



Key Enabling Technologies for the Transformation of Healthcare: Virtualization and IT-as-a-Service

WHITE PAPER

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IDC HEALTH INSIGHTS OPINION

In May 2010, IDC Health Insights published a report titled *Five Enabling Technologies for Provider Healthcare Reform* that identifies five key technologies that providers will need to adopt to achieve incentive payments under the American Recovery and Reinvestment Act of 2009 (ARRA). These technologies will also help healthcare IT executives control costs and prepare to meet the demands of the Patient Protection and Affordable Care Act of 2010 (PPACA). The five enabling technologies are:

- Meaningful use technologies for ARRA, including health information exchange (HIE), electronic medical records (EMRs), and computerized physician order entry (CPOE)
- Analytics including business, clinical, and operational intelligence
- Clinical decision support
- Virtualization including server and client technologies
- Service-based delivery of applications and storage

While virtualization and service-based delivery of applications and storage are not explicitly called out in ARRA or PPACA, these two enabling technologies provide the requisite foundation needed to achieve functional, operational, and business efficiencies required to respond to evolving regulatory requirements and to support the new care delivery and reimbursement models required to meet health reform objectives.

IN THIS WHITE PAPER

This White Paper, presented by IDC Health Insights and sponsored by EMC, describes the importance of devising a virtualization and IT-as-a-Service (ITaaS) strategy and the advantages of implementing key infrastructure technologies to support meaningful use technologies and the transformation of healthcare.

SITUATION OVERVIEW

ARRA Meaningful Use Drives IT Investment

Meaningful use is among the most important drivers of hospital IT investment today. IDC Health Insights recently published its market forecast showing that while growth of overall U.S. healthcare IT spending is expected to be about 5% in 2010, spending growth on clinical technologies specified for meaningful use (EMR, CPOE, HIE, and analytics) is expected to be about 12%. More than 40% of providers, according to a recent IDC Health Insights study, will accelerate deployment of meaningful use technologies in 2010.

Key to demonstrating meaningful use, and thus qualifying for incentive payments and avoiding penalties starting in 2015, is meeting specific usage thresholds. For example, in the final rule for stage 1 of the meaningful use criteria, more than 30% of unique patients must have at least one medication in their medication list ordered using CPOE; it is expected that the CPOE threshold will rise to 60% for stage 2 in 2013. Careful attention must be given to ensuring timely clinician adoption of meaningful use technologies. The enabling technologies of virtualization and ITaaS will play an important role in expediting deployment of new clinical applications, increasing performance, and improving ease of use.

PPACA Increases Focus on Cost Control

PPACA will also impact healthcare IT requirements. The health reform legislation creates a Center for Medicare and Medicaid Innovation to test new payment and service delivery models, such as accountable care organizations (ACOs), to reduce program expenditures while preserving or improving the quality of care. Other provisions to improve quality include linking payments to quality outcomes, value-based purchasing, increased quality measures reporting, and the creation of a "National Strategy for Quality Improvement."

Healthcare organizations that cannot support the new care delivery and reimbursement models defined under PPACA will face financial uncertainty, and financially distressed organizations will become acquisition targets for stronger, more agile healthcare organizations. Achieving the goals of healthcare reform — lowering costs while improving quality and access — will require providers to have tight control of and visibility into the clinical, administrative, and IT services provided; achieve compliance with clinical quality standards; and look for opportunities to create efficiencies to "do more with less" across the enterprise.

FUTURE OUTLOOK

The Role of IT in Health Reform: Virtualization and Service-Based Delivery

Healthcare IT will play a central role in achieving the objectives of both ARRA and health reform. Enabling technologies are at the heart of changing the cost structure of

healthcare IT and making clinical applications more accessible at the point of care. The key infrastructure technologies — virtualization and service-based delivery of applications and storage — represent two of the steps along the journey to building an internal, private, and "community" cloud infrastructure to move toward the delivery of ITaaS.

