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E-BOOK

Entry-Level All-Flash Buyer's Guide

Is It Time to Move to an All-Flash Array?

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What Should You Look for When Choosing All-Flash Storage?

Capacity

Performance

Data Availability and Protection

Simplicity

Support

Conclusion: It's Time to Move to an All-Flash Array.

Is It Time to Move to an All-Flash Array?

Over time, new technology usually gets better, faster, and cheaper. And that's exactly what's happening in infrastructure with all-flash arrays. If you're considering replacing SAS 10K HDDs, or if you need an entry-level, cost-effective flash solution, read this buyer's guide for key tips before you buy.

First, let's address the biggest myth about flash: It is not true that all-flash arrays are more expensive than high-performance disk-drive-based systems. Once you factor in data reduction capabilities, flash can be less expensive per gigabyte. Plus, all-flash arrays can deliver substantial capex and opex savings in floor space, rack space, power and cooling, server farm, software licensing, and operational human power. In fact, a 2016 Gartner study[1] found that all-flash storage pays for itself in just 5 to 6 months on average, the result of dramatic improvements in total cost of ownership (TCO).

Another benefit of moving to flash is that you are modernizing infrastructure for the future. Spinning SAS 10K disks are on the end-of-life path. Perhaps your current storage systems are behind the technology curve or approaching the end of their warranty, or perhaps the future plans of an incumbent storage vendor are uncertain. Whatever the reason, there has never been a better time to consider switching to all-flash storage.

> "By 2025, solid-state drives (SSDs) will have replaced all hard-disk drives (HDDs) used as primary storage in PCs and data centers."
>
> —Gartner, Market Insight: Preparing for the SSD Rise and HDD Demise, 9 August 2018, Joseph Unsworth and John Monroe

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What Should You Look for When Choosing All-Flash Storage?

There are five crucial factors to consider when you're researching your flash system purchase:

1. Capacity **2. Performance** **3. Data Availability and Protection** **4. Simplicity** **5. Support**

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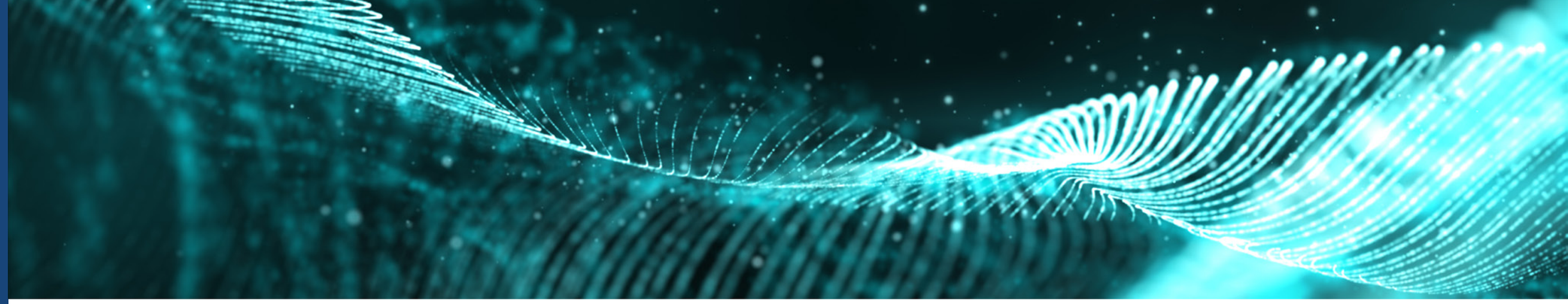

Capacity

Don't buy more capacity than you need. To avoid unnecessary upfront costs and maintenance challenges, fully document your requirements. You need to understand raw capacity, effective capacity, and data reduction ratios with storage efficiency technologies like deduplication, compression, and compaction.

