HOW HEALTHCARE ORGANIZATIONS CAN REALIZE THE FULL POTENTIAL OF VDI WITH FLASH STORAGE

Real world case studies illustrate the many benefits of all-flash VDI

PURESTORAGE®

INTRODUCTION

IT departments in large healthcare institutions face numerous challenges. They are expected to help implement new initiatives to improve patient care, oftentimes while having to support legacy applications that may have been cobbled together over many years. At the same time, they must follow ever-stricter imperatives for securing patient information – and do all this while controlling costs and increasing efficiency.

Hospitals and large clinics continue to build innovative IT systems to meet their stringent requirements, frequently with mixed results. Thus, the search continues for solutions that blend cost-effective and non-disruptive innovation that not only preserves operational continuity, but significantly improves efficiency.

One of the most important areas of innovation in healthcare IT is virtual desktop infrastructure (VDI), which has several benefits. Chief among them are improved patient care, strengthened health data security, enhanced clinician productivity, and greater cost efficiencies. But despite these potential benefits, many healthcare institutions have been either reluctant to move to VDI or have been unsatisfied with its implementation. That's because VDI poses unique implementation challenges for IT departments which, if not adequately addressed, can lead to failed deployments and user disenfranchisement. VDI is a resource hungry IT workload that has historically been difficult to accommodate on older data center systems. A frequent source of problems with VDI is an outdated or inadequate storage system that results in outages and slow VDI response – all issues that are easily resolved with modern, all-flash storage from Pure Storage.

This paper will carefully examine the benefits of VDI in healthcare organizations, and the contributions that all-flash storage can make to a successful VDI implementation.

BENEFITS OF VDI IN HEALTHCARE

VDI can benefit healthcare organizations in at least four ways:

- Improved clinician productivity
- Improved patient care
- Greater data security
- Enhanced IT cost-efficiency

IMPROVED CLINICIAN PRODUCTIVITY

Perhaps the most valuable consideration in a hospital or clinic is the amount of time physicians can reasonably spend with patients. But in a hospital, doctors are often on the move between multiple locations. If they are required to use a single PC or terminal to access data and input patient information, they waste a lot of time transcribing notes and instructions when they get back to their office. More importantly, there may delays in the entry of vital patient information and the information may be lost or misrecorded. And if a hospital wants doctors to access a PC or other device wherever they are, then there are huge challenges. Every time he or she moves location, the doctor must log into and out of a PC or other device, and the wasted time adds up.

With successful VDI, wasted time can be sharply reduced. In many hospitals, clinicians carry badges or other security devices that allow them to "tap in/tap out" to any device connected to VDI, giving them instant access to the data and applications they need, wherever they are. The time needed to log in or out is greatly minimized, and the clinician is free to go anywhere in the facility without having to be concerned about being out of touch.

IMPROVED PATIENT CARE

Easy access to information isn't just a matter of convenience, however. It also can be closely tied to better patient care. Take a common situation like a doctor prescribing medicine for a patient. In a PC-centric setting, the doctor might write a note to order a prescription, or even write the prescription on the spot. But what if there is an allergic reaction or potential negative interaction for that medicine with that patient, and what if the doctor isn't aware of it at the time? The consequences could be harmful, if not catastrophic. Contrast this with a VDI environment, where the doctor has instant access to all the data resources of the hospital, including patient history and known interactions between drugs. The potentially harmful interaction or allergy will be flagged as soon as the doctor enters the drug's name, and its prescription can be immediately avoided.

Anytime a clinician can get faster access to more information, the outcome for a patient is going to be better. Conversely, the more time clinicians spend waiting for information, the less likely they will use an application or go in search of data. That potentially means a delay in care for a patient or a missed opportunity for more beneficial treatment.

In settings where clinicians are served by VDI, long wait times for information are eliminated or sharply reduced.

GREATER DATA SECURITY

The security of protected health information (PHI) is of vital concern for all healthcare organizations, and the greatest burden for achieving security falls on IT departments. In many cases, VDI can be the single most effective tool in ensuring PHI security. That is because in VDI, data is no longer stored on end devices, but instead is kept in a central location under the control of IT professionals. Organizations thus gain greater control over data loss, intrusion prevention and end-user management. With VDI, clinicians can access PHI virtually rather than locally, so they do not have to remove patient data from a secure data center and store it in a potentially insecure mobile device.

