

Liquidware Labs Solutions Shine Light on Hidden Issues at Orange Coast College

Liquidware Labs™



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Ralph Looney
Senior Director, IT Infrastructure and Systems
Coast Community College District

Organization

Orange Coast College,
Costa Mesa, California

Virtual Desktops

700, with planned expansion to approximately 7,000

Products

Stratusphere™ UX
ProfileUnity

Overview

Orange Coast College (OCC) in Costa Mesa, California, developed a virtual desktop infrastructure (VDI) for its signature new building, the 90,000-square-foot Mathematics, Business and Computing Center (MBCC) that opened at the start of the August 2015 fall semester. OCC planned that a virtual desktop infrastructure would be a key feature and advantage of the new building.

The MBCC infrastructure currently supports 10 classrooms — each designed to serve about 40 students — as well as a 156-seat computer lab and 30 faculty offices. Virtual desktops currently support about 700 users. However, plans are to roll out VDI to roughly 7,000 desktops at three campuses over the next several years. Orange Coast College is part of the Coast Community College District, a system of three community colleges with collective enrollment of more than 60,000 students.

The virtual environment features Windows 7 desktops virtualized on VMware ESXi 6.5 and VMware Horizon View 6. The environment includes Liquidware Labs' ProfileUnity user environment solution to support non-persistent virtual desktops for students and persistent desktops for staff and faculty. OCC also has implemented Liquidware Labs' Stratusphere UX user experience monitoring solution for integration and use-case testing.



In late summer 2015 everything looked especially sunny for Orange Coast College, even by Southern California standards. For the upcoming fall semester, the community college was getting ready to open the doors to its new MBCC building for its computer, math and business programs. The facility would introduce many technology feature upgrades and innovations, including a new virtual desktop infrastructure (VDI) that would give students and faculty unparalleled access to applications, data and computer services. The new building would be the first in a series of capital improvements that were the result of a $698 million district-wide, voter-approved bond project that encompasses plans to redevelop a significant portion of the campuses over the next decade.

The Challenge

Major goals for converting from physical to virtual desktops included enabling students to access their authorized applications and files from anywhere, and making the computer labs themselves more flexible. OCC traditionally had silo-style computer labs that housed specific software. Students who needed to use specific software had to go to dedicated labs. OCC envisions using application virtualization and application layering so its facilities can support a much wider range of apps across campuses.

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"We are very student focused. We wanted to let our students take advantage of any application, from any device, anywhere," said Director of Academic and User Support Rupa Saran. "We didn't want our students to have to come into a specific lab to use a specific application. In this day and age, we ought to be able to provide applications to our students remotely."

The OCC IT team included Saran, District Senior Director of IT Infrastructure Ralph Looney, Systems Technicians Kevin Masui, Matt Marino, Steve Mihatov and Kevin Du, and Systems Engineer Danny Gorman. The team was challenged to have the new virtual desktop infrastructure and all others systems ready for the grand opening. A key assignment was finding a way to load and test the new virtual environment in a way that would effectively simulate post-deployment, real-world conditions, representing Orange Community College's largest-scale VDI.

"Verification and validation are essential for large-scale IT projects," said Looney. "When you're creating an infrastructure, two main questions you have to answer are 'Did you build the right system?' and 'Did you build the system right?' That's what we needed to test."

The experienced team understood that what is planned in the proof-of-concept (POC) sometimes plays out very differently in reality. OCC was aware of that risk and conducted rigorous pre-deployment testing. However, the testing process proved extremely demanding and put the VDI team and its vendor partners under extreme pressure to resolve performance issues before the facility's grand opening – and the start of a new semester.

Testing Uncovers Problems

Rigorous testing indeed uncovered performance issues and resource constraints. Login storms -- when hundreds of students attempt to log in at the start of class -- are common in education environments. During testing, login times were consistently around three minutes, but sometimes took up to 10. Even three minutes was considered unacceptable for OCC's students. Testing did confirm the duration of the login times but didn't indicate root causes or ways in which to resolve the issues.

In the run-up to its go-live, OCC needed real-time insight into performance and analysis for system optimization.

"The biggest challenge we had was getting the insight into what was going on behind the actual desktop," said Marino. "We knew things were slow, but we didn't know why."

