Modern SAN for the healthcare industry with NetApp and Broadcom

Modern cloud-connected SAN on all-flash array for tier 1 healthcare industry workloads

n NetApp

Executive summary

This solution brief is part of the NetApp Modern SAN Verified Architecture Program, which provides test results and validated design and configuration recommendations for Epic Electronic Health Records (EHR) deployment. The brief highlights why NetApp is Epic's highest-rated storage platform and how the rich data management capabilities of NetApp® ONTAP® make it the clear choice for Epic deployments. For more than 10 years, NetApp has been a proud partner of Epic, working together to drive next-generation technology while also meeting the ever-changing challenges of healthcare and exceeding the high standards set by Epic Honor Roll.

Questions about meeting the challenges of healthcare are answered in this solution brief for healthcare executives, architects, Epic DBAs, and IT engineers.

Using a proven validated design by NetApp, Broadcom/Brocade, Red Hat, VMware, Lenovo, and Commvault for these Epic deployments ensures:
- Always-available Epic patient records
- Exceeding Epic Honor Roll standards with modernized SAN
- Unmatched TCO and ROI
- Guaranteed performance, data reduction, and availability
- Streamlined IT operations with automation
- Highest levels of performance and scale
- Superior data management
- Industry-leading security and ransomware protection

Our findings validate that the NetApp and Broadcom solution:
- Scales up to 30 times the largest Epic deployments in the world.
- Delivers 7 times the projected scale over the next 3 years.
- Provides 17 times lower latency than Epic requirements.
- Reduces Epic refresh 720 times, from 24 hours to 2 minutes.

Key benefits

- Take advantage of unmatched performance and seamless scaling.
- Consolidate on a single common platform for a broad set of applications: Epic Operational Database (ODB), Clarity, VMware, SQL Server, Oracle, Web BLOB, and VDI.
- Easily exceed Epic Honor Roll requirements and deploy with confidence through validated best practices for design, deployment, and optimized infrastructure with known outcomes.
- Share data across departments, facilities, and institutions to enhance and expand care.
- Confidently grow with massively scalable, secure storage and guaranteed efficiencies, performance, and availability.
- Use Ansible automation workflows for efficient Epic backup and refresh.
- Enjoy superior agility with the most cloud-connected infrastructure for multicloud environments.

Challenges

Healthcare provider organizations remain under pressure to maximize the benefits of their substantial investments in Epic EHRs. As a mission-critical application, Epic has stringent server and storage infrastructure requirements to ensure availability, performance, scale, and robust data management. Healthcare organizations face multiple challenges:
- Prolonged delivery times
- Low budgets
- Lack of IT specialists
- Inefficient silos
- Increased threat of ransomware attacks
- Need to move from fire-fighting mode to business partner
- Need for a strategy to leverage emerging technologies like artificial intelligence and the cloud

Epic users with aging legacy infrastructures that are ready for a refresh can now benefit from an innovative technology solution. You can deploy a solution that increases IT agility, provides seamless scalability, reduces the cost and complexity of Epic data center operations, delivers consistent SLAs, and improves patient outcomes.

With NVMe/FC support, Red Hat Enterprise Linux (RHEL), Broadcom Gen 6 and 7 FC Fabrics, and NetApp A-series arrays, we're ready to enter a new era of wider adoption of NVMe in production environments like Epic EHR. This is possible today only with NetApp storage, with the industry-first end-to-end NVMe/FC platform.

The solution
The goal of all healthcare organizations is to improve patient care. EHRs like Epic, which are at the core of delivering on this goal, represent a considerable investment for healthcare organizations. The traditional approach of building multiple silos for each of the Epic workload pools of storage is costly, inefficient, and distracts from patient care. NetApp and Broadcom have partnered to provide a validated best practice architecture to simplify deployment and remove risk. This approach easily exceeds Epic's Honor Roll requirements and reduces support costs with NetApp, Epic's highest-rated storage vendor.

- Consolidate all Epic workload tiers (pools) and protocols (SAN and NAS) on a single simplified platform.
- Move to NVMe/FC with industry-leading and nvmeexpress.org founding members NetApp and Broadcom.
- Deliver reliable critical patient care with nondisruptive operations and future-proof your infrastructure investment without forklift upgrades.
- Employ automated near-instant backups.
- Reduce automated Epic refresh from 16 to 24 hours to a few minutes.
- NetApp guarantees performance and data reduction with 100% availability.
- Seamlessly scale to meet exponential data growth.
- Consolidate databases for large organizations.
- Connect to the cloud of your choice to meet the demands of your business.

- Transition IT from a fire-fighter cost center to speedy delivery of healthcare applications and innovation using industry-leading data management.

Epic provides detailed hardware requirements in their custom Hardware Configuration Guide. Epic depends on delivering predictable low-latency system performance and high availability. Prevalidated, rigorously tested infrastructure from the strategic partnership of industry leaders is engineered and designed specifically to deliver predictable low-latency system performance and high availability.

