ABSTRACT

Epic’s Electronic Health Records (EHR) solution offers healthcare organizations a powerful way to meet the requirements of the Affordable Care Act and demonstrate meaningful use of EHR systems—a critical aspect of the HITECH Act. Due to its unique design, Epic EHR requires a carefully planned information infrastructure to ensure proper performance and avoid risks. This white paper presents recommendations from EMC, including specific sizing and configuration guidelines for storage and backup and recovery solutions, to minimize risk and achieve high-quality, reliable results from an Epic EHR deployment.

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EXECUTIVE SUMMARY

As healthcare organizations seek ways to improve accountability of care and demonstrate meaningful use of electronic health record (EHR) technologies, many are turning to Epic. The Epic EHR features a single, patient-centric database that provides an end-to-end view of individual patients as they move through the healthcare system.

A powerful way to facilitate meaningful use, the Epic EHR application environment employs a distinctive architecture that requires special planning and expertise when designing the underlying information infrastructure. Given the size and scope of an Epic EHR, such an undertaking carries tremendous risk if appropriate design considerations are not followed.

EMC Healthcare Solutions for Epic EHR are uniquely qualified to mitigate the risks associated with deploying Epic. With more Epic experience than any other vendor and deep Epic knowledge, EMC is able to recommend and design optimal storage and backup and recovery configurations, two key components of an Epic IT infrastructure, to meet Epic’s strict availability and performance requirements. In addition, EMC has developed best practices from its direct field experience that go beyond Epic’s baseline requirements.

This white paper provides specific design guidance and recommendations to help healthcare providers build or enhance their IT infrastructures, avoid common pitfalls, and maximize their results from Epic EHR implementations—often the most significant and impactful IT projects in the history of their organizations.
INTRODUCTION
The healthcare industry has been undergoing a transformation as provisions of the U.S. Affordable Care Act go into effect. One of the most important—and challenging—elements of the Act is ensuring accountability of care to improve patient outcomes and reduce readmission rates. In fact, strong financial incentives for healthcare provider accountability are coming into play as the industry moves from a pay-per-service to pay-per-patient model. In this new world, patients will pay a single fee for treatment of a condition without being charged separately for complications or additional treatments arising from the original illness.

To cost-effectively handle the demands of healthcare transformation, clinical and administrative operations must have visibility and coordinated control over every aspect of patient care—from the emergency room and radiology to pharmacy and bedside monitoring. Electronic health records (EHRs) offer a powerful solution, and the Health Information Technology for Economic and Clinical Health (HITECH) Act provides healthcare providers that demonstrate “meaningful use” of their EHRs with government funding.

All of these factors are driving a growing number of healthcare organizations to deploy Epic EHR. One of the biggest challenges in demonstrating meaningful use is managing the many disparate systems across healthcare organizations. Epic addresses this need by providing an end-to-end view of each patient, integrating data from across the healthcare spectrum. It also provides a foundation for evidence-based decision support, quality management, and outcomes reporting to optimize care at every level.

Epic’s unique architecture is based on a single, patient-centric database built on Caché, a database environment developed by InterSystems Corporation (Figure 1). Everything in the Epic environment is tightly integrated with Caché, making its performance vital to the EHR’s success. In fact, Epic’s Caché requires a response time of 15 millisecond-read latency and less than one millisecond-write latency to meet minimum application-level performance requirements.
Epic’s EHR solution also includes its Clarity (an SQL database) reporting application, which is built on a relational database foundation. With clinicians and administrators focused on gaining intelligence and insights to enable more proactive decision-making and increased efficiency throughout the course of patient care, Clarity is also a very performance-intensive component of the Epic environment. As accountable care reporting becomes increasingly important and adopted more widely, additional pressure will be placed on the Clarity database.

A very recent change to the Epic Reporting Environment is the development of the Cogito Data Warehouse (also an SQL database). The Cogito environment while only being rolled out to new customers as a Test environment will soon come into play as a primary Data Warehouse with a greater focus on enterprise reporting, including the ability to directly ingest data from other third party applications like People Soft, Lawson and SAP. The goal of this new data warehouse is to create a true enterprise level view of the organization. Although specific performance needs of this new environment are not fully known at this time, the expectation is that Cogito will behave very similar to Clarity.

Typically representing one of the biggest investments a healthcare organization has ever made, Epic EHR projects offer healthcare providers enormous benefits and savings when deployed correctly.