The IT team knew it needed to take immediate action to address overly long login times as well as a host of mysterious inconsistencies in the VDI performance. It launched the investigation by using the VMware vRealize Operations management platform that was part of its VMware infrastructure, hoping to find clues as to why login times were so slow.

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Problems Uncovered

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However, vRealize Operations was not the right tool for the task, because it provides systems operations dashboards and collects data over time that administrators can use to analyze and improve system performance.

With the grand opening fast approaching, VMware recommended that OCC use Liquidware Labs' Stratusphere UX monitoring, performance validation and diagnostic solution on the VDI. Marino had previously used Stratusphere UX on OCC's physical desktop environment to collect performance and consumption data that was used to plan the VDI and resource allocation. Now he applied Stratusphere UX again for a deep dive into virtual desktop performance.

"With Stratusphere UX you can get accurate metrics on what is happening every moment for a virtual desktop," said Marino. "The logs break the data down so you can see what processes are being used, CPU cycles, what went right and what didn't. That visibility is very important in an academic environment, where desktop requirements can change from day to day, and even from hour to hour when classes change."

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Mysteriously Slow Logins

The OCC team initially determined that bloated user profiles were the reason for its inconsistent and slow login times.

"Our initial user profiles included all default files and settings. The way the profile was loaded, it had to copy each one from the network share to the local virtual desktop before loading the desktop for the user. We had to cut down extraneous settings and files that were not needed at login," said Du. "With each program, it's challenging to determine which files are essential without the user experience deteriorating were it to be removed. We literally had to check each one individually to get every reduction we could in the profile size."

OCC saw it could improve login times by optimizing its user profiles. To do that, it used Liquidware's ProfileUnity user environment management solution.

ProfileUnity optimizes and manages user profiles for virtual desktop images. It provides a sophisticated, advanced alternative to roaming profiles and folder redirection management that reduces login times by an average of 90 percent. ProfileUnity includes context-aware filters to deliver exactly what is needed to users at logon, and enforces best practices for storing user-authored data. Its application rights management features are extremely valuable for colleges and other organizations which must provide a wide spectrum of applications for a large, frequently changing user base.

ProfileUnity also has features to keep profiles clean and up to date, which minimizes bloat, reduces storage requirements and prevents corruption and performance problems.

ProfileUnity allowed OCC staff to make many performance-improving changes to its virtual desktops, including:

- Identifying unused services that could be removed
- Removing unnecessary triggers, debug scripts, REG keys and other extraneous items from the configuration

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As a result, Orange Coast College reduced the size of its virtual desktop images and profiles significantly while improving their performance. User profiles were reduced by more than half, from 50 to 60 MB per profile to approximately 24 MB. The main desktop image was reduced from 80 GB to 50 GB. However, even with these significant improvements, overall virtual desktop performance did not meet the standards the team sought in order to get the maximum benefits from the investment in desktop virtualization.





Finding the True Source of Desktop Trouble

Liquidware Labs Engineers Chris Walker and Jack Smith suspected OCC desktop performance was affected by unseen issues at the infrastructure and systems levels, and so they asked permission to run a Stratusphere UX Health Check on Orange Coast College's entire virtual desktop infrastructure. The results produced a treasure trove of insights that the team addressed, which improved desktop performance, ultimately meeting the standards they had targeted.

"After I reported the Stratusphere UX data to the college it made huge changes to its ESX environment," said Walker. "Then we really started getting significant improvements."

Liquidware Labs' support team and engineers worked very closely with OCC to review the virtual desktop configurations and to provide feedback and recommendations for improvements based on their extensive experience covering hundreds of VDI projects they had worked on over the years.

One of the Stratusphere UX Health Check findings was that a MS Office feature was putting undue strain on system resources.

"Liquidware Labs staff was really helpful in getting us the visibility we needed to make changes," said Masui. "They are so knowledgeable and gave us a lot of tips that helped performance. For example, we used ProfileUnity to inject some registry keys to disable a Microsoft Office graphics accelerator feature that was causing performance issues. Doing it that way was faster than recomposing images in the pool."

