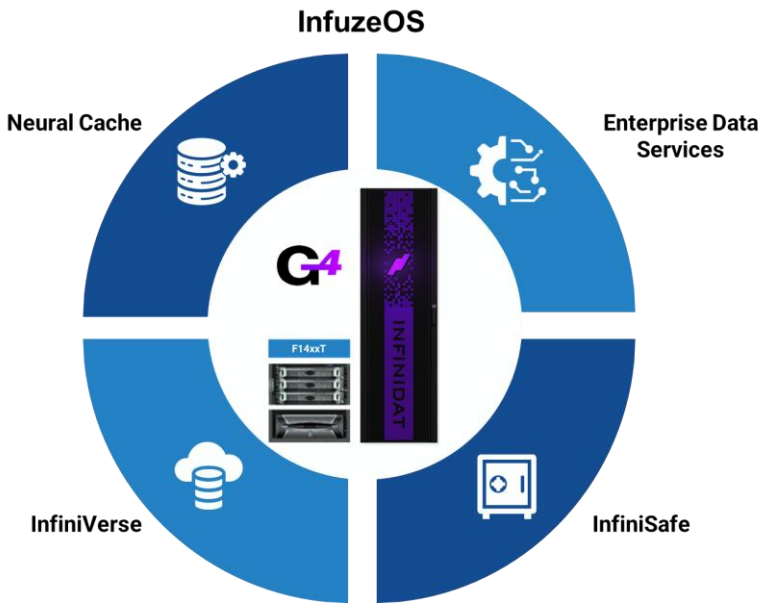
The G4, the latest generation of InfiniBox SSA, has undergone significant updates and now runs on the AMD fourth-generation EPYC processor. When compared to the InfiniBox SSA II, InfiniBox SSA G4 is powered by a single-socket 64 core CPU, boosting the total number of cores by 33%. At the same time, the AMD processor is designed to be 20% more power efficient, helping to decrease overall power consumption.

Infinidat offers two main models. The first, as with the former InfiniBox SSA II, utilizes 26RU and delivered in a 42RU rack. With the G4 platform, Infinidat has added a new model, the F1400T. This base model starts at 86 TB of usable capacity (258TB of effective capacity), delivered in a 14RU form factor.

To extend an organization's deployment of InfiniBox SSA G4 beyond core data centers to colocation and edge facilities, the storage array can be delivered in an installable, industry-standard rack filled at 60%, 80%, and 100% capacity, or organizations can install the F1400T in their own racks. Capacity can be built out as needed, without sacrificing performance or availability. In the second half of 2025, Infinidat will introduce an additional model of the F1400T that will reduce the form factor to 11RU.

[3] Source: Enterprise Strategy Group Research Report, *2025 Technology Spending Intentions Survey*, December 2024.

Figure 2. Infinidat InfiniBox SSA G4



Source: Infinidat and Enterprise Strategy Group, now part of Omdia

The InfiniBox SSA G4 is supported by InfuzeOS version 8, Infinidat's software platform for delivering the array's performance, availability, cyber-storage resilience, and ease of use. InfuzeOS unifies the entire Infinidat storage portfolio, as all versions of InfuzeOS are interoperable. Because all Infinidat hardware is built using commodity servers, customers benefit from the same InfuzeOS features.

To bolster performance, the InfiniBox SSA G4 is equipped with DDR5-based memory—up to 3,072GB of RAM—to support Infinidat's Neural Cache. With Neural Cache, AI/machine learning (ML) techniques enable the InfiniBox SSA G4 to learn about the type and amount of data applications accessed over time. Once those patterns are learned, Neural Cache will store data either in DRAM cache or back-end solid-state drives, with the goal of minimizing storage-related latencies. As the amount of application types increases (e.g., database, payment processing, analytics, artificial intelligence), Neural Cache autonomously learns their behavior to ensure that the InfiniBox SSA G4 stores the appropriate data in Neural Cache to deliver the expected performance continuously and consistently, without any storage administrator performance tuning. Since InfuzeOS supports both file-level (i.e., NFS and SMB) and block-level Fibre Channel and Ethernet-based (i.e., NVMe-TCP and iSCSI) protocols, organizations can expect the same level of performance. The InfiniBox SSA G4 controller node architecture is further enhanced with PCIe Gen 5 busses and helps it achieve up to 2.5x performance throughput gains over the InfiniBox SSA II, while still delivering storage latencies as low as 35 microseconds.