VDI can complement bring-your-own-device (BYOD) initiatives because users will already be comfortable with their own smartphone, tablet or laptop and will not need to learn the intricacies of another device for work purposes. Through secure VDI, employees can access applications through their own devices and settings more easily, safely and efficiently. With the data remaining inside the data center and with secure VDI, IT administrators have better visibility into user settings and applications metrics, as well as overall performance.

ENHANCED IT COST-EFFICIENCY

In addition to the positive impact on clinicians, VDI also has benefits for IT departments. Because operating systems are centrally maintained and managed, changes and updates can be made easily and quickly. VDI enables better policy control as everything can be managed from the data-center platform.

Administrators can see end-user, server, application and desktop performance data through one console and can make changes to attain fast response times. They also can see what end-users are accessing and can block services if necessary.

Finally, capital and operating costs can be significantly reduced because: a) end-user devices can be purchased that are less expensive than PCs; b) IT staff resources can be concentrated at a central location instead of having to attend to desktops at their various locations; and c) help-desk calls are reduced because fewer end-users have problems accessing data and applications.

THE CONTRIBUTION OF STORAGE TO SUCCESSFUL VDI

Despite the many compelling benefits of VDI in a healthcare environment, the promised benefits are not guaranteed, nor are they necessarily achieved overnight. Some organizations find that their first attempt at virtualization causes as many problems as it solves, particularly when it comes to disappointing end-user performance, unexpected management complexity, and high costs. Or, VDI may function well at the start, but fail to scale over time.

In many instances where the results from VDI implementation are disappointing, there is a clearly identifiable cause – an inadequate storage system. Typically, this involves legacy spinning-disk systems; but sometimes hybrid systems that combine hard disk and solid-state technologies are the culprit. Fortunately, there is a solution: smart storage from Pure Storage.

Pure Storage helps organizations overcome the most common reasons for disappointing results from VDI, which can be sorted into four categories.

VDI CHALLENGE #1:

Poor end-user performance. In many VDI deployments, clinical staff productivity actually declines, mainly because legacy spinning-disk, hybrid, or retro-fit flash storage systems cannot deliver data fast enough to meet demand at peak times. At times of peak load on the VDI infrastructure, a so-called "boot storm" or "log-on storm", disk-based storage cannot provide the necessary performance to allocate desktop services to all users simultaneously. End-user performance also can be negatively impacted during routine system maintenance like virus scans, patching, recomposing and software updates.

The Pure Storage solution: An all-flash array from Pure Storage delivers consistent sub-millisecond response times, even during periods of peak demand. That means the best possible end-user experience and an end to physician support-call complaints and trouble tickets. The always-on resilience and reliability of Pure Storage arrays guarantee a consistently positive end-user experience that results in improved clinical productivity. Security, another key motivator behind VDI, is enhanced by Pure Storage, which includes encryption-at-rest as a feature in all its arrays, at no extra cost.

VDI CHALLENGE #2:

High costs. Many experts say storage is the single largest cost component in VDI. So, if the storage infrastructure is not efficient or scalable, the promised cost benefits of VDI may not be achieved. Four or five years after initial implementation, total cost of ownership (TCO) can be disappointingly high.

The Pure Storage solution: Pure Storage arrays lower capital and operating costs in several ways. The superior deduplication and compression features offered by Pure result in data-reduction rates often 2x greater than typical alternatives, which means 8:1 or better for VDI environments. That means more data can be stored in far less space, lowering capital expenditures as well as operating costs, like co-location charges based on the amount of rack space used, and power and cooling fees. Pure Storage also slashes long-term costs through its breakthrough Evergreen™ Storage business model, which eliminates the cycle of replacing storage systems every three or four years. Instead, maintenance pricing remains constant, controller upgrades are included every three years, and investments are protected for the long-term. The result is that storage makes a large contribution to an attractive TCO for VDI. In many implementations, customers have further reduced their overall costs when they find that after accommodating all their VDI needs, a Pure Storage array may still have storage capacity to spare. In these cases, other workloads can be moved onto the Pure array, which is capable of handling mixed loads without performance contention.

