

# Sacramento City College Solves the Equation for Deploying High-Performance, Cost-Slashing VDI

## Leveraging Nimble Storage Makes VDI in the Class Room Practical, Seamless and Cost-Effective

Sacramento City College is an open-access, comprehensive community college serving a diverse student population of over 25,000 and a staff of 2,100. Behind the scenes is an IT department that has recently moved from an outmoded storage architecture to hybrid hard disk drive (HDD) plus solid state disk (SSD) arrays. This move laid the groundwork for migration to a virtual desktop infrastructure (VDI) to replace expensive physical desktops—a decision made based on extensive input from the campus community.

Now IT Analyst Daniel Kwong is turning possibilities into realities, starting with an ambitious rollout of VDI in student labs. Phase One of the rollout, which serves up high-performance VDI for 500 users, is projected to save \$310,000 and slash operating costs. With 2,500 physical PCs and Macs online, this is just the beginning of the savings the college will realize.

Daniel Kwong was in the same position as many of his peers in IT. With a large staff and student population, all using standard desktop hardware, costs of supporting users were high, and the cost and complexity of updating 2,500 PCs and Macs were out of line. But rolling out a VDI solution that delivered the performance of physical desktops was not even a consideration, since the college's former storage architecture gave Kwong no means of determining performance at any instant or of looking at historical performance.

That's when he discovered Nimble Storage. Although the college's IT team is still calculating savings from the VDI implementation, he quickly found that replacing a single physical desktop with one VDI instance would save the college \$620 and cut operating costs.

"We faced the same issues as other colleges and institutions: provisioning and deploying new systems, keeping software up to date, and making sure our deployments met the expectation of our users—initially, in our case, students in labs throughout the campus," Kwong said.

"Our networking environment is anchored by three HP host servers, and we ran DataCore software as our SAN solution. But our legacy storage solution simply couldn't meet the demand. The move to Nimble made sense based on performance improvements alone. Today, the college uses two Nimble CS220 arrays, one serving VDI and the other supporting campus applications including multiple SQL databases, Active Directory, file and print servers, and a host of other applications and services."

Although Kwong had a simple list of requirements for a VDI solution to replace physical desktops—it had to be easy to install, configure and support; deliver high performance; and provide significant cost savings in the short term—the major criteria for making the eventual storage decision was even simpler: performance above all.

## Performance and Tiering

"When it comes to storage, performance is the top consideration" Kwong said. "You want to be sure that you can handle the boot storms, log-in storms, and recomposition storms caused by updates to and snapshots of the golden image used to create clones for each

## Storage Profile

Sacramento City College faced a morass of issues in replacing its desktop computers. Replacement costs of \$900 per unit were unacceptable, yet VDI, a lower-cost alternative to physical desktops, could not be deployed on the college's existing storage infrastructure.

### Challenges

- Storage arrays could not host VDI, despite potential cost savings of \$620 per VDI instance
- Storage performance was impossible to measure, but adding new workloads or applications to storage arrays was risky

### Solution

- Deploy two Nimble CS220 arrays

### Immediate Benefits

- Hybrid storage platform optimizes both performance and capacity in an ideal architecture for VDI
- The ability to measure performance in real time and historically ensures an optimized VDI user experience
- Replacing outmoded physical desktops with high-performance virtual desktops resulted in a massive cost reduction

### Short-Term Objectives

- Convert 200 additional physical desktops to VDI
- Upgrade controller to support 10G Ethernet
- Reduce cabling and increase throughput
- Create plan to expand VDI availability to all students and staff

**"With our former SAN, I felt that performance was lagging, but I couldn't gain any visibility into the SAN to actually verify what was going on."**

Daniel Kwong  
Senior IT Analyst  
Sacramento City College

VDI in a pool. Students come into the lab and log in at the same time, and as a result the IOPS spike.

“With our former SAN, I felt that performance was lagging, but I couldn’t gain any visibility into the SAN to actually verify what was going on. A lot of the data I was looking for was buried very deep. Monitoring was not built into the system, and determining whether the problem was disk-, processor-, memory-, or network-related was challenging.

