

University of Louisville School of Dentistry relies on Pure Storage to support nearly 1,000 VDI users and 87,000+ patient visits annually.



#### BUSINESS TRANSFORMATION

The School of Dentistry dental 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.

#### GEO

Louisville, KY

#### INDUSTRY

Education/government/healthcare

“The biggest reason for the Pure purchase and deployment was the confidence of knowing that we would be up and running with a high level of stability, resiliency and performance.”

Christopher Morgan,  
*director of dental informatics*

## PURE STORAGE ENABLES FEARLESS INNOVATION IN HEALTH EDUCATION

### A COMMITMENT TO INNOVATION

The University of Louisville School of Dentistry has enjoyed a reputation for clinical excellence since its founding in the early 1800s. An important element of the school's reputation is its commitment to leading innovation and embedding technological advancements into dental education.

As part of the hands-on education provided by the school, its faculty, staff and students handle more than 87,000 patient visits each year. The School of Dentistry's dental informatics department is passionate about leveraging technology to improve both the student and patient experience.

For example, in 2007 the school moved to an axiUm electronic health records (EHR) system. In 2010, the school became one of the first in the country to adopt virtual desktop infrastructure (VDI) using Citrix XenDesktop, and is still one of only a handful of dental schools in the U.S. to use Citrix XenDesktop to deliver axiUm. When the school underwent renovations in 2011, they eliminated film-based, chemical-based processing rooms and embraced digital X-ray technology.

Today, the school uses VDI to access the axiUm dental education software they use for electronic record keeping, which includes scheduling, treatment planning and notes, patient management, charting and billing. The VDI initiative has made axiUm available at more than 1,100 access points—including 650 thin clients—that are available at every desk, dental chair and simulation mannequin throughout the school and its remote clinics.

For Director of Dental Informatics Christopher Morgan, the yardstick to measure success is quite simple: technology needs to run smoothly so students can concentrate on the patient encounter. In an educational environment where up to 400 students log in simultaneously five days a week, twice a day—during morning and afternoon clinic sessions—that can be easier said than done.

The School of Dentistry depends on the University of Louisville's central IT department to provide most IT services, which are shared with 15 other units within the University. Because of the School of Dentistry's critical storage needs for VDI, Christopher and his team decided they needed more control over storage resources to eliminate bottlenecks that could slow down services in the clinic – and interfere with patient care and student learning.

So for their next refresh cycle in 2014, they planned to upgrade their servers and Citrix applications, as well as purchase their own dedicated storage array, which central IT would manage on their behalf. The server and application upgrades took place over the summer, when the school and clinics were not in session. The dedicated storage array was scheduled to be brought online sometime in the early fall. Everything seemed to be going well, until the students came back to school and started logging in by the hundreds.

**CUSTOMER:**

University of Louisville School of Dentistry  
[louisville.edu/dentistry](http://louisville.edu/dentistry)

**SI PARTNER:**

- Hogan Consulting Group

**USE CASE:**

- VDI

**NUMBER OF USERS AND ACCESS DEVICES SUPPORTED:**

- Nearly 1,000

**CHALLENGE:**

- Fix a critical error that was leading to login times of more than 30 minutes; get more control over storage resources to prevent future bottlenecks

**SOLUTION:**

- Pure Storage FlashArray with VMware vSphere and Citrix XenDesktop

**RESULTS:**

- Login times dropped to 20 seconds, and the VDI Systems Administrator was able to easily add storage management to his weekly routine

“If the VDI goes down, patient care, student learning and clinic revenue are all impacted.”

Christopher Morgan,  
*director of dental informatics*

**WITHOUT A COMPUTER YOU CAN'T TREAT A PATIENT**

According to Bob Smith, project manager senior, “When the system was fully loaded, it just fell over.” Login times for the twice daily clinic sessions ballooned from a few minutes to more than half an hour. Worse, once around 100 students were finally logged in, the system would crash and reboot.

Christopher recalls that, “We started experiencing throughput issues that made it feel like we were trying to fit four lanes of traffic down a one-lane highway.”

For the School of Dentistry, the issue was creating major problems. In the beginning, the school had to cancel full clinic sessions. This not only impacted patient care, but also cost the school \$40,000 per day in lost clinic revenue, and disrupted hands-on clinic instruction for students, possibly endangering their ability to graduate on time.

