



Epic on ONTAP

Enterprise applications

NetApp
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Epic on ONTAP

EPIC on ONTAP

Epic is easier with ONTAP.

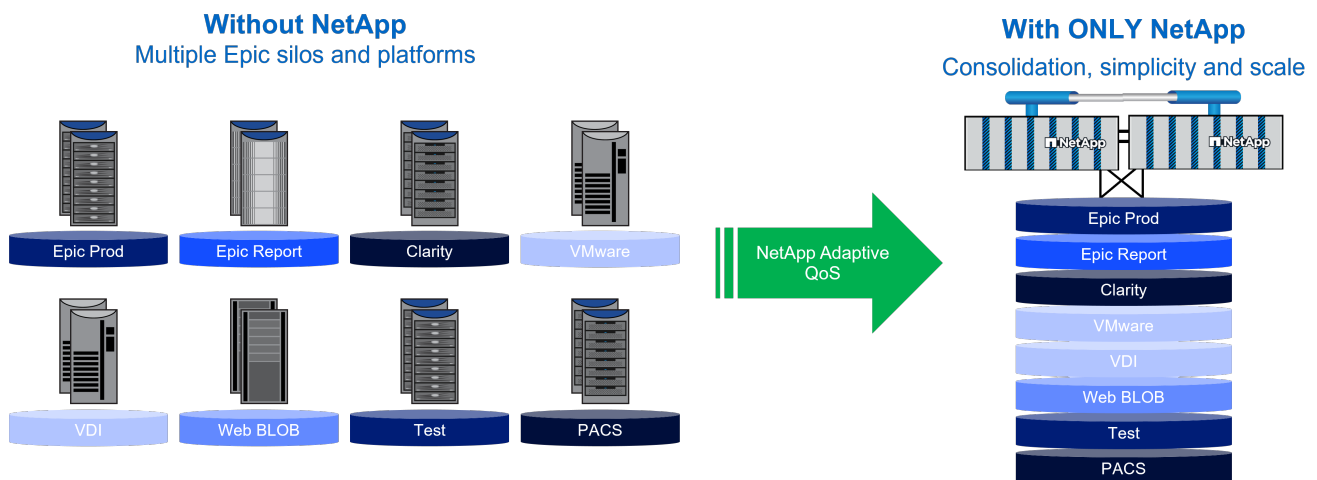
ONTAP is a data management platform that allows you to consolidate Epic workloads while meeting all of your performance, data protection, and data management requirements.

Only on NetApp can you standardize all your healthcare workloads for SAN, NAS, and Object on a single high-availability data management platform. ONTAP is the most widely deployed storage software platform in the world and comes with almost 30 years of constant innovation. You can meet all your Epic challenges with native ONTAP data management tools and application integration. There is no need to purchase a multitude of third-party tools to fill gaps in the solution.

A lot of storage vendors offer traditional, reliable, and fast block storage. They work well but are typically deployed in silos to run a single workload such as production, report, clarity, VDI, VMware, and NAS. Each of these silos has different hardware and different management tools, and they are typically managed by different IT groups. This traditional approach adds to the biggest problem with healthcare today - complexity.

NetApp makes data management easier and more efficient. Instead of throwing money at the problem with oversized silos, ONTAP uses innovation and technology to enable a consistent and guaranteed SLA for each workload on a single platform over any protocol with integrated data protection. These capabilities and tools also extend out to the cloud of your choice as illustrated below.

Scale and simplicity for Healthcare



Epic on ONTAP availability

At the core of ONTAP are nondisruptive operations that enable you to avoid costly interruption to business operations.

NetApp delivers over 99.999999% availability based on production data, which is called home through NetApp Active IQ. Each HA pair in the cluster has no single point of failure. ONTAP dates back to 1992 and is the most widely deployed data management software in the world with an exceptional history of delivering reliable

storage. Now, with Active IQ proactively monitoring and automatically resolving 97% of issues, availability is higher with significantly less support cases.

Epic recommends the use of HA storage systems to mitigate hardware component failure. This recommendation extends from basic hardware (such as redundant power supplies) to networking (such as multipath networking).

When you need to upgrade storage, scale up, scale out, or rebalance workloads across the cluster, there is no effect to patient care. You might move data, but you never again need to disrupt patient care with data migrations or forklift upgrades. Move to next-generation technology, future proof, and avoid hardware lock-in. NetApp even offers a 100% written availability guarantee.

