

Answering the Health ICT Challenge: An Optimized Infrastructure

As the guardian of health data, ICT departments need to deliver technology foundations on which better, more efficient care and services are extended to individuals, who are also empowered to manage their own and their loved ones' health.

White Paper

Learn more 

Learn from the examples of other health ICT organizations, including how to:

- Deliver a foundation that is based on best practices and connects people and systems for improved collaboration, new health delivery models, and informed decision-making.
- Design and manage an agile infrastructure that incorporates public, private, and hybrid cloud platforms in which health information is easily and securely updated, accessed, stored, retrieved, and exchanged.
- Enable healthcare providers and public health and social services agencies to turn data into information insights, so they can deliver higher quality care to more patients and citizens at a lower cost.
- Empower patients and citizens to proactively manage their own health.

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Executive Summary

- The number one challenge facing healthcare providers and public health and social services agencies is delivering higher quality care to more patients and citizens at a lower cost.
- A major obstacle is that the diverse players in the health ecosystem traditionally run their own applications in silos, with no interconnection among these applications. The result: no integrated view of how patient care and citizen health information is delivered across the health ecosystem.
- Information and communications technology (ICT) can lead the industry toward an interconnected health platform by delivering an optimized technology infrastructure that combines traditional, cloud-based, and hybrid computing models. This infrastructure will pull together the disparate parts of the health ecosystem, thereby enabling better care, workforce mobility, and security-enhanced data-delivery models.
- The new technology infrastructure will also enable patients and citizens to securely access information to proactively manage their own health.
- An optimized infrastructure will provide ICT with a cost-effective way to manage systems and ensure security, compliance, and reliability. This goal is achievable using a common management and development platform that provides common identity and incorporates familiar tools and existing technologies; works across virtually all cloud and non-cloud locations; and incorporates capabilities that are specific to health organizations' concerns.
- Through common identity and tools that work across public cloud, private cloud, and hybrid platforms, health organizations have more options than ever for providing data access to patients and care providers while still protecting personal health data.
- The Microsoft Connected Health Framework (CHF) aims to support the full continuum of care to meet the needs of patients and citizens, health professionals, and organizations. Based on the extensible and agile principles of the CHF, the Microsoft Connected Health Platform (CHP) provides offerings for optimizing health ICT infrastructures, including tools, solution accelerators, and prescriptive architecture, design, and implementation guidance.
- Organizations working toward an optimized infrastructure include Dartmouth-Hitchcock Medical Center and the Tennessee Department of Human Services in the United States; Saiseikai Kumamoto Hospital in Japan; Fred IT Group and the Tasmanian Department of Health and Human Services in Australia; the Hospital District of Helsinki and Uusimaa in Finland; annatommie in The Netherlands; and the South East Coast Ambulance Trust in the United Kingdom.

In Search of a Holistic View

Data is now viewed as one of the health ecosystem's greatest assets—and challenges. The data coursing through the systems and processes of providers, public health and social services agencies, payers, and research facilities involved with healthcare and services is as complex and diverse as the human body itself. It encompasses everything from diagnostic results and dosages to government policies, social services records, health coverage—pharmacological interactions, and more.

Complicating the situation for information and communications technology (ICT) professionals is the vast number of entities involved. Hospitals and clinics, public health and social services agencies, insurance companies, physicians' offices, patients and citizens, and more, all generate data. Each of these entities usually manages its own applications, its own policies and procedures, and its own billing and payment systems—as appropriate—with limited interconnection among them.

Citizen Involvement Is Key

When patients and citizens and their caregivers have access to health data, programs that help individuals take greater control of chronic conditions bring tangible results.



Source: Urban Institute

Figure 1

In short, healthcare providers and public health and social services agencies are drowning in data. Unless that data is turned into information, it promises to sink rather than support their efforts to provide quality healthcare and services. By delivering the foundation to combine, manage, analyze, and present data, ICT can help healthcare providers and public health and social services agencies turn data into information and insights. Thanks to cloud technologies, in addition to tools that work across traditional and cloud platforms, this is even more possible today than it was a short time ago.

Meanwhile, it is also clear that patients and citizens and society as a whole can benefit from easily accessed, high-quality health information, be it diagnoses and treatment options or disease management and financial information (see Figure 1, "Citizen Involvement Is Key," at left). This result is currently difficult to achieve because systems are saddled with a lack of data insight, excess cost, and—frequently—ineffective delivery of care and services.