The top priorities for any Epic infrastructure are ensuring high application availability and performance in a stable and consistent presentation methodology throughout the expanded health care system. This requires not just robust, highly reliable hardware and software, but also precise sizing of infrastructure components to deliver adequate performance and capacity. An effective, enterprise-wide backup and recovery plan also must be included. Falling short puts the entire EHR implementation—and healthcare organization—at tremendous risk.

**INVESTMENT IN EPIC AND HEALTHCARE**

When it comes to mitigating risk and delivering predictable results for Epic EHRs, EMC is one of the industry’s most qualified companies to assist healthcare providers in these implementations. EMC has made strategic commitments to Epic in the form of people, process and technology, including multimillion-dollar investments in test and development performed jointly with Epic and its customers to optimize solutions for Epic EHRs. In addition, EMC maintains an EMC Healthcare E-lab specifically for testing joint customer solutions, the results of which are shared with Epic to enable continuous quality improvement.

EMC is one of the few vendors to provide dedicated Epic account teams for both pre- and post-sales that include technical, implementation and service specialists and managers, many of whom focus exclusively on healthcare and Epic.

Team members also conduct Epic design workshops focused on the individual needs and objectives of healthcare organizations. These workshops go beyond Epic’s baseline requirements to take a holistic view of the healthcare enterprise. This is critical because Epic EHR transforms the business of healthcare impacting both the organization and its existing IT infrastructure. Epic,
with its unique and high service level requirements, will become tightly integrated with other applications that will provide timely patient information to Epic and the Caché database. An outage, poor performance, or a failure to protect or restore data from any one of these now critical applications can impact the quality of patient care negatively.

Benefiting from its in-depth Epic expertise, EMC has developed an Enterprise Reference Architecture (Figure 2) based on optimal storage and backup and recovery configurations to meet Epic’s strict availability and performance requirements. The reference architecture provides healthcare providers with the flexibility to select customized configurations that address their specific requirements.

![Figure 2 – Epic Enterprise Reference Architecture](image)

EMC’s suite of EMC VNX unified storage and EMC Symmetrix VMAX enterprise storage solutions deliver extremely high performance to support the intensive I/O workloads typically generated by large Epic environments. In addition, these storage platforms provide the high availability and simplified administration needed to ensure a stable delivery platform.

For comprehensive protection of Epic and other applications, healthcare providers often leverage EMC Avamar deduplication backup software and system and EMC Data Domain deduplication storage systems. These solutions ensure fast, secure and highly reliable data recovery and backup well within the strict service levels specified by Epic in the event of a data loss.

In addition, EMC has developed several Epic-specific sizing and performance simulation tools that ensure optimal infrastructure design. And because EMC considers Epic such an important partner, Epic’s IO profile has been integrated into EMC’s regression testing on both EMC’s VNX and Symmetrix VMAX platforms. EMC also provides a wide range of governance, risk and compliance capabilities woven into the fabric of its infrastructure solutions for Epic.

With the strength of EMC’s infrastructure solutions and its commitment to Epic, EMC has accumulated vast Epic experience and expertise. For example, EMC has deployed infrastructures for more than 60 percent of all Epic installations (Figure 3), including nine of the 10 largest Epic customers. These healthcare providers depend on EMC to deliver innovative Epic lab-tested solutions that provide their clinicians with fast, reliable access to patient and medical information for prompt, accurate diagnoses and decision-making.
BROAD RANGE OF EPIC STORAGE REQUIREMENTS

Validated by Epic as infrastructure technologies for its healthcare solutions, EMC Symmetrix VMAX and EMC VNX storage meet the full spectrum of rigorous performance and availability requirements of Epic environments. For example, EMC Symmetrix VMAX enterprise storage systems, which currently support more Epic production environments than any other storage platform in the industry, are suited for high-demand, larger Epic environments.

To help healthcare providers comply with Health Insurance Portability and Accountability (HIPAA) and HITECH availability requirements, VMAX provides uptime levels of 99.9999 percent across all aspects of healthcare service delivery in Epic environments (Figure 4). VMAX also scales to petabyte levels to handle the largest Epic environments.

In addition, VMAX consolidates front-end global memory and back-end functions, enabling direct-memory data access for optimized I/O operations. This is an ideal design for Epic’s performance-sensitive Caché database.

VMAX dynamic cache partitioning allows Epic customers to prioritize their I/Os so that the production database meets a consistent performance service-level agreement (SLA). Federated Tiered Storage (FTS) for VMAX allows external arrays to be used either as capacity pools leveraging EMC FAST VP (Fully Automated Storage Tiering for Virtual Pools) or managed as pass-through devices.
For security, VMAX supports a wide range of solutions from RSA, the security division of EMC, including two-factor authentication and encryption. In fact, VMAX is the only storage solution with data at rest encryption technology that has zero impact on production performance.

