Transform Healthcare with Cisco Integrated System for Microsoft Azure Stack

With digital transformation, healthcare organizations rethink delivery models

Healthcare costs continue to rise in part because, in the fundamental delivery model for healthcare, patients are treated after they become sick. The inability to link information sources with patient life experiences has resulted in a system that is expensive, inefficient and that fails to use all the intellectual capital offered by technological advances in cloud, Internet of things (IoT), and related IT technologies. For healthcare organizations to provide superior patient care, reduce costs, and gain competitive advantage, they must take a new approach to service delivery. They must adopt a model that focuses on preventing patient sickness initially and makes continuous use of connected data sources and applications to bring medical advancements more rapidly to patients to increase life expectancy and well-being.

Electronic medical records are only part of the answer

Over the past 20 years, medical organizations have pointed to their investments in new patient information management systems and electronic medical records as proof of their dedication to patient health. But although these systems are important, they alone do not address the challenge of delivering excellent healthcare. These systems help organize and provide access to patient information, but they address only specific elements of patient healthcare data. Hospitals and medical clinics today need to think more broadly about how patient data can be used as new input devices, IoT technologies, and applications capture patient data for analysis so that they can identify medical problems early when they are more treatable. Organizations also, more than ever, need to address the security of patient data. And with the increasing reliance on electronic data, IT strategy needs to consider the impact of natural and human-made disasters on patient care delivery.

Tiered medical data is the foundation of healthcare IT strategy

Who has access to patient data and where this data is stored are critical questions that any healthcare IT strategy must address. To safeguard consumer and patient data, many governments have enacted strong laws that define exactly what type of data can move to the public cloud and what type of data must remain confined to the on-premises data center.

In May 2018, 28 European countries begin enforcing the General Data Protection Regulation (GDPR), which governs the locality of consumer data and establishes specific data-management functions that must be addressed by any organization doing business in those countries. Organizations that violate these requirements can be fined up to 4 percent of their global annual turnover. This regulation also governs any non-European organization that transacts any business with the 28 nations. Thus, the impact of GDPR is felt globally.

Many individual countries and local governments are also enacting similar legislation, which will affect healthcare organizations' ability to move data to and from any public cloud. IT departments must be mindful of these new data limits to avoid public ill will should patient data enter the public domain.

Distinguishing public patient data and private patient data

If patient data is private, then how can public healthcare studies be conducted? Healthcare clinics need to be able to separate data that can be made public from data that must remain private. For example, a clinic may have a patient who is male, 53 years old, and takes 40 milligrams (mg) of Lipitor daily to prevent cholesterol build up in the arteries of the heart. The clinic also has the patient's name, address, insurance and other pertinent information in its patient management information system. In the United States, the federal government has enacted the Health Insurance Portability and Accountability Act (HIPAA): a set of laws that sets privacy standards to protect patients' medical records and other health information provided to health insurance plans, doctors, hospitals, and other healthcare providers. These standards are further refined by protected health information (PHI) regulations, which define the personally identifiable health information that is protected and regulated by HIPPA.

For example, the clinic could use the Cisco® Integrated System for Microsoft Azure Stack to establish a hybrid-cloud environment that connects to the Microsoft Azure public cloud. This solution would enable the clinic to easily move data, applications, Azure services, and related information between Azure and the in-house Azure Stack. Azure Stack's two primary advantages are that the user interface appears exactly the same as in Azure, and the APIs are identical to Azure's. Thus, a clinic could retain all the patient-specific information,

but extract clinic-wide data to upload such as the number of men between the ages of 50 and 55 who are taking 40 mg of Lipitor as a preventive measure. This approach would meet HIPPA compliance standards for research use, with the data elements that could identify individual patients (PHI) staying within Azure Stack.

Research data can be used to help evaluate the effectiveness of drug use and the occurrence of specific side effects. This information can help healthcare providers more effectively target specific illnesses, avoid prescriptions whose side effects are detrimental to a certain class of patients, and improve healthcare for all. Drugs that prove ineffective can be avoided, resulting in lower total healthcare costs and reduced time needed to help overcome patient pain and suffering.

Azure Stack can be used to assist hospitals with insurance billing and compile insurance company performance matrixes. Insurance companies bill by specific procedures, with each procedure assigned a specific billing code, or International Classification of Disease (ICD) code. By downloading specific applications and services from Azure, a clinic can use Azure Stack to gather the instances of a procedure and bill them to each insurance company to help ensure timely payment. This process benefits not only the clinic and insurance provider, but it also reduces the patient burden of tracking payments and responding to reminder notices for payment.