VDI CHALLENGE #3:

Management complexity. Moving resources and functions from desktops into the data center can increase the burden on IT staff, because VDI is expected to be always-on, always available, and always reliable. Legacy storage systems further add to the management burden by imposing complex maintenance procedures, demanding highly specialized expertise from storage experts, and requiring expensive forklift upgrades in order to expand capacity or capitalize on new technologies

The Pure Storage solution: IT managers and staff consistently praise Pure Storage for the simplicity of its installation and effortless ongoing management. Because the management requirements of a Pure array are so minimal, and the interface so intuitive, most customers find they can free up resources and time to handle more valuable projects. Managing smart storage from Pure is so easy, it can be handled by IT generalists or virtualization admins and does not require special storage expertise. VDI-related tasks are accomplished in significantly less time than with legacy spinning-disk storage systems. For example, real-world testing shows that recomposing 100 virtual desktops can be accomplished in 4 minutes with a Pure array, compared to 45 minutes with a disk-based system.

Booting 100 VMs takes less than a minute with Pure, versus around 15 minutes for disk. And provisioning a 50GB desktop from a template takes around five seconds with a Pure array deployed, compared to three minutes with disk. Another significant feature of Pure Storage arrays is non-disruptive upgrades. Software upgrades, system expansion – even a complete controller upgrade – can be accomplished with no interruption in system availability, even during production runs on a workday.

VDI CHALLENGE #4:

Dead-end growth path. Few VDI implementations cover all end-users from the start. Most often, groups of users are added over time – more departments, new categories of users, additional geographies. As this occurs, some organizations find that while their VDI was a success with hundreds of users, problems with end-user performance, management complexity, and soaring costs arise when the number of users doubles or triples. In situations where legacy storage infrastructure is stifling performance, incremental improvements are not possible; only expensive and disruptive forklift upgrades can possibly help.

The Pure Storage solution: Pure Storage removes any doubts about the ability of VDI to scale into the future. With Pure, an organization can start with a small array capable of supporting as few as 100 users with 5 to 10TB of raw capacity. With the "Love Your Storage" offer, a prospective customer can use a Pure array in a proof-of-concept trial for as long as 30 days, with no obligation, and return it at no cost if not satisfied for any reason. Once purchased, that array can be the foundation for a storage infrastructure that can eventually grow – without any disruption to ongoing operations, and without obsoleting any previous investment – into supporting more than 5,000 users and hundreds of terabytes of usable storage capacity.

CONCLUSION

IT departments in healthcare organizations now have a compelling business case for adopting VDI in combination with all-flash storage. An all-flash VDI greatly increases opportunities for improved patient care, a more efficient and productive work environment, and long-term savings in capital and operating costs.

REALIZING THE BENEFITS OF VDI AND ALL-FLASH STORAGE IN HEALTHCARE

Here are four case studies of healthcare organizations that have benefitted from implementing VDI with all-flash storage solutions from Pure Storage.

Running its EHR system on a FlashStack converged infrastructure provides Riverview doctors and caregivers **faster access to key patient records and healthcare information.**

RIVERVIEW HEALTH

SUMMARY

Riverview Health required better-performing storage to support its widespread implementation of a virtualized computing infrastructure. By adopting the FlashStack™ converged infrastructure from Pure Storage, Riverview Health has seen dramatic impro vements in performance and a radical simplification of storage management.

THE ORGANIZATION

Riverview Health is a comprehensive healthcare network comprised of a full-service hospital in Noblesville, Indiana, and 23 primary, immediate and specialty care facilities in the surrounding area. It uses an electronic health records (EHR) application and virtual desktop infrastructure (VDI) to support more than 300 clinicians.

THE CHALLENGE

Riverview's hybrid storage array was designed to automatically move frequently accessed data from spinning disk to the flash tier for faster access, but the automatic tiering provided inconsistent performance for the EHR system. One minute, patient records were available instantaneously; a little later, the same request could take several minutes. Clinicians were frustrated.