More information on NetApp's reliability, availability, serviceability, and security capabilities can be found in the [NetApp ONTAP reliability, availability, serviceability, and security](#) white paper.

Epic on ONTAP consolidation

One of the major challenges in healthcare is the inefficiency of siloed environments.

Multiple point solutions are created by various groups that impedes progress. Having a unified strategy to data management brings efficiency to accelerate transformation. Disruptive technology like digitizing patient records, Ransomware, and generative AI all the drive the need for consolidation.

With ONTAP you can consolidate file/block/object and each of your tier 0/1/2/3 workloads, on premises and in the cloud, all running on ONTAP.

Epic on ONTAP efficiency

Epic runs on all-flash arrays where most of the cost is the disk. Therefore, storage efficiency is critical for cost savings.

NetApp inline storage efficiency achieves industry-leading savings on storage with no effects to performance, and we even offer a written efficiency guarantee with the all-flash arrays.

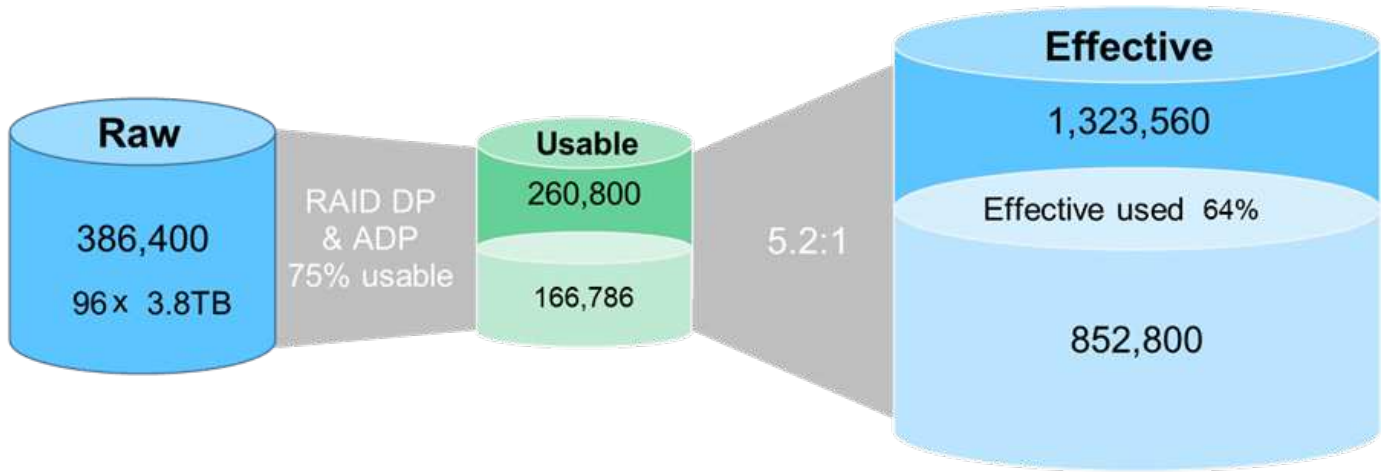
When calculating storage efficiency, it is important to measure raw to usable to effective capacity.

- **Raw capacity** Before any RAID is applied, size of disk by number of disks.
- **Usable capacity** After RAID is applied, how much usable storage is available.
- **Effective capacity** How much storage is provisioned and presented to the host or client.

The figure below is a sample efficiency calculation of a typical Epic deployment including all workloads requiring 852TB of effective storage and with 5.2:1 efficiency delivering 1.32PB of total effective data.



Based on the number of disks, raw-to-usable capacity varies slightly.



NetApp does not use NetApp Snapshot technology or thin provisioning to calculate efficiency in the guarantee program. Doing so would show unrealistic efficiencies of 30-100:1, which do not mean anything when sizing real-world storage capacity.

Epic on ONTAP performance

ONTAP introduced flash technologies in 2009 and has supported SSDs since 2010. This long experience with flash storage allows NetApp to tune ONTAP features to optimize SSD performance and enhance flash media endurance while keeping the feature-rich capabilities of ONTAP.