"Through our joint engineering with Microsoft, we're delivering to our customers a turnkey solution that is easy to deploy, manage, and scale that addresses the needs of both application developers and IT managers alike."

Liz Centoni, Senior Vice President and General Manager, Cisco

Application modernization improves patient health and reduces healthcare costs

Many organizations still run patient management information systems and applications that were developed years ago, before smartphones, tablets, and various remote data collection capabilities became available. Today, doctors and nurses expect these devices to be readily available for patient care. In addition, as healthcare maintenance organizations expand into new markets, the challenges of localizing these applications for language, exchange rate, and government regulation compliance are constant concerns.

Such applications reside within the data center and cannot be hosted on a public cloud because they are not cloud aware. This lack of cloud capability also prevents these applications from being co-licensed by third parties, eliminating a potential new revenue stream. Simply moving applications to Azure Stack is the first step one that can improve performance. If you could redesign key aspects to incorporate new data input devices rapidly and use development tools and data stores, what positive impact might this have on patients and the medical professionals who serve them?

A patient's healthcare journey starts with the clinic's website

People seeking medical assistance often start with a provider's website but are frustrated by slow response times, complex or unclear instructions on the user interface, or an inability to look up test results, causing patients to question whether the particular provider is the best one to meet their needs. Patients may assume that a poorly functioning website indicates that the practice does not stay current with the latest advances in medicine. To address such concerns, many healthcare organizations are improving their web presence, and development tools such as Azure services delivered through Azure Stack can greatly reduce the time and expense needed to revamp and maintain websites.

Patient website example

To illustrate how Azure services can modernize a website to improve a customer's experience, consider a classic architecture in which the external-facing portion of the website consists of a web portal and a services gateway.

Azure services can be incorporated into the web portal to update the production and staging elements:

- Azure Web App
- Azure Service Fabric
- Azure Kubernetes Service

Service Fabric facilitates the development, deployment, and management of highly scalable and customizable applications. Kubernetes Service is a cloud-based container deployment and management service that supports popular open-source tools and technologies for containers and container orchestration. Each of these is important to providing a superior web interface.

- **Azure Content Delivery Network (CDN):** Improves website performance by serving content from servers closest to the request
- **Azure Active Directory:** Supports consumer identity and access management
- **Azure API Management:** Provides a ready-to-use service gateway for publishing APIs to external and internal developers (Only available on Azure public cloud)

With the external-facing elements modernized, the internal-facing portion can be updated to accommodate the increased use and the additional types of data that the clinic may want to provide to users who access the website. Some of the main interface elements are:

- **Azure Active Directory Domain Services:** Provide orchestration services for data-layer management; This is a service on Azure, but integrated with Azure Stack and can be used by Stack-based apps.
- **Azure SQL Database and SQL Data Warehouse:** Used to securely store patient data; the hospital can move current Microsoft SQL Server licenses to run on Azure Stack without the need for additional license fees or programming changes (consult your Microsoft representative for details)
- **Azure Batch:** Assists with the sequencing of messages from the external to the internal portions of the website
- **Microsoft Power BI:** Integrates Power BI reports into web or mobile applications

These Azure services are updated constantly by Microsoft, which allows the clinic to use the latest programming technologies to help ensure smooth and efficient website performance and satisfied customers.

IoT interface to Azure links data to Azure Stack for preventive healthcare

Patients who have certain conditions can use simple information such as their daily weight to signal possible side effects from medication or a recurrence of a previous problem. For example, for elderly patients who have had too much water pooling around their lungs or heart leading to shortness of breath and or a feeling of being fatigued, an early warning sign that this problem may be returning is sudden weight gain. A doctor could ask the patient to install a specific scale in the patient's home that can communicate over Wi-Fi to the Azure public cloud or alternately direct to Azure Stack. Each day the patient simply steps on the scale and weighs himself or herself. No other action is required of the individual. The scale communicates the information to Azure, which then communicates that information to the clinic's Azure Stack system. Azure Stack then links the patient's assigned weight ID number to the specific individual. When the person's weight exceeds a predefined threshold, the clinic staff is alerted to contact that patient and ask the patient to visit the clinic for evaluation. Data collected in a similar manner across any number of indicators can help uncover medical issues before they escalate to more acute states.