Market Challenges and Opportunities

Security

As more patient information is moved into electronic health records (EHRs) and made accessible both inside and outside the organization via a range of devices, including mobile devices, the risk of a privacy breach rises. ARRA's HITECH Act contains new provisions intended to strengthen the HIPAA privacy and security regulations. Under ARRA, privacy breach notification, minimum use, and disclosure reporting requirements become more stringent. The risks and liabilities associated with privacy breaches increase, and annual penalties for violations can total up to \$1.5 million per provision, up from \$25,000. Security must consider the complex healthcare environment with its highly mobile and transitory workforce.

Continuous Operations

Many healthcare settings are 24 x 7 operations requiring round-the-clock access to mission-critical clinical applications. In extreme situations, lack of access to essential patient health information could mean the difference between life and death. Thus, uptime, computing performance, and reliability are critical considerations when evaluating healthcare IT.

Cost Pressures

More than half of U.S. hospitals are operating in the red. Exacerbating an already precarious financial position for providers are declining reimbursement rates by private and public payers. Careful consideration of the total cost of healthcare IT ownership is essential. More efficient IT operations will enable healthcare organizations to reinvest IT cost savings in more innovative technologies and meaningful use applications.

According to IDC research, server virtualization is largely considered to be mainstream in many industries. Recent end-user surveys have found that as many as 60% of companies surveyed use the technology. In fact, those employing server virtualization on average report that roughly one-quarter of their production applications are running on virtual machines and within the next 12 months more than half of their applications will be hosted on a virtualized server.

Client and Server Virtualization

The growth in adoption of clinical information systems as a result of ARRA funding will result in a proliferation of point-of-care computing, which will dramatically increase the demand for information and applications that provider IT teams need to manage. With costs at the forefront of the discussion for provider organizations, managers will seek to leverage virtualization to optimize their IT infrastructure. Client and server virtualization technology provides proven cost savings and demonstrated improvements to the performance, availability, and security of provider applications and is a key enabling technology for provider organizations.

IT organizations use both client and server virtualization in their datacenters to make more efficient use of resources, improve availability, assist in security and disaster recovery measures, and centralize support and administration. Virtualization allows

The healthcare industry has likewise begun to adopt this technology, and virtualization is one of the principal opportunities healthcare organizations have to reduce the cost of their computing platforms while improving the stability, security, and availability of the application environment.

the abstraction of physical infrastructure from operating systems, applications, and services and has changed the approach of organizations to datacenter design and operation. Client or desktop virtualization borrows from the traditional thin-client model but is designed to give system administrators and clinical end users the best of both worlds: enabling system administrators to host and centrally manage virtual and/or physical desktop machines in the datacenter while giving clinical end users the traditional PC desktop experience to which they have become accustomed.

Virtual desktop infrastructure (VDI) is a variation of the client/server model where individualized desktops are maintained on a central machine, thus reducing the complexity of managing multiple applications running on numerous workstations and providing end-user support. User provisioning is also simplified, making it easier to add new users. VDI can support increased service-level demands with fewer resources by centralizing management, security, and control. Within the healthcare environment, VDI enables single sign-on (SSO) and the ability for a user session to follow clinicians as they move from device to device, thus streamlining secure access to critical health information by highly mobile clinicians. Since data is stored on the centrally managed server and not local devices, the risk of a security or privacy breach of protected health information as a result of a lost or stolen laptop, tablet, or other mobile device is essentially eliminated.

Benefits of Virtualization in Healthcare

The key IT benefits associated with virtualization in healthcare fall into seven areas:

- **Cost reduction/avoidance.** Virtualization significantly reduces IT infrastructure costs and operational costs and provides opportunities for energy savings:
 - **Capital costs.** Minimizing the number of physical servers, which lowers hardware acquisition and maintenance costs, saves space in the datacenter and results in a clear return on IT's operational investment.
 - **Operational costs.** Additional operational cost savings are derived from the ability to easily update/upgrade applications and add new users.
 - **Energy savings.** Energy savings from virtualization can come from decreased energy consumed by idle servers as well as reduced cooling needs and space requirements with fewer servers in the datacenter. Additionally, public perception associated with organizations that are trying to be more "green" adds an intangible benefit.
- **Security.** Virtual environments are easier to secure. Sensitive healthcare data is not resident on the client machine; it resides instead in a single location in the datacenter. This reduces the vulnerability to intrusion or unauthorized copying of information. Security, compliance, and control of information are also enhanced.
- **Performance.** When peak demands are encountered, the ability to dynamically add processing power with virtualized clients allows the processing time to be cut significantly. The adoption of virtualized desktop infrastructure as a horizontal solution has clear utility for healthcare.

