EMC Business Continuity Solutions for Healthcare Environments

High availability for clinical and business applications
Abstract

The introduction and increasing reliance on advanced clinical systems in the delivery of healthcare has highlighted the dependence on IT departments to make patient information accessible at all times for safer, more efficient patient care. At the same time, developments in information management software and storage technology have made enterprise-wide business continuity solutions more affordable for healthcare organizations of all sizes. This EMC® Perspective outlines the growing importance placed on creating robust healthcare IT environments that incorporate information management and business continuity strategies for high availability, protection, and the quick restore of clinical and business applications.

Information accessibility leads to safer patient care

The delivery of clinical care involves a complex web of caregivers as patients are diagnosed, treated, and monitored over the course of their health episode. As more patient information moves to digital format through online nursing and physician documentation—clinical workflow and turnaround times are being accelerated as diagnoses are made more quickly and accurately.

Healthcare organizations are in the process of implementing Picture Archiving Communications Systems (PACS), Computerized Physician Order Entry (CPOE), Electronic Health Record (EHR), Clinical Data Repositories (CDR), and other healthcare applications to expedite safer patient care. As these critical applications “go live,” clinical practice becomes more dependent on the availability of realtime patient information and decision-support systems to further reduce medical errors—including adverse drug events.

The adoption of CPOE and medication administration systems in conjunction with clinical decision-support systems provides caregivers with new online tools to enter orders for medications, diagnostic tests, and ancillary services. With standardized processes for ordering, transcribing, dispensing, administering, or monitoring of medications, clinicians are provided with immediate feedback on drug interactions, dosage, or allergy checking at the point-of-care.

Migration from a film-based imaging infrastructure to a PACS environment is enabling cardiologists and radiologists to acquire, transmit, store, retrieve, and display digital images and related patient information from a variety of imaging sources and to share this information in real time with referring physicians. Modalities such as CT, MRI, ultrasound, conventional x-ray/mammography are now widely adopted while new and innovative technologies like 64-slice CT, PET-CT, flat panel digital x-ray and digital mammography are beginning to take hold.

Due to the highly integrated nature of healthcare IT, organizations need to ensure that they review the impact of the business systems within the clinical setting. For instance, scheduling, registration/admissions, supply chain, bed management systems and integration engines typically require high availability for maintaining normal operations within a hospital setting. And, as insurers begin to provide reimbursement for electronic communications with patients, e-mail is also becoming a mission-critical application for communications between caregivers, clinicians, and patients.

New information technology challenges

Historically, healthcare organizations have been successful in deploying innovative technologies, modalities, and software functionality as additional tools to deliver safer medical practice. As clinical practice reliance on digital information grows, new information technology requirements and challenges must be addressed.

The impact of a potential outage becomes magnified as access to critical information is no longer available. Once CPOE and other advanced clinical applications have been implemented, information availability is required around the clock. Healthcare organizations must create business continuity plans that include redundant networks, redundant application servers, and redundant data to achieve zero downtime and reliable performance. CIOs and IT organizations, now an integral part of care delivery, must build architectures that can respond to these new healthcare operational realities.

Even a short-term outage can have a major impact on patient care and business operations, when split-second decisions are required. Loss of critical records resulting from an...
outage can impact regulatory compliance requirements and the healthcare enterprise's ability to manage billing, cash flow and accounts receivables. These factors, plus the growing requirements to meet regulatory demands that dictate the need for information protection and recovery, have forced healthcare enterprises to reassess data protection levels and to explore more robust business continuity solutions.

Until recently, comprehensive business continuity solutions may have been financially impractical to deploy throughout the healthcare enterprise. Fortunately, technology developments have made a growing number of affordable solutions available. Clinicians can now store, retrieve, transmit, distribute, archive, and display patient information without disruption caused by either planned or unplanned outages, obsolete storage technology, or network events that went undetected.

**EMC intelligent information infrastructure for high availability**

Achieving and maintaining high availability for healthcare environments requires an enterprise-wide focus, and a clear understanding of the gaps between current and desired status, with a plan to bridge these gaps. Healthcare organizations need to consider server and storage platforms, recovery plans and tools, network management, support services, and how these components work in concert. Typically, healthcare organizations include executive management, IT, business and clinical end users as team members who determine the risk management impact as they design and implement their business continuity plan in a phased approach.

EMC offers several key infrastructure components to economically deliver highly available applications to the full spectrum of healthcare IT consumers including physician practices, departments, hospitals, enterprises, IDNs, and RHIOs. These components, when combined with clinical and business application software from EMC partners, deliver continuous information availability and protection to enable continuous hospital operations.