Cloud-enabled applications extend services and enable alternative revenue streams

To compete for new patients and recruit new doctors, healthcare organizations need to invest in new services and capabilities to draw the attention of these audiences. By using the Cisco Integrated System for Azure Stack solution to access new applications and development tools in the Azure public cloud, organizations can gain new capabilities. New devices, such as tablets and smartphones, for entering data in patient management information systems allow data to be entered as close to the patient interaction as possible. Doctors no longer need to take time at the end of the day to enter data or initiate orders for lab services, etc. Azure services can help ensure that the interfaces for these input devices are updated as technology evolves over time.

Clinics that want to enable patients to see lab results over their smartphones can seek applications with this capability from Azure. Patients can gain immediate access to results, perform trend analysis, and even compare their results across regions or to national averages. Providing support for these capabilities can help organizations establish a competitive advantage. It can help them market their services to insurance companies, providing a reason for an insurance company to add the healthcare organization to its in-network list because the value that the organization provides will reflect well on the insurance provider in its target market. Some hospitals may want to enable specific applications for the cloud to place them in the Azure marketplace for licensing by third parties, thus establishing a new revenue stream to fund additional services.

> "Microsoft and Cisco are proven innovators and trusted technology partners, giving customers the confidence that their IT environments can be supported and secure."
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> **Mike Neil, Corporate Vice President, Enterprise Cloud Group, Microsoft**

## Cisco Integrated System for Azure Stack solution

The Cisco Integrated System for Microsoft Azure Stack solution enables your healthcare organization to access the development tools, data repositories, and related Azure services needed to reinvent your applications and gain new information from your secured data. Azure Stack provides the same APIs and user interface as the Azure public cloud. The integrated system enables your team to save time building cloud-enabled applications, even when disconnected from Azure, and manage customer data while adhering to regulations related to data location and accessibility. Cisco's infrastructure provides the main automation benefits of the Cisco Unified Computing System™ (Cisco UCS®) with leading Cisco Nexus® Family networking and data security technology, while helping ensure the highest-performing design to meet your future hybrid-cloud growth requirements.

The solution offers the following benefits:

· **Design by Cisco:** All major system components are designed, developed, and manufactured by Cisco, which simplifies system management, enables single-source support, and helps avoid unforeseen product roadmap issues.

· **Leading system performance:** The latest Intel® Xeon® Scalable processors, up to 1536 GB of memory on the server, Non-Volatile Memory Express (NVMe) standard storage cache, and an optional solid-state disk (SSD) are part of the package.

· **Firm data center standards:** Maintain your IT organization's data center standards for Cisco Nexus switching and system racks by installing all system components in your racks and using your networking team's existing expertise.

· **Freedom to choose:** Purchase Azure services from any Microsoft Cloud Service Provider.

· **Proven tools:** Cisco UCS Central Software and Cisco Nexus hardware enable easy management of multiple locations or regions from a single screen on your desktop.

· **Add capacity when you desire:** Only Cisco enables customers to add capacity without requiring professional services. You can use Cisco UCS Manager to auto-discover a new server in the system rack. Just a few clicks in the Azure Stack administration portal, and you are 90 minutes (2.5 hours from the time the server is placed in the rack) from being able to use your new server.

Figure 1 shows the complete bundle for a four-node system.

Figure 1. Complete bundle for a four-node Cisco Integrated System for Azure Stack solution
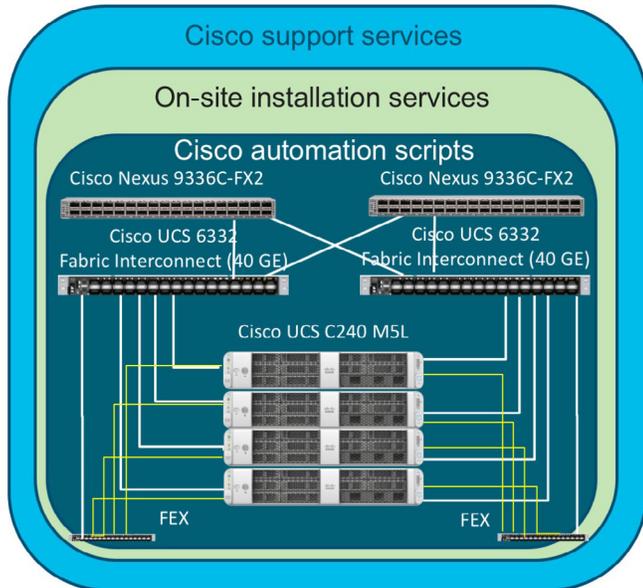
The Cisco solution starts with rack-optimized Cisco UCS C240 M5 Rack Servers. These models house two Intel Xeon Scalable processors, up to 1.5 terabytes (TB) of memory, and up to 120 TB of storage (up to 121.6 TB for all-flash systems). You can select from 16 different processors, provided that each server is configured with exactly the same processors, memory, and storage. The servers run the Azure Stack software and house all of the virtual machines and data.