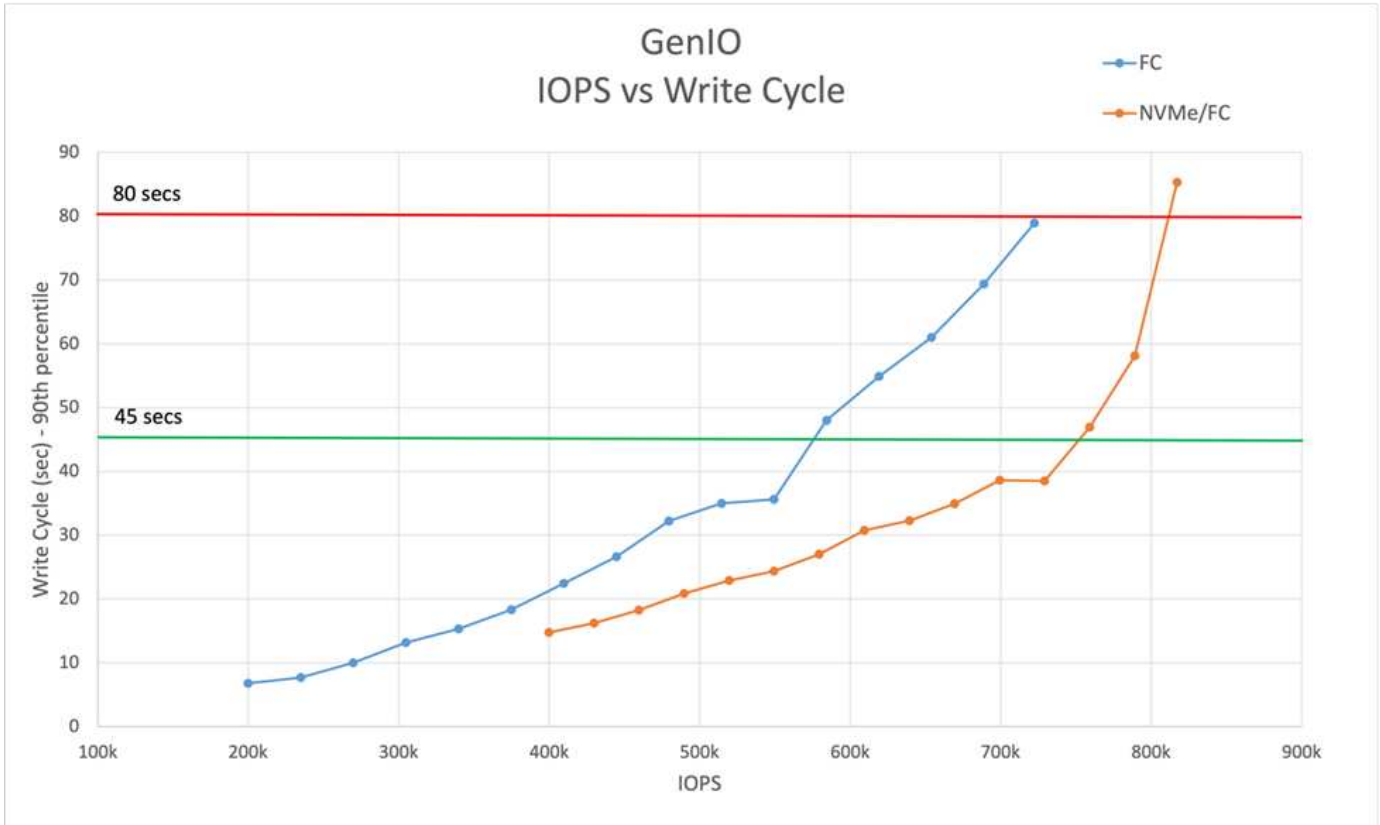
Since year 2020, all Epic ODB workloads are required to be on all-flash storage. Epic workloads typically operate at approximately 1,000-2,000 IOPs per terabyte of storage (8k block, 75%/25% read and write ratio, and 100% random). Epic is very latency-sensitive, and high latency has a visible effect on the end-user experience as well as operational tasks such as running reports, backup, integrity checks, and environment refresh times.

- The limiting factor for all-flash arrays is not the drives but, rather, it is the utilization on the controllers.
- ONTAP uses an active-active architecture. For performance, both nodes in the HA pair write to the drives.
- This result is maximized CPU utilization, which is the single most important factor that allows NetApp to publish the best Epic performance in the industry.
- NetApp RAID DP, Advanced Disk Partitioning (ADP), and WAFL technologies deliver on all Epic requirements. All workloads distribute IO across all the disks. No bottlenecks.
- ONTAP is write-optimized; writes are acknowledged once written to mirrored NVRAM before they are written to disk at inline memory speed.
- WAFL, NVRAM, and the modular architecture enable NetApp to use software to innovate with inline efficiencies, encryption, performance. They also enable NetApp to introduce new features and functionality without impacting performance.
- Historically, with each new version of ONTAP there is an increase in performance and efficiency in the range of 30-50%. Performance is optimal when you stay current with ONTAP.

