Mary Whited is just starting down the path to modern-day client virtualization, but she's already seen how important it is to match client solutions to the needs of end users—and what happens when you don't. Early in her IT career, Whited observed two virtual desktop infrastructure (VDI) projects, both using thin clients as end points, at Wake Forest Baptist Medical Center (WFBMC). One project, aimed at employees using shared workstations to perform specific tasks, is still going strong. The other, intended for office workers who used personal computers for a range of productivity applications, met so much resistance that IT cancelled the project just weeks into its initial pilot rollout.

Today, Whited oversees client and server infrastructure at WFBMC. She's applying the lessons from those projects as Wake Forest Baptist expands its use of desktop virtualization.

Complex Environment
As IT leaders at a major academic medical center, Whited and her team face the same challenges as any enterprise IT department—and then some. Along with the universal pressure to do more with less, WFBMC IT must implement an expanding universe of applications and services that will help the medical center educate students, meet rising demands for affordable healthcare, adjust to rapidly evolving regulations, and comply with stringent privacy requirements. Against this backdrop, Whited's team delivers core services to more than 20,000 clients that are located everywhere from student labs to surgical suites and used for everything from academic research to medication charting.

WFBMC has an estimated 2,500 thin clients that physicians, nurses, and clinical staff use to access critical healthcare applications while working in patient care areas. Those systems, part of the successful VDI project mentioned above, run Citrix XenDesktop* and handle more than 6,000 unique user connections each month.

Keeping Virtual Desktops Personal
Virtualization team at Wake Forest Baptist Medical Center focuses on user flexibility as it seeks cost and security benefits

“No one solution is always the right fit. No one size fits all. That was the biggest ‘aha’ for us from the POC.”

Mary Whited, Manager of Server Operations, Wake Forest Baptist Medical Center
That leaves thousands of laptop and desktop PCs that Whited views as ripe for some form of virtualization. “Studies show that over the long run, desktop virtualization can save money on administrative, repair, and acquisition costs, so at some point we'd like to have a majority of our client delivery through desktop virtualization,” she says.

In addition, Wake Forest Baptist users are asking to use a wider range of devices and work in more diverse locations, creating the need to safeguard patient confidentiality on platforms that may not have been designed with enterprise-level security in mind—let alone the medical field's strict requirements. Whited's team wants to see if desktop virtualization can help them meet these requests while maintaining control of the environment.

Open Mind, User Focus
Because of the earlier experiences, IT is approaching desktop virtualization with an open mind, a sharp focus on user needs, and hands-on pilots and proofs-of-concepts (POCs). “Not every user will benefit from a virtualized desktop, so we don’t have a preconceived notion of the actual numbers we’ll end up with,” says Whited. “We’re keeping an open mind.”

The successful VDI project gives Whited's team a solid starting point. “That project helped us learn how to deliver functionality and meet security requirements so clinicians can do their jobs and provide patient care,” she comments. “We’ve learned how to place equipment to provide redundancy and not have too many duplicate systems, and we’ve earned the trust of key physicians.”

The cancelled project provided its own valuable lessons. The late 1990s were the heyday of locking down the PC to simplify management. “When it was time for an equipment refresh, we replaced a dozen secretarial PCs with locked-down thin clients,” Whited recalls. “There was no POC and not a lot of communication. Users couldn’t personalize their PCs at all, and there was no local hard drive, so they couldn’t save files to a local disk.”

Users communicated their frustrations, and the project was halted within a few weeks. “Now, we’re much more aware of user needs and requirements and the importance of communicating with users about any changes,” says Whited.

Initial Research and POC Lay Groundwork
As a step toward broader client virtualization, the Wake Forest Baptist team conducted a small POC to expand the team's awareness of the latest virtualization technologies and explore their benefits without impacting business operations.

After researching virtualization solutions from VMware, Citrix, Microsoft, and Sun, the team decided the POC would use Citrix XenClient* as a type 1 hypervisor with virtual containers, Citrix XenDesktop for VDI, and Microsoft Windows* App-V* for application virtualization. It used VMware ESXi*, which it already had in the data center, for the server side. “At the time, VMware View* didn’t have a way to handle smartphones and tablets, which doctors want to bring into our environment, so we decided against VMware on the client side,” Whited recalls.

The WFBMC client virtualization team includes (left to right) Brad Marshall, Bob Severs, Mary Whited, Dennis Brink, Vicki Williams, and Marty Brown.

At a Glance

Project
• Prepare to expand the use of desktop virtualization beyond published applications on thin clients

Accomplishments
• Tested and demonstrated VDI, virtual containers, and other methods of virtualization in a small-scale POC
• Ready to begin a broader pilot in 2H 2011

Lessons Learned
• Keep an open mind as you identify use cases. Not every user will benefit from client virtualization or from the same delivery method.
• Use profile management tools and local client performance to meet end-user needs while giving IT the cost and administrative benefits of client virtualization.
• Use POCs and pilots to get practical experience with the technologies, assess infrastructure and resource impacts, gain real-world user feedback, and build stakeholder support.
• Stay attuned to emerging solutions, and work across IT to meet infrastructure and support requirements.
• Be flexible if resource constraints and changing priorities cause project delays.
Whited’s team is approaching desktop virtualization with an open mind, a sharp focus on user needs, and hands-on pilots and proofs-of-concepts.

Resource limitations made it hard to find time to set up the POC, so Whited enlisted support from Intel and Citrix. The POC ran in WFBMC IT’s lab in November 2010 and used four desktop and laptop PCs and one thin client.