Each server is connected to two third-generation fabric interconnects, which house the Cisco UCS Manager software. The use of two fabric interconnects means that there is no single point of failure in the architecture. These fabric interconnects are connected to two Cisco Nexus 9000 Series Switches to enable connectivity to the data center's border switches. Each switch and fabric interconnect maintain a copy of the other switch configuration to help enable easy replacement should replacement be required. Each server is configured with NVMe cache storage and 40 Gigabit Ethernet, which is managed by a Cisco Nexus 2000 Series Fabric Extender (FEX). The unified fabric that connects the system enables 40 Gigabit Ethernet traffic, which is an important benefit as the system configuration grows over time.

Azure Stack installation services managed by Cisco Advanced Services are included (a typical installation takes only three days onsite once pre-installation steps

have been completed) in the solution configuration. The system components are installed in your system rack, as we support your standard for system racks. You can configure any node increment from four up to the limit supported by Microsoft Azure Stack software.

Unique to Cisco is the capability to add server nodes to installed systems without the need for any professional services. You can purchase nodes when you want them at the most affordable prices and have them in your data center either boxed and stored or in the system rack ready to be installed as your needs dictate. When you need another server, simply place the server in the rack, cable it, and power it on. Cisco UCS Manger will autodiscover the system node, assign the Azure Stack service profile to the server, and integrate the server into the Cisco UCS cluster. This process is finished in approximately 45 minutes. Then simply access the Azure Stack administration portal, select Scale Unit and Add-Node, and enter the server's address. Azure Stack will then copy the infrastructure files to the new server and integrate the server into the cluster. The cluster will then begin to rebalance the workloads. Within approximately 90 minutes, the new node is ready to process data: only 2.5 hours from the time you open the box containing your new server.

Cisco Solutions Support is also bundled with all installed solutions. Solutions Support is the highest level of Cisco support and provides onsite repair 24 hours a day, 7 days a week, within 4 hours. In addition, your support calls are automatically routed to a team specially trained on Azure Stack. This team can also move a support call to the Microsoft Case Exchange system to enable Microsoft support engagement as needed. With this process, human error in reentering call details is avoided. The call flow would work in reverse should you elect to contact Microsoft support initially either by phone or through the Azure Stack administration portal.

Data protection with Commvault

When you use Cisco's infrastructure, you gain high-performance networking and industry-leading versatility for virtualized environments with Cisco Unified Fabric. You also automate infrastructure management with Cisco UCS Manager and help ensure consistency with policy-based management. With the latest updates to the Commvault Data Platform, Commvault continues expanding its unique data protection capabilities to Azure Stack, including Cisco infrastructure.

Thus, no matter where your data resides, Commvault has you covered. One data protection platform protects your data regardless of whether it is on Cisco Integrated System for Azure Stack, in Azure, in another public or private cloud—or wherever you need it. This approach lowers costs, providing one set of tools for your team to know and use. In addition, automated policies reduce human error and administrative costs.

Commvault uniquely provides agentless backup and recovery of your Azure Stack virtual machine and blob storage, including detailed recovery of files and folders from a simplified data management platform.

The main benefits include the following:

- **Deep integration with Azure Stack**: To provide agentless protection of the Azure Stack environment, Commvault uses the Azure Stack APIs to directly protect and recover data in Azure Stack.
- **Simplified data protection of Azure Stack:** Commvault simplifies backup and recovery for Azure Stack because you are not burdened by the need to deploy and manage agents for data protection. Simply create a service-level agreement (SLA)–based policy, and you are ready to back up data and virtual machines in your environment. Recovering virtual machines, files, and folders is just as easy.
- **Improved recovery times:** Meet more aggressive SLA demands with fast Azure Stack data recovery in a production-ready state.
- **Scalable and flexible data protection platform for your Azure Stack environment:** The Commvault Data Platform can scale as your Azure Stack environment grows.
- **Seamless, low-risk migration to Azure Stack:** Move workloads across platforms in just a few clicks. Reduce migration risk and simplify native moves to and from Azure Stack.

