



Optimizing Clinical Workflows with VMware View and Cisco VXi

Quantifying the Value of Using a Virtual Desktop Infrastructure
for Point-of-Care Delivery

WHITE PAPER

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Executive Summary

Healthcare IT professionals face the same basic dilemma as their colleagues in other industries: how to reduce costs and secure data while improving service levels and increasing flexibility. But healthcare IT organizations are also unique in that they must deliver specialized clinical applications and complex electronic health record systems—containing protected health information—to highly mobile physicians and nurses who move like hummingbirds from one computer to the next.

The traditional approach to desktop and application management has made it extremely challenging to implement electronic health records and other new healthcare IT solutions in a meaningful way. Many healthcare organizations are adopting virtual desktop infrastructure (VDI) solutions to overcome these challenges and achieve meaningful use of healthcare technology. But it's not always easy to articulate the economic justification for adopting VDI technology; most evaluations focus exclusively on IT-related issues and do not fully account for the addition of new capabilities or improvements to clinical workflow.

This white paper outlines the benefits of adopting a virtual desktop infrastructure for healthcare delivery, and goes beyond the usual IT-centric discussion about CapEx and OpEx reductions to explore the ways in which VDI improves clinical workflow at the actual point of care, where it matters most. Furthermore, the information in this white paper will help you quantify these benefits so you can overcome economic objections and accelerate adoption. Lastly, this white paper highlights the importance of adopting service-optimized solutions such as VMware View and the Cisco Virtualization Experience Infrastructure to get the most out of your investment.

Introduction: Healthcare IT is at a Tipping Point

The healthcare industry is in the midst of a major transformation. Electronic Health Records (EHR) hold the promise of improving the safety, quality, efficiency and cost-effectiveness of healthcare delivery. The United States federal government has set forth an ambitious goal of establishing a national EHR infrastructure by the year 2015, and has set aside \$19 billion in financial incentives for healthcare provider organizations that adopt and demonstrate “meaningful use” of electronic health records. After that, a penalty phase will begin, and the government will begin reducing Medicare payments to healthcare organizations that can't demonstrate meaningful use of EHR technology.

Security and compliance are also major concerns for the healthcare industry. In the wake of several major data security breaches affecting confidential medical records, the federal government has mandated stronger requirements and significant penalties for non-compliance with HIPAA regulations. Consequently, many organizations have also been forced to move beyond “best efforts” to secure patient data.

Unfortunately, the traditional approach to desktop and application management has made it challenging for many healthcare organizations to satisfy the basic requirements for meaningful use of electronic health records. The reason is that traditional healthcare infrastructures are too complex and costly to support the needs of modern healthcare provider organizations, especially when it comes to point-of-care delivery. Many organizations today are saddled with brittle, fragmented IT infrastructures that include a mix of legacy client-server applications, custom/homegrown solutions, and modern clinical applications that come pre-installed on specialized hardware appliances. Some applications have to be installed locally on endpoint devices, while some must be accessed over the network, and others still can only be used on dedicated PCs or workstations.

The result is an expensive, inflexible, hard-to-manage infrastructure for IT teams, and a cumbersome workflow for caregivers—finding the right terminal, logging in, launching the right application—that takes valuable time away from patients. The situation is so bad that many facilities have more servers than hospital beds, and some clinicians have

become so frustrated that they have reverted to taking notes on paper and waiting until the end of their shift to record the information electronically. When taken together as a whole, the dilemma facing healthcare IT is not one that can be solved by following tradition. Healthcare provider organizations need a new approach to desktop and application management, one that can make clinicians more productive and enable organizations to leap ahead in the race to modernize healthcare in the United States.

Modernizing Healthcare Delivery with VDI

Healthcare organizations are adopting virtual desktop infrastructure (VDI) technology to overcome many of these challenges and modernize their endpoint computing environments. With VDI, traditional desktop PCs are replaced with virtual machines that are securely hosted in the datacenter, where clinicians can access them remotely from PCs, laptops, thin clients, zero clients, and mobile devices. But creating a seamless, well-balanced virtualization solution from a set of diverse point products can be a complicated process. The best approach is to implement an integrated, service-optimized platform that enables healthcare IT staff to deliver a consistently productive user experience with more cost control of infrastructure and client services, and more protection of patient information.