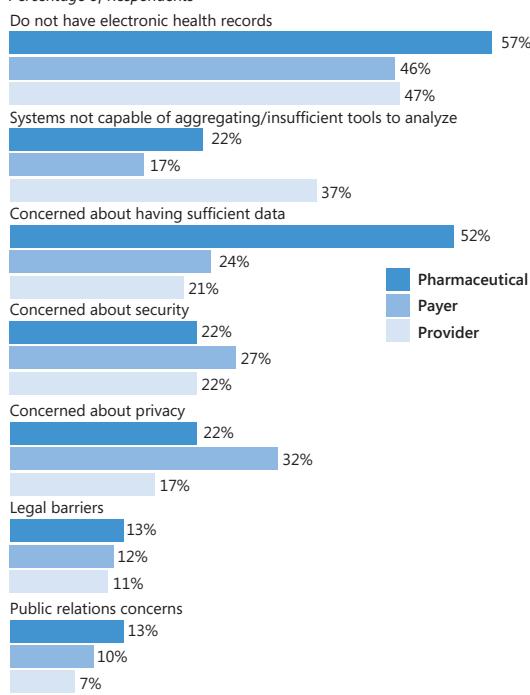
"The healthcare industry needs to focus on the core processes that span the payers, the providers, the pharmaceutical companies, and the federal organizations," says Dan Garrett, a Partner in PricewaterhouseCoopers' Healthcare IT Practice. "It has to create a consistent view of the patient, of the healthcare delivery process, and how these processes flow between patient, physician, and administrator." By doing so, healthcare providers, public health and social services agencies, and patients and citizens will view health information—in addition to the care and services provided and received—holistically, rather than in fragmented pieces. Combined with the capability to measure, monitor, and manage this information, organizations will be able to provide more efficient and higher quality care and services.

Clearly, Garrett argues, the industry must start taking a different tack to solve this problem. "No one in the industry is comfortable with how long it's taking to create solutions for better medical care."

Barriers to Using Data

Health ecosystem officials cite many reasons for why they do not use secondary data. (*Secondary use of data is defined as clinical, financial, administrative, and self-reported data that is aggregated, analyzed, and presented in a concise, actionable format for the purposes of identifying trends, predicting outcomes, and influencing patient care, drug development, and therapy choices.*)

Percentage of Respondents



Base: 700 participants comprising 110+ pharmaceutical and life sciences companies, 130+ payers, and 480+ providers

Source: PricewaterhouseCoopers Survey

Figure 2

Answering the Call

The answer for forward-looking health ICT organizations is to deliver an optimized infrastructure that—based on best practices and collective learning—enables organizations to more quickly, easily, and cost-effectively connect people and systems for improved collaboration and informed decision-making. In the United States, the Tennessee Department of Human Services (DHS) is one organization doing just that.

DHS needed to deliver high-impact applications to improve citizen services for the tens of thousands of state residents in need, in addition to facilitating information sharing within and among the state's many agencies. Its computing platform at the time presented long development times and high training costs. The organization needed an efficient, secure, and scalable platform for delivering and supporting new solutions. It turned to Microsoft® Visual Studio® Team System 2008 to accelerate development and support its application lifecycle management strategy and to Microsoft® Windows Server® 2008 and Microsoft® SQL Server® 2008 to deliver and support those solutions.

Now, DHS uses in-house expertise to build core services based on a service-oriented architecture (SOA) that are, in turn, based on the Microsoft® .NET framework to support the internal applications used by DHS employees and the online solutions for patients and citizens. "This means a single new piece of software can now help automate internal processes and extend those same services to taxpayers over the Web," says Tracy White, IS Director at the Tennessee DHS, which leads to cost savings. Using the .NET framework will lead to at least a 25 percent improvement in time-to-market and associated development costs, she says.

Facing the ICT Challenge in Health

Organizations inevitably face many challenges on the way to delivering an infrastructure that enables the optimal use of data (see Figure 2, "Barriers to Using Data," at left). These challenges can be attributed to the triad that underlies all technological delivery: process, people, and technology.

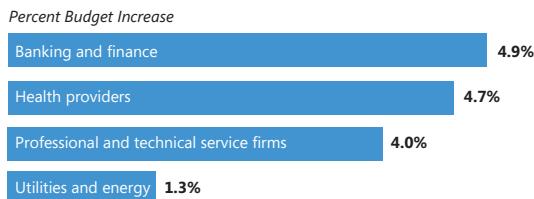
The triad of process, people, and technology includes many obstacles. The following are among them:

Infrastructure. From a process perspective, the main challenge is technical infrastructure. The locations from which health data originates and must be tracked are extensive, as are the auditing requirements. And the information relating to patient or client visits needs to be accessed from even more locations—pharmacies, insurance companies, social services agencies, home health providers, laboratories, patients' bedsides, and even citizens' homes.

Additionally, the creation of disease management information and integrated care records, which are key to empowering citizens to make better health and wellness decisions, requires figuring out how to accommodate data from myriad databases, in a variety of formats, and exchanged through different communications mechanisms (via FTP, fax, or across the Web).

ICT Operational Budgets Are Increasing

A handful of industries in the United States are seeing an increase in 2009/2010 IT operational budgets compared with last year's budgets; health is among them.