InfiniBox SSA G4 leverages the triple active/active/active controller architecture used across the InfiniBox family, powered by the HPE ProLiant DL345 Gen11 servers. All controller nodes participate equally in servicing frontend I/O, as each node has access to all backend devices.

The triple controller architecture also plays a key role in ensuring the high availability and reliability of InfiniBox SSA G4. Combining the controller's visibility into all backend storage, along with Infinidat's InfiniRAID capabilities (e.g., separating data layout from the physical storage and spreading data across all storage), data is typically rebuilt in minutes to available spare space should a device failure occur, with no loss of performance. Infinidat stands behind the system availability of all InfiniBox G4 platforms with a 100% guarantee.

- To address cybersecurity concerns and reduce the recovery window should a cyberattack occur, Infinidat employs a three-layer approach called Next-Gen Data Protection and Recovery that leverages Infinidat's InfiniSafe technologies. The foundation of the approach is based on InfiniSafe's three capabilities: producing immutable and time-based snapshots with no performance impact, enabling organizations to create a fenced forensic environment to test for a "known good copy," and recovering any data set size on the InfiniBox SSA G4 in one minute or less. This recovery time objective (RTO) is guaranteed by Infinidat.
- Should a cyberattack occur, InfiniSafe is supported by InfiniSafe Cyber Detection, a joint development effort with Index Engine's CyberSense. InfiniSafe Cyber Detection detects ransomware corruption with 99.99% effectiveness by continuously analyzing how data in the immutable snapshots might have changed over time. When patterns of ransomware, malware, or other forms of data corruption are detected, organizations are notified of the attack type and blast radius.
- To build upon InfiniSafe's cyber recovery capabilities, Infinidat helps shrink a cyberattack threat window with InfiniSafe Automated Cyber Protection (ACP), an automation and orchestration tool that can seamlessly integrate with existing cybersecurity data center-wide operations. With ACP, any security-related incident or event triggers the automatic creation of immutable snapshots at the time of occurrence and initiates further scanning. Organizations no longer need to wait for notifications of events to take corrective action after the fact. The feature can be integrated into existing security operations centers; security information and event management; security orchestration, automation, and response applications; as well as simple syslog functions for less-complex environments. ACP will be available for third-party integration as dictated by customer interest.

Enterprise Strategy Group Technical Validation

Enterprise Strategy Group validated how organizations can benefit from the Infinidat InfiniBox SSA G4 by evaluating how the storage platform can support the performance end users demand of business- and mission-critical applications, while bolstering the storage's cyber resiliency in light of increasing and more sophisticated ransomware attacks.

Fulfilling Performance Needs for Consolidated Data-intensive Applications

The need for high performance storage remains a concern for organizations. Organizations are looking to reduce storage complexity in their environments, which typically translates into consolidating workloads onto fewer systems. However, storage consolidation always carries the risk of degrading performance of one or more supported business- or mission-critical applications. Performance becomes a more critical issue as organizations deploy more AI/ML workloads, and high-performance storage becomes especially critical as end users expect lower response times.

With Infinidat InfiniBox SSA G4, organizations can expect storage performance to maximize application performance, especially when consolidating workloads.