“Our existing DataCore SAN was extremely difficult to configure, troubleshoot, and manage, so I looked at network storage from Dell EqualLogic, Xiotech, NetApp, EMC, and Nimble. I immediately ruled out Xiotech because it’s Fibre Channel-based, and I can’t deal with the complexity of Fibre Channel.”

Kwong dismissed NetApp and EMC on cost alone. Nor did Dell make the cut. “The way Dell implements SSDs, I still would have had to manage the tiering on the backend,” he said. “I would have had to put most data on the SATA drives but put high-performance data on the Tier 1 SSDs.”

With its competitors out of the running and Nimble Storage arrays “looking good because of the way Nimble implements caching,” Kwong selected Nimble. “The prospect of the savings alone, over \$600 per desktop replacement, was especially alluring,” he said.

The Nimble Storage solution was also able to solve the matter of log-in storms, which was a growing issue caused by the concurrent log-ins of between 30 and 100 users at any time—often times delaying the start of class. This repeated throughout the day as one lab ended and another began. “Log-in storms generate a ton of I/O, and we would soon learn that as many concurrent log-ins as we could throw at the CS-Series, it wouldn’t flinch.” Once again the Nimble Storage array proved capable of meeting every existing need, he said.

One factor in particular in Nimble’s favor was how it implemented SSD. “Because of the way the company implements caching, I didn’t have to tier the SSDs,” said Kwong. “Nimble’s Cache Accelerated Sequential Layout (CASL™) architecture, realtime inline compression, and data organized in full writeable blocks just made a lot of sense. What Nimble’s approach to SSD meant to me, as a practical matter, was tierless storage—a massive improvement in architecture that reduces complexity and makes my job infinitely easier.”

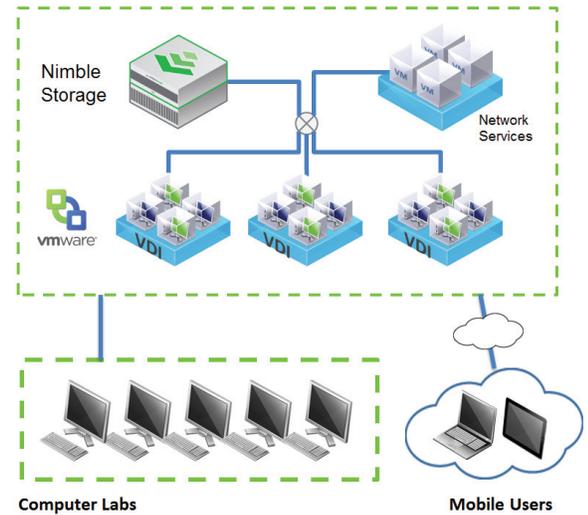
Deploying Nimble’s SSD-based system had a much more profound advantage as well. “I no longer have to worry about ripping out my network infrastructure and replacing it,” he said.

Nimble also offered another benefit, according to Kwong. “Just looking at the acquisition and maintenance costs alone, and not considering OPEX, I save about 10 to 15 percent or more with Nimble compared to the closest competitor, even before considering the savings in the ongoing rollouts of VDI. And Nimble’s added features far outweigh those that other solutions had to offer.”

## Fast-Tracking VDI

Kwong manages the IT infrastructure for the college’s student labs— including a library lab, a math lab, an ESL lab, and others—where students work with data-intensive applications such as AutoCAD. The number of applications, the number of users, and the number of classes—each with different computing requirements—made implementing VDI all the more complex.

**“We’re currently running 300 desktops on the Nimble CS220 array, with no perceptible performance issues. The Nimble Storage array just keeps on chugging away.”**



VDI deployment at Sacramento City College using VMware View and Nimble Storage

Before moving to Nimble, Kwong had considered virtualizing desktops, starting in the labs. But he hesitated to make any sudden moves. “VDI is complicated enough as it is. You don’t want the added complexity of having to tier your data. That was the issue we would have faced if we had adopted Dell EqualLogic systems,” he said.