VMware first introduced VDI technology in 2006. Today, VMware and Cisco offer combined solutions based on VMware View™, the leading desktop virtualization solution, and Cisco Virtualization Experience Infrastructure (VXi), an open, end-to-end, service-optimized infrastructure for workplace virtualization. These solutions combine seamlessly to help healthcare provider organizations of all sizes evolve their legacy client computing environments to a more modern, user-centric model that directly impacts patient care.

Simplify Desktop Management

With a virtual desktop infrastructure that includes VMware View and Cisco VXi, there is no need to install or manage desktop environments on end-user devices. Instead, desktops and applications are virtualized and run on servers in the datacenter. From a central location, IT administrators can deploy and maintain thousands of virtual desktops from a single administrative interface.

VMware View templates speed desktop provisioning by automating the process of creating consistent, compliant clones of a well-defined master (“golden”) image configuration, while Cisco VXi automates the process of scaling the physical infrastructure, configuring every aspect of the hardware stack, including firmware, in minutes. This automation helps organizations rapidly scale up to support additional users. Combining VMware View with Cisco VXi also enables healthcare organizations to integrate their networking, computing, storage, and virtualization resources, radically reducing the number of devices that must be maintained and monitored by approximately one-third compared to other centralized and decentralized desktop solutions.

Streamline Clinical Workflows

VDI makes it easier for clinicians to access consistent, persistent user workspaces as they move from endpoint to endpoint throughout the course of their shifts. VMware View and Cisco VXi go a step further by enabling “one click” access to clinical desktops, giving end users fast access to all their applications and patient data. Organizations can also add single sign-on capabilities from providers such as Imprivata OneSign. These workflow improvements make it easier for clinicians to use the EHR systems, which in turn help healthcare providers reach the adoption levels necessary to meet meaningful use requirements.

Deliver Rich User Experiences

Organizations often struggle to provide a consistent, high-quality user experience for all services across all connections. The performance of rich media, such as voice and video, often fails to meet user expectations. But VMware View with PCoIP and Cisco VXi make it possible to deliver high-performance workspaces with rich media to clinicians at any location, even over high-latency and low-bandwidth connections. VMware View intelligently brokers virtual desktops as needed and adjusts performance and functionality to match the endpoint device so that clinicians get a seamless experience as they travel from device to device. Cisco VXi accelerates remote desktop sessions, rich media transport and print services, while also mitigating the intensive SSL loads during peak hours of operation. These capabilities help IT teams maximize efficiency and utilization without sacrificing performance or throughput.

Improve Security, Control and Compliance

VDI technology allows healthcare IT organizations to centralize desktops and applications on server hardware in the datacenter, where they are easier to secure and control. This approach also helps to keep personal health information from being stored locally on mobile devices that are vulnerable to theft and loss.

In addition, VMware View provides granular policy controls that allow administrators to restrict access of USB devices to patient data, or to restrict access to certain applications or desktops when a clinician is off duty. Support for single sign-on and two-factor authentication enhance usability while providing compliance teams with comprehensive logging and audit trails. Cisco VXi, as a virtualization-aware infrastructure, further augments security by facilitating user segmentation and policy enforcement for each user workplace at the virtual machine level, with end-to-end control and full visibility into all virtual resources.

Ensure Non-Stop Point of Care

As more healthcare organizations accelerate their journey from paper to electronic-based systems and clinical workspaces, the reliability and availability of the underlying IT systems becomes absolutely critical. VMware View is built on the industry's most reliable virtualization platform, VMware vSphere®, and provides layered protection against downtime and data loss with no single point of failure. Integrated business continuity and disaster recovery capabilities, including load balancing, failover, fault tolerance, virtual desktop backup, site-wide disaster recovery, help to maximize uptime, preserve patient data, and maintain compliance with HIPAA and other industry regulations.

With these capabilities, VMware View and Cisco VXi together enable IT teams to provide caregivers with fast, reliable access to critical patient systems, helping to solve the "last-mile" challenge of delivering EHR and other clinical applications to clinicians at the point of care.

The Challenge of Measuring TCO

Most industry analysts and experts agree that adopting a virtual desktop infrastructure powered by VMware View can yield significant business value with a high return on investment (ROI). For example, Forrester Research conducted a study of a healthcare organization that adopted VMware View, and found an anticipated ROI of 122-128 percent with a net savings of more than USD \$2 million over four years¹. Similarly, IDC Research found that organizations deploying VMware View saved on average over \$610 annually for each supported end user².

