Executive Summary

Hospital data centers face unprecedented challenges in today’s healthcare environment. The rapidly growing volume of patient data – fueled by the widespread adoption of EMR, a fast-expanding number of HIT applications and increasing use of highly sophisticated imaging technology – taxes storage capacity and management capability. Meaningful use Stage 2 requires an improved ability to share this expanding trove of information, but achieving this goal is complicated by a lack of data center standards. In addition, more stringent and closely enforced HIPAA mandates heighten the importance of data security.
The fact that I.T. budgets and staffs remain limited at the same time hospitals confront accelerating demand on their data centers exacerbates the predicament. The capital investment hospitals need to build a new data center or expand their current one can be prohibitive, not to mention bigger data centers also raise operational costs. Meanwhile, the lack of physical space available for data center expansion in most hospitals, especially older facilities, underscores the importance of accommodating growth within a confined footprint.

As a result, hospitals need to implement smarter strategies to maximize the performance and flexibility of their existing data centers as well as ease the management burden for their already taxed I.T. staffs. Identifying and implementing the right storage, virtualization, power/cooling and security solutions supports physical and human resource efficiency, as well as secure data access, enhanced business continuity capability, improved regulatory compliance and increased ability to adapt to the demands of the constantly evolving healthcare landscape.

**New Pressures on Hospital Data Centers**

In healthcare systems today, massive amounts of digital data are being collected from a burgeoning number of sources. These include:

1. **EMRs.** Patient records usually include data from multiple caregivers, and individual patients sometimes have multiple records. Meaningful use requires more recordkeeping and increased ability to share data with caregivers and patients.

2. **Clinical applications.** The average hospital has between 150 and 300 applications. Exchanging data between these applications can be challenging, since they frequently use different data formatting and follow different standards. Clinicians may be forced to search multiple systems for the data they need to support informed decision making.

3. **PACS.** Technology advances mean more highly sophisticated images are being captured, expanding individual file sizes exponentially. HIPAA requirements forbid compressing the images when storing them in order to preserve their quality, creating even more demand for storage space.

4. **Medical devices.** Dozens of devices from defibrillators to vital sign monitors to infusion pumps collect extensive data on hospitalized patients to ensure safety, support care decisions and track treatment.

**More data, more challenges**

Hospitals need to streamline capturing, sharing and handling patient data — as well as assure secure access to data inside and outside their facilities — to improve workflow and enhance care delivery. Yet the sheer volume of data generated threatens to overwhelm data center storage capacity and jeopardize the high availability of data, which has become so fundamental to quality patient care. At the same time, budget constraints create pressure to keep storage and management cost per gigabyte as low as possible.

**Security risk keeps rising**

The frequency of data breach continues to climb right along with increases in data, data users and mobile devices. The cost of data breach also keeps rising, especially since the U.S. Department of Health & Human Services has stepped up enforcement of HIPAA regulations. The average economic impact of a data breach in 2012 was $2.4 million, up nearly $400,000 from two years earlier, according to the annual data breach study by the Ponemon Institute. Security vigilance inside the data center and beyond remains as essential as ever, given that more than 94 percent of the healthcare organizations surveyed experienced a breach, and nearly half experienced more than five incidents.

By 2016, nearly 90% of U.S. hospitals are expected to have some type of EHR system.  
*Source: Frost & Sullivan*
PACS storage requirements in U.S. hospitals have grown at a rate of more than 20% per year for the past five years.

Source: Frost & Sullivan

Assessing the Need

The first step in developing a strategy to improve data center efficiency involves gaining a clear understanding of short- and long-term data management and storage needs. Key questions to address include:

- How much has the organization’s data load grown over the past year? Over the past five years?
- What additional applications are likely to be deployed in the next year, or next five years?
- Are there legacy applications that are no longer used?
- What are the availability requirements of new and existing applications?

Next, it is crucial to thoroughly evaluate the existing data center, either using internal resources or a third-party assessment team. A detailed audit should be conducted to inventory components, monitor and measure server, storage, and power and cooling usage, analyze the effectiveness of security strategies, identify weaknesses and provide recommendations for performance optimization.

Based on this information, the organization then needs to identify its goals and determine its budget. Defining goals in the context of a comprehensive three- to five-year plan provides the flexibility to phase in and coordinate necessary changes to the data center while minimizing the impact on resources.

Smart Solutions Maximize Performance

Hospitals can take advantage of a multitude of cost-effective solutions and tools to boost the efficiency of their existing data centers and stretch their I.T. staff resources.

State-of-the-art storage management optimizes capacity

Healthcare organizations not only generate extensive amounts of new data — they also keep more data for longer periods of time, as required by HIPAA, meaningful use and other government mandates. In the past, they simply added new drives when they needed additional storage capacity. Today, however, costs can quickly spiral out of control with that approach. In addition to requiring large capital investments, storage devices tend to have uneven data utilization as well as demanding constant attention and expertise to manage.

State-of-the-art technologies such as automated storage tiering, virtualization, data deduplication and cloud storage can help optimize disk capacity, keep storage costs manageable, meet government data retention mandates, and provide critical flexibility and data availability.