**EMC VNX UNIFIED STORAGE**

EMC VNX unified storage provides Epic environments with advanced efficiency, five-nines availability, management tools and built-in protection software. In addition, VNX storage leverages innovative Flash drives to deliver sub-millisecond reads of Epic data.

VNX also enables healthcare organizations to cost-effectively manage multi-protocol file systems and multi-protocol block storage on a single, unified platform. With fast-growing Epic environments, centralized management and visibility across diverse storage assets enables healthcare providers to scale more efficiently and smoothly.

**MEETING CACHÉ PERFORMANCE DEMANDS WITH FLASH DRIVES AND STORAGE TIERING**

In both VMAX and VNX environments, Flash drives provide a high-performance advantage for handling the production Caché database. Figure 5 illustrates the impact of replacing traditional fibre channel disks with enterprise flash drives, which reduced average read times from more than 12 milliseconds to between 1 to 2 milliseconds in a customer’s Epic environment.

![Figure 5 – Epic Caché read times before and after enabling Flash drives](image)

Other advantages of Flash drives include significant improvements in batch processing, as well as database integrity checks. Epic considers database integrity checks an absolute necessity, and expects them to be run at least weekly against the production database rather than a copy. Flash drives enable this task without any degradation of production performance.

In addition, EMC’s Fully Automated Storage Tiering for Virtual Pools (FAST VP) on the VMAX and the FAST Suite on VNX increase the efficiency of storage running non-production components of the Epic environment. FAST VP and the FAST Suite make it possible to allocate less-costly, high-capacity storage disk for non-production environments while still providing necessary performance.

VFCache extends FAST technology to the server, adding another tier of intelligence and performance to the I/O stack. This integration eliminates the I/O gap that would cause an application server to process more I/O than the disk drives can deliver. When coupled with FAST, VFCache creates the most efficient and intelligent I/O path from the Epic application to the data store. With both FAST and VFCache technologies, EMC provides an end-to-end tiering solution that optimizes Epic capacity and performance from the server to the storage.

**VIRTUALIZING EPIC ENVIRONMENTS**

While the majority of Epic environments still run in physical environments, healthcare providers are seeking to virtualize more of their EHR infrastructures.

To aid in this transition, EMC storage and backup and recovery solutions feature tight integration with VMware for both server and desktop virtualization. In fact, EMC and VMware have 75 integration points between the two product lines – more than any other storage vendor in the industry.

In addition, Epic and EMC are collaborating on development and testing that would enable Epic customers to virtualize desktop environments as well as large-scale databases.
Another way for healthcare organizations to leverage EMC storage technologies in virtualized environments is with Vblock Systems, which integrate compute, network, virtualization and storage technologies in a single converged infrastructure. Offering high performance and streamlined administration, Vblock Systems are managed with a common interface that provides healthcare organizations with end-to-end visibility of the Epic EHR infrastructure.

**EPIC STORAGE SIZING AND CONFIGURATION BEST PRACTICES**

Special care must be taken when configuring and sizing the underlying Epic EHR infrastructure to ensure a positive end-user experience and meet expectations for meaningful use. Storage platform selection is based on multiple factors, such as desired availability and anticipated workload complexity. For example, VNX delivers five-nines availability while VMAX provides six-nines of availability. In addition, Epic’s InterSystems Caché database requires a specific, high-performance storage design to address its unique write methodology.

Drawing on its extensive healthcare and Epic expertise, EMC offers specialized Epic delivery teams to work with healthcare organizations throughout the design and implementation process. EMC’s approach is to start with Epic’s prescribed “Hardware Configuration Guide” and then optimize the configuration and sizing based on EMC’s field experience and knowledge of growth patterns typical in Epic environments.

Initially leveraging Epic’s guide to generate sizing data, EMC then implements its own tools to apply Epic-specific algorithms to the data and determine the required storage sizing. All aspects of the array are taken into consideration—from the processor and engines to the disk itself (Figure 6).

EMC’s Epic technical consultants work directly with the healthcare organization’s IT team to perform these sizing calculations. Once the data has been validated, EMC Professional Services works with EMC’s Epic Healthcare Solutions Practice organization to successfully deliver the solution.

