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Cut Costs With Computing

by Patrick H. Hartley

What if there were a way to triple the number of administrative computers in your district without tripling the cost? Take a look at the numbers and consider Thin Client computing.

The world runs on computer technology and there is no question that it is a vital component of today's educational process. Unfortunately, computer technology has the lifespan of a housefly in a room full of frogs. Leading companies upgrade their desktops every 36 months. Servers get upgraded every 24 months. With this rate of change, how can schools afford to keep viable technology in the hands of students and staff?

The current paradigm for technology expenditures in schools is too often focused on the simplest and most evident cost of technology: initial purchases of hardware and software. The costs of supporting and administering the technology and its related infrastructure are often misunderstood or actually ignored.

This cost-induced myopia can result in crisis periods when districts realize that their technology is growing hopelessly outdated and the costs of maintaining, upgrading, and replacing computer equipment have become prohibitive. Districts in this position are faced with few choices. Luckily, there is a tool available that was first made popular in business: the Total Cost of Ownership (TCO).

TCO is helping many educational organizations analyze and understand the actual costs involved in purchasing, deploying, and maintaining their technology endeavor.

Total Cost of Ownership

The TCO concept essentially involves minimizing the expense required to use technology while maximizing the use of those investment dollars. These investment dollars are broken down into two basic areas: "hard costs," which include the price of equipment and software, and "soft costs," which include the costs to support the equipment and its users.

Hard costs are fairly easy to figure out for technical implementation. They reflect the costs to purchase the equipment and software needed to fuel any technology endeavor. These costs are fairly comparable across organizations.

Soft costs are more difficult to realize. They reflect the cost of applying resources to install, maintain, manage, and even power the physical hardware and infrastructure. They may include everything from the electricity needed to run the computers to a percentage of the salary for the Help Desk technician. These costs vary greatly between organizations and are often difficult to compare.

In order to reduce the total cost of ownership, many school districts, including my own, are adopting the idea of centralized computing and software application management in order to minimize the effects of rapid technology change and obsolescence. A key component of this concept is Thin Client (TC) computing.

Thin Client Computing

This idea is almost a return to the days of mainframe computers, where users throughout the enterprise accessed a large computer system at a central location from "dumb" terminals. The terminals did little or no processing themselves, but simply passed keystrokes on to the mainframe computer, which processed them and responded with a screen display or printout.

With the advent and rise in popularity of the personal computer (PC), computing became much more decentralized and the reliance on mainframe technology diminished. The PC evolved faster than its bigger sibling and within a few years it was possible to place more computing power on the desktop than was available from the legacy mainframes.

Often the centralized mainframe became simply a server for printing or a storage area for data. All the actual processing was now done at the desktop, where the user had much more freedom and more personal tools to decide how and when the data were processed into information.

TC computing is an outgrowth and evolution of both of these technologies.

Software and Hardware Components of TC

Thin Client technology is truly a blend of old and new ideas. In its simplest form, it is composed of a Thin Client Appliance that connects via a network or modem to a Terminal Server.

The TC appliance's job is to send keystrokes and mouse movement to the Terminal Server at the other end of the connection. Several manufacturers supply Thin Client appliances. With a cost as low as \$400 each, most of these devices contain no moving parts (usually no floppy disk or CD-ROM drives either) and can be the size of a paperback. The appliances are easily interchangeable, so repair is simply a matter of swapping the broken one for a new one. Many of them include kits that will allow them to be mounted very neatly to the sides of a monitor or desk, freeing up considerable space.

In addition to using a dedicated appliance, Thin Client terminal software can also be run on a standard desktop computer in order to provide access to standardized central applications for the user. This will allow the PC to be used in its fullest extent for non-standard hardware and software as needed by the individual user.

The Terminal Server runs an operating system specifically designed to provide Thin Client services (such as Windows 2000 " Terminal Server). This server acts as the brains of the system. When a user connects to the server, it creates a virtual version of the standard GUI desktop. It then acts on the instructions from the appliance and passes a "picture" of what is happening on the virtual desktop at the server back to the user at the Thin Client appliance.

Terminal Server hardware is available from most major manufacturers. In general, these servers differ from standard file and print servers in their hardware configurations. Terminal Servers often contain multiple processors (most commonly two), large amounts of RAM (up to four gigabytes), multiple network cards, and very fast hard drives. Exact specifications will depend on the results of testing in each specific environment. Terminal Servers and their software can cost anywhere between \$7,000 and \$14,000 each.