Another bottleneck Walker uncovered involved OCC's use of AppVolumes to layer in applications upon login. Using Applications Non-Responding and latency metrics built into Stratusphere UX, Walker identified that applications supported by AppVolumes were all experiencing issues. This led him to believe that AppVolumes was not configured properly and, again, his analysis proved correct. OCC's VMware consultants adjusted the settings for the solution and the issue was corrected.

One of Walker's final, critical steps was to use Stratusphere UX's Login Breakdown feature to see how virtual desktops interacted with the data center. Ultimately, this step was key to identifying root causes of login time issues. The login breakdown feature provides vital and granular visibility into events that run during machine boot and the login process, providing details about all major steps, including Authentication, User Group Policy, User Profile Service, Per User System Parameters, Themes, Windows License Status Check, and Restoring Network Connections.

Using the login breakdown function, Walker uncovered the fact that the storage configuration was causing IOPS bottlenecks that were stretching out the login times. Addressing the storage configuration and IOPS turned out to be the final piece of the puzzle in correcting the totality of issues affecting OCC's VDI, and it also helped improve storage execution.

"Storage latency was occurring because the Power Save feature was turned on, affecting the CPU Ready Time," said Marino. CPU Ready Time is a vSphere metric that records the amount of time a virtual machine is ready to use CPU but cannot schedule time because all CPU resources (on a ESX host) are busy. "Stratusphere UX let us see that data," added Marino. "Once we turned off the Power Save feature our performance time improved by about 80 percent."

Inconsistent Versions, Configurations Cause Problems

The Stratusphere UX metrics that Walker presented also revealed that the college's VMware ESXi hosts were not uniformly configured on the new, high-performance servers that had been purchased to support the VDI. Walker ran identical workloads on all ESXi hosts but got different Stratusphere UX metric readings on them, leading him to suspect that the BIOS was not configured uniformly on all servers. That indeed turned out to be the case.

"From Stratusphere UX we learned that our CPU ready times were off the wall," said Masui. "We also learned that it turned out to be a BIOS setting that we could easily change. Stratusphere UX really helped us identify the resource issues."

Problems also resulted from the fact that the IT team used one version of the hypervisor during all the pilot testing and then upgraded it when they went into production, again resulting in unexpected operations. The OCC team determined that with each major change to the infrastructure, it needed to test the underlying capacity and workloads to make sure that it had sufficient resources properly configured for the new conditions.

"We literally rebuilt every ESX server," said Looney. "Liquidware Labs put an incredible amount of resources into ensuring Orange Coast College would be successful. They went above and beyond their obligations and our expectations, and that's why we were able to be successful from day one."



Additional Infrastructure Optimization

The Stratusphere UX Health Check analysis resulted in several other critical changes to the virtual desktop infrastructure, including:

- Adjustments to user-profile portability and shell-folder checks to streamline login and redirection
- Changes to automatic-save interval times
- Changes to how INI executes on login

"This experience taught us, very quickly, that VDI was not a 'set it and forget it' situation," said Looney. "The virtual desktop infrastructure requires constant fine-tuning to get the results we wanted. Also, you need to address all the issues, not just a few. Figuring out the servers, storage and IOPS we needed at every stage had been really challenging for us, until we got the data we needed. But we are confident going forward that we have the right tools in the Liquidware Labs solutions to maintain and optimize our environment."

"I still use Stratusphere UX regularly now that the VDI is in production," said Marino. "If we're notified that something is running slow or we have any other issues, we use Stratusphere UX to investigate. It is the best tool I have to see what's really happening, either in the ESXi hosts or the virtual desktops themselves."

The Results

The acute challenges have been solved – login times now average around 30 seconds, which represents a huge improvement from the three-to-five minute norms from testing. There is also much less resource contention and inconsistency on the back end.

"Now we have achieved a good, positive user experience, which was my goal," said Saran. "Liquidware played a big part in that, because of their products and their people."

"If we didn't have Stratusphere UX and the Liquidware support I don't think we could have done this efficiently," said Marino. "It really saved us a lot of time."

With an eye to continually improving virtual desktop performance and expanding their use across campus, OCC has made Stratusphere UX and ProfileUnity permanent parts of its virtual desktop infrastructure. ProfileUnity is used to manage user profiles and help optimize desktop images, while Stratusphere UX provides crucial performance and diagnostic information the support team couldn't get anywhere else.

Liquidware Labs™

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