**UNDERSTANDING EPIC DATABASE DESIGN**

To effectively configure storage infrastructures for Epic, it’s important to understand the distinct I/O patterns for both the Caché and Clarity databases.

Caché is designed with an I/O access pattern of continuous, random database file reads interspersed every 80 seconds by large bursts of writes. To ensure acceptable user response times, the flush of writes must be completed before the next write cycle begins, preferably in less than 30 seconds. Consequently, the write cache must be sized on the storage system to handle this periodic flush of writes without forcing a de-stage from cache to disk.

As virtualization of Epic environments spreads, sizing must also be considered for any virtual machines (VMs) that are hosting the production Caché database.

By contrast, the Clarity database running on a Structured Query Language relational database server has two distinct workloads—ETL (extract, transform, load) and reporting. The ETL workload is characterized by long, sequential write operations sometimes lasting up to six hours. The reporting workload is read-intensive and varies based on an organization’s individual level of report consumption.

To handle Clarity’s I/O profile, EMC recommends VFCache with Peripheral Component Interconnect Express (PCIe), Flash technology and intelligent caching software. This combination accelerates read operations for SQL Server databases by reducing latency and increasing throughput.
OPTIMAL STORAGE ARCHITECTURES FOR EPIC DATABASES

The standard storage architecture recommended by Epic includes two arrays deployed in separate data centers (Figure 7). In this design, the production Caché database is replicated via asynchronous Cache Shadowing in a manner similar to log shipping. Additionally, some EMC-Epic customers implement synchronous and asynchronous storage replication software for the non-production databases and other data like the Web Blob or Virtual server environments.

Epic defines multiple disk pools each based on workload characteristics. Applications and functions with offsetting workloads are generally placed together in a single disk pool.

Each disk pool in the Epic architecture demands a specific and distinct configuration. For example, in Disk Pool 1 (production Caché database), all drives must be dedicated to the Caché workload regardless of which disk tier is used—Fibre Channel, SAS or Flash. In fact, even Flash drives must be sized to hold the entire Caché database. RAID 1-0 is recommended for Fibre Channel or SAS and RAID 5 for Flash drives.

When Caché is configured for VMAX, EMC recommends that a quantity of front-access (FA) ports be dedicated to adequately handle the write bursts without diminishing performance.

Similarly, VNX running Caché requires a sufficient number of LUNs to spread the load across all back-end loops. EMC estimates eight LUNs for all sites under 10,000 IOPS and one additional LUN per 1,000 reads above 10,000 IOPS.

EMC specifies Fibre Channel with RAID 10 for the journal, application and shadow files in Disk Pools 2 and 3.

For Clarity, non-production Epic components and the BLOB (binary large object base) for disaster recovery, EMC recommends RAID 5 Fibre Channel or SAS drives in Disk Pools 4, 5 and 6. Epic very recently implemented a performance requirement for the Web Blob data requiring high speed disk for performance.
To further optimize performance, efficiency and capacity, EMC’s FAST VP or FAST Suite can be leveraged in Disk Pools 4 and 5. EMC suggests increasing capacity of these disk pools by 20 percent over standard storage configurations to maintain adequate capacity as additional clones, training environments and other requirements are addressed. The use of FAST technology for the Web Blob will accommodate the recently introduced performance requirements.

REPLICATION AND CLONING BEST PRACTICES

For increased protection, EMC recommends replicating Clarity to another disk pool at the secondary site using low-performance asynchronous or batch techniques. In addition to BLOB disaster recovery, which is standard in Epic environments, EMC also advises replicating VMs in the Epic production environment to the secondary site for business continuity.

Finally, for clone space allocated in Disk Pool 7, EMC recommends leaving the clone fractured throughout the day and resynchronizing at night to avoid a write penalty. Fifty percent of the database drives can be allocated for faster resynchronizing, or higher-speed drives can be added to further accelerate the process.

In addition, EMC suggests a minimum of two clones of the production Caché database on a rotating basis, keeping one clone offline at all times while the second clone is synchronizing. This allows for simplified operational recovery if file corruption or data loss occurs.

EMC’s Epic technical consultants assist healthcare providers with determining the number and size of all clones needed for support, training, test and development. Implementing clones correctly minimizes the need for configuration work and eliminates the need for manual copy processes in the future.

BACKUP AND RECOVERY SOLUTIONS FOR EPIC

With so many aspects of a healthcare organization relying on Epic and its single, patient-centric database, protecting this application is critical. Because of Epic’s unique design and intensive demands on an infrastructure, an effective enterprise backup and recovery solution must address several key requirements.

