Exploring Client Virtualization to Extend the Campus Computer Lab

Purdue University pilots Intel® vPro™ technology and Citrix XenClient*

Purdue University’s Information Technology department (ITaP) is always looking for ways to enhance the student experience on the West Lafayette, Indiana campus. When Intel approached ITaP with an opportunity to explore the use of Intel® vPro™ technology and Citrix XenClient® software, we were interested in participating to see if we could arrive at a solution that would help expand our computer lab experience beyond the rows of computers in our traditional student computer labs.

Since Purdue already operates an extensive Citrix XenApp* farm with over 200 software applications available for student use, it was a logical choice to tie in the XenClient laptop setup to our XenApp server environment. We set up Dell Latitude* E6410 laptops with a XenClient 1.0 Receiver that had two Microsoft Windows* 7 Professional virtual machines (VMs) installed. One VM was a user image with administrative rights for users to own and use. The other was a "Purdue" image with restricted rights that included direct links to the XenApp environment using the XenApp Web Client. In this Purdue VM, once our testers authenticated to the Purdue domain, they had access to all the Citrix XenApp applications within the Purdue VM and could launch and close them as if the apps were locally installed.

Our test group included three Purdue students, an instructor/staff member from the College of Engineering, and an ITaP staff member. Among the many tests we ran, the most significant ones tested the use of applications from the XenApp environment, the use of both Windows VMs within the XenClient environment, and the use of networking across the XenClient environment to the Windows VMs.

Lessons Learned

Students need to access lab applications away from the labs, and the pilot showed that there are ways to provide that access within a VM. The students who helped with our test were very positive about having access to the software applications that are standard in our labs. They liked that the access was virtually seamless, and that the experience was similar to being in front of a lab machine, with the added convenience of avoiding travel and the flexibility to work when they wanted to. Performance was optimized once we tweaked the system resource settings within XenClient and adjusted the amount of memory dedicated to the VMs.

What we did

- Used Citrix XenClient® software and Intel® vPro™ technology in a pilot exploring client virtualization for remote lab access

What we learned

- Virtual machines can provide a means to give students remote access to lab applications.
- Integration between XenClient and the guest OS requires a level of technical expertise to manage.
- It’s important to find the right virtualization model for the usage model and the level of available support. XenClient could be suitable for departmental resources, or for areas that have IT management resources and whose students have standardized laptops.
One tricky aspect of running two VMs within the XenClient environment concerned managing wireless access to the Citrix XenClient Receiver and the Windows 7 VMs. The Receiver acts as the contact point for connecting to any wireless network, so all authentication had to occur outside the VMs. This meant that if users changed their authentication or wireless setup, they had to reboot the VMs. While this wasn’t a major hindrance, it was inconvenient and would take the end user several minutes to resolve. In addition, managing the XenClient environment plus two Windows VMs required an elevated level of administration. Any corruption of the XenClient environment or the Windows VMs often required a more technically trained staff member to intervene.

We would love to have Intel vPro technology on the full range of students’ PCs so we could utilize its security and management capabilities. As an alternative, putting the XenApp Web Client on a traditionally installed OS could be a better way to implement a bring-your-own-computer (BYOC) model in such a varied environment.

XenClient could be appropriate, however, with laptops that are departmental resources, or for students enrolled in a college or department within the university where students have a specified laptop and the department has hands-on IT management. In this situation, XenClient could provide the personal model for students along with central management for IT. We plan to look further at the XenApp client plug-in, and may explore XenClient further with one of our colleges or departments later in the year. We will also continue to monitor client virtualization technologies as they mature.