CASE STUDY
Intel® Xeon® Processor E5 Family
Education
Virtualization

Creating a virtual campus

The Singapore Institute of Technology adopts a virtualized educational model with servers running on Intel Xeon processor E5 family

The Singapore Institute of Technology (SIT) provides industry-focused degree programs to graduates of the country's five polytechnics. Established in 2009, SIT enables diploma graduates from Singapore's local polytechnics to obtain degrees in engineering and applied sciences, health science, design, interactive digital media, education and hospitality through reputable university partners from around the world. This educational model offers students significantly greater choices in terms of upgrading to degrees within their chosen field of study.

CHALLENGES

- **Implement a flexible IT infrastructure.** Build an IT infrastructure that can scale in line with SIT's growth ambitions.
- **Ensure support for a distributed network of campus locations.** Utilize an IT infrastructure that can work within a network of distributed campuses.
- **Facilitate cost-efficient management of students' desktops.** Achieve maximum value from IT investment by ensuring IT budget supports SIT's wide range of demands.

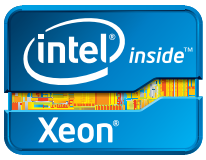
SOLUTIONS

- **Deploy Intel Xeon processor E5 family-based servers.** Deliver technology resources through virtualized servers running on Intel Xeon processor E5 family.
- **Implement a virtualized infrastructure.** Leverage VMware® vSphere™ and VMware View™ to virtualize IT infrastructure from the data center to the desktop to meet SIT's unique requirements.
- **Maximize flexibility of IT infrastructure.** With a virtualized infrastructure, students can access learning resources from any device, allowing SIT to maximize the return on existing infrastructure.

IMPACT

- **Reduced IT infrastructure cost.** Reduced overall server and desktop costs by 20 to 25 percent by adopting a virtual desktop strategy and cut datacenter real estate requirements by 50 percent.
- **Allowed SIT to control its software licensing costs.** Managed licensing costs more effectively and enabled provisioning of a new desktop 30 percent more quickly.
- **Supported the adoption of a 'use your own device' strategy.** Students are able to access learning resources on their own device through a virtualized environment, promoting a more tech-savvy SIT.

A virtualized IT infrastructure running on servers based on Intel® Xeon® processor E5 family and VMware® allows SIT students to access learning resources anytime, anywhere



"Virtualization is the backbone that allows our educational model to run seamlessly; it enables us to be more agile, responsive, and scale in accordance to our vision."

Ee Choon Huang
Director
Communications and Information Technology
Singapore Institute of Technology

Building a virtualized learning institution

SIT currently operates using interim facilities at Singapore's polytechnics and other locations. With its network of distributed campuses, planning and implementing a supporting IT infrastructure was challenging.

"We are offering many different degree programs across different locations in Singapore, and with partners from around the world. We needed our infrastructure to be as flexible as possible," said Ee Choon Huang, Director for Communications and Information Technology at SIT. "Our IT budget needs to support a wide range of demands, so we need to ensure that we get maximum value from our investments."

Delivering distributed IT resources and scaling for growth

SIT planned to leverage virtualization from the datacenter to the desktop to meet its unique requirements. The institution ultimately decided to implement a virtualized infrastructure using VMware vSphere and VMware View.

"We found VMware to be the market leader, and it had more robust and mature tools than the other vendors," said Huang. "Its technologies provided to be ideal for making desktop operating environments available to students across multiple locations."

"We evaluated a traditional model whereby most of the computing resources are installed locally on personal computers," explained Kok Boon Tan, Assistant Director for Communications and Information Technology at SIT. "However, given our unique educational model and network of distributed campuses, we realized that this would cause us a lot of implementation and support issues that would prove taxing in the future."

Tan said space at each campus needed to be optimized fully, making it important to find a way of delivering the technology resources students need without deploying considerable amounts of physical hardware.

The virtualized server based on Intel Xeon processor E5 family and desktop infrastructure in place within SIT has been designed to cope with anticipated growth in demand, and to scale quickly as student numbers grow. "By 2015, we believe we will have more than 5,000 part-time and full-time students studying at SIT," said Tan. "With a virtualized infrastructure in place, we will be in a position to quickly ramp up resources when needed, and also provide students with access to applications and data that they require."