Enterprise Strategy Group Testing

To characterize the performance of the InfiniBox SSA G4, Enterprise Strategy Group reviewed the results obtained when comparing the InfiniBox SSA G4 with previous releases. Three metrics were examined:

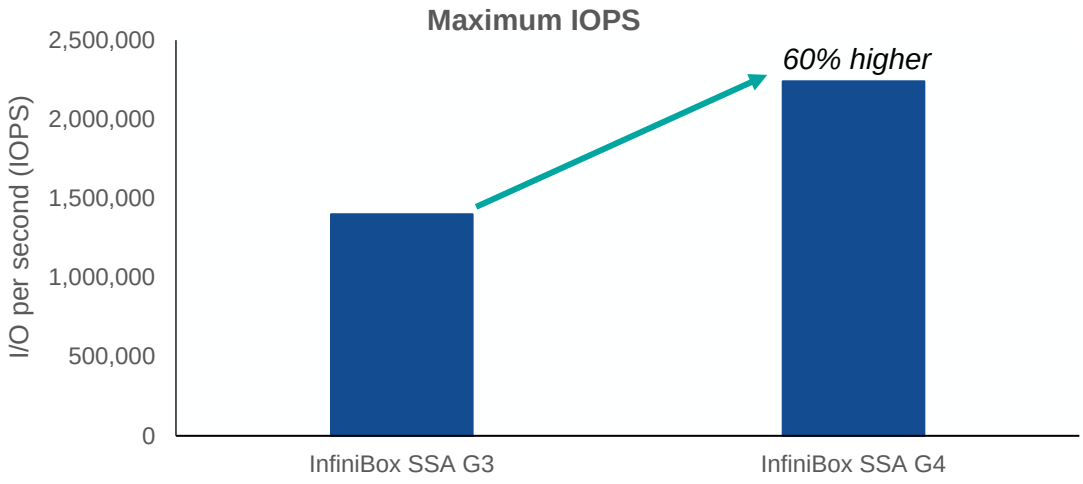
- The maximum achievable IOPS compared between the InfiniBox SSA G4 and SSA G3.
- The maximum achievable bandwidth compared between the InfiniBox SSA G4 and SSA G3, using 64KB – 256KB read blocks.
- The maximum achievable backend reads compared between the InfiniBox SSA G4 and SSA II, using 4KB read blocks.

To estimate these metrics, Infinidat employs an internally developed in-house automated performance testing suite. This suite has been developed and used repeatedly to evaluate every layer of Infinidat's storage systems to detect any performance impact due to numerous factors, such as code changes, driver updates, or hardware modifications. In addition, Infinidat also conducts external protocol testing using industry-standard tools such as FIO, IORate, and VDBench. This testing is designed to run hundreds of diverse I/O patterns, including real-world application profiles gathered from customer environments over the years. (A diagram of the testbed is located in the Appendix for reference.)

In addition to characterizing performance, the two testing approaches uncover deviations from historical internal performance benchmarks. These deviations are flagged and fed back to Infinidat's internal development team to analyze and resolve, revealing a focus on ongoing improvement.

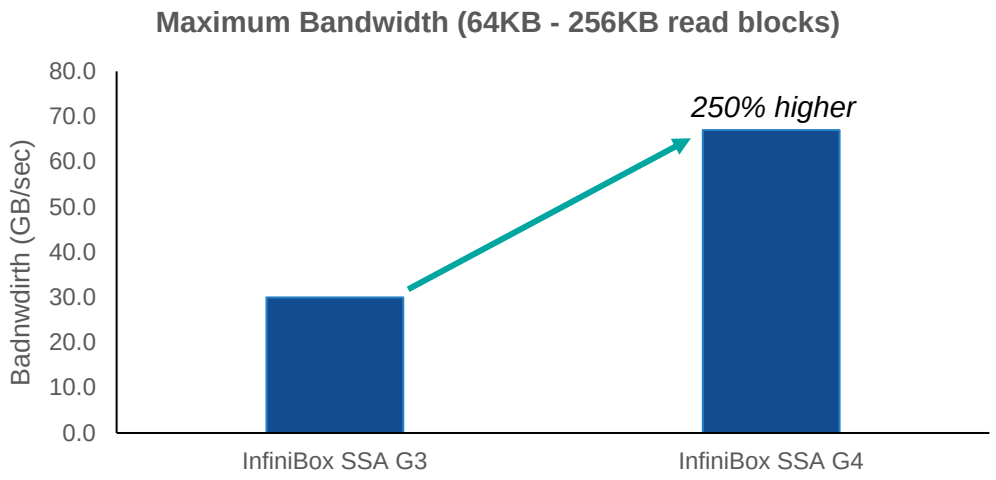
Results of the comparisons are shown in Figures 3, 4, and 5.