Base: 200 IT executives

Source: Computer Economics

Figure 3

One option to consider for simplifying the challenge of exchanging data is cloud-based computing models. Through cloud services (whether private, public, or hybrid), health organizations can more easily allow remote data access to a wide variety of users. For instance, remote clinicians can access test results and patients can check their medical records, update their personal information, or research health and wellness tools. Cloud-based solutions can also provide faster and less expensive delivery of application development, data and image storage and sharing, PC management and security, and optimized infrastructure.

Service Levels. The people part of the triad equates to meeting service levels; that is, ensuring staff at all points along the care continuum is as

efficient and productive as possible. This goal encompasses both granular issues, such as using advanced technology to avoid dosage errors and drug interactions, and issues on a grander scale, such as ensuring data is aggregated in a way that presents complete information for care professionals and patients and citizens.

Underlying service levels is the ubiquitous challenge of keeping budgets in line. Even though recent reports show health as one of the few industries in which budgets and staffing are increasing (see Figure 3, "ICT Operational Budgets Are Increasing," at left), ICT professionals must still justify these resource requests, which are regularly scrutinized by either government agencies or non-profit boards.

Data Security. From a technology standpoint, health ICT professionals must contend with increasing security, regulatory, and privacy issues. They need to protect patient and citizen care data from inappropriate access and, at the same time, make it easily accessible to patients and citizens, caseworkers, caregivers, and government agencies. The latter requires data access both to track potential epidemics and disease outbreaks and to promote healthy behavior. For every regulation there is an associated audit record that must be maintained to confirm compliance.

Additionally, hospitals must consider the issue of identity management; that is, ensuring the person accessing the health information is authorized to do so, and whether they really are who they purport to be. With governments enacting an increasing number of provisions regarding electronic health data exchange and storage—in addition to more countries considering data breach notification rules and penalties—the ability to ensure authorization and authentication continues to be crucial.

Accommodating Existing Systems and New Standards. One way to improve the interoperability of physical, regulatory, and financial components is to create an infrastructure that enables systems to efficiently work together and to exchange and aggregate data, no matter where the data originates or how it is stored.

This capability entails using systems, platforms, and services that not only manage current healthcare information needs but are also flexible enough to pull in future data. Such a platform would enable all types of applications—traditional, open source, and mixed source—and data in multiple formats to interoperate and coexist.

Optimized ICT Infrastructure Leads to Improved Information Access

Through online application platforms, made possible by optimized ICT, governments are working to improve public health.

Country	Government-Sponsored Portal	Capabilities
Denmark	Sundhed.dk	Provides access to various services, such as viewing an individual's hospital records, booking appointments, sending email to healthcare providers, ordering medication, renewing prescriptions, and registering for organ donation. Each patient in Denmark has a custom Web page with information relevant to medical history.
Finland	TerveSuomi (HealthFinland)	Finland's portal is being developed to provide citizens with online access to timely and relevant healthcare information. In the future, it is intended to offer access to electronic health records or online health services. It is currently designed to use semantic Web technology to solve problems associated with publishing health information online, such as difficulty finding the right information, duplication of effort, and a lack of quality control. All content is designed to be shared and reused by any third-party Web site or application. Finland is developing common metadata standards and ontologies so data can be easily aggregated from multiple publishers.
Sweden	1177.se	Launched in 1998, the portal reflects Sweden's early start in developing health IT applications designed to improve the patient experience. The portal is intended to provide a government-sponsored outlet for trusted health information. While it does not link to patients' electronic health records and is not as content-rich as other portals, it had over a million visitors per month in 2008. The Swedish government plans to introduce additional online services, such as scheduling medical appointments and renewing prescriptions.
United Kingdom	NHS Direct, NHS Choices	Is designed to point people to the most appropriate form of treatment and encourage the best use of health services. Provides in-depth information on medical conditions, treatment options, and drug information, in addition to extensive resources for finding healthcare providers.
U.S. National Institutes of Health	PubMed and Medline Plus	A database of biomedical research and an online resource for health and drug information.

Source: The Information Technology & Innovation Foundation, "Explaining International IT Application Leadership: Health IT"

Figure 4

The health and technology industries are also making significant strides in developing standards as part of U.S. and international health IT initiatives. Here are just three examples of the many positive developments:

- The Integrating the Healthcare Enterprise (IHE) initiative. This standards effort put forth by more than 250 health and technology organizations aims to improve the way computer systems in health share information.
- The Health Level Seven (HL7) standards. These specifications are designed for the exchange and integration of electronic health information in clinical practices and the delivery of health services.
- The Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT). This international health terminology enables clinicians, researchers, and patients and citizens to share and exchange health and clinical terminology worldwide.

Additionally, the XML protocol, industry-standard middleware, and SOA enable the simplified exchange of information among diverse systems. These technologies enable the integration of data from disparate systems. They also increase the availability of information through Web portals and application platforms, which are intended to provide patients and citizens with access to Web-based applications and services to manage their health and wellness needs (see Figure 4, "Optimized ICT Infrastructure Leads to Improved Information Access" at left). These efforts are part of a trend to engage ICT in delivering a citizen-centric approach to healthcare.