Below is a comparison of some of the hard costs for the desktop model of computing vs. the Thin Client model:

Desktop: Server - \$5,000

Network Software - \$2,500

100 Personal Computers - \$150,000

Total: - \$157,500

Thin Client:

Server \$7,500

Network Software - \$2,500

100 Network Appliances - \$40,000

Total: - \$50,000

Again, comparisons of soft costs are very difficult, as they vary depending upon each organization's technical support infrastructure, expertise, and current deployment of technology. In general, soft costs are less in a Thin Client environment because software, hardware, and user support are centralized.

Example Deployment Model

Many companies offer TC solutions and components, including WYSE, Sun, Microsoft, CITRIX, IBM, and DELL. (There are even ways to build your own solution using LINUX.) These companies often provide software add-ons and management snap-ins that allow TC deployment to include the ability to deploy applications such as Microsoft Word, so that they can be launched from a Web page and run inside a Web browser window.

Each one of these solutions has attributes that may make it the best choice in a given environment. The only way to determine the best hardware and software in a particular environment is to do extensive testing. The one rule to remember for deploying Thin Client in any organization is this: There are NO cookie-cutter solutions!

Successful deployment will occur only as a result of thorough and continuous testing and ongoing administration. Be very wary of anyone presenting a turnkey solution. Platforms and solution choices must be carefully considered and tested before purchasing even a single piece of hardware or software. Each organization is different!

In the case of my own district, almost a year of extensive research and testing has indicated that using Thin Client under Windows 2000 appears to be the best solution for our environment.

After extensive testing and evaluation we chose to deploy a Thin Client solution in several phases. Our ultimate goal is that all core applications will be standardized and delivered via terminal server to a Thin Client device or software agent on a PC.

These core applications were determined to be:

- Microsoft Office 2000
- Internet Explorer
- Lotus Notes
- Norton Anti-Virus

My district's deployment will replace a large number of administrative desktop computers with TC appliances in those areas where access to non-standard applications and hardware is not needed. For instance, a building principal might get an appliance so that he or she can do e-mail, word processing, and Web browsing, while the building secretary might retain a desktop PC for extra applications such as multimedia and desktop publishing. However, core applications will still be delivered via terminal server to client software to the desktop.

Teachers will receive a TC appliance as a tool from which they will have access to online grading and student assessments as well as the core applications. The idea is to give teachers a highly reliable data device similar in concept to the telephone already deployed in each classroom. This will free up full-blown existing computers for full-time use as instructional devices rather than tying them up in an administrative role.

The proposed model will also centralize data storage for 32 separate sites and allow all users access to data and applications from anywhere, at any time. Overall, we will deploy centrally managed Thin Client to almost 3000 users at one-third the cost of a similar deployment of desktop computers.

Deployment Pros and Cons

There are several reasons to consider Thin Clients as a way to replace or augment desktop computers.

- The hard cost of deploying the Thin Client solution is typically 30 to 60 percent of deploying an equivalent number of desktop computers.
- Proper deployment of Thin Client will allow for the reduction of support costs by centralizing administration.
- Everyone in the enterprise has access to the same versions of software. Software can be upgraded and changed "overnight" without having to touch every device on the network.
- Thin Clients provide ubiquitous access to data and programs from any TC-compliant platform. Staff can access the same programs and data from anywhere, including home.
- By adding products such as Citrix MetaFrame, the Windows 2000 desktop and associated applications may be run on a wide variety of computers such as Macs, Linux, and even DOS systems. This allows the organization to extend the life of existing "vintage equipment."

Although this appears very attractive at first glance, there are some tradeoffs for deploying Thin Client instead of full-blown desktop computers.

- Thin Clients are typically far less flexible than PCs in meeting additional user needs. For instance, a user who needs a software package that is not available on the terminal server may be out of luck until the administrator for the Thin Client network can make it available.

- Some programs may not run at all on Thin Clients. Programs that have been customized or written in-house may not be useable when deployed via Thin Client. Typically, programs that are 32-bit Windows programs run best. Old DOS and Windows 3.1 programs may not run at all.
- Thin Clients are typically limited to the use of only 256 colors and very basic sound, if they offer sound at all. This can make developing or deploying multimedia applications via Thin Client difficult.
- Reusing older equipment means working with hardware that may no longer be supported by the manufacturer. Available spare parts may be limited or cost-prohibitive.
- Administration of Thin Clients and Terminal Servers will require ongoing tuning and management, especially in educational organizations that are growing rapidly.

Proper planning, implementation, and management of TC may extend the life of a district's technology endeavor and help to stretch those scarce technology dollars, but it is not a cure-all for technology woes. It may be a possible solution for reducing your educational organization's TCO, but only after thorough testing and trials.

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