Nevertheless, some VDI initiatives get stuck at the evaluation stage because the economics of VDI appear very similar to the total cost of ownership (TCO) for traditional desktop and laptop environments. A small number of evaluations fall flat due to technical issues such as the use of legacy computing hardware to host virtual desktops, which can

¹ Forrester, "Total Economic Impact of VMware VDI: Healthcare", July 2008

² IDC, "Quantifying the Business Value of VMware View", September 2009

limit the performance, utilization, and ultimately, the return on investment. But the real problem is that healthcare organizations lack the tools they need to assess the costs and benefits of VDI solutions in a meaningful way.

Traditional analysis methods focus on the IT costs and benefits associated with datacenter and endpoint hardware only. They do not fully capture the economic benefits that come from improvements in areas such as business continuity and disaster recovery, nor do they measure the end-user productivity gains and clinical workflow improvements that are possible with VDI. For example, Forrester's analysis measures benefits such as PC replacement savings and electricity savings, but only considers the worker productivity gains as they relate to the reduction of computer crashes and PC-related problems. Likewise, IDC's report focuses exclusively on improvements to management, operational efficiency, and IT staff labor costs. Thus, while there is recognition that VDI has potential to transform healthcare delivery and help improve patient care, very few healthcare organizations have developed the quantitative measurements necessary to calculate the true TCO of adopting VDI as point-of-care solution.

Quantifying the Intangible Benefits of VDI

The Cisco Global and Transformational Partnerships Organization (GTPO), with input from VMware, recently delivered a consultative engagement at Metro Health, an innovative healthcare provider, that better quantified the true TCO of a VDI deployment. This engagement focused not only on IT costs but also on workflow and productivity benefits, and identified three important clinical workflows where VDI generates huge improvements over a traditional laptop and desktop environment.

Metro Health at a Glance

Serving the Grand Rapids and Western Michigan area, Metro Health is an integrated group of health care organizations, including physician groups, neighborhood outpatient centers, managed care services, a philanthropic foundation and more.

Metro Health uses Epic as their primary EHR system for both in-patient and out-patient services, and leverages VMware View to deliver end-user access at the point of care. "We will have everyone on virtual desktops, from doctors and nurses accessing medical records from any thin client workstation, to technicians who view X-rays, to professional staff accessing any of our 450+ applications," said Aivars Apsite, technology manager at Metro Health.

This robust clinical system, called "Metro View," spans all hospital departments and specialties, giving healthcare providers the tools they need to deliver safe, high-quality care. Using VMware View to virtualize clinical and office desktops provided a very appealing option. Virtual desktops are secure within the datacenter and can be immediately accessed from any terminal in the organization, making it easy for doctors and nurses to quickly retrieve the information and access the applications necessary to treat patients.

Metro Health has been a VMware customer since 2007, and one of the biggest gains from adopting desktop virtualization has been the ability to provide secure instant access to information from any endpoint: "Our medical staff can freely move throughout the hospital and the outpatient sites," said Apsite, "allowing them to securely access their clinical desktop and applications from anywhere."

Overview of Consultative Engagement

The Cisco engagement at Metro Health's VDI environment, through a series of on-site workshops and interviews, followed a collaborative approach to identify and evaluate the comprehensive impact of VDI and showed how this investment delivered a rapid payback. What was unique about this engagement is that it went beyond the usual discussions of IT-related expenditures to identify—and quantify—the impact of VDI on clinical workflows. During this engagement, Cisco and Metro Health identified several critical workflows (use cases) where virtualizing the clinical desktop generated huge

improvements in productivity for clinicians. Of these use cases, three were determined to provide the greatest benefits to Metro Health, and are detailed below. In the past, these benefits were considered “intangible” and difficult to quantify. But this study demonstrates that there is a tangible, quantifiable way to measure the impact of VDI on clinical workflows, and that it is well worth evaluating because these workflow benefits can exceed the IT-related benefits.

IT-Related Cost Reductions

The results of the analysis revealed that Metro Health could reduce their capital expenses by 30 percent by implementing an integrated VDI platform that includes Cisco VXi with VMware View. The analysis also shows that Metro Health could decrease their IT operating expenses through lower software maintenance and support costs, reduced desktop power consumption, and improved application availability.