In addition to interoperability, new advances in infrastructure and industry-standard middleware technology enable ICT to accommodate—rather than replace—existing systems and to provide a foundation for future development. A properly delivered integrated infrastructure creates the foundation for solving today's challenges and tomorrow's challenges, too.

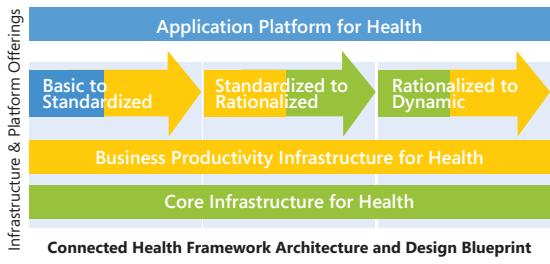
A Strong Foundation

As part of its strong, ongoing partnership with the health industry, Microsoft has developed the Connected Health Framework (CHF) and the Connected Health Platform (CHP) to provide the building blocks for these key capabilities. They allow the flexibility to let health organizations deliver ICT as a service, even if those organizations are providing the infrastructure in their data centers. If they choose to leverage public cloud resources, such as the Microsoft Online Services, organizations benefit from improved agility along with both economies of scale and economies of skill, thereby enabling them to shift resources to focus on the core activities

for taking care of patients' and citizens' health. An additional benefit of using these cloud resources is the capability to shift some of the organizations' computing budget from capital expenses to operating expenses.

Connected Health Platform

The CHP takes advantage of IO models and tools that Microsoft has developed for other industries and customizes them for the health industry.



Source: Microsoft

Figure 5

Together, the CHF and the CHP are designed to guide and aid the industry as it moves toward optimized infrastructures that will ultimately improve care and reduce costs.

The Microsoft CHP is the implementation of the CHF Architecture and Design Blueprint on the Microsoft platform. The CHF provides a collection of vendor-agnostic best practices and guidelines for delivering service-based and standards-based, interoperable e-health solutions that are integrated, highly secure, flexible, and scalable. Its goal: to improve the industry's ability to support the full continuum of care and services to meet the needs of patients and citizens, health professionals, and organizations.

For example, Saiseikai Kumamoto Hospital, a comprehensive medical facility for the Hokuriku region in Japan, has implemented the CHF so that its ICT staff can better integrate clinical and administrative data from across the organization while keeping acquisition and maintenance costs reasonable. It will also be using the CHF to improve business intelligence, encourage detailed information sharing, and support industry standards for improved integration.

Based on the extensible and agile principles of the CHF, Microsoft CHP provides offerings for optimizing health ICT infrastructures, including tools, solution accelerators, and prescriptive architecture, design, and delivery guidance. It provides the foundation for the development, delivery, and operation of open, secure, and extensible e-health solutions on the Microsoft platform. The CHP is designed to provide health organizations with benefits and efficiencies in multiple areas:

- Driving value by enabling better alignment between ICT and the health organization's strategy
- Enhancing security, privacy, and compliance efforts
- Improving system adaptability to constantly changing care providers' needs
- Reducing cost
- Accommodating options for multiple cloud computing models

Taking advantage of infrastructure optimization (IO) models and tools that Microsoft has developed for other industries, the CHP specializes them for the health industry. These models and tools include Application Platform Optimization (APO) for Health, Business Productivity Infrastructure Optimization (BPIO) for Health, and Core IO for Health (see Figure 5, "Connected Health Platform," at left). For example, to help address health organizations' information management challenges, the CHP provides the foundation for capabilities such as enterprise content management (ECM), enterprise search, communication and collaboration tools, and business intelligence (BI). In other words, the CHP is designed to provide the optimal technology foundation for e-health solutions that help address health organizations' most pressing challenges and enable better, more efficient care.

A Foundation of Interrelated Parts

An integrated infrastructure is enabled by the following components.