Figure 3. Maximum Achievable IOPS – InfiniBox SSA G3 and SSA G4



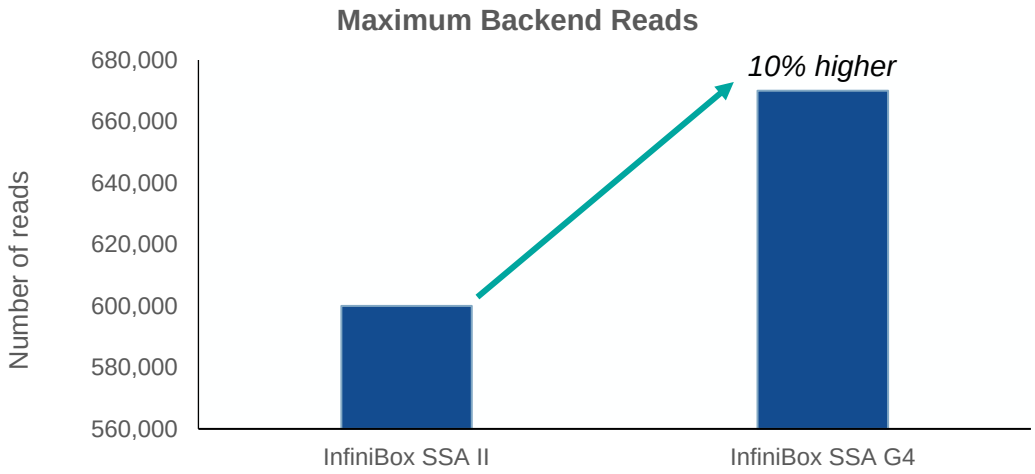
Source: Enterprise Strategy Group, now part of Omdia

Figure 4. Maximum Bandwidth – InfiniBox SSA G3 and SSA G4



Source: Enterprise Strategy Group, now part of Omdia

Figure 5. Maximum Backend Reads – InfiniBox SSA II and SSA G4



Source: Enterprise Strategy Group, now part of Omdia

Based on the results, Enterprise Strategy Group validated that performance can increase when using the InfiniBox SSA G4. Specifically, we saw a 60% improvement in the maximum achievable IOPS, a 240% increase in the maximum bandwidth achievable, and a 10% improvement in the maximum reads. We also found that latencies achieved (as low as 35 microseconds) were similar to those achieved in the InfiniBox SSA II.

We can attribute the performance improvements to the following architectural elements:

- **Controller node updates.** The additional power provided by the AMD EPYC processor, PCIe Gen 5 bus, and DDR5 technologies directly support the gains in performance seen in the InfiniBox SSA G4.

- **A trie tree data structure.** With this specialized search tree data structure, InfuzeOS tracks the location of every I/O by examining the InfiniBox SSA G4's backend storage capacity to ultimately decide if an I/O is placed in Neural Cache.
- **Neural Cache.** By holding statistics on how often I/Os are retrieved, InfuzeOS can predict the I/Os to be accessed based on previously exhibited data access patterns.
- **InfiniRAID.** Working in conjunction with Neural Cache and the trie tree data structure, InfiniRAID optimizes data placement on storage devices and optimizes all pre-fetch of data based on caching algorithms.