These components include:

- Tiered-networked storage platforms that provide the availability, reliability, scalability, and performance needed by the healthcare enterprise.
- Server virtualization to dynamically map computing resources to the healthcare enterprise. IT costs with the ability to treat the data center as single pool of processing, storage, and networking power.
- Information management and protection software to meet recovery-point and recovery-time objectives for business continuity and disaster recovery plans and to maintain the privacy and security of patient records, confidential e-mails, and other communications.
- Active archiving components to provide secure and rapid recall of historical images and to meet state, federal, country, and HIPAA regulatory requirements for records retention.
- Enterprise network management capabilities to proactively identify network problems and automatically escalate resolution to minimize or completely avoid network disruptions.
- Healthcare applications provided by EMC Healthcare PACS, EHR, and CPOE partners that are integrated with this EMC intelligent information infrastructure to deliver a highly functional and available applications environment.

This information infrastructure, built for reliability, supports both short-term access and long-term archiving and can be integrated with cardiology, radiology and other clinical and business systems to automate workflow and streamline operations. The EMC infrastructure is clinically optimized with EMC partners' applications to expedite information access, retrieval, backup, recovery, archiving, and other required functionality.

EMC and its partners help healthcare enterprises accelerate their digital transformation by combining the servers, storage platforms, and software with implementation services, problem escalation policies, and support plans.
**Tiered networked storage platforms to meet performance and recovery objectives**

The EMC Symmetrix DMX™ series is designed to meet the most demanding service levels and addresses the critical challenge of managing ever-escalating healthcare information growth. Healthcare organizations can consolidate, protect, and keep patient information available at all times—even in the event of a failure or site disaster. DMX users can optimize storage resources, support multiple service levels, centralize management, and reduce the total cost of ownership.

The EMC CLARiiON® CX3 UltraScale™ series is designed to deliver maximum healthcare application performance, scalability, reliability and ease of use. Each of the three CX3 models allows IT organizations to capitalize on its 4Gb/s capabilities for high performance and quick retrieval times of patient information and medical images. The system offers seamless scalability and users can deploy a combination of disk drive technologies simultaneously in one system. Data can be moved non-disruptively between storage tiers with CLARiiON Virtual LUN technology as application and service-level requirements change.

The EMC Celerra® family of IP storage offers a full range of solutions that enable healthcare IT organizations to meet requirements from the data center to a network of remote clinics or imaging centers. All systems support NFS, CIFS, and iSCSI protocols, making it easy to consolidate file servers and direct-attached storage onto a single platform.

EMC Centera™ content-addressed storage (CAS) offers fast access to online archived medical images and patient information and can be customized based on clinical protocols to meet defined organizational services levels for record access and long-term protection.

The diagram below depicts how EMC tiered networked storage platforms can be deployed to support healthcare applications.

**Server virtualization**

EMC virtualization solutions help optimize a healthcare organization’s computing assets—including applications, databases, servers, and storage—into a simple, cost-effective, flexible, tiered architecture that aligns with healthcare provider requirements. EMC provides solutions for a wide range of enterprise virtualization requirements, including application testing to disaster recovery platforms that allow healthcare IT the ability to restart a logical server on a new device in the event of an equipment failure.
Information protection and security

Information protection, availability, and security are governed by regulatory requirements for healthcare organizations including HIPAA and JCAHO. Today, healthcare providers are demanding a unified view of patient information from birth to present day that can be quickly and securely accessed by authorized physicians, clinical labs, pharmacies, hospital staff, and insurers. At the same time, healthcare IT staffs struggle to match growing availability needs with outdated or ineffective backup and recovery processes.

EMC works with healthcare organizations to determine how much data they can afford to lose if their applications go down; and what is the longest outage their end users can tolerate. The answers to these questions are referred to respectively as the recovery-point objective (RPO) and the recovery-time objective (RTO).

**Match the protection level to the information value**

Based on an understanding of acceptable data loss (RPO) and outage duration (RTO), EMC offers a range of high availability and business continuity solutions and services that helps match the protection level to the information value.

At a very basic level, data is protected by making copies of the production data. How quickly a copy can be made determines how often the copies can be made and the potential data loss. Tape backup at the left of the figure above provides the lowest level of protection and results in the greatest potential data loss and longest time to restore in the event of a disruption. With healthcare environments requiring online processes for continuous operations, tape is rapidly becoming no longer acceptable for primary backup purposes. Today many healthcare organizations use low-cost ATA-based storage arrays to back up to disk (B2D), or deploy tape emulation as an alternative to tape technology. These are faster and more reliable backup processes than tape for storing physical copies of data as it alleviates some of the challenges and provides higher protection levels.