Offering	Provides	Sampling of Corresponding CHP Guidance, Tools, and Solution Accelerators	Key Microsoft Products
Windows Optimized Client Devices	Enables application and information access from anywhere for health professionals, caseworkers, administrators, and patients and citizens. Provides ICT with simplified application management and better security and control.	Desktop Automated Build and Deployment http://www.microsoft.com/industry/healthcare/technology/hpo/desktop/desktop.aspx Group Policy for Healthcare Desktop Management http://www.microsoft.com/industry/healthcare/technology/hpo/desktop/grouppolicy.aspx Microsoft Deployment Toolkit Solutions Pack http://www.microsoft.com/industry/healthcare/technology/hpo/desktop/mdt.aspx	<ul style="list-style-type: none"> Microsoft® Windows® 7 Enterprise Microsoft® Windows Server® 2008 Microsoft® System Center Microsoft® Windows Mobile® Microsoft® Forefront™ Microsoft® Desktop Optimization Pack
Optimized Server and Data Center	Enables a reliable, scalable, cost-efficient, and secure infrastructure that provides streamlined management capabilities and secure services that align with organizational and patient and citizen access needs.	Windows Server Update Services Design and Operation http://www.microsoft.com/industry/healthcare/technology/hpo/security/wsus.aspx Test Lab Infrastructure Virtualization http://www.microsoft.com/industry/healthcare/technology/hpo/serverbuild/testlab.aspx Windows SharePoint Services 3.0 Deployment http://www.microsoft.com/industry/healthcare/technology/hpo/serverbuild/wssdeployment.aspx	<ul style="list-style-type: none"> Microsoft® Windows® 7 Enterprise Microsoft® Windows Server® 2008 Microsoft® SQL Server® 2008 Microsoft® System Center Microsoft® Forefront™
Security and Compliance	In-depth defense ensures secure, identity-based access to data from virtually anywhere, in addition to built-in, integrated security features and simplified security and compliance management.	Active Directory Design and Migration http://www.microsoft.com/industry/healthcare/technology/hpo/security/activedirectory.aspx Forefront Client Security Deployment and Operations http://www.microsoft.com/industry/healthcare/technology/hpo/security/FCS.aspx IT Compliance Management Guide http://technet.microsoft.com/en-us/library/dd206732.aspx	<ul style="list-style-type: none"> Microsoft® Active Directory® Microsoft® Identity Lifecycle Manager 2007 Microsoft® Forefront™ Microsoft® Windows Server® 2008
Health Integration and Interoperability	Enables ICT to connect data, systems, and processes to help reduce complexity and operational costs and to facilitate connected care.	The Microsoft Connected Health Framework http://www.microsoft.com/industry/healthcare/technology/Health-framework.mspx XDS.b Developer white paper http://download.microsoft.com/download/1/9/4/19404de3-cee6-4d4a-bfa5-8302ce4bb811/IHE%20XDS%20b%20Developer%20White-paper%205-2008.pdf Getting Started with HL7 v3 and BizTalk Server 2006 http://www.microsoft.com/downloads/details.aspx?FamilyID=ce84af68-35fc-4ded-b9f8-91feff05d8d0&DisplayLang=en	<ul style="list-style-type: none"> Microsoft® BizTalk® Microsoft® Amalga™ Unified Intelligent System Microsoft® Azure Systems Platform Microsoft® HealthVault™

Source: Microsoft

Figure 6

The CHP can also help health organizations determine the best strategy to incorporate cloud computing into their ICT environment. In many cases, cloud-computing options offer economic advantages because they fall under the operating expense budget rather than the capital expense budget. This gives small and midsize health organizations, especially, the flexibility they may need in terms of budgeting for new applications and computing resources. Cloud computing also provides health organizations with the ability to quickly provision computing capability or capacity as needs change or test new applications quickly and easily.

Determining which cloud computing models are best for any given situation involves a variety of decisions, such as whether to consolidate servers using virtualization technology or whether to deliver new applications, such as email or electronic medical records or case management, in a cloud-based scenario.

Indeed, in some situations, health organizations may want to deploy some applications internally, either in a community (a.k.a., private) cloud or in a traditional data center, for security or regulatory reasons. Other applications may be more appropriate for delivery through a public cloud solution. Organizations can also devise an infrastructure that accommodates both, known as a hybrid cloud solution. Microsoft can help health organizations determine which scenario is most appropriate based on organizational, regulatory, and infrastructure needs.

The IO for Health models and tools helps characterize levels of ICT efficiency that organizations can achieve by delivering infrastructure and platform services more efficiently. The underlying goal for all of the IO initiatives is to enable the health ICT department to become a strategic asset to the organization, with an agile infrastructure in which information is easily and securely updated, accessed, stored, retrieved, and exchanged. This goal can be achieved through

the adoption of ICT infrastructure best practices that are available through the CHP with the IO for Health models and tools. These best practices enable organizations to achieve higher optimization status and to benefit from both the increased efficiency of its ICT department and—in general—the lower costs of services delivered by ICT.

Connected Health Platform Key Offerings

The CHP encompasses a number of key offerings, in addition to guidance, tools, and solution accelerators. Individually, they constitute building blocks that contribute to an efficient ICT infrastructure. Collectively, these offerings create a system in which information is easily accessible and exchanged, one that is secure and highly available (see Figure 6, "A Foundation of Interrelated Parts," on page 10).

Many Microsoft customers have already delivered some of these capabilities in their efforts to work toward an optimized infrastructure, as the following examples show.

