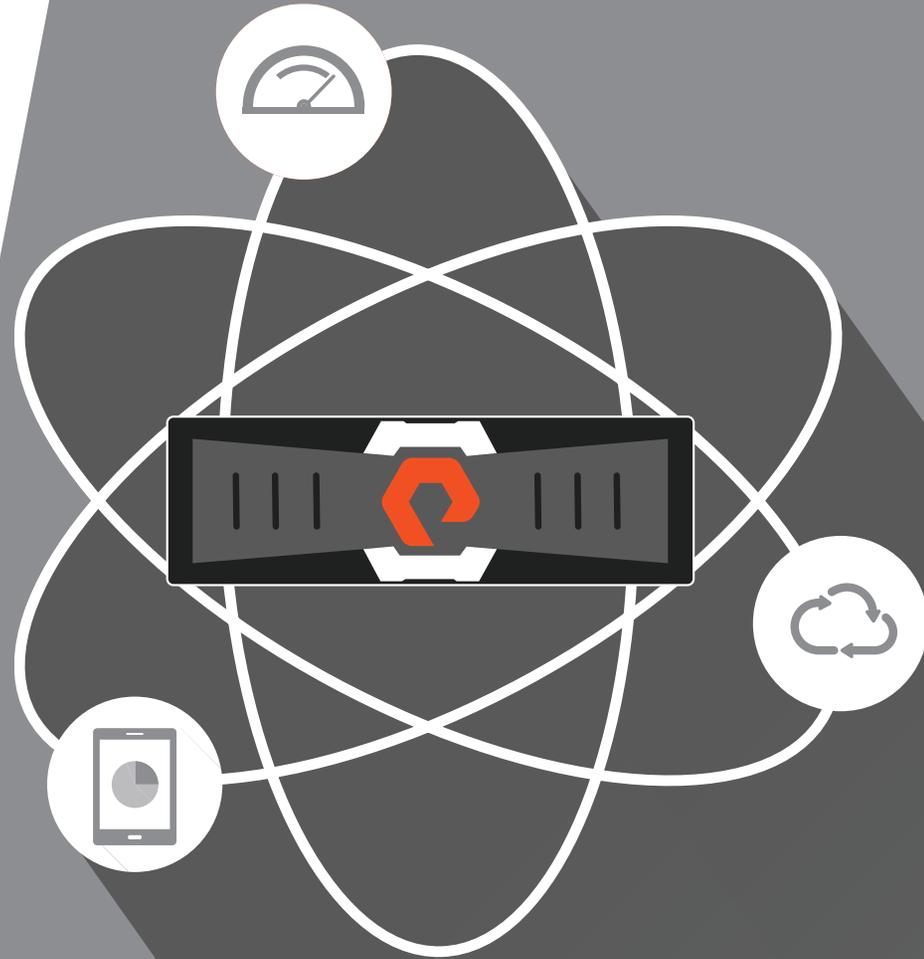


REALIZE THE PROMISE OF VDI WITH FLASH STORAGE

Case Studies About How Organizations
Are Benefiting from All-Flash VDI



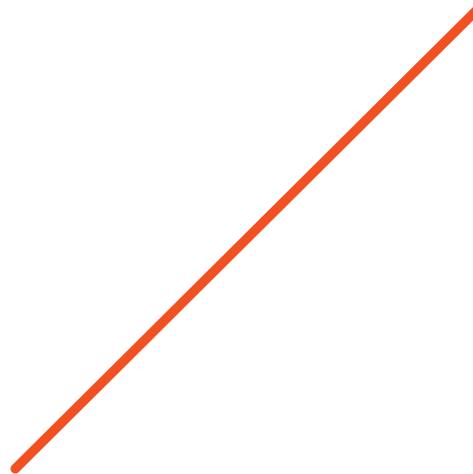
INTRODUCTION



The promised benefits of virtual desktop infrastructure (VDI) – including simplified management, enhanced security and reduced costs – are very attractive to both IT managers and senior executives. But these 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 fails to scale larger over time.

In many instances where the results from a 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 – of all sizes and across multiple industries – overcome the most common reasons for disappointing results from a VDI. All-flash storage delivers:

- 1. ALWAYS-ON, ALWAYS FAST** and always secure VDI, ensuring a consistently superior end-user experience
- 2. EFFICIENCY** with up to 2x better data-reduction rates, lowering capital and operating costs
- 3. EFFORTLESS STORAGE MANAGEMENT**, sharply reducing the demands on IT staff
- 4. EVERGREEN GROWTH AND SCALABILITY**, incorporating non-disruptive upgrades and clearly defined costs known well in advance

Whether you're planning a VDI rollout, or have already implemented VDI that's delivering sub-par results, this white paper will provide valuable guidance – citing actual end-user deployments – that clearly illustrates how deploying flash storage can optimize your end-user productivity and experience with VDI.