The NetApp and Broadcom Verified Architecture Program exceeds Epic system requirements with a modular, prevalidated solution that provides:
- Flexible validated design to host the broad range of Epic workloads
- SAN Modernization with Gen6/7 NVMe/FC
- ONTAP nondisruptive operations that eliminates operational downtime
- A simple, automatable, flexible, and agile software-driven ONTAP architecture
- Consolidation of all Epic pools of storage with Adaptive QoS and NetApp Service Level Manager and NAS and SAN storage
- Cloud-connected storage to the cloud of your choice

The ONTAP cost-effective, efficient foundation is the only storage solution today that delivers a consolidated Epic High Comfort Rated solution for all Epic workloads. (See the Epic quarterly SPATS document for details.)

Working together, NetApp and Broadcom with Epic software enable healthcare providers to deliver better patient care through increased uptime and responsiveness, greater scalability, and reduced costs. Providers can focus on their primary goal: delivering safe, high-quality patient care. By running the Epic environment on this new foundation, healthcare organizations can expect to improve staff productivity while lowering capital and operating expenses.

Additional benefits of running Epic software on NetApp

- **Consolidation**. Confidently run all Epic workloads together using built-in Adaptive QoS and Services Level Manager. Uncover performance issues and complexity, and reduce the need to create more silos.
- **Resource optimization**. Reduce server counts and boost utilization while improving performance using NVMe/FC.
- **Agility**. Reduce complexity and costs, giving your organization greater agility to provision new database replications and environments to support initiatives such as population health management.
- **Productivity**. Deploy quickly and speed Epic applications, greatly reducing end-user log-in times, system response times, report times, and other user interactions.
- **Industry-standard components**. Combine industry-standard compute, networking, storage, and enterprise-class management into a single system running RHEL.
- **Reliability**. NetApp promises 99.9999% reliability but overdelivers with 99.999999%, as shown in the NetApp Active IQ® Digital Advisor tool.

To gain the full benefits of NVMe/FC, the solution must be end to end from server HBA to network and storage. The collaboration of NetApp and Broadcom brings the industry's first end-to-end NVMe/FC solutions together. Today, critical applications like Epic are typically deployed over Fibre Channel, making it the ideal choice for NVMe. Epic has a high comfort level with using FC as the transport. The FCP fabric can coexist with NVMe/FC, simplifying the transition to NVMe.

The components are integrated in a verified configuration that scales from entry-level designs for small hospitals to the largest Epic deployments in the world.

NetApp storage

NetApp AFF performance is optimized with innovative flash technologies and Gen 6 and 7 capabilities. With storage based on NetApp ONTAP, you can use a single storage operating system for flash, disk, and cloud storage.

NetApp AFF systems are the highest-rated storage platform by Epic and the only High Comfort rated solution for both SAN and NAS on a single unified platform. NetApp ONTAP storage offers features that are vital in Epic environments, simplifying management, increasing availability, and reducing the total amount of storage needed. Some of the benefits of using NetApp ONTAP storage include:

- Scale seamlessly with industry-first NVMe/FC.
- ONTAP is the only High Comfort storage platform to consolidate NAS and SAN.
- ONTAP is the only storage software approved by Epic to consolidate all Epic pools of storage.
- Guaranteed performance: Simple delivery of Epic's performance SLAs using the built-in Service Level Manager.
- Guaranteed data reduction: Realize 5:1 data reduction.
- Guaranteed 100% availability.
- NetApp FlexClone® technology allows near-instant creation of readable/writable database copies like SUP, REL, and PJX, regardless of size.
- Integrated data protection and disaster recovery features help customers protect critical data assets and provide disaster recovery.
- Nondisruptive operations mean that upgrading and maintenance can be performed without taking data offline.
- Other features include security compliance and ransomware prevention, detection, and remediation.

NetApp Verified Architecture results

Lab setup

We configured and installed ONTAP 9.8 on two AFF A800 storage systems, and connected eight Fujitsu PRIMERGY RX2540 M4 servers running RHEL 8.2 with Broadcom LPe32002 HBAs and NVMe/FC end-to-end Brocade G630 switching. On each A800, we created two aggregates and four storage virtual machines. Each aggregate contained 16 volumes and 16 namespaces, with each volume containing a single namespace.

GenIO performance testing

Our test results show an A800 HA pair running Fibre Channel Protocol (NVMe/FC to come) at more than 600K GenIO IOPs, meeting all Epic requirements at 60μs write latency. These numbers showcase the unmatched performance and scale of the fastest storage platform in the world. The NetApp solution can seamlessly scale to 1750 Global References.

Clarity-Oracle performance testing

For Epic's largest customers, consolidating all the data into a single instance requires a storage platform that provides seamless linear scaling. Customers expect up to 250TB in database size and performance of 500K IOPs. The results in the following figure show that the A800 HA can easily exceed these requirements, with the ability to scale to 10 times.

About NetApp

In a world full of generalists, NetApp is a specialist. We're focused on one thing, helping your business get the most out of your data. NetApp brings the enterprise-grade data services you rely on into the cloud, and the simple flexibility of cloud into the data center. Our industry-leading solutions work across diverse customer environments and the world's biggest public clouds.

As a cloud-led, data-centric software company, only NetApp can help build your unique data fabric, simplify and connect your cloud, and securely deliver the right data, services and applications to the right people—anytime, anywhere. www.netapp.com

Clarity Oracle - ONTAP Scale Out

| | Epic Required IOP Scale | IOPs per A800 HA | OPs per 16-node A800 cluster |

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