

EMC PERSPECTIVE



**The Private Cloud for
Healthcare Enables
Coordinated Patient Care**

Table of Contents

A paradigm shift for Healthcare IT	3
Cloud computing encompasses several deployment models	4
The promise of coordinated patient care	4
Journey to the private cloud for Healthcare.....	5
The future is bright.....	8
About EMC in Healthcare	9

The Private Cloud for Healthcare Enables Coordinated Patient Care

A paradigm shift for Healthcare IT

It is always a good idea to begin any undertaking with an end goal in mind—and developing a cloud strategy for Healthcare IT (HIT) is no exception. Cloud computing represents a paradigm shift which enables IT to focus less on the physical assets it is managing and more on the services it is providing—services to patients, physicians, ambulatory care providers, public health organizations, and payers.

Providing services across the continuum of care will require the ability to scale application workloads, share information, and ensure that patient information is protected, secured, and always available when needed. It also will mean changing business cost models, streamlining administrative and clinical workflows, automating processes, and consolidating IT assets. In fact, thanks to the promise of cloud computing, today’s HIT departments can consider new business models as investments that are made toward a fully optimized electronic health record.

Public versus the private cloud for healthcare

Cloud computing encompasses several deployment models.

- **Public cloud** services refer to computing services provided by an entity to augment the internal capabilities of multiple external customers. This model enables IT to take advantage of economies of scale offered by public cloud providers. However, it may not provide the level of control and security which IT requires.
- **Private cloud** is a virtual IT infrastructure that is securely controlled and operated by the organization. Private cloud computing offers the controls and security of today’s data center with the agility required for business innovation. Because it can be extended to affiliated organizations as part of a federated or community cloud, a private cloud can connect healthcare providers, healthcare providers, and clinical labs that all may play a role in a patient care episode.
- **Community cloud** extends IT services to trusted, affiliated organizations as part of a federated network. It has the potential to transform business models and information delivery networks.
- **Hybrid cloud** services simply refer to the concept that an organization may mix and match to provide the complete range of needed IT services.

	<i>Private Cloud</i>	<i>Community Cloud</i>	<i>Hybrid Cloud</i>	<i>Public Cloud</i>
NIST Definition	Cloud infrastructure is operated solely for an organization	Cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns	Cloud infrastructure is a composition of two or more clouds (private, community, or public)	Cloud infrastructure is made available to the general public or a large group
Primary IT Ownership	IT managed by professional internal staff with back-end vendor support (primarily enterprise segment) or by a third party		Any combination of internal management and external cloud services vendor	Owned by an organization selling cloud services (e.g. Telco, ISV, SI, Hosting Provider or OEM)
Cloud Location	May exist on or off customer premise		Both on and off premise	Exists off premise
Consumer of IT Services	Internal customers of the IT organization: Finance, HR, etc.	Internal customers of the community	Both the internal customers of the organization as well as the IT organization itself	Companies across all segments (SOHO, SMB, Mid-Market and some Enterprise)
Examples	<i>NASA Nebula Cloud</i>	<i>Google Cloud for US Government (planned for 2010)</i>	<i>GeoEye (satellite and aerial imagery company)</i>	<i>Amazon EC2</i>

Figure 1: National Institute of Standards and Technology

Many healthcare organizations wonder whether public cloud services will underpin their vision of a fully-optimized electronic health record. When security and scalability issues can be addressed, a public cloud offering may be appropriate. However, protected health information (PHI) regulations require higher levels of security—levels which may not yet be attainable in a public cloud environment. As a result, many healthcare IT organizations must maintain control over mission-critical applications. A private cloud model enables information sharing while providing the security needed to ensure confidentiality and authorized access to information.

In the long-term, a “community” cloud model is likely to offer the capabilities to truly transform healthcare delivery. Community cloud will enable information sharing to go beyond traditional organizational boundaries, enabling healthcare organizations to fully leverage their information assets while still protecting patient confidentiality.

The promise of coordinated patient care

For healthcare organizations, the task at hand is to improve the way medical information is being managed and securely exchanged among stakeholders. In fact, many healthcare organizations are already using information management technologies to coordinate patient care across multiple caregivers and facilities. Web-based portals provide physicians with patient information at the point of care. Because a more complete patient record is available to all caregivers, duplicative or unnecessary tests are eliminated.