Another way to achieve higher protection levels at a lower cost point is by deploying point-in-time snapshot technology. A snapshot is a pointer to the original data at a point in time and allows a logical copy of data to be made with much greater frequency, versus a full copy which needs to be fully synchronized before accessing. Physical copies are either clones or mirrors. A clone is a separate physical copy of the production dataset at a specific point in time. Clones can be made by applying only the incremental changes that have occurred in the production data to the cloned dataset since the last time a clone was made. Alternatively, a physical copy can be created by “splitting off” or disconnecting one of the mirrored copies from the mirroring process. This is often referred to as a business continuity volume or “BCV.”

A mirror is a separate physical copy that continually tracks or mirrors the changes made to a production dataset. A mirror can be either asynchronous or synchronous. An asynchronous mirror accumulates all changes made to the production dataset and then applies them at specific intervals. Any transactions made between the time the accumulated changes are applied may be lost if the production dataset is disrupted. A synchronous mirror continually applies each change made to the production dataset to the copy as well before committing the translation back to the production server. Since the copy is always
in synch with the original, no transactions are lost in the event of a disruption to the original. Mirrors are usually made remotely from the production data in order to decrease the changes of an event that disrupts both the production and the mirrored copies.

Information security—protection of “digital assets,” particularly maintaining patient information privacy—is at the top of the list of IT concerns and challenges of healthcare senior management. EMC believes that security must become information-centric, starting with securing the data itself, then moving out through layers of increasingly intelligent infrastructure.

**Enterprise archiving for healthcare content protection**

State, federal, and country regulations including HIPAA, require that health records be protected with secure access to ensure accurate and ready retrieval over defined retention periods, including audit trails. EMC Centera content-addressed storage (CAS) offers fast access to online archived medical images and patient information and can meet defined organizational services levels for long-term access and records protection.

EMC Centera’s CAS architecture delivers information location independence, self-healing and management, guaranteed content authenticity and single-instancing—helping healthcare organizations achieve compliance with internal rules and external regulations. EMC Centera can be integrated at the file level or object level with any standards-based PACS, CPOE, or other healthcare application, and can also unify archives across the healthcare enterprise. And when implementing a tiered networked storage strategy, data retention policies can be automatically set by type of data, dramatically reducing archiving administrative effort and cost.

**Enterprise network intelligence**

The EMC Smarts® family of software provides a broad set of solutions for managing complex infrastructure end-to-end, across technologies, and from the network to the hospital department or physician’s office. Healthcare organizations can use this innovative technology to model infrastructure components and their relationships across networks, applications, and storage to understand the effect on services. Then, Smarts software analyzes data from multiple sources to pinpoint root-cause problems—automatically, and in real time, so that when a network monitoring station “lights up” with an issue that is quickly impacting a widening ripple of systems and applications, IT specialists can rapidly pinpoint the source of the problem and attack the root cause.

**Offering the highest levels of availability needed**

Deploying an EMC intelligent information infrastructure in conjunction with EMC partners’ clinical and business applications creates an IT environment that offers healthcare organizations the highest levels of availability and protection. This infrastructure offers the following benefits:

- **High availability and disaster tolerance to meet clinician information and regulatory requirement needs.**
- **Departments, hospitals, Integrated Delivery Networks (IDNs), and Regional Health Information Organizations (RHIOs) become more productive as their patient-centric information infrastructures are expanded.**
- **Providers gain immediate access to relevant images, test results, patient history, allergies, billing, and other related information regardless of where it is physically stored, while preserving patient privacy and system security protection.**
- **Enables critical patient data to be automatically moved to the right storage platform at the lowest total cost.**
- **Advanced, data-intensive clinical modalities and other technologies can be leveraged by authorized caregivers from any location, facility, office, or home—24x7.**
- **Clinical workflow improvements allow caregivers to expand caseloads, facilitate consultations, and improve the timeliness of decision-making across the enterprise, leading to improved patient outcomes.**

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**Willis-Knighton protects critical medical records using EMC MirrorView/S**

Willis-Knighton is one of the fastest growing health systems in the United States with an aggressive plan to eliminate paper throughout its network of four hospitals in the Shreveport, Louisiana area.