COMMON CAUSES FOR VDI DISAPPOINTMENT

The reasons behind a disappointing VDI implementation can be sorted into four categories.

1. POOR END-USER PERFORMANCE

A key promise of a VDI is the speed and ease with which end-users can access the data and applications they need to do their jobs efficiently. But in many VDI deployments, end-user performance 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. One result can be a so-called “boot storm” or “log-on storm.” In these instances, it can take minutes for an end-user to gain access to system resources or complete a critical transaction. End-user performance also can be negatively impacted repeatedly during routine system maintenance like virus scans, patching, recomposing and software updates.

2. HIGH COSTS

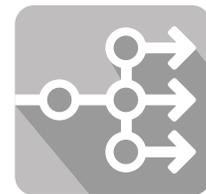
VDI deployments are frequently undertaken with the expectation that costs will decline for both equipment and management. But the savings from using “thin clients” can be swallowed up if the storage supporting the VDI still uses inefficient legacy spinning-disk or poorly architected flash technologies. 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 look disappointingly different from original expectations.

3. MANAGEMENT COMPLEXITY

Another commonly expected outcome of VDI is simplified management of the computing infrastructure. But moving resources and functions from the desktop and into the data center can actually increase the burden on IT staff. VDI is expected to be always-on, always available, and always reliable. That means the IT staff must perform maintenance, upgrades, and expansions with as little impact on end-users as possible. Smart storage will substantially simplify management and operations, often freeing up one or more IT staff members to spend time on higher value projects. That’s usually not the case with legacy storage.

4. DEAD-END GROWTH PATHS

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.



ALL-FLASH VDI SOLVES YOUR PROBLEMS

Smart storage arrays from Pure Storage address each of these VDI challenges.



1. END-USER PERFORMANCE

High performance is the hallmark of all-flash storage technology. 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 support-call complaints and trouble tickets. The always-on resilience and reliability of Pure Storage arrays also help guarantee a consistently positive end-user experience. 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.



2. COST

Pure Storage arrays lower capital and operating costs in several ways. Pure's superior deduplication and compression features 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. Moreover, long-term costs are known well in advance, with no surprises. 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. These new workloads will also be beneficiaries of the performance, security, and data-reduction features of the Pure array.



3. MANAGEMENT

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 when they reduce the bandwidth required to handle storage tasks. 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.



4. GROWTH PATH

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 – 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.

The commitment of Pure Storage to helping customers realize all the benefits of VDI is exemplified in its FlashStack™ offering. FlashStack is a flexible, all-flash converged infrastructure solution that combines the latest in compute, network, storage hardware, and virtualization software into a single, integrated architecture. These validated reference designs help to accelerate time to deployment, lower overall IT costs, and reduce deployment risk.

Highly efficient components – from industry leaders Pure Storage, Cisco Systems, VMware, and Citrix – reduce the costs associated with power, cooling, and data center space. FlashStack is available from accredited FlashStack Partners who collaborate to provide the right converged infrastructure best suited to the specific needs of each customer.

IT TRANSFORMATION WITH FLASH STORAGE

Organizations illustrate how Pure Storage improves their VDI experience

The University of Louisville School of Dentistry's informatics team no longer receives support desk calls due to VDI storage performance. **Now, the school can focus without interruption on advanced learning and quality patient care.**



THE COMPANY

The University of Louisville School of Dentistry has enjoyed a reputation for clinical excellence since its founding in the early 19th Century. An important element of the school's reputation is its commitment to leading innovation and embedding technological advancements into dental education. The school handles more than 87,000 patient visits a year, and its informatics department is committed to applying technology to improve the experience for both students and patients.

THE CHALLENGE

In 2010, the school implemented a VDI using Citrix XenDesktop. Today, it uses that VDI to access the axiUm clinic-management system. The VDI makes axiUm available at more than 1,100 access points, including 650 thin clients. Up to 400 students log in at the same time twice a day, which posed a challenge to system performance. In fact, log-in times ballooned to almost 30 minutes, and when around 100 students were finally logged in, the system would crash and reboot. In response to the problem, the school had to cancel some regularly scheduled clinics, disrupting patient care and costing up to \$40,000 a day in lost revenue.

THE SOLUTION

The school contacted the Hogan Consulting Group, its system integrator for VDI, and asked them to find a solution. Hogan diagnosed a problem between XenServer and the legacy storage array used by the school. It recommended installation of a Pure Storage FlashArray and a new version of XenDesktop. The decision to buy a Pure array was made on a Thursday, and by the following Monday the device was running production workloads. "Response times to load a profile and get a session were better than normal right away," said Bob Smith, a project manager on the school's informatics team.