Optimized Desktops and Devices. Given the wide variety of people who access health data, ICT staff must ensure that clinicians, patients and citizens, caseworkers, and others have efficient and controlled access to the information they need, no matter what their location is or which device they are using. Offering this flexibility requires that ICT staff use centralized management and security policies. They also need a single, integrated view of client devices across environments. This approach simplifies application and resource management when it comes to delivery, configuration, monitoring, and reporting.

These capabilities can be found at the South East Coast Ambulance Trust. Part of the National Health Service (NHS) in the United Kingdom, the trust responds to 9-9-9 calls from the public and urgent calls from health professionals in both Kent and Sussex, in addition to providing non-emergency patient transport services (prebooked patient journeys to and from healthcare facilities). The trust's philosophy is to allow its 3,000-member staff in 65 locations—even remote workers—to efficiently access anything from anywhere, with the appropriate security permissions.

By migrating three legacy ICT systems into a single state-of-the-art network, the trust has done just that. Its infrastructure is built with Microsoft® Windows® 7, Windows Server 2008, Microsoft® Exchange 2007, SQL Server 2008, Microsoft® Office 2007, and Microsoft® Office Communications Server 2007 R2. Using the security and productivity features of Windows 7, remote staff can connect securely to central resources without the inconvenience of going through a virtual private network and ICT can enforce centralized security policies such as encryption. "We can all sleep peacefully at night knowing that whatever network our users touch, they belong to us," says Ian Arbuthnot, Director of IM&T at South East Coast Ambulance Trust. "We are all they can see and vice versa."

Optimized Server and Data Center. Given the extensive amount of data that a health system encompasses, ICT staff must enable a streamlined delivery system that is highly secure and easy to manage. Compliance efforts must be tracked, and sensitive data must be protected through sophisticated identity-management tools.

At the same time, because health workers need uninterrupted access to systems, ICT services must be designed with availability, reliability, and business continuity in mind. To this end, ICT staff can take advantage of server virtualization technologies. Virtualization helps maintain data availability and—by utilizing server capacity to the fullest—it reduces storage, energy, and administration costs.

"We can all sleep peacefully at night knowing that whatever network our users touch, they belong to us. We are all they can see and vice versa."

— Ian Arbuthnot, Director of IM&T at South East Coast Ambulance Trust

"It was getting harder to manage our virtualized environment, so we were really excited about the management efficiencies we would get with System Center Virtual Machine Manager 2008. The Quick Migration feature and central Administrator Console would really simplify and speed routine server management."

—Robert McShinsky, Senior Systems Administrator at DHMC

In the United States, Dartmouth-Hitchcock Medical Center (DHMC), an academic medical center in New Hampshire, is focusing on this aspect of the integrated infrastructure. The ICT staff began to look into virtualization three years ago because of limited space in its data center and rising electric costs. However, its original approach caused some server management problems, along with unintended downtime, which interfered with the hospital's patient services.

When the ICT staff learned about the Windows Server 2008 operating system and Hyper-V™ virtualization technology, it was immediately interested. "It was getting harder to manage our virtualized environment, so we were really excited about the management efficiencies we would get with System Center Virtual Machine Manager 2008," says Robert McShinsky, Senior Systems Administrator at DHMC. "The Quick Migration feature and central Administrator Console would really simplify and speed routine server management."

In addition to simplified server management, virtualization has enabled the ICT staff to provide higher application availability for patient-critical applications, such as the hospital's scheduling application and operating room monitoring systems, and to create more stable backup processes. "With Hyper-V, we can move affected applications to new servers without users even knowing, completely eliminating downtime," McShinsky says.

In all, DHMC expects to consolidate an additional 75 servers using virtualization, which will lead to a cost savings of more than \$325,000 annually, he says. "These savings come from a per-server savings of \$1,400 from lower maintenance costs; \$1,600 from reductions in data center power, cooling, and space; and \$1,300 from hardware savings."

Health organizations can also optimize their infrastructure with cloud-based solutions. Orthopedic diagnostic, treatment, and rehabilitation center annatommie, in The Netherlands, is using the Microsoft Business Productivity Online Standard Suite from Microsoft Online Services for communication and collaboration. For a low per-user monthly subscription fee to Exchange Online, annatommie employees are able to send and receive email messages, book treatment rooms and equipment, and schedule meetings. Staff members in any of annatommie's four offices can view all of these shared resources from the firm's SharePoint Online site.

By integrating the appointment scheduler with the patient data system, annatommie enables staff to use electronic forms with automated workflows in the Microsoft Office InfoPath® information gathering program. Staff members can enter patient data electronically using SharePoint Online and automatically route forms to the appropriate people. Built-in security measures ensure that only authorized personnel can view patient files, which remain on-site in an annatommie database, although they are still accessible to employees through the cloud-based system.