First, Epic environments often are very large. Traditional approaches to backup, such as tape, typically struggle to keep up with the exponential growth that can occur with an Epic EHR. Secondly, it’s important to address the diversity of data types in Epic. An appropriate backup solution for an Epic EHR must be comprehensive enough to address the unique characteristics of Caché, Clarity, VMs and file systems. Finally, effective offsite data replication is necessary to ensure recoverability if the primary site was disabled.

In addition, Epic has mandates that must be followed, such as daily full backups and recovery windows of six hours or less.

EMC, a market leader in purpose-built backup and recovery appliances, has developed proven best practices for protecting Epic repositories, including Caché and Clarity, and offers tight integration with VMware vSphere. EMC also delivers a complete backup and recovery portfolio that can perform and scale at pace with growing Epic environments.

PROVEN BACKUP AND RECOVERY RESULTS

EMC backup and recovery solutions offer advantages in four key areas: disk-based backup leveraging variable-length deduplication technology, intelligent replication, rapid recovery and global reporting. The impact of these capabilities on numerous Epic customers has been profound:

EMC’s variable-length deduplication technology helped one Epic customer reduce storage requirements for one month’s worth of full daily backups from 37 terabytes to less than one terabyte.

Another healthcare provider enabled disaster recovery from a remote location by replicating only deduplicated backup data over the network and shrinking data and network bandwidth utilization by 99 percent.

One Epic customer recovered 31,000 patient records three times faster with EMC than its previous solution.

Another healthcare organization relying on Epic automatically monitors and reports on backup operations across multiple sites from a single console, tracks efficiencies and predict capacity usage—all with EMC reporting tools.
ENTERPRISE BACKUP AND RECOVERY

At the core of EMC’s backup and recovery suite of solutions are EMC Avamar deduplication backup software and system, and EMC Data Domain deduplication storage systems (Figure 8). These solutions deliver the full daily backups and rapid recovery demanded by Epic, as well as extend data protection across the entire healthcare provider’s environment, including virtualized environments, file systems and other enterprise applications.

AVAMAR: DEDUPLICATION BACKUP SOFTWARE AND SYSTEM

Avamar features variable-length client-side deduplication, which significantly reduces backup times by sending only unique changed blocks to the primary Avamar Data Store, while always maintaining daily full backups for immediate single-step restore. Avamar provides single file recovery in minutes. In addition, the Avamar Data Store scales to 124 terabytes of deduplicated capacity to handle the largest Epic environments. With its powerful capabilities, Avamar helps Epic:

- Reduce data moved to backup targets by up to 95 percent
- Lower CPU usage as much as 80 percent
- Shrink backup times by up to 90 percent
- Decrease data stored as much as 30 times
- Narrow replication bandwidth by up to 99 percent

Avamar also offers tight integration with VMware’s vStorage API for Data Protection (VADP), enabling both guest and image-level backup of VMs. In VMware environments, Avamar leverages Changed Block Tracking for both backup and recovery, enabling extremely fast recovery of VMs. With Avamar protection of both physical and virtual infrastructures, healthcare providers can advance virtualization of Epic and other applications with confidence.
INTEGRATING AVAMAR AND DATA DOMAIN FOR LARGE EPIC ENVIRONMENTS

For larger Epic implementations, EMC recommends integrating Avamar with EMC Data Domain Systems through Data Domain Boost software, which provides access to an additional 570 terabytes of usable capacity. The Data Domain system is built for very high throughput—up to 31 terabytes per hour—to support large databases such as InterSystems Caché. In addition, Data Domain system also can be integrated with any of the leading backup management solutions such as EMC NetWorker for streamlined administration.

Backup performance can be enhanced even further with Data Domain Boost software. By distributing portions of the deduplication process to application clients, Data Domain Boost speeds backups by up to 50 percent, enables more efficient resource utilization and provides application control of the Data Domain replication process.

To meet the six-hour recovery requirement in a large Epic environment, a typical scenario would leverage Avamar agents enabled with Data Domain Boost to back up the Caché and Clarity databases to Data Domain, while backing up the remainder of the Epic environment directly to Avamar. The result is a single, integrated, enterprise-class backup and recovery solution that meets the needs of the entire Epic environment while still leaving enough bandwidth and capacity to handle other enterprise applications.

COMPREHENSIVE REPORTING

To enable global reporting, EMC offers Data Protection Advisor (DPA)—an end-to-end monitoring, reporting, and analytics tool. DPA collects data from across all elements of the data protection environment, with built-in support for both physical and virtual environments. It provides predictive analysis, which constantly monitors for failures, developing conditions or thresholds, and then automatically alerts backup administrators via email, SNMP, scripts or Windows Event Logs.