But the move to Nimble removed any doubts about the move to VDI, eliminating the need to figure out and implement tiered storage. “I let Nimble handle the I/O and all of the IOPs, and let Nimble’s CASL architecture determine how to assign data to the SSDs.”

“With the first 150 systems virtualized and up and running, we added another 150 virtualized desktops this year, so we’re currently running 300 desktops on the Nimble CS220 array, with no perceptible performance issues,” Kwong notes. “The array just keeps on chugging away.”

“I’m comfortable with up to 75 percent capacity utilization, and I’m at approximately 55 percent right now. I don’t even have to consider IOPS or I/O today. I figure we have a limit of up to 500 VDI’s on the CS-220. But that’s not because of any storage capacity or performance concerns—it’s because, at that point, I could start to overload the hosts.”

## Solving “Golden Image” Challenges

Kwong says that imaging for VDI, which is I/O-intensive, can tax both the network and network storage. The nature of the college labs, however, can make the challenge even greater.

“For VDI, I start with a golden master image, which is essentially a bare-bones Windows 7 with patches. But each lab has its unique applications that require different images, which can vary by semester or even by class. With Nimble, I can image the entire lab and do all of the maintenance tasks on the back end. It’s a huge improvement and a productivity booster.”

Nimble also offers a huge change from the day when users were frustrated because changes they were counting on could not be implemented in time, Kwong added. “We have one computer lab that doubles as a teaching lab for our staff. The majority of the time the lab is configured for student work. But occasionally a class for both staff and faculty will require a special piece of software or a special configuration for just a three-hour slice of time. After that class we switch back to our standard image. That’s not a situation you want to wrestle with unless your storage and VDI are on Nimble.”

## Massive Cost Reductions

The cost of replacing a physical desktop is \$900; the total cost of replacing 30 desktops in one lab would be \$27,000. Because IT operates on a three- to five-year replacement cycle for its IT infrastructure, Kwong plans to replace between 200 and 500 desktops annually—which, in a world of physical desktops, would incur a rip-and-replace effort costing between \$180,000 and \$450,000.

“With our new setup, we’re spending \$280 per desktop – a savings of \$620. And all costs have been paid for upfront: infrastructure, hardware, software, and storage. At that rate, as the college reaches its initial cap of 500 desktops, we’ll have saved \$310,000.”

Kwong points to additional, less visible savings to the college. “Even as we move up to 500 VDI instances, I won’t have to upgrade the network. Both Nimble and VMware are flexible enough to allow me to use our existing gigabit network to do multi-task I/O, leverage the multi-task technology of iSCSI, and address the I/O load.”

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## Simplifying Management, Positioning for Growth

“When it comes to Nimble, I pretty much don’t have to touch it,” said Kwong. “Our system been very reliable, rock solid. The only time I even think about it is when I want to look at I/O or IOPS to keep an eye on performance. Even if I run into an issue such as a full data store, I don’t have to go back to the Nimble SAN to do anything. It’s all managed through VMware. As for performance, I can check current IOPS and historical IOPS easily from the Nimble console.”

Kwong adds that with the ease of deploying VDI and the monitoring tools at his disposal, he no longer has to double as a storage administrator. “If I don’t have to wear that hat, I’m happy.”

Kwong says he sees a strong migration path for his storage architecture. “I like the direction Nimble is going in, with its ability to scale out and scale deep. To increase just capacity, for example, it’s nice to know that I can easily add a shelf for future growth. We’re going to continue to grow our virtual infrastructure, we’re going to add desktops to it, and we’re going to continue running our storage on Nimble.”



Sacramento City College is an open-access community college providing a wide range of educational opportunities and support services leading to transfer, career advancement, basic skills development, and personal enrichment. Our commitment to continuous improvement through outcome-guided assessment, planning, and evaluation promotes student learning. Through these efforts, we contribute to the intellectual, cultural, and economic vitality of the community.



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