Security and Compliance. Because ICT staff deals with sensitive health data, data security and compliance with industry or governmental regulations are crucial. An optimized infrastructure incorporates a clearly defined security policy, one that protects privacy and reduces vulnerability by incorporating highly granular security settings. For example, by delivering systems with access rights based on roles rather than individuals, ICT staff can more easily manage who gets access to certain data and control that access. At the same time, though, security cannot be a barrier to data access. When accessed via a holistic infrastructure

Connected Health Platform Solution Accelerators

The aim of these solution accelerators is to help organizations more quickly improve efficiencies.

Health Solution Accelerator	Description
The Microsoft Health Common User Interface—Design Guidance and Controls for Healthcare Application Developers	Promotes improved patient safety in clinical applications by providing user interface designers, application developers, and patient safety experts with guidelines, controls, and showcase demonstrators.
Health Connection Engine	Facilitates interoperability among multiple systems by abstracting the interfaces used to connect them and by providing a rich and extensible adapter framework.
Cross-Enterprise Document Sharing XDS.b	Based on the IHE XDS.b integration profile, which provides a standards-based interoperable approach for managing document sharing between any health enterprise, XDS.b improves patient safety and staff efficiency by allowing timely access to patient data at the point of care.
Health Collaboration Fundamentals	Provides on-demand collaborative workspaces, discussion forums, and a people directory.
Managing Meetings for Health Organizations	Provides a shared workspace where meeting attendees or committee members can share agendas, papers, presentations, and actions.
Using Scorecards to Improve Performance Management in Healthcare	Acts as a template for configuring a management dashboard to track organizational metrics.
Policies and Procedures	Assists health organizations that find it difficult to create, maintain, publish, and easily access policy and guideline information.
Electronic Forms Resource Kit	Enables the creation of electronic forms by providing a User Information Web Service and set of template parts, sample forms, and supporting tools.
Template Gallery	Assists in creating a Template Gallery site, as either part of an intranet portal or a stand-alone Web site. This site will enable users to centrally publish, discover, rate, and request electronic assets such as document templates, Microsoft® Office Groove® templates, electronic forms, and spreadsheets.

Source: Microsoft

Figure 7

through which the ICT staff can propagate appropriate security rules, data can be protected through centralized solutions rather than piecemeal solutions that may create vulnerabilities.

Identity management is particularly challenging in hospital environments that employ temporary interns, residents, and ICT staff. Sentillion proVision, part of the Microsoft acquisition and available only to healthcare provider organizations such as hospitals, helps ICT staff deliver centralized policies for creating, managing, suspending, or terminating network and application accounts in clinical and business applications. This capability enables ICT to ensure that caregivers have the access they need on the first day of their assignment and that those privileges are turned off when their tenure concludes. Using an automated system also helps ICT deliver audit reports for compliance purposes.

Microsoft offers other options for security, as well. Australia's Tasmanian Department of Health and Human Services (DHHS) has paid particular attention to security in its Microsoft® Office SharePoint® Server 2007 community portal. The DHHS implemented the portal to integrate information from diverse sources and to give clinicians secure access to state and local health policies and procedures, up-to-date staff lists, and professional resources. The information is tailored by role or location, so clinicians access only the information they need to do their jobs. Rights management policies also ensure that only those people who are authorized to view, edit, and publish documents can do so, thereby protecting sensitive information and minimizing risk.

Health Integration and Interoperability. When all of these solutions come together, the ultimate result is a manageable, cost-effective infrastructure that enables information sharing across the health ecosystem. By making information more fluid, ICT departments deliver a system in which health professionals, caseworkers, and others are interconnected, which enables them to work together to provide services more effectively with a single view of patient and citizen data.

And by delivering systems in which data extensibility is a main tenet, data can be updated once and propagated accordingly. This capability provides a

key benefit to public health and social services agencies, providers, and patients and citizens: the assurance that the data they are accessing is timely and accurate. At the same time, system integration and interoperability reduce costs because they enable new and existing technologies to coexist and because there are fewer servers to deliver and manage. The Hospital District of Helsinki and Uusimaa (HUS) is Finland's largest health organization, with more than 445,000 people using its services annually. HUS recently upgraded its ICT environment from a host of disparate systems to Microsoft® BizTalk® Server, using Microsoft BizTalk Accelerator for HL7, so that its hospitals can collaborate efficiently in an environment that integrates different critical applications.

"Communication has never been better," says Mikko Rotonen, Development Director for HUS ICT. "The efficiency of how we deal with patients has improved remarkably, and the scalability of the solution means we can continue to grow for the foreseeable future—and this at a low cost." HUS staff can now collaborate faster and easier among departments, hospitals, and external health services, which results in thorough patient care. It also enjoys 28 percent higher system throughput and potentially even more scalability.

Resolving Issues

The benefits of an integrated infrastructure closely align to top health industry issues.