Commvault's capabilities appeal to service providers and enterprise customers because Commvault provides a simplified data protection strategy to meet demanding data protection requirements.

Data protection with Veeam

Veeam for Microsoft Azure Stack delivers hyperavailability for any application and any data in on-premises and hybrid environments using Azure Stack, offering flexible backup and recovery options that enable organizations to achieve speed and agility and helping ensure protection of their data no matter where it resides.

Veeam and Cisco have collaborated to offer an integrated and preconfigured data-availability solution based on Cisco UCS and Veeam technology. The Veeam Availability Solution for Cisco UCS and Azure Stack comes ready for deployment and is verified jointly by Veeam and Cisco.

The Veeam Availability Solution for Cisco UCS offers these main features:

- **Mobility of infrastructure-as-a-service (IaaS) workloads:** Veeam makes it easy to protect your public cloud workloads, enabling quick and easy restoration either on your premises or in Azure Stack.
- **Restoration of Azure Stack:** Restore virtual machines to Azure Stack to reduce business disruption without the need for complex configurations or hardware investments.
- **Speed, agility, and compliance:** Increase agility with data restoration, accelerate time to market by enabling development and testing environments, and help ensure compliance regardless of where data resides.

Veeam for Microsoft Azure Stack is a best-in-class solution that is an excellent fit for customers that require an advanced, enterprise-class data availability solution for their virtual environments that is simple to order, deploy, and manage and that can easily be expanded over time as needs increase. The Veeam solution uses Cisco UCS C240 M5 Rack Servers and S3260 Storage Servers to deliver high-speed recovery, data-loss avoidance, and verified protection with complete visibility for applications requiring high availability and scalability. It provides fast, flexible, and reliable recovery of applications and data, bringing backup and replication together in a single solution with award-winning support.

Cisco Integrated System for Azure Stack running disconnected from Azure

Natural disasters can disable connectivity to any public cloud. Healthcare organizations need to maintain patient services and access to electronic medical records in such instances: for example, in locations in which hurricanes and tornados are frequent occurrences. The Cisco Integrated System for Azure Stack solution can run completely disconnected from Azure. Thus, information can continue to be provided to medical personnel can continue to access this information if web connectivity is lost. Note that specific licenses for Azure services from Microsoft are required to enable this capability. In addition, hospitals can consider placing a smaller Azure Stack system in a small truck that can be driven to remote locations to help provide medical services when disasters occur and to capture medical data from victims as quickly as possible.

Ruggedized systems for Cisco Integrated System for Azure Stack

If a healthcare organization needs a system with a smaller form factor or a system that can withstand higher or lower temperatures or vibrations, Cisco can meet these requirements. Cisco has a vast amount of experience meeting such requirements in government, military, and similar use cases that can be extended to services for medical customers. Typically, each customer has its own set of system requirements, and Cisco has partnered with third-party vendors that can repackage the Cisco system components and perform the required testing. The Azure Stack infrastructure software will perform exactly the same as our typical system infrastructure products, and these other form factors will receive the same level of customer and installation support that healthcare customers expect from Cisco.

Cisco Integrated System for Azure Stack can help your healthcare organization meet the digital transformation challenge

In a 2016 study by IDC (IDC Cloud Goes Mainstream, 2016), only 3 percent of respondents indicated that their hybrid-cloud implementation was optimized. Are you ready to address the wave of digital transformation before it reaches your clinic with an optimized hybrid-cloud solution from Cisco? We stand ready to help you take the next steps on your journey, whether that you want to assess which applications to cloud enable, decide which Azure services can help you manage your patient data, or size a system for your specific needs. For additional information, visit https://www.cisco.com/c/en/us/solutions/data-center/integrated-system-microsoft-azure-stack/index.html and then contact your Cisco Services sales representative or Cisco authorized channel partner.

For more information

For additional information, see the following:

- Cisco Integrated System for Microsoft Azure Stack (solution overview)
- Cisco Integrated System for Microsoft Azure Stack (data sheet)
- Commvault ScaleProtect with Cisco UCS (solution brief)
- Veeam Support for Microsoft Azure Stack