Hong Kong University of Science and Technology experienced poor end-user performance and difficulty in administration running VDI on legacy storage, so the university transitioned to flash with Pure Storage to drastically increase performance and bid farewell to previous technical challenges. Now equipped with a self-managing, scalable flash array capable of high IOPS and effective data reduction, the university offers access to high-performance persistent desktops over VDI to faculty members and students.

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

BUSINESS TRANSFORMATION

The school can now dedicate IT manpower to discovering innovative ways of utilizing IT for better education.

GEO

Hong Kong

INDUSTRY

Education

"We chose Pure Storage because of its reputation as one of the leaders spearheading the evolution of storage with its flash offerings. It is a trusted brand."

Samuel S.K. Kwan, PhD, *Director, Information Technology Services Center*

BRIGHT MINDS REALIZE GREAT ACHIEVEMENTS WITH TECHNOLOGY SUPPORT

Hong Kong University of Science and Technology (HKUST) is one of the most prestigious universities in Hong Kong, with approximately 15,000 students currently enrolled. Established in 1991, HKUST has already earned itself world renown with its leadership in the advancement of science, technology, business and humanities in the region. As an international educational institution with a focus on the sciences, the university is a hotbed of research and development. To HKUST, while having the school's research efforts recognized is important, to steer, nurture and educate the next generation of leaders are also a mission of the university.

To provide the optimal research and education environment for faculty members and students, HKUST relies greatly on technology. In today's world where everyone demands speed and accuracy, IT is a key enabler for people to perform any task. For researchers, IT enables them to compile and share results of experiments; and for lecturers and students, IT enhances teaching and learning by enabling a level of interaction that is not possible with traditional tools.

With technology involved in every aspect of HKUST, the task of overseeing HKUST's IT is monumental — and that responsibility falls on the university's Information Technology Services Center. "HKUST is one of the top universities in the region. And with that reputation, every year we attract some of the best talent from all over the world to come here to learn, study, teach and conduct research. Their innovation knows no bounds. To support them, the school is keen to adopt high technology that enables or supports them to explore, share, develop and apply knowledge of old and new," said Dr. Samuel Kwan, Director, Information Technology Services Center, HKUST.

At HKUST, technology and education go hand in hand. To provide a standardized desktop environment for students — complete with licensed software and adequate computing power — HKUST deployed a virtual desktop infrastructure (VDI) in the campus. The VDI can be accessed by all students and faculty members, using computers that are running Windows, macOS or any other major operating systems. The initial vision for the VDI was that any user can leverage the computing power of the school for a unified experience, both inside and outside of the classroom. On a management perspective, VDI could also grant the IT staff simplicity and flexibility. "Our University respects and values freedom in teaching and learning, and that makes flexibility a crucial criterion to consider as we evaluate which technology to deploy," added Dr. Kwan.

COMPANY:

Hong Kong University of Science and Technology
www.ust.hk

USE CASE:

- VDI – VMware® Horizon® 7

CHALLENGES:

- Virtual desktop performance slowed by even a small pool of concurrent users.
- Disk-based storage unable to provide desirable IOPS.

IT TRANSFORMATION:

- Boot storms no longer drag the system down.
- Systems running significantly faster to provide a positive user experience.
- Reduced storage physical footprint; running VDI with just one FlashArray//M10.
- Easy management of virtual machines.
- Achieved a data reduction rate of 19:1.

"This is a testament to the performance of the Pure Storage data reduction algorithm. We can stretch our storage a lot further."

Samuel S.K. Kwan, PhD, ***Director, Information Technology Services Center***

During the initial VDI deployment with VMware Horizon 7, it ran on a rack of disk-based storage. However, as more students started using the VDI for their coursework, the system began to show its shortcomings. "Login times began to slow down for students. It was not fit for in-class use," said Dr. Kwan. Lecturers could not afford to have a significant portion of class time dedicated to waiting for the virtual desktops to boot up. The subpar performance of the initial VDI deployment could not achieve the benefits that Dr. Kwan envisioned for the school.

"Our team set off to investigate the issue and we quickly discovered that it was a storage throughput issue. Our storage could not keep up," said Dr. Kwan.