- **Raw capacity.** The total amount of addressable capacity of the storage devices in a storage system.
- **Effective capacity.** The amount of data stored on a storage system. There is no way to precisely predict the effective capacity of an unloaded system. This measure is normally used on systems that employ space optimization technologies.
- **Data reduction ratio.** Typically expressed as the division of uncompressed size by compressed size.
- **Data deduplication.** Technique for eliminating redundant data in a dataset. In the process of deduplication, extra copies of the same data are deleted, leaving only one copy to be stored.
- **Compression.** Reduction in the number of bits needed to represent data. Compressing data can save storage capacity, speed up file transfer, and decrease costs for storage hardware and network bandwidth.
- **Compaction.** The reduction of the number of data elements, bandwidth, cost, and time for the generation, transmission, and storage of data without loss of information by eliminating unnecessary redundancy, removing irrelevancy, or using special coding.

Note: Different workloads result in very different ratios. Therefore, you should tell your vendor about all the types of workloads you are likely to use with flash.

Thin provisioning and inline data reduction features, such as deduplication, compression, and compaction, should provide substantial space savings without affecting performance, enabling you to purchase the smallest possible amount of storage capacity. With all-flash storage, you can dramatically reduce your data center costs with the most effective capacity for any workload.

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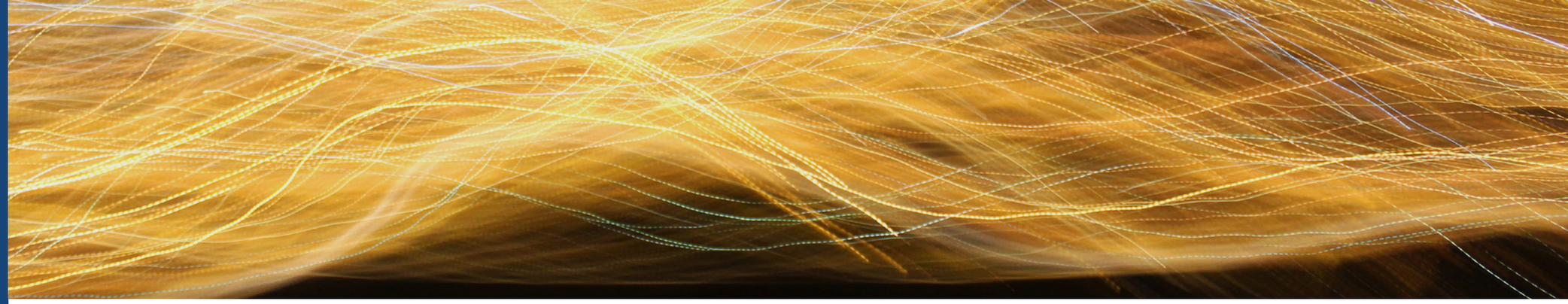

Performance

A primary advantage of moving from spinning disk to flash is consistent high performance. Predictable performance is also vital for next-generation data centers and small enterprises because it allows you to consolidate many workloads on a single system without compromising performance.

There are three basic measurements of performance: I/O operations per second (IOPS), throughput, and latency. IOPS is the number of block operations per second; throughput is the measure of how fast each block is processed; and latency is how fast the data transfer begins. Performance numbers differ across different workloads. SSDs deliver superior performance over HDDs in terms of the three most common storage performance metrics.

- **IOPS.** Transaction-oriented applications such as databases generate small, random reads and writes. This type of storage performance is measured in IOPS, the most common metric for all-flash storage. A single SSD can deliver IOPS measured in the tens of thousands, whereas a single HDD can only deliver hundreds of IOPS, which means that many HDDs would be needed to achieve the performance of a single SSD.
- **Latency.** Usually measured in milliseconds or microseconds, latency is a measure of how long it takes a storage system to satisfy an I/O. This is an important metric for time-critical applications such as real-time trading and online transaction processing (OLTP), which are extremely latency sensitive. Interactive users notice and react to differences in latency.
- **Throughput.** Applications such as data warehouses and video rely on sequential access to data in large blocks, resulting in a workload that is dramatically different from transaction-oriented applications. Throughput is a measure of the amount of data that can be moved in to or out of a storage system; it is typically reported in MB/sec or GB/sec.

