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Make one-to-one computing a reality

Abstract

Providing every student with access to computing technology and digital resources is a strategy known as one to one (1:1) computing, by which schools can:

- Enable personalized and collaborative learning
- Meet regulatory standards for digital learning, assessments or tracking
- Prepare their students for 21st century careers

Traditionally the 1:1 computing model has been achieved by providing access to PCs, but adding PCs costs more than just their price alone. In an effort to establish a future-proof IT platform, schools are turning to desktop virtualization to achieve 1:1 computing without straining existing resources or budgets.

The traditional model:
1:1 computing with PCs at every desk

Funding obstacles

More and more educators advocate a 1:1 PC ratio at the classroom level to better teach and engage students. While this is a laudable goal, they find themselves faced with the challenge of funding such initiatives, which involve significant investment in the purchase of PCs.

Support for laptops, tablets and notebooks is often considered as an alternative. But while this method adds mobility for the user, it requires significant investment in a WiFi or mobile data network that can support every user and the ongoing repair or replacement of broken and stolen devices.

IT staffing obstacles

Let's say a school district is able to increase funding and install 500 PCs to serve 500 students at a typical K-8 school. The increased maintenance and support would require at least one or two additional full-time technicians on site at each school.

With limited IT support budgets, many districts rely on teachers to troubleshoot computer problems in the classroom. Most teachers lack the technical skills necessary to quickly diagnose and repair those problems. Soon malfunctioning PCs lay dormant while students again have to work two or more per PC.

Infrastructure obstacles

School buildings, especially older ones, just don't have the infrastructure to support 1:1 computing with PCs.

- **Space:** A typical mini PC sitting on a desk with keyboard, LCD monitor and a mouse is 24" wide by 16" deep. This uses 75 square feet of desk space to support 28 students. PCs that are moved underneath to allow room for reading and writing at the desk are often kicked, which reduces their lifespan greatly.
- **Electrical:** A typical PC uses about 110W of power. The electrical requirements for a total installation add up quickly. Older buildings are not necessarily wired to support such electrical usage. Even if a building can support the usage, the cost of electricity alone is often prohibitive.
- **HVAC:** A typical 110W PC will put out over 680 BTU (British Thermal Units) per hour. In a school where there are 28 PCs per classroom replicated across nine classrooms, the school would require an additional 4.2 tons worth of air conditioning load to handle the increased thermal output, roughly equivalent to the air conditioning load for an additional 2.5 classrooms.

The sustainable model:
1:1 computing with desktop virtualization

Desktop virtualization moves the operating system (OS), applications and data from the PCs of many students, teachers and staff to one centralized location, usually a server. Everyone then connects simultaneously to the server to access their software and files from simple terminals, removing the need for resource-intensive PCs.

The two flavors of desktop virtualization

There are two main approaches to desktop virtualization. Both work by virtualizing software and presenting it to the user.

- **Virtual Desktop Infrastructure (VDI):**
  With VDI, the entire operating system, applications and settings that would have been deployed on a PC are instead virtualized as a package for each user on the server called a virtual machine or VM. This allows IT to manage resources centrally, but they must still manage an entire set of OS and applications for each user.
- **Session Virtualization (Remote Desktop Services):**
  With session virtualization, a single version of both the operating system (OS) and applications used by the group are installed on a server. Specialized software creates virtual desktop sessions, which are personal desktop environments that allow each user to access the shared OS and applications separately. This allows IT to both manage resources centrally and to manage fewer instances of software.

Lower acquisition cost

In both desktop virtualization models, a classroom of 28 PCs is replaced by a server that can support 28 users and simple, low cost and durable thin clients at each desk. The cost of the server and 28 clients is less than that of 28 PCs. And because servers and thin clients last longer than PCs, refresh cycles and the investment they require are greatly reduced.

Session virtualization has more significant cost savings beyond this. By running fewer instances of the OS and software, fewer resources are taken up and more users can fit onto each server.

Lower technical support cost

The cost of supporting a PC (maintenance, patching, repairs, and general management) is 85% of the total cost of ownership. Simply by reducing the number of physical computers, and therefore the number of computers you have to repair or visit each day, overall support costs are reduced significantly.

Desktop virtualization allows technical support staff to use server management software to provide support for multiple campuses without ever leaving the district office. If a virtual desktop needs attention, the teacher simply alerts the district support technician who accesses the station on the server and applies a fix in a matter of minutes, with minimal classroom disruption.

Session virtualization further reduces demand for technical services by reducing the number of servers, OS and software that need to be managed. Each technician can service more users than with VDI, allowing schools to increase computing access more significantly before needing to add additional IT staff.

The infrastructure-friendly solution

Desktop virtualization puts less strain on existing school infrastructure.

- **Space:** Thin clients are no larger than a deck of playing cards and can be mounted to the back of a monitor with a few screws. This reduces the footprint to just that of the keyboard and mouse and prevents the thin clients from being kicked or spilled on. It also gives teachers much more flexibility in the physical configuration of their classrooms.
- **Electrical:** Compared to a 110 watt PC, thin clients require a fraction of the electricity. Using as little as 1 watt per device, 28 thin clients in a classroom would require just 28 watts of power whereas 28 computers would use 3080 watts on average.
- **HVAC:** Because thin clients require minimal electricity, there is virtually no increase in heat generated in the classroom. Large numbers of clients can be deployed without the need to expand HVAC systems.

Conclusion

Thousands of school systems around the world are making their one to one computing goals reality thanks to desktop virtualization. Its benefits, in reducing acquisition costs, lowering the IT administrative burden and eliminating infrastructure challenges, offer a computing model that is not only attainable, but sustainable into the future.