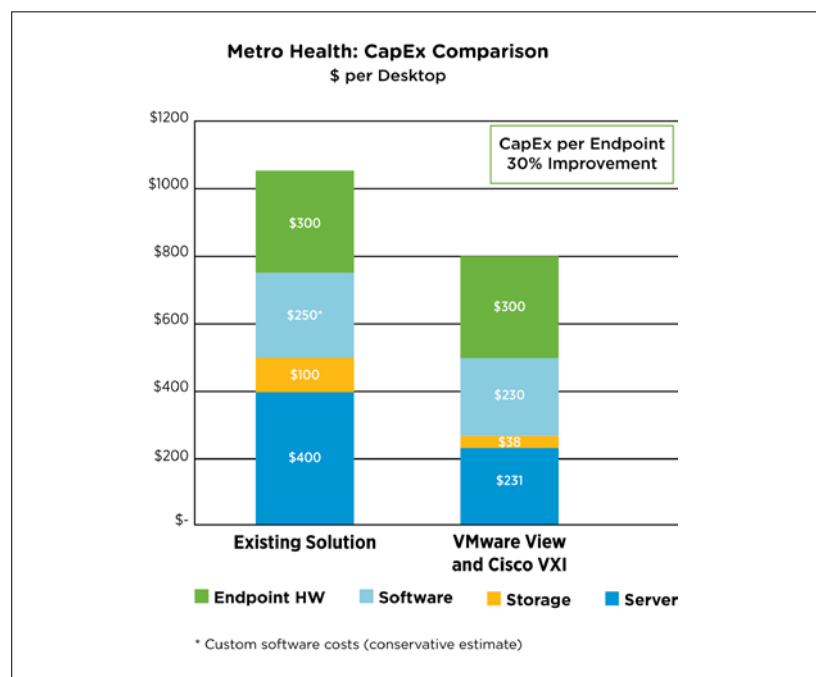


Figure 1. Metro Health VDI CAPEX Comparison

Referential Clinical Imaging

Old Workflow:

- Dedicated PCs
- 10 min. round trip
- Local access only

New Workflow:

- Any endpoint
- 5 min. round trip or remote access

Results:

- “Time-to-reach” end workstation reduced by 50%
- Productivity gain = 33%

Clinical Workflow Improvements

Although these IT-related cost reductions are encouraging, the consulting team discovered far more compelling benefits when they set out to discover the impact of VDI on three distinct clinical workflows at Metro Health:

- Referential clinical imaging
- “Follow-me” clinical desktops for nurses
- Ubiquitous dictation for physicians

These use cases reveal the dramatic cost savings that organizations can achieve when they use an integrated VDI platform for point-of-care delivery.

Referential Clinical Imaging

The current system, at Metro Health, for referential viewing of clinical images is to use a dedicated workstation running the imaging software application. Metro Health provides a few of these workstations on each floor of their hospital, which means that doctors must find and travel to one of these workstations when they need to analyze a patient’s imaging. The actual analysis requires only a few minutes at the workstation, but the associated “travel time” can be five times as long.

Follow-Me-Desktops

Old Workflow:

- 50+ logins a day
- 2+ min. to log in, launch app and view patient data

New Workflow:

- Access virtual desktop from any endpoint
- Instantly resume all apps and data

Results:

- Login times reduced by 50%
- Productivity gain = 33%

Ubiquitous Dictation for Physicians

Old Workflow:

- Dedicated workstations with application and USB microphone
- Physicians take 5-minute round trip to workstation each time
- Remote physicians must be provisioned separately

New Workflow:

- Any USB-enabled endpoint that accepts dictation
- No need to provision dedicated hardware for remote physicians

Results:

- “Time-to-reach” workstation reduced by 50%
- Potential reduction in software licensing and hardware costs
- Productivity gain = 33%

Travel time is even more of an issue when doctors receive an emergency call while at home. Previously, their only options are to either call someone at the hospital to analyze the image and give them a diagnosis, or to travel to the hospital and view the images themselves. But with virtual desktop infrastructure, clinicians can now view medical images on any available endpoint—whether at home, in the office or at a mobile clinic. The advanced networking and display protocol technology in View and VXi together provide an outstanding rich-media experience with the high level of graphics support needed to display and render clinical imaging. This approach saves a tremendous amount of time for clinicians, and improves the quality of work-life for physicians.

Follow-Me Clinical Desktops for Nurses

Nurses at Metro Health are very mobile, and they use a variety of endpoints in the hospital, ranging from PCs in their staff room to workstations-on-wheels (WOW) and desktops in patient rooms. In a typical 10-hour shift, a nurse needs to access an endpoint at least 50 times. Each time, the nurse has to authenticate to the endpoint, access the appropriate clinical application (e.g., Epic EpiCare) and bring up the patient’s data in the application. This process can take up to three minutes each time, which takes a significant amount of time away from patient care over the course of a single shift.