Although these architectural elements have not changed since Enterprise Strategy Group's previous validation of the InfiniBox SSA II, we believe that these elements are worth repeating, as they help establish both stability and predictability in the performance achieved. To further ensure platform stability, it is also important to note the any performance increases were achieved with minimal performance tuning. (Infinidat has stated that advanced tuning is planned over time to further increase overall system performance.)

While Enterprise Strategy Groups acknowledges that these performance numbers are based on internal testing, Infinidat offers performance guarantees based on an automated validation process. These guarantees are designed according to the peak workloads that customers intend to support with an Infinidat storage array. Before deploying any InfiniBox, Infinidat models the read/write workloads that customers intend to consolidate on Infinidat's proposed deployment. Using the results of the modeling, Infinidat documents the guarantees tailored to the individual customer's expectations. In other words, these performance guarantees are customized, not based on any historical averages of part performance.

Enterprise Strategy Group should also take note that consolidating the data of multiple applications onto the InfiniBox SSA G4 not only preserves performance but also helps organizations occupy smaller footprints, thus reducing real estate, power, and cooling expenses.

Why This Matters

When it comes to on-premises storage—whether in core data centers, in colocation facilities, or at the edge—performance remains a top-cited system-related challenge for both file- and block-based storage.[4] This is no surprise, as organizations deal with ongoing complexity in their IT environments and, subsequently, the unwanted, related costs. As organizations seek to address complexity and cost issues by consolidating workloads, the supporting storage must be able to store and manage the expected growth in data while supporting applications in delivering the performance end users expect.

Enterprise Strategy Group validated that the Infinidat InfiniBox SSA G4 can deliver the application performance that end users expect, especially when consolidating the data of multiple workloads onto a single storage system. After reviewing the architecture of the InfiniBox SSA G4, as well as internal testing numbers, we concluded that the InfiniBox SSA G4 is designed to exceed the performance of previous releases. We also validated its performance via Infinidat's history of issuing performance guarantees tailored to each customer. These guarantees are determined based on modeling the profiles of all workloads a customer plans to consolidate on the InfiniBox SSA G4, not on common statistics such as historical averages or percentiles across all customers.

[4] Source: Enterprise Strategy Group Research Report, *Navigating the Cloud and AI Revolution: The State of Enterprise Storage and HCI*, March 2024.

Reinforcing Cyber Resiliency

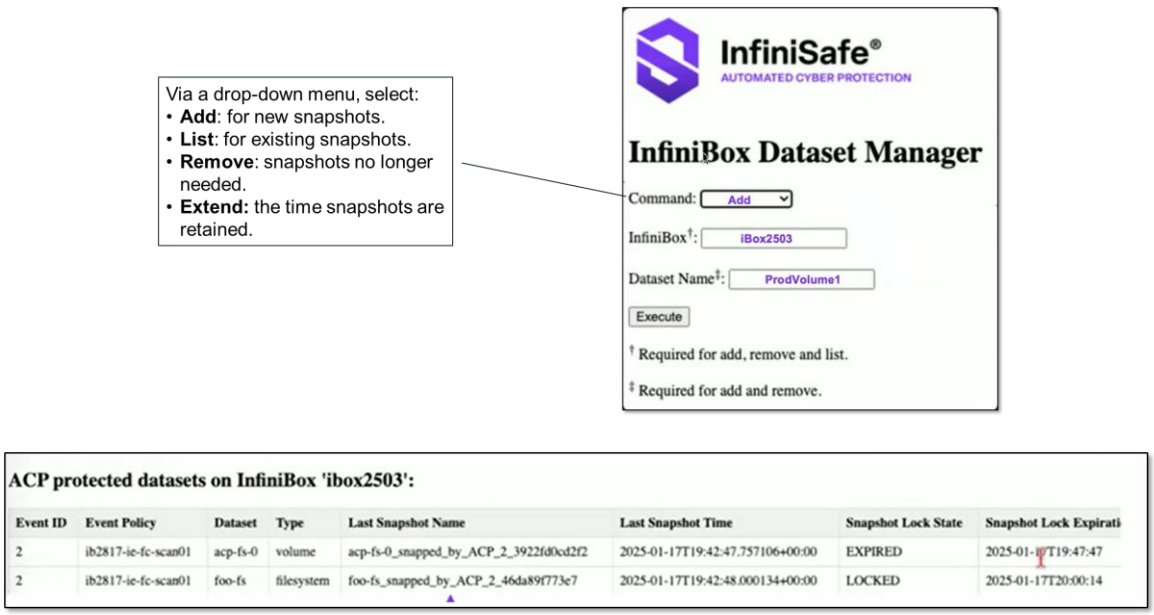
Merely detecting a cyberattack is insufficient in supporting an organization's cyber-resiliency efforts, especially if the attack has already infiltrated the organization's stored data. While creating immutable snapshots can help, copying corrupted data greatly risks how quickly and cleanly organizations can recover. Improving cyber resiliency not only requires detecting and isolating ransomware or malware as early as possible but also recovering quickly and cleanly.