Implementing a cost-effective virtualized infrastructure

Tan said opting for a virtualized server infrastructure based on Intel® Xeon® processor E5 family rather than rolling out multiple physical servers enabled SIT to achieve physical space savings of around 50 percent. "This has also helped us lower our power consumption and cooling costs," he added.

By deploying VMware vMotion™, SIT has been able to protect its applications and data with redundancy that's beyond available in a physical infrastructure. If a host server experiences a problem, or loads start to compromise its performance, the IT team can easily migrate running virtual machines to another physical server. This process does not affect users in any way.

"VMware vMotion helps provide high availability for our applications," said Tan. "We can set things up in a very quick manner and services will always be available. It is a very cost-effective way to do it."

Using virtual desktops to deliver desktop environment

To complement the virtual Intel Xeon processor E5 family-based server infrastructure, SIT decided to make virtual desktops available to students. Rather than relying on traditional PCs, the institution has installed virtual desktop devices on which students can access their individual desktops, applications and data.

Virtual desktops can be configured from templates to suit individual students, ensuring each has access only to the applications and data they require for their particular studies.

By early 2012, SIT had around 60 virtual desktop terminals across labs in two campus buildings, serving about 200 students. This could rise to several thousands as the SIT model matures.

"With the high cost of software licensing, it is not feasible to provide a license to each of the PCs in the labs or to the students," explains Tan. "Instead, we can make sure that a pool of resources is available for students to use as they require. The costs savings here are significant. License control and management is an important factor for us."

With VMware virtualization, SIT has also greatly simplified desktop management across its distributed network of satellite campuses. "Everything can be managed from the datacenter rather than us having to physically attend to individual client machines, which is time and resource intensive," said Tan. "It is possible now to provision a new virtual desktop around 30 percent faster than it would have taken to provision a physical machine.

"We estimate that adopting a virtual desktop strategy has reduced our overall server and desktop costs by 20 to 25 percent. It also means that we can scale more easily as student numbers increase," added Tan.

VMware virtualization at SIT has also enabled students to start using their own notebook computers to connect to the institution's IT infrastructure and access their personal virtual desktops. "By allowing students to access their virtual desktops from their personal notebooks, we will be able to allow them to continue working on campus even when the computer labs are closed. We are also testing the desktops to make available to students at home, and via tablets and other handheld devices. This is something that we will expand in the future so our students are not limited in the ways they can access their learning resources. This suits our students, most of who are digital natives that want to be able to learn anytime, anywhere, and from any device," stated Tan.

IMPLEMENTATION OVERVIEW

VMware Products	Applications	Platform
VMware vSphere	Unisim process modelling software	IBM Servers running on Intel Xeon E5 processor
VMware vCenter Server	Matlab technical computing software	IBM storage
VMware View	AutoCAD architectural and engineering software	
	Adobe multimedia design and editing software	

Lessons learned

- An IT infrastructure needs to be flexible to meet SIT's different degree programs across different locations.
- Virtualization gives SIT the platform to meet IT demands in an efficient and cost-effective manner and to scale for future demands.
- A virtualized IT infrastructure running on servers based on Intel Xeon processor E5 family allows SIT to deliver technology resources to students without deploying considerable amounts of physical hardware.

Expanding virtual infrastructure in the future

After completing a successful pilot in March 2012, SIT began expanding the project to its campuses island-wide. Over the next two years, SIT plans to install small server rooms within each of its buildings at the polytechnics and is building another datacenter within its headquarters. Each on-campus server room will be equipped with two physical servers that could host between 10 and 12 virtual machines, plus another physical server to handle functions such as backup. "This configuration will allow us to meet demand for the very fast deployment of applications and services, and to scale quickly to support growing number of students and demands," said Tan.

The institute will manage a considerable proportion of its IT resources from its headquarters, further reducing costs and improving IT staff efficiency. The virtual servers at each campus will run a range of applications, depending on the courses being offered at that location. Typical applications include Adobe multimedia design and editing software, and AutoCAD engineering and architectural modeling software.

If you want to know more about how the Intel-VMware Alliance can help your business, visit http://www.intel.com/go/virtualization and http://www.vmware.com/virtualization/.

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