- **Automated storage tiering.** The main objective of storage tiering is to reduce costs by keeping only the mission-critical data on the highest-performance Tier 1 devices. Tier 1 storage solutions provide high availability, quick response times and fast data transfer rates, making them ideal for patient data needed by clinicians diagnosing and treating patients.

Once a patient is discharged or treatment is completed, however, migrating the data to less expensive, high-capacity Tier 2 and Tier 3 storage frees up valuable Tier 1 storage space as well as reducing hardware costs and management overhead. While many organizations have typically migrated data to lower-tier storage manually, today’s growing data volume and shrinking I.T. Size isn’t everything: Essential features of an optimized data center facility

Existing hospital data centers may have enough square footage to support the virtualized, flexible data centers needed today — and tomorrow. But whether healthcare organizations are renovating space or building new housing, they should incorporate the following features:

- **Scalable electrical services** provide the necessary flexibility to match blade and storage pool densities.
- **Revamped raised flooring** accommodates traditional wiring and works as a plenum for air exchange in cooling systems. Flooring must also be designed to support the concentrated weight of multi-blade racks, rather than the more distributed weight required for older data centers.
- **Targeted lighting systems** make it easier to read information on components from both sides of a rack. They can also automatically dim and switch on and off to optimize power usage.
resources make it essential to automate the process using data archiving software. Data is classified based on usage, required response time, application and other predetermined performance characteristics and automatically moved between storage tiers accordingly.

• **Virtualization.** Storage virtualization pools physical storage resources from multiple storage devices within a hospital’s network to appear as a single storage device. Typically, virtualization solutions support a variety of storage devices simultaneously and optimize their usage appropriately. A key virtualization benefit for healthcare organizations is the ability to migrate data without disruption, assuring the 24/7 uptime so critical to patient care. Other advantages include centralized administration, improved allocation efficiencies, and increased flexibility and scalability.

• **Data deduplication.** By eliminating redundant instances of data among users and databases within the system, data deduplication reduces physical and virtual storage requirements. Although administrators have more commonly used deduplication for backup and archive files, applying it to primary storage also delivers valuable benefits.

• **Cloud storage.** The healthcare industry has been slow to adopt cloud technology because of concerns about data and application security. But for an increasing number of healthcare organizations, cloud storage or storage as a service (SaaS) with HIPAA–compliant partners is becoming an attractive option. Advantages include data accessibility, improved employee mobility, redundancy, physical and virtual data protection, on-demand scalability and cost savings.

Cloud storage is estimated to be as much as seven times cheaper than traditional SAN or NAS solutions.

Source: “The TCO Problem of Storage,” January 2012
http://www.storage-switzerland.com/Articles/Entries/2012/1/9_The_TCO_Problem_of_Storage.html
Server virtualization does more with less

Although server virtualization has been around for at least a decade, many data centers remain physical-only environments. Increasingly, however, hospitals are realizing that implementing virtualization technology opens the door to a broad spectrum of efficiencies and capabilities simply not possible otherwise.

For starters, server virtualization and clustering solutions enable hospitals to run multiple virtual operating systems and applications independently on a single machine. This eliminates the need to follow the conventional one-application-per-server model that leads to server sprawl and underutilization. By using fewer physical servers and maximizing the capacity of each, hospitals reduce their data center footprint as well as their energy footprint. After all, fewer servers means less networking gear, fewer racks, and lower power and cooling costs.

Thanks to capabilities such as fault tolerance, high availability, and live data migration that doesn’t interrupt application access, virtualization solutions deliver continuous uptime and ensure reliable clinician access to vital patient information. In addition, dynamic load balancing and resource allocation automatically optimize hardware utilization and enable zero-downtime server maintenance.

Server virtualization also supports faster, more efficient business continuity and disaster recovery; plays a key role in moving infrastructure or services to the cloud; better controls virus and malware outbreaks; and simplifies management of OS and application patch updates.

Converged infrastructure supports efficiency

A converged infrastructure integrates several traditionally siloed I.T. components such as virtualization, servers, storage, networking, security and management into a single system. The result is a highly scalable, cost-efficient way to deploy a more simplified infrastructure. This unified approach optimizes human as well as technology resources, enabling I.T. staff to focus more on delivering services to clinicians and other end users and less on figuring out how to make disparate I.T. components work together.

The benefits of a converged infrastructure solution include improved data availability with less infrastructure, lower sustainable TCO and support costs, better service quality, predictable cost and performance models, simplified network management, more efficient use of bandwidth, and a robust platform for faster application development and deployment.

Enhance data center efficiency

- **Go virtual.** Accelerate your server and storage virtualization efforts to improve efficiency, better utilize capacity, reduce costs and simplify management.
- **Rethink traditional strategy.** Update networking protocols and architectures to capitalize on bandwidth and capacity, rather than adding expensive disk storage to take on new loads.
- **Standardize now.** Adopt standards-based technology to automate routine management, lay the foundation for interoperability and information exchange, simplify future scaling and reduce maintenance costs.
- **Embrace the cloud.** Utilize an external cloud for select applications or deploy an internal cloud to support a wide range of users and services with easy scalability and rapid provisioning.
- **Use power wisely.** Slash costs by concentrating cooling precisely where you need it within racks and aisles rather than chilling the entire data center interior.
- **Work with a trusted I.T. partner** with the expertise to help you assess your current and future data center needs and select, implement and support cost-effective solutions to optimize performance.