**Exploring Use Cases, Building Support**

Using different technologies and delivery models lets the Wake Forest Baptist team consider the various use cases for client virtualization and identify ways to create a virtualized environment that maps to users’ evolving work styles while meeting the institution’s needs for security and cost control. For example, the team can use client-based virtualization methods to support a bring-your-own-computer (BYOC) model, giving users the flexibility to use personal devices or work from remote locations while keeping confidential information in the data center. Solutions such as XenClient, which take advantage of Intel® vPro™ technology, can optimize the user experience by using the intelligent client’s performance and graphics capabilities.

With the POC up and running, Dennis Brink, senior network systems analyst and a key member of the virtualization team, conducted demos for IT colleagues and leaders of several departments within WFBMC, including Finance. “In our environment, if we can get buy-in from key stakeholders and users, our projects will go more smoothly,” Whited says. “The POC was a good step toward that. Everyone was impressed and provided positive feedback.”

The demos led to brainstorming and sharing ideas for using virtualization to address challenges the different groups were confronting. The academic computing team was excited about delivering virtual desktops or virtual applications in classrooms and practicum areas. Researchers saw the potential to gather valuable data from medical records while further safeguarding patient confidentiality. Physicians noted the ability to move more freely between PCs and tablets, checking patient schedules on a tablet, moving to a PC for detailed charting, and sharing data between them.

While identifying use cases is an ongoing process, the team targeted several high-return possibilities:

- **Classroom/training computers.** “Class time is valuable,” says Whited. “You can save a lot of time if you always have the golden image in place or ready to go.”
- **Kiosks.** Employees use kiosks across the campus to check pay stub information, change insurance options, and perform other tasks. These systems are good candidates for virtual delivery, according to Whited. The team is also interested in expanding its welcome and self-service check-in stations with virtual images.
- **Travel.** Some researchers spend months at remote locations. “With virtualization, we could allow them access through a Web portal, so they would work locally and remotely without having to come in via the virtual private network,” says Whited.
- **Software development.** Developers can test their Windows 7 applications in a virtual operating system, saving the setup time of a new system.

**Ready to Pilot**

With the POC concluded and enthusiasm high, Whited’s team was eager to conduct a pilot that would elicit user feedback, assess infrastructure and support requirements, and build the business case. But resource constraints forced a delay. WFBMC is conducting one of its largest IT projects ever, an 18-month effort to migrate its electronic medical record (EMR) system to Epic EpiCare*. IT is also rolling out dozens of new applications designed to help Wake Forest Baptist demonstrate that its clinicians are making “meaningful use” of their EMR systems, as recent legislation requires.

Now IT is preparing to start the pilot with infrastructure build-out to support 100 users. Technologies will replicate those used for the POC except for a shift from VMware ESXi to Citrix XenServer* for the VDI back end.

Whited’s team has several goals for the pilot, starting with gaining feedback from users in a cross-section of departments. The team plans to gather user feedback through surveys and interviews and pay careful attention to it. “In IT, we tend to think we know what users need and we just have to convince them,” says Bob Severs, a senior network systems analyst at WFBMC and part of the client virtualization team. “You have to really listen to what users are telling you.”

> “Not every user will benefit from a virtualized desktop, so we don’t have a preconceived notion of the actual numbers we’ll end up with. We’re keeping an open mind.”

Mary Whited, Manager of Server Operations, Wake Forest Baptist Medical Center
Another goal is to better understand the disk and network impacts of virtualization. "There are tools you can use, but you have to put them into practice if you want a solid grounding as you go forward," says Whited, who also teaches technology courses at Forsyth Technical Community College. "In addition to the infrastructure impacts, we'll look at management resources and whether we'll need more FTEs."

Whited hopes the pilot will also help the team get a handle on the up-front costs of server-based client virtualization. "VDI is attractive, but it's so cost-heavy in the first year or two that it's cheaper to just replace all your desktops and continue with the standard delivery model," she says. "You have to look at a 5-to-10-year period to see the ROI. Otherwise the up-front costs for storage, servers, and software licensing are prohibitive. Profile management adds further cost."

Whited is optimistic that phased deployment will ease the transition. "We're hoping to slide it in gradually to lower the initial costs and make the project more financially attractive," she says. "Once the infrastructure is built, the financials will be there."

Creating a Win-Win
As part of an academic institution, Wake Forest Baptist users are accustomed to a high degree of flexibility, and the IT team wants to meet their expectations as much as possible. Whited and her team view user profile management as critical. They would also like to see personalization capabilities incorporated into the virtualization solution, if only to bring its price down.

"If a virtualized system replaces the user's PC, we need to provide them with some ability to customize it," says Severs. "That was a huge learning experience from the pilot in 1998-99. We have to find a way to give users the freedom to set their wallpaper or whatever, and provide enough flexibility that they'll feel comfortable."

The team also expects to put significant effort into communicating with users. "We'll need to educate them about any changes that affect how they work," says Brink. "We also want to sell them on the benefits of virtualization—that even if it's not perfect for them, the payoff is worth it overall. We hope to find the best of both worlds."

While thin clients have their place, Whited says most users will remain on a rich client, even with virtualized application delivery. "Users will still need local peripherals," she says. "They'll need graphics and video. They'll have applications that need to run locally, outside the VDI environment. There will always be a need for a significant number of rich clients."

For more information on Wake Forest Baptist Medical Center: www.wakehealth.edu