Several large deployments (10,000-plus users) have reported savings on the order of 30% off their current client maintenance and management budget.

- **Availability.** Virtualization mitigates unplanned outages and improves business continuity by enabling automatic switchover to working resources in the case of an outage, which is critical in patient care delivery environments. This approach enables many more options for automating business continuity strategies.
- **Accessibility.** For clinicians new to EMR and CPOE, the ability to dynamically address mobile requirements can ease the integration of the new tools into their workflow, support more choices of endpoint devices, and help accelerate information access.
- **Transparency/visibility.** Virtualization provides a comprehensive view across all the physical and virtual layers and into infrastructure components such as storage arrays, routers, switches, firewalls, and hypervisors, simplifying compliance, resource monitoring, and troubleshooting.
- **Customer service.** Reductions in help desk call volumes and improvements in first call resolution rates result from replacement of aging desktops with new equipment, standardized client images, and improved remote desktop support and network management tools.

Service-Based Delivery of Applications and Storage

Time-sensitive IT implementations required to qualify for ARRA incentives have strained the physical and human resources of IT departments at provider organizations. Healthcare IT professionals are under pressure to deliver complex applications with high performance and security, while tight budgets demand cost reduction initiatives.

Consequently, healthcare IT professionals will seek service-based offerings that reduce the infrastructure burden on their organizations and at the same time reduce operating costs and the associated capital investment. Service-based delivery options that will be adopted by providers to meet these demands include application hosting and management and Software-as-a-Service (SaaS) for new and existing applications, as well as cloud-based services.

Service-based delivery of applications and storage leverage cloud computing, which IDC defines as consumer and business products, services, and solutions delivered and consumed in real time over the Internet. There are two broad categories of deployment for cloud computing: public clouds and private clouds. Public clouds are open to a largely unrestricted universe of potential users; are designed for a market, not a single enterprise; and except for the Internet and kiosks, are not commonly used in healthcare. Private clouds are designed for and access restricted to a single enterprise (or extended enterprise). A private cloud is an internal shared resource, not a commercial offering, and the IT organization is the "vendor" of the shared/standard service to its users. A variation of this model is the private hosted cloud in which a vendor or vendors perform the role of the internal IT organization. Private cloud and private hosted cloud deployments are more commonly used in healthcare than public clouds.

Key cloud computing attributes include:

- *Shared, standard service — built for a market (public), not a single customer*
- *Solution packaged — a "turnkey" offering, integrates required resources*
- *Self-service — administrative, provisioning; may require some initial training*
- *Elastic scaling — dynamic and fine grained*
- *User-based pricing — supported by service metering*
- *Accessible via the Internet — ubiquitous (authorized) network access*
- *Standard user interface technologies — browsers and underlying technologies*
- *Published service interface/application programming interface (API) — Web services, other common Internet APIs*

Benefits of Service-Based Delivery of Applications and Storage

Several important benefits are helping to drive interest in service-based delivery of applications and storage that offer built-in security and cloud-based implementation models. They include:

- **Cost reduction/avoidance.** In a cloud environment, applications and services can safely run on commodity servers, which gives hospitals the ability to retire and/or repurpose some of their most powerful (and expensive-to-maintain) servers and substantially reduce overhead costs.
- **Transition from capital to operating expenses.** Cloud services typically require minimal up-front investment, demand lower start-up costs, and have regular monthly subscription fees that are usage based. This shift from capital to operational expenditures frees up capital budgets for investing in meaningful use technologies and innovation.
- **Agility and scalability.** The provision of computing, networking, and storage services in a utility-style manner provides a complete set of integrated resources that can be quickly deployed, made immediately available, provide a robust and reliable level of responsiveness, and deliver both cost-effectiveness and the ability to rapidly scale.
- **System manageability.** Cloud providers usually offer system and application management software that supports rapid self-service provisioning and configuration and usage monitoring. Often this includes the ability to automatically fix software faults and "spin up" replacements, which means that the user experience doesn't change even if overloading, hardware problems, or misconfigurations are detected in existing systems. Human intervention isn't typically needed for these events, which keeps operations flowing consistently.
- **Security.** While security is often cited as a challenge, new SaaS or SaaS-based applications have stronger security models than many older legacy applications. Today, cloud providers offer multiple types of predefined service-level agreements and compliance policies to ensure that data security concerns are addressed.
- **Availability and stability.** Cloud computing architectures provide for dynamic provisioning of resources, which enables information migration to other points in the cloud on demand. The benefit is that one event or anomaly will not take down an entire system and will improve information flow and operational stability. Cloud implementations must also include backup and data recovery where information is backed up automatically by the primary system to the cloud environment. Information can be sourced from multiple locations but stored centrally in the cloud.