Health Industry Issue	Benefits of an Integrated Infrastructure
Advocates and critics alike are calling for cost savings across the care continuum.	Automating ICT administrative activities reduces labor costs both within hospitals and at social services agencies.
Public health services need to track citizen health beyond traditional care facilities.	Easy-to-use client devices help citizens access and update health information.
The industry must protect sensitive data while also accessing data to discover trends.	Role-based access protects patients and citizens while aiding compliance for both health and governmental organizations.
Medical practitioners are concerned with the availability of electronic records.	Virtualization technology improves system reliability.
Practitioners need insight into patient care, from the hospital to the clinic to the patient's home.	An integrated infrastructure enables data sharing across systems.
To better utilize expensive specialists, the industry requires remote-care options.	The use of integrated collaboration technologies, such as unified communications, aids diagnosis and treatment.
The industry needs to accommodate future advances in technology.	An integrated infrastructure makes it simpler to add new capabilities.

Source: Microsoft

Figure 8

Accelerating the Effort

An example of the head start that the Microsoft CHP guidance, tools, and solution accelerators can provide is Melbourne-based Fred IT Group, Australia's largest ICT solution provider to the pharmaceutical industry. Fred IT contracted with a Microsoft partner to develop an electronic prescription solution, called eRx Script Exchange. Using the Microsoft CHP Health Connection Engine solution accelerator, the partner was able to deliver the solution in just six months (see Figure 7, "Connected Health Platform Solution Accelerators," on page 13).

The eRx system sends prescriptions through a secure gateway for retrieval by a patient's pharmacy of choice, no matter where in Australia the patient or the pharmacy is located. It does not interfere with the workflows currently used by clinicians and pharmacists; rather, it augments the existing paper prescription system to be more efficient. With paper-based scripts, there was a lack of communication among general practitioners (GPs), not to mention transcription errors—a major healthcare cost in Australia. GPs and specialists were also unable to track whether prescriptions were filled. The eRx Script Exchange has reduced errors and improved patient care and safety. "With eRx, the prescriber and pharmacist can be assured that what the GP or specialist prescribes is presented electronically to the dispense system," says David Freemantle, Project Director for the eRx Script Exchange.

The Benefits of an Integrated, Optimized Infrastructure

The idea of implementing or managing all of these offerings—whether through traditional or cloud-based computing models—may seem daunting. But the fact is, they are all interrelated, as evidenced by the commonality of many of the products within the Microsoft CHP to solve the relevant issues. As a result, implementing any one of them makes delivering the next one less complicated.

More importantly, the top benefits of an integrated infrastructure strongly correlate to issues that medical practitioners expect health ICT executives to solve (see Figure 8, "Resolving Issues," at left). One of the more daunting issues in this regard is the ability to consolidate information from multiple sources in a way that offers consistent access for a variety of users without burdening ICT with an untenable integration challenge. In those situations, cloud computing can bring unprecedented capabilities for information delivery at reasonable cost with appropriate security.

Because its boundaries span further than any single entity, the health industry must focus its endeavors beyond specific applications and data toward best practices and a flexible underlying platform.

Ultimately, because its boundaries span further than any single entity, the health industry must focus its endeavors beyond specific applications and data toward best practices and a flexible underlying platform. That is the goal of the best practices within the Microsoft Connected Health Framework and also of the applications and services within the Microsoft Connected Health Platform. The CHP, with its CHF foundation, creates a sustainable, cost-effective environment that enables easy access to secure and accurate health data across the entire health ecosystem, efficient and flexible use of technology resources, and better insights into ways to continually improve public health outcomes and patient care and to empower patients and citizens to proactively manage their own care.

The goals, of course, are improved outcomes in health and social services, says Accenture Senior Manager Andrew Truscott, who has focused on health ICT, including security, for the last 10 years. Truscott has also worked in ICT at the NHS. "We'll understand so much more about welfare, social care, morbidity, and other issues," he says. The more data you have, Truscott believes, the more information you can analyze. "You can't do that with data silos. The payoff will come when we have tools that break down the silos."

Just as humans will always develop ailments, medical technology will always create capabilities to address those ailments. And those capabilities will undoubtedly be embedded not only in applications but in devices that will need to be both easy to use and accessible across a network. This approach reflects perhaps the most important aspect of an integrated infrastructure: a foundation on which the health ecosystem can accommodate the changes the industry is sure to face—rapidly, effectively, securely, and reliably.

For More Information

annatommie

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=4000003679

Health ICT Resource Center

<http://www.microsoft.com/healthict>

Microsoft Core IO Assessment

<http://www.microsoft.com/infrastructure/about/gettingstarted.mspx>

Dartmouth-Hitchcock Medical Center

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=4000002484

eRx Script Exchange

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000005221

Hospital District of Helsinki and Uusimaa

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000002764

Saiseikai Kumamoto Hospital

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000003702

South East Coast Ambulance Trust

<http://www.microsoft.com/uk/nhs/content/articles/windows-7-makes-data-more-secure-at-south-east-coast-ambulance.aspx>

Tasmanian Department of Health and Human Services

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000000683

Tennessee Department of Human Services

http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=4000001330