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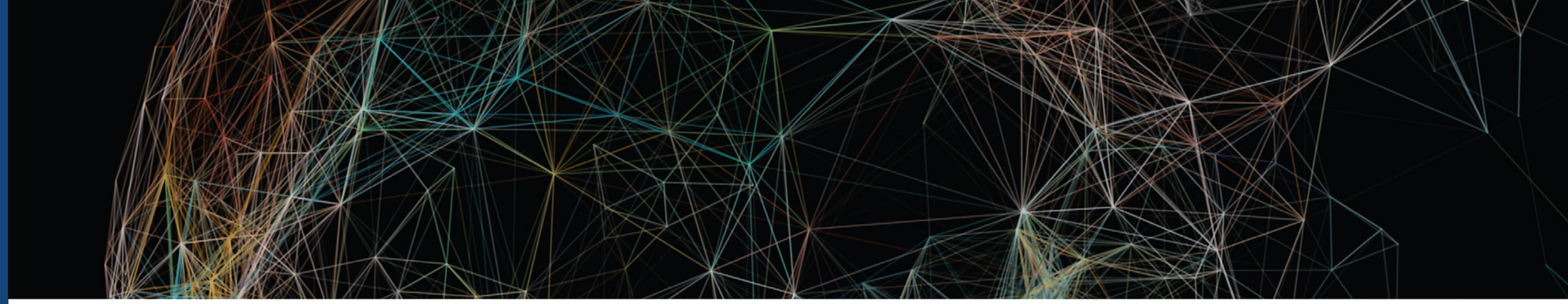

Data Availability and Protection

Data stored on flash still needs to be managed and protected, just as it always has been. Requirements include protection against failed devices; protection against intentional or accidental data corruption; and facilities for disaster recovery. Enterprise flash drives have impressive reliability. Unlike HDDs, flash drives have no spinning disks or moving parts, increasing their reliability.

Downtime or data loss can have devastating effects on the productivity of your team and the availability of your data. Consider these factors:

- **Resiliency and availability.** SSDs have been available in the market for a number of years, and industry data indicates that they are inherently more reliable than HDDs. SSDs do fail, however, so standard forms of data protection still apply. Most all-flash storage systems incorporate some form of RAID. Given their much higher performance, if an SSD that is part of a RAID group fails, rebuilds happen much more quickly, limiting exposure to a second failure.
- **Avoiding planned and unplanned downtime.** Just because SSDs are reliable doesn't mean that an all-flash storage system isn't subject to both hardware and software failures that can cause unplanned downtime. It's always good advice to choose a vendor with a well-designed architecture, mature processes, a proven track record of reliability, and first-class support and professional services.

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- **Data protection and disaster recovery.** No matter how reliable the architecture you choose, you still need backup and disaster recovery (DR) to protect against user errors, bugs in application software, widespread power outages, and other natural and human-made disasters. Modern storage architectures should integrate snapshot and replication functions that make backup, recovery, and DR functions faster and more efficient.
- **Cloud-integrated backup and recovery.** Data loss can be avoided with a reliable and comprehensive backup and recovery solution that enables you to roll back to a point in time before your systems were affected. Today's public cloud services can simplify backup and recovery and reduce the total cost of protecting your data with greater efficiency, reliability, and security over traditional on-premises backup and recovery solutions. Look for flash solutions that integrate seamlessly with leading public clouds to give you greater flexibility in choosing how and where to back up your data.
- **Regulatory compliance.** The regulatory compliance landscape is changing quickly, with governmental laws and industry regulations becoming ever stricter to protect personal data and ensure operational transparency. Such regulations may require organizations to archive email messages, documents, patient records, design files, and other data for years—and to prove that the data hasn't been changed or deleted. Data must be immutable and encrypted, while also being readily available for e-discovery. Failure to quickly retrieve required records can result in legal and financial liability.