Sharing a robust electronic health record not only leads to improved patient care and outcomes but also helps to reduce overhead. When information is standardized across the care continuum, demographic data can be entered once, rather than multiple times, and integrated eligibility tracking can monitor the end-to-end process of enrolling patients in state and federal benefit programs.

As we move into the future, IT will play an ever bigger role in the business of healthcare. Underlying the discussion of “meaningful use” is the vision of a transformed healthcare industry. A vision that streamlines the information flow from drug discovery and development to clinical trials, directly to patient diagnostics and treatment.

A cloud-based Healthcare IT Services model will enable this transformation:

- The IT infrastructure will become the backbone of coordinated delivery networks.
- Automated workflows will boost productivity and reduce cost.
- Web-based portals will facilitate new methods of coordinating care for patients from their homes
- Clinical decision support tools across the enterprise will improve preventative care, disease, and medication management
- An aggregated Electronic Health Record (EHR) will enable research, evaluation, and comparison of patient outcomes

Healthcare organizations already are beginning to build the community cloud—a secure, networked infrastructure to support the coordinated care vision. In order to position your organization for the health care model of the future, implemented solutions must scale over time to encompass a growing delivery system. Implementation of private cloud technologies helps solve today’s problems while developing the foundation for the extended community cloud.

Journey to the private cloud for Healthcare

Cloud computing enables a more dynamic flow of information. Virtualization technology breaks the tie between the application and the physical infrastructure enabling IT to leverage pooled resources—compute, network, and storage—to achieve performance and availability requirements. Advanced automation, provisioning, and virtualization technologies enable users, via any device, to access the information and applications they need, while ensuring that compliance and governance is not compromised. In the private cloud environment, IT continues to control the information, ensuring governance, compliance, and security.