THE SOLUTION

"We needed the fastest possible infrastructure to support our EHR application and VMware View infrastructure," said Jason Pearce, director of information systems infrastructure, adding that the objective was to improve the productivity of caregivers by minimizing any delays in accessing patient data. Pure Storage was selected for a host of reasons: it offered predictable high performance, low latency, in-line deduplication and compression, encryption at rest, and a predictable path for implementing future upgrades and expansion.

Riverview Health has committed to the FlashStack converged infrastructure that combines all-flash storage arrays from Pure Storage, VMware software, and UCS servers and Nexus switches from Cisco Systems. "With a FlashStack architecture, I know we will have an infrastructure we can leverage well into the future as we implement the next generation of applications," Pearce said.

KEY BENEFITS

The unpredictability experienced with hybrid storage disappeared. IOPS for the Microsoft SQL Server database supporting the EHR system increased 50 percent, while peak transactions per second tripled. Latency in the time needed to read or write to patient records, which had been as high as 8 ms, is now consistently at or below 0.5 ms. That means clinicians serving patients spend less time waiting for data or adding new information to a patient's record. Pearce observed that one of the benefits of Pure Storage arrays for any company in healthcare is the inclusion, at no extra cost, of encryption at rest; a feature increasingly demanded to meet data-security requirements.

After months of unacceptable delays in accessing patients records through its EHR system, Unity installed a Pure Storage FlashArray, and **'the difference has been night and day'.**

UNITY HEALTHCARE

SUMMARY

Unity Healthcare relies heavily on its Electronic Health Record (EHR) as well as many other patient management applications, all focused on improving patient care and operational efficiency. When the performance of Unity's storage infrastructure started to impact medical staff productivity as well as back-office personnel, the IT staff investigated several flash-based solutions in the market and chose to install Pure Storage all-flash arrays. Since then, Unity's application performance has been trouble-free, storage-related CAPEX and OPEX have been significantly reduced, and storage management has been dramatically simplified.

THE ORGANIZATION

As a small, physician-owned provider in an industry increasingly dominated by large organizations, Unity Healthcare in Lafayette, Indiana, distinguishes itself by the close relationships it builds between the local community as well as its 650 employees. All departments within Unity strive to balance the mission of excellent patient care with the goal of operational efficiency. That is especially true of its IT department, which for many years has invested in Electronic Health Records (EHR) and Virtual Desktop Infrastructure (VDI) systems designed to make it easier for doctors and other clinicians to serve patients effectively and efficiently.

THE CHALLENGE

Unity was a satisfied user of Allscripts for both its EHR and practice management applications, but there came a time when both clinicians and back-office staff started complaining about the time it was taking to use critical applications – as long as 45 seconds for a report to appear or a screen to populate. Allscripts was able to achieve some improvements in system performance by making adjustments in the software, but a more effective solution was needed. "With our legacy SAN, we were almost out of capacity and we were seeing increasingly unacceptable levels of performance," said Brent Fletcher, IT Director.

THE SOLUTION

SIS, a leading technology and managed IT solutions provider with a specialty in EHR, recommended Pure Storage. "Their flash storage solutions take away so many of the performance, migration, deployment and management headaches that have historically plagued EHR implementations," said David Herbon, account manager with SIS. Among their core competencies is expertise in data protection and storage management. This expertise extends to healthcare where SIS helps organizations like Unity minimize the risk of migrating to electronic health records (EHR).

KEY BENEFITS

After installing a FlashArray from Pure Storage, "the difference was night and day," Fletcher said. "The billing office noticed it right away and let us know." Physicians and other clinicians also noted the greater efficiency of access to the key EHR and patient-management applications they rely on every day. In addition to solving the performance problems affecting end-users, Pure has simplified life for the IT department with its effortless management. And the de-duplication and compression features, resulting in an overall data reduction of 7:1, has allowed the IT team to support other strategic efforts.