KEY BENEFITS

The school has seen benefits from the Pure FlashArray in several areas. Log-in times which used to take 90 seconds or more are now accomplished in as few as 20 seconds. Data-reduction rates of 7.4:1 mean less money is spent on storage hardware and data-center operating costs. The radically simplified management of Pure flash arrays means the school can manage storage without a dedicated staff position. And the ultra-high reliability of the Pure array means help-desk calls related to storage performance have disappeared. After installation of the Pure array, the school found that it could handle all of the VDI requirements and still had capacity to spare. So, the school moved its Microsoft SQL Server database onto the array.

SoftBank Corp. has one of the largest VDI deployments in Japan. After upgrading its storage infrastructure with all-flash arrays from Pure Storage, **the company has improved the end-user experience for both customers and employees**, sharply reduced the time it takes to perform critical system-maintenance tasks, and cut capital and operating costs related to storage.



THE COMPANY

With over 60,000 employees and a large portfolio of businesses, The SoftBank Group is a global technology leader. SoftBank Corp. is a key player in the corporate family and for years has been engaged in a company-wide innovation program designed to nurture a variety of employee work styles to improve operational efficiency and strengthen competitiveness. SoftBank implemented VDI with VMware Horizon to support a new work style innovation program for employees.

THE CHALLENGE

After the massive Fukushima earthquake in Japan in 2011, companies of all types made plans to support employees in remote locations as part of business-continuity planning in times of disaster. That added to the criticality of SoftBank's VDI deployment for employees. Within a few months, a VDI was put in place supporting 14,000 employees as well as call-center functions. But deploying such a large-scale VDI posed challenges, particularly with respect to storage. "Operating a VDI is about constantly trying to overcome storage bottlenecks," noted Tatsuya Mori, Manager of Virtualization Technology. "Any delays in storage directly impact the user productivity in a negative way."

THE SOLUTION

In 2014, SoftBank was planning a refresh of VDI storage to improve performance, and decided to pursue flash technology after an evaluation of all the options. "Flash storage provides significantly better I/O performance than disk storage," said Toshio Takeuchi, Head of the Service Promotion Office for SoftBank. "We selected Pure Storage for VDI especially for its deduplication technology and non-disruptive operation that were ahead of competitors." In March 2015, SoftBank deployed two Pure Storage FlashArrays.

KEY BENEFITS

The deduplication and compression features provided by Pure Storage have resulted in an 8:1 data reduction, slashing the number of racks needed for the VDI by half, and also reducing power consumption. System-administration workloads have been dramatically reduced as well. For example, the time needed to recreate master images has been reduced to one-quarter of what it used to take. Re-creation is done once a month for all VMs during normal business hours, whereas in the past such maintenance work was performed during the weekends and evenings to avoid interruption of end-users' activity. In December 2015, SoftBank released its cloud-based B2B VDI services called White Cloud Desktop Service after being upgraded on the all-flash storage technology from Pure. While the VDI response times have been greatly improved with this service, Softbank has also benefited from keeping the price to customers the same as legacy services based on hard-disk storage.

When a legacy storage system at Ohio National Financial Services failed to keep up with the demands of its VDI, interruptions in critical IT systems caused major disruptions in key business operations. **Once a Pure Storage array was installed, the problems vanished.** Now, key applications take far less time to run, capital and operating costs have been cut, and application-development projects are completed much faster.



THE COMPANY

Ohio National is a major provider of life insurance, annuities, disability insurance and retirement planning. Founded in 1909, the company has more than \$40 billion in assets under management, and sells its products nationwide through a network of some 50,000 representatives.

THE CHALLENGE

Like many IT organizations, the technical staff was eager to enjoy the benefits of VDI. They had implemented a virtual environment for some 1,300 employees, and things seemed to be going well. But when spinning-disk storage proved unable to keep up with the demands, the term VDI became a bad word. "The previous array we had was very problematic across multiple performance dimensions. We had sporadic disconnects, screens freezing, and unacceptable latency," recalled Ricky Comstock, storage administrator. "We had 300 desktops that were still on Windows XP and support for that was ending. So, we needed to move them over to Windows 7, and VDI was going to allow us to do that. But when we moved them to VDI, all of the users and all their applications would stop working for 30 seconds, and then start up again. This problem affected even our senior executives, who demanded a resolution." Because the company had a shared array for all its storage, problems with the VDI affected everything else, Comstock noted, "so it wasn't just a bad day for desktop users; it was a bad day for everyone. This was something we had to fix quickly."

THE SOLUTION

Believing flash storage could be the answer to the problem, the IT team arranged a proof of concept trial with arrays from Pure Storage and one other company. Given the importance of getting a solution quickly, the team decided to go "all in and put the entire production apps on the flash boxes," Comstock recalled. They ran production apps for two weeks on one array, and then two weeks on the other system, measuring performance carefully. While both competing arrays "performed exceptionally," he noted, the differentiator in favor of Pure was its superior data reduction – 14:1 for Pure against 9:1 for the alternative. "When you compare the data reduction numbers, it made the cost even less than we expected," Comstock observed. "This 'free' capacity allowed us to defer the purchase of new capacity until the next fiscal year."