ESSENTIAL GUIDANCE

Virtualization and service-based delivery of applications and storage are key steps along the journey to the private cloud and offering ITaaS.

Virtualization: Preparing for the Cloud

The growth in adoption of clinical information systems in response to ARRA will result in a proliferation of point-of-care computing, dramatically increasing the number of client machines and applications that provider IT teams need to manage. In point-of-care computing, demands on availability, uptime, and performance are high, while the budgets to implement and manage devices are constrained. The implementation of clinical applications is increasing not only the cost of the IT server environment but also the IT infrastructure, desktop, and help desk support staffing costs. Consequently, tools that drive improved performance of applications as well as efficiencies in the management of client computing are becoming imperative for healthcare. With costs at the forefront of the discussion for provider organizations, managers will seek to optimize their infrastructure, including their IT environment.

Hospital IT executives recognize that these costs, though essential for service delivery, are relatively "invisible" to the organization at large and that new approaches are needed to maximize IT service levels while mitigating the expected increases in cost. Virtualization shifts investment dollars from these "invisible" services to more customer-facing capabilities, providing greater visibility into the value IT can deliver to the end-user community. Using virtualization, IT has improved agility in servicing the requests of end users and is able to streamline the development and deployment of new and upgraded solutions. Client and server virtualization technology provides proven cost savings and demonstrated improvements to the performance, availability, and security of provider applications and will be a key enabling technology for provider organizations.

ITaaS: Creating a Competitive Advantage

Healthcare organizations are beginning to consolidate datacenters, build shared services, and move to cost and agility environments that include virtualization and "everything as a service," which includes the movement to cloud computing environments. At this point, healthcare IT organizations can explore offering ITaaS not only to their own organization but as a service offering to other organizations in the community or broader region. ITaaS creates a new revenue opportunity for the ITaaS healthcare organization while allowing smaller organizations to leverage the IT expertise of larger healthcare organizations and concentrate on their own core competencies.

Healthcare organizations that have strong ITaaS capabilities can create a competitive advantage when it comes to merging or acquiring healthcare organizations because they can more easily migrate the acquired organization's IT portfolio to the consolidated datacenter, reducing IT costs and improving access to clinical, administrative, and financial applications.

Virtualization, the Cloud, and ITaaS Enable Meaningful Use

The combined forces of ARRA and health reform are stimulating investment in clinical applications at a pace that threatens to outrun the ability of IT organizations to fund, support, and maintain these applications without the use of innovative

infrastructure technologies. Tools such as virtualization and cloud computing will be required to support the deployment of clinical applications to highly mobile workers who are not bound by the walls of the hospital or clinic.

Service levels will need to be high to provide the uptime and availability required to foster clinical adoption. Resource monitoring for capacity and optimization planning, as well as chargeback for resource usage, will help IT executives assess usage effectively and plan for growth. New regulations and higher penalties will change the economics of security breaches, requiring that data is secure and accessible only to those who need it, albeit with rapid recovery times in the case of outages and protection from theft and misplaced data implied in the infrastructure. The benefits that accrue from thoughtful use of virtualization and cloud computing will include cost savings that help stretch IT resources and capabilities, productivity benefits for providers and IT staff that will help ease the move to electronic clinical processes required by ARRA and healthcare reform, and security measures that will control data access in the expanding clinical computing environment.

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- Minimize technology risk through accurate planning
- Benchmark themselves against industry peers
- Adopt industry best practices for business/technology alignment
- Make more informed technology decisions and drive technology-enabled business innovation

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