**Willis-Knighton stores their PACS images on a high-performance EMC CLARiON Fibre Channel storage area network (SAN) in a primary data center at Willis-Knighton Health Systems Medical Center. To further protect these vital medical records, Willis-Knighton uses EMC MirrorView™/Synchronous (MirrorView/S) software to continuously replicate the PACS images to a second CLARiON SAN at a disaster recovery site seven miles away.**

Jonathan Lee, Network Coordinator at Willis Knighton Health Systems, said, “Loss of our PACS images could have a very serious impact on patient care because our physicians reference them frequently in the course of treating a patient. “Previously, our PACS images were stored on optical disk, which would have required hours to restore. If we ran into mechanical problems, it could take longer—possibly even days. Today we can failover to our disaster recovery site in a matter of minutes. So our physicians can continue to access the PACS images with virtually no disruption to patient care.
Speed time-to-clinical-value with EMC Technology Services

Purchasing the right hardware, software applications, and information management tools is an important step in creating an intelligent information infrastructure for high availability and protection in healthcare IT environments. But these purchases must be done in tandem with a clear understanding of the current IT environment. A better first step would be to create a high availability plan that defines user requirements, evaluates availability and recovery alternatives, and designs the information infrastructure.

The next step in building the infrastructure is to deploy and test the technologies by developing recovery and failover plans to meet or exceed HIPAA business continuity requirements. Lastly, skilled resources must be in place to manage resources, implement improvements, and measure results.

EMC can help healthcare organizations build and implement optimum business continuity and information protection plans in conjunction with our healthcare partners. EMC Technology Solutions professionals offer storage consulting services that help determine the optimal architecture to form the buying decision. Design, implementation, and operations services accelerate implementation and ensure satisfaction with the high availability healthcare IT environment created.

AHIMA has developed the following retention recommendations:

- Each healthcare provider should ensure that patient health information is available to meet the needs of continued patient care, legal requirements, research, education, and other legitimate uses.

- Each healthcare provider should develop a retention schedule for patient health information that meets the needs of its patients, physicians, researchers, and other legitimate users, and complies with legal, regulatory, and accreditation requirements.

- The retention schedule should include guidelines that specify what information should be kept, the time period for which it should be kept, and the storage medium.

Examples of Retention Standards for Healthcare Information

<table>
<thead>
<tr>
<th>Healthcare Information</th>
<th>Type of Retention Period</th>
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<tbody>
<tr>
<td>Diagnostic images</td>
<td>5 years</td>
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<tr>
<td>Disease index</td>
<td>10 years</td>
</tr>
<tr>
<td>Fetal heart monitor records</td>
<td>10 years after infant reaches age of majority</td>
</tr>
<tr>
<td>Master patient/person index</td>
<td>Permanent</td>
</tr>
<tr>
<td>Operative index</td>
<td>10 years</td>
</tr>
<tr>
<td>Patient health/medical record (adults)</td>
<td>10 years after the most recent encounter</td>
</tr>
<tr>
<td>Patient health/medical record (minors)</td>
<td>Age of majority plus statute of limitations</td>
</tr>
<tr>
<td>Physician index</td>
<td>10 years</td>
</tr>
<tr>
<td>Register of births</td>
<td>Permanent</td>
</tr>
<tr>
<td>Register of deaths</td>
<td>Permanent</td>
</tr>
<tr>
<td>Register of surgical procedures</td>
<td>Permanent</td>
</tr>
</tbody>
</table>

Source: American Health Information Management Association (AHIMA)

- The EMC Business Continuity Assessment Service for Healthcare Environments is designed to assist healthcare organizations in managing their risk. First, it assesses how well current business continuity capabilities align with the needs of the organization. Secondly, it identifies threats that can impact critical healthcare and IT operations causing the continuity capability to be activated. EMC analyzes current business continuity strategies, capabilities, processes, staffing, and testing programs focusing on the ability to meet established business and regulatory requirements including HIPAA and JCAHO.

In addition, the assessment examines potential threats that could result in an interruption and recommends appropriate mitigation action steps. The strategic objective of the assessment is to assist senior management in the execution of their responsibilities to manage risk by assessing the current continuity program, potential causes for its invocation, and recommend appropriate actions to reduce risk and increase continuity program effectiveness.

- The EMC Backup Assessment Service provides an analysis of components in an existing data center backup infrastructure that is designed to help healthcare organizations analyze their backup environment and assess the benefits of redesigning the backup architecture.
The EMC difference

EMC is helping healthcare enterprises of all sizes successfully implement comprehensive data protection and business continuity solutions. Its experienced team has extensive knowledge of replication technologies and storage deployment best practices, along with the proven methodologies to help healthcare organizations quickly assess both the risks and consequences of data loss to develop optimal data protection implementation plans and maintain the availability of critical clinical and business applications.

Partnering with the best

EMC partners with the leading healthcare application providers to offer clinical and business solutions globally to healthcare provider organizations of all sizes. EMC and its partners offer a comprehensive set of solutions, software, and services to help healthcare organizations plan, build, and manage IT environments.

Take the Next Step

To learn more about EMC business continuity solutions for healthcare environments, please contact your EMC account manager or visit www.EMC.com/healthcare and www.EMC.com/continuity.