Obstetrics & Gynecology of Indiana

OBSTETRICS AND GYNECOLOGY OF INDIANA

THE ORGANIZATION

Obstetrics and Gynecology of Indiana serves approximately 90,000 patients a year through nine offices in central Indiana. Founded in 1993, the practice has 38 physicians. It uses PrimeSuite® from Greenway Health® for its electronic health record (EHR) and practice-management applications, running on a Microsoft® SQL Server® database. Its servers are virtualized using VMware® ESX® and about 200 end-users are supported by Citrix® XenApp® to deliver virtual apps and secure remote access.

THE CHALLENGE

The practice had been using a spinning-disk storage-area network (SAN), but it was running out of capacity, and the vendor had announced it would no longer be supporting VMware. "So we had no choice but to buy a new storage system," said Paul Stage, IT Director. In addition, "We were seeing latencies of anywhere from 10 ms to 30 ms. This threatened the quality of the end-user experience, and that's the last thing we want."

THE SOLUTION

Stage arranged 30-day proof-of-concept trials with two vendors, one of them Pure Storage. The entire production environment was loaded onto each device and evaluated. Key selection criteria were high performance, so doctors and other clinicians would have timely and reliable access to patient files, and ease of management, which was critical to an IT staff consisting of only two people. At the end of the POC trials, Pure Storage was the clear winner. "Pure Storage offered all-flash at less cost than hybrid, it gave us all the performance we could ever want, and it was much easier to configure and expand."

KEY BENEFITS

End-users saw quicker responses to requests for patient files and other transactions, thanks to a dramatic lowering of latencies on the storage array. Latencies that had ranged between 10 ms and 30 ms were now consistently 1 ms or less. That impact is most felt by the roughly 200 end-users on Citrix XenApp. "Screen refreshes are almost instantaneous. And a report that used to take 2 minutes or more is now available in less than 30 seconds." Stage reported similar process improvements inside the IT operation. "My VMware reports typically required 5 minutes to run, and now they're finished in 5 seconds. And the time it takes to recover or move a virtual machine has been cut by half." The data-compression and de-duplication features of the Pure Storage array "means we have been able to shrink our data-center footprint by half, which saves both time and money."

ST. LUKE'S HEALTHCARE

THE COMPANY

St. Luke's Healthcare of Duluth, Minnesota has two hospitals, 14 primary care clinics, 24 specialty clinics, and two pharmacies that serve the people of northeastern Minnesota, northwestern Wisconsin, and the Upper Peninsula of Michigan. St. Luke's has a virtualized computing environment using Citrix XenDesktop and XenApp.

THE CHALLENGE

St. Luke's legacy spinning-disk storage system was becoming increasingly slow and unable to keep up with growing performance demands. Latencies reached as high as 300 ms. Clinicians complained about slow performance hampering their ability to efficiently move from one patient to another. St. Luke's was adding additional virtual host servers and storage capacity to circumvent the performance degradation and inefficiencies in its legacy SAN. The goal was to find a new solution to support its growing virtual environment at a lower overall capital cost while dramatically improving the environment to meet the new paradigms facing healthcare IT.

THE SOLUTION

St. Luke's acquired a Pure Storage FlashArray FA-420 and upgraded to a FlashArray//M50. There are currently 1,700 VDI users, including healthcare providers and administrative staff. Clinicians save time with a "tap-and-go" feature enabled by Pure Storage and Imprivata functionality. Imprivata fits into the XenDesktop architecture by integrating the Imprivata OneSign product with Citrix XenDesktop to provide No Click Access, authentication, and single sign-on with just the tap of a badge.

KEY BENEFITS

Forrester Research conducted a Total Economic Impact study to determine the ROI from St. Luke's deployment of Pure Storage FlashArray solutions for VDI. Forrester found St. Luke's will realize risk-adjusted benefits of $1.255 million over three years, or an ROI of 234% and a payback of just three months. Forrester noted that "the performance benefits of Pure Storage have resulting business benefits that transcend the data center and have a positive impact on the organization and patient care."

Among the identified benefits were:

- Happier and more productive physicians and other care providers
- Capital cost reductions
- Operating cost reductions
- Simplified storage management
- Improved performance and scalability; reduced latency

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sales@purestorage.com | 800-379-PURE | @purestorage