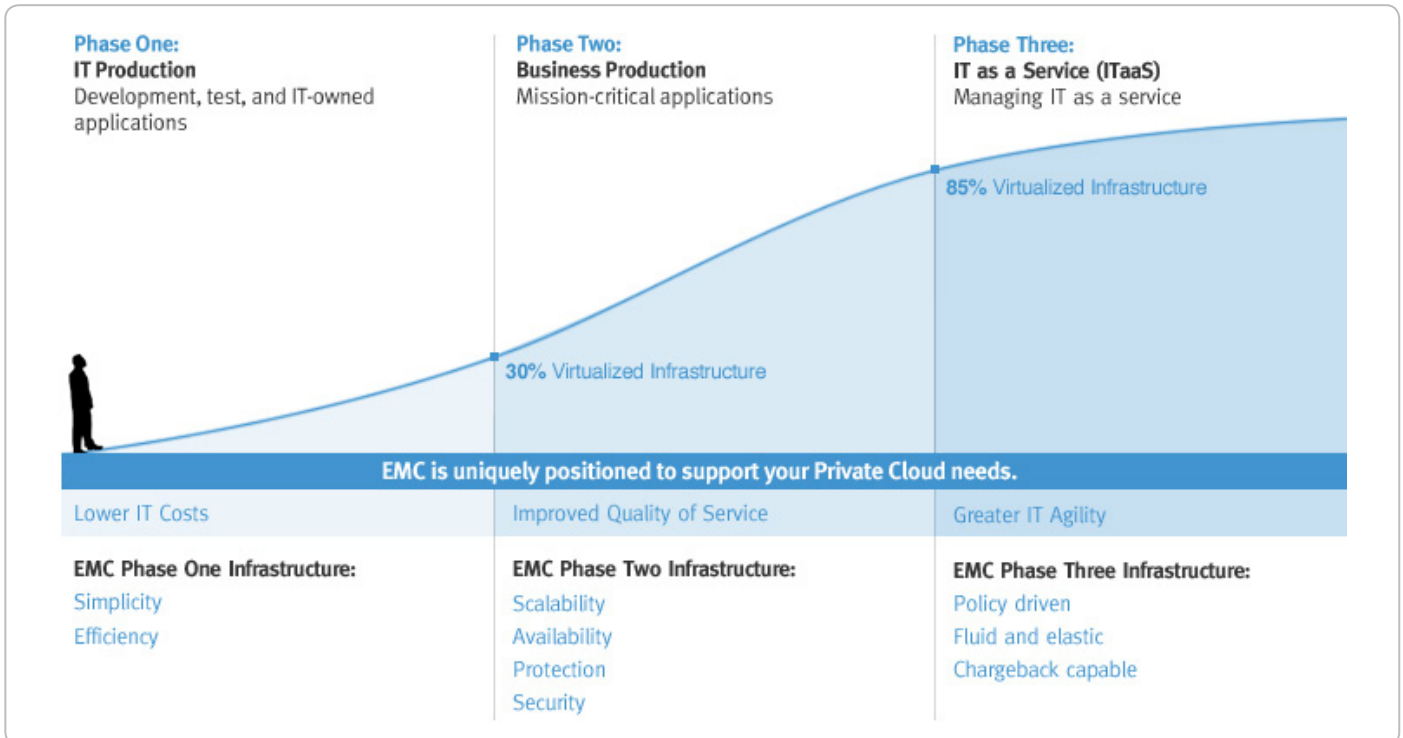


Figure 2: Phases in the Journey to the Private Cloud for Healthcare

The Journey to the Private Cloud for Healthcare will be accomplished over time in phases. (Figure 2.)

- The first phase focuses on efficiency and, primarily, yields substantial cost savings for IT. The primary activities of this phase are rationalization and consolidation. The applications portfolio is rationalized to simplify IT management. Lower-tier applications are virtualized and consolidated onto fewer servers to improve resource utilization and to reduce cost and complexity.
- The second phase, which involves the virtualization of mission-critical applications, improves the quality of services that IT can deliver to business and clinical services. The healthcare organization leverages new technology to improve application performance, security, dynamic scaling, and disaster recovery. The application owners benefit from faster test/development cycles and rapid implementation as well as from higher SLAs.
- The final phase transforms the IT organization into a strategic business asset as it improves agility and promotes new clinical and business initiatives. Self-service portals enable departments to provision their own resources supported by chargeback mechanisms based on SLAs. Policy-based automation frees IT staff for higher-value tasks.

A phased approach to cloud deployment enables IT to use cost savings from early phases to help fund needed strategic IT investments in later phases.

Phase 1: Healthcare IT Production

Historically, over seventy percent of the typical IT budget has supported existing stove-piped capabilities with only a quarter remains to support new initiatives. (Figure 3.) The operating costs for older infrastructure—including power, cooling, and data center space—often exceed the benefits of using these assets.

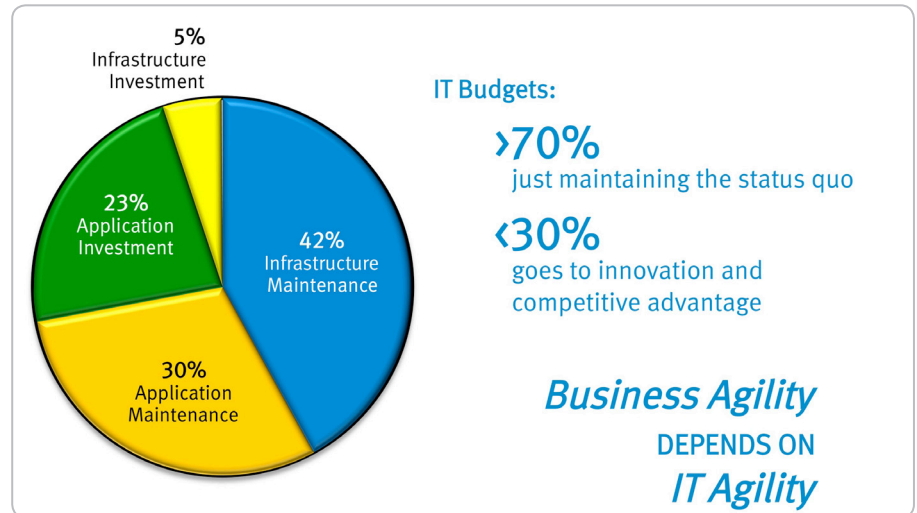


Figure 3: Over 70% of the current IT budget is spent on maintenance

In many cases, IT resources in one area are underutilized while those in another area are stretched to capacity. Virtualization helps solve this problem by dynamically allocating pooled resources when they are needed by an application. Virtualization combined with consolidation of server, network, and storage resources improves utilization and frees up resources for higher value initiatives.