With VDI, each nurse connects to their “session” that maintains its state as they move from endpoint to endpoint. Nurses can log into any endpoint at any location and instantly resume their session, including all applications, data, and user customizations, resulting in significant productivity improvements.

Ubiquitous Dictation for Physicians

Physicians typically “dictate” their notes from patient sessions into a recording device. At Metro, all physicians are given a dictation microphone that enables them to plug into a workstation running their dictation application. Metro provides several dedicated dictation workstations on each floor of the hospital. Doctors typically see several patients during their rounds and then travel to a dictation workstation and use their microphones to record their notes. This process is time-consuming and can cause errors.

With VDI, enabled by the USB support in VMware View and Cisco VXi, doctors can now access their dictation application from any endpoint at Metro by just plugging their microphones into the USB slot. This not only saves them time in finding a workstation but also has the potential to reduce errors since the notes from each patient’s session can be recorded immediately.

Overall Results

While the tangible IT-related economics of implementing VDI using VMware View with Cisco VXi at Metro Health shows a reduction in TCO, the payback period on this investment was approximately three years, which did not bode well for an immediate investment from a financial perspective. However, when the clinical workflow and productivity benefits are quantified and included in the analysis, the payback period improves dramatically, as illustrated in Figure 2.

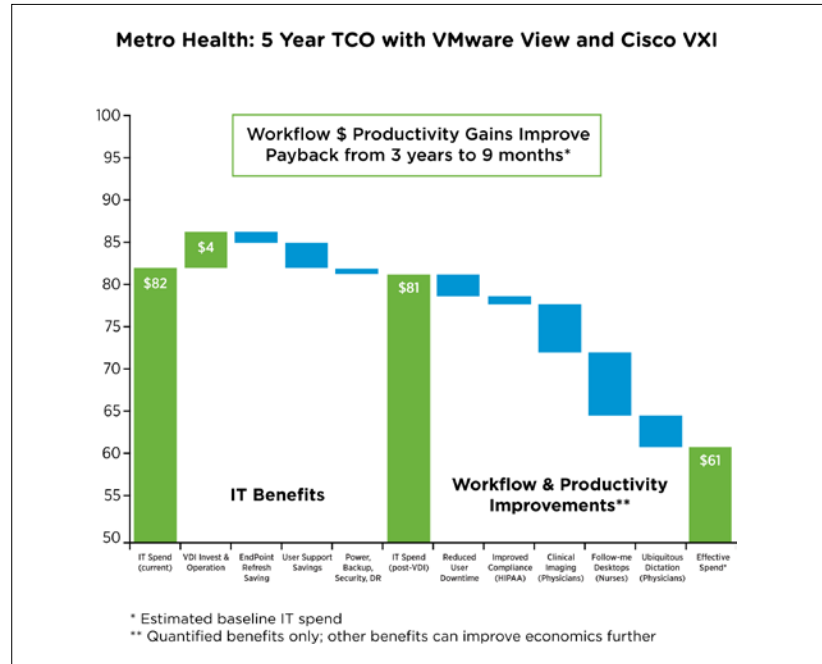


Figure 2. 5 Year TCO Analysis with Workflow and Productivity Gains

What's more, when the business benefits associated with these clinical workflow optimizations are taken together as a whole and measured over a five-year period against the expenditures associated with VDI, the payback period accelerates from three years to just nine months, as shown in Figure 3, and the economic case for VDI as a point-of-care solution becomes much more compelling.