With InfiniSafe ACP, organizations can automate immediate immutable snapshots when a security-related incident or event occurs. InfiniSafe ACP can also be seamlessly integrated into other data center-wide cybersecurity applications and environments so that any detection of a threat or attack can trigger the creation of clean immutable snapshots by the InfiniBox G4 solutions. By employing ACP into a proactive strategy to have known states of their data available for recovery in case of a cybersecurity event, organizations can significantly reduce the time to respond and recover.

Enterprise Strategy Group Testing

Enterprise Strategy Group reviewed how organizations can configure automatic immutable snapshots with InfiniSafe ACP. We navigated to the ACP UI and chose the action to take. Commands available include adding new snapshots to be taken, listing existing snapshots to be taken, removing snapshots currently in effect, or extending the time that snapshots are retained (see Figure 6). The system and volumes from which snapshots are taken can be chosen. To easily identify ACP snapshots, all snapshot names include the phrase "snapped_by_ACP." Current status and expiration date are also presented.

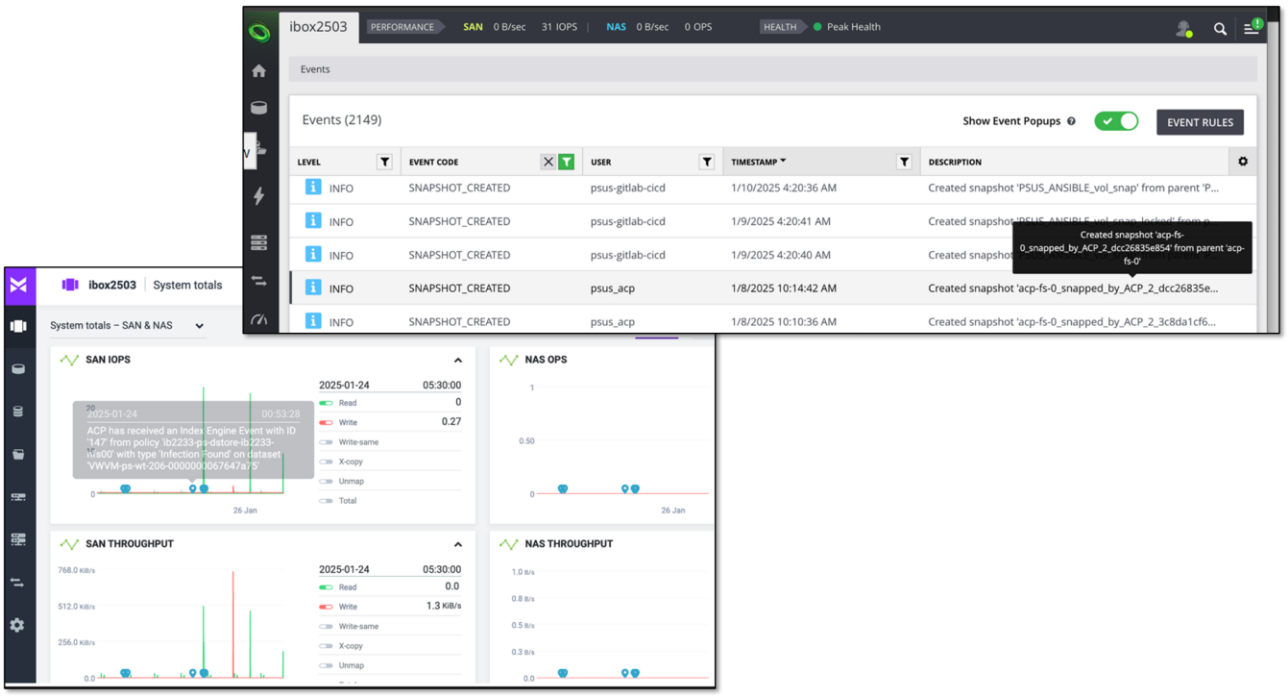
Figure 6. Actions to Take With ACP Snapshots