Analysts report that we are still in the beginning stages of virtualization with only 15-20 percent of organizations worldwide having virtualized their servers. Yet, those healthcare organizations which have virtualized their IT environments report substantial savings from consolidating servers as a first step in their evolution to a cloud computing model.

In some cases, there's an opportunity to standardize policies and practices across ancillaries, departments, or facilities within an integrated delivery network. This may provide an opportunity to eliminate redundant applications and standardize on one platform. It should also simplify Healthcare IT and improve efficiencies.

Cloud computing opens a new conversation between Healthcare IT and the clinical end-users it serves. An important part of that conversation is the validation of requirements in a service catalogue. This catalogue can serve as a contract between IT and its customers (e.g. physicians, delivery centers)—a contract which evolves as requirements change.

The service catalogue should include explicit conditions for information security and compliance to meet clinical services requirements. In this way, IT can develop an architecture that is appropriate for sharing and protecting information in the coordinated healthcare delivery model of the future. The costs associated with providing various tiers of service should be made explicit in the service catalog. This sets the stage for chargeback schemes in later phases.

This stage also presents an opportunity for standardizing policies across IT operations if this has not been done in the past. The increasing scale and complexity of environments coupled with the high rate of change make manual approaches to operations less and less viable over time. Process rationalization during Phase 1 ensures consistent adherence to best practices and sets the stage for automation which further improves efficiency.

While beginning the journey, it is important to look ahead to the needs of the mission-critical clinical and business applications which will become the focus of Phase 2. Virtualization offers many benefits; but before jumping in with both feet, it's important to understand that virtualization carries with it implications for how IT organizations conceptualize, design, architect, deploy, and manage the infrastructure.

Virtualization solutions will offer varying degrees of performance and reliability as well as differing management tools and disaster recovery options. Because many virtual machines will run on a single server, deficiencies may seem to be compounded in a virtualized environment. That's why it's so important to plan ahead. Unless longer-term business needs are matched with the functionality and scale offered by various vendors, costly migration from one platform to another may be required.

To get started, the IT architect will look at the entire environment: the servers, network, storage, and virtualization platform. The components need to be balanced so that improved utilization in one area does not introduce a bottleneck in another.

Phase 2: Clinical and business application production

In the second phase, the emphasis is on improving the SLAs of clinical and business applications. While many healthcare application vendors may have been slow to support virtualization in the past, the picture has been changing as more healthcare organizations are mandating that new applications run on a virtualized infrastructure.

Virtualization touches every domain—server, network, storage, application—and can complicate root-cause analysis, service availability, and performance troubleshooting. These typically labor-intensive processes must be automated in order to achieve efficiencies in a virtualized setting. Phase 2 presents an opportunity to automate operational processes as well as a chance to revisit backup methods and implement advanced security technologies.

Virtualization helps contain expenditures, lower facility costs, and reduce ongoing management costs. Employing management technologies to automate operations also helps Healthcare IT enforce policy and best practices across the organization. This phase presents Healthcare IT with an opportunity to rein in information growth with deduplication technology and to meet protected health information (PHI) and personally identifiable information (PII) regulatory requirements.

With the ability to move applications as easily as files across a network, virtualization technologies offer improved availability and ensure disaster recovery. Additional capacity can be provisioned quickly and easily as departments grow. In many cases, secondary virtualized data centers help balance workloads and serve as failover sites for primary centers

Of course, Healthcare IT must develop a roadmap for virtualizing applications, as it may be better to leave some applications in a physical environment. Business process owners and clinical end-users alike need to be involved to develop a plan that balances the impact to clinical protocols and workflow with the capabilities of technology and the limitations of funding models. Phase 2 is all about creating an environment that improves quality of service—one that's scalable, available, protected, and secure.

Phase 3: Healthcare IT-as-a-Service

Cloud computing is the realization of the National Institute of Standards and Technology (NIST) vision of IT as a service-oriented organization, dynamically allocating resources to meet the changing needs of the healthcare organization. Clinical workflow is accelerated for safer patient care decision-making and time-to-treatment.