A sustainable power and cooling climate reduces cost

As data and data centers grow, so do power demands. For example, high-density blade servers deliver more processing power in a smaller footprint, but they bring power costs three to five times higher than previous-generation equipment.

The most effective way for organizations to tightly control data center climate and budget in an era of rising utility rates and heightened focus on sustainability is to develop a comprehensive power and cooling strategy. This includes eliminating physical machines to reduce the amount of power needed to run the servers and cool the server room. Replacing aging servers is also a tried-and-true way to reduce power consumption.

Designing a modular, energy-efficient power and cooling system lowers costs and provides valuable flexibility. Using new techniques to concentrate cooling near the equipment that generates the most heat, rather than cooling an entire data center, yields savings. And, right-sizing power requirements reduces energy waste, maximizes ROI and helps maximize the hardware lifecycle.
Proper backup power planning remains crucial for uninterrupted access to critical patient data. In addition, a data center infrastructure management (DCIM) system that collects and manages information about equipment, resource use and operational status can help I.T. management align equipment to organizational needs and sustainability objectives.

**Backup solutions keep pace**

The evolution of the data center in the face of exponential data growth has required advances in backup solutions. Among other issues, solutions must now factor in the reality that data on a virtual machine is also likely to move across multiple physical hosts. This has contributed to the popularity of disk-based backup systems with data deduplication capabilities that provide faster access and recovery than tape-based options. Comprehensive data protection also requires offsite storage, either by physically removing hard drives to another location or electronically replicating them to a satellite location or cloud.

**Client virtualization centralizes control**

Client virtualization houses all computing tasks and data on a centrally hosted server within the data centers, rather than on each user’s physical device. The proliferation of end-user desktops, workstations and mobile devices, as well as the soaring popularity of BYOD, make client virtualization a valuable solution for healthcare organizations. I.T. staffs can exert tight control over data while still allowing clinicians secure and seamless access to critical information.

Benefits of client virtualization include the ability to:

- Update, access and store data centrally.
- Secure data from a central computing interface rather than having to lock down individual machines. And since data doesn’t reside on thin client devices, there’s no threat of data breach if devices are lost or stolen.
- Centralize application management, fixes and updates across the enterprise.
- Tighten HIPAA compliance.

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**Security strategies safeguard vital information**

Security remains a top priority for healthcare organizations, given the ever-present risk of costly data breach. Hospitals must regularly assess their data centers and I.T. environments for vulnerabilities and implement a multi-layered, enterprise-wide, HIPAA-compliant security strategy to protect sensitive patient data. A comprehensive solution includes content filtering, data leakage products, network access control, patch management tools, intrusion prevention and detection solutions, antivirus and antispyware solutions, physical security to prevent unauthorized access to the data center itself, and encryption of data at rest and in transit — including self-encrypting drives to encrypt all data on the individual storage devices.

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**Patient Data Management Plays Big Role in Data Security**

In 2012, 146 healthcare breaches affecting 500 or more individuals were reported, up from 121 the previous year. However, improved privacy and security safeguards have reduced the number of patient records affected from 10.6 million to 2.4 million.

![Patient Data Management Plays Big Role in Data Security](chart.png)

CDW Healthcare: A Technology Partner that Gets IT

Hospitals need a trusted partner who understands how to optimize data center performance to keep pace with fast-growing digital demands. CDW Healthcare’s knowledgeable experts leverage our strategic technology partnerships to deliver comprehensive solutions including storage management and virtualization, converged infrastructure, power and cooling, security and data backup. We help healthcare facilities select, configure, implement and support flexible solutions to maintain their technology investment well into the future.

To learn more about how CDW Healthcare can help your hospital implement smart data center strategies that maximize performance and capitalize on limited resources, contact your account manager, call 800.500.4239 or visit CDW.com/communIT.

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IBM® Storwize® V7000 and V7000 Unified
Healthcare organizations need efficient, flexible and resilient infrastructures. IBM® Storwize® V7000 and Storwize V7000 Unified are virtualized storage systems designed to consolidate workloads into a single storage system for simplicity of management, reduced cost, highly scalable capacity, performance and high availability. They offer improved efficiency and flexibility through built-in SSD optimization, thin provisioning and non-disruptive migration of data from existing storage. Storwize V7000 and V7000 Unified are among the most innovative, powerful and easy-to-use disk systems in the storage marketplace.

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IBM® System x® and BladeCenter® servers help deliver a dynamic infrastructure that provides leadership quality and service you can trust. The new generation of System x and BladeCenter servers delivers business value and reduces costs for clients through industry-leading scalability, virtualization and management capabilities. And, they also:

• Reduce operating costs with higher performance, energy efficiency, simplified management, virtualization and increased utilization
• Manage present and future risk in challenging economic conditions with best-in-class RAS and future-proof I.T.
• Improve service with an end-to-end approach to systems management