Source: Enterprise Strategy Group, now part of Omdia

ACP snapshots can also be viewed via the InfiniBox management UI (top right of Figure 7) and InfiniMetrics tool (bottom left of Figure 7) and used for tracking and reporting purposes.

Figure 7. ACP Snapshot View in InfiniBox Management UI and InfiniMetrics



Source: Enterprise Strategy Group, now part of Omdia

Why This Matters

According to Enterprise Strategy Group research, one of top three business drivers underlying an organization's data resilience programs is to improve cyber-resilience efforts.[5] It is no longer sufficient to detect if a security-related incident or event has corrupted the organization's data. The extent of the infiltration must be isolated, especially if snapshots are created regularly. If such events are not isolated, corrupted data could be replicated in subsequent snapshots, risking how quickly and cleanly organizations can recover and resume normal business operations.

Enterprise Strategy Group validated that InfiniSafe ACP can help organizations shrink the time period needed to maintain normal business activity in light of a detected security event or incident. We reviewed how easily organizations can configure automated immutable snapshots to be created when triggered by the detection of ransomware, malware, or other data corruption incident. Organizations can now take proactive steps to ensure that the blast radius can be contained when detecting a security event.

[5] Source: Enterprise Strategy Group Research Report, *Achieving Cyber and Data Resilience: The Intersection of Data Security Posture Management With Data Protection and Governance*, September 2024.

Conclusion

With organizations wanting to harness and extract any and all value from continually growing amounts of data, the need for more storage capacity will only grow. Performance continues to be an issue, as organizations do not want to sacrifice application performance and disrupt business operations unnecessarily. Yet, as organizations use an increasing number of applications and workloads, consolidating the supporting storage makes sense to reduce IT environment complexity. Reduced complexity leads to decreased capital and operational costs, especially those related to power and cooling as sustainability concerns remain top-of-mind.

Simultaneously, cyberattacks and ransomware remain a constant threat to any organization's data. It is not enough to only detect these events; their effect also needs to be isolated should they infiltrate data and minimize the window in which a clean recovery can occur.

The Infinidat InfiniBox SSA G4 has been designed to deliver the performance and cyber resilience that organizations demand today from their storage, while reducing complexity, cost, and environmental impact. With the InfiniBox, organizations can deliver the high performance that organizations require to support the consolidation of business-critical workloads, helping to reduce overall complexity in on-premises, colocation, and edge environments. All features, data services, and data security mechanisms are delivered via InfuzeOS, the software platform that unifies the entire Infinidat portfolio and delivers a consistent and easy user experience.

For those seeking to bolster their cyber-resiliency efforts, InfiniSafe ACP isolates a cyberattack or ransomware attack from proliferating while reducing the recovery window via automatic immutable snapshots. Organizations can either use InfiniSafe Cyber Protection with InfiniSafe ACP or integrated ACP into existing data center cyber-detection tools.