The third phase is a transition to service-centric Healthcare IT. In this phase, resources are pooled based on usage patterns. For healthcare organizations, IT-as-a-Service can minimize the challenges associated with locally-installed, legacy client/server systems. Chargebacks are based on tiered levels of service, associated with applications and end-users. Governance becomes policy-based so that data residing anywhere in the cloud is subject to appropriate controls. An agile infrastructure enables dynamic scaling of resources as the needs of the organization change. What this means for Healthcare IT is that organizational resources are freed up to undertake more critical initiatives. Service delivery improves as upgrades and integrations can be made with radiology, cardiology, pathology, oncology, and mammography.

New healthcare applications and systems are implemented in shorter time frames, and with cost models well-understood, decisions can be made about moving additional services to a cloud strategy as deemed appropriate to the organization. Individual departments are no longer waiting for IT to provision additional resources but rather can self-provision as the needs of the department change. Privacy and security of patient data is incorporated as encryption and access controls are leveraged across the cloud to host electronic health record applications.

In addition, cloud implementation enables the Healthcare IT organization to offer services to an extended community of caregivers. This backbone becomes the infrastructure for “meaningful use” and truly coordinated care. Hospitals are creating communities of trusted organizations to consume the cloud services that are offered. In this “community cloud” model, hospitals will present patient care applications along with traditional IT services (e.g., user authentication, archiving services) to offer a wide range of technology services to affiliated physician groups and clinics or smaller health-care organizations.

This third and arrival stage is all about improving Healthcare IT’s agility. Healthcare IT delivery is policy-based, automated and provides cost transparency.

The future is bright

As healthcare organizations are working to deploy enhanced electronic health record functionality, they need to consider their existing IT infrastructure. Your current IT environment may reflect recent budget limitations more than it does strategic IT investments in support of innovative clinical delivery models. Integrated Delivery Networks (IDNs), expanding ambulatory practices, and hospital mergers and partnerships have further complicated the IT job as these disparate clinical systems now must be integrated to coordinate patient care.

Increasingly, technology has been deployed across healthcare organizations to support the flow of information for improved quality of patient care. From medical imaging and patient monitoring to integrated-EHR deployments, we’ve seen progress in technology which improves diagnostic capabilities and patient outcomes. At the same time, these advances have increased the complexity of the IT infrastructure and, in many cases, have introduced administrative overhead which increases costs—resulting in slower adoption of innovative IT models.

Cloud computing acts as a technology enabler of truly, coordinated patient care. It presents Healthcare IT with an opportunity to integrate, streamline, and innovate—to enable flexible, IT efficiencies at a lower cost. Because cloud-based IT environments are easier to manage than physical ones, IT staffs are freed up to provide more support to clinical departments. Healthcare providers of all sizes can focus on improved clinical processes and workflow instead of the continued justification, acquisition, and maintenance of on-site technology. Initially, healthcare providers deploy cloud computing for data storage and archiving—decreasing the cost and maintenance of a physical hardware environment. As the virtualization journey progresses, pooled IT resources and intelligent automation provide the means to further reduce the resources spent on operating and maintaining systems.

As a result, attention will focus on new initiatives addressing online appointment scheduling, registration, billing, and electronic health record modules to improve patient access. PACS image sharing and access to a patient’s full medical imaging record will enable caregivers to improve care quality, eliminate redundant tests, and lower radiation exposure. Patient care gets even better when Radiology, Cardiology, and Pulmonary Services can collectively view and share study images.

On a worldwide scale, healthcare will be transformed as new technology models emerge. Cloud computing is a paradigm shift for delivering IT services to an integrated healthcare system. Each organization will determine its own model, one that balances risk and cost while serving its mission and the needs of its patients and affiliates. Choosing the right architecture and partnering with the right set of vendors will enable Healthcare IT to build the foundation for the health care delivery network of the future.

About EMC in Healthcare

EMC Corporation

EMC Corporation is the world's leading developer and provider of information infrastructure technologies and solutions that enable healthcare organizations of all sizes to store, protect, and manage patient information to improve the delivery of care. Accelerate Electronic Health Record deployments with EMC information infrastructure solutions to support critical clinical, IT, and business applications. Your Journey to the private cloud for Healthcare begins with EMC.



EMC Corporation
Hopkinton
Massachusetts
01748-9103
1-508-435-1000
In North America 1-866-464-7381
www.EMC.com

Take the next step

Information about EMC's solutions, products, and services for Healthcare can be found at www.EMC.com/healthcare.