KEY BENEFITS

Once data and applications were moved onto the Pure Storage array, Comstock said, "the problems disappeared. The calls from unhappy users stopped. The performance difference was dramatic." A hedging application that is critical to the entire company used to take 20 hours to process – and as long as 32 hours when the old storage array was causing problems – but can now be completed in 2 hours. And a nightly security inventory program that previously took 4-5 hours to complete can now run in 1 minute. Application development also has benefitted from being moved onto the VDI, with productivity improving so much that some projects are being finished ahead of schedule. And the smaller footprint of the Pure Storage equipment has lowered power and cooling costs by 90%. Ease of management has proved one of Pure's biggest advantages, Comstock noted, freeing up IT staff to work on more strategic priorities and new applications. And adding storage capacity is remarkably easy. "When we wanted to add a shelf to increase capacity, we got the equipment in a couple of days, versus the 4-6 weeks that our previous storage vendor always quoted. And the Pure upgrade was done in minutes, right in the middle of a workday with no disruption or downtime."



St. Luke's Health System wanted to reap the benefits of VDI throughout the organization, but legacy storage arrays could not handle more than 200 users without unacceptably long log-in times and other performance problems. **After moving its VDI onto a Pure Storage FlashArray, the improved performance and greater reliability have made doctors and other care-givers more productive.** The healthcare provider also enjoys radically simplified storage management and has achieved a three-year return on investment of 234%.

THE COMPANY

St. Luke's Health System in Duluth, Minnesota, operates two hospitals, 14 primary care clinics, 24 specialty clinics and two pharmacies serving the people of northeastern Minnesota, northwestern Wisconsin, and the Upper Peninsula of Michigan.

THE CHALLENGE

St. Luke's wanted VDI to make its staff more productive and improve the quality of care for patients. These goals were frustrated, however, when its legacy spinning-disk storage system became increasingly slow and unable to keep up with the growing performance demands of VDI. Transactional latency levels were unacceptably high at 300 ms, and the legacy storage could not handle more than 200 users without unacceptably long log-in times as well as slow access to medical records and sluggish applications. St. Luke's needed sub-millisecond latency for its applications to satisfy medical and administrative staff productivity requirements to better serve patients.

THE SOLUTION

After evaluating several vendors, St. Luke's selected Pure Storage and installed one its FlashArrays in January 2014. Today, the array supports VMware servers, a Microsoft SQL Server database, an FTP server, and a Citrix XenDesktop and XenApp VDI environment serving 1,700 users, including healthcare providers and administrative staff. St. Luke's healthcare providers save time with a "tap-and-go" feature enabled by Pure Storage and Imprivata. The Imprivata OneSign product is integrated with Citrix XenDesktop and the Pure array to provide access, authentication and single sign-on with the tap of an ID badge. About 1,300 providers take advantage of tap-and-go, each tapping an average of 40 times a day and saving 20 seconds with each login versus the legacy storage environment. That equates to about 13 minutes saved per day, per person.

KEY BENEFITS

The impact of the Pure array on the VDI environment was immediate. Marcus Dallum, IT infrastructure manager, said the Pure array was at least 10 times faster than the spinning-disk system it replaced. And the deduplication and compression features of Pure also impressed the IT staff. "In our VDI environment, we have an 8.4:1 data-reduction ratio. If you add in the thin provisioning, it's 10.1:1. So it's been really great to have that many virtual desktops use so little space." St. Luke's has seen savings in the costs of power, cooling and data-center space since it acquired the Pure Storage array. It even was able to defer replacing an air conditioning unit. With Pure Storage, the storage administrator spends less time monitoring capacity and performance. And the IT staff has benefitted from the nondisruptive upgrade features of Pure Storage. St. Luke's recently decided to upgrade its original Pure Storage array, an FA-420, to a FlashArray //m50. The upgrade was done during normal business hours and took only 60 minutes. "Most of that time was spent re-cabling connections and making them look nice," Dallum noted. "We didn't have to come in at night, and we didn't have to announce any downtime." Routine software updates also are accomplished non-disruptively during business hours.

CONCLUSION

Smart storage all-flash arrays from Pure Storage can solve many common causes for under-performing VDI deployments by sharply boosting performance and reliability, making storage management effortless, ensuring evergreen expansions, and markedly improving your return on investment. If your organization is considering implementing VDI – or, if you already have VDI but it isn't meeting your expectations – talk to the experts at Pure Storage.

Visit www.purestorage.com/contact

For more information on Pure Storage VDI solutions go to: www.purestorage.com/vdi



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

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