NVMe

When performance is paramount, NetApp also supports NVMe/FC, the next-generation FC SAN protocol.

As can be seen in the figure below, our GenIO testing achieved a much greater number of IOPS using NVMe/FC protocol versus the FC protocol. The NVMe/FC connected solution achieved over 700k IOPS before surpassing the 45-second write cycle threshold. By replacing SCSI commands with NVMe, you also significantly reduce the utilization on the host.



Epic on ONTAP scalability

The Epic Hardware Configuration Guide accounts for ~20% growth per year for 3 years. However, environments can also grow unexpectedly.

NetApp can seamlessly scale performance and capacity up to 12 nodes for NAS, SAN, and Object clusters. As a result, you can nondisruptively scale up and out as your business grows.

Epic Iris brings added scaling capabilities. It enables larger customers that have multiple Epic instances to consolidate to a single instance. The [NetApp Verified Architecture Epic on Modern SAN](#) document demonstrates that Epic can seamlessly scale consolidated workloads to 720K IOPS on an single HA and scale out to over 4M IOPS in a cluster. You can scale up nondisruptively by upgrading controllers or adding disks to existing clusters.

NAS, SAN, and Object data also has the ability to be moved nondisruptively between nodes in the cluster. Each HA pair in the cluster can be any combination of ONTAP FAS and AFF system types and sizes. You can balance your workloads across a single cluster to maximize your storage investment.

ONTAP also provides the option to use object storage on StorageGRID or the cloud as a backup target and/or automatic cold storage tiering target. This capability enables you to free up expensive, all-flash disks, tier snapshots, and cold data automatically to Object.

The result is that Epic simply runs better with the NetApp product portfolio, leveraging ONTAP, multiple protocols, StorageGRID, and the cloud of your choice. These products provide options for disaster recovery,

archiving, analytics, tiering, and more.

Epic storage efficiency configuration

A snapshot is a point-in-time copy of a volume that is read-only.

A snapshot puts a logical lock on all the blocks in the active file system. NetApp ONTAP Snapshot copies are near instant, and they do not use any additional storage.

Write Anwhere File Layout, or WAFL, is a write-only file system; it does not perform additional IO, such as copying the data in a snapshot-protected block before being overwritten. No data is ever moved; therefore, snapshots have no effect on storage capacity or performance. Snapshots provide tremendous savings in storage while augmenting the backup solution.

FlexClone

A NetApp ONTAP FlexClone volume is a clone of an existing volume or a snapshot of an existing volume. It is otherwise an ONTAP volume like any other, and can itself be cloned, protected with snapshots, and configured with a QoS policy.

As with snapshots, a FlexClone volume does not require any additional space at creation time. Only changes to the clone require additional capacity.

Epic requires 10 to 30 copies of the production databases for various operational requirements such as streaming backups, integrity checks, and staging upgrade environments. The need for a solution built on FlexClone volumes has increased with the move to more frequent upgrades.



A fully automated Epic backup solution and Epic refresh solution are provided by NetApp as part of the solution using Ansible and native NetApp tools.

Epic on ONTAP security

Security is the number one concern for organizations and healthcare executives today. It has never been more difficult to manage, and organizations are challenged with compliance, data governance, antivirus protection, and ransomware.

A complete guide to Epic and storage security is beyond the scope of this document; however, [Security Hardening Guide for ONTAP](#) details all the extensive and advanced security features available with ONTAP.

NetApp Active IQ Unified Manager monitors for security violations based on the information included in [TR-4569](#) and reports them in the dashboard to simplify security management. These tools can help your organization meet your security goals to protect, detect, and remediate against attacks.

NetApp has also partnered with security vendors to provide integration through [NetApp FPolicy](#) software to enhance your security offering. Furthermore, [multifactor \(MFA\) authentication](#) can be added to secure your Epic environment against unauthorized access with leaked credentials.

Finally, ONTAP native Snapshot copies and immutable SnapLock technologies with [ONTAP cyber vault](#), offer a unique air gap capability to protect your patient records against ransomware. See NetApp documentation on [The NetApp Solution for Ransomware](#). For a more strategic approach to security, see [NetApp and Zero Trust](#).

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