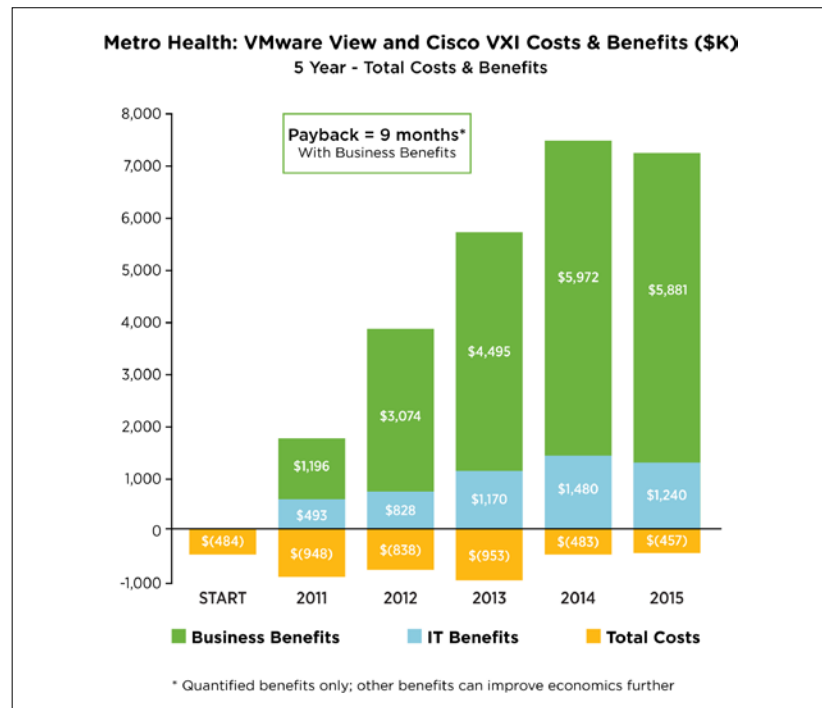


Figure 3. VMware View and Cisco VXi 5 Year TCO Analysis - Costs and Benefits

Conclusion

As the monolithic desktop PC becomes a thing of the past, so too must the monolithic, IT-centric approach to measuring the total cost of ownership. To truly understand the costs and benefits of VDI technology, healthcare organizations must also examine the productivity improvements that solutions such as VMware View and Cisco VXi bring to clinicians at the actual point of care, where it matters most.

The workflow improvements outlined in this white paper can help you articulate a compelling financial case for adopting VDI technology, but they represent only few of the many potential use cases where a virtual desktop infrastructure can have a positive impact on productivity and patient care. Other clinical and non-clinical uses of VDI technology include:

- **Patient discharge** – Discharging patients from the hospital can take as many as five hours to complete, and often involves approvals from multiple providers at multiple locations across the hospital (and sometimes even at multiple facilities). VDI technology has the potential to help healthcare organizations to accelerate this process and make life easier for clinicians and patients alike by reducing the associated travel and login times.
- **Employee training** – Using VDI for employee training makes it possible to stream instructional videos to any endpoint, which in turn reduces or eliminates the time required to travel to a training facility and improves compliance. Training labs using virtual desktops can be easily and quickly re-imaged from a central location and ready in no time for the next class. In addition, solutions such as VMware View and Cisco VXi have the potential to help reduce some medical errors through the use of pervasive virtual desktops that move hospitals closer to the vision of ubiquitous real-time access to clinical information.
- **Non-clinical workflows** – While VDI is an ideal solution for point-of-care delivery, VMware View and Cisco VXi are designed to scale effortlessly and address the widest possible variety of users and user cases, from quality management and IT operations to administration, reception and other functions across the organization.

The consultative engagement at Metro Health also highlights the importance of selecting a computing platform that is architected for end-to-end, service-optimized desktop virtualization. Non-stop point of care, and the ability to deliver EHR as a non-stop service, is becoming increasingly critical with every patient record that gets digitized. When the power goes away and your clinicians are completely dependent on electronic records, an outage where a caregiver cannot access point-of-care applications can quickly become a Severity-1 event. When lives are on the line, you can't afford a virtual desktop infrastructure that will let you down. You need a robust solution that you can rely on today, and in the years to come as your organization makes even more pervasive use of technology to improve patient outcomes.

About VMware View

VMware View is a complete virtual desktop solution that enables healthcare organizations to significantly improve point of care workflows for caregivers and the quality of care for patients. Built to deliver desktops and applications as a secure managed service, this solution simplifies desktop administration and management while increasing security of data by establishing a modern end-user computing architecture. VMware's End-User Computing vision seeks to free users and IT from more than two decades of complex, device-centric computing and deliver a more consumer-focused cloud experience for the enterprise.

About Cisco VXi

The Cisco Virtualization Experience Infrastructure (VXi) is a service-optimized desktop virtualization platform that can deliver any application to any device in any workplace environment, support a rich user experience, and provide IT with additional security and control. In combination with cross-domain professional services and a broad partner ecosystem, Cisco VXi offers a new, more flexible services architecture that addresses critical IT and business requirements rather than just focusing on technical speeds-and-feeds or the latest tactical issue.