As time went on, the legacy storage proved time and time again to be the culprit dragging down system, especially when user demand spiked. To complicate the issues, the VDI at HKUST provisioned persistent desktop instances for its users, creating a storage capacity issue that had to be addressed by acquiring costly new storage. The alternative was to restrict access to the resources, which was neither desirable in the short run nor feasible in the long run.

ALL-FLASH STORAGE REMOVES APPLICATION BOTTLENECKS

After a few disk-based storage array expansions, HKUST decided to eliminate the storage bottlenecks completely by migrating to an all-flash array with a Pure Storage FlashArray™//M10, which has the ability to support 1000 concurrent users.

"We've been interested in going all-flash for a while, but as a tertiary institute, we had to be prudent with our funds. As cost of flash came down thanks to the wide adoption of it in today's smart phones, having an all-flash storage array became an option for us — and we are glad to have hopped on board," said Dr. Kwan.

"We chose Pure Storage because of its reputation as one of the leaders spearheading the evolution of storage with its flash offerings. It is a trusted brand," said Dr. Kwan.

Dr. Kwan said the installation of the arrays went smoothly without noticeable issues. To Dr. Kwan's IT team, installation and configuration of the array were easy and intuitive. Deployment of the all-flash array took the team at least 30% less time, compared to HKUST's previous array upgrades. He also mentioned that Pure Storage provided great technical support throughout the deployment.

With the all-flash array up and running, all the storage bottlenecks that HKUST had encountered prior were eliminated. The Pure Storage array is a self-managing storage, freeing Dr. Kwan's staff from performance troubleshooting and other storage maintenance work that used to strain the team's limited manpower. Now, the team may commit their time to other critical missions or new projects to integrate VDI and other IT resources or services and continue improving the teaching and learning environment at HKUST.

Enhanced with flash, the VDI at HKUST now not only solves compatibility and software licensing issues for the students, it also provides much better access to the high-performance computing resources to those who need it. "Power users no longer need to splurge and buy themselves an expensive workstation for coursework. Even the most basic laptops can run intensive programs by tapping into the computing resources of the VDI," added Dr. Kwan. "On a side note, many users of the VDI have even praised the system for its noticeably improved performance after our flash deployment."

"The benefits of flash array deployment can be perfectly illustrated with one of our recent projects with a programming class. We were tasked to provision resources to run 45 concurrent persistent desktop instances for students to develop their programs.

DELIVERING A BETTER LEARNING EXPERIENCE

Previously, it was not possible for the old storage array to support this level of usage with this many users logging in at the same time and performing IO intensive tasks. However, with the FlashArray//M10, it became a very easy job for us. The system performed stably throughout the exercise without throttling even under load. Thanks to the all-flash performance, students were able to take full advantage of the resources provided to them via our VDI to run compilations quickly and smoothly. The project made a sound example of how IT can help support our classes and deliver a better teaching and learning experience. I consider it our own success story," said Dr. Kwan.

> "Thanks to the all-flash performance, students were able to take full advantage of the resources provided to them via our VDI to run compilations quickly and smoothly."
>
> Samuel S.K. Kwan, PhD, ***Director, Information Technology Services Center***

Since HKUST opted for persistent desktops, storage capacity was a significant issue in the past. After deploying a FlashArray//M10, Pure Storage achieved a 19:1 data reduction rate at HKUST. "This is a testament to the performance of the Pure Storage data reduction algorithm. We can stretch our storage a lot further," said Dr. Kwan.

Another advantage is the Pure Evergreen™ Storage model. When HKUST was using mechanical disks, the IT team had to throw away racks of arrays due to disk failure or performance issues. With the new array, HKUST can enjoy its all-flash performance with the same array for at least 10 years. Performance upgrades can be done incrementally with modular upgrades of NVRAM, controller and connectivity options. With every three-year maintenance contract renewal, HKUST will get a free controller upgrade as well. "In short, flash is a greener option," said Dr. Kwan.

Talking about next steps, Dr. Kwan said the school was impressed with the performance of Pure Storage, and would consider moving additional resources to flash in the future. He said, "We strive to stay on the leading edge of innovation. The performance of flash would also allow us to tackle advanced research scenarios such as to work with Big Data with better agility. If deploying more flash storage could help us meet our research and educational goals in the future, we will gladly explore our options."

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