“We went into emergency mode, and quickly figured out what our bare minimum requirements would be to operate. In the operatory we went from having one desktop for each student to three students sharing one machine. We created a generic login for the X-ray terminals so students wouldn't have to log out and log back in for X-rays. We put paper signs on the workstations forbidding people to log on,” Christopher explained.

**SOLUTION**

Christopher brought in Hogan Consulting Group, the school's VDI Systems Integrator Partner to help troubleshoot the problem and propose a solution. After two weeks, the IT team at the School of Dentistry asked Hogan Consulting to re-architect major components of their system from the ground up so they could guarantee the system VDI would work.

From the beginning, Hogan Consulting believed a problem between XenServer and the legacy storage array was creating the problem. They proposed a solution that would eliminate any chance that storage was causing performance problems for the XenDesktop environment. Although the School of Dentistry had already purchased an IBM StorWize V7000 array as part of their initial refresh plans, Hogan strongly recommended they deploy a Pure Storage FlashArray instead, virtualize with VMware vSphere, and upgrade to a new version of Citrix XenDesktop for VDI.

According to Garrett Buck, a Hogan Consulting Group account executive, “We needed to come up with a solution we knew would solve the issue, and we weren't as confident that the IBM array would truly fix it. However, as an all-flash array, we knew Pure was a system with the reliable, consistent performance the school needed to relieve their bottleneck.”

According to Bob, “Once the decision to purchase the Pure FlashArray was made, it was a Thursday, and Pure Storage had a box to us by the next Monday. When it fired up, response times to load a profile and get a session up went to better than normal right away.”

**PRODUCT LIST:****Data center solutions**

- Pure Storage FlashArray

**Applications and databases**

- Citrix XenDesktop
- VMware vSphere
- axiUm
- Microsoft SQL databases for:
  - Citrix XenDesktop
  - MiPACS
  - VMware vSphere

**100% ENCRYPTION HELPS THE  
SCHOOL OF DENTISTRY MAINTAIN  
HIPAA COMPLIANCE**

“Now we have a better storage solution and a better environment to work in. When you look in the portal 100 times and it’s always ‘all good’ you begin to see a pattern.”

Bob Smith, *project manager senior*

**RESULTS**

**Faster logins.** Prior to the refresh, a typical 2–3 GB XenDesktop instance would take about 90 seconds to load. Now, a login can take as few as 20 seconds with a typical load time of 30–40 seconds, which increased productivity and satisfaction of students, faculty and administrators.

**Impressive data reduction.** Deduplication and compression across workloads delivers data reduction of 7.4 to 1, making all-flash less expensive than disk or competitive hybrid disk/flash solutions. The school was able to continue to use the IBM V7000 as a lower tier of storage for their picture archiving and communication system (PACS) with Pure supporting the database for the PACS system. While the original deployment on Pure Storage was 100 percent VDI, the capacity savings allowed the school to move their SQL databases for Citrix and VMware onto the Pure Storage array as well. Today they are running about 70 percent VDI and 30 percent database on their Pure Storage array, while only using about 18 percent of the array’s capacity.

**Simple management.** Christopher didn’t want to hire a separate storage admin, which is why he initially opted for an IBM disk array that could be managed by central IT. With Pure Storage, his systems administrator can manage storage very easily. In fact, management is so easy that the School of Dentistry is independently managing and controlling their own storage without additional staff or central IT management.

**Reliable performance.** Pure Storage for XenDesktop provides vastly improved resiliency, scalability and performance, resulting in more stability and better user experience than the previous system. Christopher’s team no longer receives support desk calls due to storage performance. He says daily login storms, boot storms, anti-virus scanning and overnight maintenance are no longer problems.

In fact, the school has not opened a support case with Pure Storage since its adoption in 2014. Since Christopher and his team control their own storage resources, unexpected performance issues from other units don’t impact the School of Dentistry.

**NEXT STEPS**

The University of Louisville School of Dentistry is already planning their next innovation initiative, and will soon be expanding to include capabilities for 3D imaging, rendering and modeling using NVIDIA GPU technology. According to Christopher, Pure Storage will be an important element of this new undertaking.

When the University of Louisville’s J.B. Speed School of Engineering decided to implement VDI with Citrix XenDesktop and XenApp, Hogan Consulting Group recommended they deploy a Pure Storage system to help bolster their environment as well.



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