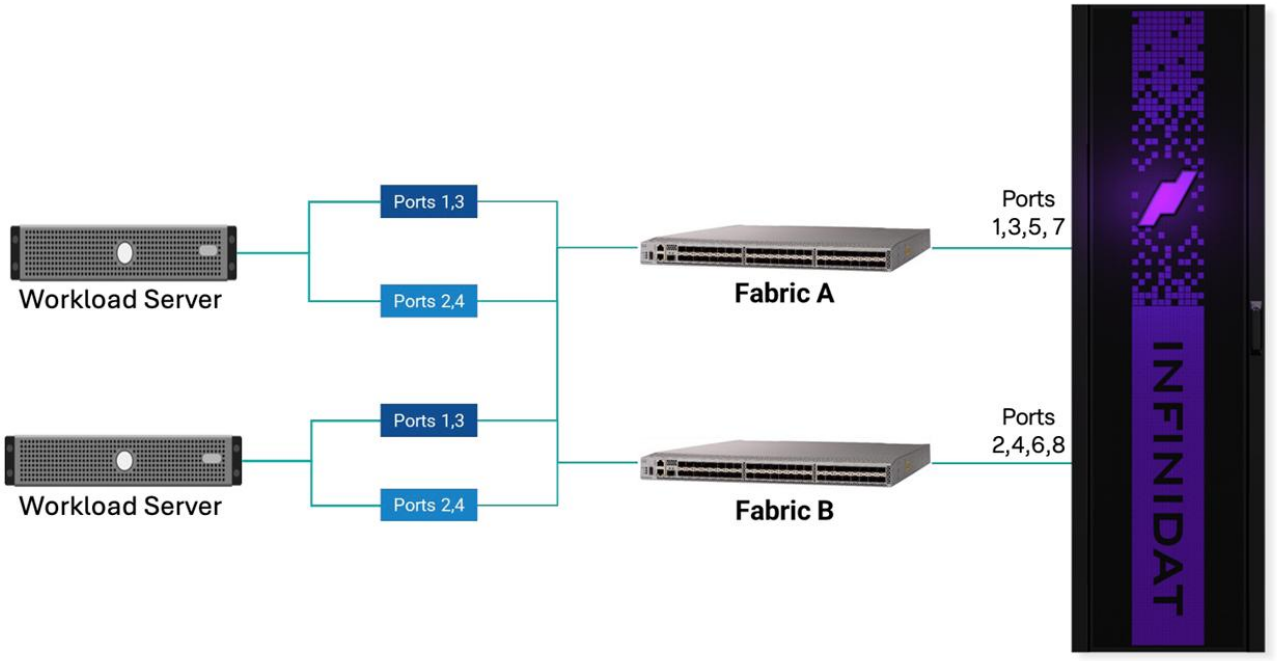
Enterprise Strategy Group validated that the Infinidat InfiniBox SSA G4 delivers the following benefits:

- High performance needs for data-intensive applications, especially when consolidating multiple workloads on less storage.
- Strengthened cyber resiliency by using InfiniSafe ACP to create clean and immutable snapshots automatically and immediately upon detection of a cyberattack or ransomware attack via InfiniSafe Cyber Protection or third-party data center cyber-detection tools.

Throughout the years, Enterprise Strategy Group has observed and validated the benefits that the Infinidat portfolio delivers to its customers. We had the opportunity to validate a previous generation of the InfiniBox SSA, and we could see how this product has evolved. Our current validation shows that the InfiniBox SSA G4 continues to deliver the performance and security that organizations still demand. As these demands have become more prominent, especially with the growth in both data and cyberattacks, we validated that the InfiniBox SSA G4 meets these demands head-on. We recommend that organizations evaluate this next-generation InfiniBox more closely for their unique storage needs.

Appendix

Testbed for Performance Measurement (32G Fibre Channel Connectivity)



Source: Infinidat and Enterprise Strategy Group, now part of Omdia

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