Improved Reliability

Some IT professionals continue to be concerned about the durability of flash media, or flash "wear-out," even though a wealth of real-world data demonstrates that SSDs are extremely reliable. The good news is that most vendors are so confident about the long-term reliability of their all-flash systems that they're happy to provide you with an extended warranty. Other options, such as free controller upgrades, may also be available if you are willing to commit to a long-term service contract.

The bottom line is that you must protect your data from both internal and external threats, ensure data availability and accessibility, eliminate maintenance disruptions, and quickly recover from failures.

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Future-proof

Cloud connectivity

Total cost of ownership

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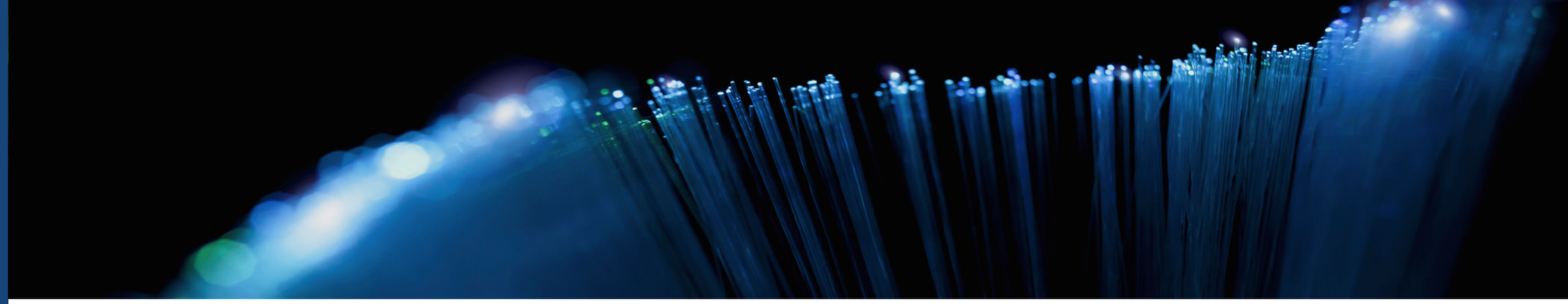

Simplicity

Many newcomers to the flash arena place speed above all else, sacrificing enterprise feature sets that would enable them to optimize and protect their hybrid cloud environments. They are looking for storage that can enable them to:

- Future-proof their architecture to take advantage of emerging standards
- Connect to the cloud
- Simplify IT to lower total cost of ownership

Future-proof

Obviously, an all-flash solution must fit easily with your current application environment. Out-of-the-box integration with enterprise applications, such as those from Citrix, Microsoft, Oracle, VMware, and SAP, can facilitate provisioning and application-consistent data protection.

However, any all-flash solution that you invest in today should also be able to accommodate the future needs of your enterprise applications. These needs could include the ability to support faster network technologies, such as NVMe-oF or other infrastructure upgrades; the ability to support a different storage protocol or to add NAS support to an existing SAN system; and the ability to replicate data from flash storage to other media, either on premises or in the cloud

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Cloud connectivity

If your organization is considering a hybrid cloud strategy or developing next-generation applications, you may need to be able to run them both on your premises and in the cloud. Storage that offers cloud integration can simplify the migration of applications and data to and from the cloud. You should consider all-flash systems that can facilitate the following functions:

- Move workloads to and from the cloud
- Automatically tier data between on-premises and cloud storage
- Back up on-premises storage to the cloud
- Provide disaster recovery in the cloud

Total cost of ownership

For most IT organizations, cost is an important factor in purchasing decisions. As noted earlier, Gartner and other analysts have found that all-flash storage can significantly lower TCO relative to traditional storage systems. You may need to do a TCO comparison of a proposed all-flash array versus your existing disk-based or hybrid flash systems to justify the purchase. Be sure to factor in the following items as part of your analysis:

- **Storage density.** The storage density of SSDs is growing faster than that of HDDs. In 2018, the first 30TB SSDs were released, exceeding the capacity of the densest HDDs available at that time by nearly 100%. All-flash storage can take the place of multiple racks of HDD storage in both capacity and performance, enabling data centers to recover space and significantly reduce power and cooling expenses. Whether your organization deploys multiple systems or just one, maximizing capacity is an important goal.
- **Storage efficiency.** When you begin comparing all-flash storage, at a minimum, your capacity calculations should include inline storage efficiencies. You should also include snapshot copies and clones if you intend to use them. Most all-flash arrays on the market today offer inline deduplication and compression, reducing the total amount of storage you must purchase to store data. Remember that the effectiveness of storage efficiency technologies varies from one vendor to another.
- **Software licenses.** The consolidation of workloads onto an all-flash platform can result in software savings.

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Support

IT infrastructure is supposed to be a means to an end, not an end in itself. However, the continuous monitoring, management, and maintenance required with traditional storage systems may be keeping your IT team from focusing enough attention on the applications and services that move your business forward.

Look for all-flash storage that:

- Reduces or eliminates routine management tasks
- Enables maintenance and upgrades to be performed without planned downtime
- Offers fast and efficient data management capabilities, including snapshot copies, replication, and cloning
- Provides intuitive user interfaces with role-based access control
- Integrates with your existing management and monitoring framework
- Provides REST APIs, PowerShell cmdlets, plug-ins, and/or other integrations that make it easy to automate and orchestrate storage in your environment

Data migration is often the most challenging aspect of modernizing your data center. To reduce the risks associated with any major migration, choose a vendor whose solutions eliminate storage silos and forklift migration in the long run. Some vendors offer incentives and promotions to ease the initial transition to flash storage. Be sure that they also have proven tools and methodologies that provide insight and transparency, as well as control over the process.

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With an entry-level all-flash storage system, price and simplicity are likely to be your most important considerations. But you shouldn't have to sacrifice performance and security. Delivering data simply, quickly, and cost effectively is essential to driving business growth, and hybrid cloud has emerged as the most efficient way to meet changing business needs.

Every IT organization is trying to determine how to modernize with hybrid cloud, and on-premises all-flash storage systems are crucial to speed up enterprise applications. However, many small enterprises continue to use hard disk storage systems because of the perceived high cost of all-flash solutions.

However, all-flash storage systems are no longer out of reach. Designed for IT generalists, these systems can help you meet new business requirements while providing comprehensive data services, integrated data protection, seamless scalability, new levels of performance, and cloud integration.

One brand new storage system that meets these criteria is the NetApp® AFF C190. Powered by NetApp ONTAP® data management software, the AFF C190 offers a simple, smart, and secure enterprise-class flash system at an affordable price.

Fast-provisioning workflows enable you to provision new storage systems in just minutes from power-on to serving data. And you can simplify your infrastructure by consolidating your file and block data onto a single storage system.

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The AFF C190 offers industry-leading hybrid cloud integration, supporting all major public clouds, including Google Cloud, Amazon Web Services (AWS), Microsoft Azure, IBM Cloud, and Alibaba Cloud. It also delivers 10 times faster application response than hybrid arrays.

The AFF C190 also includes Active IQ®, NetApp's cloud-based predictive analytics platform, which features AI- and ML-infused actionable intelligence that drives better performance. The result is higher availability, simplified management, improved efficiencies, and predictive analytics for fault management, capacity, and upgrade planning. Customers also have access to NetApp's cloud-based data lake with Active IQ data (anonymized) to perform their own queries around configuration optimization, best practices, and integration of newer technologies.

With all of these features and performance wrapped into an affordable package, the question is no longer whether to choose all-flash storage. Now you need to ask yourself, "Why would I not choose all-flash storage?"

For more information about the NetApp C190, visit our Entry-Level All-Flash webpage.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation, and optimize their operations. For more information, visit www.netapp.com. #DataDriven

Endnotes

[1] Gartner, *Solid-State Array TCO Reality Check*, January 22, 2016.

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