More than 400 DPA automated reports on capacity management, backup completion, utilization, performance and other measures, are automatically delivered to IT, compliance and hospital executive staff. The result is a more secure, reliable and efficient backup infrastructure.

BEST PRACTICES FOR BACKUP AND RECOVERY INFRASTRUCTURE DESIGN

Because of Epic database’s structure, which spans eight file systems, EMC recommends separating backups into four to eight data sets. EMC also suggests frequently backing up journal files as well since Caché writes to a journal file between write bursts that occur every 80 seconds. This approach provides a more comprehensive backup and reliable recovery.

In addition, the maximum concurrent file count for an Avamar client writing to Data Domain is 1,000 files. As a result, it may be necessary to install multiple Avamar clients to allow concurrent backup and restore streams between Avamar and Data Domain.

To ensure strong backup and recovery performance, the Avamar client proxy server requires sufficient processor cores and memory. A minimum of one processor core and two gigabytes of memory for each data stream on the backup proxy server will be needed. EMC also recommends 10 Gigabit Ethernet network cards to provide the best performance for backup and restore in an integrated Avamar and Data Domain environment.

Figure 9 details EMC’s recommendations on sizing and configuring the backup and recovery infrastructure and aligning them with retention and recovery timeframes.
**DATA MOBILITY AND ACCESS**

EMC VPLEX, an appliance that resides between a healthcare provider’s Epic servers and heterogeneous storage assets, delivers data mobility and access within, across and between data centers for large Epic environments and multi-site deployments. It uses a unique clustering architecture that enables servers at multiple data centers to have read/write access to shared block storage devices.

Federated AccessAnywhere technology developed by EMC and available with VPLEX enables a single copy of Epic data to be shared, accessed, and relocated over distance. This provides healthcare providers with transparent load sharing across multiple sites, as well as the flexibility to relocate workloads across sites to manage peak periods of activity. If a disruption at occurred at one data center, the failed services can be restarted at the surviving site with minimal effort while minimizing time-to-recovery.

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<td>Nightly</td>
<td>Snapshot</td>
<td>Caché DB (Flat File)</td>
<td>7 days</td>
<td>8 hours</td>
</tr>
</tbody>
</table>

*Figure 9: EMC Recommended Sizing for Epic Backup and Recovery*
DEDICATED EPIC SERVICES AND SUPPORT

To further ensure quality of deployment, a dedicated Epic service account manager collaborates with healthcare organizations to serve as a single point of contact for every stage of planning, designing, implementing and supporting a backup and recovery solution for Epic.

Often working with EMC Professional Services, the service account manager brings deep Epic expertise and skills to coordinate the delivery of the EMC backup and recovery technologies, services and support resources. In addition to advising on best practices and managing code upgrades and fixes, the Epic service account manager also provides proactive service and prompt problem resolution.
THE INEVITABLE CONCLUSION

As healthcare organizations evolve to address requirements of the Affordable Care Act and HITECH, EMC is committed to helping them maximize investments in critical technologies such as Epic EHR. EMC invests millions in developing and testing solutions with Epic and continues to expand its dedicated Epic sales, support and services teams.

More than 170 Epic hospital implementations, including Epic’s largest customer, rely on EMC’s infrastructure solutions. In addition, approximately 80 percent of new Epic deployments in the last 3 years are supported by EMC storage. The knowledge and insights gained from this experience enable EMC to mitigate risk and ensure more predictable results for Epic implementations.

EMC solutions have been extensively proven to deliver leading performance, availability, scalability and reliability in the most demanding Epic environments—production as well as test and development. EMC’s suite of storage and backup products deliver database response rates that exceed Epic’s specifications, enable daily full backups with no performance degradation and ensure recovery within Epic’s strict six-hour window.

Epic supports the use of EMC for its environments and develops new Epic software using EMC storage platforms and information management tools. EMC and Epic are committed to exploring new, innovative ways to enhance EHR for the future, including virtualization and cloud-based initiatives.

With EMC, Epic customers are assured of receiving the technologies and services to optimize the quality and efficiency of care, accelerate diagnoses and decision-making, and deliver better long-term outcomes for their patients.

CONTACT US

To learn more about how EMC products, services, and solutions can help solve your business and IT challenges, contact your local representative or authorized reseller—or visit us at www.EMC.com.